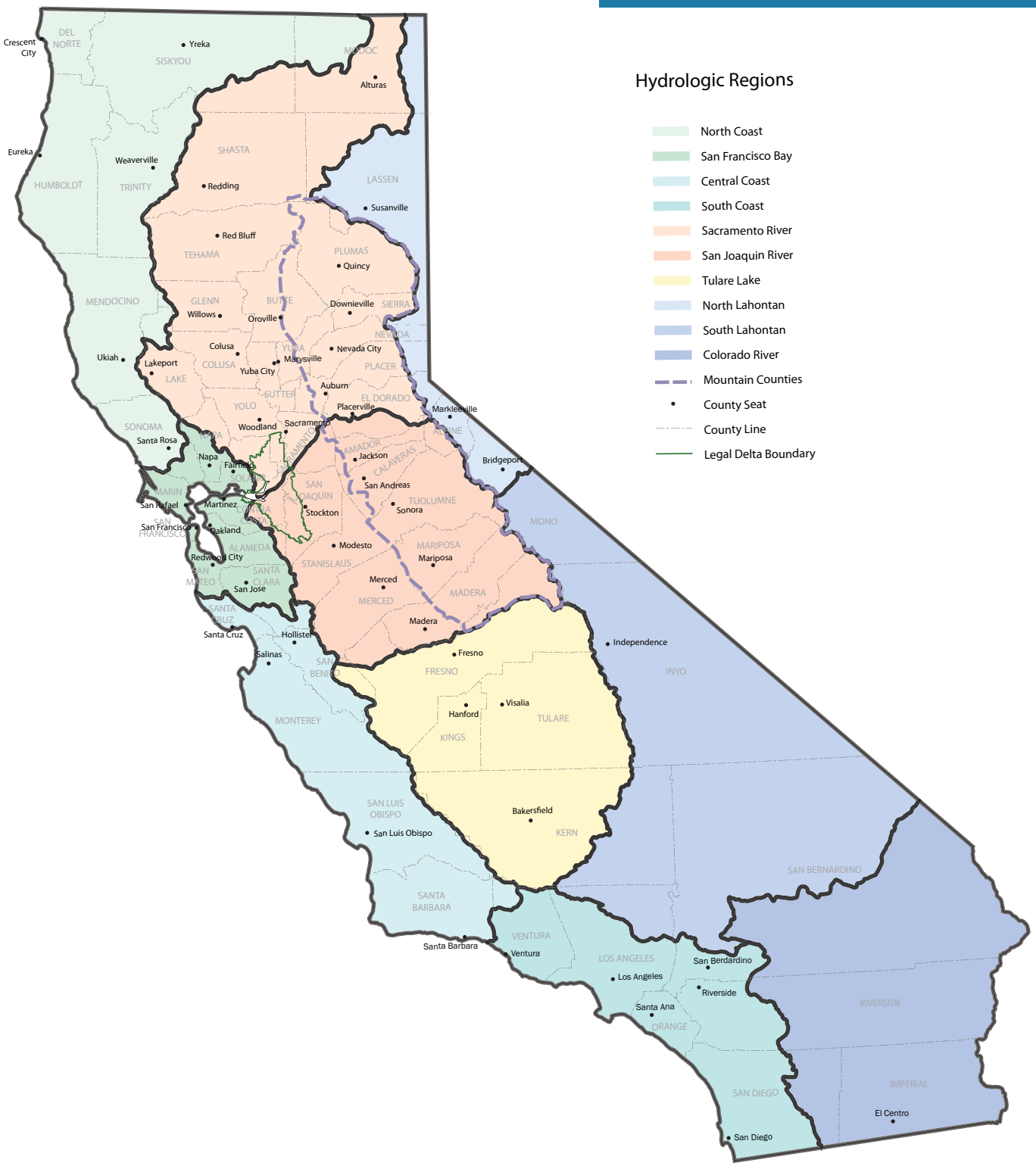
# Statewide Data

# Regional Data
(Select Region from Map)

# Delta

# Mountain Counties

# Glossary



# California

Scenarios

- Definitions
- Factors
- Narratives

Statewide Information

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

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All Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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Data Documentation

California Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | 4986 | 5057 | 5349 | 5197 | Data for 2002-2005 is under development | | | |
| Total Desalination | 0 | 0 | 0 | 0 | | | | |
| Water from Refineries | 0 | 0 | 0 | 0 | | | | |
| Inflow From Oregon | 2105 | 0 | 1498 | 988 | | | | |
| Inflow From Mexico | 182 | 179 | 166 | 155 | | | | |
| Precipitation[1] | 329588 | - | 187743 | 139183 | | | | |
| Runoff - Natural | 53812 | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | 0 | 0 | | | | |
| Local Deliveries[2] | 22538 | 44818 | 19771 | 15342 | | | | |
| Local Imports | 943 | 993 | 811 | 828 | | | | |
| Central Valley Project :: Base Deliveries | 1585 | 2249 | 1926 | 2015 | | | | |
| Central Valley Project :: Project Deliveries | 3707 | 4759 | 4790 | 4106 | | | | |
| Other Federal Deliveries | 693 | 941 | 799 | 667 | | | | |
| State Water Project Deliveries | 2142 | 2750 | 3629 | 2086 | | | | |
| Water Transfers - Regional | 1 | 0 | 1 | 0 | | | | |
| Water Transfers - Imported | 0 | 0 | 0 | 0 | | | | |
| Recycled Water - Agriculture[1] | 28 | 166 | 28 | 28 | | | | |
| Recycled Water - Urban[1] | 271 | 281 | 254 | 262 | | | | |
| Recycled Water - Groundwater[1] | 8 | 6 | 43 | 42 | | | | |
| Groundwater Extractions - Banked[1] | 0 | 0 | 0 | 0 | | | | |
| Groundwater Extractions - Adjudicated[1] | 848 | 716 | 927 | 903 | | | | |
| Groundwater Extractions - Unadjudicated[1] | 9122 | 14201 | 13926 | 16785 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 594 | 2606 | 825 | 636 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 14288 | 11985 | 10352 | 7558 | | | | |
| Re-use of Return Flows - Urban[1] | N/A | 366 | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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California Land Use Information

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Population[1] | 32857690 | 33429402 | 34088135 | 34757640 | 35396898 | 35995754 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 8942 | 8926 | 8975 | 8670 | 8718 | 8556 | 8680 | 8693 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 560 | 569 | 537 | 534 | 584 | 608 | 576 | 553 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

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California Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | 85 | 0 | 108 | -13 | | | | |
| Groundwater Recharge-Adjudicated Basins | 0 | 0 | 0 | 0 | | | | |
| Groundwater Recharge-Unadjudicated Basins | 0 | 0 | 0 | 0 | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 2527 | 2631 | 2575 | 2557 | | | | |
| Evaporation from Reservoirs | 2189 | 2426 | 2415 | 2293 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 6213 | 742 | 3646 | 3203 | | | | |
| Agricultural Applied Water Use | 25172 | 32103 | 31777 | 31530 | | | | |
| Managed Wetlands Applied Water Use | 1355 | 1630 | 1473 | 1285 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 1747 | 1722 | 2124 | 1996 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 1698 | 2329 | 1918 | 1926 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 1123 | 861 | 1132 | 1121 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 308 | 408 | 364 | 385 | | | | |
| Urban Commercial Use[1] | 1263 | 1003 | 1581 | 1583 | | | | |
| Urban Industrial Use[1] | 542 | 488 | 590 | 596 | | | | |
| Urban Large Landscape[1] | 580 | 743 | 678 | 611 | | | | |
| Urban Energy Production | 137 | 136 | 137 | 137 | | | | |
| Instream Flow Net Water Use[1] | 2199 | 3522 | 2216 | 2250 | | | | |
| Required Delta Outflow Net Water Use[1] | 9505 | 7213 | 7232 | 4486 | | | | |
| Excess Delta Outflow[1] | N/A | 15329 | N/A | N/A | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 32140 | 25689 | 18255 | 6945 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 16827 | 22164 | 21676 | 21786 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 501 | 698 | 647 | 580 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 2332 | 2465 | 2670 | 2611 | | | | |
| Total Net Use - Agriculture[1] | 22613 | N/A | 27764 | 27929 | | | | |
| Total Depletion - Agriculture[1] | 20371 | N/A | 25553 | 25953 | | | | |
| Total Net Use - Urban[1] | 6320 | N/A | 7195 | 7032 | | | | |
| Total Depletion - Urban[1] | 6317 | N/A | 7192 | 7030 | | | | |
| Total Net Use - Environmental[1] | 44822 | N/A | 28673 | 14691 | | | | |
| Total Depletion - Environmental[1] | 44682 | N/A | 28540 | 14550 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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# Selected References

## Regional Reports

### Flood Management Information

California Flood Management, An Evaluation of Flood Damage Prevention Programs (Bulletin 199 – 1980)

California High Water publications ( Bulletin 69-various events)

California Data Exchange Center materials for hydromet systems

Flood Emergency Action Team (FEAT) Report, DWR dated May 1997

Water Resources Development in California (occasional reports on US Army Corps Flood Control Projects)

Sacramento and San Joaquin River Basins Comprehensive Study (US Army Corps of Engineers, 2002)

OES Multi-Hazard Mitigation Plans (2007)

Integrated Regional Water Management (IRWM)Plans

FEMA HAZUS-MH software and associated databases

CA Floodplain Management Task Force, DWR Final Report (December 2002)

Responding to California's Flood Crisis, DWR publication (January 2005)

### Water Quality Information

State Water Resources Control Board, Watershed Management Initiative. http://www.waterboards.ca.gov/watershed/index.html#wmi

State Water Resources Control Board, Groundwater Ambient Monitoring Assessment (GAMA) Program. http://www.waterboards.ca.gov/gama/index.html

State Water Resources Control Board, Geographic Environmental Information Management System (GEIMS-Geotracker) http://www.geotracker.waterboards.ca.gov/about.htm

State Water Resources Control Board, Surface Water Ambient Monitoring Program (SWAMP) Database. http://www.waterboards.ca.gov/swamp/index.html

California Environmental Data Exchange Network (CEDEN) http://bdat.water.ca.gov/Php/ceden.php

State Water Resources Control Board, Basin Plans. http://www.waterboards.ca.gov/plnspols/index.html

State Water Resources Control Board, 2002 Clean Water Act Section 303(d) list of water quality limited segments. http://www.waterboards.ca.gov/tmdl/303d_lists.html

State Water Resources Control Board, 2002 Clean Water Act Section 305(b) Report. http://www.waterboards.ca.gov/tmdl/305b.html

State Water Resources Control Board, 2006 Clean Water Act Section 305(b) Report - Water Quality Assessment of the Condition of California Coastal Waters and Wadeable Streams. http://www.waterboards.ca.gov/swamp/docs/factsheets/305breport2006.pdf

U.S. Geological Survey, National Water-Quality Assessment (NAWQA) Program

Sacramento River Basin Study Unit http://ca.water.usgs.gov/sac_nawqa/

San Joaquin- Tulare Basin Study Unit http://ca.water.usgs.gov/sanj/

Santa Ana Basin Study Unit http://ca.water.usgs.gov/sana_nawqa/

Nevada Basin and Range (NVBR) study unit http://nevada.usgs.gov/nawqa/

### General Planning Information

Urban Water Management Plans submitted to DWR pursuant to the Urban Water Management Planning Act (Water Code Sections 10610 - 10656). ftp://ftp.water.ca.gov/uwmp/completed-plans/

Groundwater Management Plans submitted to DWR (pursuant to Water Code 10753.7)

Integrated Regional Water Management Plans submitted to DWR pursuant to Proposition 84, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Costal Protection Act, passed by California voters in November 2006. http://www.grantsloans.water.ca.gov/grants/implementation/prop84/integregio_fundingarea.cfm

## Scenarios

### Environmental Flows

State Water Resources Control Board Division of Water Rights database of instream flow requirements

California Bay Delta Authority. Water Use Efficiency program “Targeted Benefits” in–stream flow needs

US Fish and Wildlife Services. Anadromous Fish Restoration Program--- Water Acquisition Program

### Flood Management Information

California Department of Water Resources. 1980. California flood management: an evaluation of flood damage prevention programs. Bulletin 199. Sep.

Central Valley Flood Protection Plan (proposed)

County general plans

Integrated Regional Water Management Plans

local flood district plans

US Army Corps of Engineers, Sacramento District. 2002. Sacramento and San Joaquin River basins, California, comprehensive study. Dec 20.

US Army Corps of Engineers. Various. Water Resources Development in California (occasional reports on US Army Corps Flood Control Projects).

# Companion State Government Plans

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 1. Air Resources Board | Air Quality Plans | | Climate change, water quality, water use, energy |
| 2. Air Resources Board | State Implementation Plan for Ozone | 1994 | |
| 3. Air Resources Board | State Implementation Plan for Carbon Monoxide | 1998 | |
| 4. Air Resources Board | Strategic Plan | 1997 | |
| 5. Air Resources Board | Comprehensive Work Plan | 1997 | |
| 6. Bay Conservation & Development Commission | The San Francisco Bay Plan | 1999 | Major regional planning |
| 7. Bay Conservation & Development Commission | Strategic Plan | 1998 | |
| 8. Bay Conservation and Development Commission | Suisun Marsh Protection Plan | | |
| 9. Boating & Waterways | Strategic Plan 2000-04 | 2000 | Recreation, noxious weeds |
| 10. Business, Transpiration, and Housing Agency | California Infrastructure and Economic Development Bank | | Scenario development, land use, economic development patterns |
| 11. Business, Transpiration, and Housing Agency | California Partnership for the San Joaquin Valley Strategic Action Proposal | 2006 | |
| 12. CALFED Bay-Delta Program | Delta Vision | Jan. 2008 | Major regional planning |
| 13. CALFED Bay-Delta Program | Delta Strategic Plan | Dec. 2008 | |
| 14. Caltrans | California Transportation Plan 2025 | 2006 | Scenario development and forecasting related to land use and water use. |
| 15. Caltrans | Ten-Year State Highway Operations and Protection Program/The Five Year Maintenance Plan | | |
| 16. Caltrans | California State Rail Plan | 2005 | |
| 17. Caltrans | Interregional Transportation Strategic Plan | 1998 | |
| 18. Caltrans | State Transportation Plan | 1993 | |
| 19. Caltrans | Climate Action Program at Caltrans | 2006 | |
| 20. Caltrans | California Regional Blueprint Planning Program (Progress Report – regional and statewide performance measures) | 2007 | |
| 21. Caltrans | California Aviation System Plan (CASP) | 2006 | |

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| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 22. Caltrans | Goods Movement Action Plan (GMAP) | 2007 | Collaboration with CalEPA |
| 23. Coastal Commission | Public Access Action Plan | 1999 | Major regional planning |
| 24. Coastal Commission | Strategic Plan | 1997 | |
| 25. Community Services and Development | Strategic Plan | 1997 | |
| 26. Conservation | Soil Conservation Plan (not implemented) | | Watershed management, Ag Land stewardship |
| 27. Conservation | Strategic Plan: California Farmland Conservancy Program | | |
| 28. Conservation | Farmland Mapping and Monitoring Program | | |
| 29. Conservation | Watershed Coordination Grant Program | | |
| 30. Conservation | Williamson Act | | |
| 31. Conservation | Strategic Plan 2001 | 2001 | |
| 32. Conservation Corps | Strategic Plan | 1998 | Emergency response, Restoration projects |
| 33. Consumer Affairs | Strategic Plan | 03/01/2005 | *[suggestion: Consumer education campaign, like "Flex Your Power"]* |
| 34. Corrections | Five-Year Infrastructure Plan | Annually | Major regional planning. Prison footprint and plant similar to a city. – contains major infrastructure, including water quality treatment. |
| 35. Delta Protection Commission | Strategic Plan | 2006 | *[suggestion: Water education curriculum for public schools; Green building for public schools and voluntary private schools (via State Architect)]* |
| 36. Education | California State Plan for Educational Improvement | 2000 | |
| 37. Education | Consolidated State Plan | | |
| 38. Emergency Medical Services Authority | Strategic Plan | 1998 | Emergency response |
| 39. Energy Commission | California Energy Demand 2000-2010 | 2000 | |
| 40. Energy Commission | California Energy Plan | 1997 | |
| 41. Energy Commission | Strategic Plan | 1997 | |
| 42. Energy Commission | Integrated Energy Policy Report | Every 2 years since 2001 | |
| 43. Energy Resources, Conservation and Development Commission | Strategic Plan | 1997 | |
| 44. Environmental Protection Agency | Strategic Vision | 2000 | Climate change, water quality |
| 45. Environmental Protection Agency | Environmental Protection Indicators for California (EPIC) | | |

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 46. Environmental Protection Agency | Clean Beach Initiative | | |
| 47. Environmental Protection Agency | Climate Action Team Scoping Plan | | |
| 48. Environmental Protection Agency | Climate Change Early Action Report | | |
| 49. Finance | Strategic Plan 1997-98 | 1997 | |
| 50. Fish and Game | CVPIA REFUGE WATER SUPPLY<br>• An Interagency Coordinated Program for Wetland Water Use Planning, USBR, USFWS, DFG, Grasslands Water District, June, 1998<br>• Report on Refuge Water Supply Investigations, Central Valley Hydrologic Basin, California, Bureau of Reclamation, March 1989<br>• San Joaquin Basin Action Plan/Kesterson Mitigation Plan, Bureau of Reclamation and DFG, December 1989<br><br>RESTORATION/RECOVERY/MANAGEMENT/CONSERVATION PLANS<br>• Restoring Central Valley Streams: A Plan for Action, DFG, November 1993<br>• Recovery Strategy for California Coho Salmon, DFG, February 4, 2004<br>• Steelhead Restoration and Management Plan for California, DFG, February 1996<br>• Pelagic Fish Action Plan, Resources Agency, March 2007<br>• Central Valley Joint Venture Implementation Plan, CVJV, 2006<br>• Baylands Ecosystem Habitat Goals, San Francisco Bay Area Wetlands Ecosystem Goals Project, March 1, 1999<br>• Environmental Water Account<br><br>CALFED/CBDP<br>• Ecosystem Restoration Program Plan Volumes I and II, July 2000<br>• Ecosystem Restoration Program Plan Strategic Plan for Ecosystem Restoration, July 2000<br>• Ecosystem Restoration Program Draft State 1 Implementation Plan, August 2001<br><br>FISHERY MANAGEMENT PLANS<br>Final Restoration Plan for the Anadromous Fish Restoration Program, USFWS, January 9, 2001<br><br>AGREEMENTS<br>• Agreement Between the Department of Water Resources and the Department of Fish and Game to Offset Direct Fish Losses in relation to the Harvey O. Banks Delta Pumping Plant, December 30, 1986<br>• San Joaquin River Group Authority – Vernalis Adaptive Management Plan, DWR. DFG, USBR, USFWS<br>LARGE SCALE PLANNING EFFORTS<br>California Wildlife Action Plan, DFG | | **LINKAGE TO 25 RESOURCES MANAGEMENT STRATEGIES**<br>• All the above DFG water-related policies relate directly to the "Ecosystem Restoration" and "Watershed Management" strategies under the *Practice Resource Stewardship* category.<br>• Many also relate indirectly to the "Pollution Prevention" strategy under the *Improve Water Quality* category. |

