

# GAMBLING ON THE WATER TABLE

The High-Stakes Implications of the Las Vegas Pipeline  
For Plants, Animals, Places and People





## DEFENDERS OF WILDLIFE

Defenders of Wildlife is a national, nonprofit membership organization dedicated to the protection of all native wild animals and plants in their natural communities.



## GREAT BASIN WATER NETWORK

The Great Basin Water Network is an umbrella organization for groups and individuals committed to protecting the water resources of the Great Basin for current and future inhabitants (human, animal and plant).

### AUTHOR

Krista Schlyer

### PROJECT DIRECTORS

Noah Matson, Vice President for Land Conservation, Defenders of Wildlife

Brian Segee, Staff Attorney, Defenders of Wildlife

### REVIEWERS

Kara Gillon, Defenders of Wildlife; Dennis Ghiglieri and Rose Strickland, Toiyabe Chapter of the Sierra Club;

Susan Lynn, Great Basin Water Network

### MAP

International Mapping Associates, Inc.

### EDITORIAL TEAM

Editor: Kate Davies

Art Director: Jen Lee

© 2007 Defenders of Wildlife

1130 17th Street, N.W.

Washington, D.C. 20036-4604

202.682.9400

Cover photos: Fish Springs National Wildlife Refuge, Cecil Garland, rancher © Krista Schlyer/Wayfarer Photography;  
desert tortoise © Paul and Joyce Berquist/Animals Animals; gambling table © istockphoto.com

All inside photos © Krista Schlyer/Wayfarer Photography unless otherwise noted.



FSC

Recycled

Supporting responsible  
use of forest resources

Cert no. SCS-COC-00635  
www.fsc.org

© 1996 Forest Stewardship Council

Printed on 100% post-consumer-waste, process-chlorine-free recycled paper manufactured with wind power, creating the following environmental benefits: 10.14 trees not cut down; 29.27 pounds of waterborne waste not generated; 4,306 gallons of water/waste flow saved; 476 pounds of solid waste not generated; 938 pounds of greenhouse gases prevented; 7,180,800 Btus of energy not consumed; 487 pounds of air emissions not generated.



# **GAMBLING ON THE WATER TABLE**

---

The High-Stakes Implications of the Las Vegas Pipeline  
For Plants, Animals, Places and People



We cannot take from rural Nevada to support urban Nevada—all Nevada’s communities deserve a decent standard of living.”

—Terry Marasco, innkeeper and activist  
Baker, Nevada

**TABLE OF CONTENTS**

Introduction ..... 3

Booming and Thirsty: Las Vegas and Environs ..... 5

Quenching the Thirst: The Southern Nevada Water Authority’s Pipe Dream..... 6

Map: The Proposed Southern Nevada Water Authority Groundwater Development Project and Protected Public Lands ..... 8

High Stakes: Plants, Animals, Habitats and Protected Natural Areas at Risk ..... 10

Concerned Stakeholders: Rural Residents Fear for Lands and Livelihoods ..... 14

Conservation-Based Alternatives and Recommendations ..... 16

Conclusion ..... 17

Endnotes ..... 18

# INTRODUCTION

© JOHN HICKS/CORBIS



U.S. FISH AND WILDLIFE SERVICE

**Not far from the bustle of downtown Las Vegas lies the serenity of Desert National Wildlife Refuge.**

In the heart of Nevada lies one of the nation's most exquisitely spare and unusual landscapes. Where the great, hot Mojave Desert transitions into the cooler Great Basin Desert, mountains etch a jagged skyline, Joshua trees and beavertail cactus meet endless valleys of greasewood and sagebrush, desert bighorn sheep scale rugged slopes, and pronghorn range upon flats that were once the bottom of vast lakes. In lush oasis pools, silvery desert fishes—species found nowhere else in the world—nibble on algae and meander warm springs fed by glaciers that melted thousands of years ago. From wildflowers to kit foxes to minute invertebrates, life forms evolved in the harsh, dry heat of the Nevada deserts, nurtured by the one thing that makes it all possible: water, in the unlikeliest of places.

As little as three inches of rain fall here per year, and every drop is precious and accounted for, by plants, fish, reptiles, birds and mammals—including people. Human habitation in the region dates back more than 1,000 years and many people continue to live off this land, including Native Americans, ranchers, farmers and business owners who count on the tourists from all over the world who come here to experience this treasured landscape.

Over the past 60 years, increasingly intensive human use of the water that keeps this land alive has altered the delicate

balance of the ecosystem, causing the extinction or endangerment of many species. Today, there is a new threat to the entire natural landscape of Nevada, as well as much of northwestern Utah and southeastern California, that dwarfs all that has come before. Las Vegas, the booming city in the hottest and driest part of the nation that has erupted into one of the fastest-growing metropolitan areas in the country. A confluence of circumstances, including a rapidly diminishing supply of water from the Colorado River and new water-resource challenges presented by global warming, has left Las Vegas looking for alternate sources of water to sustain its sprawling development.

Las Vegas long ago tapped out the limited groundwater available in southern Nevada. Although the city has made significant progress in its efforts to conserve water, its explosive growth continues, leading to a search for more water hundreds of miles away in the most remote and undeveloped areas of the state. Under the Clark, Lincoln and White Pine Counties Groundwater Development Project, the Southern Nevada Water Authority proposes to extract hundreds of thousands of acre-feet of groundwater from eastern Nevada and convey it to the greater Las Vegas area through a massive pipeline. This report describes this plan, the natural and human communities it threatens and some alternatives the city should implement before attempting to take any more water from this fragile desert.

## THE GREAT BASIN: A LIVING LANDSCAPE



**American white pelicans and other migratory birds rely on the watery habitats of Fish Springs National Wildlife Refuge—the only wetlands for 50 miles.**

To comprehend the magnitude of the threat posed by Las Vegas' plan to pump rural Nevada water, it is helpful to understand the natural processes that formed and continue to sustain life in the Great Basin.

Millions of years ago, seismic unrest thrust the Earth's rocky crust upward to form mountains and cracked and shifted the layers of rock that remained underground.

This turmoil of the land created the Great Basin and helped define the weather patterns that often make water scarce here. The Sierra Nevada and Cascade Mountains to the west of the Great Basin block clouds of ocean moisture and squeeze them nearly dry as they move east, leaving little precipitation for the land that lies in the rain shadow of these great western mountains—the Great Basin and Mojave deserts. What rain does fall is used to its maximum efficiency or stored in a vast subsurface vault. With no natural outlet to the ocean, water that falls here in the form of rain or snow stays right here. Some of the water that entered the system thousands of years ago is still stored in an extensive, complex aquifer—a layer of permeable, water-holding rock—that can lie a mile or more below the surface. This Great Basin regional aquifer is really a system of many dozens of groundwater basins interconnected through fissures and underground flows deep in the carbonate rock layer that stretches from Salt Lake City, Utah, to Death Valley, California.

