



Texas blind salamander



Fountain darter



San Marcos gambusia



Comal spring pupfish

THE EDWARDS AQUIFER: ESA-Driven Management

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Management of the Edwards Aquifer in central Texas has been a controversial and divisive issue for over 50 years. Its use as a water source has inspired intense regional competition and occasional open conflict in courts and the state legislature. Bitter disputes have erupted between rural and urban interests, and between pumpers and those dependent on springflows. Some groups demanded regulation of groundwater withdrawals, while others contended such limitations would violate private property rights. Ultimately, the federal Endangered Species Act (ESA) brought state regulation to the aquifer and ended unrestricted withdrawals.

The Aquifer

The Edwards Aquifer is essentially the sole source of water for almost two million people, including San Antonio residents. In 1975, the U.S. Environmental Protection Agency declared the aquifer the nation's first "sole source aquifer" under the Safe Drinking Water Act of 1974. Withdrawals from it have increased from approximately 100,000 acre-feet in 1934 to a peak of 542,400 acre-feet in 1989.

Aquifer levels vary with rainfall, recharge, and the rate of groundwater withdrawals. Most aquifer recharge results from brief

but intense storms. The karstic limestone aquifer is highly permeable and porous, thus it is very transmissive and responds

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quickly to recharge events and droughts alike (see table). Recharge in the 1970s

through 1990s exceeded the average for the period of record, 1934 to 2006. Furthermore, recharge in the conflict-ridden 1990s exceeded the combined recharge of the 1940s and 1950s.

Population also grew quickly during these decades when water was plentiful, and the public has become accustomed to a water surplus. This predicament is similar to that facing Colorado River Compact states, which have struggled to share water apportioned in 1922, based on what were thought to be average flow years but in fact were unusually wet.

Key Edwards Aquifer recharge and pumping totals	Acre-feet/Year
Median aquifer recharge, 1934-2006	560,900
Record lowest aquifer recharge (1956)	43,700
Record highest aquifer recharge (1992)	2,486,000
Average contribution of Comal and San Marcos springs to flow in the Guadalupe River, 1955-2006	331,500
Volume pumped in 1956 when Comal Springs ceased to flow for 144 days	321,000
Maximum amount Texas Water Development Board's model and FWS indicate can be pumped during a repeat drought of record to ensure 60 cfs at Comal Springs	225,000
State-recommended limit on aquifer pumping, 1968 Texas Water Plan	400,000
Aquifer pumping allowed in 2008, under 1993 legislation	400,000
Aquifer pumping authorized by Texas Legislature in 2007	572,000
Median aquifer pumping, 1997-2006	382,800

Whether aquifer pumping continues at the average rate or increases to the full permitted amount in the future, it would have to be cut drastically during a repeat drought of record to avoid placing endangered species in jeopardy.



Photo: Joe Fries

Comal Springs riffle beetle



Photo: Joe Fries

Peck's cave amphipod



Photo: Joe Fries

Comal Springs dyopid beetle



Photo: Paul Montgomery

Texas wild rice

The Springs

Comal and San Marcos springs, fed by the Edwards Aquifer (see map), are among the largest springs in the United States. Combined, they contribute around 335,000 acre-feet of water to the Guadalupe River annually. During droughts, spring discharge diminishes in volume but contributes a greater percentage of river flow. During the Edwards Aquifer's drought of record from 1947 to 1957, Comal Springs ceased to flow for 144 days in 1956.

The Species

Comal and San Marcos springs provide habitat for one threatened and seven endangered aquatic species of fish, salamanders, invertebrates,

and wild rice. During dry periods, spring flows can fall to critical levels, impacting aquatic habitat and causing "takes" of species listed under ESA. Extremely low or no flow from these springs places the species in jeopardy. Withdrawals from the Edwards Aquifer also reduce spring discharge and can impact the listed species. The endangered fountain darter at Comal and San Marcos springs is typically the first species to be affected by declining spring discharge, and serves as an indicator of stress to the system.

