

# Draft Compendium of Feb. 5, 2008 Sustainable Water Resources Roundtable

**National Indicators Draft Framework: Nov. 20, 2007**

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## The SWRR Indicator Framework

Indicators represent a way to measure progress. They can provide a metric for understanding the extent to which water resources are managed to meet the long term needs of our social, economic and environmental systems. In essence, they can help us understand whether or not the nation is on a sustainable course in its management of water and related resources.

The roundtable proposes a five-part framework for organizing water sustainability indicators that represents the inherent interdependency of our nation's water resources:

- **Water availability**
- **Water quality**
- **Human uses and health**
- **Environmental health**
- **Infrastructure and institutions**

Fourteen key indicator categories fall within this framework. Others, described elsewhere, cover the ecosystem processes and social or economic drivers that influence the categories. See the roundtable's preliminary report at [http://acwi.gov/swrr/Rpt\\_Pubs/prelim\\_rpt/index.html](http://acwi.gov/swrr/Rpt_Pubs/prelim_rpt/index.html) for more information.

**A. Water availability:** People and ecosystems need sufficient quantities of water to support the benefits, services and functions they provide. These indicator categories refer to the total amount of water available to be allocated for human and ecosystem uses.

**1. Renewable water resources:** Measures of the amount of water provided over time by precipitation in a region and surface and groundwater flowing into the region from precipitation elsewhere. USGS considers renewable water resources to be the upper limit of water consumption that can occur in a region on a sustained basis.

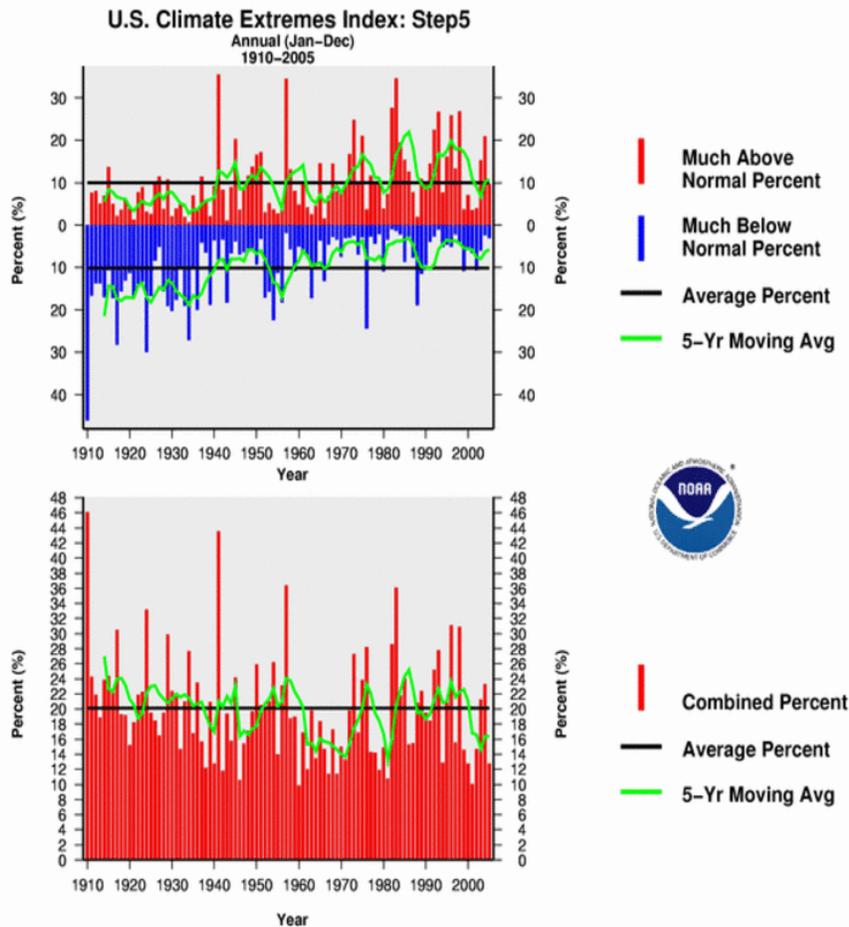


FIG. 1A: U.S. Climate Extremes Index; (Source: NOAA Satellite and Information Service, National Environmental Satellite, Data, and Information Service (NESDIS), National Climatic Data Center, U.S. Department of Commerce. <http://www.ncdc.noaa.gov/oa/climate/research/cei/cei.html>)

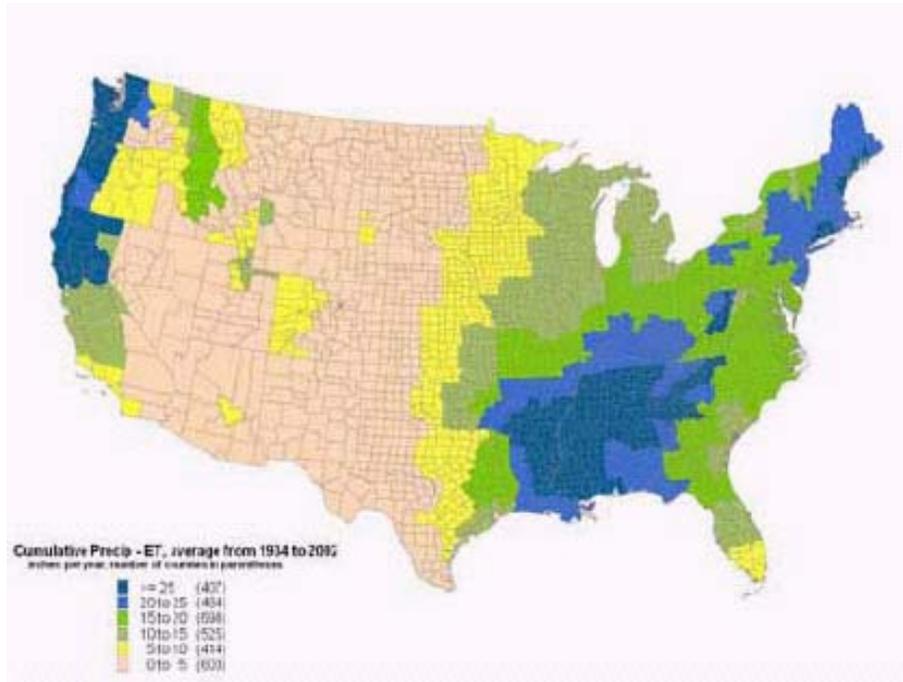


FIG.1.B: Available Precipitation (difference between monthly precipitation and potential evapotranspiration) across the United States based on 1934-2002 average data at the climate division level; (Source: Roy, S.B., Ricci, P.F., Summers, K.V., Chung, C.-F., and Goldstein, R.A. (2005). Evaluation of the Sustainability of Water Withdrawals in the United States, 1995-2025; Journal of the American Water Resources Association, 41(5):1091-1108)

**2. Water in the environment:** Measures of the amount of water remaining in the environment after withdrawals for human use.

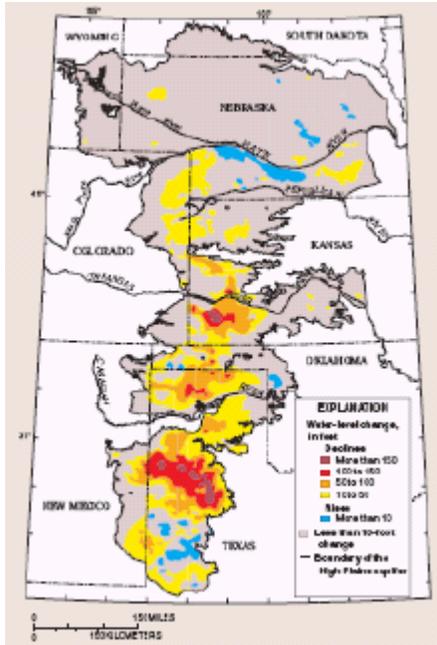


FIG.2.A: Changes in ground-water levels in the High Plains aquifer from before ground-water development to 1997; (Source: U.S. Geological Survey, 2002, Concepts for national assessment of water availability and use: U.S. Geological Survey Circular 1223, 34 p.)

**3. Water use sustainability:** Measures of the degree to which water use meets current needs while protecting ecosystems and the interests of future generations. This could include the ratio of water withdrawn to renewable supply.

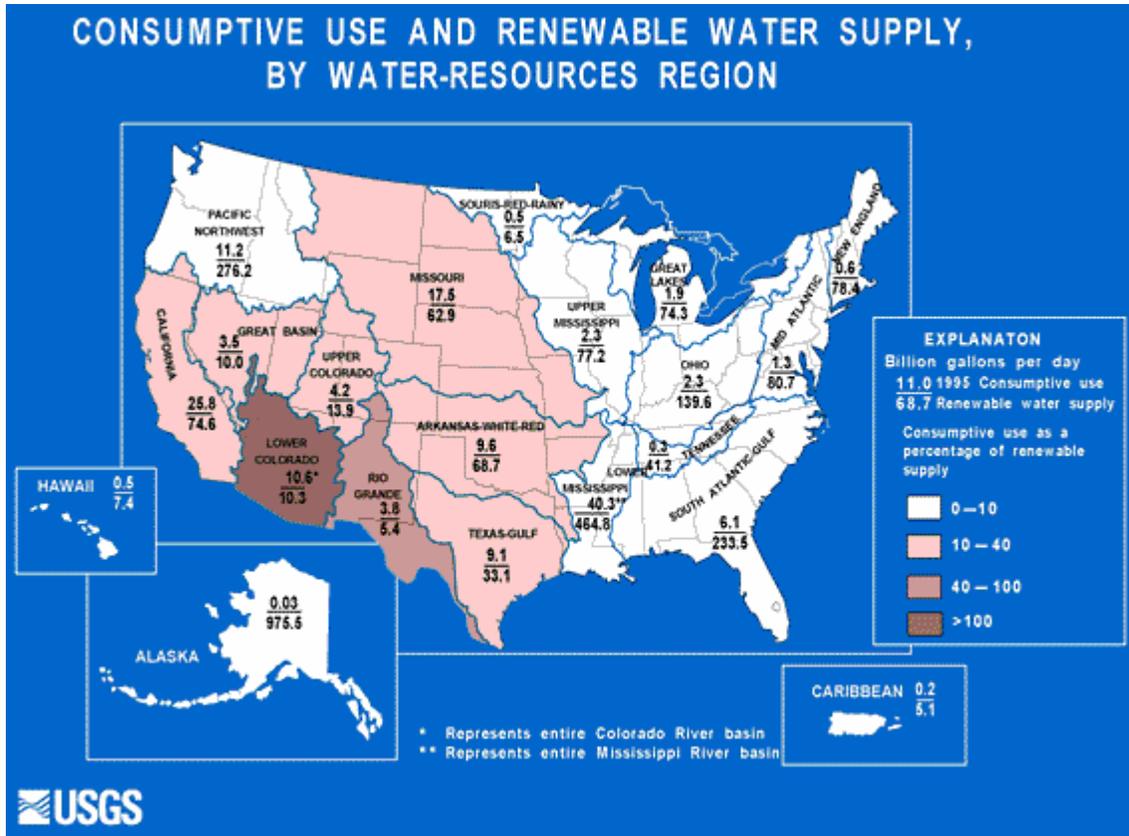


FIG.3.A: Consumptive Use and Renewable Water Supply, 1995  
(Source: <http://water.usgs.gov/watuse/misc/consuse-renewable.html>)