About 12,000 years ago, glacial runoff flooded the region, creating lakes and rivers and nurturing biological communities. When the climate gradually became drier, lakes such as the enormous Lake Bonneville, which covered much of western Utah, evaporated. Fish, wildlife and plants adapted to the chang-

ing conditions. Fish took to the smaller, isolated pools and to the springs that continued to bubble up from the subsurface aquifer. Some, such as the Bonneville cutthroat trout, made homes in the streams at the base of mountains, while others found a niche in the warm springs at Devil's Hole and in the Moapa Valley and elsewhere. Certain plants colonized the alkaline flats and pressed their roots deep into the earth seeking out the water that remained below the ground. Mammals, reptiles and birds adjusted by going longer without water or getting supplemental water from food sources.

Today, water that begins as snow in the mountains travels to the valley where it runs off as surface water or seeps into the ground, some of it eventually making its way through a maze of cracks deep into the rocky aquifer. Here, water gathers and flows, building pressure along fault lines that pushes some of it to the surface at the region's warm springs. The water that builds in the shallow subsurface aquifer may be pressed to the surface in local springs or recharged to the air through evapotranspiration, the loss of water from the soil and the leaves and stems of ground-water-dependent plants.

Scientists have not yet completely mapped the detailed workings of the Great Basin's carbonate aquifer system, but the patterns and pathways of water, its movement over and through the land and the shape of the land itself clearly have guided the development of living communities. Without this ancient hydrologic system intact, the Great Basin ecosystem and its diverse plants and animals—many found nowhere else in the world—would not exist.

## BOOMING AND THIRSTY: Las Vegas and Environs

From its beginnings, Las Vegas has had a thirst beyond the capabilities of its own water sources to quench. Half a century ago, the city dried up ancient springs in the Las Vegas valley, but its population continued to explode. Today, Las Vegas' pursuit of water is not just a local issue, it's also a regional one with serious implications for water supplies, communities and the environment throughout Nevada and in areas of neighboring Utah and California.

Las Vegas is Spanish for "the meadows," but this name conferred by Spaniards passing through in the early 1800s makes little sense now given the current cityscape—dehydrated but for the elaborate concrete casino fountains and fabricated lakes watered by pipes from the Colorado River. At one time artesian wells spouted from the ground and greened this arid land with wetlands and meadows. Springs provided water for native peoples a thousand years ago, for 19th century travelers along the Old Spanish Trail and for Mormons who settled in this region.<sup>1</sup> Then the casino-building boom of the 1950s caused a plunge in the groundwater table that dried the local springs, forever altering the land and driving a native fish, the Las Vegas dace, to extinction.<sup>2</sup>

Ever since, this city in the desert has relied almost completely on Colorado River water stored in nearby Lake Mead. Under the 1922 Colorado River Compact, the seven states within the river's basin allocated much of the river's flow among them. The compact, however, was based on flows during an extraordinarily

wet decade.<sup>3</sup> This overestimation of the flow of the river led to an over-appropriation of water and the situation has grown only more problematic as unfettered growth, global warming and an extended dry period have driven water supplies in Lake Mead and Lake Powell to their lowest levels since filling. In addition, storage of the river's water in these man-made lakes spreads the surface of the river out, allowing for the loss of more than 1 million acre-feet per year to evaporation—enough water for 8 million people annually.<sup>4</sup>

And while even misallocated and mismanaged Colorado River water was more than enough for Las Vegas in its infancy—the city had only a few thousand people living in it prior to World War II—the state's encouragement of rapid-fire population growth has stretched the Colorado thin. From 1950 to 2005, Clark County's population grew from 48,000 to an estimated 1.75 million people.<sup>5</sup> This incredible growth has been driven largely by Las Vegas, the fastest-growing metropolitan area in the country, according to the last census.<sup>6</sup> The population nearly doubled in the decade prior to 2000, growing from 850,000 to more than 1.5 million people, and is expected to double again by 2030. Moreover, not only is the city growing, it also continues to have one of the highest per capita rates of water consumption in the West, multiplying its draw on the Colorado River.<sup>7</sup> In addition to its suburbs, the city is supporting the development of satellite communities, small cities farther out in the desert, which put even more pressure on scarce water resources.



Las Vegas is the fastest-growing metropolitan area in the United States.

## QUENCHING THE THIRST: The Southern Nevada Water Authority's Pipe Dream

© FRANCKE/BILDERBERG/AURORA PHOTOS



**In California's Owens Lake, transformed into a salt-encrusted, dusty desert by a 250-mile pipeline built nearly a century ago to bring water to the city of Los Angeles, lies a cautionary tale for Las Vegas.**

Las Vegas' water predicament demands a big-picture, long-term approach to water-resource management. With progressive water conservation and better management of its current supply of Colorado River water, the city could meet its water needs well into the future. While the city has taken some steps toward water conservation, it is focusing its financial and planning priorities on desert groundwater development. On average, Las Vegas spends \$103 per person on the development of water supply and only about \$19 per resident on conservation measures.<sup>8</sup> And its water supply development plan centers on the largest municipal groundwater project ever undertaken in the United States. The region's water management agency, the Southern Nevada Water Authority (SNWA), plans to build more than 440 miles of pipeline, up to 84 inches in diameter, in northeastern Nevada to pump water from the Great Basin regional aquifer. A vast regional infrastructure of production wells, pumping stations, water treatment plants, power lines and other support facilities will accompany the pipeline.

SNWA's main pipeline (see map on pages 8 and 9) would reach nearly 300 miles north of Las Vegas, extending beyond Great Basin National Park at the Utah border, and would convey 200,000 acre-feet of water or more per year from seven basins in Clark, Lincoln and White Pine counties. (An acre-foot of water is about 325,000 gallons, or enough water to supply two families of four people for a year.<sup>9</sup>) The direct financial cost of the plan, according to SNWA,

ranges from \$2 billion to \$5 billion but is likely to be much higher.<sup>10</sup> As detailed in this report, the environmental, cultural and indirect financial costs of the plan are exponentially higher. In addition to the removal of water essential to the survival of rural Nevada, the pipeline, three pumping stations, a 40-million-gallon underground storage reservoir, six regulating tanks each with a 3-million-gallon capacity, more than 250 miles of power lines, two electrical substations and a water treatment facility will be located on public land managed by the Bureau of Land Management (BLM).<sup>11</sup> Some of the considerable land disturbance associated with the project will be in an area of critical habitat for the threatened desert tortoise.