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 51. Food & Agriculture | Strategic Plan | 1998 | Agriculture - numerous |
| 52. Food & Agriculture | California Noxious and Invasive Weed Action Plan | Sep 2005 | |
| 53. Forestry & Fire Protection | California Fire Plan (review and update in 2005) | 1997 | The Strategic Plan and the Fire Plan both relate to: Watershed Management, Floodplain Management, Recharge Areas Protection, and Ecosystem Restoration. We also have an Urban Forestry Program that would relate to Urban Runoff Management, Urban Land Use Management and indirectly to Urban Water Use Efficiency. |
| 54. Forestry & Fire Protection | Strategic Plan | | |
| 55. Forestry & Fire Protection | Climate Change Policy (under development) | | |
| 56. General Services | Strategic Plan | 1997 | State Agency buildings and property, energy use. |
| 57. Health and Human Services Agency | Strategic Plan | 1997 | |
| 58. Health Services | Strategic Plan: Shaping the Future | 1994 | Public Health associated with Water (supply, quality, flood, vector control, etc.) |
| 59. Highway Patrol | Strategic Plan 2000-2003 | 1999 | Issues associated with emergency response for flood |
| 60. Housing & Community Development | Statewide Housing Plan: Raising the Roof | 2000 | Housing patterns and assumptions |
| 61. Housing & Community Development | Strategic Plan 2000-03 | 2000 | |
| 62. Integrated Waste Management Board | Five-Year Plan for Waste Tire Recycling Management Program | | Water Quality |
| 63. Integrated Waste Management Board | Statewide Waste Prevention Plan | 1993 | |
| 64. Integrated Waste Management Board | Strategic Plan | 1997 | |
| 65. Ocean Protection Council | Strategic Plan | 2006 | Major Planning |
| 66. Office of Emergency Services | State of California Emergency Plan | 1998 | All Hazards mitigation planning, emergency response, potential DWR partnering for 24 hour operations. |
| 67. Office of Emergency Services | Strategic Plan | 1997 | |
| 68. Office of Emergency Services | State Hazard Mitigation Plan | 2004, next in 2007 | |
| 69. Office of Environmental Health Hazard Assessment | Strategic Plan | 1997 | |
| 70. Office of Historic Preservation | Comprehensive Statewide Historic Preservation Plan | 1997 | Recreation, historic tribal issues |
| 71. Office of Planning and Research | General Plan Guidelines | 2003 | General Plan Guidelines, overall state planning policy |
| 72. Office of Statewide Health Planning and Development | Strategic Business Plan | 1998 | Public Health |

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 73. Parks & Recreation | The Seventh Generation: The Strategic Vision of California State Parks | 2001 | Recreation, watersheds, ecosystem restoration<br><br>By fostering environmental stewardship, Water-dependant Recreation is linked to the overall Environmental Benefits Management Objective. |
| 74. Parks and Recreation | California Outdoor Recreation Plan - 2002-2003 | (in progress) | |
| 75. Parks and Recreation | State Park System Plan | 2002-2003 | |
| 76. Parks and Recreation | California Recreational Trails Plan | 2002 | |
| 77. Pesticide Regulation | Strategic Plan | 1997 | Water quality |
| 78. Public Utilities Commission | Business Plan 1999-2000 | 1999 | Energy, Climate Change, Flood, Infrastructure |
| 79. Public Utilities Commission | Water Action Plan | 2005 | |
| 80. Public Utilities Commission | General Rate Case Plan | | |
| 81. Public Utilities Commission | Energy Action Plan | 2003 | |
| 82. Resources Agency | Bay Delta Conservation Plan (BDCP) | | |
| 83. Seismic Safety Commission | California Earthquake Loss Reduction Plan 1997-2001 | 1997 | Water supply and reliability, flood, all hazards mitigation |
| 84. State and Consumer Services Agency | Strategic Plan | 1998 | See Consumer Affairs |
| 85. State Coastal Conservancy | Strategic Plan | 1997 | Major Regional Planning |
| 86. State Lands Commission | Strategic Plan | 1997 | Public Trust, Watershed, Recreation |
| 87. State Military Department | Strategic and Functional Plan | 2002 | Emergency Response |
| 88. State Water Resources Control Board | Strategic Plan | IP | Numerous |
| 89. State Water Resources Control Board | California Ocean Plan | 1997 | |
| 90. State Water Resources Control Board | Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California (California Thermal Plan) | | |
| 91. State Water Resources Control Board | Water Quality Control Policy for the Enclosed Bays and Estuaries of California | | |
| 92. State Water Resources Control Board | Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California | 2000 | |
| 93. State Water Resources Control Board | eWRIMS (GIS systems) | 2007 | |
| 94. State Water Resources Control Board | Regional Water Quality Control Plans (Basin Plans) | | |

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| | • North Coast Region Basin Plan<br>• San Francisco Bay Region Basin Plan<br>• Central Coast Region Basin Plan<br>• Los Angeles Region Basin Plan<br>• Central Valley Region Basin Plan<br>• Lahontan Region Basin Plan<br>• Colorado River Basin Region Basin Plan<br>• Santa Ana Region Basin Plan<br>• San Diego Region Basin Plan | | |
| 95. State Water Resources Control Board | State Implementation Plan (AKA: Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays and Estuaries) | 2000 | Numerous<br>Developed by the RWQCBs, they are watershed management strategies that consider local conditions and pollution sources for their priority watersheds. |
| 96. State Water Resources Control Board | Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California (California Thermal Plan) | 1975 | |
| 97. State Water Resources Control Board | Water Quality Control Policy for the Enclosed Bays and Estuaries of California | 1999 | |
| 98. State Water Resources Control Board | eWRIMS (GIS systems) | Launched 2007 | |
| 99. State Water Resources Control Board | Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling | 1975 | |
| 100. State Water Resources Control Board | Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan) | 2000 | |
| 101. State Water Resources Control Board | Water Quality Control Plan for the San Francisco Bay/Sacramento – San Joaquin Delta Estuary | 1995 | |
| 102. State Water Resources Control Board | Groundwater Cleanup and Containment Zone Policy | 1996 | |
| 103. State Water Resources Control Board | Sources of Drinking Water Policy | 1988 | |
| 104. State Water Resources Control Board | Policy Regarding Water Reclamation | 1977 | |
| 105. State Water Resources Control Board | SRF (State Revolving Fund) Policy | 2003 | |

| Agency/Department | Plan Title | Date | Nexus |
|---|---|---|---|
| 106. State Water Resources Control Board | Watershed Management Initiative (WMI) Chapters (one for each Regional Board)<br>RB 1 - North Coast Region<br>RB 2 - San Francisco Bay Region<br>RB 3 - Central Coast Region<br>RB 4 - Los Angeles Region<br>RB 5 - Central Valley Region<br>RB 6 - Lahontan Region<br>RB 7 - Colorado River Basin Region<br>RB 8 - Santa Ana Region<br>RB 9 - San Diego Region | Varies, done separately for each Region | The Regional Boards have developed watershed management strategies that consider local conditions and pollution sources for their priority watersheds. |
| 107. Toxic Substances Control | Strategic Plan | 1997 | |
| 108. Water Resources | California Water Plan Update – Bulletin 160 | 2005, next in 2009 | |
| 109. Water Resources | Oroville Facilities FERC Relicensing | | |
| 110. Water Resources | California's Groundwater - Bulletin 118 | 2003 | Groundwater |

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- Crop Idling for Water Transfers ..... 13
- Dewvaporation or Atmospheric Pressure Desalination ..... 13
- Fog Collection ..... 13
- Irrigated Land Retirement ..... 13
- Rainfed Agriculture ..... 14
- Water bag Transport/Storage Technology ..... 14

## Agricultural Lands Stewardship

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National Governors Association, Center for Best Practices. Private Lands, Public Benefits: A Policy Summit on Working Lands Conservation; 2001 Mar 16; Washington D.C.

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Association of California Water Agencies [Web site] www.acwanet.com

California Bay Delta Authority. Final Draft Year-4 Comprehensive Evaluation of the CALFED Water Use Efficiency Element, December 2005.

California Department of Food and Agriculture [Web site] www.cdfa.ca.gov/

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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

# Central Coast

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- Inflow
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Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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Central Coast HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 10 | 8 | 12 | 11 | | | | |
| Evaporation from Reservoirs | 74 | 60 | 76 | 72 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 214 | 97 | 171 | 157 | | | | |
| Agricultural Applied Water Use | 816 | 1043 | 999 | 1152 | | | | |
| Managed Wetlands Applied Water Use | 0 | 0 | 0 | 0 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 69 | 57 | 84 | 87 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 43 | 93 | 53 | 55 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 33 | 26 | 38 | 34 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 13 | 19 | 16 | 16 | | | | |
| Urban Commercial Use[1] | 48 | 37 | 53 | 50 | | | | |
| Urban Industrial Use[1] | 24 | 18 | 24 | 24 | | | | |
| Urban Large Landscape[1] | 14 | 18 | 10 | 10 | | | | |
| Urban Energy Production | 14 | 14 | 14 | 14 | | | | |
| Instream Flow Net Water Use[1] | - | 18 | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 174 | - | 95 | 49 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 557 | 730 | 681 | 786 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 0 | 0 | 0 | 0 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 65 | 78 | 73 | 74 | | | | |
| Total Net Use - Agriculture[1] | 605 | N/A | 746 | 859 | | | | |
| Total Depletion - Agriculture[1] | 605 | N/A | 746 | 859 | | | | |
| Total Net Use - Urban[1] | 197 | N/A | 221 | 218 | | | | |
| Total Depletion - Urban[1] | 197 | N/A | 221 | 218 | | | | |
| Total Net Use - Environmental[1] | 174 | N/A | 95 | 49 | | | | |
| Total Depletion - Environmental[1] | 174 | N/A | 95 | 49 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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Data Documentation

Central Coast HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 25202 | - | 12596 | 11848 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 79 | 63 | 51 | 46 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | - | 47 | - | - | | | | |
| Central Valley Project :: Project Deliveries | 18 | 22 | 57 | 60 | | | | |
| Other Federal Deliveries | 54 | 58 | 61 | 55 | | | | |
| State Water Project Deliveries | 25 | 25 | 31 | 28 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | - | - | - | | | | |
| Recycled Water - Urban[1] | 18 | 17 | 18 | 19 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 897 | 1130 | 1094 | 1258 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 165 | 62 | 30 | 36 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| Central Coast Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 1409115 | 1430974 | 1459205 | 1476780 | 1492984 | 1507886 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 417 | 422 | 439 | 438 | 419 | 391 | 396 | 448 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 147 | 173 | 166 | 164 | 180 | 177 | 189 | 216 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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# Colorado River

Scenarios

- Definitions
- Factors
- Narratives

Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

Back to Selections

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

Back

Colorado River HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | -15 | - | -59 | -9 | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 1556 | 1555 | 1553 | 1552 | | | | |
| Evaporation from Reservoirs | 120 | 218 | 122 | 121 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 147 | 1 | 14 | 76 | | | | |
| Agricultural Applied Water Use | 3532 | 3450 | 3675 | 3562 | | | | |
| Managed Wetlands Applied Water Use | 32 | 31 | 30 | 30 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 144 | 28 | 155 | 123 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 57 | 97 | 56 | 67 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 26 | 5 | 16 | 36 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 8 | 11 | 3 | 8 | | | | |
| Urban Commercial Use[1] | 71 | 28 | 124 | 145 | | | | |
| Urban Industrial Use[1] | 3 | 0 | 5 | 5 | | | | |
| Urban Large Landscape[1] | 157 | 189 | 149 | 122 | | | | |
| Urban Energy Production | 77 | 77 | 77 | 77 | Data for 2002-2005 is under development | | | |
| Instream Flow Net Water Use[1] | - | - | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 2560 | 2488 | 2627 | 2548 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 32 | 31 | 30 | 30 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 222 | 144 | 208 | 196 | | | | |
| Total Net Use - Agriculture[1] | 3703 | N/A | 3832 | 3723 | | | | |
| Total Depletion - Agriculture[1] | 3703 | N/A | 3832 | 3723 | | | | |
| Total Net Use - Urban[1] | 423 | N/A | 421 | 412 | | | | |
| Total Depletion - Urban[1] | 423 | N/A | 421 | 412 | | | | |
| Total Net Use - Environmental[1] | 32 | N/A | 30 | 30 | | | | |
| Total Depletion - Environmental[1] | 32 | N/A | 30 | 30 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

Back

Data Documentation

Colorado River HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | 3905 | 3856 | 4053 | 3947 | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | 182 | 179 | 166 | 155 | | | | |
| Precipitation[1] | 9455 | - | 3034 | 4770 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 7 | - | 6 | 4 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | - | - | - | - | | | | |
| Other Federal Deliveries | - | - | - | - | | | | |
| State Water Project Deliveries | 156 | 109 | 101 | 24 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | - | - | - | | | | |
| Recycled Water - Urban[1] | 16 | 16 | 17 | 18 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 387 | 403 | 416 | 409 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 131 | 1 | 134 | 135 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

Back

| Colorado River Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 573140 | 587546 | 606535 | 627805 | 642683 | 669735 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 628 | 627 | 629 | 627 | 627 | 550 | 606 | 587 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 133 | 92 | 103 | 113 | 92 | 109 | 82 | 72 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Back Next Page

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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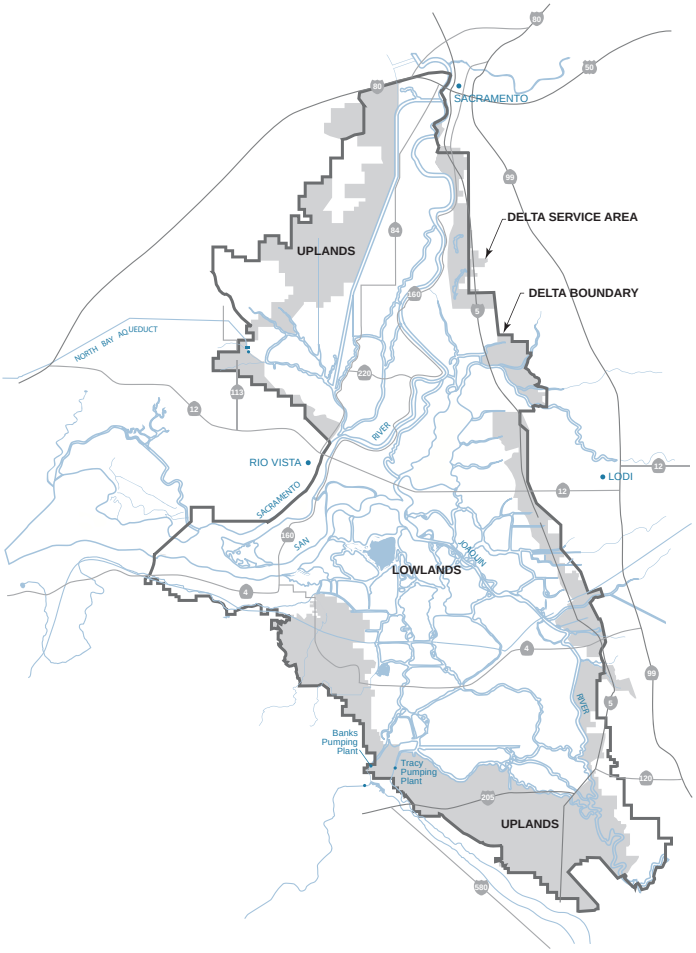
## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

# Delta





Scenarios

Definitions

Factors

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Regional Reports

Resource Management Strategies

Water Portfolio

Back to Selections

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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| Delta Water Balance Estimates[1] (TAF) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Sacramento River Inflow | 29015 | 21770 | 18360 | 10517 | 13104 | 18304 | 17129 | 16747 |
| Yolo Bypass Inflow | 8996 | 1635 | 2961 | 366 | 708 | 1122 | 3121 | 707 |
| Eastside Tributaries Inflow | 2096 | 1399 | 1078 | 372 | 462 | 534 | 445 | 1173 |
| San Joaquin River Inflow | 8456 | 3568 | 2846 | 1732 | 1396 | 1365 | 1373 | 3777 |
| North Bay Aqueduct Exports | 39 | 37 | 47 | 45 | 47 | 42 | 52 | 48 |
| Contra Costa Water District Diversions at Rock Slough and Old River | 160 | 133 | 126 | 104 | 121 | 138 | 120 | 119 |
| State Water Project Exports at Banks Pumping Plant or Clifton Court Intake | 2134 | 2439 | 3692 | 2635 | 2900 | 3458 | 3251 | 3625 |
| Central Valley Project Exports at Tracy | 2474 | 2262 | 2487 | 2332 | 2505 | 2685 | 2722 | 2679 |
| Delta Consumptive Use[2] | 1691 | 1691 | 1693 | 1691 | 1691 | 1691 | 1693 | 1691 |
| Delta Precipitation[2] | 1423 | 734 | 956 | 764 | 758 | 739 | 753 | 1089 |
| Delta Outflow | 43487 | 22542 | 18155 | 6944 | 9163 | 14050 | 14922 | 15403 |

1 Data from DAYFLOW Program; NOTE: includes DAYFLOW corrections through 01-07-2004 (http://iep.water.ca.gov/dayflow)

2 Content Required by Water Code Section 10004.6

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
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| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
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| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
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| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
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| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# Mountain Counties

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Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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Mountain Counties Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 92 | 98 | 92 | 92 | | | | |
| Evaporation from Reservoirs | 630 | 683 | 630 | 630 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 82 | 31 | 58 | 77 | | | | |
| Agricultural Applied Water Use | 260 | 351 | 331 | 307 | | | | |
| Managed Wetlands Applied Water Use | - | 50 | - | - | | | | |
| Urban Residential Use - Single Family - Interior[1] | 29 | 25 | 29 | 30 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 59 | 49 | 59 | 61 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 11 | 17 | 12 | 12 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 4 | 6 | 5 | 5 | | | | |
| Urban Commercial Use[1] | 12 | 17 | 12 | 12 | | | | |
| Urban Industrial Use[1] | 15 | 11 | 15 | 15 | | | | |
| Urban Large Landscape[1] | 11 | 19 | 11 | 11 | | | | |
| Urban Energy Production | - | - | - | - | | | | |
| Instream Flow Net Water Use[1] | 313 | 712 | 327 | 341 | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 914 | 312 | 763 | 313 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 177 | 238 | 224 | 207 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | - | 35 | - | - | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 60 | 62 | 55 | 57 | | | | |
| Total Net Use - Agriculture[1] | 283 | N/A | 357 | 339 | | | | |
| Total Depletion - Agriculture[1] | 206 | N/A | 357 | 339 | | | | |
| Total Net Use - Urban[1] | 139 | N/A | 136 | 143 | | | | |
| Total Depletion - Urban[1] | 139 | N/A | 136 | 143 | | | | |
| Total Net Use - Environmental[1] | 1227 | N/A | 1090 | 654 | | | | |
| Total Depletion - Environmental[1] | 1227 | N/A | 1090 | 654 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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Data Documentation