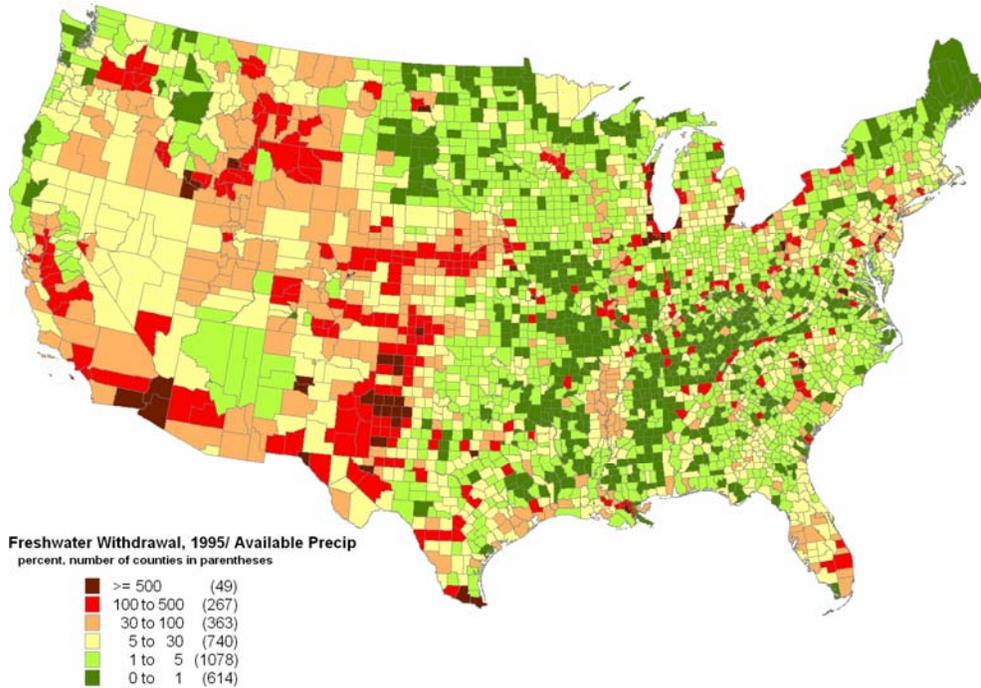


FIG.3.B: Total Freshwater Withdrawal in 1995 (as a percent of available precipitation); (Source: Roy, S.B., Ricci, P.F., Summers, K.V., Chung, C.-F., and Goldstein, R.A. (2005). Evaluation of the Sustainability of Water Withdrawals in the United States, 1995-2025; *Journal of the American Water Resources Association*, 41(5):1091-1108)

**B. Water quality**

People and ecosystems need water of sufficient quality to support the benefits, services and functions they provide. This indicator category is for composite measures of the sustainability of water quality for human and ecosystem uses.

**4. Quality of water for human uses:** Measures of the quality of water used for drinking, recreation, industry and agriculture.

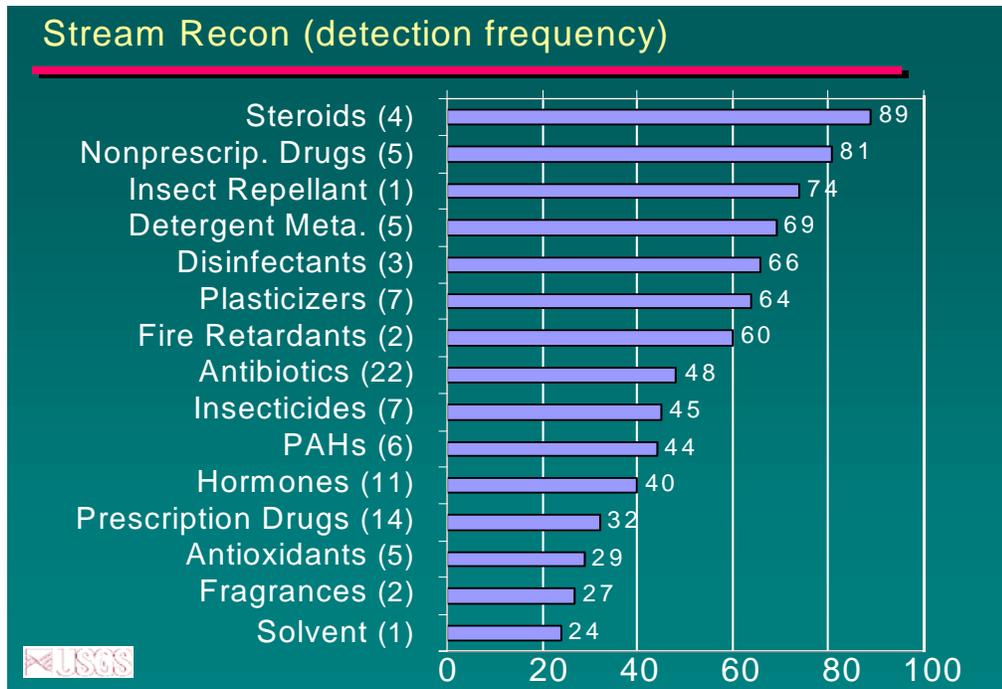


FIG.4.A: Emerging Contaminants (Source: USGS Toxic Substances Hydrology Program, <http://toxics.usgs.gov/regional/emc.html>)

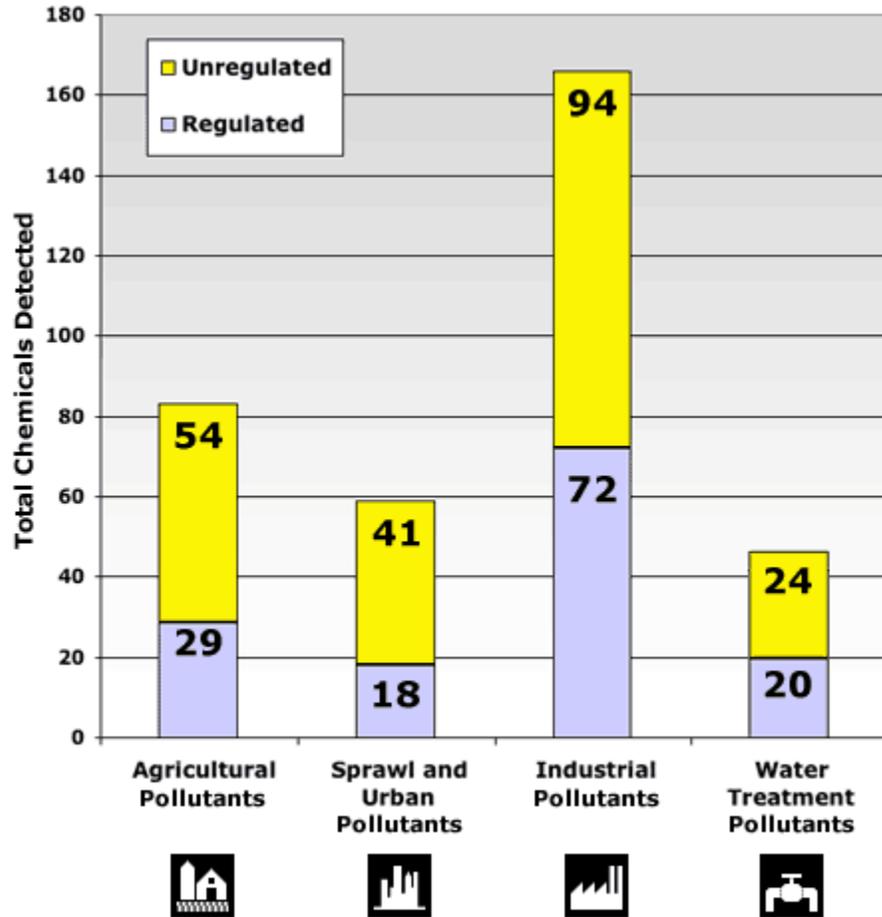


FIG.4.B: Source: Environmental Working Group analysis of water utility test data for 1998-2003, compiled and provided to EWG by state drinking water offices; National Tap Water Quality Data Base, <http://www.ewg.org>

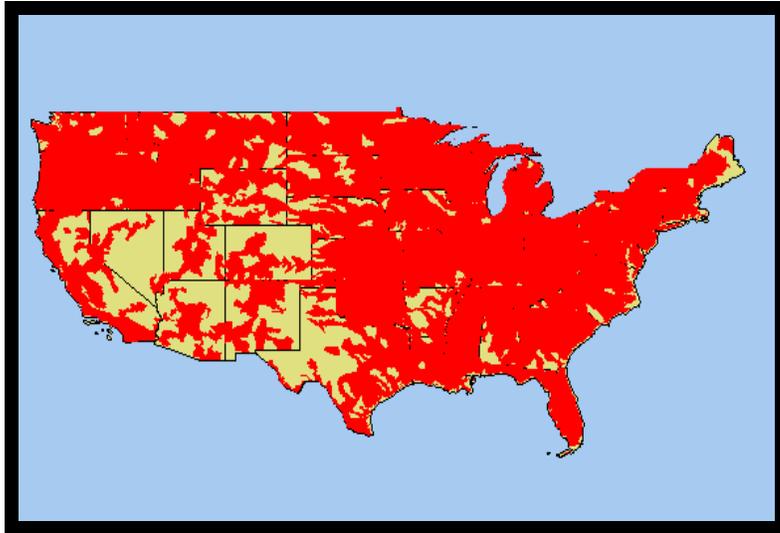


FIG.4.C: U.S. EPA, Watershed Tracking and Environmental Results, Envriomapper for Water to show National Trends for Impaired Waters (2002) Impaired water shaded in red (Source: U.S. EPA, <http://www.epa.gov/waters/enviomapper/index.html>)