The Law

Groundwater in Texas is governed by the rule of capture, whereas surface water is governed by prior appropriation. Thus, as surface water first recharges the Edwards Aquifer and later flows from the springs, its legal character changes from surface water to groundwater and back to surface water, or from prior appropriation to rule of capture and back to prior appropriation. Permits issued by the state to surface water rights holders downstream are based in part on flows from the aquifer. Reduced recharge and increased pumping in the region deplete spring discharge, interfering with established surface

water rights of users downstream on the Guadalupe River.

Sierra Club v. Babbitt

In 1991, the Sierra Club filed a suit in the U.S. District Court alleging the Interior Department and U.S. Fish and Wildlife Service (FWS) had allowed takings of endangered species by not ensuring a water level in the Edwards Aquifer adequate to sustain Comal and San Marcos spring flows. The plaintiffs requested that FWS be enjoined to restrict withdrawals from the aquifer under certain conditions and develop and implement recovery plans for named endangered and threatened species. In 1993, the court agreed and said that if the Texas Legislature did not adopt a management plan to limit withdrawals from the aquifer by the end of its session, the plaintiffs could seek additional relief, such as placing the aquifer under federal judicial control through FWS.

The legislature acted, creating the Edwards Aquifer Authority (EAA), a conservation and reclamation district tasked with:

- adopting a critical period management plan for restricting withdrawals when aquifer levels and spring discharge rates are low;
- issuing permits for groundwater pumping based on historical use;

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- limiting total pumping from the aquifer through three staged reductions, so that continuous minimum flows in the springs would be ensured before 2013;
- developing and implementing a groundwater management plan and assessing pumping fees.

The effect of the *Babbitt* case was to change 100 years of common law with respect to aquifer use. Now EAA was authorized to achieve the required withdrawal limits through issued permits or by purchasing and retiring permitted withdrawal rights. However, when EAA finished issuing permits in 2006, they totaled 549,000 acre-feet—some 99,000 acre-feet above the statutory limit. Instead of reducing permitted withdrawals to the required amount, EAA sought authorization for higher pumping limits.

A Change in Direction

The legislature responded. In 2007, it raised the pumping cap to 572,000 acre-feet per year and required EAA to develop a Recovery Implementation Program (RIP). A RIP is a multistakeholder initiative that seeks to balance water use and development with the recovery of federally listed species. RIPs use a long-term (15- to 50-year) interdisciplinary approach of policy formation, scientific research, habitat restoration, and education. Stakeholders develop a comprehensive document that outlines goals, activities, timelines, measurements of success, and roles of the participants, and then sign a cooperative agreement to implement the activities. The Edwards Aquifer RIP's 26-member steering committee includes representatives of state and regional water agencies, municipalities,

industries, agriculture, environmental organizations, and the public.

In less than six months the group has completed all procedural tasks necessary to begin work. The EAA's Expert Science Committee is tackling the difficult substantive questions that have vexed the region for decades, including the necessity to maintain minimum spring flows. The EAA, state agencies, and FWS are required to approve and execute a RIP agreement by October 2012, to take effect by 2013.

More Change Needed

After ten years of EAA regulation, the Edwards Aquifer still is unable to satisfy all the demands for its water. For Comal and San Marcos springs to continue flowing permanently and for endangered species and water users on the Guadalupe River to be protected, the following measures are required:

- conserve Edwards Aquifer water to the maximum extent possible;
- adopt a regional drought management plan to preserve springflow during drought;
- develop an efficient market for trading aquifer water rights;
- develop significant amounts of additional surface and groundwater supplies;
- create a regional habitat conservation plan to obtain an ESA incidental-take permit.

The Edwards Aquifer dispute resulted from an inability to balance multiple demands on a limited resource with the need to shelter protected species. This type of dispute is occurring with increasing frequency throughout the country. The Edwards Aquifer RIP may be the last, best chance for area stakeholders to influence aquifer management without legislative or judicial intervention. To address intractable ESA disputes by constraining the federal process in terms of timing, issues to be addressed, and governance, other states might do well to consider this process.

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