# Water Woes:

## How dams, diversions, dirty water and droughts put America's wildlife at risk

## Top Ten Report 2012

ENDANGERED SPECIES COALITION

Featuring photographs by
Joel Sartore and Judd Patterson

# Introduction

Water is as essential to us as the air we breathe. And water, in all its forms, brings us a fundamental joy that is unmatched by other elements of nature. Whether it's splashing in puddles, running through a sprinkler, diving into a swimming hole, whitewater rafting a powerful river, skiing a majestic mountain, ice-skating on a local pond, or just listening to the rush of a waterfall, our collective childhood memories include many wonderful experiences of water.

While water blankets our planet, 97 percent of it is salty, and 2 percent is locked in snow and ice. Less than 1 percent is available as freshwater, stored in rivers, lakes, wetlands, and aquifers. This freshwater is our lifeblood. We've settled along riverbanks, and used freshwater for our enjoyment, transportation, irrigation, fisheries, tourism, energy production, and drinking water. In short, we've fully tapped this indispensible resource.

Though we have an unabashed love for water, we treat it with little respect. We use water as our dumping grounds—the pollution and runoff from our cities, industries, and farms spills into our rivers and other freshwater sources. We've diverted, dammed, and drained our rivers, parching some of our greatest waterways out of existence. Even the mighty Colorado River, though strong enough to carve out the Grand Canyon, has been no match for our intensive water consumption. Most years, it no longer reaches the sea. In fact, few of our rivers remain pristine.

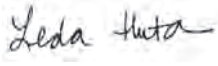
And new man-made threats are bearing down on our freshwater resources. Climate change is expected to alter precipitation and increase droughts. According to scientific models, climate change, combined with population growth, will result in much of the United States experiencing water scarcities by 2025. Meanwhile, as hydraulic fracturing (fracking) spreads, so does the potential for more dirty water. According to an Argonne National Laboratory report, our oil and gas wells produce more than two billion gallons of contaminated water per day.

For our country's imperiled wildlife, these threats are severe. We've seen massive fish kills, closures of multi-million dollar fisheries, and even the extinctions of species. Fish no longer reach their spawning grounds, frogs suffer from chemicals seeping through their delicate skin, introduced plants choke native plants from their habitats, exotic aquatic species threaten native fish, and development threatens the stream-side homes of mammals and birds.

This report details the top ten water woes for endangered species. It describes how our water management—our dams, diversions, dirty water, and droughts—have imperiled America's wildlife, birds, fish, and plants. But this is also a report about hope—how those of us living with threatened and endangered species can take action to help.

Thanks to one of the strongest endangered species laws in the world, we can protect our natural heritage. It is not too late to save our species across the country, and we can all do our part. Supporting the groups involved in this report and their work to protect wildlife, plants, and habitats is important. Standing up for fish and wildlife protections is essential. And at home, we can make a difference by eliminating any leaks in plumbing; by installing water-efficient toilets, showerheads, washing machines, and dishwashers; by landscaping with native plants adapted to our local environment; by reducing or eliminating our lawns; and by installing rain barrels to capture storm water for watering the garden.

Join us in protecting our country's incredible web of life.



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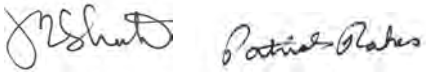
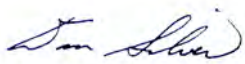


J.R. Shute and Patrick Rakes
**Conservation Fisheries, Inc.**

Jamie Rappaport Clark
**Defenders of Wildlife**



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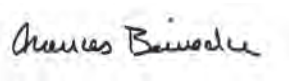

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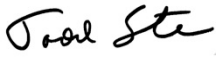
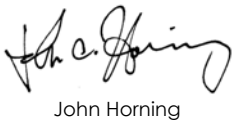


Todd Steiner
**SPAWN**



John Horning
**WildEarth Guardians**

# Acknowledgements

Endangered Species Coalition member groups from across the country submitted nominations for species that are threatened by water availability and water conditions in their habitat. We would like to thank each of the individuals from our member groups who nominated a species included in this report. Our many and sincere thanks go to:

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Gilly Lyons and Amy Baird

**SAVE THE FROGS:**
Michael Starkey

**WildEarth Guardians:**
Mark Salvo and Lori Colt

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Endangered Species Coalition staff members and contractors Derek Goldman, Mitch Merry, Hugo Mogollon, Mark Rockwell, and Tara Thornton dedicated much time and energy to this report, assisting with the writing, tracking down photographs, and coordinating the media. We are particularly grateful to Nancy Welch for writing the report and shepherding it through from start to finish.

Finally, we are grateful to our designer Eulalia Cornejo Coello, who produced a stunning and organized report.

# Water Woes:

## How dams, diversions, dirty water and droughts put America's wildlife at risk

# Edwards Aquifer and the San Marcos River:

## Texas Wild Rice

Jason A. Samfield

The San Marcos River's headwaters are the San Marcos Springs, which rise from the Edwards Aquifer in central Texas. The San Marcos spring field is one of the largest in the United States, and water has traditionally been so plentiful that the river has never run dry in recorded history. It is cool, clear, and swift-flowing, running through the City of San Marcos and then joining the Blanco River about four miles below the springs.

John Thomaides

Texas wild rice is an aquatic herbaceous perennial grass found only in the San Marcos River. The plants root firmly in the gravelly bottom, and have bright green, linear leaves up to six feet long that live completely immersed and undulating in the swiftly flowing water. It produces narrow flower stalks that emerge above the water.

Flowering typically occurs in the spring and fall, although it may occur throughout the year in warm weather. This wild rice is well adapted to high quality water at a near-constant temperature. Once abundant, the species is now so rare that it is found only in a short stretch of the upper San Marcos River.

**Texas Wild Rice**
***(Zizania texana)***

**Status:**
Endangered since 1978.
**Range:**
A two-mile segment of the upper San Marcos River in central Texas.

**Population:**
Approximately 500 patches roughly averaging seven square meters in size.

## Water in the Balance

The plant's deep, clear-water habitat has been in decline due to increasing agricultural, industrial, and residential demands.