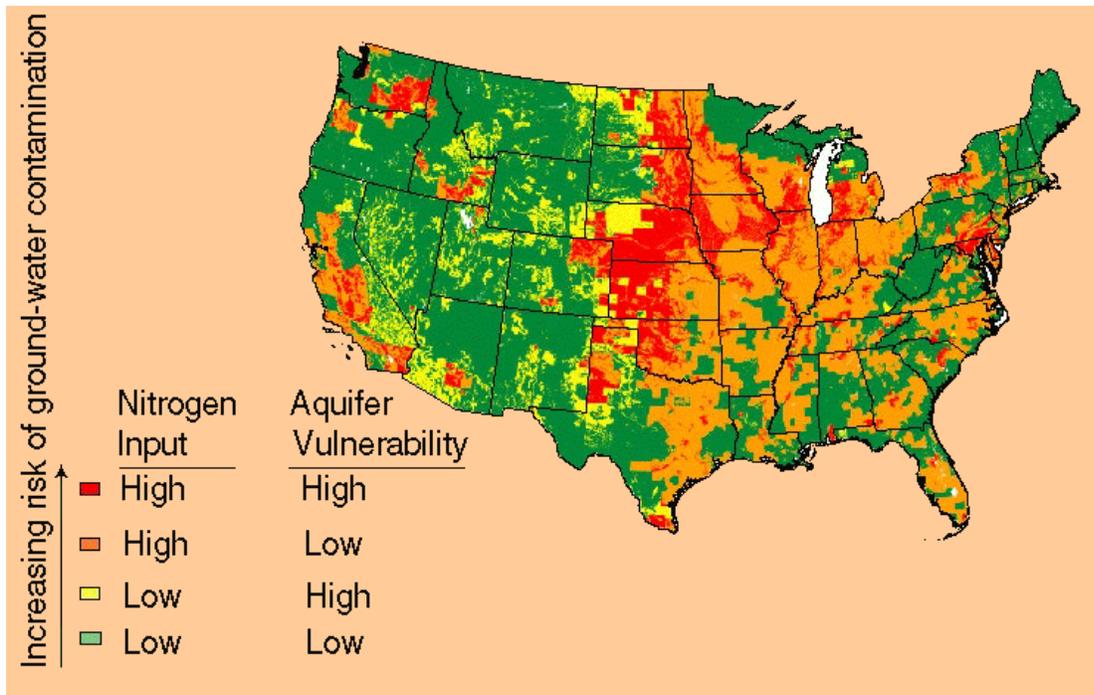


FIG.4.D: Nitrate Impact on Aquifers, (Source: Nolan, Bernard T., Barbara C. Ruddy, Kerie J. Hitt, and Dennis R. Helsel (2001), *A National Look at Nitrate Contamination of Ground Water*, U.S. Geological Survey, Reston, Virginia)

**5. Quality of water in the environment:** Measures of the quality of water supporting flora and fauna and related ecosystem processes.

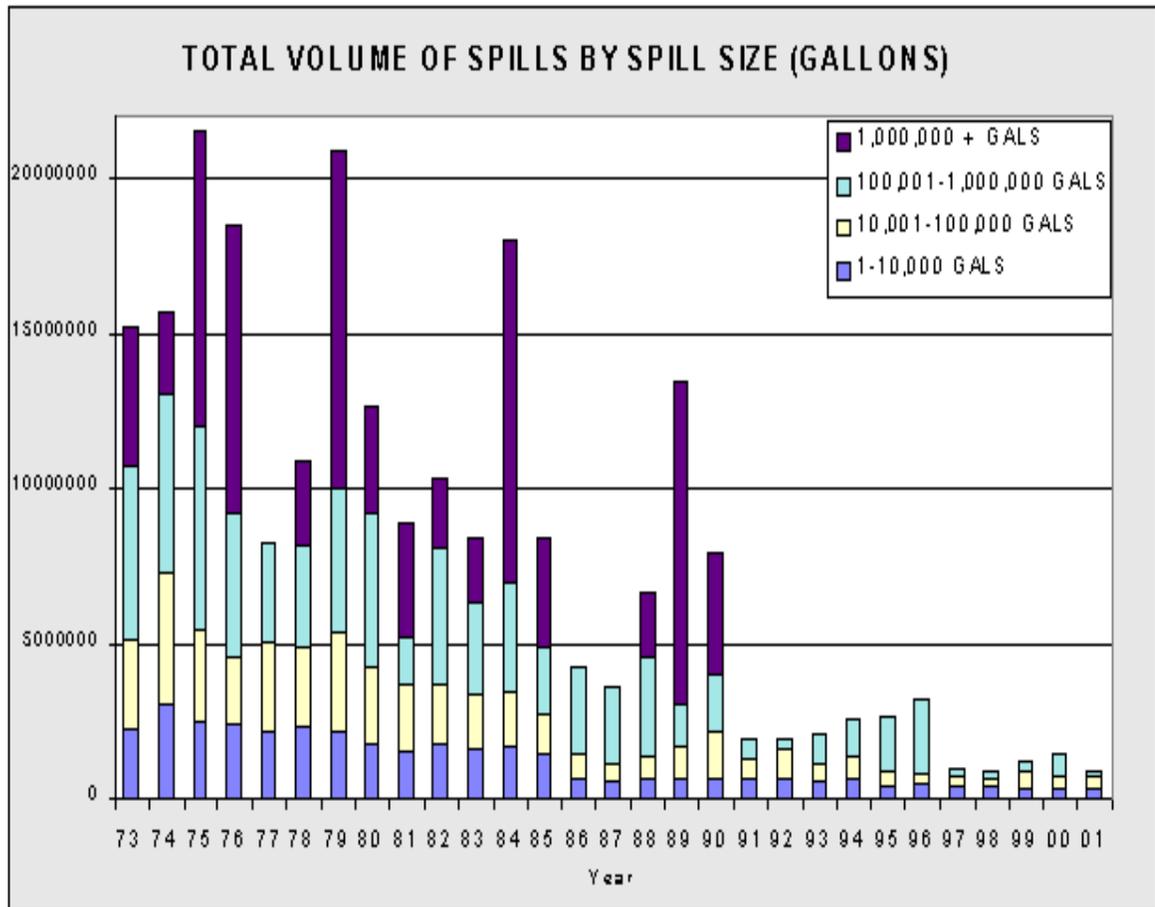


FIG.5.A: Total Volume of Oil Spills by Spill Size  
(Source: Compliance Analysis Division, U.S. Coast Guard, Polluting Incident Compendium, 1973-2001; <http://www.uscg.mil/hq/g-m/nmc/response/stats/Summary.htm>)

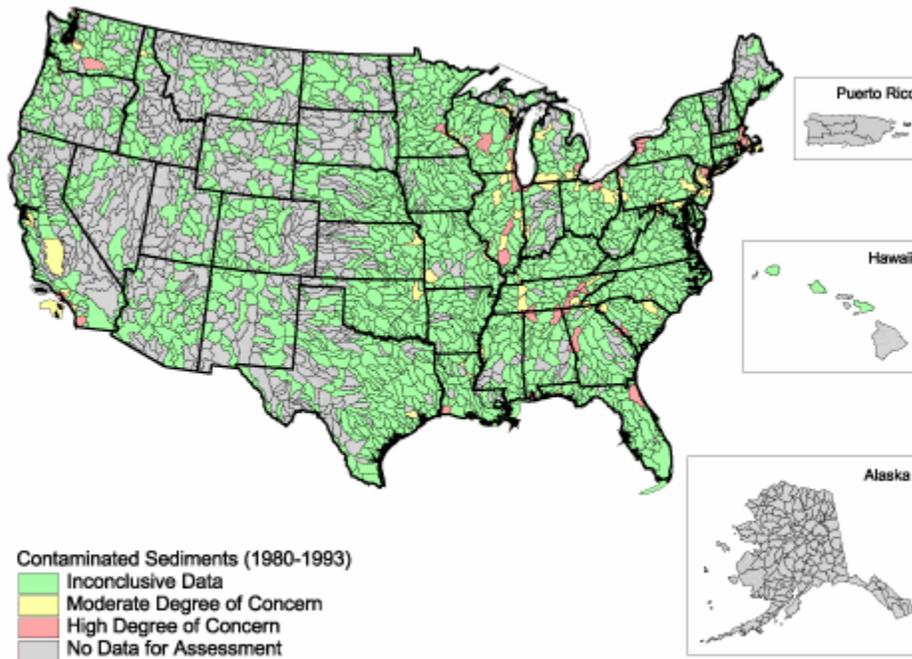


FIG.5.B: Contaminated Sediments between 1980 and 1993. (Source: National Sediment Quality Survey Database, <http://www.epa.gov/waterscience/cs/report/2004/>)

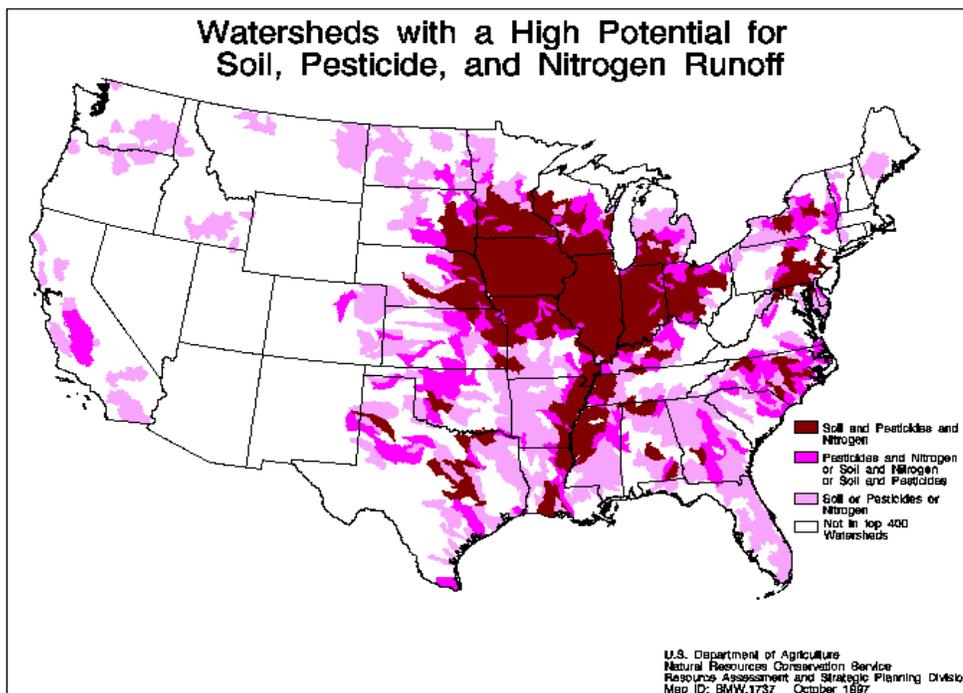


FIG.5.C: Watersheds with a High Potential for Soil, Pesticide, and Nitrogen Runoff, 1990-1995 (Source: <http://www.nrcs.usda.gov/technical/land/lqif/m1737l.gif>)