Mountain Counties Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 55206 | - | 38412 | 23445 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | | | | | | |
| Local Deliveries[2] | 1582 | 1484 | 1515 | 1064 | | | | |
| Local Imports | 10 | 9 | 10 | 9 | | | | |
| Central Valley Project :: Base Deliveries | - | 1 | - | - | | | | |
| Central Valley Project :: Project Deliveries | 26 | 26 | 26 | 18 | | | | |
| Other Federal Deliveries | 2 | 2 | 1 | 2 | | | | |
| State Water Project Deliveries | - | - | - | - | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 1 | 4 | 1 | 1 | | | | |
| Recycled Water - Urban[1] | - | - | - | - | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 66 | 59 | 66 | 79 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 8 | 56 | 12 | 7 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 6724 | 4153 | 4572 | 2765 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| Mountain Counties Population and Land Use Information by Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 526443 | 531809 | 540361 | 551359 | 560058 | 569208 | 576981 | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 95 | 98 | 94 | 93 | 97 | 99 | 96 | 104 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# Selected References for Resource Management Strategies

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n/a

## Other

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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

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# References

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# North Coast

Scenarios

- Definitions
- Factors
- Narratives

Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

Back to Selections

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

Back

North Coast HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 39 | 43 | 45 | 42 | | | | |
| Evaporation from Reservoirs | 168 | 186 | 181 | 163 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 271 | 62 | 183 | 144 | | | | |
| Agricultural Applied Water Use | 635 | 844 | 779 | 615 | | | | |
| Managed Wetlands Applied Water Use | 391 | 505 | 424 | 254 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 29 | 41 | 30 | 29 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 35 | 62 | 41 | 41 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 13 | 3 | 14 | 14 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 4 | 1 | 4 | 4 | | | | |
| Urban Commercial Use[1] | 17 | 11 | 17 | 18 | | | | |
| Urban Industrial Use[1] | 30 | 28 | 32 | 31 | | | | |
| Urban Large Landscape[1] | 11 | 6 | 12 | 13 | | | | |
| Urban Energy Production | - | - | - | 0 | | | | |
| Instream Flow Net Water Use[1] | 1425 | 1547 | 1442 | 1474 | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 30923 | 25602 | 17321 | 6548 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 449 | 596 | 551 | 444 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 156 | 174 | 194 | 155 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 41 | 57 | 46 | 48 | | | | |
| Total Net Use - Agriculture[1] | 529 | N/A | 641 | 523 | | | | |
| Total Depletion - Agriculture[1] | 523 | N/A | 634 | 516 | | | | |
| Total Net Use - Urban[1] | 118 | N/A | 127 | 127 | | | | |
| Total Depletion - Urban[1] | 118 | N/A | 127 | 127 | | | | |
| Total Net Use - Environmental[1] | 32615 | N/A | 19073 | 8244 | | | | |
| Total Depletion - Environmental[1] | 32615 | N/A | 19073 | 8244 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

North Coast HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | 2105 | N/A | 1498 | 988 | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 79216 | - | 50755 | 31254 | | | | |
| Runoff - Natural | 53812 | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 538 | 27595 | 593 | 341 | | | | |
| Local Imports | 2 | 16 | 3 | 18 | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | - | - | - | - | | | | |
| Other Federal Deliveries | 335 | 474 | 409 | 238 | | | | |
| State Water Project Deliveries | - | - | - | - | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 12 | 17 | 12 | 12 | | | | |
| Recycled Water - Urban[1] | 0 | 0 | 0 | 0 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 264 | 345 | 335 | 453 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 68 | 100 | 86 | 24 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 143 | 131 | 116 | 30 | | | | |
| Re-use of Return Flows - Urban[1] | N/A | 4 | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

Back

| North Coast Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 628870 | 635957 | 644000 | 651300 | 655413 | 660935 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 340 | 347 | 327 | 280 | 348 | 318 | 333 | 328 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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US Bureau of Reclamation. 2007. San Luis Drainage Feature Reevaluation Record of Decision. Mar. Availability: http://www.usbr.gov/mp/sccao/sld/docs/sld_feature_reeval_rod.pdf

Westlands Water District. 2002. Why Land Retirement Makes Sense for Westlands Water District. Availability: http://www.westlandswater.org/long/200201/landretirebro.pdf

### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

Wang, Ucilia. 2002 Dec 14. Plan to export Gualala, Albion water to Southern California drew heat on North Coast. Santa Rosa Press Democrat.

# North Lahontan

Scenarios

- Definitions
- Factors
- Narratives

Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

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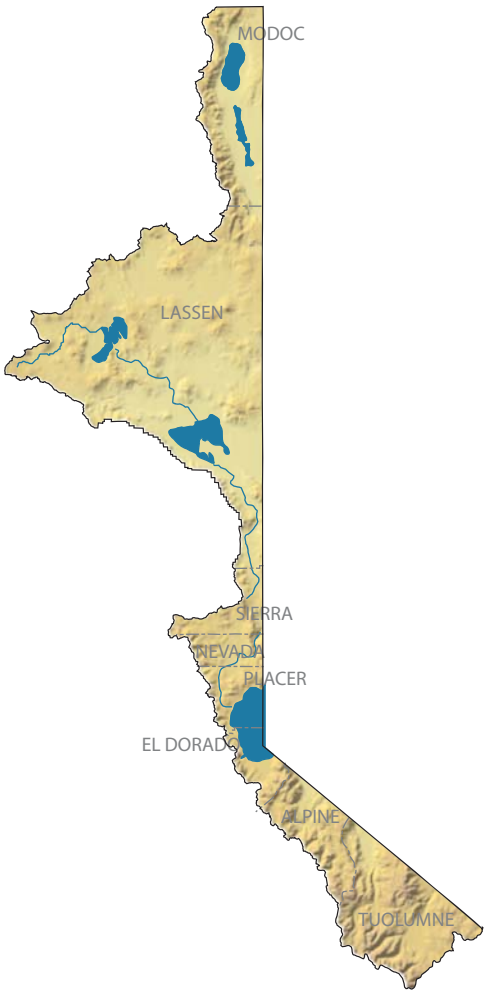

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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North Lahontan HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 295 | 304 | 314 | 318 | | | | |
| Evaporation from Reservoirs | 176 | 208 | 214 | 268 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 63 | 7 | 33 | 12 | | | | |
| Agricultural Applied Water Use | 375 | 446 | 458 | 428 | | | | |
| Managed Wetlands Applied Water Use | 19 | 25 | 26 | 21 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 3 | 5 | 4 | 4 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 5 | 10 | 5 | 6 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 4 | 2 | 4 | 5 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 1 | 1 | 1 | 1 | | | | |
| Urban Commercial Use[1] | 8 | 6 | 9 | 9 | | | | |
| Urban Industrial Use[1] | 14 | 4 | 14 | 14 | | | | |
| Urban Large Landscape[1] | 2 | 3 | 2 | 3 | | | | |
| Urban Energy Production | - | - | - | - | Data for 2002-2005 is under development | | | |
| Instream Flow Net Water Use[1] | 85 | 53 | 85 | 85 | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 96 | 87 | 56 | 29 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 241 | 291 | 298 | 281 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 13 | 19 | 20 | 17 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 9 | 13 | 9 | 9 | | | | |
| Total Net Use - Agriculture[1] | 331 | N/A | 395 | 369 | | | | |
| Total Depletion - Agriculture[1] | 331 | N/A | 395 | 369 | | | | |
| Total Net Use - Urban[1] | 24 | N/A | 25 | 26 | | | | |
| Total Depletion - Urban[1] | 24 | N/A | 25 | 26 | | | | |
| Total Net Use - Environmental[1] | 194 | N/A | 162 | 130 | | | | |
| Total Depletion - Environmental[1] | 194 | N/A | 162 | 130 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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Data Documentation

North Lahontan HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 10655 | - | 6708 | 3756 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 501 | 474 | 465 | 382 | | | | |
| Local Imports | 0 | 0 | 0 | 0 | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | - | - | - | - | | | | |
| Other Federal Deliveries | - | - | - | - | | | | |
| State Water Project Deliveries | - | - | - | - | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 5 | - | 5 | 5 | | | | |
| Recycled Water - Urban[1] | - | - | - | - | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 89 | 141 | 162 | 184 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 28 | 34 | 36 | 31 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 314 | 279 | 182 | 127 | | | | |
| Re-use of Return Flows - Urban[1] | N/A | 1 | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| North Lahontan Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 95970 | 96999 | 99035 | 99815 | 100744 | 101874 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 131 | 134 | 125 | 104 | 135 | 125 | 125 | 128 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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n/a

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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

Wang, Ucilia. 2002 Dec 14. Plan to export Gualala, Albion water to Southern California drew heat on North Coast. Santa Rosa Press Democrat.

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# Sacramento River

Scenarios

- Definitions
- Factors
- Narratives

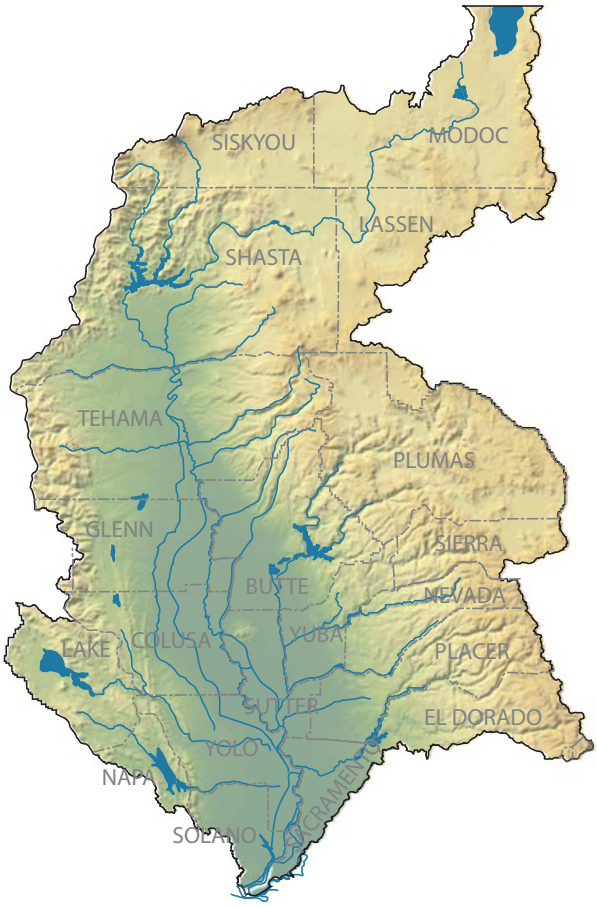
Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

Back to Selections



Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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Sacramento River HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 321 | 413 | 332 | 326 | | | | |
| Evaporation from Reservoirs | 701 | 785 | 799 | 729 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 1358 | 243 | 1058 | 1057 | | | | |
| Agricultural Applied Water Use | 5841 | 7828 | 7927 | 7782 | | | | |
| Managed Wetlands Applied Water Use | 398 | 540 | 430 | 446 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 120 | 172 | 136 | 140 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 224 | 351 | 268 | 273 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 72 | 35 | 87 | 89 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 20 | 10 | 24 | 24 | | | | |
| Urban Commercial Use[1] | 113 | 77 | 140 | 138 | | | | |
| Urban Industrial Use[1] | 77 | 59 | 84 | 85 | | | | |
| Urban Large Landscape[1] | 92 | 59 | 111 | 120 | | | | |
| Urban Energy Production | - | 0 | 0 | 0 | | | | |
| Instream Flow Net Water Use[1] | 586 | 7 | 600 | 614 | | | | |
| Required Delta Outflow Net Water Use[1] | 9505 | 7213 | 7232 | 4486 | | | | |
| Excess Delta Outflow[1] | N/A | 15329 | N/A | N/A | | | | |
| Wild and Scenic Rivers Net Water Use[1] | 948 | - | 783 | 321 | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 3678 | 5049 | 4983 | 4908 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 128 | 260 | 170 | 163 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 313 | 348 | 379 | 384 | | | | |
| Total Net Use - Agriculture[1] | 5534 | N/A | 7343 | 7303 | | | | |
| Total Depletion - Agriculture[1] | 4478 | N/A | 6088 | 6302 | | | | |
| Total Net Use - Urban[1] | 635 | N/A | 756 | 773 | | | | |
| Total Depletion - Urban[1] | 633 | N/A | 754 | 770 | | | | |
| Total Net Use - Environmental[1] | 11392 | N/A | 8999 | 5803 | | | | |
| Total Depletion - Environmental[1] | 11388 | N/A | 8995 | 5799 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

Sacramento River HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 89500 | - | 57106 | 35895 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 13940 | 8412 | 12205 | 8843 | | | | |
| Local Imports | 10 | 52 | 10 | 9 | | | | |
| Central Valley Project :: Base Deliveries | 1572 | 2189 | 1913 | 2002 | | | | |
| Central Valley Project :: Project Deliveries | 418 | 195 | 554 | 495 | | | | |
| Other Federal Deliveries | 198 | 269 | 228 | 240 | | | | |
| State Water Project Deliveries | 15 | 15 | 15 | 20 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | 98 | - | - | | | | |
| Recycled Water - Urban[1] | - | - | - | - | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 1855 | 2625 | 2815 | 2927 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | 368 | 2328 | 569 | 446 | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 4964 | 7719 | 4442 | 3753 | | | | |
| Re-use of Return Flows - Urban[1] | N/A | 332 | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| Sacramento River Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 2480300 | 2542072 | 2593110 | 2664495 | 2735502 | 2797803 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 1996 | 2005 | 2020 | 1916 | 1954 | 1942 | 1976 | 1906 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 15 | 17 | 18 | 19 | 17 | 18 | 17 | 15 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# San Francisco

Scenarios

- Definitions
- Factors
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Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

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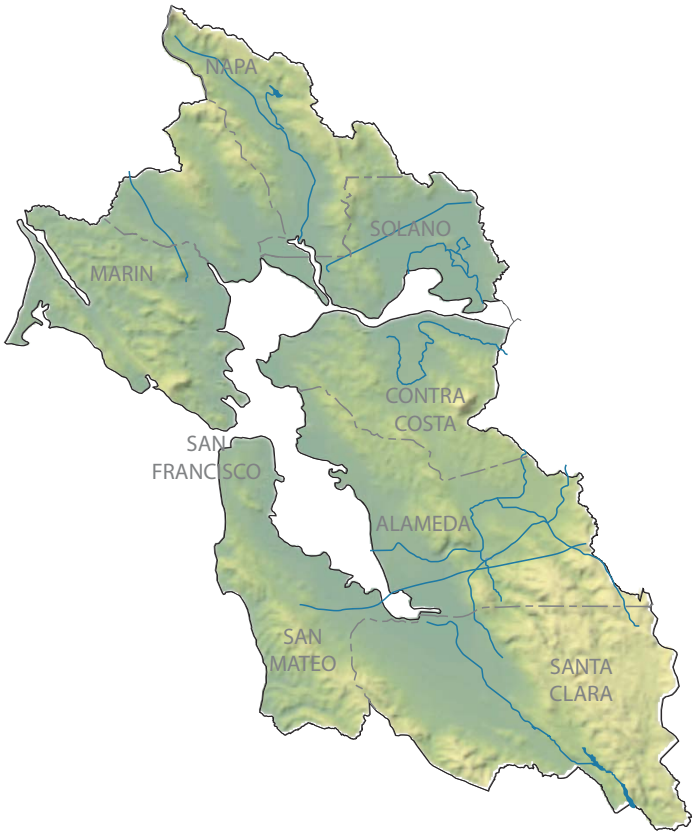

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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| San Francisco Bay Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 5931540 | 6002708 | 6105650 | 6171350 | 6219352 | 6248495 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 67 | 79 | 70 | 72 | 43 | 41 | 90 | 90 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Back

San Francisco Bay HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 10 | 10 | 10 | 10 | | | | |
| Evaporation from Reservoirs | 104 | 106 | 103 | 99 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 35 | 27 | 36 | 34 | | | | |
| Agricultural Applied Water Use | 90 | 127 | 108 | 119 | | | | |
| Managed Wetlands Applied Water Use | 6 | 6 | 6 | 6 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 120 | 121 | 130 | 136 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 280 | 283 | 304 | 317 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 171 | 192 | 185 | 194 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 43 | 48 | 46 | 48 | | | | |
| Urban Commercial Use[1] | 206 | 226 | 223 | 233 | | | | |
| Urban Industrial Use[1] | 59 | 104 | 64 | 66 | | | | |
| Urban Large Landscape[1] | 84 | 85 | 91 | 95 | | | | |
| Urban Energy Production | - | - | - | - | | | | |
| Instream Flow Net Water Use[1] | 23 | 1353 | 22 | 20 | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 69 | 98 | 84 | 92 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 3 | 4 | 3 | 3 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 291 | 442 | 307 | 320 | | | | |
| Total Net Use - Agriculture[1] | 92 | N/A | 110 | 120 | | | | |
| Total Depletion - Agriculture[1] | 92 | N/A | 110 | 120 | | | | |
| Total Net Use - Urban[1] | 936 | N/A | 1012 | 1054 | | | | |
| Total Depletion - Urban[1] | 936 | N/A | 1012 | 1054 | | | | |
| Total Net Use - Environmental[1] | 29 | N/A | 28 | 26 | | | | |
| Total Depletion - Environmental[1] | 29 | N/A | 28 | 26 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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Data Documentation

San Francisco Bay HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 11438 | - | 6644 | 4908 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 274 | 1570 | 244 | 216 | | | | |
| Local Imports | 489 | 507 | 503 | 530 | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | 105 | 103 | 109 | 109 | | | | |
| Other Federal Deliveries | 38 | 36 | 35 | 38 | | | | |
| State Water Project Deliveries | 146 | 101 | 155 | 121 | | | | |
| Water Transfers - Regional | 1 | - | 1 | 0 | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 11 | 15 | 10 | 10 | | | | |
| Recycled Water - Urban[1] | 6 | 6 | 6 | 6 | | | | |
| Recycled Water - Groundwater[1] | 6 | 6 | 6 | 6 | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 38 | 221 | 139 | 220 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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## Agricultural Lands Stewardship

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US Bureau of Reclamation. 2007. San Luis Drainage Feature Reevaluation Record of Decision. Mar. Availability: http://www.usbr.gov/mp/sccao/sld/docs/sld_feature_reeval_rod.pdf

Westlands Water District. 2002. Why Land Retirement Makes Sense for Westlands Water District. Availability: http://www.westlandswater.org/long/200201/landretirebro.pdf

### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

Wang, Ucilia. 2002 Dec 14. Plan to export Gualala, Albion water to Southern California drew heat on North Coast. Santa Rosa Press Democrat.