The San Marcos River system has recently been included in a federal Habitat Conservation Plan, and the State of Texas has declared the upper two miles of the river a State Scientific Area, which affords a degree of habitat protection. Ensuring optimum conditions for Texas wild rice benefits biodiversity *and* people, as businesses and municipalities are dependent on spring flows for recreational tourism dollars.

The Edwards Aquifer is the primary pumping source for millions of people and countless economic enterprises. Lowering the aquifer directly affects the spring flow, and consequently lowers the San Marcos River. Over most of Texas, landowners and companies can pump out massive amounts of water, even drying up wells under Texas' "rule of capture." However, the State has established the Edwards Aquifer Authority and a Barton Springs/Edwards Aquifer Conservation District to ensure that the aquifer can provide sufficient water for the river's seven threatened and endangered species. Meanwhile, urbanization is leading to water pollution and an over-abundance of sedimentation due to urban and construction run-off. Other threats include invasive species, including non-native aquarium plants, and damage from recreational activities.

### What You Can Do

The Center for Plant Conservation has helped save Texas wild rice through funding, research, and collaboration with U.S. Department of Agriculture to establish a seed bank. In addition, the US Fish and Wildlife Service, the Texas Parks and Wildlife Department, the City of San Marcos, Texas State University, The Edwards Aquifer Authority, the San Antonio Water System, various municipalities, agricultural interests, and other water-interested stakeholders have implemented different tactics to protect the plant, such as maintaining plants at fish hatcheries, conducting monitoring, research, and restoration projects, educating the public, keeping the river clean, and developing plans and methods to reduce water use during times of drought. Individuals should use the river responsibly by refraining from dumping automotive fluids, solvents, and aquarium fish and plants, and by supporting efforts to protect the water supply, to prevent urban runoff, and to implement reasonable recreation management plans.

# The Pacific Rim Ecosystem:
## Salmon

Neil Ever Osborne

Salmon are indigenous to the Pacific Northwest and California. Indeed, Tim Egan, a New York Times columnist, once described the Pacific Northwest as "any place a salmon can get to." Pacific salmon are anadromous, living in both fresh and salt water during different life stages. The young are born in streams and rivers where they rear while their bodies undergo physiological changes, called smolting, that allow them to transition to salt water. As juveniles, they migrate through brackish water to the ocean where they mature and live, depending on the species, for one to five years. Adult salmon then return to their original natal streams to spawn; they then die after a few days or up to a couple of weeks.

Salmon in the Pacific Rim ecosystem, including Alaska and south to central California, are keystone species, having an outsized impact on their surrounding regions relative to their populations. Salmon are critically important to healthy watershed ecosystems, in part because adults migrating back to their spawning grounds are loaded with vital marine nutrients. The ecosystem services of an abundant salmon run to a watershed are immense; hundreds of species benefit from the nutrients provided to the entire watershed from decaying salmon carcasses. Riparian canopy trees, under-story shrubs and grasses, birds, mammals, reptiles, insects, and juvenile salmon all rely on nutrients borne by adult salmon through river systems to their fresh water spawning grounds. Salmon are part of a crucial food web that directly or indirectly benefits as many as 140 other wildlife species, including grizzly bears, bald eagles, gray wolves, osprey, and sandhill cranes.

Throughout the Pacific region, salmon have been the backbone of thriving commercial fishing industries, and recreational salmon fishing has traditionally brought in millions of dollars in permits, gear, and charter boat expenses. Salmon also support related on-shore businesses such as restaurants and fish distributers. These fish have profound cultural significance for certain populations throughout their range, including numerous Native American tribes. Finally, wild salmon are valued by the public as a delicious and nutritious food.

**The Central California Coho *(Oncorhynchus kisutch)***

**Status:**
Listed as endangered in 2005.

**Range:**
From Punta Gorda in northern California south to Monterey, California.

**Population:**
Recent estimate 500-1,000.

NOAA

The Central California Coastal Coho salmon *(Oncorhynchus kisutch)*, also called the silver salmon, is relatively small and slim, typically weighing between six and thirteen pounds.

Juveniles usually over-winter in their natal stream, migrating to the ocean after a year of growth. Most spawning adults are three years old, but this group often includes some two-year olds (known as jacks). The Coho is a popular game fish in fresh and salt water, due, in part, to its schooling behavior in shallow waters. Fishing for Coho salmon is banned in California's ocean and fresh waters, however, due to their extremely reduced populations.

**Sacramento River Winter Run Chinook *(Oncorhynchus tshawytscha)***

**Status:**
Listed as endangered in 1994 .

**Range:**
The Sacramento River in California.

**Population:**
827 adults in 2011.

**Snake River Sockeye *(Oncorhynchus nerka)***

**Status:**
Listed as endangered in 1992.

**Range:**
Salmon River (Idaho), Snake River (Idaho and Washington), and Columbia River (Washington).

**Population:**
1,268 in 2011 (1,118 hatchery origin; 150 natural/wild origin).

D Ross Robertson

The Sacramento River Winter Run Chinook *(Oncorhynchus tshawytscha)*, the largest of these three salmon species, typically weighs about thirty to forty pounds. Because of their size, the Chinook, or King, salmon choose relatively large streams and rivers for spawning, and can tolerate deeper and faster flowing water than other species of salmon. The Winter Run Chinook is an indicator species for the health of the San Francisco Bay-Sacramento River delta ecosystem, the largest estuary on the West Coast.

Neil Ever Osborne

Snake River Sockeye salmon *(Oncorhynchus nerka)* has an unmatched migration, as they travel more than 900 miles and nearly 7,000 vertical feet twice in their lifetimes, down to the ocean and back up to spawn. Their spawning habitat in the Sawtooth Mountains of Central Idaho is the highest-elevation wilderness salmon habitat left in the continental United States. The Sockeye's preferred mountain streams and lakes are likely to remain cold, even in the face of global climate change, which could allow Snake River Sockeye to weather the impacts of our warming climate in a way that lower-elevation spawners may not be able to do.