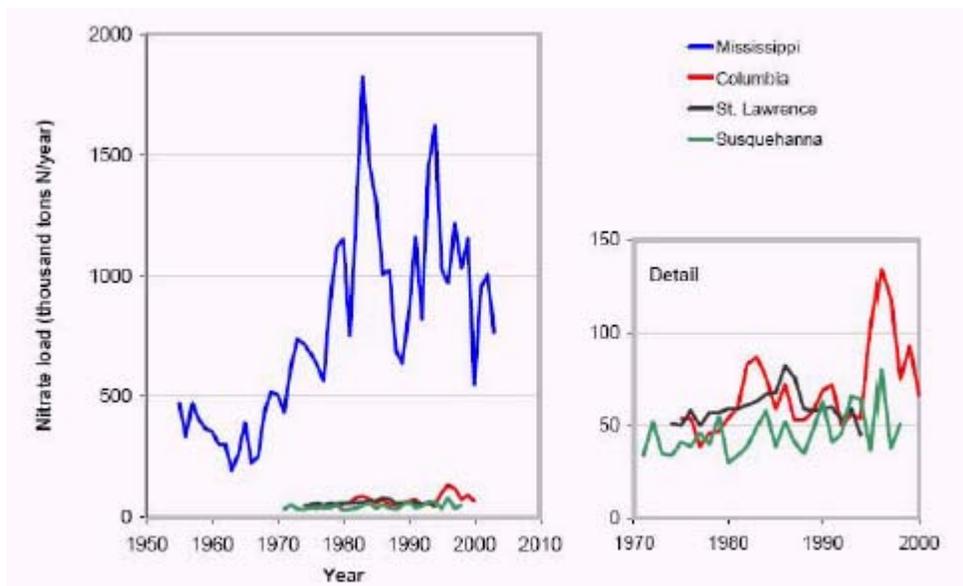


FIG.5.D: Nitrate Load Carried by Major Rivers;  
(Source: Figure prepared for the U.S. Environmental Protection Agency State of the Environment 2006 report using data from U.S. Geological Survey.)

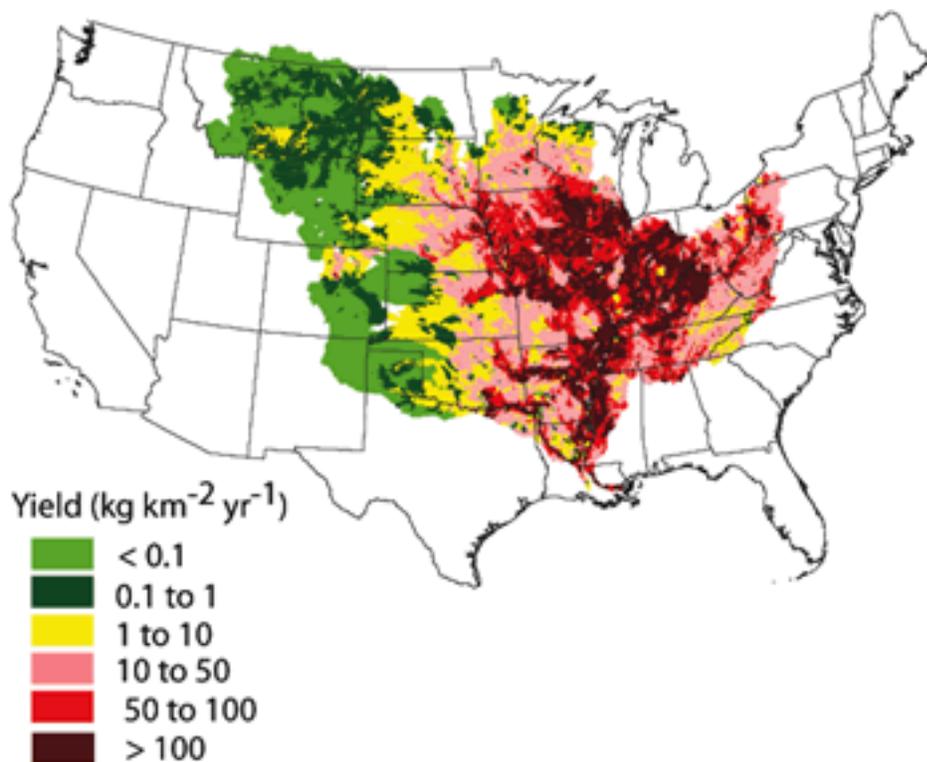


FIG.5.E: Phosphorus Delivered to the Gulf of Mexico, 2007.  
(Source: [http://water.usgs.gov/nawqa/sparrow/gulf\\_findings](http://water.usgs.gov/nawqa/sparrow/gulf_findings))

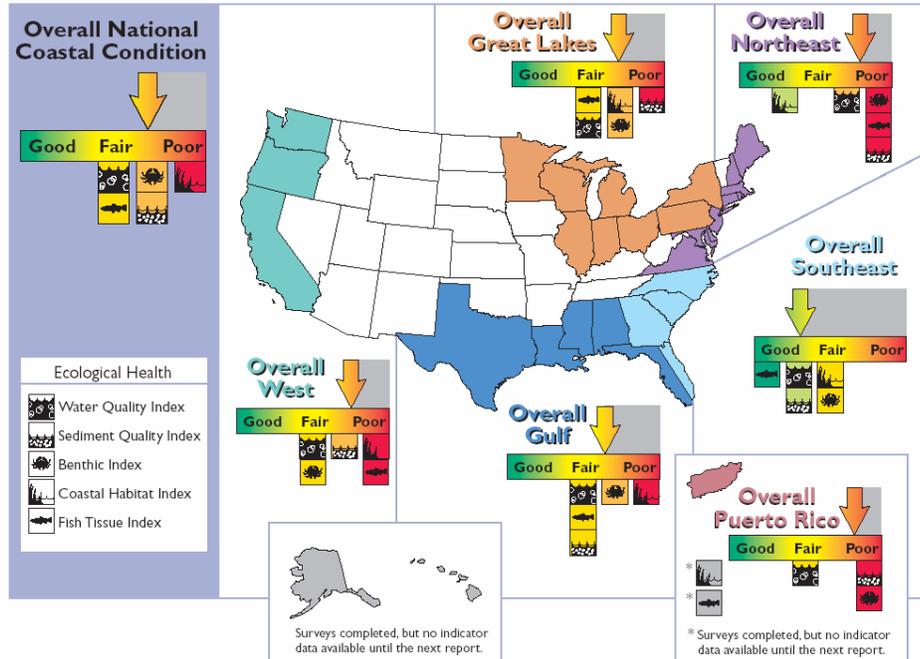


FIG.5.F: Overall National and Regional Coastal Conditions Between 1997 and 2000;  
(Source: U.S. EPA, December 2004. National Coastal Condition Report II. Office of  
Research and Development/Office of Water. EPA-620/R-03/002.  
(<http://www.epa.gov/owow/oceans/nccr2/>)

**6. Water quality sustainability:** Composite measures of the degree to which water quality satisfies human and ecosystem needs.

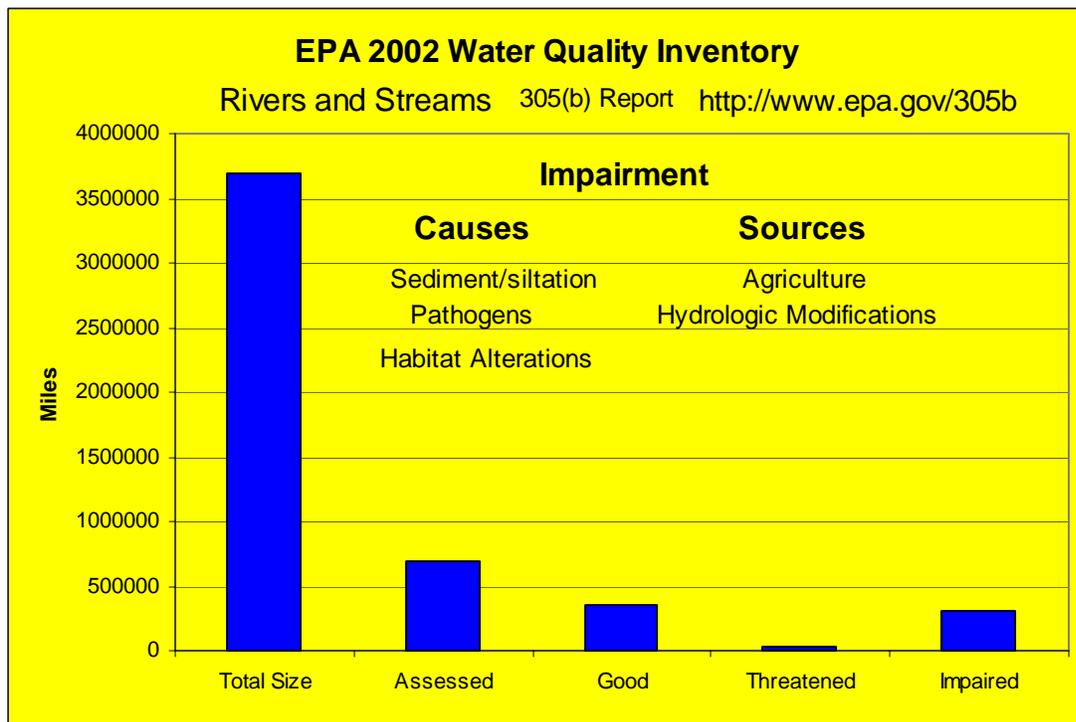


FIG.6.A: EPA 305(b) results for Rivers and Streams.