# San Joaquin River

Scenarios

- Definitions
- Factors
- Narratives

Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
- Population/Land Use

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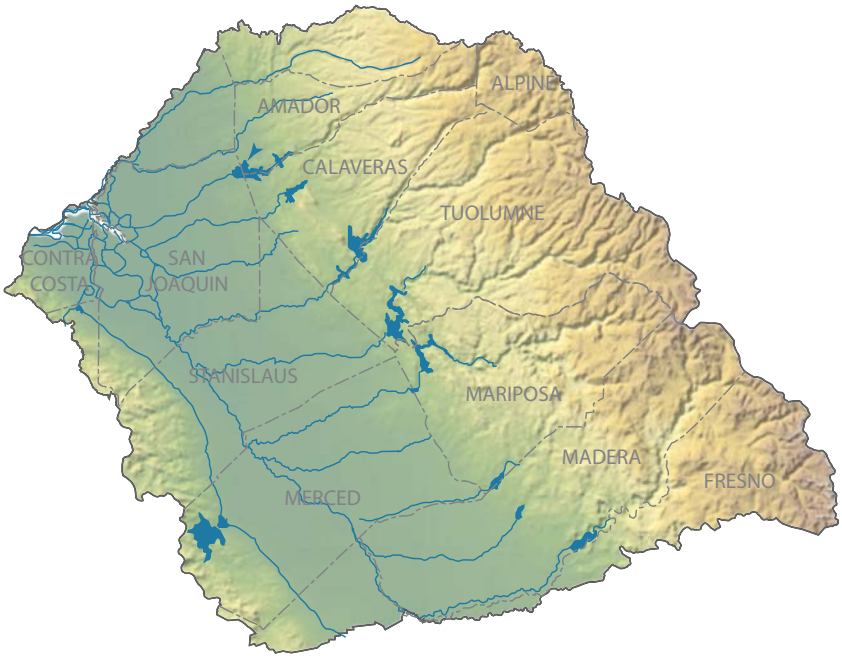

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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San Joaquin River HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 77 | 80 | 90 | 82 | | | | |
| Evaporation from Reservoirs | 420 | 486 | 477 | 449 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 1514 | 132 | 870 | 820 | | | | |
| Agricultural Applied Water Use | 5079 | 7069 | 6556 | 6794 | | | | |
| Managed Wetlands Applied Water Use | 415 | 419 | 445 | 415 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 94 | 101 | 101 | 106 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 172 | 187 | 186 | 197 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 83 | 89 | 90 | 94 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 42 | 45 | 45 | 47 | | | | |
| Urban Commercial Use[1] | 35 | 38 | 38 | 40 | | | | |
| Urban Industrial Use[1] | 86 | 86 | 89 | 90 | | | | |
| Urban Large Landscape[1] | 30 | 33 | 33 | 36 | | | | |
| Urban Energy Production | - | - | - | - | | | | |
| Instream Flow Net Water Use[1] | - | 463 | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | | - | | | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 3408 | 4843 | 4406 | 4628 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 106 | 140 | 150 | 137 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 191 | 208 | 207 | 218 | | | | |
| Total Net Use - Agriculture[1] | 4897 | N/A | 5656 | 5906 | | | | |
| Total Depletion - Agriculture[1] | 3717 | N/A | 4707 | 4938 | | | | |
| Total Net Use - Urban[1] | 353 | N/A | 374 | 400 | | | | |
| Total Depletion - Urban[1] | 353 | N/A | 374 | 400 | | | | |
| Total Net Use - Environmental[1] | 240 | N/A | 278 | 272 | | | | |
| Total Depletion - Environmental[1] | 108 | N/A | 151 | 138 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

San Joaquin River HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 35535 | - | 23209 | 16120 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 3230 | 4002 | 3541 | 3549 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | 13 | 13 | 13 | 13 | | | | |
| Central Valley Project :: Project Deliveries | 1354 | 1873 | 1791 | 1654 | | | | |
| Other Federal Deliveries | 64 | 103 | 66 | 98 | | | | |
| State Water Project Deliveries | 4 | 5 | 5 | 4 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 1 | 33 | 1 | 1 | | | | |
| Recycled Water - Urban[1] | 1 | 1 | 1 | 1 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 1766 | 2867 | 2646 | 2969 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | 143 | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 5190 | 2591 | 4192 | 2515 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| San Joaquin River Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 1669890 | 1707483 | 1751010 | 1812710 | 1862041 | 1916251 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 1969 | 1949 | 1965 | 1953 | 1927 | 1918 | 1899 | 1916 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 85 | 93 | 86 | 90 | 126 | 118 | 106 | 103 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# San Joaquin River

Scenarios

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- Inflow
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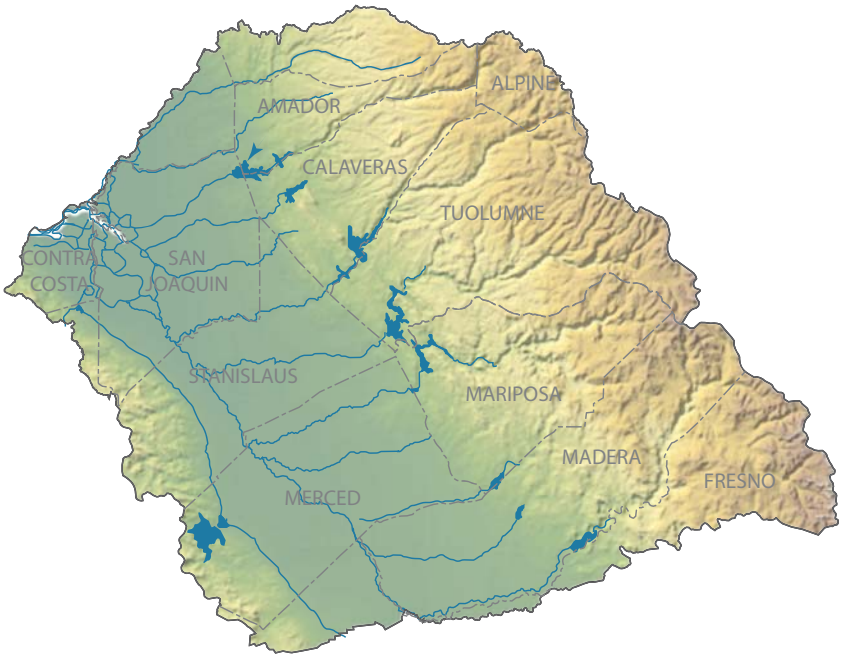

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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San Joaquin River HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 77 | 80 | 90 | 82 | | | | |
| Evaporation from Reservoirs | 420 | 486 | 477 | 449 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 1514 | 132 | 870 | 820 | | | | |
| Agricultural Applied Water Use | 5079 | 7069 | 6556 | 6794 | | | | |
| Managed Wetlands Applied Water Use | 415 | 419 | 445 | 415 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 94 | 101 | 101 | 106 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 172 | 187 | 186 | 197 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 83 | 89 | 90 | 94 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 42 | 45 | 45 | 47 | | | | |
| Urban Commercial Use[1] | 35 | 38 | 38 | 40 | | | | |
| Urban Industrial Use[1] | 86 | 86 | 89 | 90 | | | | |
| Urban Large Landscape[1] | 30 | 33 | 33 | 36 | | | | |
| Urban Energy Production | - | - | - | - | | | | |
| Instream Flow Net Water Use[1] | - | 463 | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | | - | | | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 3408 | 4843 | 4406 | 4628 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 106 | 140 | 150 | 137 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 191 | 208 | 207 | 218 | | | | |
| Total Net Use - Agriculture[1] | 4897 | N/A | 5656 | 5906 | | | | |
| Total Depletion - Agriculture[1] | 3717 | N/A | 4707 | 4938 | | | | |
| Total Net Use - Urban[1] | 353 | N/A | 374 | 400 | | | | |
| Total Depletion - Urban[1] | 353 | N/A | 374 | 400 | | | | |
| Total Net Use - Environmental[1] | 240 | N/A | 278 | 272 | | | | |
| Total Depletion - Environmental[1] | 108 | N/A | 151 | 138 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

San Joaquin River HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 35535 | - | 23209 | 16120 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 3230 | 4002 | 3541 | 3549 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | 13 | 13 | 13 | 13 | | | | |
| Central Valley Project :: Project Deliveries | 1354 | 1873 | 1791 | 1654 | | | | |
| Other Federal Deliveries | 64 | 103 | 66 | 98 | | | | |
| State Water Project Deliveries | 4 | 5 | 5 | 4 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | 1 | 33 | 1 | 1 | | | | |
| Recycled Water - Urban[1] | 1 | 1 | 1 | 1 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 1766 | 2867 | 2646 | 2969 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | 143 | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 5190 | 2591 | 4192 | 2515 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| San Joaquin River Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 1669890 | 1707483 | 1751010 | 1812710 | 1862041 | 1916251 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 1969 | 1949 | 1965 | 1953 | 1927 | 1918 | 1899 | 1916 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 85 | 93 | 86 | 90 | 126 | 118 | 106 | 103 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

Published technical and scientific papers

Ranches

United States Department of Agriculture, ARS State educational institutions (Fresno CIT, Cal Poly, etc.)

### Water bag Transport/Storage Technology

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

# South Coast

Scenarios

- Definitions
- Factors
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Regional Reports

Resource Management Strategies

Water Portfolio

- Inflow
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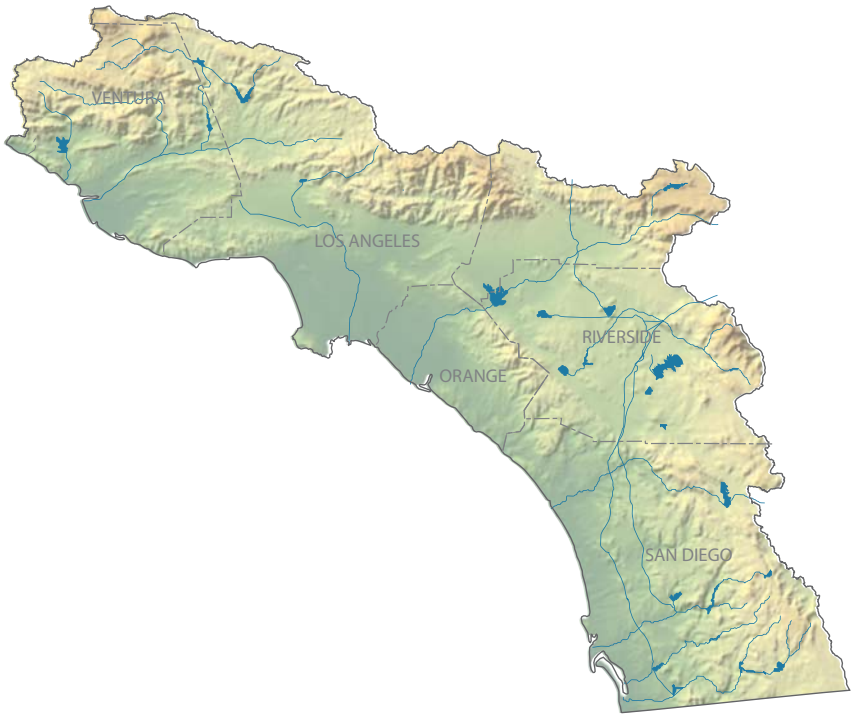

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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South Coast HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 19 | 20 | 19 | 18 | | | | |
| Evaporation from Reservoirs | 149 | 158 | 164 | 161 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 257 | 51 | 150 | 166 | | | | |
| Agricultural Applied Water Use | 692 | 840 | 908 | 758 | | | | |
| Managed Wetlands Applied Water Use | 31 | 31 | 38 | 37 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 991 | 1060 | 1253 | 1144 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 670 | 928 | 752 | 709 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 603 | 388 | 543 | 510 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 106 | 188 | 140 | 151 | | | | |
| Urban Commercial Use[1] | 700 | 533 | 914 | 886 | | | | |
| Urban Industrial Use[1] | 186 | 128 | 210 | 210 | | | | |
| Urban Large Landscape[1] | 166 | 323 | 243 | 188 | | | | |
| Urban Energy Production | 40 | 39 | 40 | 40 | | | | |
| Instream Flow Net Water Use[1] | - | - | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 495 | 615 | 646 | 543 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 31 | 31 | 38 | 37 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 942 | 891 | 1135 | 1048 | | | | |
| Total Net Use - Agriculture[1] | 606 | N/A | 796 | 665 | | | | |
| Total Depletion - Agriculture[1] | 606 | N/A | 796 | 665 | | | | |
| Total Net Use - Urban[1] | 3298 | N/A | 3860 | 3621 | | | | |
| Total Depletion - Urban[1] | 3298 | N/A | 3860 | 3621 | | | | |
| Total Net Use - Environmental[1] | 31 | N/A | 38 | 37 | | | | |
| Total Depletion - Environmental[1] | 31 | N/A | 38 | 37 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

South Coast HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | 1081 | 1201 | 1296 | 1251 | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 20873 | - | 7522 | 9327 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 292 | 283 | 211 | 217 | | | | |
| Local Imports | 442 | 418 | 294 | 272 | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | - | - | - | - | | | | |
| Other Federal Deliveries | 4 | 1 | 1 | - | | | | |
| State Water Project Deliveries | 688 | 739 | 1300 | 959 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | - | - | - | | | | |
| Recycled Water - Urban[1] | 202 | 215 | 183 | 189 | | | | |
| Recycled Water - Groundwater[1] | 2 | - | 37 | 36 | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | 786 | 606 | 865 | 841 | | | | |
| Groundwater Extractions - Unadjudicated[1] | 846 | 1124 | 1008 | 1021 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 288 | 22 | 38 | 112 | | | | |
| Re-use of Return Flows - Urban[1] | N/A | 29 | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| South Coast Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 17554050 | 17870527 | 18223425 | 18592825 | 18967005 | 19296182 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 259 | 266 | 254 | 248 | 266 | 244 | 229 | 226 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 33 | 23 | 26 | 24 | 23 | 18 | 18 | 16 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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# Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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California Cattlemen Association

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Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

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# South Lahontan

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Resource Management Strategies

Water Portfolio

- Inflow
- Outflow
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Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

Back

South Lahontan HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | - | - | - | - | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 162 | 161 | 164 | 163 | | | | |
| Evaporation from Reservoirs | 45 | 39 | 45 | 42 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 34 | 9 | 10 | 7 | | | | |
| Agricultural Applied Water Use | 281 | 318 | 361 | 344 | | | | |
| Managed Wetlands Applied Water Use | - | - | - | - | | | | |
| Urban Residential Use - Single Family - Interior[1] | 75 | 24 | 109 | 101 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 56 | 147 | 69 | 68 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 12 | 3 | 28 | 13 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 7 | 14 | 9 | 7 | | | | |
| Urban Commercial Use[1] | 28 | 8 | 19 | 20 | | | | |
| Urban Industrial Use[1] | 8 | 1 | 5 | 6 | | | | |
| Urban Large Landscape[1] | 8 | 10 | 7 | 5 | | | | |
| Urban Energy Production | 6 | 6 | 6 | 6 | | | | |
| Instream Flow Net Water Use[1] | 80 | 81 | 67 | 58 | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 188 | 214 | 238 | 235 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 0 | - | - | - | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 71 | 75 | 84 | 81 | | | | |
| Total Net Use - Agriculture[1] | 245 | N/A | 310 | 302 | | | | |
| Total Depletion - Agriculture[1] | 245 | N/A | 310 | 302 | | | | |
| Total Net Use - Urban[1] | 139 | N/A | 179 | 156 | | | | |
| Total Depletion - Urban[1] | 139 | N/A | 179 | 156 | | | | |
| Total Net Use - Environmental[1] | 80 | N/A | 67 | 58 | | | | |
| Total Depletion - Environmental[1] | 80 | N/A | 67 | 58 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

Data for 2002-2005 is under development

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

Data Documentation

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Data Documentation

South Lahontan HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 20409 | - | 7476 | 9741 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 57 | 162 | 58 | 47 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | - | - | - | - | | | | |
| Other Federal Deliveries | - | - | - | - | | | | |
| State Water Project Deliveries | 73 | 95 | 108 | 82 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | 3 | - | - | | | | |
| Recycled Water - Urban[1] | 28 | 25 | 29 | 30 | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | 62 | 110 | 62 | 62 | | | | |
| Groundwater Extractions - Unadjudicated[1] | 272 | 231 | 373 | 361 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 19 | 30 | 21 | 21 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| South Lahontan Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 698375 | 707447 | 721490 | 738645 | 758670 | 780308 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 64 | 64 | 65 | 62 | 64 | 58 | 66 | 66 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results ir more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
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### Rainfed Agriculture

California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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# Tulare Lake

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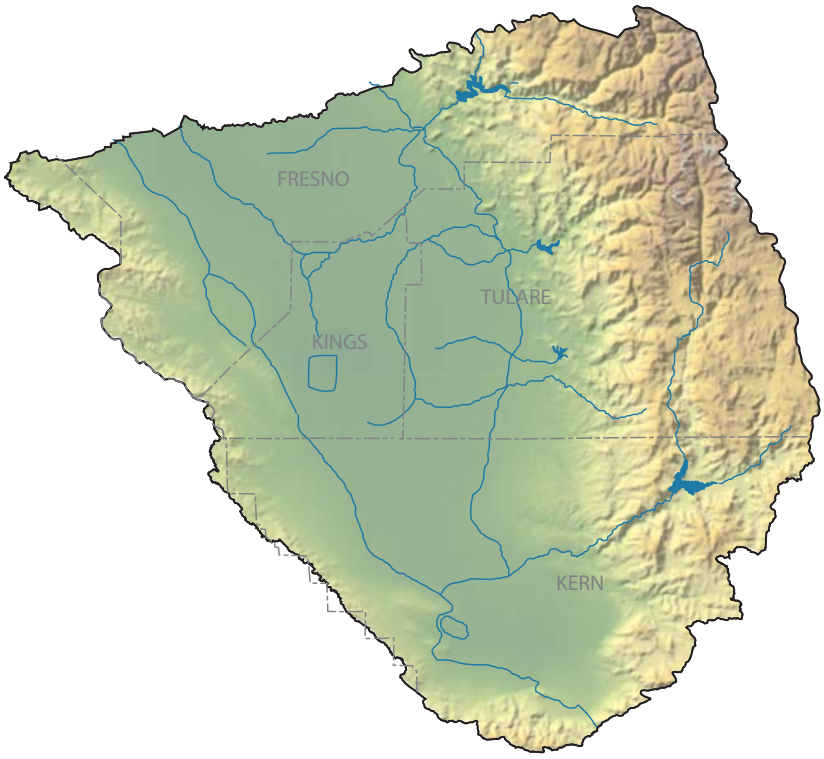

Hydrologic Regions

| | |
|---|---|
| NC | North Coast |
| SF | San Francisco |
| CC | Central Coast |
| SC | South Coast |
| SR | Sacramento River |
| SJ | San Joaquin River |
| TL | Tulare Lake |
| NL | North Lahontan |
| SL | South Lahontan |
| CR | Colorado River |

