CWP 2013 Update Technology Caucus and California Council of Science and Technology

Water Technology Research Priorities (Preliminary Results)

Information Collection

CCST

- Survey (Web Based)
- Focus Groups (Conference Call)

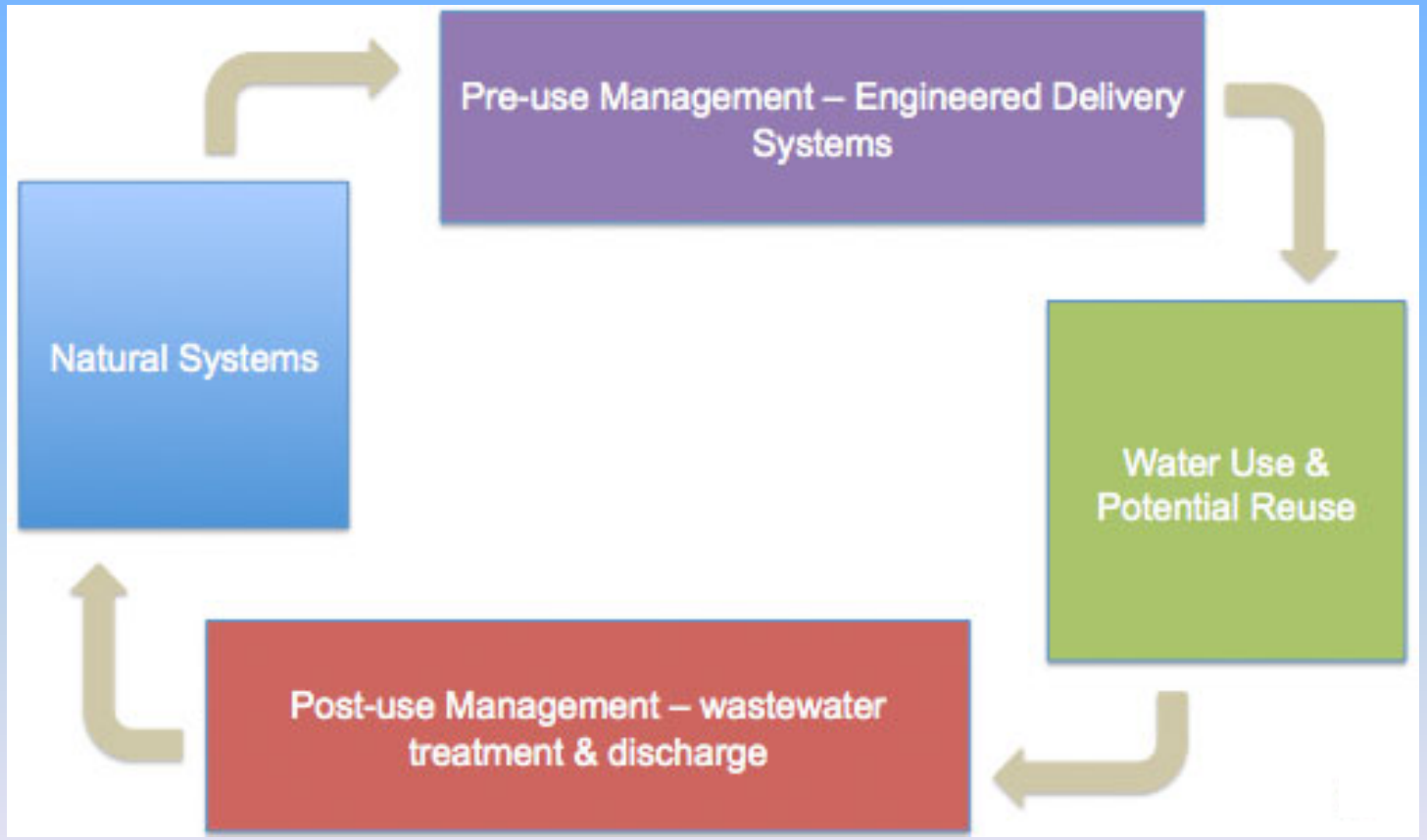
DWR

- Water Technology Meetings
- Sacramento (CSUS - Center for Collaborative Policy)
- San Jose (Santa Clara Water District)
- San Bernardino (CSU San Bernardino)