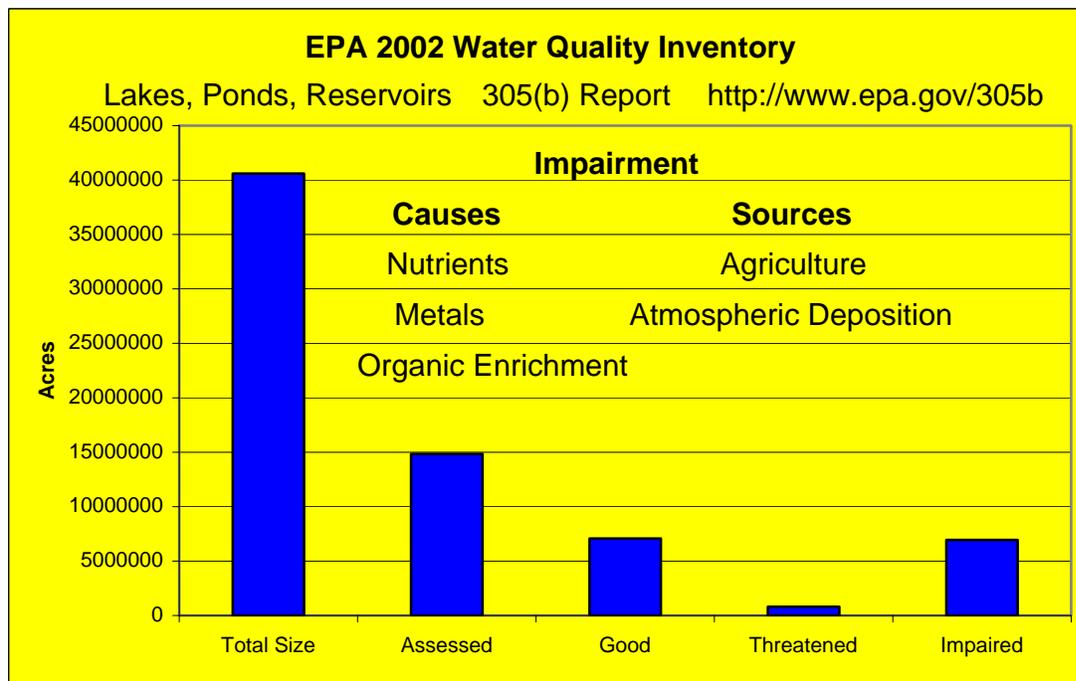


FIG.6.B: EPA 305(b) results for Lakes, Ponds, and Reservoirs.

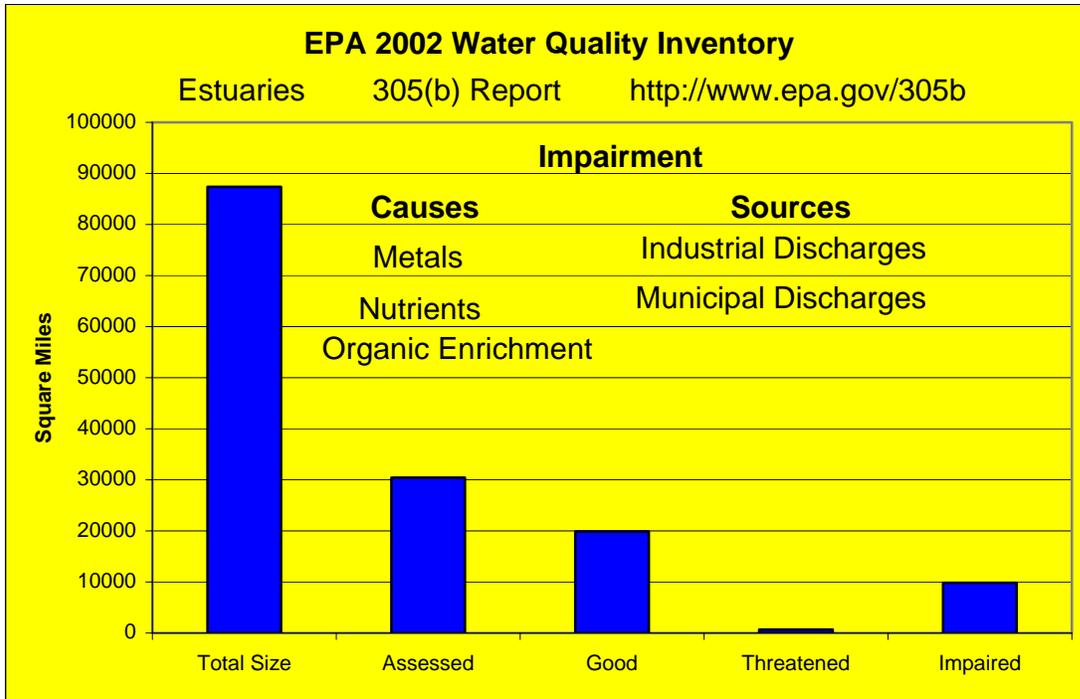


FIG.6.C: EPA 305(b) results for Estuaries.

C. **Human uses and health.** People benefit from the use of water and water-dependent resources, and their health may be affected by environmental conditions.

**7. Withdrawal and use of water:** Measures of the amount of water withdrawn from the environment and the uses to which it is put.

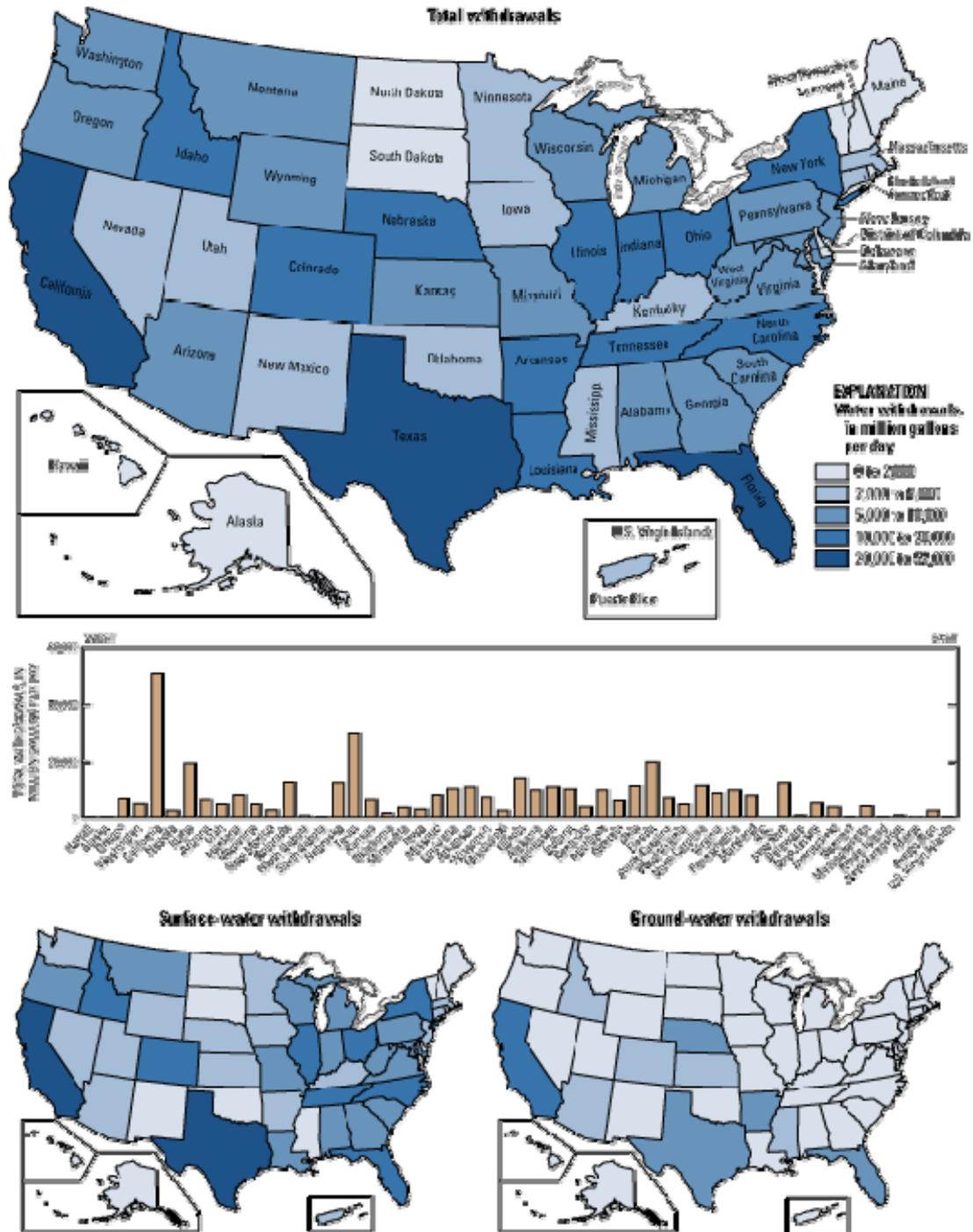


FIG.7.A: Total, surface-water, and ground-water withdrawals for the United States, 2000 (U.S. Geological Survey Circular 1268, 46p, <http://water.usgs.gov/watuse/data/2000/index.html>)

