



## Options for Sustainable Management of Ground Water

### Relating Sustainability to Management of Withdrawal and Use

**Sustainable** ground-water use above all means limiting the rate of ground-water withdrawal to achieve the following objectives:

- prevent aquifer depletion,
- guarantee minimum flow rates downstream and maintain lake levels,
- prevent drawing contaminants into the well or water supply system, and
- prevent land subsidence and adverse water chemistry changes.

Sustainable ground-water withdrawals take into account impacts on surface waters and other objectives listed above. “Safe yield”, in contrast, is a technical term associated with trying to estimate the amount of ground water an aquifer can supply. Safe yield only addresses water levels in the source aquifer; it does not account for cumulative impacts of withdrawals on surface water features. Using today’s understanding of the hydrologic connections that exist between surface water and ground water, we must adopt a more technically sound management approach that addresses the *whole* hydrologic system.

Sustainability implies that a new dynamic equilibrium is reached that approximately balances recharge, discharge, and withdrawals. Evidence that a new equilibrium has been reached is stabilization of water levels in the aquifer, although they may be lower than prior to ground-water pumping. The immediate effects of lower aquifer levels on other parts of the hydrologic system may or may not be measurable. If production wells are far from the sources of recharge or discharge, such as is the case for the Mt. Simon–Hinckley bedrock aquifer in the Twin Cities area, equilibrium will not be reached within a practical time frame. Instead, all water pumped will come from storage in the aquifer, and management of this part of the system must be based on an acceptable rate of water-level decline within a defined planning period.

A crucial component of managing water resources for sustainability, therefore, is a network of wells to monitor ground-water levels and stream gauges to measure the changes in water levels and flows as they occur. Adjustments to withdrawals can then be made in response to changes in ground-water levels and flows. Consideration of the whole hydrologic system requires analysis and evaluation of each proposed water withdrawal in the context of that whole. Cumulative impacts on the hydrologic system result from the incremental effects on water resources. Cumulative impacts can result from individually minor impacts on the resource that collectively and over a period of time have a significant effect. To minimize impacts and plan for sustainability, it is not sufficient to treat each well or proposed withdrawal as separate from other past, existing, and proposed uses of the regional supply.

*Quite simply, sustainability means living within the Earth’s limits. It means living in a world where feeding people does not necessitate polluting groundwater and coastal shorelines. Where transporting people and goods does not mean polluting our air and changing our climate. Where heating our homes and powering our industries does not require vast amounts of polluting fossil fuels.*

*Sustainability means doing things better—not doing without. Right now, Canadians consume too much and most of it is wasted. (Dr. David Suzuki, quoted in David R. Boyd, *Sustainability within a Generation: A New Vision for Canada*, 2004, David Suzuki Foundation)*

## Approaches to Managing Water Resources Sustainably

Described below are examples of approaches used in Minnesota and elsewhere that seek to manage resources sustainably.

### JOINT WATER SUPPLY PLANNING AND MANAGEMENT

**Central Puget Sound Water Suppliers Forum.** The Central Puget Sound Water Suppliers Forum (Forum) formed to provide greater coordination in regional water supply planning in response to significant challenges to meeting water needs for people and fish habitat. The three-county area centered on Puget Sound is experiencing rapid population growth while the region is working to improve conditions for the threatened species of fish. There is considerable uncertainty about the total volume of water that will be available to the water utilities for use.

*One of the Forum's main goals is to work collaboratively with state agencies, tribes, environmental organizations, businesses, and other interested stakeholders to develop a sustainable water resources management program for the region over the next 10 years. [from the website of the Central Puget Sound Water Suppliers Forum]*

Some considerations include the following:

- At least 24 of the 158 largest water utilities in the area anticipate demand will exceed current capacity before 2020.
- Effective water resource decision making requires contributions from a variety of stakeholders.
- In order to develop a sustainable water resources program for the region, the group decided that “a collaborative water resource management decision-making process is needed now”.

The initial product was The 2001 Central Puget Sound Regional Water Supply Outlook, a report that captures the results of a 2-year water-supply assessment of the three-county area. Many participants contributed to development of this foundation document. The next steps toward collaborative decision making have yet to be defined.

**Twin Cities Metropolitan Area.** Minnesota has the potential to develop a collaborative process, especially in the Twin Cities metropolitan area. Some steps toward a subregional planning effort have begun in the southwest and northwest metropolitan areas prompted by population growth and encroachment on areas of environmental concern. As in the Puget Sound area, no formal process has yet emerged and participation has been voluntary and limited to the primary water suppliers. Inclusion of other stakeholders will be necessary for the joint planning efforts to ultimately succeed.