If similar efforts in other parts of the arid West are any indication, SNWA's groundwater project will have devastating impacts on the rural communities and natural environments of Nevada. In the early 1900s, the city of Los Angeles diverted the Owens River, which subsequently dried Owens Lake, then one of California's largest. When that didn't yield enough water, the city began pumping groundwater from the region, sinking the water table, drying up springs and killing off groundwater-dependent plants. As a result, the Owens Valley is now plagued by air pollution and considered the largest single source of particulate matter in the country.<sup>12</sup> In fact, from 2000 to 2005, three-quarters of the worst dust events in the country occurred at Owens Lake. The Owens Valley is just one of the parables history has to offer on large-scale water transfers.



Water transfers that have affected the Salton Sea in California and such faraway places as the Aral Sea in Kazakhstan have created similar air pollution problems.

Despite these cautionary tales, in its planning efforts to date, SNWA has been unable, or unwilling, to address meaningfully to what extent its pipeline project will adversely affect wildlife, the environment and rural communities that depend on groundwater. Although the BLM will prepare an environmental impact statement under the National Environmental Policy Act addressing the impacts of pipeline construction and groundwater pumping on federal lands, this process will not be completed until well after SNWA's water right applications are considered by the Nevada state engineer—the official responsible for allocating water rights. Indeed, the state engineer recently granted SNWA 40,000 acre-feet of groundwater annually in Spring Valley, directly adjacent to Great Basin National Park. The state's decision to grant these water rights threatens to turn the federal environmental review process into a mere formality.

In essence, SNWA's and the Nevada state engineer's answer to environmental concerns amounts to “we can't tell until we start pumping.” This response is problematic, especially in light of the fact that independent hydrologists, using the figures from SNWA's own research, have determined that the project may lead to a significant reduction in the water table.<sup>13</sup> Several studies have found that the SNWA plan could lower the water table by 50 to 100 feet—and even as much as 1,600 feet—in large portions of the regional aquifer.<sup>14</sup> In Spring Valley, the state engineer permitted 40,000 acre-feet of groundwater despite the fact that hydrologists have cautioned that the available water in this basin may be 14,000 acre-feet per year or much less.<sup>15</sup> Additionally, a recent U.S. Geological Survey study found that portions of Great Basin National Park are vulnerable to water loss from the Las Vegas plan.<sup>16</sup>

More fundamentally, the “perennial yield” method used by the Nevada state engineer to determine how much water to remove from the aquifer will inherently result in significant environmental degradation. Under this method, the engineer calculates the perennial yield (the amount of groundwater that can be withdrawn each year by SNWA and other water rights holders and applicants) of the various basins that make up the regional aquifer by including the amount of water that groundwater-dependent plants release to the air through evapotranspiration. This estimation assumes that more water will be “available” for use by Las Vegas, because the plants that currently use the water will die. However, the loss of these groundwater-dependent plants, called phreatophytes, would leave the desert floor without its chief anchor and would hasten and worsen the dustbowl conditions predicted for the West in several 2007 studies, including one by the Intergovernmental Panel on Climate Change.<sup>17</sup>

## VEGAS PIPELINE MAJOR THREAT TO REGIONAL BIODIVERSITY

Few people know the desert of Nevada and its most vulnerable inhabitants as well as Jim Deacon. A professor emeritus of biological science and environmental studies at the University of Nevada in Las Vegas, Deacon has been studying the natural oases systems of this region since the late 1950s and is now one of the foremost authorities on the fishes of Nevada's desert.

Throughout his 42-year career at the university, Deacon observed the threats that groundwater pumping and stream diversion have posed to natural communities here. His first experience was with the Las Vegas dace, a native fish that went extinct in the 1960s when groundwater pumping for Las Vegas dried the springs in which it lived. Because of his work on behalf of desert fishes, the extinct dace was named after Deacon—*Rhinichthys deaconi*.

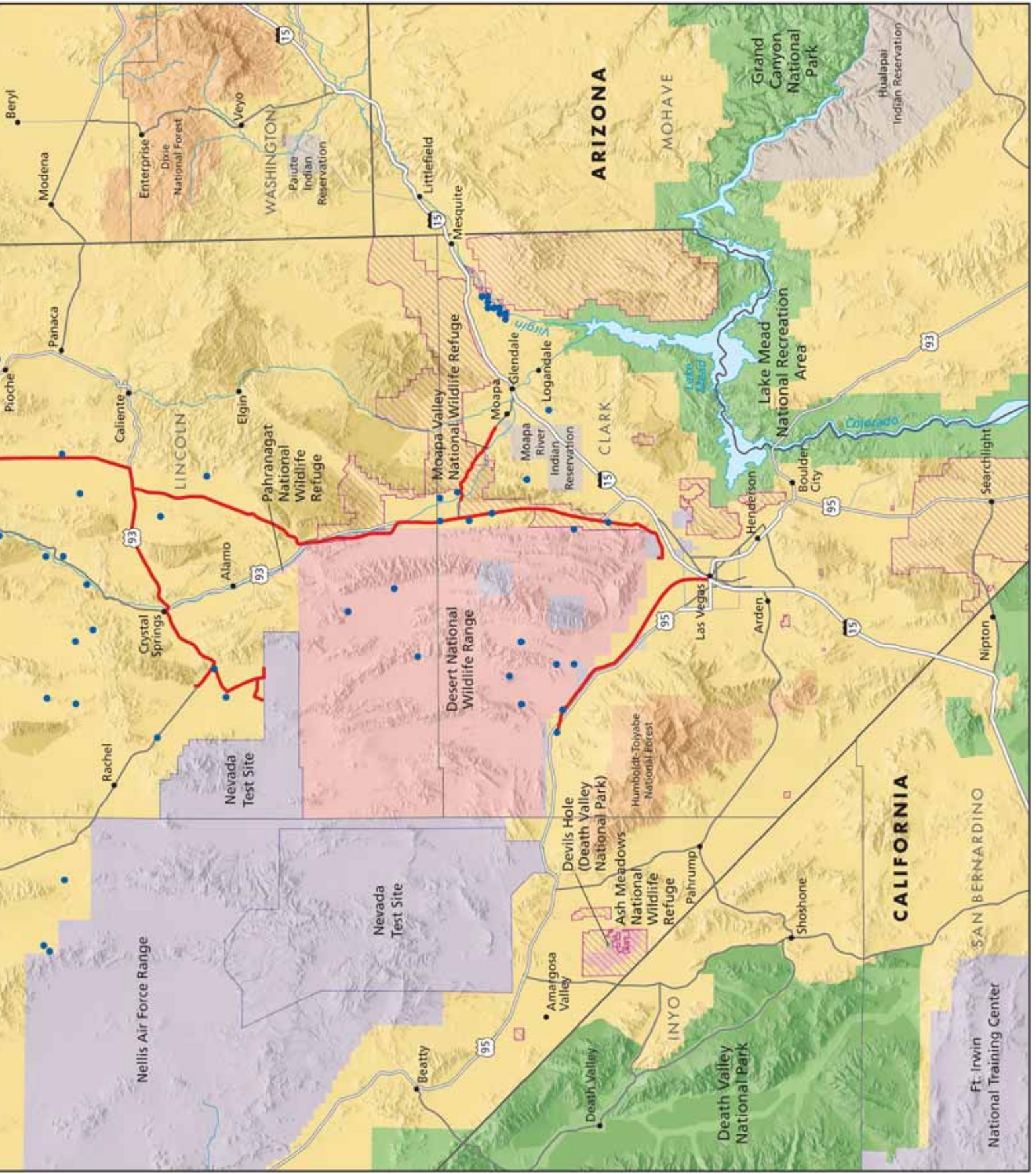
In 1968, Deacon co-authored a paper predicting that continued pumping of groundwater for irrigation in the Pahrump Valley west of Las Vegas could lead to the failure of the Manse Spring, home of the Pahrump poolfish, within 10 years. Fortunately, Deacon's paper led to the establishment of a small population of the fish in another location, which saved the species from extinction when the spring ultimately did fail.