## Water in the Balance

The West Coast has historically been home to a complex system of free-flowing streams, rivers, and estuaries that have provided critical habitats for salmon, which rely on three types of water—fresh, brackish, and salt—to complete their life cycle. Hatchlings (called fry) require the highly oxygenated water of swift moving streams and rivers, while juveniles rely on wetlands surrounding their natal streams to shield them from silt and pollution. Adults remain vulnerable to changes in water quality and temperature, and require essential passage from the ocean back to their natal streams to spawn.

Challenges to salmon are many. Significant loss of spawning and nursery habitat has occurred because of poor land-use practices, dam-building, and policies allowing agricultural, residential, and commercial development in riparian habitat and floodplains. Dams built for hydropower, navigation, and water diversion (to supply municipal drinking water and irrigation) are major factors impacting these three species' declining populations. In addition to blocking migration routes to and from spawning habitat, dams create slow-moving slackwater reservoirs, which allow river temperatures to reach levels considered dangerous or even lethal to coldwater species like the Sockeye. Other barriers—including roads, bridges, culverts, and water diversions—restrict fish passage. In California alone, there are more than 1,000 identified barriers that fragment salmon habitat and thwart their migration. In addition, poor water quality caused by agricultural and industrial pollution, increased temperatures, and decreased in-stream flow, creates toxic conditions that impair growth, migration, and survival of these species.

### What You Can Do

Individuals can help save the salmon by conserving water, by planting local, native plants that do not require irrigation, and by reducing their own carbon footprint. Individuals can also actively support agencies and organizations that are working to restore and improve natal streams, protect salmon habitat, provide adequate water flows, remove dams, and block construction of new barriers. The Natural Resources Defense Council (NRDC), Save Our Wild Salmon Coalition (SOS), and the Salmon Protection and Watershed Network (SPAWN) are all actively working to protect and restore salmon populations from the Pacific Northwest to Central California.

# The Colorado River:

## Native Fishes

Adrille (edit by Aqwis)

The Colorado River and its tributaries are the lifeblood of the Southern Rockies and the desert Southwest. The river is critically important to the ecological, cultural, and economic health of millions in the American West. Over the years, the Colorado has been transformed from a wild, free flowing river into an extensive system of dams, diversions, and reservoirs that has devastated the river's ecology.

Joel Sartore

For more photos by Joel Sartore: http://www.joelsartore.com

Four Colorado River fishes—the Colorado pikeminnow *(Ptychocheilus lucius)*, the bonytail chub *(Gila elegans)*, the humpback chub *(Gila cypha)*, and the razorback sucker *(Xyrauchen texanus)*—are indicators of river health. Historically, when these fishes were more numerous, they may have had an important role in riverine ecosystems, influencing populations of small fish species, crustaceans, arthropods, and other prey. Some of the species were commercially valuable, and all four of the Colorado River fishes continue to be culturally important to Native Americans and many westerners. Their populations and ranges are severely limited; the Colorado pikeminnow is currently found only in the Upper Colorado River Basin; the bonytail chub's last remaining population is found in Lake Mojave; the humpback chub is sparsely found in the Little Colorado River and adjacent sections of the Colorado River. The razorback sucker's largest remaining population is in Lake Mojave; reintroduction efforts of this species have been disastrous, with some 12 million young and juvenile fish predated by non-native fish.

**Four Colorado River Fishes**

**Status:**
All four Colorado River fishes are listed as endangered.

**Range:**
The Colorado River basin and tributaries.

**Population:**
Generally unknown, but estimated to be small or very small given the species' limited range. The Colorado pikeminnow is likely the most numerous, while the bonytail chub may be functionally extinct.

## Water in the Balance

Each of the four Colorado River fish have special habitat needs and depend on specific water flow characteristics, from the bonytail chub's preference for pools and eddies of warm, often heavily silted water to the humpback chub's reliance on river bottom features to hold its position in deeper, turbulent waters. Excessive demands on the Colorado River have greatly imperiled each of these species.

Myriad threats now face Colorado River fishes. Among them are unchecked urban and suburban growth, agriculture, and massive dams and water diversions that alter water temperature and flow. Increasingly, heavy metal contamination from the region's coal mines and coal-fired power plants is poisoning the last wild populations of razorback sucker and pikeminnow. These contaminants, and global warming—which contributes to diminished stream flows—are pushing these fishes to extinction. Their jeopardy is a disturbing sign that the health of the entire the Colorado River system is in trouble.

### What You Can Do

Individuals can support conservation efforts by communicating their concerns about the Colorado River to local, state, and federal decision makers. WildEarth Guardians is actively engaged in preventing coal mining and shutting down or cleaning up the coal-fired power plants that pollute the Colorado River. Other organizations are working to improve river management, preserve instream flow, and remove dams that threaten the ecology of the Colorado River Basin.

# America's Everglades:

## The Everglade Snail Kite

National Park Service Rodney Cammauf

The Everglades are a unique and biologically diverse region in the semi-tropical southern reaches of the Florida peninsula and one of the most extensive wetland systems in the world. The Everglades feature vast sawgrass marshes, bogs and rivers, mangrove and cypress stands, and islands densely forested with a wide variety of hardwood trees. Bordered by three seas—the Atlantic, the Caribbean, and Gulf of Mexico—the Everglades provide shelter to migratory populations, including hawks, hummingbirds, and Monarch butterflies, and are home to more than sixty federally-listed endangered species, including mammals, birds, reptiles, invertebrates and plants. An additional 600 species native to the Everglades are considered rare or imperiled.

JuddPatterson

For more photos by Judd Patterson: http://www.birdsinfocus.com

The Everglade Kite is an unusual bird of prey, relying on a single food source, the fresh water Florida apple snail. The kite is a medium-sized hawk with a wingspan of about forty-five inches, and has an unusual beak that is slender and sharply hooked, perfect for shucking snails from their shells. The kite is a system-wide indicator species for the Everglades' ecological condition, largely because its status now is the product of human management decisions.

