

## Chapter 12: FRESH WATER

### BACKGROUND

- [One in six people do not have adequate water](#) for drinking, cooking and cleaning. Two out of five people lack sufficient water for decent sanitation. This fuels poverty, human suffering, political instability and ecological degradation.
- [Climate change will continue to change global hydrology](#), making freshwater supplies and water-based ecosystem services less stable and secure. The United States is experiencing increased evaporation, loss of snowpack, regional drought and an increase in violent storms. Both surface and groundwater sources are vulnerable.
- Species that depend on [freshwater habitats](#) are among the most threatened in North America and the world.
- Regional U.S. water supplies are becoming increasingly unreliable; shortages have disrupted daily life and harmed agricultural productivity and ecological health. A [General Accounting Office \(GAO\) study](#) projects that 36 states anticipate water shortages in the next 10 years under normal water conditions and 46 states under drought conditions. Estimates for water supply and demand through 2025 indicated a high likelihood of local and regional water shortages in the United States.<sup>1</sup>
- Many municipal water systems already face water scarcity and variability.
- Desalination is an energy-intensive process and a costly means of providing fresh water with limited capacity to supply water to large populations and areas remote from coasts.
- Aging water infrastructure is contributing to water and energy waste and increasing the cost of water delivery and treatment.
- Resources for emergency response to water shortages and water-related disasters are constrained; long-term strategies are lacking.
- [“Freshwater availability is...a critical limiting factor](#) in economic development and sustainability, which directly impacts electric-power supply.”<sup>2</sup>
- [Most electricity in the U.S. \(about 85%\) is produced by closed-loop, steam-based power cycles](#),<sup>3</sup> which use large volumes of water (steam) to drive turbines and additional water for cooling. [“On average, each kWh of electricity generated via the steam cycle requires approximately 25 gallons of water.”](#)<sup>4</sup> (Fossil-fueled systems and nuclear energy withdraw and consume the largest volumes.)
- The extraction and production of source fuels also requires volumes of water – particularly the extraction of oil from coal tar and shale. There will be “increased conflicts and competition for the water the power industry will need to operate their thermoelectric generation capacity.”
- Reduced stream flows may restrict energy production in areas where water supplies are insufficient for power plant development or operations.
- [Agriculture is the world’s largest user of fresh water.](#)

## FRAMEWORK FOR FEDERAL POLICY

- Predicted water shortages and rapid environmental change require a comprehensive and cohesive U.S. water management strategy, adapted to regional needs. The strategy must establish nationwide goals for water conservation, water quality, watershed and ecosystem protection, and include a road map for adapting water resource management to climate change.
- Restoration and conservation strategies must “design with nature” and make the best use of natural processes to achieve conservation goals. Steps should include: a) restoring floodplains, wetlands, riparian areas, coastal forests and groundwater re-charge areas; b) safeguarding the existing water retention and filtration capacity of forests, wetlands, headwaters, natural shorelines and floodplains; c) restoring major freshwater and estuarine ecosystems, including the [Everglades](#), the [Chesapeake Bay](#) watershed and the [Great Lakes](#); and d) protecting coastal aquifers from saltwater incursion where possible. These actions will reduce runoff; increase filtration and groundwater recharge; help keep cleaner freshwater supplies in watersheds and aquifers and not washed out to sea; reduce erosion and sedimentation; protect water quality and freshwater habitat; and reduce the scale of dead zones in coastal waters and the Great Lakes.
- Water conservation must go hand-in-hand with energy conservation as a national priority based on need, common sense and efficiency. National policies must provide a catalyst for technological and social breakthroughs on water use and conservation.
- Infrastructure must be modernized for drinking water, wastewater and flood control systems as well as to improve planning and emergency preparedness to provide safe, reliable municipal water supplies and reduce losses from water-related disasters.
- U.S. energy strategy should incorporate the social and environmental factors associated with specific energy choices, including water consumption and impacts on water quality and habitat.
- A national dialogue should be engaged on strategies to determine priority uses for water that include considerations of rights (and commensurate responsibilities) and the purposes for which “new” and recycled water are used.
- Impacts on food production must be anticipated and strategies and policies should be developed to respond to higher variability in precipitation, increasing temperature and potential water scarcity and/or inundation. Better efficiencies in irrigation and chemical input; careful choices in crop and management practices; and conservation of wetlands and erodible soils should also be considered. (See Agriculture chapter.)