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Tulare Lake HR Water Outflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Groundwater Recharge-Contract Banking | 100 | - | 167 | -4 | | | | |
| Groundwater Recharge-Adjudicated Basins | - | - | - | - | | | | |
| Groundwater Recharge-Unadjudicated Basins | - | - | - | - | | | | |
| Evaporation and Evapotranspiration from Native Vegetation | N/A | N/A | N/A | N/A | | | | |
| Evaporation and Evapotranspiration from Unirrigated Ag | N/A | N/A | N/A | N/A | | | | |
| Evaporation from Lakes | 39 | 37 | 39 | 34 | | | | |
| Evaporation from Reservoirs | 233 | 180 | 234 | 191 | | | | |
| Ag Effective Precipitation on Irrigated Lands | 2321 | 112 | 1122 | 730 | | | | |
| Agricultural Applied Water Use | 7831 | 10138 | 10006 | 9976 | | | | |
| Managed Wetlands Applied Water Use | 63 | 73 | 74 | 76 | | | | |
| Urban Residential Use - Single Family - Interior[1] | 102 | 113 | 121 | 126 | | | | |
| Urban Residential Use - Single Family - Exterior[1] | 155 | 172 | 185 | 193 | | | | |
| Urban Residential Use - Multi-family - Interior[1] | 107 | 119 | 128 | 133 | | | | |
| Urban Residential Use - Multi-family - Exterior[1] | 64 | 71 | 77 | 80 | | | | |
| Urban Commercial Use[1] | 38 | 41 | 45 | 46 | | | | |
| Urban Industrial Use[1] | 54 | 59 | 64 | 66 | | | | |
| Urban Large Landscape[1] | 16 | 17 | 19 | 20 | | | | |
| Urban Energy Production | - | - | - | - | Data for 2002-2005 is under development | | | |
| Instream Flow Net Water Use[1] | - | - | - | - | | | | |
| Required Delta Outflow Net Water Use[1] | - | - | - | - | | | | |
| Excess Delta Outflow[1] | - | - | - | - | | | | |
| Wild and Scenic Rivers Net Water Use[1] | - | - | - | - | | | | |
| Evapotranspiration of Applied Water - Ag[1] | 5181 | 7240 | 7162 | 7320 | | | | |
| Evapotranspiration of Applied Water - Managed Wetlands[1] | 33 | 38 | 41 | 38 | | | | |
| Evapotranspiration of Applied Water - Urban[1] | 187 | 208 | 223 | 233 | | | | |
| Total Net Use - Agriculture[1] | 6072 | N/A | 8105 | 8160 | | | | |
| Total Depletion - Agriculture[1] | 6072 | N/A | 8105 | 8160 | | | | |
| Total Net Use - Urban[1] | 198 | N/A | 236 | 246 | | | | |
| Total Depletion - Urban[1] | 198 | N/A | 236 | 246 | | | | |
| Total Net Use - Environmental[1] | 36 | N/A | 44 | 41 | | | | |
| Total Depletion - Environmental[1] | 33 | N/A | 41 | 39 | | | | |
| Groundwater Sustainable Yield[1] | N/A | N/A | N/A | N/A | | | | |
| Groundwater Supplies Not Useable from Pollution[1] | N/A | N/A | N/A | N/A | | | | |
| Supplies Needed to Recover Groundwater Overdraft[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Agriculture[1] | N/A | N/A | N/A | N/A | | | | |
| Water Conservation Savings - Urban[1] | N/A | N/A | N/A | N/A | | | | |

1 Content Required by Water Code Section 10004.6

N/A = Data Not Available

"-" = Not Applicable

Data Documentation

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Data Documentation

Tulare Lake HR Water Inflow Estimates by Year in Thousand Acre-Feet

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|
| Colorado River Deliveries | - | - | - | - | Data for 2002-2005 is under development | | | |
| Total Desalination | - | - | - | - | | | | |
| Water from Refineries | - | - | - | - | | | | |
| Inflow From Oregon | - | - | - | - | | | | |
| Inflow From Mexico | - | - | - | - | | | | |
| Precipitation[1] | 27306 | - | 12693 | 11564 | | | | |
| Runoff - Natural | N/A | N/A | N/A | N/A | | | | |
| Runoff - Incidental | N/A | N/A | N/A | N/A | | | | |
| Total Groundwater Natural Recharge | N/A | N/A | N/A | N/A | | | | |
| Groundwater Subsurface Inflow | N/A | N/A | N/A | N/A | | | | |
| Local Deliveries[2] | 3622 | 2257 | 2397 | 1698 | | | | |
| Local Imports | - | - | - | - | | | | |
| Central Valley Project :: Base Deliveries | - | - | - | - | | | | |
| Central Valley Project :: Project Deliveries | 1811 | 2567 | 2280 | 1788 | | | | |
| Other Federal Deliveries | - | - | - | - | | | | |
| State Water Project Deliveries | 1035 | 1661 | 1915 | 849 | | | | |
| Water Transfers - Regional | - | - | - | - | | | | |
| Water Transfers - Imported | - | - | - | - | | | | |
| Recycled Water - Agriculture[1] | - | - | - | - | | | | |
| Recycled Water - Urban[1] | - | - | - | - | | | | |
| Recycled Water - Groundwater[1] | - | - | - | - | | | | |
| Groundwater Extractions - Banked[1] | - | - | - | - | | | | |
| Groundwater Extractions - Adjudicated[1] | - | - | - | - | | | | |
| Groundwater Extractions - Unadjudicated[1] | 2708 | 5114 | 4937 | 6985 | | | | |
| Unimpaired Streamflow[1] | N/A | N/A | N/A | N/A | | | | |
| Re-use of Return Flows - Agriculture[1] | - | - | - | - | | | | |
| Re-use of Return Flows - Managed Wetlands[1] | 3205 | 1151 | 1331 | 964 | | | | |
| Re-use of Return Flows - Urban[1] | - | - | - | - | | | | |

1 Content Required by Water Code Section 10004.6

2 Local deliveries for 1999 include instream flows and W&S Flows that were in a separate line item in Update 2005

N/A = Data Not Available

"-" = Not Applicable

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| Tulare Lake Land Use Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| Population[1] | 1816440 | 1847689 | 1884675 | 1921915 | 1962504 | 2016285 | N/A | N/A |
| Agricultural Irrigated Land Area[1] (thousands of acres) | 3070 | 3032 | 3083 | 2970 | 2937 | 2969 | 2961 | 2998 |
| Agricultural Multi Cropped Area[1] (thousands of acres) | 145 | 170 | 136 | 123 | 145 | 169 | 163 | 130 |
| Undeveloped / Natural Land Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Large Landscaped Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Residential Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Commercial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Urban Industrial Area[1] | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

1 Content Required by Water Code Section 10004.6
N/A = Data Not Available
"-" = Not Applicable

## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| Economic and Financial (E/F) | 1 - Population increases as projected by the Department of Finance. | 1 - Population increases at a slower rate than projected by the Department of Finance. | 1 - Population increases at a faster rate than projected by the Department of Finance |
| | 2 - The California economy continues to be generally robust with periodic down turns. Average household incomes continue to rise. Economic conditions for California tribes continue to improve at a modest rate. | 2 - The California economy continues to grow and experiences more moderate down turns, in part due to significant development in "green" technologies and industries. Average household incomes continue to rise, particularly for lower and middle class households. Economic conditions for California tribes continue to improve. | 2 - California's economy grows more slowly than in the past and experiences greater swings between boom and bust with. Household incomes rise more slowly than expected, particularly for low and middle income households. California's high cost of living and business results in out-migration of business and a decline in research and development. |
| | 3 - The area of irrigated agricultural land continues to decline at current rate. The intensity of agriculture (e.g. multi-cropping) increases and there are continued shifts to higher value permanent crops. | 3 - The area of irrigated agricultural land stabilizes at current acreage, and shifts to more multiple cropping and higher value permanent crops | 3 - The area of irrigated agricultural land declines more rapidly than current rate although increases in agricultural intensity (e.g. multi-cropping) and shifts to higher value permanent crops partially compensates economic affects. |
| | 4 - Clean and reliable water supplies continue to be excessively costly or unavailable to some Californians. | 4 - Clean and reliable water supplies are affordable and available for all Californians. | 4 - Clean and reliable water supplies is excessively costly or unavailable to an increasing number of Californians. |
| | 5 - Total costs (including energy and treatment costs) associated with providing clean and reliable water increase at current rate. | 5 - New energy saving and water treatment technologies reduce the tota costs of providing clean and reliable water. | 5 - Higher than expected energy and water treatment costs increase the total costs of providing clean and reliable water more than under current trends. |
| | 6 - Water resource management and ecosystem restoration is funded at the current rate. | 6 - A healthy economy along with strategic use of bond funding results in more stable and higher investment in water resources management and ecosystem restoration. | 6 - Less funding for water resources management and ecosystem restoration is available. |
| | 7 - Existing patterns of residential development continue, but on smaller lots, reflecting the increasing cost of buildable land. | 7 - Economic opportunities drive a significant shift towards high-density development patterns, lessening the footprint of new urban development. | 7 - Trends towards large-lot, decentralized residential development outpace infil and high-density development. |
| Institutional and Political (I/P) | 1 - Agencies continue to enact regulations to promote compact and mixed-use. Some new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies enact more significant regulations that promote compact and mixed-use urban development. All new urban development is designed to be less vulnerable to catastrophic events such as flooding and wildfire. | 1 - Agencies promote fewer regulations that promote compact and mixed-use urban development. Most new urban development is designed without significant consideration of catastrophic events such as flooding and wildfire. |
| | 2 - Divergent political views about long-term improvements to the State's water management systems and ecosystem restoration continue. | 2 - Political consensus is achieved on long-term solutions to improve the State's water management systems and ecosystem restoration. | 2 - Political differences significantly hinder initiatives to improve the State's water management systems and ecosystem restoration. Disputes are settled through court. |
| | 3 - Some efforts continue to maintain land in agricultural production through land conservation agreements and modest improvements to the Williamson Act. | 3 - New emphasis to maintain land in agricultural production through land conservation agreements and revamping of Williamson Act. Strong policies in place to preserve prime agricultural lands. | 3 - Efforts to maintain land in agricultural production through land conservation agreements falters. The Williamson Act is no longer in effect. |
| | 4 - Water planning and management in California becomes more integrated between water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. Agencies are more willing to share information. | 4 - Water planning and management in California fully integrates water supply, water quality, flood protection, ecosystem restoration, climate change, and land use. California develops a set of standards and protocols allowing seamless sharing and aggregation of water planning information. Every region in the State has an Integrated Regional Water Management Plan. | 4 - There is some integration of regional water management and planning, but not with local land use planning and regional flood planning. Few agencies consider the potential affects of climate change in their water plans. Limited sharing of water management information and analysis among planners. |
| | 5 - State, regional, and local water agencies continue to defer maintenance on infrastructure including the Delta levy system. | 5 - State, regional, and local water infrastructure including conveyance systems, water treatment facilities, and Delta levies receives stable funding, meets current engineering and environmental performance standards, and is well maintained. | 5 - California agencies find it increasingly difficult to obtain the necessary funding to maintain and operate state, regional, and local water infrastructure. |
| | 6 - Additional water quality regulations are adopted to control runoff from urban areas, agricultural lands, and timbered areas. | 6 - Comprehensive non-point source water pollution programs are implemented with state and federal assistance. | 6 - Local governments and business continue to oppose new non-point source water pollution regulations through lawsuits due to high implementation costs. |
| | 7 - Stakeholder participation in water management decisions continues to increase. California tribal governments continue to gain greater access to and participation in California's political system. | 7 - A larger share of Californians actively participate in water management decisions. California implements a new cabinet-level agency to work directly with California's tribes. | 7 - Many California interest groups do not participate actively in water management decisions. Public support of proposed water management actions is limited. |

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## Update 2009 Scenario Narratives

| Uncertainty Category | "Current Trends" | "Optimistic Outlook" | "Challenging Conditions" |
|---|---|---|---|
| **Natural System (NS)** | 1 - Air temperature increases throughout the state and precipitation patterns become more variable, as predicted by middle-of-the-road global circulation model predictions (as reported by the IPCC). Loss of mountain snowpack is significant and peak river flows occur earlier in the spring. Groundwater basins in regions that experience drying conditions become more at risk to overdraft. | 1 - Air temperature increases throughout the state, but at the lower end of IPCC predictions. Variability of precipitation remains similar to historical patterns. In some regions precipitation increases leading to more reliable local supplies. Loss of snowpack is less severe than anticipated by the IPCC. Precipitation and surface flows over groundwater basins continue to replenish groundwater basins. | 1 - Air temperature increases significantly throughout the state, and heat waves become more frequent and severe. Precipitation declines across most of the state, and precipitation events become more concentrated in single large events. There is significant loss in snowpack and peak river flows occurs earlier than middle-of-the-road IPCC projections. Groundwater basins receive less natural replenishment. |
| | 2 - Invasive species continue to be introduced to the state's natural aquatic systems. | 2 - Natural ecosystems respond favorably to restoration efforts. Invasive species are more easily controlled. There is greater understanding of ecosystem function and climate change. | 2 - Natural ecosystems do not respond favorably to restoration efforts. Invasive species increasingly out-compete local species. Little progress is made in understanding of ecosystem function and the effects climate change on California's aquatic ecosystems. |
| | 3 - Pollution and salt accumulation continue to impact California's surface water and groundwater bodies. There are some local efforts to reduce pollution caused by non-point source pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - Improved control of pollution and salt accumulation leads to lower impacts on California's surface water and groundwater bodies. Many areas have reduced non-point source water pollution from urban areas, agricultural lands, and timber harvest areas. | 3 - California's surface water and groundwater bodies experience more pollution and salinity than current trend. Non point-source pollution continues to be a serious problem. |
| | 4 - Floodplains management initiatives are moderately successful. | 4 - Floodplains management initiatives are extremely successful. | 4 - Floodplains management initiatives are not very successful. |
| **Technological (Tech)** | 1 - Modest advancement in residential appliances and irrigation technology allows for greater water use efficiency. | 1 - Significant advances in residential appliances and irrigation technology allows for even greater water use efficiency than in Current Trends. | 1 - Limited advances in residential appliances and irrigation technology hinder water use efficiency improvements. |
| | 2 - Modest improvement in water treatment technology allows more cost effective clean up of groundwater and brackish water. | 2 - Improvements to water treatment processes allow low cost and quick in-situ groundwater clean-up, wastewater treatment, and allow widespread availability of high quality water for specialized industrial purposes. | 2 - Water treatment technology remains at today's level. |
| | 3 - Energy use requirements for water treatment and distribution decrease modestly. | 3 - Significant reductions in energy use requirements reduces costs of water treatment and distribution. | 3 - Energy saving technology does not significantly improve from today. |
| | 4 - Some agencies starting to use web based technologies to share water management information and analysis. | 4 - New technologies enable greater sharing of water management information and analysis through the internet. | 4 - Water agencies do not effectively use internet technologies to share water management information. |
| **Cultural Practices (Cul)** | 1 - People continue to demand housing in coastal and central valley regions. | 1 - People continue to demand housing in coastal and central valley regions, but embrace infill projects and high-density development patterns. | 1 - People continue to demand housing in previously undeveloped areas of the coastal and central valley regions. |
| | 2 - Strong demand continues for recreational opportunities including water based recreation. | 2 - Much greater public demand to visit parks, wildlife areas and heritage sites and engage in outdoor recreation. | 2 - Demand for recreational opportunities including water based recreation does not increase beyond current level. |
| | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. | 3 - End users become more receptive to sustainable resource concepts, including high water efficiency appliances and landscaping practices. Private expenditures on increasing water use efficiency significantly increases. | 3 - Consumers do not embrace high water efficiency appliances and landscaping practices, and private investments in increasing water use efficiency is lower than expected. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| **Economic and Financial (E/F)** | **Total Population** | Statewide total population projection regardless of geographical distribution. |
| | **Per Capita Income** | Average annual income from all sources per person for a planning area. |
| | **Total Commercial Activity** | Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. |
| | **Commercial Activity Mix** | The mix of high and low water using commercial activity. |
| | **Total Industrial Activity** | Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. |
| | **Industrial Activity Mix** | The mix of high and low water using industrial activity. |
| | **Energy Costs** | Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g. the cost of nitrogen fertilizer, tractor manufacturing, etc). |
| | **Irrigated Crop Area - Irrigated land area** | Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. |
| | **Irrigated Crop Area - Multi-cropped land area** | Total acres of crops planted as a second or third crop within a year. |
| | **Irrigated Crop Area - Permanent crop land area** | Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. |
| | **Irrigated Crop Area - Seasonal crop land area** | Total acres of seasonal crops that are planted and harvested once or more a year. |
| | **Water Management Funding** | Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. |
| **Institutional and Political (I/P)** | **Population Density (Inst / Political)** | Average number of people per square mile for a planning area. |
| | **Population Distribution (Inst / Political)** | Geographic location within California of the population projection. |
| | **Passive Conservation (Inst/Political)** | The amount of background conservation occurring independent of the BMP and EWMP programs. |
| | **Water Quality - Drinking Water Standards** | State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. |
| | **Irrigated Crop Area - Irrigated Land Area (Institutional/Political)** | Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. |
| | **Irrigation Technology Use** | Technologies used for the direct irrigation of crops or for crop water use savings. |
| | **Water Price - Rate Structure** | Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Water Price - Cost Recovery** | Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation), etc. |
| | **Managed Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. |
| | **Private Wetlands - Irrigated land area** | Total acres of irrigated habitat managed within a privately owned wildlife refuge. |
| | **Instream Flow Requirements / Objectives** | Volume of water dedicated to instream uses and aquatic habitat. |
| | **Floodplain Development** | Total acres of land developed for non agricultural purposes within a designated 100 year, 200 year, and 500 year floodplain. |
| | **Flood Threat Recognition** | Total economic value of land located within a designated 100 year, 200 year, and 500 year floodplain. |

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| Uncertainty Category | Narrative Scenario Factor Definitions | |
|---|---|---|
| | **Factor** | **Definition** |
| | **Flood Protection Standards** | Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. |
| | **Urban Runoff Regulations** | State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. |
| | **Ag Discharge Requirements** | State and federal regulations regarding water returned to streams, rivers, groundwater aquifers or evaporation ponds by agricultural users. |
| | **Regulation of Delta Exports** | State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. |
| | **Colorado River Agreements (Inst/Political)** | State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. |
| | **Endangered Species Listing** | Number of species listed as State or federal threatened or endangered. |
| **Natural System (NS)** | **Air Temperature Variability** | Changes in the fluctuation of daily high and low temperatures at specific location. |
| | **Air Temperature Trends** | Changes in monthly average air temperature over time at a specific location. |
| | **Precipitation Variability** | Changes in the intensity and frequency of precipitation at a specific location. |
| | **Precipitation Trends** | Changes in monthly average precipitation over time at a specific location. |
| | **Snowpack/melt (intermediate factor)** | Geographic distribution of monthly snow accumulations and runoff for a specific watershed |
| | **Sea-level Rise** | Departure of mean daily sea level from historical average. |
| | **River/Stream Unimpaired Flows** | Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. |
| | **Extent of Invasive Species** | Estimated number, geographic distribution, and hazard posed by species that are not native to an area. |
| | **Resilience of Endangered Aquatic Species** | Health and vitality of endangered species whose primary habitat is dependent on water. |
| **Technological (Tech)** | **Membrane Technology Innovation** | Effectiveness of as yet developed membrane technology to treat water and reduce associated energy requirements. |
| | **Groundwater Injection Technology Innovation** | Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. |
| | **Water Use Technology Innovation** | Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscape irrigation. |
| | **Flood System Integrity** | Ability of flood infrastructure to withstand a flood with a 100 year, 200 year, and 500 year return interval. |
| | **Infrastructure Performance** | Ability of water management system infrastructure to perform as designed over time. |
| **Cultural Practices (Cul)** | **Demand for Water-based Recreation** | Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). |
| | **Population Density (Cultural)** | Average number of people per square mile within for a planning area. |
| | **Population Distribution (Cultural)** | Geographic location within California of the population projection. |