**The Everglade Kite**
***(Rostrhamus sociabilis plumbeus)***

**Status:**
Listed as endangered since 1967.

**Range:**
South central Florida wetlands.

**Population:**
80 percent decline since the late 1990s; only 250 breeding pairs remain.

## Water in the Balance

Fresh water in the right balance is critical to the inter-connected habitats of the Everglades. Water availability and fluctuations in the Everglades are no longer a matter of natural processes. Since the early 1900s, south Florida's wetlands have been largely managed to serve agricultural and residential needs. During dry periods, water is taken from the Everglades, rendering conservation areas far too dry for far too long; during wet periods, metropolitan and agricultural areas force excess water, laden with harmful chemicals, into these already-saturated water conservation areas. The Everglades' natural systems are forced to absorb the impacts of these unnaturally high and low water levels, with resulting habitat degradation and even destruction. The Everglades are also threatened by the forecasts of climate change; rising sea levels would initially create brackish rivers and bogs, and then potentially submerge portions of the watershed entirely.

The kite is threatened primarily by the degradation, pollution, and outright destruction of its wetland habitat and the resulting loss of its primary food source. Increased demands on freshwater from cities and farms has lowered water levels and dried out wetlands, virtually wiping out apple snail populations, and, consequently, the snail kite. Water pollution also poses a serious threat as pesticides applied to groves and row crops drift or flow into the marshes. Toxins can accumulate in the apple snail and potentially be passed on to the kite. Additional threats include proliferation of invasives, recreational shooting, and excessive disturbance near kites' nests. Other threatened and endangered species have also been negatively impacted by our water management, including the wood stork, Cape Sable seaside sparrow, American crocodile, and the Florida manatee.

### What You Can Do

**Individuals can contribute to the Everglades restoration efforts by following guidelines on water conservation during dry periods, by advocating for better water management and agricultural practices, by holding accountable natural resource agencies, by supporting the Everglades Coalition, and by practicing careful boating and viewing habits that do not disturb nests in the Everglades.**

**Defenders is a member of the multi-NGO effort, the Everglades Coalition. Defenders works for landscape level restoration of natural water regimes and other ecological processes, and to conserve and restore a connected wildlife habitat system through public land acquisition and landowner conservation easements.**

# Tennessee River Watershed:

## The Marbled Darter and the Tan Rifflеshell

CFI

The Tennessee Watershed incorporates numerous man-made reservoirs, nine major rivers, and countless tributary streams and creeks that flow through the state. These hundreds of thousands of lake acres and some 60,000 river-miles sustain Tennessee's communities, provide recreation, support the state's economy, and are home to an extraordinary variety of aquatic species, including a significant number of endangered species. The watershed is particularly important to two groups of imperiled species—darters (small, non-game fish) and mussels. The Little River, which rises from the highest elevation in the state and flows for approximately sixty miles before emptying into Loudoun Lake, is the only remaining habitat of the marbled darter. The Clinch and Powell rivers, which flow from the Appalachian Mountains of southwestern Virginia, are the only remaining undammed headwaters of the Tennessee River system, and the Clinch River basin, which is home to at least thirty-five mussel species, is one of the most critical hotspots in the nation for imperiled species, including the tan riffleshell.

CFI

**Marbled Darter**
***(Etheostoma marmorpinnum)***

**Status:**
Listed as endangered (as part of the Duskytail darter group) in 1993.

**Range:**
Six river miles of the Little River, Blount County, TN.

**Population:**
Fewer than 1,000.

The marbled darter is a small and short-lived fish, with a typical lifespan of just one year; because of this, the darter usually has only one opportunity to spawn. Females lay multiple clutches of eggs on the underside of slab-shaped rocks in the slower-moving waters of the Little River, and the males guard the eggs. Both young and adult marbled darters live in slow runs and pools, and require relatively silt-free cover and plentiful aquatic insects for feeding; the darter's diet includes mayfly nymphs and other larvae. Marbled darters were originally identified by a single specimen found in the Holston River in Tennessee; they are now extinct in the Holston, and are found only in the lowermost six river-miles of the unimpounded portion of the Little River in Blount County, Tennessee. Conservation Fisheries is captively propagating marbled darters in hopes of establishing additional populations further upstream in the Little River, with the longer-range goal that populations will be re-established in the Holston River, as well.

**Tan Riffleshell**
***(Epioblasma florentina walkeri)***

**Status:**
Listed as endangered in 1977.

**Range:**
The only reproducing population is found on a two-kilometer reach of Indian Creek, a tributary of the Clinch River in southwest Virginia .

**Population:**
The current population is unknown. In 2001, the population was determined to be approximately 2,000 adults.

Dick Biggins

The tan riffleshell is a small freshwater mussel with a brown- to yellow-colored shell with numerous green rays. These tiny shellfish make a living by eating small particles suspended in the water, serving to clean and restore nutrients to their habitat. Tan riffleshells belong to the genus *Epioblasma,* which are the most endangered unionids in the United States. As of 2001, all but one of the remaining species in the genus were listed as endangered. Once widely spread throughout rivers and lakes in Tennessee and southwestern Virginia, the tan riffleshell is now on the edge of extinction. The only known population includes fewer than 1,000, and is isolated in less than a two-mile reach of the Indian Creek tributary of the Clinch River in southwest Virginia. Since 2002, the National Park Service has collaborated with the U.S. Fish and Wildlife Service, other state and federal agencies, and two mussel hatcheries to breed freshwater mussels, including the tan riffleshell, and reintroduce them to the Clinch River habitat.

## Water in the Balance

While this watershed is widespread, covering much of the state, it is significantly altered. The Tennessee Valley Authority currently operates twenty-nine dams on the Tennessee River and its tributaries, making it one of the largest hydropower systems in the world. Dividing up the river and its tributaries in this way has caused species populations to become highly isolated, with no suitable habitat corridors to connect the populations. Species with small isolated populations have become particularly vulnerable to water quality threats.