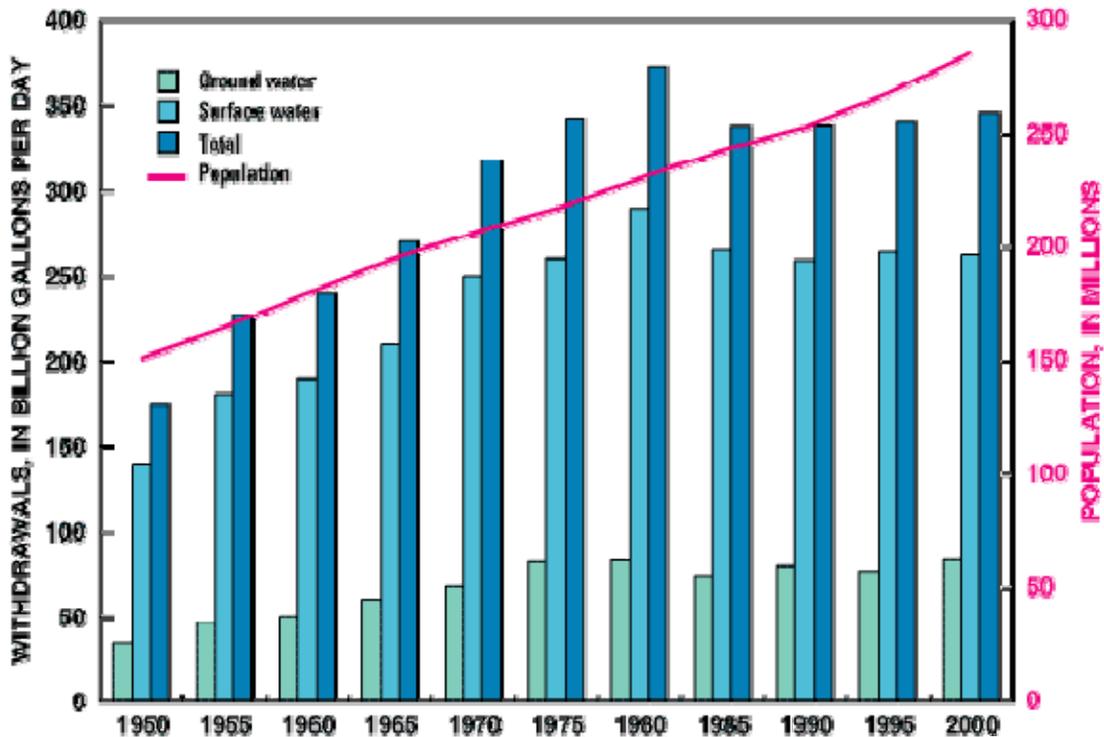


FIG.7.B: Trends in U.S. freshwater withdrawals and population, 1950-2000 (*U.S. Geological Survey Circular 1268*, 46p, <http://water.usgs.gov/watuse/data/2000/index.html>)

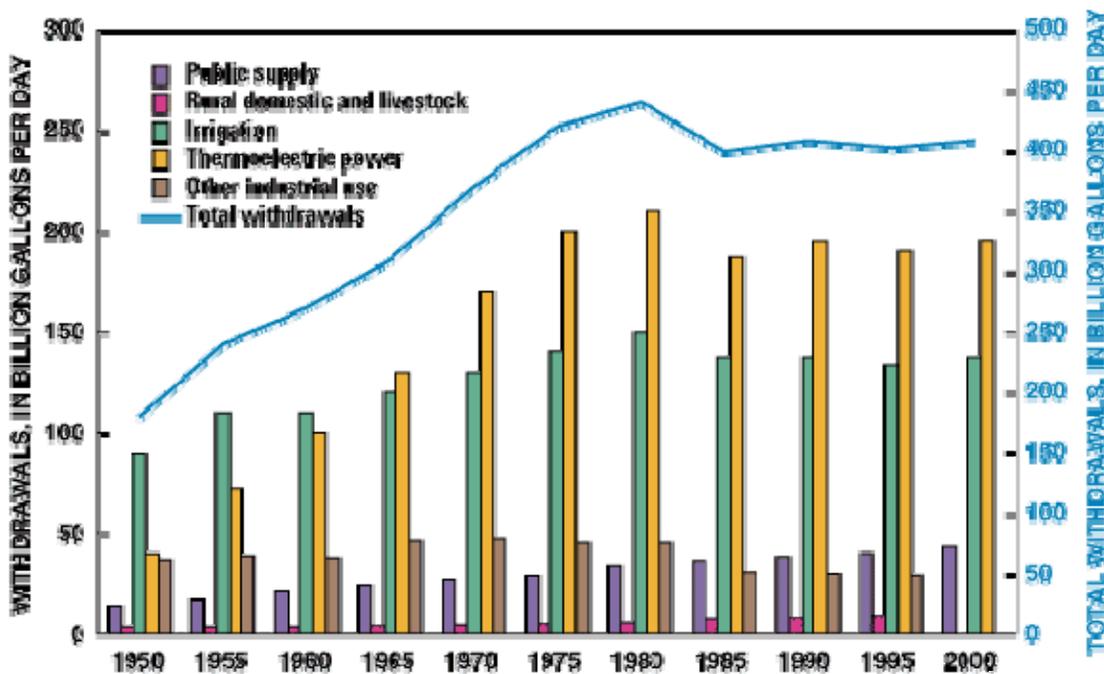


FIG.7.C: Trends in total U.S. water withdrawals by water-use category, 1950-2000 (*U.S. Geological Survey Circular 1268*, 46p, <http://water.usgs.gov/watuse/data/2000/index.html>)

**8. Human uses of water in the environment:** Measures of the extent to which people use water resources for waste assimilation, transportation and recreation.

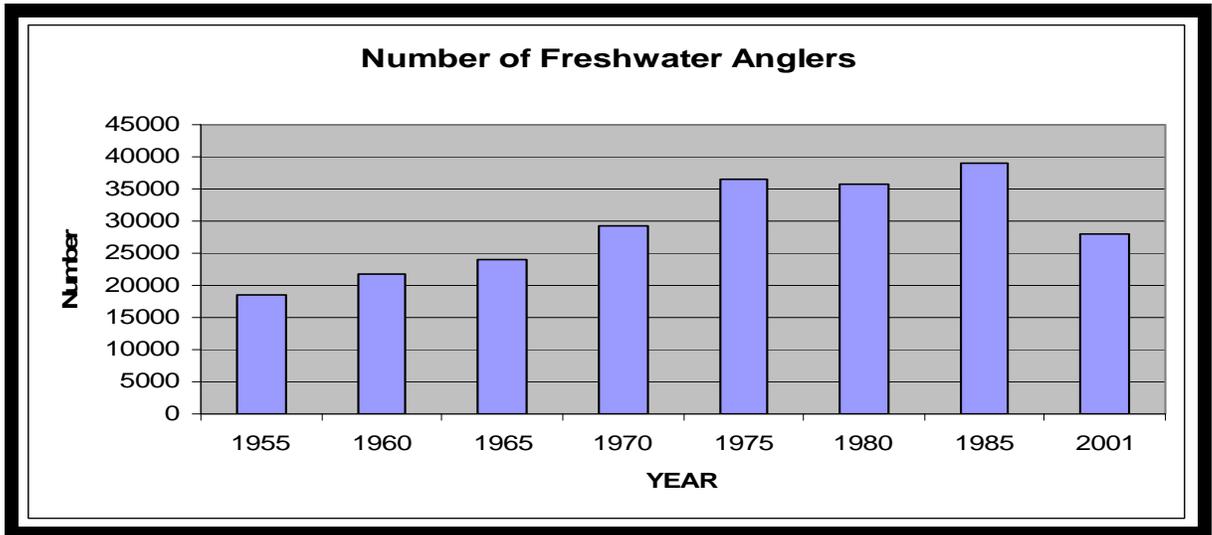


FIG.8.A: Public Participation in Fresh water Recreation; (Source: U.S. Fish and Wildlife Service – National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Survey (<http://www.fws.gov/fishing>))

**9. Water-dependent resource use:** Measures of the extent to which people use resources like fish and shellfish that depend on water resources.

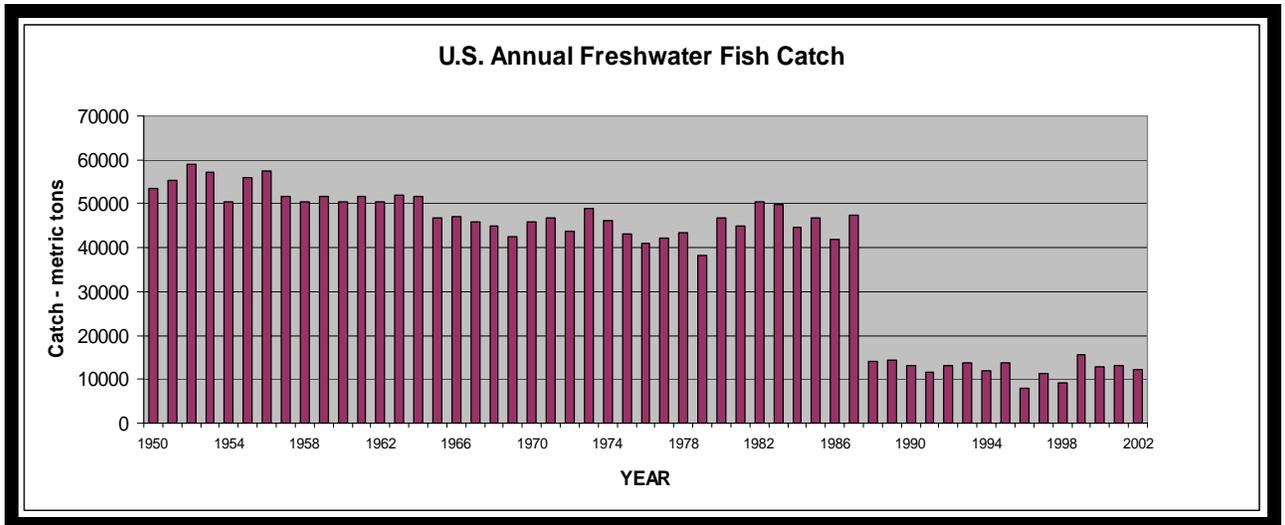


FIG.9.A: U.S. Annual Freshwater Fish Catch; (Source: The World Resources Institute Earth Trends Report, *Capture by Species: Fresh water Fish* ([http://earthtrends.wri.org/searchable\\_db](http://earthtrends.wri.org/searchable_db)) as reported by the Food and Agricultural Organization of the United Nations, 2004 (<http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>))

**10. Human health:** Measures of the extent to which human health may be affected by the use of water and related resources.