Despite these experiences and others with groundwater depletion and subsequent loss of biodiversity, Deacon says that the threat to regional biodiversity posed by Las Vegas' pipeline dwarfs all previous threats he has seen. In a paper he co-authored on the pipeline project's probable effects on the ecosystem, Deacon asserts that it could cause a bigger reduction to the water table over 100 years than happened in the 15,000 years after the glaciers receded.



**Biologist Jim Deacon considers the proposed pipeline the biggest threat ever to biodiversity in the Great Basin.**





## HIGH STAKES: Plants, Animals, Habitats and Protected Natural Areas at Risk

The complex system of scant precipitation, varied ground elevations and groundwater faults and flows that defines the Great Basin has in turn shaped the natural life within it, right down to the very colors of the landscape. Pale sage and sand, taupe, thorny brown and dusty rose—these are the colors of a land of scarce rain and the flora and fauna that manage to survive there. They're the colors of plants that grow low to the ground with small, water-conserving leaves and specialized root systems and the colors of animals that seek shelter from the sun and organize their movements around the presence of water at springs and seeps. They're the colors of greasewood and creosote, of desert bighorn sheep, desert tortoises, mule deer and jackrabbits.

But there are other colors here in scattered oases—the fluttering bright green of a cottonwood leaf, the swaying deep green of a bulrush, the aqua blue of a thermal spring. These incongruous patches of color are the vital openings for water, much of it glacial melt from the last ice age that has been waiting for thousands of years to make its way to the surface. The distribution and use of water here is frugal and efficient in a natural system that rests on a complex and fragile equilibrium established over millennia.

In its quest for water, SNWA has repeatedly said that the effects of groundwater pumping cannot be known prior to actually going in and removing the water. The stakes of this reckless gambler's approach, which are higher than any Las Vegas has ever seen, include the very survival of endangered species such as the Moapa dace, Devil's Hole pupfish and 18 other federally threatened and endangered species. These "umbrella species," the protection of which helps lesser-known animals, including at least 137 spring-dependent species, primarily locally endemic snails, insect and fishes.<sup>18</sup> Also at risk are the groundwater-dependent plants that cover the desert floor in green, sweeten the desert air and anchor the soil, while protecting the entire region from dust storms; and some of the last major strongholds for desert tortoises and desert bighorn sheep and crucial migration stopovers for waterfowl and songbirds along the Pacific Flyway.

The very lands set aside to protect this desert wildlife and habitat are on the table, too. The ante, briefly described below, includes five



The desert tortoise, a federally threatened species, stands to lose vital habitat to the pipeline.

national wildlife refuges, which by law must protect the species and habitats under their management, and a national park that boasts some of the world's oldest trees and newest known species

### MOAPA VALLEY NATIONAL WILDLIFE REFUGE

About 60 miles northeast of Las Vegas, behind a series of Plexiglas panels that serve as a window to Muddy River, the tiny Moapa dace goes about its daily business—nibbling on algae, securing a mate and laying its eggs in warm springs at the headwaters of the Muddy River. The Moapa Valley National Wildlife Refuge set up the window to give visitors a closer look at this fish whose future rides on the outcome of Las Vegas' quest for water. The Moapa dace once swam more widely in the headwaters of the Muddy, but habitat degradation, groundwater pumping and invasive species have worked against it. The waters of the 100-acre Moapa Valley refuge constitute this little fish's last hope.

In an attempt to save this endangered species, the U.S. Fish and Wildlife Service established the Moapa Valley refuge in 1979 by acquiring lands previously occupied by resorts. For the dace to survive, the land must return to a more natural state, which means removing the concrete poured around the warm springs to create chlorinated swimming pools for resort guests. In addition to undoing the structural changes to this habitat, the refuge is working to remove non-native plants and fish—including a species of tilapia that has further decimated the dace, to restore native plants and stream flows and to monitor the water temperatures and levels so important to the fish's survival.

About 1,200 Moapa dace now exist, breeding almost exclusively at this refuge, which springs from the aquifer that Las Vegas and its satellite communities are planning to tap. Just 20 miles down the road from the refuge, a developer wants to build a 42,000-acre golf course community with up to 12 golf courses, a swimming complex and 150,000 new homes, all on top of critical habitat for the threatened desert tortoise. If this development and the SNWA pipeline succeed in pumping thousands of acre-feet of groundwater



The endangered Moapa dace breeds primarily in the warm springs of the Moapa Valley refuge.

here, they will further compromise an aquifer already stressed by local groundwater pumping. This will literally pull the plug on the Moapa dace. The status of this vulnerable fish, like the coal miners' canary, elucidates the health of the system as a whole and the fates of other species that rely on this habitat, including the endemic Moapa pebblesnail, the White River springfish, the threatened desert tortoise and numerous bird species, including Nevada's largest breeding population of vermilion flycatchers and a dense concentration of yellow-billed cuckoos.

### DESERT NATIONAL WILDLIFE REFUGE

The southern boundary of the Desert National Wildlife Refuge is less than a mile from the Las Vegas metropolitan area. The 1.5-million-acre refuge, the largest in the lower 48 states, draws 70,000 visitors a year and preserves a place where six mountain ranges rise above the confluence of the Mojave and Great Basin deserts, where desert marigolds and Indian paintbrush bloom brightly against the desert floor.