Both the marbled darter and the tan riffleshell are significantly threatened by water degradation in their respective habitats. The marbled darter, which, like the tan riffleshell, serves as an ecological indicator, has been heavily impacted by agricultural practices in the Little River watershed—including the use of pesticides, herbicides, and fertilizers—and especially by increasing amounts of silt in the river. The darter is further affected by commercial and residential development, both of which pollute the darter's habitat with large quantities of silt from construction and unpaved roads. Recreational overuse of the river by tourists upstream of the marbled darter's habitat also contributes to the degradation of their fragile habitat.

Once one of the healthiest and most diverse streams of its size in the country, the Clinch River and its many tributaries, including Indian Creek, are heavily threatened. Fossil fuel development, bridge construction and maintenance, and construction of the Tennessee Valley Authority Dam decimated populations of the tan riffleshell in Tennessee, Virginia, and Kentucky. The last remaining reproducing population, found in a short stretch of the Indian Creek, is primarily threatened by hazardous byproducts of the coal-fired power plants and the coal mining industry in the greater Tennessee watershed. Repeated spills of sulphuric acid and heavy metals from mining have compounded contamination in the Clinch River and its watershed. Illegal discharges of coal ash (also known as fly ash), which contains a number of deadly toxins, continues to impact both ground and surface waters, heavily polluting this species' small and fragile habitat. Like all freshwater mussels, the tan riffleshell is a proverbial "canary in the coal mine." When these filter feeders are inundated with sediment and pollution, and entire colonies die off, alarm bells should be ringing.

### What You Can Do

Individuals can help by supporting educational efforts and legislation aimed at reducing agricultural and construction runoff into these rivers and their tributaries. We can also encourage farmers in the Indian Creek watershed, in Virginia, and the Little River watershed, in Tennessee, to participate in the USDA Farm Service Administration's (FSA) riparian buffer programs, which are designed to reduce pollutants. When shopping, individuals can also seek out organic products, not only foods, but also organic cotton clothes, bedding and other products. (Even large retailers such as Patagonia and American Apparel have a strong emphasis on using organic cotton.) Supporting Conservation Fisheries, Inc., Defenders of Wildlife, and other engaged conservation groups will also directly impact educational and legislative efforts aimed at preserving these species' habitats.

# California's Coastal Sage Brush Ecosystem:

## The San Bernardino Kangaroo Rat

Al Kelley

The sagebrush steppe, an open, mostly treeless grassland, is an iconic Western habitat that is being threatened throughout much of its range. In California, the sagebrush ecosystem is found primarily at lower elevations of coastal southern portions of the state. This habitat is typically arid, with sandy loam substrates and widespread alluvial fans, the fan-shaped deposits that form when a stream broadens as it opens to a flood plain. Ephemeral streams—streams that flow only during and briefly after periods of rain—are also commonly found in this ecosystem. The amount of plant growth varies depending on how frequently the area floods. Major flooding prevents plants from taking hold and spreading, while infrequent flooding allows native plants—including scrub sage, chaparral, buckwheat and grasses, and coastal cacti—to flourish. The San Bernardino kangaroo rat relies on an intermediate sage brush habitat, one that has moderately infrequent flooding and patchy plant cover with plenty of sandy loam for burrowing.

**The San Bernardino Kangaroo Rat**
***(Dipodomys merriami parvus)***

**Status:**
Endangered since 1998.

**Range:**
Small stretches of habitat in San Bernardino and Riverside Counties, CA.

**Population:**
Three isolated, fragmented populations.

This bi-pedal rodent with its long tail and soft fur is one of the smaller sized kangaroo rats-rodents that are known for drumming with their feet. Highly adapted to arid conditions and the natural flood cycles of their habitat, kangaroo rats don't need drinking water, requiring only the moisture in their food to survive. They rely on their sage scrub habitat for two features critical to their survival and reproduction: alluvial fans and seed banks. The loose sand in the alluvial fans provides sand-bathing sites where rats clean oils from their hair; the oil then acts as a scent marker to communicate the rat's identity to its neighbors. Seeds banks provide their key food; the rats harvest seeds and carry them in specialized, fur-lined cheek pouches, caching the food in sandy areas for future consumption. Even the green vegetation that grows after flooding plays a key role in the species survival, as it stimulates reproduction.

## Water in the Balance

Dry washes and intermittent ephemeral streams in arid parts of the American West provide forage, cover, nesting, and movement corridors for wildlife. Functionally, these areas moderate soil and air temperatures, stabilize channel banks, promote seed banking, and trap silt and fine sediment, providing habitat to diverse plants and animals. Rainfall and flood flows often trigger pulses of germination in ephemeral streambeds, and the annual and perennial plants found here provide food for wildlife. Because ephemeral stream bed deposits are often looser than the soils of surrounding uplands, they are especially important habitat for sand-burrowing species like the kangaroo rat.

The San Bernardino kangaroo rat has declined as its habitat in southern California has been heavily developed for residential and commercial purposes. Development fragments their habitat and populations, resulting in inbreeding and the consequent vulnerability to genetic defects. Over 90 percent of the San Bernardino kangaroo rat's habitat has been destroyed by development, and what remains has been hydrologically altered by dams and flood-control measures. Water-management practices that divert or stop the flow of water in the washes and streams prevent natural cycles of flooding. Without sufficient flooding, scrub plants flourish, and the ecosystem converts from intermediate to mature, with dense plant growth overtaking the sandy loam substrate required by the kangaroo rat.

### What You Can Do

Individuals can help by contributing to organizations, including the Endangered Habitats League, that are actively promoting legal challenges to massive flood plain development.

# The Ozark Rivers and Eastern U.S. Rivers:

## The Hellbender

National Park Services

The Ozark rivers flow through a rich and diverse landscape of high plains and densely forested valleys whose relative isolation and physical features shelter a wide range of unique species. Approximately two-thirds of the endangered species in Oklahoma, Illinois, Missouri, and Arkansas are found in the Ozarks. Three major Ozark rivers—the Current, Jacks Fork, and Eleven Point—are home to the hellbender. Beyond the Ozarks, the hellbender is also found in the rivers and streams that snake through the eastern United States. These waterways are home to many unique and highly threatened freshwater species found nowhere else in the world

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The Hellbender *(Cryptobranchus alleganiensis)* is the largest salamander in the United States and the third largest in the world. There are two subspecies—the Ozark hellbender, listed as endangered, and the Eastern hellbender, which is under status review. Hellbenders have remained virtually unchanged through time, having broad, flat heads and bodies with very loose, fleshy skin running the length of their sides to their paddle-like tails. They have poor vision but benefit from light-sensing cells along the length of their bodies, and rely primarily on vibrations and scents for communication and foraging. Hellbenders reach maturity at five to eight years, and live up to thirty years.