### DESIGNATION OF A REGIONAL MANAGEMENT ENTITY

**Southwest Florida Water Management District.** “The purpose of the Southwest Florida Water Management District (District) is to manage the water and water-related resources within its boundaries. The District’s mission is maintaining the balance between the water needs of current and future users as well as protecting and maintaining natural systems.”

This District was established in state law with overall authority to regulate water-related activities; implement structural and nonstructural flood control; develop and implement water conservation requirements; oversee water resource and supply development, associated data collection, and analysis efforts; and carry out public education.

The District can acquire land in order to carry out its programs. By concentrating all water activity for a particular geographic area in one place, water issues are addressed comprehensively and in an integrated fashion.

**Kansas Ground-Water Management Districts.** Local units of government, called ground-water management districts, provide water-use administration, planning, and information in five areas of Kansas. The districts (Figure 1) are governed by local boards with state oversight and have been instrumental in providing information and identifying research within their boundaries. Additionally, each local board is empowered to regulate ground-water uses in its district.

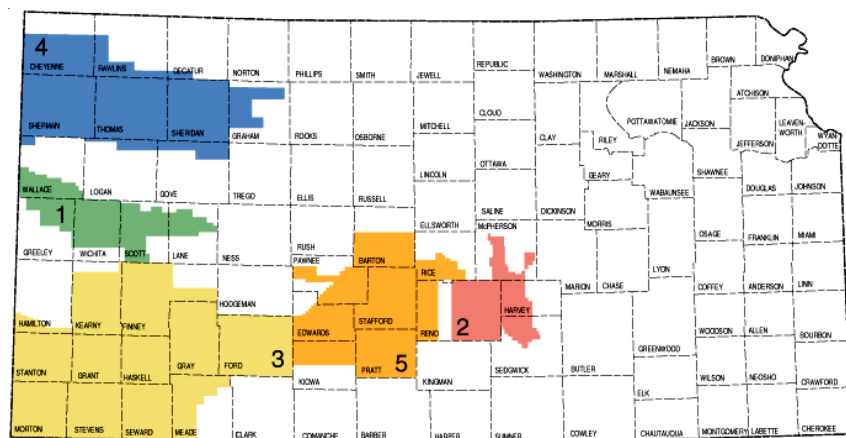


FIGURE 1. Five ground-water management districts in Kansas.

Some districts have taken a lead in a broad range of management actions to protect their ground water and, by their actions, have slowed the decline in water levels. Their actions included establishing minimum well spacing to spread out the effect of withdrawals on water levels. The districts have identified unauthorized pumping and overpumping, which has resulted in legal action in some instances. They have established restrictions and moratoriums on new wells. These districts are well aware that more

challenges remain. In District 3 (southwest Kansas), for example, formerly gaining rivers remain in losing condition or have reduced discharge. District 1 notes in its management plan that at the current rate of withdrawals, the residents and water users have 20 years of water left.

**REGIONAL WATER UTILITY ALTERNATIVE**

**Tampa Bay Water.** Also in Florida, the Tampa Bay area formed a regional water supply system, Tampa Bay Water, by consolidating the multiple well fields and pumping stations of six local governments in west-central Florida (Hillsborough County, Pasco County, Pinellas County, New Port Richey, St. Petersburg, and Tampa) and incorporating desalination of seawater into its approach. Investment in a desalination facility was possible because of the large service area and population.

Tampa Bay Water was created in August 1998 through contracts and legislation that changed the name, structure, and operations of the West Coast Regional Water Supply Authority. The creation of Tampa Bay Water represented an end to the region’s “water wars” and a new alliance between Tampa Bay Water and the Southwest Florida Water Management District. Their joint efforts are to plan for and develop alternate water-supply sources and facilities for supplying the region during the next 20 years and to maintain the natural systems dependant on these same water resources.

**Twin Cities Metropolitan Area.** A bold plan would be to create regional water utility that would treat surface water from the Minnesota River or Mississippi River or quarry dewatering water from the major quarries along the rivers. Existing city wells would serve as backup for low-flow or contamination emergencies. Using ground water and surface water in combination results in less severe impacts locally. The stresses on natural systems can be avoided by distributing the withdrawals based on precipitation, streamflow, and availability. The expected result of this approach is that ground-water levels would be managed to avoid adverse impacts along the river valleys and some resource values along the river valleys would be restored.