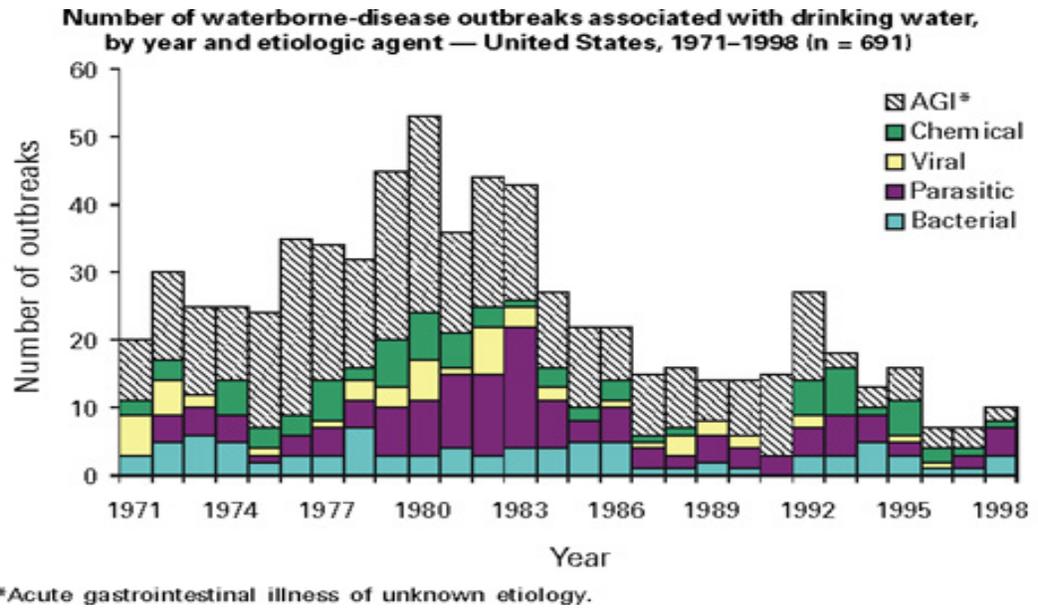


FIG.10.A: Reported Incidence of Waterborne Disease: Number of outbreaks, etiologic agent, and source of waterborne exposure—1971-1998; Adapted From: Surveillance for Waterborne Disease Outbreaks - US, 1997-1998 (UNICEF, State of the World’s Children) Accessible at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss4904a1.htm>

D. **Environmental health.** People use land, water and water-dependent resources in ways that affect the conditions of ecosystems.

**11. Indices of biological condition:** Measures of the health of ecosystems.

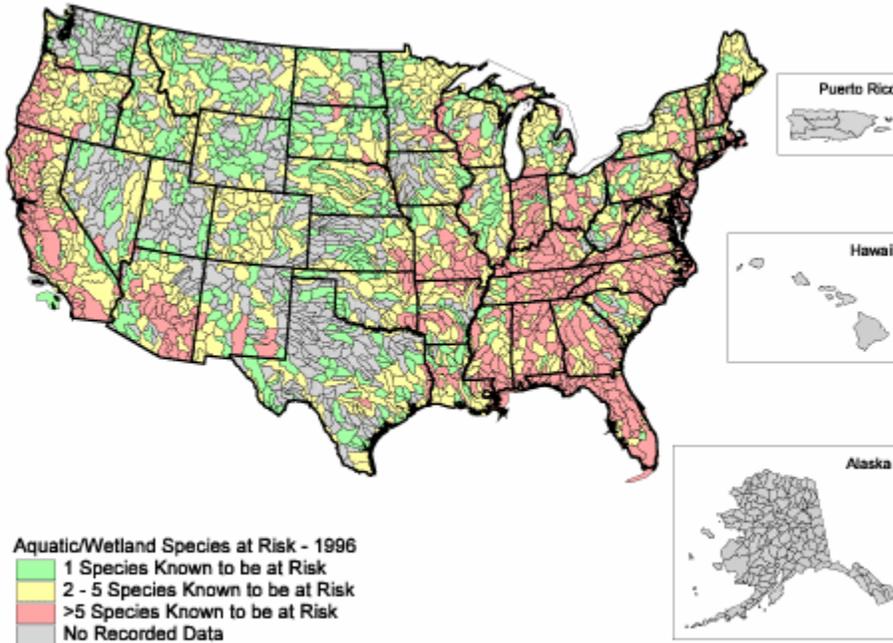


FIG.11.A: Aquatic/Wetland Species at Risk, 1996;  
(Source: [http://oaspub.epa.gov/eims/direnrpt.report?p\\_deid=1750&p\\_chk=5582](http://oaspub.epa.gov/eims/direnrpt.report?p_deid=1750&p_chk=5582))

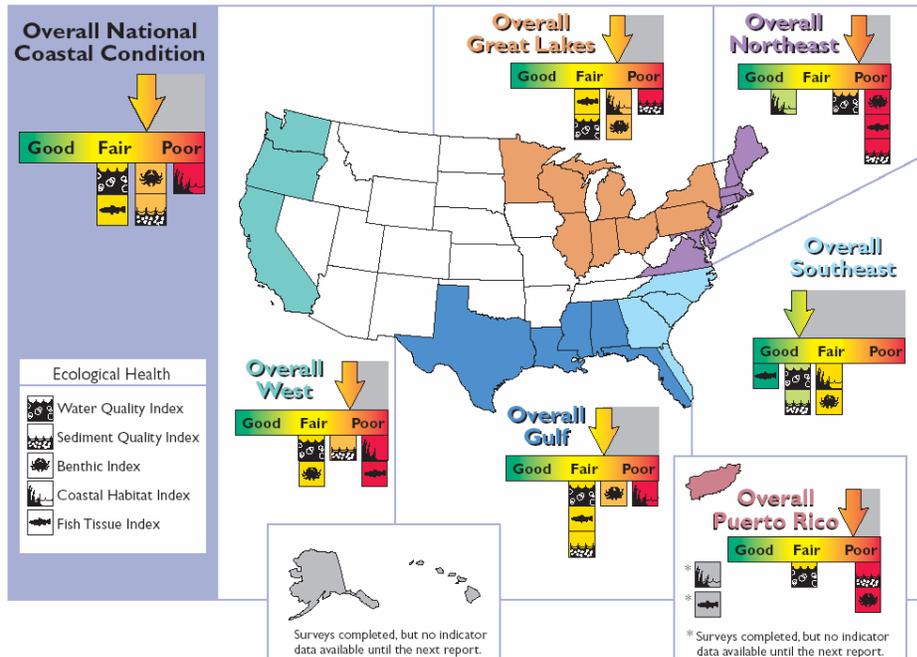


FIG.11.B: Overall National and Regional Coastal Conditions Between 1997 and 2000; (Source: U.S. EPA, December 2004. National Coastal Condition Report II. Office of Research and Development/Office of Water. EPA-620/R-03/002. (<http://www.epa.gov/owow/oceans/nccr2/>))

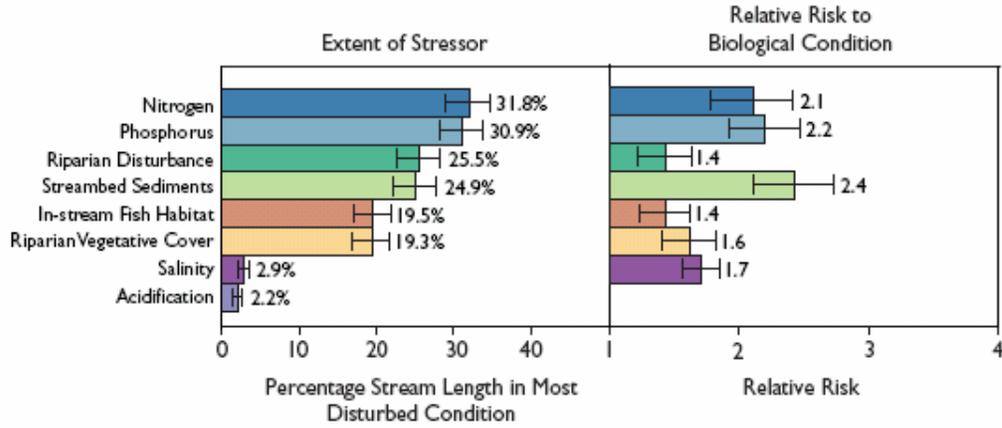


FIG.11.C: Water Conditions in Wadeable Streams; (Source: EPA Wadeable Streams Assessment, 2006, <http://www.epa.gov/owow/streamsurvey>)

**12. Amounts and quality of living resources:** Measures of the productivity of ecosystems.

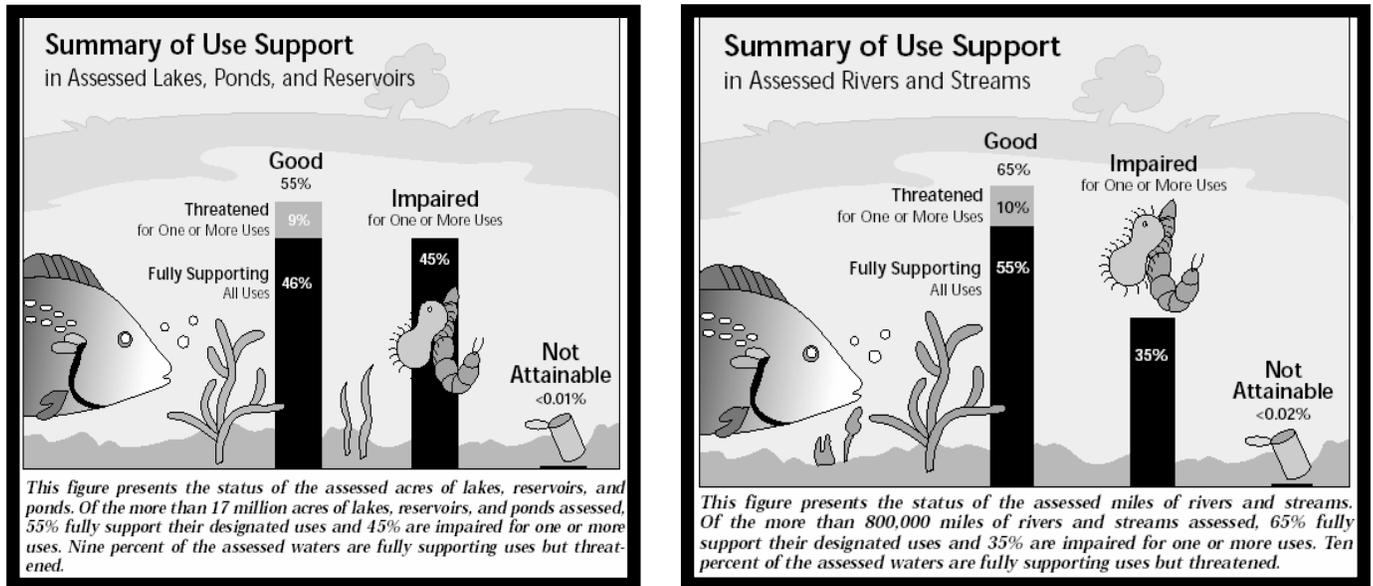


FIG. 12.A: Summary of Use Support; (Source: 1998 U.S. EPA State and Tribal Section 305b Report, <http://www.epa.gov>)