In the spring, desert winds carry the scent of creosote and sagebrush over the landscape and through trees where yellow-rumped warblers and western kingbirds rest. Under a blanket of desert shrubs, in the shaded spines of yucca and Joshua trees and along the edges of shimmering pools in spring-fed oases, the desert's creatures dwell. They have adapted to this environment of extremes, where sanctuary from the sun and a reliable supply of water mean survival, and drought and habitat destruction are tantamount to death or even extinction. More than 50 mammal species live here, including the desert bighorn sheep, which the refuge was established to protect in 1936. This mammal can go for eight days without a drink of water, lose more than 30 percent of its body weight (a human being dies of dehydration at 10 percent loss), and still survive—drinking up to five gallons of water when it becomes available. But despite its adaptations, the bighorn is still vulnerable to changes in water availability, as are the threatened desert tortoise and myriad other reptiles, fish, groundwater-dependent plants and 320 species of birds that share this refuge.

The Nevada state engineer has already approved SNWA's application to pump groundwater directly from the aquifer that sustains this refuge. Major reductions in the water table here could result,<sup>21</sup> devastating the springs on which native fish and other animals depend and lowering the groundwater to a level out of reach of many desert plants. In addition to threatening the refuge and its wildlife, the loss of these plants would worsen the dustbowl conditions predicted for the state.<sup>22</sup>

### ASH MEADOWS NATIONAL WILDLIFE REFUGE

In the spring-fed pools of Ash Meadows National Wildlife Refuge algae glow brightly green beneath waters clear as glass in the only pool in the world where Ash Meadows pupfish—one of 24 species of animals and plants that are found nowhere else on Earth but here—dart and wiggle.

Established in 1984, this refuge, located 90 miles west of Las Vegas,

## PHREATOPHYTES: ANCHORS OF THE DESERT



**Rabbitbrush is one of the long-rooted, groundwater-dependent plants known as phreatophytes that keep arid soils in place.**

**D**esert plants, particularly the desert shrub community of greasewood, rabbitbrush and sagebrush—plants collectively known as *phreatophytes*—are some of the most underappreciated plants around. Their role in keeping the air clean and healthy, in coloring the desert floor, providing shelter and shade for animals and perfuming the air is misunderstood or, even worse, ignored. So much so that the hydrologic approach to groundwater management in Nevada calculates the amount of water that can be withdrawn from an aquifer by assuming that if groundwater-dependent plants die—and therefore are no longer releasing water to the air through evapotranspiration—more water will be available for people to use. The problem with this approach is that along with being a foundational element supporting biodiversity in the desert (providing shelter, shade and food for desert animals), these plants—with roots that can reach nearly 50 feet into the ground—anchor the dusty desert soil, keeping it in place when the winds kick up. One study determined that the pipeline plan could cause the loss of more than 60 percent of the phreatophytes in some areas of the Great Basin.<sup>19</sup>

History testifies to the folly of stripping an ecoregion of this most basic element. The Dustbowl of the 1930s displaced hundreds of thousands of people and crippled the economy in large part because prairie grasses that anchored the topsoil were plowed under and replaced with shallow-rooted crops.<sup>20</sup>

Phreatophytes should be protected as the West's best hope to avoid a return to the Dustbowl, especially in light of recent predictions of long-term drought in the region due to climate change. Fortunately, many Great Basin residents who make their livings from farming, ranching and ecotourism share scientists' appreciation for this vital vegetation. As innkeeper Denys Koyle says, "Everybody out here just loves their phreatophytes."



The Ash Meadows sunray is one of several imperiled plants found in an area where the pipeline could lower the water table 50 to 100 feet.

protects a unique habitat of isolated species, a Galapagos-like island of water in a sea of Mojave Desert, a place with more endemic species than any other area in the country and the second-highest number in North America.<sup>23</sup> In addition, this system of springs and streams and pools provides habitat for more than 240 species of birds including roadrunners, quail, phoebes and thrashers, many reptiles and mammals such as coyotes, jackrabbits and sometimes desert bighorn. The refuge draws 50,000 visitors annually, many of whom travel great distances to see its incredible diversity of plants and animals.

Before this area gained protection as a refuge, groundwater pumping and the diversion of springs for agricultural use disrupted the fragile hydrologic system that sustained it. The Devil's Hole pupfish, the iridescent blue fish found only in a single very deep pool on the refuge, nearly disappeared when the water level in its pool began rapidly dropping in the late 1960s. With protections for this species, and even a reduction in groundwater withdrawal

mandated as a result of a 1976 Supreme Court case, the Devil's Hole pupfish seemed to recover, but now is again in decline. The current pupfish population is about 40 individuals. Although the source of the decline is uncertain, it has been linked to distant groundwater pumping from the aquifer that feeds desert springs.<sup>24</sup>

Other species unique to Ash Meadows have suffered similar declines due to invasive species and loss of water including the endangered Ash Meadows pupfish, Warm Springs pupfish and Ash Meadows speckled dace, as well as the many endemic plants here, such as the threatened Ash Meadows gumplant, threatened Ash Meadows sunray and endangered Amargosa niterwort.

Las Vegas' plan to pump water from the headwaters of the Ash Meadows flow could mean the eventual end for many of these unique species. Groundwater in the Ash Meadow's basin is already overallocated at about 113 percent under existing groundwater rights.<sup>25</sup> Further stress caused by large-scale pumping for Las Vegas could cripple this globally unique area, designated a "wetlands of international importance" in 1987 by an international conservation treaty.

#### **PAHRANAGAT NATIONAL WILDLIFE REFUGE**

In the Pahranaagat Valley, meandering expanses of marsh grasses briefly interrupt the sprawling desert that blankets much of Nevada. To the east and west of these rare wetlands, dark mountains loom protectively. Here, the scarcity of the desert finds an oasis of plenty. Northern harriers surf valley winds. Canvasbacks, mallards and American coots float on ponds rimmed with bulrushes. White-crowned sparrows congregate on greasewood shrubs. Kingfishers scan waters to locate an underwater meal.

Long ago, Paiute Indians named this stretch of land "Pahranaagat," place of many waters. Today, this oasis is part of the Pahranaagat National Wildlife Refuge, established in 1963 to protect an essential stopover for waterfowl and songbirds along the Pacific Flyway. It also provides habitat for many species of special concern and endangered and threatened species such as the desert tortoise, bald eagle and southwestern willow-flycatcher, a six-inch-long bird



American coots scramble across the surface of a Pahranaagat refuge pond for takeoff.

that migrates 2,000 miles from Central America each spring to breed at Pahrnatag. For some 32,000 visitors each year, this refuge offers a place to watch birds, take photographs, hunt and camp.