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## Update 2009 Scenario Factors

| Uncertainty Category | Initial 2009 Scenario Factors | Additional Scenario Factors |
|---|---|---|
| Economic and Financial (E/F) | Total Population | International Trade Agreements |
| | Per Capita Income | Commercial Employment |
| | Total Commercial Activity | Industrial Employment |
| | Commercial Activity Mix | Cost of Pesticides and Fertilizers |
| | Total Industrial Activity | Water Treatment Costs |
| | Industrial Activity Mix | |
| | Energy Costs | |
| | Irrigated Crop Area - Irrigated land area | |
| | Irrigated Crop Area - Multi-cropped land area | |
| | Irrigated Crop Area - Permanent crop land area | |
| | Irrigated Crop Area - Seasonal crop land area | |
| | Water Management Funding | |
| Institutional and Political (I/P) | Population Density (Inst / Political) | Land Use Regulations Including Eminent Domain Authority |
| | Population Distribution (Inst / Political) | Air Quality (Carbon Emissions) |
| | Passive Conservation (Inst/Political) | Water Privatization |
| | Drinking Water Standards | Massive Population Migrations |
| | Irrigated Crop Area - irrigated land area (Institutional/Political) | Passive Energy Conservation |
| | Irrigation Technology Use | Governance System |
| | Water Price - Rate Structure | Farm Bill Polices |
| | Water Price - Cost Recovery | Instream Water Quality Requirements / Objectives |
| | Managed Wetlands - Irrigated habitat area | Recreational Requirements |
| | Private Wetlands - Irrigated habitat area | Forest Management Requirements |
| | Instream Flow Requirements / Objectives | Green House Gas Emissions |
| | Floodplain Development | Regional Transportation Systems |
| | Flood Threat Recognition | Regulations of Chemicals |
| | Flood Protection Standards | |
| | Urban Runoff Regulations | |
| | Ag Discharge Requirements | |
| | Regulation of Delta Exports | |
| | Colorado River Agreements (Inst/Political) | |
| | Endangered Species Listing | |
| Natural System (NS) | Air Temperature variability | Water Temperature Variability |
| | Air Temperature trends | Water Temperature Trends |
| | Precipitation Variability | Stream-Aquifer Interaction |
| | Precipitation Trends | Catastrophic Events |
| | Snowpack/melt (intermediate factor) | Saltwater Intrusion |
| | Sea-level Rise | Extreme Precipitation Events |
| | River/Stream Unimpaired Flows | Condition of Pelagic Fishes |
| | Extent of Invasive Species | Phytoplankton Densities |
| | Resilience of Endangered Aquatic Species | |
| Technological (Tech) | Membrane Technology Innovation | Data Sharing Technology |
| | Groundwater Injection Technology Innovation | Water Quality Monitoring/Detection Technology |
| | Water Use Technology Innovation | Stormwater Capture Systems |
| | Flood System Integrity | Gray Water Systems |
| | Infrastructure Performance | Water Treatment Technology |
| | | Development of Safer Chemicals |
| Cultural Practices (Cul) | Demand for Water-based Recreation | Water Use Intensity |
| | Population Density (Cultural) | Forest Management Practices |
| | Population Distribution (Cultural) | Consumer Preferences |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Local Supplies | Source | http://www.waterplan.water.ca.gov/docs/technical/localdeliveries.xls |
| | Definition | The amount of water delivered by local water agencies and individuals. It includes direct deliveries of water from streamflows, as well as local water storage facilities. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm11.htm |
| | Data Recommendations | Local diversions (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required) |
| Return Flow from Other DAU/Co. within PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Return Flow from Other PA | Source | |
| | Definition | Represents surface return flows from irrigated agriculture to stream channels that are available for use in another area; does not include reuse of excess applied water that percolates to groundwater. |
| | Process Diagram | |
| | Data Recommendations | Need additional measurement points. Need annual reports of wastewater produced and/or NPDES permits |
| Local Imports | Source | http://www.waterplan.water.ca.gov/docs/technical/localimpdeliveries.xls |
| | Definition | The amount of water transferred by local agencies from other regions of the state. |
| | Process Diagram | |
| | Data Recommendations | Local Imported deliveries (In most cases we have no real time data, only historical numbers) |
| Groundwater Extraction - Unadjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that are not adjudicated nor part of a contract banking program from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Adjudicated | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from basins that have been adjudicated from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Extraction - Banked | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water withdrawn from formal interagency banking programs from the beginning of the water year to the end of the water year. |
| | Process Diagram | |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |

| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Recycled Water | Source | http://www.waterplan.water.ca.gov/docs/technical/recycled.xls |
| | Definition | The planned treatment of wastewater for specific beneficial purposes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm13.htm |
| | Data Recommendations | |
| Brackish Desalination | Source | |
| | Definition | Water coming from a brackish source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | |
| | Data Recommendations | |
| Colorado River Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/colriver.xls |
| | Definition | The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use of the Colorado River Water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm9.htm |
| | Data Recommendations | |
| State Water Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/swp.xls |
| | Definition | The sum of all deliveries to State Water Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm7.htm |
| | Data Recommendations | |
| Central Valley Project :: Base Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of prior rights water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Central Valley Project :: Project Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/cvp.xls |
| | Definition | The delivery of project water to Central Valley Project contractors. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm8.htm |
| | Data Recommendations | CVP base and project deliveries – need actual measurements (Agricultural – Small Riparian Diverters have almost no up to date records, the earliest records are 1976) |
| Other Federal Deliveries | Source | http://www.waterplan.water.ca.gov/docs/technical/otherfed.xls |
| | Definition | The sum of deliveries from federal projects other than the Central Valley Project. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm10.htm |
| | Data Recommendations | |
| Ocean Desalination | Source | http://www.waterplan.water.ca.gov/docs/technical/desal.xls |
| | Definition | Water coming from an ocean source that is desalted by reverse osmosis or other processes. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm14.htm |
| | Data Recommendations | |
| Water from Refineries | Source | http://www.waterplan.water.ca.gov/docs/technical/refineries.xls |
| | Definition | Water produced as a byproduct of the oil or gas refining process. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm16.htm |
| | Data Recommendations | |
| Water Transfers - Regional | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred within a hydrologic region from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |

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| Water Inflow Assumptions for Current Conditions | | |
|---|---|---|
| Inter-basin Water Transfers | Source | http://www.waterplan.water.ca.gov/docs/technical/transfers.xls |
| | Definition | Water that is transferred across hydrologic region boundaries from one agency to another. Transfer requires approval from the Board for a change in place of use. |
| | Process Diagram | |
| | Data Recommendations | additional data needed |
| Inflow from Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowor.xls |
| | Definition | Klamath River inflow from Oregon |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Inflow from Mexico | Source | http://www.waterplan.water.ca.gov/docs/technical/inflowmx.xls |
| | Definition | The New River and Alamo River inflows from Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Precipitation | Source | http://www.waterplan.water.ca.gov/docs/technical/precip.xls |
| | Definition | The amount of precipitation that falls on an area as either rain or snow. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Natural Runoff | Source | http://www.waterplan.water.ca.gov/docs/technical/runoff.xls |
| | Definition | The portion of precipitation that runs off the land and makes up the natural flow in rivers. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm2.htm |
| | Data Recommendations | |
| Incidental Runoff | Source | |
| | Definition | The portion of precipitation that would have been used by natural vegetation but now contributes to runoff. This is a result of roads, paved areas, building roofs, land drainage systems, fields developed for irrigation, and other changes in land use. |
| | Process Diagram | |
| | Data Recommendations | |
| Water Use Efficiency Measures | Source | |
| | Definition | |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm29.htm |
| | Data Recommendations | |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Groundwater Recharge-Contract Banking | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins under formal contract programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Adjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that have been adjudicated by a court of law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Groundwater Recharge-Unadjudicated Basins | Source | http://www.waterplan.water.ca.gov/docs/technical/groundwater.xls |
| | Definition | The amount of water recharged into groundwater basins that are neither adjudicated nor part of formal contract banking programs. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm20.htm |
| | Data Recommendations | (Agricultural and Managed Wetlands have incomplete information in most basins, additional data and the means to collect that data is required. Groundwater extractions are often backed into, which tells us there was no means of calculating GW Pumpage). Fund water source mapping & collection of pumping records |
| Evaporation and Evapotranspiration from Native Vegetation | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The evaporation of precipitation from land surfaces and the evapotranspiration of precipitation by trees, brush, grass, and other plants. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | Develop additional plant unit E&ET values |
| Evaporation and Evapotranspiration from Unirrigated Ag | Source | |
| | Definition | The evaporation of precipitation and the evapotranspiration of precipitation by dry-farmed crops. |
| | Process Diagram | |
| | Data Recommendations | Develop crop coefficients & collect or map acreage |
| Evaporation from Lakes | Source | |
| | Definition | The annual surface evaporation from natural lakes |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Evaporation from Reservoirs | Source | |
| | Definition | The annual surface evaporation from constructed surface water reservoirs |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm38.htm |
| | Data Recommendations | |
| Ag Effective Precipitation on Irrigated Lands | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | Annual precipitation used by crops planted in developed irrigated land areas. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm28.htm |
| | Data Recommendations | Refine soil moisture capacity data and infiltration/runoff relationships by DAU |
| Agricultural Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The quantity of water delivered to the farm headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Improve frequency of land use surveys; 2. Collect more data on irrigation methods; 3. Collect data on or farm applied water;4. Collect data on water sources |

| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Managed Wetlands Applied Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The quantity of water delivered to the wetland headgate |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm31.htm |
| | Data Recommendations | 1. Collect annual acreage by habitat type; 2. Collect flood-up and drawdown dates, flood depths, flow through rates, and other management practices |
| Urban Residential Use - Single Family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a single-family, detached housing unit for such uses as personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Single Family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a single-family, detached housing unit. Uses include landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Interior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used within a residential, multi-family housing unit (with two or more units), which houses two or more households (such as duplexes, apartments, or condominiums). Uses include personal hygiene, cooking, drinking, and laundry. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Residential Use - Multi-family - Exterior | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used outside of a residential, multi-family housing unit, for uses such as landscape irrigation, swimming pools, car washing, sidewalk cleaning, and the watering of domestic animals. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Commercial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used by non-manufacturing business establishments including retail services, office buildings, restaurants, and other consumer-oriented services or businesses. Also includes employee uses, privately owned large landscaped areas (parks and golf courses) and recreational facilities (temporary lodging). This can include Institutional or Governmental use as well. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Industrial Use | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The uses of water for processing, manufacturing, and other industrial plant uses as defined by the North American Industry Classification System (NAICS). This water can be used as cooling water, or for rinsing, washing, diluting, and other sanitation operations. Also included are employee uses and landscape irrigation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Urban Large Landscape | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used to irrigate recreational and large landscape areas such as golf courses, parks, play fields, highway medians, and cemeteries. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |

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| Water Outflow Assumptions for Current Conditions | | |
|---|---|---|
| Urban Energy Production | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The water used for cooling in thermo-electric power generation. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | Collect additional data & conduct studies. Municipal data limited |
| Instream Flow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The use of water within its natural watercourse as specified in an agreement, water rights permit, court order, FERC license, or other State or federal requirement. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Required Delta Outflow Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Fresh water outflow from the Sacramento-San Joaquin Delta required by law to protect the beneficial uses within the Delta from the incursion of saline water. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Excess Delta Outflow | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Freshwater outflow from the Sacramento-San Joaquin Delta that exceeds the amount required by law. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm37.htm |
| | Data Recommendations | |
| Wild and Scenic Rivers Net Water Use | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | Annual natural flows from the designated State and Federal Wild and Scenic Rivers system. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm35.htm |
| | Data Recommendations | |
| Evapotranspiration of Applied Water - Ag | Source | http://www.waterplan.water.ca.gov/docs/technical/agwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by agricultural crops. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm22.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine crop coefficients; 3. Statewide coverage of detailed soil survey data |
| Evapotranspiration of Applied Water - Managed Wetlands | Source | http://www.waterplan.water.ca.gov/docs/technical/envrwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by managed wetlands. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm34.htm |
| | Data Recommendations | Need more measurements of evap or ETo throughout state |
| Evapotranspiration of Applied Water - Urban | Source | http://www.waterplan.water.ca.gov/docs/technical/urbanwu.xls |
| | Definition | The applied water consumptively used through evaporation and transpiration by urban areas, parks and other recreation areas and by energy production. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm39.htm |
| | Data Recommendations | 1. Need more measurements of evap or ETo throughout state; 2. Refine estimates of landscape ETAW |
| Outflow to Nevada | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowNV.xls |
| | Definition | Runoff that flows from California to the state of Nevada |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Oregon | Source | http://www.waterplan.water.ca.gov/docs/technical/outflowOR.xls |
| | Definition | Runoff that flows from California to the state of Oregon. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |
| Outflow to Mexico | Source | |
| | Definition | Runoff that flows from California to Mexico. |
| | Process Diagram | http://www.waterplan.water.ca.gov/technical/processmaps/flowpm/dgm12.htm |
| | Data Recommendations | |

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California Cattlemen Association

Commodity groups

Federal Bureau of Land Management and National Forest Service

Information from best professional/scientific assessment/ judgment of DWR's staff and others

Local agencies (reports and publications)

Local farm advisers and UC System

Private rangeland owners and relevant associations of rangeland managers/owners

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# California Water Plan Update 2009

## Glossary

**A**

acre-foot (af) – The volume of water that would cover one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

adjudication –The act of judging or deciding by law. In the context of an adjudicated groundwater basin, landowners or other parties have turned to the courts to settle disputes over how much groundwater can be extracted by each party to the decision.

agricultural discharge standards – State and federal regulations regarding water returned to streams, rivers, groundwater aquifers, or evaporation ponds by agricultural users. Context: Scenario Factor.

agricultural lands stewardship – Conserving natural resources and protecting the environment by compensating owners of private farms and ranches for implementing stewardship practices. Context: Resource Management Strategy.

agriculture water reliability (average) – A measure of a water system's ability to sustain the social, environmental, and economic agricultural systems that it serves during a year of average precipitation

agricultural water use efficiency – The ratio of applied water to the amount of water required to sustain agricultural productivity. Efficiency is increased through the application of less water to achieve the same beneficial productivity or by achieving more productivity while applying the same amount of water. Context: Scenario Factor, Resource Management Strategy.

air temperature trends – Changes in monthly average air temperature over time at a specific location. Context: Scenario Factor.

air temperature variability – Changes in the fluctuation of daily high and low temperatures at specific location. Context: Scenario Factor.

allocation of long-term contractual imports – Interregional allocation of water for periods of time more than one year through mechanisms such as the State and federal water projects. Context: Scenario Factor.

alluvial – Of or pertaining to or composed of alluvium.

alluvium – A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, as a cone or fan at the base of a mountain slope.

anthropogenic – Of human origin or resulting from human activity.

applied water – The amount of water from any source needed to meet the demand of the user. For instream use, applied water is quantified as the amount of streamflow dedicated to instream purposes (or reserved under federal or State wild and scenic rivers legislation). It also is the amount of streamflow required for maintaining flow and water quality in the Sacramento-San Joaquin Delta per State Water Resources Control Board Decision 1630 or previous standards. Context: Water Portfolio

applied water reduction – A decrease in the amount of water needed to meet the demand for beneficial use; can be a supply for both new (real) water and reused water. Context: Resource Management Strategy. See also new water.

appropriative right – The right to use water that is diverted or extracted by a nonriparian or nonoverlying party for nonriparian or nonoverlying beneficial uses. In California, surface water appropriative rights are subject to a statutory permitting process while groundwater appropriation is not.

aquifer – A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant (i.e. economic) quantities of groundwater to wells and springs.

aquifer remediation – See groundwater remediation/aquifer remediation

aquitard – A confining bed or formation composed of rock or sediment that retards but does not prevent the flow of water to or from an adjacent aquifer. It does not readily yield water to wells or springs, but stores groundwater.

artesian aquifer – A body of rock or sediment containing groundwater that is under greater than hydrostatic pressure; that is, a confined aquifer. When an artesian aquifer is penetrated by a well, the water level will rise above the top of the aquifer.

artesian pressure – Hydrostatic pressure of artesian water, often expressed in terms of pounds per square inch; or the height, in feet above the land surface, of a column of water that would be supported by the pressure.

artificial recharge – The (intentional) addition of water to a groundwater reservoir by human activity, such as putting surface water into dug or constructed spreading basins or injecting water through wells.

available groundwater storage capacity – The volume of a groundwater basin that is unsaturated and capable of storing groundwater.

available soil water – The amount of water held in the soil that can be extracted by a crop; often expressed in inches per foot of soil depth. It is the amount of water released between in situ field capacity and the permanent wilting point.

average annual cost of implementing option – Annualized total monetary cost of option required for “turn key” implementation including environmental and third party impact mitigation, storage, conveyance, energy, capitalized operations and maintenance, administrative, planning, legal and engineering costs. Context: Evaluation Criteria; Planning Concept/Consideration.

average annual runoff – The average value of total annual runoff volume calculated for a selected period of record, at a specified location, such as a dam or stream gage.

average year water demand – Demand for water under average hydrologic conditions for a specific level of development.

**B**

basin irrigation – Irrigation by flooding areas of level land surrounded by dikes. Used interchangeably with level border irrigation, but usually refers to smaller areas.

basin management objectives (BMOs) – See management objectives

beneficial use – Use of water either directly by people or for their overall benefit. There are 24 categories of beneficial uses identified by the State Water Resources Control Board.

border irrigation – Irrigation by flooding strips of land, rectangular in shape and cross leveled, bordered by dikes. Water is applied at a rate sufficient to move it down the strip in a uniform sheet. Border strips having no downfield slope are referred to as level border systems. Border systems constructed on terraced lands are commonly referred to as benched borders.

**C**

catastrophic vulnerability – The probability and magnitude of potential negative economic, public health, and environmental impacts associated with water management actions. Context: Scenario Factor, Evaluation Criteria.

Central Valley Project deliveries – The volume of water imported to a given area through the Central Valley Project. Context: Scenario Factor.

check irrigation – Modification of a border strip with small earth ridges or restrictions (checks) constructed or inserted at intervals to retain water as it flows down the strip.

CIMIS – California Irrigation Management Information System- A network of automated weather stations that are owned and operated cooperatively between the DWR and local agencies. The stations are installed in most of the agricultural and urban areas in the State and provide farm and large landscape irrigation managers and researchers with “real-time” weather data to estimate crop and landscape ET rates and make irrigation management decisions.

climate change – Changes in average annual temperature and precipitation and their monthly patterns in 2050 compared to today.

Colorado River agreements (Institutional/Political) – State and federal regulations, contractual agreements, and court rulings affecting the use of water from the Colorado River. Context: Scenario Factors.