### The Hellbender

**Status:**
The Ozark hellbender was listed as endangered in 2011. The Eastern hellbender is under status review for protection throughout its range.

**Range:**
New York south to Mississippi and Georgia, west to Missouri and Arkansas.

**Population:**
The Ozark hellbender has declined by 75 percent since the 1980s; fewer than 600 remain in the wild.

## Water in the Balance

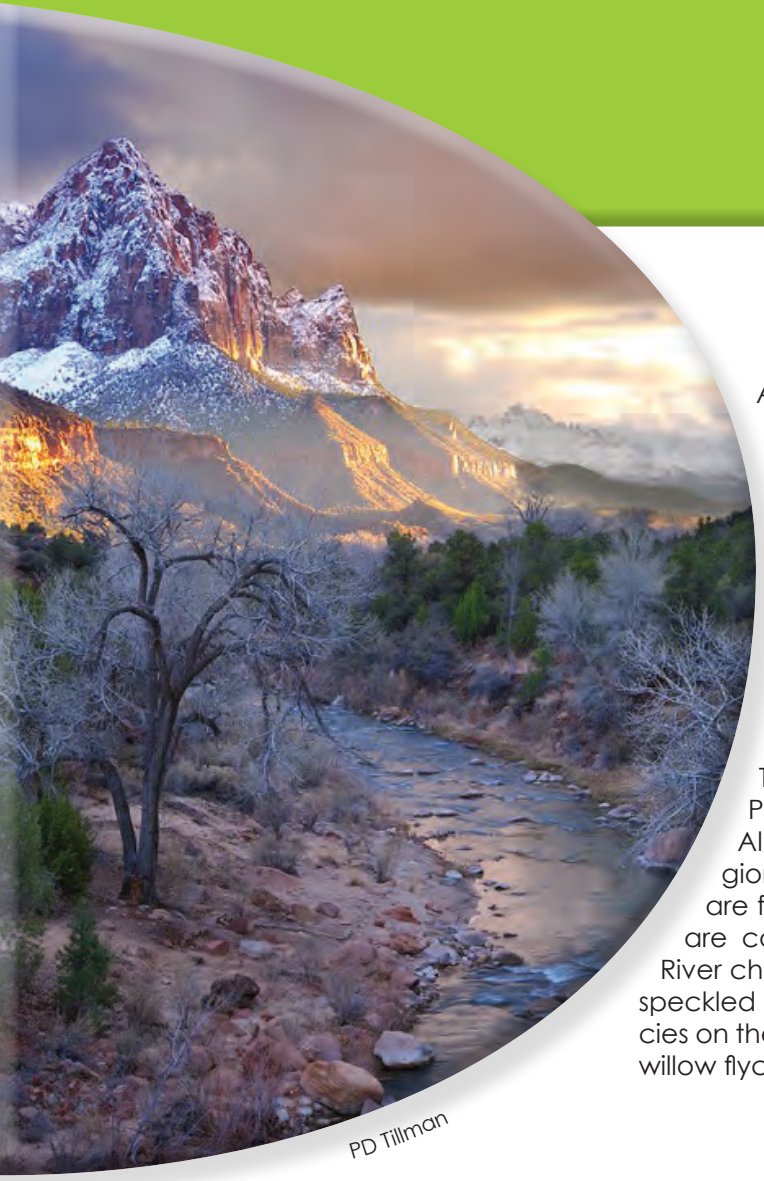
The hellbender is completely dependent on clean, cold-running water with rocks, crevices, and logs to provide protection and breeding grounds. Threats to its habitat come primarily from human activities. Damming and channelization, decreases in water flow, increases in water temperature, erosion, and pollution all threaten this sensitive salamander. Runoff from urbanization, agriculture, and mining poisons the hellbender's water and food. As their habitat degrades, they become more susceptible to disease and deformities. Overharvesting for the international pet trade and for science further decreases the population.

In the Ozarks, the rivers have changed dramatically over the past hundred years, beginning in 1911 with the damming of the White River. Additional dams were built through the 1970s, creating dozens of lakes for both recreational and commercial purposes, but with harmful consequences to freshwater animals. The first U.S. Park based on a river system—the Jacks Fork and Current Rivers—was founded here in 1964, with millions of tourists visiting it and surrounding rivers annually. The first federal fish hatchery was built here in 1888, and the region is home to both warm and cold water trout hatcheries and fishing parks. Forestry, mining, and agriculture also dominate and degrade portions of the Ozark watershed.

### What You Can Do

The Center for Biological Diversity is working to obtain federal protection for the hellbender throughout its East Coast range. Such protection will help safeguard waterways which support not only the hellbender, but numerous other species, as well. Individuals, particularly those who live in the hellbender's native regions, can help save this species by making thoughtful consumer and lifestyle choices that will protect waterways so crucial to the hellbender's survival. Using less water and electricity, buying organic foods, and choosing products with reduced packaging all make a difference. Particularly important is electing not to use pesticides, and opting for non-toxic cleaning and personal care products to reduce negative impacts on waterways.

# The Virgin River:
## The Woundfin and the Southwestern Willow Flycatcher



PD Tillman

A tributary of the Colorado River, the Virgin River originates in Southwestern Utah with the confluence of the East Fork Virgin and the North Fork Virgin Rivers. The snow pack of the river's surrounding mountains annually replenishes the river. It flows out of Dixie National Forest, through Zion National Park, past the city of St. George and continues for a total of approximately 160 miles before emptying into the Colorado River at the Lake Mead reservoir, about forty miles east of Las Vegas. In 2009, the North Fork of the Virgin River was designated as Wild and Scenic.