An ancient perennial stream, the White River, established this valley. Although the riverbed is now dry for many miles upstream and down, the water that does fill it comes from large underground thermal springs tied to the deep aquifer underlying much of Nevada and western Utah. Large-scale groundwater pumping poses a major threat to the health of these springs and the refuge's wildlife. Hydrologic studies of the likely long-term effects of the Las Vegas pipeline proposal found that the water table around Pahrnatag could drop more than 50 feet,<sup>26</sup> a plunge that would cause widespread loss of groundwater-dependent plants and some, if not all, of the springs that sustain wildlife here.

### FISH SPRINGS NATIONAL WILDLIFE REFUGE

The land surrounding Fish Springs National Wildlife Refuge in northwestern Utah is nearly uninhabited—desert punctuated here and there by ranches. On the refuge, daybreak over the eastern mountains sheds light on a valley of marshes and vast pools where the thermal springs that fill this watery haven bubble up from deep underground. The only sounds are waterfowl honking, redwing blackbirds chattering, meadowlarks singing and the rustling, splashing and complaining of redheads, snowy egrets, sandhill cranes and wrens. About 3,000 people each year brave rough roads and isolation—the nearest gas station is nearly 80 miles away—to observe, photograph or hunt here.

The U.S. Fish and Wildlife Service established this refuge in 1959 to compensate for the loss of wetlands available for migrating and nesting birds along the Pacific Flyway. It is named for the Utah chub, a native fish that has inhabited area waters since ancient Lake Bonneville covered much of the state more than 14,000 years ago. As the lake gradually dried, thermal springs maintained this oasis. The drying of springs and plowing of wetlands for agriculture continues to claim the watery habitats that American white pelicans, tundra swans, cormorants, cinnamon teal and other migratory birds rely on during their long journeys over the deserts of the American West.

The aquifer SNWA plans to tap feeds the springs that sustain these habitats. A drop in the water table could be triggered over time from pumping anywhere in the basin, but especially and most immediately from the planned pumping of more than 100,000 acre-feet per year from the Snake and Spring valley basins to the west of this refuge. Because of its distance from the planned wells, the Fish Springs refuge may not experience the effects on its water supply for decades or even centuries—far too late to stop any negative impact.

### GREAT BASIN NATIONAL PARK

The bright wind-swept valleys, dark caverns, spring-fed streams and high peaks of Great Basin National Park protect a land of the ancients. Bristlecone pine, including some of the world's oldest



The jackrabbit is a desert animal that, like many others, gets most of the water it needs from the plants it eats.

living specimens at nearly 5,000 years, weather harsh conditions atop the Great Basin's second tallest mountain, 13,000-foot Wheeler Peak. Cave formations, wrought by a dissolving of ancient rock, continue to form drip by drip in the belly of the Earth. Extraordinary night skies showcase timeless constellations.

This park, established in 1986 and visited by about 80,000 people each year, is a place where precipitation, wind and internal unrest have sculpted a landscape, which in turn has molded communities of plants and animals. Biologists are still discovering new life forms here in the caverns where pools of water provide homes for elusive invertebrates. And species such as the Bonneville cutthroat trout, a resident of this land since the time of ancient Lake Bonneville, are being restored in streams where non-native species and overharvesting once threatened their long-term survival.

The proposed Las Vegas pipeline would reach more than 250 miles from the city at the southern end of the state, all the way to this national park and beyond. According to a U.S. Geological Survey study of the pipeline project, water resources at the park are vulnerable to groundwater withdrawal, especially in neighboring Snake and Spring valleys, where the SNWA is seeking more than 100,000 acre-feet per year. Other studies of the likely effects of the pipeline project have predicted an eventual 50- to 100-foot drop in the level of the water table here.<sup>27</sup> Park wildlife, including fish, invertebrates found in cave pools, deer, elk and many other animals are dependent on these scarce water resources. Moreover, if the groundwater level drops as predicted, groundwater plants that hold the desert floor in place would vanish, giving rise to dust storms stirred by the high winds that channel through Snake Valley. This would decimate tourism, obscure night sky views that are some of the best in the country and affect public health.

## CONCERNED STAKEHOLDERS: Rural Residents Fear for Lands and Livelihoods

The proposed pipeline also threatens the homes and livelihoods of the Great Basin's rural residents. Many business owners in the area depend on a healthy ecosystem to attract tourists. Water is essential to the operations of the farmers and ranchers whose families go back generations on this land. And for the Goshute people, who have been here for many centuries, the springs are a foundation of life and culture.

### BUSINESS OWNERS

The desert foothills of the Snake Range at the eastern edge of Great Basin National Park harbor one of the most isolated tourism economies in the country. About 300,000 people come here every year for the national park, elk and mule deer hunting, fishing, and bike and motorcycle riding. The popularity of this destination is completely dependent on the health of this ecosystem, which, in turn, is entirely dependent on water. It's no wonder the owners of the inns that are the anchor businesses in this community have spent years, countless hours of their time, and money out of their own pockets, opposing the SNWA pipeline plan.

When Terry Marasco moved to Baker, Nevada, a gateway to the national park, to take over the Silver Jack Inn in 2004, he didn't immediately grasp the full extent of the pipeline project. When he did, he got worried—for the local environment and for his business. A significant reduction in groundwater levels, a foreseeable result of the pipeline, would kill groundwater-dependent plants, hurt air quality, and affect fish populations and water availability. "We have some of the best mule deer hunting in the West, and if the vegetation dies, they're gone," Marasco says. "This is about the foundations of everyone's life."

In February 2005, Marasco sent letters to every registered voter



**Innkeeper Denys Koyle worries about the impacts of the pipeline on nature and tourism.**

in White Pine County saying people needed to get together and take some action. This was the beginning of the Snake Valley Citizens Alliance, which has been working ever since to fight the Las Vegas groundwater pipeline.

Denys Koyle, owner of the Border Inn, a popular establishment near the national park on the Utah-Nevada state line, says the proof of just how disastrous any further reduction in water would be lies all around. Koyle cites the graphic example of 12 wild horses found dead in 2000 at a nearby spring that had dried up. A prolonged dry spell coupled with the installment of irrigation equipment at a local farm had lowered the groundwater table and caused the springs to stop producing.

Then there is the wind, which often blows 40 miles per hour for months at a time. Residents here know that despite occasional dust storms, the plants that carpet this valley, like groundwater-dependent greasewood, keep the air clean and the desert floor where it belongs. A few years ago, a dust storm blew two motorcyclists off the road, recounts Koyle, and the truck that stopped to help them was rear-ended by a driver who couldn't see through all the dust. If this valley loses its air-purifying and soil-anchoring phreatophytes (see page 11), accidents like this—and worse—would be commonplace. "Who's going to want to drive through here?" Koyle asks.