Identified Priority Research Needs

1. Data Management & Modeling
2. Data Acquisition
   - ✓ **Ground Based (in situ) Monitoring**
   - ✓ **Remote Sensing**
3. Water-Energy Nexus
4. Water Treatment Technologies
   - ✓ **Membrane**
   - ✓ **Biological**
5. **Watershed Management**
6. **Water Use Efficiency**
   - ✓ **Agricultural**
   - ✓ **Urban**

California's Water Cycle (first tier categories)



Data Management & Modeling (1/2)

1. Support should be given to the California Water and Modeling Forum to maintain current modeling protocols and standards that provide guidance to water stakeholders and decision-makers, and their technical staff as models are developed and used to solve California's water and environmental problems (CWP 2013 Update)
2. California should embrace a distributed data storage and use policy with the various data base managers compliant to a common data management protocol with all data linked to the appropriate metadata.

Data Management & Modeling (2/2)

3. Data base portals such as Water Planning Information Exchange being developed by DWR should be able to host translators capable of integrating data into information and formats desired by the users.
4. The Resources Agency, CalEPA, Health and Human Services, Public Utilities Commission, Energy Commission, Bureau of Reclamation, USEPA, and other stakeholders should develop and implement a water use and quality measurement and reporting strategy and implementation plan necessary for sustainable California water planning and management.

In Situ Data Acquisition (1/2)

1. Together with a distributed data storage policy for California with the various data base managers compliant to a common data management protocol, the protocol should also include data acquisition requirements;
2. Investment is required in analytical capability, including sensors to be used in situ, that effectively and economically detects with required statistical certainty constituents at concentrations having a public health, environmental or economic consequence.

In Situ Data Acquisition (2/2)

2. Where analytical capability is deployed in real world environments, economical sensors and analytical procedures for the desired constituents must be developed that are capable of –
   i. withstanding the rigors of the environment in which they are deployed,
   ii. producing accurate and precise data over long periods of time.

Remote Sensing (1/2)

1. Together with a distributed data storage policy for California with the various data base managers compliant to a common data management protocol, the protocol should also include data acquisition requirements;
2. Development and use of robust, cost effective sensors capable of accurately determining quantitatively certain parameters for fresh water bodies including turbidity, salinity, and chlorophyll;
3. Continue the development of utilizing airborne drones to provide targeted data to complement satellite data on snowpack;

Remote Sensing (2/2)

4. Develop inexpensive, local remote sensors to replace or complement in situ sensors for the purpose of providing monitoring capability that is less susceptible to vandalism;
5. Increase partnerships between NASA, state and private sectors to enhance providing a better use of existing resources while realizing savings by reducing duplicative monitoring and/or increasing required data acquisition opportunities;
6. Develop the software necessary to translate data from both remote and in situ sensors so that it is compatible with models used for planning and operational purposes.

Water-Energy Nexus (1/2)

1. Greater use of smart grid technologies, especially to increase use of renewable energy sources and possibly for water management;
2. Minimizing unnecessary energy dissipation at point of use by delivering water with the energy needed and thereby not wasting excess energy (e.g., unnecessarily high pressure);
3. Increased use of low water consumption technologies in the production of energy, especially electrical power (e.g. dry cooling, etc.)

Water-Energy Nexus (2/2)

4. Implementation of energy harvesting technology where feasible (e.g. retrieving energy when water is fed from a high pressure system to a system requiring less pressure); and
5. Increased use of technologies to improve energy efficiency for water treatment and transport processes as well as energy production (e.g., using a relatively low energy biological process that will provide a comparable treatment efficiency as a high pressure membrane process for the targeted constituents) .