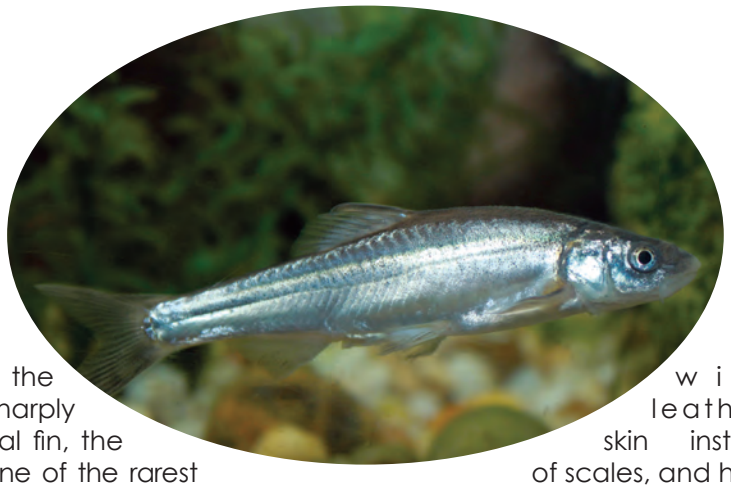
The river flows through a landscape where the Colorado Plateau, the Great Basin, and the Mojave Desert meet. Although the Virgin River flows through an extremely arid region, it directly supports hundreds of species, some of which are found nowhere else on earth. A number of these species are considered sensitive or endangered, such as the Virgin River chub, Virgin spinedace, flannelmouth sucker, desert sucker, speckled dace, and relict leopard frog. Two key Virgin River species on the endangered list are the woundfin and the southwestern willow flycatcher.

**The Woundfin**
***(Plagopterus argentissimus)***

**Status:**
Endangered since 1970.

**Range:**
Historically, the Virgin River in Utah, Arizona and Nevada.

**Population:**
Extinct in the wild since 2005; restocked populations are consistently unable to persist due to water mismanagement and degraded habitat conditions.



Brian Gratwicke

Named for the spine on its sharply pointed dorsal fin, the woundfin is one of the rarest and most specialized minnows in the world, being highly adapted for living in shallow, swift, silty desert streams. Woundfins are slender and small, rarely exceeding 3" in length; their narrowly flattened heads and bellies give them a torpedo-like appearance. They are silvery-blue with leathery skin instead of scales, and have distinctive barbells on the corners of their lips. Woundfins are omnivorous, relying on a diet of seeds, insects, algae, and general detritus. The woundfin is scientifically important because it is the only species in its genus.

**The Southwestern Willow Flycatcher**
***(Empidonax traillii extimus)***

**Status:**
Endangered since 1995.

**Range:**
Widely scattered riparian habitats in the desert Southwest, including the Virgin River in New Mexico, Arizona, and extreme southern portions of Nevada; possibly western Texas, southern California (from the Santa Ynez River south); extreme southwest Colorado; and extreme southern portions of Utah.

**Population:**
900 – 2,000 breeding pairs.

Jim Burns

Audubon

The southwestern willow flycatcher is one of four (possibly five) subspecies of flycatchers differentiated by their breeding range. The southwestern willow flycatcher is a small bird, generally no more than 6" in length, and is distinguished by its unique "sneezy fitza-bew" song. The flycatcher nests in trees and thickets in dense riparian habitats with surface water or saturated soil; areas that don't meet this requirement may still be used for foraging and migration.

The willow flycatcher is heavily dependent on the availability of high-quality water, in large part to support the trees and thickets that provide safe refuge for nesting. The flycatcher feeds on insects, which benefits humans by reducing exposure to vector-borne diseases, and protects many plant species that would otherwise be harmed by insect populations.

## Water in the Balance

Both the woundfin and the southwestern yellow flycatcher depend on the riparian habitat of the Virgin River. Flows in this river were largely designated for residential and agricultural use by 1910; currently there are substantial political barriers to providing river flows necessary to restore the health of the Virgin River to allow these species to recover and thrive. Water overconsumption, increasing residential and commercial development, and agriculture all command enormous amounts of water from the river, and drought heightened by global climate change further drains the river and degrades the habitat required by the woundfin and willow flycatcher.

The woundfin avoids clear waters, instead preferring warm, cloudy, shallow streams. Rarely found in quiet pools, they require fast-moving water and can tolerate mineralized waters relatively well. The southwestern willow flycatcher depends on clean and abundant water, both in breeding habitats in the United States and in the tropical rainforests where it winters. Lack of water in the Virgin River is the primary threat to both the woundfin and the southwestern willow flycatcher; there is simply not enough water remaining in the river to allow the woundfin to re-establish and sustain populations, or to support the rich riparian habitat on which the flycatcher depends. The woundfin and southwestern willow flycatcher are critically important ecologically because they are umbrella species; restoring the river's health would provide substantive habitat for them and would also protect habitats of more than seventy-five sensitive species found in the Virgin River and its tributaries.

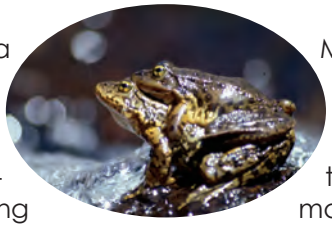
### What You Can Do

Individuals in the region can make lifestyle choices that minimize carbon footprints and do not support unsustainable urban development around the Virgin River. The Center for Biological Diversity is launching a multi-faceted campaign intended to foster recovery of the woundfin and to create reform in water use throughout the Virgin River basin. Numerous environmental organizations, including the National Audubon Society, the Center for Biological Diversity, the Western Environmental Law Center, and Defenders of Wildlife are working collaboratively to protect the southwestern willow flycatcher and restore its fragile habitat.