## EXECUTIVE ACTIONS

1. Establish an independent national commission on water resources and climate change to oversee implementation of the following recommendations and to develop additional responsive strategies to safeguard water supplies, water quality and freshwater dependent ecosystems.
2. Direct the Environmental Protection Agency (EPA), United States Department of Agriculture (USDA), National Oceanic and Atmospheric Administration (NOAA), Department of the Interior (DOI) and Federal Emergency Management Agency (FEMA) to develop a comprehensive plan for nationwide conservation, protection and replenishment of water resources that includes: watershed restoration and protection; ecosystem protection (including water quality and habitat); water conservation programs and incentives; water infrastructure modernization; emergency preparedness and risk reduction from water-related hazards and disasters;

coordination of federal, regional, state and watershed policy; and criteria for energy production and delivery systems to conserve and protect water.

3. Direct the EPA, USDA, DOI and **NOAA** to develop an integrated wetland and floodplain restoration program to enhance groundwater recharge and natural controls for storm water, with priority given to flood-prone areas and areas with depleted groundwater systems.
4. Direct the [Council on Environmental Quality](#) (CEQ) to convene a high-profile summit on how existing federal agencies and programs can be reformed to avoid further wetland and riparian destruction and promote large-scale river and wetland restoration, including the role for innovative public/private restoration finance options.
5. Direct the EPA and other land and water management agencies to give priority to wetland restoration projects that restore fully functional wetlands. Enforce “no net loss” wetland policy when calculating land-conversion options, and encourage net gain.
6. Direct the EPA to expand the reach of storm water management programs by developing a funding program to support states in providing technical assistance to local governments to convert ornamental turf grasses (lawns, etc.) and impervious surfaces (where appropriate) to rain gardens, xeriscapes or other landscaping and permeable surfaces that capture and filter storm water.
7. Update key federal floodplain and wetlands directives under [Executive Orders 11988](#) and [11990](#) to reflect anticipated impacts from intense precipitation events as well as the impact of land development from recent decades on hydrology.
8. Direct the [United States Forest Service](#) (USFS) and [Bureau of Land Management](#) (BLM) to protect the water retention and filtration functions of forests and rangelands in their management practices on federal lands and support complementary efforts on private lands. To support this effort, identify and remove financial barriers that currently prevent farmers from converting marginal agricultural lands to permanent grassland or forest.
9. Direct the EPA to expand, improve and promote the “[Water Sense](#)” water efficiency program to complement the federal Energy Star Program and promote water efficiency in water fixtures, appliances, landscape irrigation, etc.
10. Establish an **interagency task force** (coordinated with the commission in item 1 as appropriate) to develop recommendations for ways the federal government can support strategies to address leaking infrastructure, promote wastewater recycling and re-use, changes in water fee structures that promote conservation, as well as xeriscaping, precision agriculture and irrigation, cistern use, etc.
11. Direct all federal agencies to develop and adopt **water conservation practices** in their operations, including federal purchases of water fixtures, landscaping and related maintenance.
12. Direct the General Services Administration (GSA) to improve incentives in federal construction for the use of **permeable pavements, green roofs and other green building approaches** that contribute to water and energy conservation.
13. Urge state regulators to **require that new power generation facilities meet strict water use performance criteria** to be determined based on projected changes in rainfall. During the southeastern drought of 2007, hydroelectric power generation was reduced by as much as 66 percent, resulting in an increased reliance on imported power, often from coal fired or other carbon intensive power sources. During the 2003 heat wave in France, many nuclear power facilities were forced to shut down because of inadequate supplies of cooling water.

- 14.** The president should direct the EPA to inventory and assess wastewater and storm water treatment infrastructure systems throughout the United States that fail to provide consistent and adequate treatment for current or projected sewage and storm water volume (including anticipated increases from intense storms). The assessment will identify priorities for rapid improvement and modernization; develop a timetable for reaching compliance with current environmental laws and reducing environmental risks and hazards to public health and safety; include a projection of federal resources required to implement upgrades and an analysis as to whether current requirements for local matching funds under the State Revolving Loan program are barriers to rapid advances in water treatment infrastructure.
- 15.** Direct the EPA, FEMA, USGS, NOAA and the Corps to develop a nationwide assessment of flood control infrastructure (dams and levees) and floodplain management to determine the best strategies for reducing risk and restoring and conserving functioning ecosystems in light of increases in storm intensity and flooding. In addition to hard systems such as levees, significant attention must be paid to floodplain protection, re-location of high-risk communities and other green infrastructure solutions. Interim steps should include major updating of [National Flood Insurance Program](#) (NFIP) Flood Hazard maps, denoting 200 and 500-year flood hazards, consideration of factors for sea level rise, areas susceptible to coastal shoreline erosion and areas behind levees and below dams. Strategies should also consider reasonably predictable future conditions and areas which have or may become flood prone due to climate change.
- 16.** Request the Government Accountability Office conduct a systematic and comprehensive review of federal Corps of Engineers reclamation and other water projects, facilities and operations as they relate to priorities for construction and operations in the context of climate change mitigation and adaptation. The review should assess benefits and costs (financial, social and ecological) related to water supply, water quality, flood management, hydropower, transportation, natural habitat protection and ecosystem services (similar to assessments under Federal Energy Regulatory Commission [FERC] re-licensing) in the context of climate-driven hydrological changes. Dams and impoundments should be assessed as to whether they will be net greenhouse gas emitters, and also in conjunction with protecting public safety in areas with high risks of flash flooding.
- 17.** The White House should convene a national meeting of municipalities to launch a national initiative on municipal water system planning and infrastructure modernization.
- 18.** Direct the EPA and the Department of Energy (DOE) to undertake a study on energy used to supply, transport, treat and dispose of wastewater, identifying opportunities for increased efficiencies and conservation.
- 19.** Appoint a national working group with representation from regional, state and local water policy experts and diverse stakeholders and interests (including broader ecological needs), and coordinated with the group recommended in item 1, to assess and develop recommendations for coordination of U.S. federal and regional water management systems in the context of rapid environmental change and risks to human health and safety.
- 20.** Direct federal water management agencies to include integrated water resources planning and assistance as a primary mission. Establish an interagency mechanism to improve coordination and implementation of federal programs related to water management.
- 21.** Provide technical support and funding for states to develop state water plans, and provide incentives for states to further support local watershed planning. Incentives for cooperation include: coordination of federal planning assistance; federal consistency and sliding cost-share scales for water resources development; flood insurance and disaster recovery aid to encourage increased state and local planning and investment in improving safety; ecosystem restoration; and reliability of public water supplies and managing water related resources.