Water Treatment – Membrane (1/2)

1. Further development of more economical and energy efficient, robust general-purpose membranes, capable of removing contaminants -
   i. not currently removed by membranes (e.g. boron and other elements and compounds smaller than water molecules), and
   ii. capable of proficiently processing wastewaters for water re-use
   iii. causing treatment issues for inland brackish waters;

Water Treatment – Membrane (2/2)

2. Further development of energy recovery technology from high pressure membrane processes; and
3. Significantly broadened deployment of concentrate diffusion technologies for seawater already used in venues outside California
4. Development of smart control technology with appropriate sensor development for operation of water treatment processes both distributed and on-site.

Water Treatment – Biological (1/2)

1. Further development of biological treatment processes capable of economically, efficiently and with minimal energy requirements removing nitrate and other chemical constituents principally from groundwater followed by coarse filtratation and disinfection to meet public health requirements for direct injection in drinking water distribution systems;
2. Use of engineered wetlands and meadows, optimized to produce a biologically treated effluent capable of meeting secondary treatment requirements with the wetlands and meadows also providing habitat benefits.

Water Treatment – Biological (2/2)

3. Further development of animal wastes digestion systems that optimizes substrate processing so that it is both environmentally compliant and maximizes biofuel production and use while producing one or more of the following –
   i. methane for injection into California's natural gas pipeline systems,
   ii. methane suitable for on farm use or for injection into an engine powering a generator, and/or
   iii. fertilizer having a 3% minimum N content with much of the N in the inorganic form, capable of storage without deterioration for a year or longer and being dispersed through conventional fertigation systems.
4. Development of smart control technology with sensor development for operation of water treatment processes both distributed and on-site.

Watershed Management

1. Software development that leads to the combining and utilization if applicable models more effectively in recognition of climate change impacts on watersheds;
2. Improved data collection for surface water and groundwater basin descriptive parameters, including water runoff and storage as a function of time throughout the basin by more extensive use of satellite monitoring, where applicable, and partnering with other agencies (i.e., DWR, SWRCB, USGS, etc.) where possible, and
3. Expanded use of flood plains and other sites having good recharge potential for groundwater recharge.

Water Use Efficiency – Agriculture (1/3)

1. Widespread adoption of water measurement and soil moisture sensing technologies to both maximize water application and timing;
2. Select and install high efficiency water distribution systems, provide necessary maintenance, and utilize proper irrigation scheduling methods;
3. Universal adoption of one or more technologies for water management, including remote sensing, weather based, and/or crop/soil based technologies;

Water Use Efficiency – Agriculture (2/3)

4. Development of cost-effective information management and controller technology for monitoring drip and micro-sprinkler line pressures throughout fields;
5. Use agricultural water and land whenever possible to provide environmental benefits (e.g. flooded rice ground to provide seasonal wetlands for migratory birds and reproduction habitat for fish);
6. Identification of multiple use opportunities for water supplies (e.g. water exchanges between agricultural and urban users);

Water Use Efficiency – Agriculture (3/3)

7. Improving water use efficiency with the adoption of pressurized irrigation systems; Migration to lower water intensity crops and less acreage in permanent plantings; and
8. Fully understanding third-party impacts before implementing any large-scale changes in agricultural practices.

Water Use Efficiency – Urban (1/2)

1. Enhanced metering infrastructure to promote more efficient water use (i.e., individual apartments; remote access to water use data, etc.);
2. Greater use of incentive based pricing to encourage more water conservation;
3. Greater deployment of lower water use technologies such as low flow appliances such as toilets and clothes and dish washers in the home and low flow cleaning technologies in the commercial and industrial sectors;

Water Use Efficiency – Urban (2/2)

4. Greater reuse and more reliance on partially treated water for non-potable purposes such as for landscape irrigation and cooling;
5. Enhanced leak detection and repair programs; and
6. Greater use of low water intensity landscaping (may require stricter codes/regulation).

QUESTIONS?

Thank You