# The Sierra Nevada:
## Mountain Yellow-legged Frogs


Michael Marfell

The Sierra Nevada mountain range in California and Nevada is home to some of our country's most spectacular geography, including Yosemite Valley, Mount Whitney, the highest point in the contiguous United States, and Lake Tahoe, the largest alpine lake in North America. The mountains host wilderness areas accessible only by foot or horseback, and three national parks—Yosemite, Sequoia, and King's Canyon. The ecology of the mountains is complex and defined by distinct ecosystem characteristics at different elevations. The Mountain Yellow-legged frogs—both species —are found in creeks, lakes, and sunny riverbanks at elevations from 1,200 to 7,500 feet.


Vance Vredenburg

The closely-related Sierra Nevada Yellow-legged frog and the Southern Mountain Yellow-legged are important for an intricate food web—eating large quantities of insects, which may carry human diseases, as well as serving as a food source for snakes, birds, beetles and butterflies. These frogs are two and a half inches as adults. Their abdomens and the undersides of their hind legs are yellow-to-orange, and their backs are yellow-to-reddish, with dark brown or black blotches.

Males develop small, glandular growths—nuptial pads—on the base of their thumbs to help them hold females during mating season. They have adapted to survive in environments that are too cold for most amphibians. Both species are highly vulnerable to the deadly chytrid fungus which has spread through the Sierra Nevada in the past decade, decimating frog populations.


Chad Lane

**Sierra Nevada Yellow-legged Frog *(Rana sierra)* \ Southern Mountain Yellow-legged Frog *(Rana muscosa)***

**Status:**
The Southern Mountain Yellow-legged Frog is state (CA) and federally listed as endangered. The Sierra Nevada Yellow-legged Frog is state (CA) listed as threatened and federally listed as a candidate.

**Range:**
The Southern Mountain Yellow-legged Frog occurs in Southern California's mountain ranges and in the Sierra Nevada Mountains south of ridges that separate the headwaters of the South Fork Kings River from the Middle Fork Kings River, from Mather Pass to the Monarch Divide. The Sierra Nevada Yellow-legged Frog occurs to the north of these ridges.

**Population:**
Unknown. Both species are extinct from 93 percent of their historic range.

## Water in the Balance

The Yellow-legged frogs are highly aquatic, depending on the clear, cool waters of mountain lakes and streams for their survival. Their habitat is undergoing manmade changes that threaten their survival. Non-native trout have been introduced into the fishless mountain lakes. These trout are voracious predators of tadpoles and can eat frog populations to extinction.

Pesticides from California's Central Valley also contribute to the species' decline. The windborne chemicals accumulate in the high mountains and pollute streams and lakes. Frogs have permeable skin that easily absorbs toxic chemicals, which makes them especially vulnerable. Frogs are indicators of environmental stress; their health is indicative of the health of the biosphere as a whole.

### What You Can Do

One of the simplest and most impactful things we can do is to stop using pesticides and choose organic foods whenever possible. We need to urge the California Fish and Game Department to stop stocking high mountain lakes with non-native fish where the Mountain Yellow-legged frogs already exist. Individuals can also support organizations, including SAVE THE FROGS that are working to save these species from extinction by bringing awareness to their plight and educating the public about the importance of frogs and their habitats.

# The Sonoran Desert:

## Sonoran Pronghorn Antelope

wikimedia commons Highqueue

The Sonoran Desert, one of the largest and hottest in the U.S., covers 120,000 square miles in southwestern Arizona, southeastern California, and in the Mexican states of Sonora and Baja. Two major and rapidly growing metropolitan areas, Phoenix and Tucson, are located in the desert, and nearly twenty Native American tribes live on reservations within the Sonoran's bounds. Of the four U.S. deserts, the Sonoran is the most biologically diverse, populated by an abundance of species that are uniquely suited to the desert's harsh weather, including extreme heat, summer monsoons and winter rains, and periods of intense aridity and nighttime cold.

**The Sonoran Pronghorn Antelope *(Antilocapra americana sonoriensis)***

**Status:**
Listed as endangered since 1967.

**Range:**
Native to the Sonoran Desert of southwest Arizona and northern Sonora, Mexico.

**Population:**
Approximately 500, of which about ninety live in the United States.

The Sonoran Pronghorn is a magnificent species that symbolizes the essence of prehistoric wilderness when vast herds roamed across the deserts of an untamed North American continent. They are different from all other hoofed animals because their branched, hollow horns are made from hair, like the permanent horns of goats, but these are shed each year like the solid antlers of deer.

Robin Silver

Pronghorn are the fastest land animal in North America, capable of running up to sixty miles per hour. At three feet tall and 100 pounds, they are the size of goats, while their closest living relatives are giraffes. Pronghorn have excellent vision and eyes nearly as large as those of an elephant, which allow them to easily detect predators.

## Water in the Balance

Drought is a major factor affecting the survival of Sonoran pronghorn adults and fawns, and the increasingly severe and frequent droughts in the Southwest have become a significant threat. Indeed, during a major drought in 2002, more than 80 percent of the U.S. pronghorn population died, with only twenty-one members of the herd surviving. Drought is also inhibiting the herd's population growth, as fawn survival is highly dependent on the timing, duration, and distribution of sparse but important rainfall during the winter months and monsoon rains during the summer. Without these critical periods of rain, there isn't enough forage for the newly-weaned fawns or adult pronghorn to survive. Federal and state managers—including representatives of the U.S. Fish and Wildlife Service, Arizona Game and Fish, the Oregon Pipe National Monument, and the Barry M. Goldwater Bombing Range—currently supply water during the driest months to keep the U.S. herd from perishing.

The threat that Sonoran pronghorn face from lack of water is compounded by other threats created by humans. Construction of highways, railroads, and fences, and residential and commercial development all fragment the pronghorn's foraging grounds and block their access to new food sources. Off-road vehicle use, mining, agricultural over-grazing, and illegal immigration and smuggling—along with law enforcement's responses to these activities—keep the pronghorn on the brink of extinction.

### What You Can Do

**Individuals can help save the Sonoran pronghorn by reducing their greenhouse gas footprint and by becoming politically active in the campaign to protect the pronghorn's sensitive habitat from threats posed by an array of human activities. The Center for Biological Diversity is working to save the pronghorn and its desert habitat from an array of threats including vehicular use, harmful border construction, harmful border law enforcement activities, and climate change.**

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