### RANCHERS AND FARMERS

In Callao, Utah, where several ranching families grow hay and raise cattle, rancher Cecil Garland has been living off the land for 35 years. "We started with a couple hundred acres, six cows and a lot of dreams," Garland says. Now he and his wife, Annette, have more than 500 acres and a couple hundred cows. Like Garland, many of the ranches here have expanded their operations over the past few decades, causing an increase in the use of groundwater. In the throes of a prolonged drought, Garland and his neighbors have seen wells fail, springs go dry



**The pipeline will affect "the foundations of everyone's life," says innkeeper Terry Marasco.**



and ponds evaporate with their expanding irrigation operations. Water scarcity is a fact of life everyone here has to grapple with.

SNWA has claimed it only wants to take surplus water from the aquifer, a claim at which Garland shakes his head. “If there was enough water, we’d be farming this whole valley,” he says. The finite nature of water resources is a limitation that defines life on this land. “We live within those boundaries, and Las Vegas has got to learn to live under those same terms,” Garland says.

### THE GOSHUTE TRIBE

Of all the parties involved in the pipeline issue, none is more attuned to the availability of water than the Goshute tribe. Indeed, only the earth and the wildlife have a more long-standing right to the water than these Native Americans. The Goshutes were part of the Shoshone-speaking peoples that came to the Great Basin 1,000 years ago and established a culture that could thrive in one of the hottest and driest places on the continent. Although the Goshutes once lived throughout this region, the arrival of European settlers in the mid-1800s eventually forced them onto two reservations, one of which straddles the Utah-Nevada borders between Spring and Snake valleys—the basins from which Las Vegas wants to tap more than 100,000 acre-feet of water per year.

The springs that bubble up from the aquifer are the Goshutes’ sole source of drinking water. A significant reduction of the water table would deprive them of this basic resource. Additionally, it would threaten traditions that the Goshutes have practiced for centuries, such as weaving baskets from the stems of groundwater-dependent willow trees.

### THE GREAT BASIN WATER NETWORK

To protect the water resources of the Great Basin for current and future residents—human, animal and plant—area businesses and many other rural Nevadans and Utahans banded together to form the Great Basin Water Network. The network serves as an umbrella organization of local residents and groups dedicated to seeing that decisions on water development proposals are made cautiously and based on the best available scientific information. Innkeeper Terry Marasco, a network member, summed up what motivates the Great Basin Network in a letter to his neighbors in rural White Pine County: “We cannot take from rural Nevada to support



urban Nevada—all of Nevada’s communities deserve a decent standard of living. We cannot let our legislators, commissioners, nor our Chambers of Commerce allow this [the pipeline] to happen.”

A mule deer browses in Great Basin National Park.



Rancher Cecil Garland urges Las Vegas to take a cue from rural Nevadans and accept the finite nature of water resources.

## CONSERVATION-BASED ALTERNATIVES AND RECOMMENDATIONS

Before the Las Vegas metropolitan area moves forward with this massive groundwater development, it must take proactive measures to conserve the water it has. To its great credit, Las Vegas has implemented some effective water conservation programs, including giving rebates for water-smart landscaping, supporting educational campaigns on water issues and offering coupons for businesses that use water-smart practices. Las Vegas should expand on successful programs such as its turf buy-out program, which pays landowners to remove water-inten-

Las Vegas could save the billions of dollars it will need to build the pipeline simply by adopting inexpensive conservation measures.

sive grass and replace it with desert landscape plants. But the city needs to do much more. Las Vegas uses more water per capita than most other southwestern cities—an average of 256 gallons per day. In Tucson, Arizona, per capita water consumption is 156 gallons per day and in Albuquerque, New Mexico, it's 173 gallons per day. Just by matching the per capita consumption of Tucson, Las Vegas could save more than the amount it is seeking to pump from the Great Basin aquifer.<sup>28</sup> The city could also save the billions of dollars it will need to build the pipeline simply by adopting inexpensive conservation measures such as:

- Changing the rate structure for water to provide incentives for decreasing water consumption, such as charging the biggest water users the true cost of water.
- Requiring utility companies to conduct water audits of every property in the Las Vegas metropolitan area and developing incentive programs to encourage citizens to fix leaky pipes and make sure their homes are up to water-smart code.
- Instituting tax breaks for innovative approaches to saving water by businesses.
- Capturing urban runoff from rainstorms for landscaping or for sending to filtration plants for indoor use.

With the proven creativity with which it approaches the entertainment industry, Las Vegas could also devise smart, environmentally responsible approaches to water transfer, banking, storage and reuse that could give the city a solid supply of water for the future including:

- Developing more sustainable growth patterns that reduce water use.
- Implementing aspects of the “Conservation Before Shortage” alternative presented to the Bureau of Reclama-

tion as part of the Colorado River shortage sharing process. This policy emphasizes voluntary and compensated reductions in water use, promotes the benefits of looking to the entire Colorado River basin for new efficiency and conservation projects, and allows third parties to create and store conserved water. Improving water management throughout the entire basin would help extend limited water supplies. These types of measures also provide important vehicles for transferring developed water to growing urban areas such as Las Vegas, while decreasing pressure to develop new water sources with significant environmental ramifications.

- Continuing to emphasize underground water banks, such as the one in Arizona where SNWA has banked a significant amount of water under an agreement with that state.

If Las Vegas exhausts all other water-supply alternatives and still chooses to pursue groundwater development in the Great Basin, water imported from other areas of Nevada should be used for drought protection first, not for the facilitation of more growth in the metropolitan area. The following steps should be taken to lessen the ecological impact:

- Ensure that there is a transparent process that fully involves the public and thoroughly analyzes environmental effects before an irreversible commitment of resources is made.
- Conduct in-depth research of groundwater flow systems, including modeling to predict impacts to aquifers from proposed groundwater pumping, and publicize the results.
- Prohibit pipeline incursions on national wildlife refuges, national and state parks and other areas designated for conservation purposes, such as BLM areas of critical environmental concern.
- Restrict groundwater production in any area that would pose risks to critically endangered and/or highly endemic species or other state or federally listed species, adversely affect aquatic resources on protected federal lands, or impair federal water rights.
- Appoint an independent panel of scientific experts to ensure objective science, extensive monitoring and mitigation of adverse effects are employed in the process.
- Gradually phase in groundwater withdrawal over decades to give the land time to respond and allow sufficient time to monitor wells and assess effects.
- Objectively define—in consultation with an independent panel of scientific experts—what adverse effects to the environment would trigger a future shut-down of the pipeline: A six-inch reduction in the groundwater level? A one-foot drop? The drying of any spring in the region?
- Outline the procedure to be carried out in the event of a shutdown of the pipeline, including how long it would be shut down and on what basis it would be turned on again.