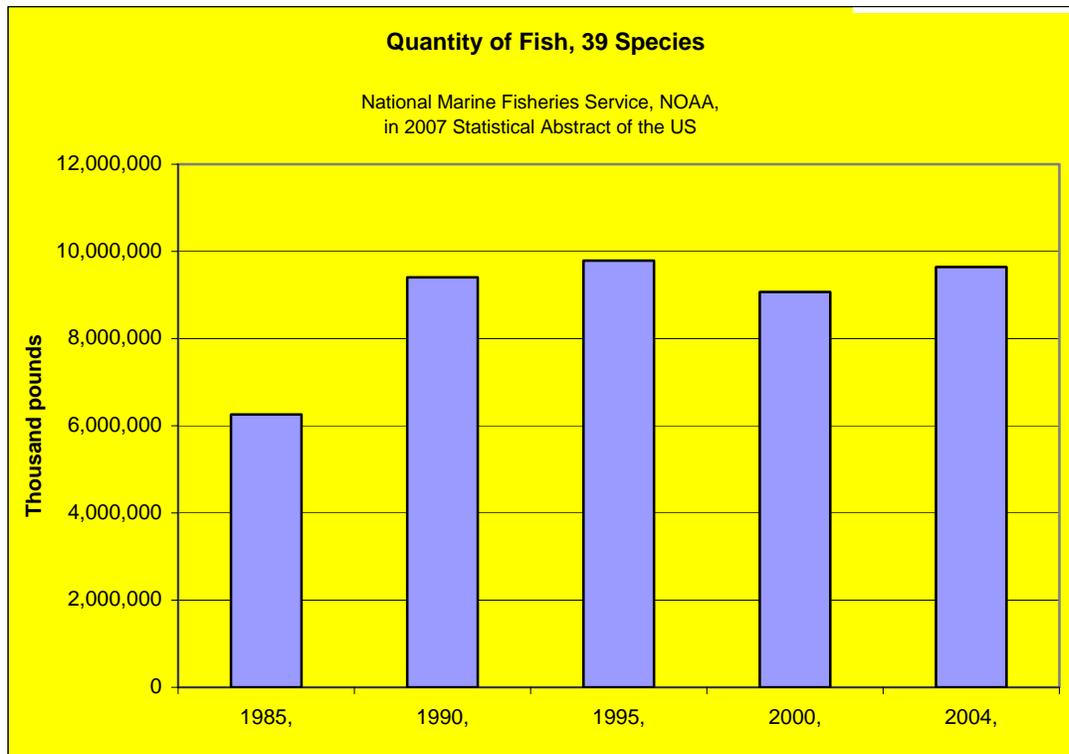


FIG. 12.B: Quantity of Fish Landed. Source: National Marine Fisheries Service, NOAA, in 2007 Statistical Abstract of the United States. Table 867. [http://www.census.gov/compendia/statab/natural\\_resources/fisheries\\_aquaculture/](http://www.census.gov/compendia/statab/natural_resources/fisheries_aquaculture/)

**E. Infrastructure and institutions.** The infrastructure and institutions communities build enable the sustainable use of land, water and water-dependent resources.

**13. Capacity and reliability of infrastructure:** Measures of the capacity and reliability of infrastructure to meet human and ecosystem needs.

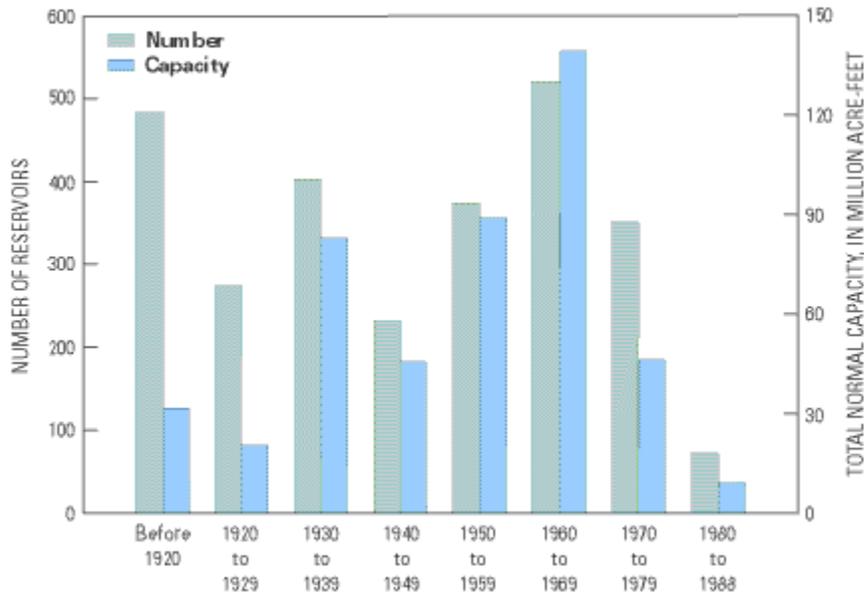


FIG.13.A: Number and Capacity of Reservoirs Built Since Before 1920 to 1988; (Source: U.S. Geological Survey, Report to Congress, *Concepts for National Assessment of Water Availability and Use*, U.S. Geological Survey Circular 1223, August 2002, <http://pubs.water.usgs.gov/circ1223/>)

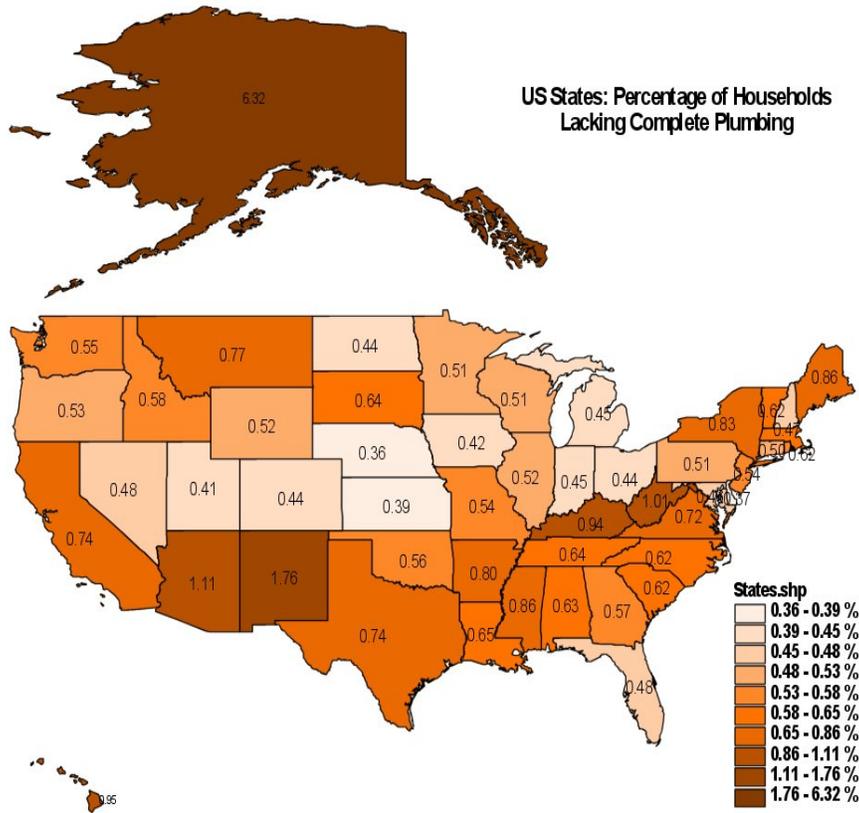


FIG.13.B: Percent of the Population Lacking Complete Plumbing by State; (Source: Rural Community Assistance Partnership; 2004; *Still Living without the Basics in the 21<sup>st</sup> Century*. <http://www.rcap.org/resources/basics.html>)

**14. Efficacy of institutions:** Measures of the efficacy of legal and institutional frameworks in managing water and related resources sustainably.

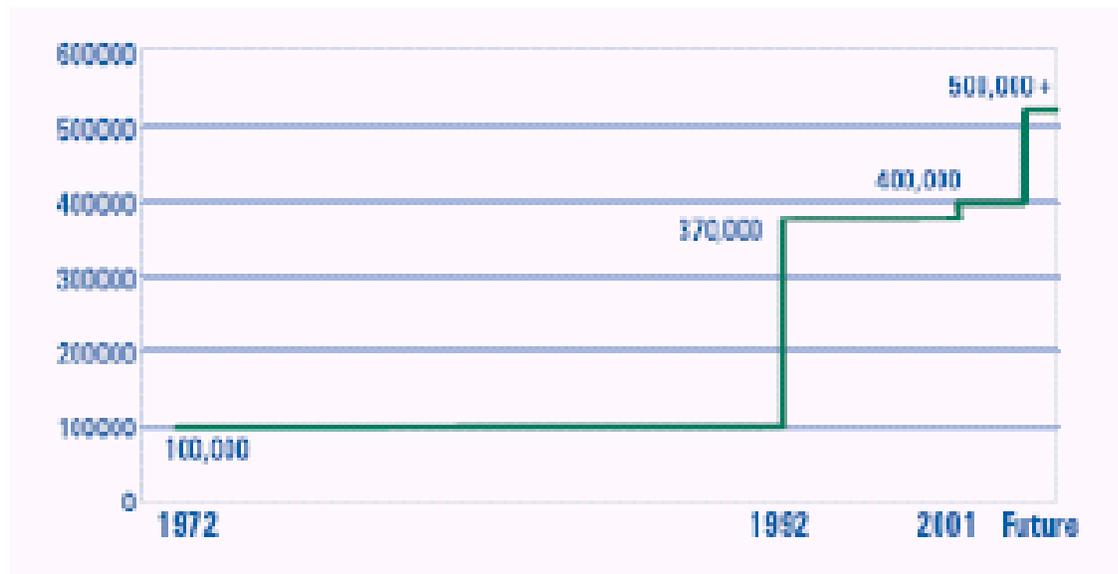


FIG.14.A: Growth of the NPDES Program; (number of facilities or sources); (Source: USEPA, 2001, <http://www.epa.gov>)

**We welcome your participation in and support of the Sustainable Water Resources Roundtable.**

Additional information can be found on the Roundtable at <http://acwi.gov/swrr>. Contact David Berry at [davidberry@aol.com](mailto:davidberry@aol.com) or Tim Smith at [etsmithsiri@aol.com](mailto:etsmithsiri@aol.com).