Colorado River deliveries – The amount of water diverted from the Colorado River by the Metropolitan Water District of Southern California, Imperial Irrigation District, Coachella Valley Water District, Palo Verde Irrigation District, the Yuma Project, and others under California's entitlement to use Colorado River Water.

commercial activity mix – The mix of high- and low-water using commercial activity. Note that commercial activity is broken into two factors: total commercial activity and commercial activity mix. The latter factor allows designation of the type of commercial activity that is occurring. See also total commercial activity. Context: Scenario Factor.

community water system – A public water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents. See also public water system.

consumed fraction – the portion of agricultural applied irrigation water that satisfies evapotranspiration.

conveyance – Provides for the movement of water and includes the use of natural and constructed facilities including open channels, pipelines, diversions, fish screens distribution systems and pump lifts.

conveyance facilities – Canals, pipelines, pump lifts, ditches, etc. used to move water from one area to another. Context: Study Plan Building Block, Resource Management Strategy.

confined aquifer – An aquifer that is bounded above and below by formations of distinctly lower permeability than that of the aquifer itself. An aquifer containing confined groundwater. See also artesian aquifer.

conjunctive management and groundwater storage – Coordinated operation of surface water storage and use, ground water storage and use, and conveyance facilities. Context: Resource Management Strategy.

conjunctive use – Application of surface and groundwater to meet the demand for a beneficial use. Coordinated and planned management of both surface and groundwater resources in order to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin during years of above-average surface water supply.

conservation tillage – A tillage practice that leaves plant residues on the soil surface for erosion control and moisture conservation

consumptive use – A quantity of applied water that is not available for immediate or economical reuse. It includes water that evaporates, transpires, or is incorporated into products, plant tissue, or animal tissue. Consumptively used water is removed from available supplies without return to a water resource system (uses such as manufacturing, agriculture, landscaping, food preparation, and in the case of Colorado River water, water that is not returned to the river.)

contaminant – Any substance or property preventing the use or reducing the usability of the water for ordinary purposes such as drinking, preparing food, bathing washing, recreation, and cooling. Any solute or cause of change in physical properties that renders water unfit for a given use. (Generally considered synonymous with pollutant.)

cost recovery – See water price-cost recovery.

cost of reliability enhancement – The total cost required to add an increment of reliability. Context: Evaluation Criteria.

cost of unreliability – The sum of the forgone long-term value and short-term costs incurred to the users. Context: Evaluation Criteria

critical conditions of overdraft – A groundwater basin in which continuation of present practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts. The definition was created after an extensive public input process during the development of the Bulletin 118-80 report.

cover crop – Close growing crop, that provides soil protection, seeding protection, and soil improvement between periods of normal crop production, or between trees in orchards and vines in vineyards. When plowed under and incorporated into the soil, cover crops may be referred to as green manure crops.

crop coefficient – A numerical factor (normally identified as Kp or Kc) that relates the evapotranspiration (ET) of the individual crop (ETc) to reference evaporation or some other index.

crop idling – The temporary or permanent fallowing of land previously under irrigation that results in a reduction in stresses to a water system (e.g., alternate land use must result in a reduction in water use and/or enhancement of water quality, etc.).

crop rotation – A system of farming in which a succession of different crops are planted on the same land area, as opposed to growing the same crop time after time (monoculture).

crop unit water use –The volume of irrigation water used per unit area of land, commonly expressed in acre-feet per acre. As used in scenario evaluation, a change in unit water use can be a function of evapotranspiration rates and cultural practices, but NOT use efficiency. Agricultural use efficiency is captured under its own distinct factor. Context: Scenario Factor.

**D**

detailed analysis units (DAUs) – The smallest study area for the analysis of water supply and use.

dedicated (or developed) water supplies – water distributed among urban and agricultural uses, used for protecting and restoring the environment, or storage in surface water and groundwater reservoirs. In any year, some of the dedicated supply includes water that is used multiple times (reuse) and water held in storage from previous years. This is about 40 to 50 percent of the total annual water supply received from precipitation and imported from Colorado, Oregon, and Mexico. Context: Water Portfolio.

deep percolation – Percolation of water through the ground and beyond the lower limit of the root zone of plants into groundwater deep percolation of surface and groundwater. Water that is applied for agricultural, urban, and managed wetlands in excess of the net use requirements. Water either is applied for groundwater recharge or percolates naturally to the water table. This does not include reuse, evaporation, evapotranspiration of applied water, or flows/percolation to a salt sink. Context: Water Portfolio

Delta outflow – Fresh water outflow from the Sacramento-San Joaquin Delta to protect the beneficial uses within the Delta from the incursion of saline water.

demand for water-based recreation – Water-dependent recreation activities that are consumptive (e.g. parks), flat-water (e.g. boating), or flow-based (e.g. whitewater rafting). Context: Scenario Factor.

depletion – The amount of water consumed within a service area that is no longer available as a source of supply. For agricultural and environmental wetlands water use, depletion is the sum of irrecoverable water and the evapotranspiration of applied water (ETAW) due to crops, wetlands vegetation, and flooded water surfaces. For urban water use, depletion is the ETAW due to landscaping, wastewater outflow to a salt sink, and incidental evapotranspiration. For instream flow, depletion is the amount of dedicated flow that proceeds to a salt sink. Context: Water Portfolio

desalination – Water treatment process for the removal of salt from water for beneficial use. Source water can be brackish (low salinity) or seawater. Context: Study Plan Building Block.

dewvaporation (Atmospheric Pressure Desalination) – Desalination through humidification and subsequent dehumidification (collection of evaporated water). Context: Resource Management strategy.

distribution system – System of ditches or conduits and their controls that conveys water from the supply canal to the farm points of delivery

domestic well – A water well used to supply water for the domestic needs of an individual residence or systems of four or fewer service connections.

drinking water standards – State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. Context: Scenario Factor.

drinking water system – see public water system

drinking water treatment and distribution – Treatment is the physical, biological and chemical processes that make water suitable for potable use. Distribution includes storage, pumping, and pipe systems to protect and deliver the treated water to customers. Context: Study Plan Building Block.

drip irrigation – A method of micro irrigation wherein water is applied to the soil surface as drops or small streams through emitters. Discharge rates are generally less than 8 L/h (2 gal/h) for a single-outlet emitters and 12 L/h (3 gal/h) per meter for line-source emitters.

drought preparedness– The magnitude and probability of economic, social or environmental consequences that would occur as a result of a sustained drought under a given study plan. Evaluation criteria measure the "drought tolerance" of study plans. Context: Water Management Objective

drought condition – Hydrologic conditions during a defined period, greater than one dry year, when precipitation and runoff are much less than average.

drought year supply – The average annual supply of a water development system during a defined drought period.

duty of water – The total volume of irrigation water required to mature a particular type of crop. It includes consumptive use, evaporation, and seepage as well as the water returned to streams by percolation and surface water.

**E**

economic incentives – Financial assistance and pricing policies intended to influence water management including, for example, amount of use, time of use wastewater volume, and source of supply. Context: Resource Management Strategy.

ecosystem restoration – The activity of improving the condition of natural landscapes and biotic communities. Context: Study Plan Building Block.

effective precipitation – That portion of precipitation that supplies crop evapotranspiration. It includes precipitation stored in the soil before and during the growing season

effective porosity – The volume of voids or open spaces in alluvium and rocks that is interconnected and can transmit fluids.

effective rooting depth – The depth from which soil moisture is extracted; it is determined by the crop rooting characteristics and soil depth limitations.

electrical conductivity (EC) – The measure of the ability of water to conduct an electrical current, the magnitude of which depends on the dissolved mineral content of the water.

Endangered Species listing – Number of species listed as State or federal threatened or endangered. Context: Scenario Factor

energy availability – The energy consumption to facilitate water management-related actions such as desalting, pump-storage, groundwater extraction, conveyance or treatment. This criterion pertains to the economic feasibility of a proposed water management action in terms of O&M costs. Context: Evaluation Criteria.

energy costs – Refers to the cost of energy use related to producing, conveying and applying water. It also refers to the cost of energy use for processes and inputs not directly related to water, but which can affect the demand for water (e.g., the cost of nitrogen fertilizer, tractor manufacturing, etc.). Context: Scenario Factor.

energy production – Both instantaneous capacity (megawatt) and energy produced (kilowatt hours). Context: Evaluation Criteria.

environmental justice – The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. (Section 65040.12. (c) Government code)

environmental water (flow based) – The amount of water dedicated to instream fishery uses, Wild and Scenic rivers, required and actual Sacramento-San Joaquin Delta outflow, and the Environmental Water Account.

environmental water (land based) – The amount of water used for fresh- and brackish-water managed wetlands and native vegetation.

Environmental Water Account (EWA) – The CALFED Environmental Water Account Program started in Water Year 2001. Releases for Delta Outflow-EWA is water released for endangered species protection and recovery.

environmental water quality – Water quality in terms of ecosystem health, recreation, salinity intrusion, usability per sector, treatment costs, etc. Aquatic species and water bodies are vulnerable to changes to water quality.

ETo (Reference Evapotranspiration) – The evapotranspiration rate from an extended surface of 3 to 6 inch (8–15 cm) tall green grass cover of uniform height, actively growing, completely shading the ground, and not short on water (the reference ET reported by CIMIS).

evaluation criteria – The technical information that will be used to compare the favorability of different response packages of resource management strategies against future scenarios in California Water Plan Update 2010. They are designed to identify and measure potential effects on water supply, the environment, energy use or production, recreational opportunities, groundwater overdraft, and many more.

evaporation – The physical process by which a liquid or solid is transformed to a gaseous state.

evaporative demand – The collective influence of all climatic factors on the rate of evaporation of water.

evapotranspiration (ET) – The amount of water transpired (given off) by plants, retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces

evapotranspiration of applied water (ETAW) – The portion of evapotranspiration (ET) that was provided by the applied irrigation water.

extent of invasive species  Estimated number, geographic distribution, and hazard posed by species that are not native to an area. Context: Scenario Factors

**F**

flood irrigation – Method of irrigation where water is applied to the soil surface without flow controls, such as furrows, borders, or corrugations

flood protection standards – Regulatory requirements affecting flood protection infrastructure design and maintenance and floodplain development. Context: Scenario Factor.

flood threat recognition – Total economic value of land located within a designated 100-year, 200-year, and 500-year floodplain. Context: Scenario Factor.

floodplain development – Total acres of land developed for non-agricultural purposes within a designated 100-year, 200-year, and 500-year floodplain. Context: Scenario Factor.

floodplain management – Actions designed to reduce risks to life, property, and the environment due to flooding. Actions can include watershed management, infrastructure construction and operation, variations in land use practices, floodway designations, etc. Context: Study Plan Building Block.

flood risk – The magnitude and probability of consequences that would occur as a result of flood-induced infrastructure damage under a given study plan. Context: Evaluation Criteria.

flow diagram – Diagram that characterizes a region’s hydrologic cycle by documenting sources of water such as precipitation and inflows and tracks the water as it flows (through many different uses) to its ultimate destinations.

flow diagram table – An itemized listing of all the categories contained in the Flow Diagram including more detailed information, organized by “inputs” and “withdrawals.”

full cost – (1) all monetary costs associated with project planning, implementation, financing, or impact mitigation plus any recurring costs required to sustain benefits; PLUS (2) all nonmonetary costs that are incurred either at implementation or on a recurring basis such as unmitigable environmental or cultural impacts, public trust, environmental justice, or other nonmarket-based societal values. (Coincides with CEQA/NEPA study and other permitting requirements.) Context: Planning Concept/Consideration.

furrow irrigation – Method of surface irrigation where the water is supplied to small ditches or furrows for guiding across the field.

**G**

groundwater – Water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated. It excludes soil moisture, which refers to water held by capillary action in the upper unsaturated zones of soil or rock.

groundwater basin – An alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and having a definable bottom.

groundwater budget – A numerical accounting, the groundwater equation, of the recharge, discharge and changes in storage of an aquifer, part of an aquifer, or a system of aquifers.

groundwater in storage – The quantity of water in the zone of saturation.

groundwater injection technology innovation – Effectiveness of as yet developed water injection technology to improve groundwater injection and reduce associated energy requirements. Context: Scenario Factors.

groundwater management – The planned and coordinated management of a groundwater basin or portion of a groundwater basin with a goal of long-term sustainability of the resource.

groundwater management plan – A comprehensive written document developed for the purpose of groundwater management and adopted by an agency having appropriate legal or statutory authority.

groundwater mining – The process, deliberate or inadvertent, of extracting groundwater from a source at a rate in excess of the replenishment rate such that the groundwater level declines persistently, threatening exhaustion of the supply or at least a decline of pumping levels to uneconomic depths.

groundwater monitoring network – A series of monitoring wells at appropriate locations and depths to effectively cover the area of interest. Scale and density of monitoring wells is dependent on the size and complexity of the area of interest, and the objective of monitoring.

groundwater overdraft – The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions.

groundwater quality – See water quality

groundwater recharge facility – A structure that serves to conduct surface water into the ground for the purpose of replenishing groundwater. The facility may consist of dug or constructed spreading basins, pits, ditches, furrows, streambed modifications, or injection wells.

groundwater recharge – The natural or intentional infiltration of surface water into the zone of saturation.

groundwater remediation/aquifer remediation – Groundwater Remediation involves extracting contaminated groundwater from an aquifer, treating it, and then either putting it back in the aquifer or using it for agricultural or municipal purposes. Aquifer Remediation is usually accomplished by treating groundwater while it is still in the aquifer, using in-situ methods involving biological, physical, or chemical treatment or electrokinetics. Context: Study Plan Building Block, Resource Management Strategy.

groundwater source area – An area where groundwater may be found in economically retrievable quantities outside of normally defined groundwater basins, generally referring to areas of fractured bedrock in foothill and mountainous terrain where groundwater development is based on successful well penetration through interconnecting fracture systems. Well yields are generally lower in fractured bedrock than wells within groundwater basins.

groundwater storage capacity – Volume of void space that can be occupied by water in a given volume of a formation, aquifer, or groundwater basin.

groundwater subbasin – A subdivision of a groundwater basin created by dividing the basin using geologic and hydrologic conditions or institutional boundaries.

groundwater table – The upper surface of the zone of saturation in an unconfined aquifer.

groundwater quality – Water quality can affect supply integrity. Many pollutants are hydrophilic and not easily filtered by soil. Treated groundwater can be added to water supply. Context: Evaluation Criteria.

**H**

hazardous waste – Waste that poses a present or potential danger to human beings or other organisms because it is toxic, flammable, radioactive, explosive, or has some other property that produces substantial risk to life.

hydraulic barrier – A barrier created by injecting fresh water to control seawater intrusion in an aquifer, or created by water injection to control migration of contaminants in an aquifer.

hydraulic conductivity – A measure of the capacity for a rock or soil to transmit water; generally has the units of feet/day or cm/sec.

hydrograph – A graph that shows some property of groundwater or surface water as a function of time at a given point.

hydrology – A science related to the occurrence and distribution of natural water on the earth including the annual volume and the monthly timing of runoff.

hydrologic cycle – The circulation of water from the ocean through the atmosphere to the land and ultimately back to the ocean.

hydrologic region – A study area consisting of multiple planning subareas. California is divided into 10 hydrologic regions.

hydrostratigraphy – A geologic framework consisting of a body of rock having considerable lateral extent and composing a reasonably distinct hydrologic system.

hyporheic zone – The region of saturated sediments beneath and beside the active channel and that contain some proportion of surface water that was part of the flow in the surface channel and went back underground and can mix with groundwater.

**I**

in-lieu recharge – The practice of providing surplus surface water to historic groundwater users, thereby leaving groundwater in storage for later use.

industrial activity mix – The mix of high and low water using industrial activity. Note that Industrial Activity is broken into two factors: Total Industrial Activity and Industrial Activity Mix. The latter factor allows designation of the type of industry that is occurring. This is necessary to account for the large variation in water demands by industry type. See also total industrial activity. Context: Scenario Factor.

infiltration – The flow of water downward from the land surface into and through the upper soil layers.

infiltration capacity – The maximum rate at which infiltration can occur under specific conditions of soil moisture.

infrastructure – The underlying foundation or basic framework of a system.

infrastructure performance – Ability of water management system infrastructure to perform as designed over time. Context: Scenario Factor.

instream flow requirements/objectives (Institutional/Political) – Volume of water dedicated to instream uses and aquatic habitat. Context: Scenario Factors.

integrated regional water management – A comprehensive, systems approach for determining the appropriate mix of demand and supply management options that provide long-term, reliable water supply at lowest reasonable cost and with highest possible benefits to customers, economic development, environmental quality, and other social objectives.

intercropping – The simultaneous planting of two or more crops in the same field. The practice is used to help control pest populations that can occur on monoculture crops, sometimes called "polycropping" or "plant stratification."

interregional import projects – Movement of water between regions through mechanisms such as the State and federal water projects. Context: Scenario Factor.

irrecoverable water – the amount of water that flows to a salt sink, is used by the growth process of plants (evapotranspiration), or evaporates from a conveyance facility or drainage canal. ~~the amount of applied water that is not available for supply or reuse, including discharge to saline sinks, evaporation, and evapotranspiration.~~ See also recoverable water

irrigated crop area-irrigated land area (economic/financial) – Geographic footprint of irrigated crop acres (by type) planted as a function of crop markets. Context: Scenario Factor.

irrigated crop area-irrigated land area (institutional/political) – Geographic footprint of irrigated crop acres (by type) planted as a function of institutional and political policies. Context: Scenario Factor.

irrigated crop area-multicropped land area (economic/financial) – Total acres of crops planted as a second or third crop within a year. Context: Scenario Factor.

irrigated crop area-permanent crop land area (economic/financial) – Total acres of permanent crops such as orchards and vines that require several years to mature into productive plants. Context: Scenario Factor.

irrigated crop area-seasonal crop land area (economic/financial) – Total acres of seasonal crops that are planted and harvested once or more a year. Context: Scenario Factor.

irrigation efficiency (IE) – The efficiency of water application and use, calculated by dividing a portion of applied water that is beneficially used by the total applied water, expressed as a percentage The two main beneficial uses are crop water use (evapotranspiration, ETc) and leaching to maintain a salt balance.

irrigation technology use – Technologies used for the direct irrigation of crops or for crop water use savings. Context: Scenario Factor.

irrigation water requirements – The quantity of water exclusive of precipitation that is required from various uses.

**J**

joint powers agreement (JPA) – An agreement entered into by two or more public agencies that allows them to jointly exercise any power common to the contracting parties. The JPA is defined in Ch. 5 (commencing with Section 6500) of Division 7 of Title 1 of the California Government Code.

**L**

land subsidence – The lowering of the natural land surface due to groundwater (or oil and gas) extraction.

leaching requirements – The fraction of water entering the soil that must pass through the root zone in order to prevent soil salinity from exceeding a specific value.

leaching efficiency – The ratio of the average salt concentration in drainage water to an average salt concentration in the soil water of the root zone when near field capacity.

leaky confining layer – A low-permeability layer that can transmit water at sufficient rates to furnish some recharge from an djacent aquifer to a well.

lithologic log – A record of the lithology of the soils, sediments and/or rock encountered in a borehole from the surface to the bottom.

lithology – The description of rocks, especially in hand specimen and in outcrop, on the basis of such characteristics as color, mineralogic composition, and grain size.

**M**

managed wetlands-irrigated land area (institutional/political) – Total acres of irrigated habitat managed within a federal, state, or local wildlife refuge. Context: Scenario Factors

management objectives – Objectives that set forth the priorities and measurable criteria of water management. Examples include improve water quality, augment water supplies, improve use efficiency, etc.

matching water quality to use – a resource management strategy that recognizes not all water uses require the same quality water. High quality water sources can be used for drinking and industrial purposes that benefit from higher quality water, and lesser quality water can be desirable for some uses, such as riparian streams with plant materials benefiting fish. Context: Resource Management Strategy.

maximum contaminant level (MCL) – The highest drinking water contaminant concentration allowed under federal and State Safe Drinking Water Act regulations.

membrane technology innovation – Effectiveness of as yet developed membrane technology to treat water and reduce associated energy. Context: Scenario Factor.

requirements

microirrigation – The frequent application of small quantities of water as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line. Microirrigation encompasses a number of methods or concepts such as bubbler, drip, trickle, mist, or spray.

multicropping – The practice of consecutively producing two crops (double cropping) or more of either like or unlike commodities on the same land within the same year. An example of double cropping might be to harvest a wheat crop by early summer and then plant corn or beans on that acreage for harvest in the fall. Suitable climates and reliable water supplies are important factors with this practice.