## CONCLUSION



**As Las Vegas continues to build and grow, it must explore alternatives to taking water from sensitive lands and rural residents.**

**A**n impressive diversity of plants, wildlife and people has relied on the natural hydrology of the Great Basin for millennia. Because scarcity of water colors life here to such a great extent, the future of this landscape hangs in a balance that will shift according to where Las Vegas will get its water and how much of it the city needs. As this issue is being resolved, decision-makers must consider what it says about us as a nation if we don't make every effort possible to protect precious water resources in our fastest-growing city, located in the driest part of the country with one of the highest per capita rates of water consumption. They must also recognize that sensitive desert species, such as the desert tortoise and the Moapa dace, serve as harbingers of the consequences of living outside the bounds of our natural resources. The loss of any of these species could mark the tipping point toward ecological collapse.

More and more new information points to a future increasingly short on resources for an ever-increasing population. A 2007 study on the future effects of global warming by the Intergovernmental Panel on Climate Change, for example, predicts nearly a century of drought for the rapidly growing Southwest. Given this outlook, large-scale groundwater withdrawal that would threaten ecosystems, decimate plant and animal communities, cause catastrophic dust storms and deprive rural communities of the water ranchers, farmers business owners and Native American tribes need is more than unwise—it is irresponsible.

As Las Vegas continues to grow, there are alternatives to taking water from sensitive natural areas and rural residents. In addition to looking at measures to ensure sustainable growth, the city must focus on conserving the water it has, tapping into the latest water supply conservation techniques and technology and creating innovative solutions that provide water for all the people and wildlife of the Great Basin.

### GET INVOLVED

For more information about Nevada water issues, including what you can do to help, contact:

**Great Basin Water Network**

1775 East Plumb Lane #170  
Reno, NV 89502  
775.786.9955  
[www.greatbasinwater.net](http://www.greatbasinwater.net)

**Defenders of Wildlife**

1130 17th Street, N.W.  
Washington, D.C. 20036-4604  
202.682.9400  
[www.defenders.org](http://www.defenders.org)

## ENDNOTES

1. Springs Preserve. "About the Springs Preserve" Available from [http://www.springspreserve.org/html/about\\_history\\_urban.html](http://www.springspreserve.org/html/about_history_urban.html). Internet accessed May 2007.
2. Deacon, J. and J.E. Williams. *Fueling Population Growth in Las Vegas: How Large-Scale Groundwater Withdrawal Could Burn Regional Biodiversity*. American Institute for Biological Sciences, In Press. Washington, D.C.
3. National Research Council, *Colorado River Basin Management* (2007); M. Reisner. *Cadillac Desert: The American West and its Disappearing Water*. New York: Penguin Books, 1986. 124-125.
4. Glen Canyon Institute. "Water Supply and Lake Powell," available from <http://www.glencanyon.org/library/water.php>. Internet accessed May 2007. Glen Canyon Institute estimated that this amount of water was enough for four million people annually. However, this estimate is based on a conservative calculation that one acre-foot is enough for a family of four annually. While this estimate may reflect water usage in areas such as Las Vegas, southern California water managers have for some time been able to supply twice as many people with the same amount of water (in other words, one acre-foot is enough for *two* families of four for a year)—see endnote 9. We have thus used the estimate that better reflects responsible water conservation measures.
5. Edwards, J.G. "People Have Been Betting Against Las Vegas' Prospects for Growth as Long as the City Has Had Gambling." *Las Vegas Review-Journal*, December 25, 2005.
6. U.S. Census Bureau. Press Release, April 2, 2001.
7. Hutchins-Cabibi, T., B. Miller and A. Schwartz. A. *Water in the Urban Southwest: An updated Analysis of Water use in Albuquerque, Las Vegas Valley and Tucson*. Western Resource Advocates. Boulder, Colorado. 2006.
8. Ibid.
9. City of San Diego. "Water Reuse Study," March 2006, p. 8-1, section 8, available from <http://www.sandiego.gov/water/waterreusestudy/involvement/fd2006.shtml>. Internet accessed May 2007.
10. Roessler, C. *Las Vegas and the Groundwater Development Project*. Progressive Leadership Alliance of Nevada. Las Vegas, 2006.
11. Southern Nevada Water Authority. "Clark, Lincoln, and White Pine Counties Groundwater Development Project: Draft Conceptual Plan of Development." Las Vegas, 2006. Available from [http://www.snwa.com/assets/pdf/gdp\\_concept\\_plan.pdf](http://www.snwa.com/assets/pdf/gdp_concept_plan.pdf). Internet accessed May 2007. This infrastructure will itself create significant power demands for pumping, transporting and treating this water, and the concomitant water needs for producing that energy.
12. U.S. Environmental Protection Agency. "Owens Valley Particulate Matter Plan." Available from <http://www.epa.gov/region09/air/owens/qa.html>. Internet accessed May 2007.
13. Hutchinson, A. "Las Vegas Tries to Prevent a Water Shortage." *Popular Mechanics*, February 2007.
14. Deacon and Williams. In press.
15. Van Liew, W.P. *Preliminary Assessment of the Hydrogeology of Spring Valley and Snake Valley Hydrographic Areas*. National Park Service, Water Resources Division. Fort Collins, Colorado, 2006.
16. Baker, G. "USGS Study Shows Park Waters Susceptible to Pumping." *The Midden*. Summer 2006.
17. Zarembo, A. and B. Boxall "Permanent Drought Predicted for the Southwest." *Los Angeles Times*. April 6, 2007.
18. Deacon and Williams. In press.
19. Schaefer, D.H. and J.R. Harrill. "Simulated effects of proposed ground-water pumping in 17 basins of east-central and southern Nevada." *Water-Resources Investigations Report*, No. 95-4173. U.S. Geological Survey. 1995.
20. Reisner, M. *Cadillac Desert: The American West and its Disappearing Water*. New York: Penguin Books. 1986, 149-150.
21. Deacon and Williams. In press.
22. Zarembo and Boxall. *Los Angeles Times*. April 6, 2007.
23. U.S. Fish and Wildlife Service. *Desert National Wildlife Refuge Complex*. Newsletter, Fall 2002.
24. Deacon and Williams. In press.
25. Ibid.
26. Ibid.
27. Ibid.
28. Roessler, C. *Las Vegas and the Groundwater Development Project*.



DEFENDERS OF WILDLIFE  
1130 17th Street, N.W.  
Washington, D.C. 20036-4604  
202.682.9400  
[www.defenders.org](http://www.defenders.org)



GREAT BASIN WATER NETWORK  
1775 East Plumb Lane #170  
Reno, NV 89502  
775.786.9955  
[www.greatbasinwater.net](http://www.greatbasinwater.net)