22. Develop a national public education campaign that increases public awareness of the role that water plays in our economy and well-being, and the role we can all play in protecting and conserving fresh water.
23. Direct all federal agencies to include water consumption and water quality impacts as criteria in full-cost, life-cycle analysis to inform decisions about public investments in energy development.
24. Direct the DOE to consider the water impacts of various energy resources and technologies – particularly in areas of the United States expected to experience drought – as it develops program priorities. Emphasize research, development, demonstration and deployment of fuels and energy technologies that minimize water use and identify opportunities to simultaneously advance CO<sub>2</sub> emissions reductions and water conservation.

## LEGISLATIVE ACTIONS

25. Reconsider incentive programs that give priority to inefficient land uses, and maintain existing forestland by encouraging permanent easements and extending existing tax credits under the Forest Legacy program for permanent easements to keep forested land in forests.
26. Fully fund Farm Bill programs such as the Environmental Quality Incentives Program, Conservation Security Program, Conservation Reserve Program and various programs that foster protection and reestablishment of wetlands and federal and state programs that support farmland conservation. Increase funds appropriated to the USFS State and Private Forestry Program.
27. Enact the **Clean Water Restoration Act** in order to restore protections to water bodies excluded by recent narrow interpretations of the [Clean Water Act](#).
28. Support the Great Lakes Restoration Collaboration Implementation Act and other ecosystem-scale restoration plans for major freshwater and estuarine ecosystems in the United States.
29. Phase out federal subsidies for irrigation water that promote unsustainable water use, particularly in the western United States, and establish a national competitive grants program, open to states and local governments, to analyze water conservation and water supply system operational changes needed to increase the resilience of public water supply systems.
30. Revise federal water and sewer infrastructure funding mechanisms to give priority to those projects that achieve the highest practical levels of water conservation.
31. Mandate that the Corps of Engineers evaluates proposed projects in a framework that places the highest priority on those projects that protect public safety and restore critical degraded coastal and river ecosystems.

<sup>1</sup> United States General Accounting Office, “Freshwater Supply, States’ Views of How Federal Agencies Could Help Them Meet the Challenges of Expected Shortages,” GAO Report No. GAO-03-514, July 2003, <http://www.gao.gov/new.items/d03514.pdf>.

<sup>2</sup> Thomas J. Wilbanks et al., “Effects of Climate Change on Energy Production and Use in the United States,” a Report by the U.S. Climate Change Science Program and the subcommittee on Global Change Research, Department of Energy, Office of Biological & Environmental Research, Washington, DC.: 2007, 51, <http://www.climatescience.gov/Library/sap/sap4-5/final-report/sap4-5-final-chap3.pdf>.

<sup>3</sup> *Water & Sustainability (Volume 3): U.S. Water Consumption for Power Production—The Next Half Century*, EPRI, Palo Alto, CA: 2002. 1006786. 1, <http://www.epriweb.com/public/00000000001006786.pdf>.

<sup>4</sup> Thomas J. Wilbanks et al., “Effects of Climate Change on Energy Production and Use in the United States,” a Report by the U.S. Climate Change Science Program and the subcommittee on Global Change Research, Department of Energy, Office of Biological & Environmental Research, Washington, DC.: 2007, 51, <http://www.climatescience.gov/Library/sap/sap4-5/final-report/sap4-5-final-chap3.pdf>.