**N**

natural recharge – Natural replenishment of an aquifer generally from snowmelt and runoff; through seepage from the surface.

net groundwater withdrawal – groundwater extraction in excess of percolation into a groundwater basin. Context: Water Portfolio

net water use (demand) – the amount of water needed in a water service area to meet all requirements or demands. It is the sum of several components including (1) evapotranspiration of applied water within an area, (2) the irrecoverable water from the distribution system, and (3) the agricultural return flow or treated urban wastewater leaving the area. See also applied water. Context: Water Portfolio

new water – Water that is legally and empirically available for a beneficial use; can be developed through many strategies such as capturing surplus water, desalination of ocean water and reductions in depletions. (Same meaning as real water) Context: Planning Concept/Consideration.

nonpoint source – Pollution discharged over a wide land area, not from one specific location. These are forms of diffuse pollution caused by sediment, nutrients, etc., carried to lakes and streams by surface runoff. See also point source

**O**

operational flexibility – The temporal or spatial operational efficiency of existing and proposed infrastructure to maximize benefits. Context: Evaluation Criteria.

operational yield – An optimal amount of groundwater that should be withdrawn from an aquifer system or a groundwater basin each year. It is a dynamic quantity that must be determined from a set of alternative groundwater management decisions subject to goals, objectives, and constraints of the management plan.

ordinance – A law set forth by a governmental authority.

other interregional import deliveries – This factor is intended to capture the interregional movement of water for "projects" such as Russian River, Trinity River Exports or Putah South Canal. Note that the project name must be specified in the study plan narrative. Context: Scenario Factor.

overdraft – See groundwater overdraft

overlying right – Property owners above a common aquifer possess a mutual right to the reasonable and beneficial use of a groundwater resource on land overlying the aquifer from which the water is taken. Overlying rights are correlative (related to each other) and overlying users of a common water source must share the resource on a pro rata basis in times of shortage. A proper overlying use takes precedence over all non-overlying uses.

**P**

passive conservation (inst/political) – The amount of background conservation occurring independent of the BMP and EWMP programs. Context: Scenario Factor.

pelagic fish – fish that spawn in open water, often near the surface. Many river-dwelling anadromous fishes, such as shad are also pelagic spawners

per capita income – Average annual income from all sources per person for a planning area Context: Scenario Factor.

perched groundwater – Groundwater supported by a zone of material of low permeability located above an underlying main body of groundwater.

percolation – Process in which water moves through a porous material, usually surface water migrating through soil toward a groundwater aquifer.

perennial yield – The maximum quantity of water that can be annually withdrawn from a groundwater basin over a long period of time (during which water supply conditions approximate average conditions) without developing an overdraft condition.

permeability – The capability of soil or other geologic formations to transmit water.

pesticide – Any of a class of chemicals used for killing insects, weeds, or other undesirable entities. Most commonly associated with agricultural activities, but has significant domestic use in California.

planning area (PA) – A sub-section of a hydrologic region containing a number of detailed analysis units.

point source – A specific site from which wastewater or polluted water is discharged into a water body. See also nonpoint source

pollution (of water) – The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.

pollution prevention – Improving water quality for all beneficial uses by protecting water at its source, reducing the need and cost for other water management actions and treatment. Context: Resource Management Strategy.

population density (cultural) – Average number of people per square mile for a planning area. Context: Scenario Factor.

population distribution (cultural) – Geographic location within California of the population projection. Context: Scenario Factor.

population projection – The 2030 forecast of population made by the California Department of Finance or other agencies. Context: Scenario Factor.

porosity – The ratio of the voids or open spaces in alluvium and rocks to the total volume of the alluvium or rock mass.

possible contaminating activity (PCA) – Human activities that are actual or potential origins of contamination for a drinking water source. PCAs include sources of both microbiological and chemical contaminants that could have an adverse effect upon human health.

precipitation enhancement – The action of artificially stimulating clouds "cloud seeding" to produce more rainfall/snowfall than would naturally occur. Context: Resource Management Strategy.

precipitation trends – Changes in monthly average precipitation over time at a specific location. Context: Scenario Factors.

precipitation variability – Changes in the intensity and frequency of precipitation at a specific location. Context: Scenario Factors.

prescriptive right – Rights obtained through the open and notorious adverse use of another's water rights. By definition, adverse use is not use of a surplus, but the use of non surplus water to the direct detriment of the original rights holder.

private wetlands-irrigated land area (institutional/political) – Total acres of irrigated habitat managed within a privately owned wildlife refuge

public trust doctrine – A legal doctrine recognizing public rights in the beds, banks, and waters of navigable waterways, and the State's power and duty to exercise continued supervision over them as trustee for the benefit of the people.

public water system – A system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

pueblo right – A water right possessed by a municipality which, as a successor of a Spanish or Mexican pueblo, entitled to the beneficial use of all needed, naturally occurring surface and groundwater of the original pueblo watershed Pueblo rights are paramount to all other claims.

**R**

rate structure – See water price-rate structure.

real water – See new water. Context: Planning Concept/Consideration.

recharge – Water added to an aquifer or the process of adding water to an aquifer. Groundwater recharge occurs either naturally as the net gain from precipitation or artificially as the result of human influence. See also artificial recharge.

recharge area protection – The action of keeping recharge areas from being paved over or otherwise developed and guarding the recharge areas so they don't become contaminated Context: Resource Management Strategy.

recharge basin – A surface facility constructed to infiltrate surface water into a groundwater basin.

recoverable water – the amount of applied water that is available for supply or reuse; including surface runoff to non-saline bodies of water and deep percolation that becomes groundwater. See also irrecoverable water

recreation – Water-dependent recreation activities that are consumptive (e.g., parks), flat-water (e.g., boating), or flow-based (e.g., whitewater rafting). Context: Scenario Factor.

recreation (reservoir-based) – Flat water recreation, such as boating and skiing, in the form of future storage facilities as well as operation of existing surfaces storage facilities. Context: recreation sport-fish populations – Populations of fish species that support recreational fishing.

recreation (watercourse-based) – Activities that are dependent on instream flows such as whitewater rafting.

recycled water – Treated municipal, industrial, or agricultural wastewater to produce water that can be reused. Context: Resource Management Strategy

regional self-sufficiency – The degree to which a study plan involves implementation of regional water management options. Context: Evaluation Criteria.

regulation of Delta exports – State and federal regulations, contractual agreements, and court rulings affecting the inflows, outflows, and export of water from the Delta. Context: Scenario Factors.

reliability planning – Water reliability management planning is done by comparing the costs of taking actions to maintain or increase reliability to the costs of accepting less reliability. On this basis, accepting of the costs

of adverse effects of less than 100 percent reliability could be a legitimate planning decision. Providing full water supply to meet 100 percent of projected future water demand is not the planning goal, rather, the goal is to find the justified level of reliability. Context: Planning Concept/Consideration.

resilience of endangered aquatic species – Health and vitality of endangered species whose primary habitat is dependent on water. Context: Scenario Factor.

resource management strategy – A project, program, or policy that helps federal, State or local agencies manage water and related resources. Resource management strategies can reduce water demand, improve operational flexibility, increase water supply, improve water quality, or practice resource stewardship.response packages.

return-flow system – A system of pipelines or ditches to collect and convey surface or subsurface runoff from an irrigated field for reuse.

reused agricultural water – Water that is used by more than one grower and is, therefore, not available for reallocation should one grower become increasingly efficient (i.e., applied water reductions minus real water equal zero). Context: Planning Concept/Consideration.

riparian right – A right to use surface water, such right derived from the fact that the land in question abuts the banks of streams.

river/stream unimpaired flows – Monthly estimated volume of unimpaired flows in rivers and streams within California. Unimpaired flow refers to the full natural flow within a stream that would exist without storage or diversion of water for human uses. Context: Scenario Factors.

root zone – The portion of the soil profile through which plant roots readily penetrate to obtain water and plant nutrients, expressed in inches or feet of depth.

runoff – The volume of surface flow from an area.

**S**

safe yield – The maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect saline soil – A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most plants.

saline intrusion – The movement of salt water into a body of fresh water. It can occur in either surface water or groundwater bodies.

salinity – Generally, the concentration of mineral salts dissolved in water. Salinity may be expressed in terms of a concentration or as electrical conductivity. When describing salinity influenced by seawater, salinity often refers to the concentration of chlorides in the water.

saturated zone – The zone in which all interconnected openings are filled with water, usually underlying the unsaturated zone.

scenarios – Sets of plausible future conditions based on different assumptions of factors such as population size, density, and distribution, per capita income, commercial and industrial activity, and crop area and water use. In California Water Plan Update 2005, the three scenarios for 2030 are strictly narrative and are “no action” (i.e., they do not reflect any additional resource management strategies in the form of response packages beyond those currently planned, such as new water efficiency programs).

sea-level rise – Departure of mean daily sea level from historical average. Context: Scenario Factors.

seasonal vs. permanent crop mix – Shifts in crop type between seasonal and permanent. This factor depicts the diminished ability to reduce water use during times of increased water scarcity (due to shifting from seasonal to permanent crops). In other words, shortage losses increase when shifting from season to permanent. Context: Scenario Factor.

seawater intrusion barrier – A system designed to retard, cease or repel the advancement of seawater intrusion into potable groundwater supplies along coastal portions of California. The system may be a series of specifically placed injection wells where water is injected to form a hydraulic barrier.

secondary porosity – Voids in a rock formed after the rock has been deposited; not formed with the genesis of the rock, but later due to other processes. Fractures in granite and caverns in limestone are examples of secondary openings.

seepage – The gradual movement of water into, through, or from a porous medium. Also, the infiltration of water into the soil from canals, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field.

semi-confined aquifer – A semi-confined aquifer or leaky confined aquifer is an aquifer that has aquitards either above or below that allow water to leak into or out of the aquifer depending on the direction of the hydraulic gradient.

service area – The geographic area served by a water agency.

snowpack/melt (intermediate factor) – Geographic distribution of monthly snow accumulations and runoff for a specific watershed. Context: Scenario Factors.

soil moisture – The water in soils. Usually expressed as a percentage of the dry weight of the soil. Can also be expressed on a wet weight or a volume basis.

soil texture – Soil texture refers to the percentage of sand, silt, and clay particles in a soil. Sand, silt, and clay particles are defined by their size. Soil texture has important effects on soil properties. Water-holding capacity, drainage class, consistence, and chemical properties are just a few examples of properties that are affected by soil texture.

specific retention – The ratio of the volume of water a rock or sediment will retain against the pull of gravity to the total volume of the rock or sediment.

specific yield – the ratio of the volume of water a rock or soil will yield by gravity drainage to the total volume of the rock or soil.

spring – a location where groundwater flows naturally to the land surface or a surface water body.

sprinkler irrigation – Method of irrigation in which the water is sprayed, or sprinkled, through the air to the ground surface.

stakeholder – individuals or groups who can affect or be affected by an organization's activities. or: Individuals or groups with an interest or "stake" in what happens as a result of any decision or action. Stakeholders do not necessarily use the products or receive the services of a program.

State Water Project deliveries – The volume of water imported to a given study area from the State Water Project. Context: Scenario Factor.

statewide water management systems – These include physical facilities (more than 1,200 State, federal, and local reservoirs, as well as canals, treatment plants, and levees), which make up the backbone of water management in California, and statewide water management programs, which include water-quality standards, monitoring programs, economic incentives, water pricing policies, and statewide water-efficiency programs such as appliance standards, labeling, and education.

strategic plan – The long-term goals of an organization or program and an outline of how they will be achieved (e.g., adopting specific strategies, approaches, and methodologies).

stratigraphy – The science of rocks. It is concerned with the original succession and age relations of rock strata and their form, distribution, lithologic composition, fossil content, geophysical and geochemical properties—all characters and attributes of rocks as strata—and their interpretation in terms of environment and mode of origin and geologic history.

stress irrigation – Management of irrigation water to apply less than enough water to satisfy the soil water deficiency in the entire root zone. (Preferred term is limited irrigation.)

subirrigation – Application of irrigation water below the ground surface by raising the water table to within or near the root zone.

subsurface drip irrigation – Application of water below the soil surface through emitters, with discharge rates generally in the same range as drip irrigation. This method of water application is different from and not to be confused with subirrigation where the root zone is irrigated by water table control.

surface irrigation – Irrigation in which the soil surface is used as the conduit, as in furrow and border irrigation, and as opposed to sprinkler, drip, and subirrigation.

surface storage facilities – The volume and yield of usable reservoir storage in a given area. Context: Resource Management Strategy.

surge irrigation – A surface irrigation technique wherein flow is applied to furrows (or less commonly, borders) intermittently during a single irrigation set.

subsidence – See land subsidence

subterranean stream – Subterranean streams "flowing through known and definite channels" are regulated by California's surface water rights system.

surface supply – Water supply obtained from streams, lakes, and reservoirs.

surplus water – Water that is not being used directly or indirectly to benefit the environmental, agricultural or urban use sectors. Context: Planning Concept/Consideration.

sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

sustainability – A specific resource that avoids complete depletion over a specified time horizon. The continued feasibility of a specified economic activity over a specified time horizon, usually influenced by management and policy actions t Context: Economic Activity.

system reoperation – Changing existing water system operation and management procedures or priorities to either meet competing beneficial uses or derive more total benefits from the water system by operating more efficiently. Context: Resource Management Strategy.

**T**

third party impacts – The occurrence of incidental economic impacts to parties not directly related to (impact-causing) water management actions. For example, agricultural land retirement can impact local tax revenues and/or labor conditions, etc. Context: Evaluation Criteria.

total capital cost – Total monetary cost of option required for "turn key" implementation including environmental and third party impact mitigation, storage, conveyance, energy, capitalized O&M, administrative, planning, legal and engineering costs. Context: Planning Concept/Consideration.

total commercial activity –Refers to all activities in the service-producing sectors, which include farm services, transportation, public utilities, trade, finance, insurance, real estate, services, and government. This factor is a driver of (and indicator for) commercial water use. Context: Scenario Factor.

total industrial activity –Refers to all activities in good-producing sectors, which include farm production, mining, construction, and manufacturing. This factor is a driver of (and indicator for) industrial water use. Context: Scenario Factor.

total irrigated crop area – The total area of irrigated crops (by type) planted in a planning area during a given year. This number includes multiple cropping. Context: Scenario Factor.

total population – The statewide total population projection regardless of geographical distribution. Context: Scenario Factor.

transpiration – An essential physiological process in which plant tissues give off water vapor to the atmosphere.

**U**

unconfined aquifer – An aquifer which is not bounded on top by an aquitard. The upper surface of an unconfined aquifer is the water table.

underground stream – Body of water flowing as a definite current in a distinct channel below the surface of the ground, usually in an area characterized by joints or fissures. Application of the term to ordinary aquifers is incorrect.

unit applied water – The quantity of water applied to a specific crop per unit area (sometimes expressed in inches of depth).

unsaturated zone – The zone below the land surface in which pore space contains both water and air.

urban land use management – Planning for the housing and economic development needs of the growing population while providing for the efficient use of water and other resources.

urban runoff management – A broad series of activities to manage both storm water and dry weather runoff.

urban runoff regulations – State, federal, and local regulations and management practices affecting the quality, re-use, and discharge of dry weather and storm runoff from urban areas. Context: Scenario Factors.

Urban Water Management Planning Act – Sections 10610 through 10657 of the California Water Code. The Act requires urban water suppliers to prepare urban water management plans which describe and evaluate sources of water supplies, efficient uses of water, demand management measures, implementation strategies and schedules, and other relevant information and programs within their water service areas. Urban water suppliers (CWC Section 10617) are either publicly or privately owned and provide water for municipal purposes, either directly or indirectly, to more than 3,000 customers or supply more than 3,000 acre-feet of water annually.

[urban] water reliability (average) – A measure of a system's ability to sustain the social, environmental and economic systems that it serves during a year of average participation. Context: Evaluation Criteria.

[urban] water reliability (dry) – A measure of a system's ability to sustain the social, environmental and economic systems that it serves during a dry year. Context: Evaluation Criteria.

[urban] water reliability (wet) – A measure of a system's ability to sustain the social, environmental and economic systems that it serves during a wet year. Context: Evaluation Criteria.

urban water use efficiency – Methods or technologies resulting in the same beneficial residential, commercial, industrial, and institutional uses with less water or increased beneficial uses from existing water quantities. Context: Scenario Factor, Resource Management Strategy.

usable storage capacity – The quantity of groundwater of acceptable quality that can be economically withdrawn from storage.

**V**

volatile organic compound (VOC) – A manmade organic compound that readily vaporizes in the atmosphere. These compounds are often highly mobile in the groundwater system and are generally associated with industrial activities.

**W**

water bag transport/storage technology – Water diverted in areas that have unallocated fresh water supplies, storing the water in large inflatable bladders, and towing to an alternate coastal region. Context: Resource Management Strategy.

water balance – An analysis of the total developed/dedicated supplies, uses, and operational characteristics for a region.

water demand – The desired quantity of water that would be used if the water is available and a number of other factors such as price do not change. Demand is not static.

water demand elasticity – The desire to use water is based on a number of factors such as the intended use for the water, the price of water, and the cost of alternative ways to meet the intended use.

water depletion – net water use minus water that can be later recovered, such as deep percolation and return flow, to developed supply. Context: Water Portfolio.

water management funding – Funding provided by federal, State, regional, and local entities to finance water management and infrastructure. Context: Scenario Factors.

water portfolio – A picture of the water supply and use for a given year statewide or by region, subject to availability of data; includes the flow diagram, flow diagram table, water balances, and summary table.

water price-rate structure – Designates the rate basis for cost recovery (e.g., flat, uniform, tiered, etc.). Block/tiered rates are assumed to provide cost signals to consumers. Costs can include capital, O&M, financing, environmental compliance (documentation, permitting and mitigation). Context: Scenario Factors.

water price-cost recovery – Designates who (marginal or existing users) pays the marginal and existing water costs. Also specifies circumstances where other revenue sources are used to recover costs. Costs can include capital, O&M, financing, environmental compliance. Context: Scenario Factors.

water quality – Description of the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose or use.

water quality-drinking water standards – State and federal regulations regarding water delivered by water purveyors that is used as a potable supply. Context: Scenario Factor.

water reliability (dry) – A measure of a system's ability to sustain the social, environmental, and economic systems that it serves during a dry year.

water reliability (wet) – A measure of a system's ability to sustain the social, environmental, and economic systems which it serves during a wet year.

water service area –

water supply exports – The amount of water that a region transfers to another to meet needs. Context: Regional Reports.

water supply imports – The amount of water that needs to be brought in from other regions to meet needs. Context: Regional Reports.

water table – See groundwater table

water transfers – A temporary or long-term change in the point of diversion, place of use, or purpose of use due to a transfer or exchange of water or water rights. A more general definition is that water transfers are a voluntary change in the way water is usually distributed among water users in response to water scarcity. Context: Scenario Factor, Resource Management Strategy.

water use technology innovation – Effectiveness of as yet developed technology to improve water conservation and reduce associated energy requirements for agricultural and landscaping. Context: Scenario Factor.

water year – A continuous 12-month period for which hydrologic records are compiled and summarized. Different agencies may use different calendar periods for their water years.

watershed – The land area from which water drains into a stream, river, or reservoir.

watershed management – The process of evaluating, planning, managing, restoring, and organizing land and other resource use within an area that has a single common drainage point. Context: Resource Management strategy.

Wild and Scenic River – State- and federal-designated river system; 17 rivers in California including many forks and tributaries, about 1,900 miles of river are designed wild, scenic, or recreational. Authority: 1968 National Wild and Scenic Rivers Act and the California Wild and Scenic Rivers Act of 1972. Context: Water Portfolio.