Great Rivers of the West: NEVADA





Report prepared by Tim Palmer and Ann Vileisis



Truckee River. Cover: Walker River.

Letter from the President

Rivers are the great treasury of biological diversity in the western United States. As evidence mounts that climate is changing even faster than we feared, it becomes essential that we create sanctuaries on our best, most natural rivers that will harbor viable populations of at-risk species—not only charismatic species like salmon, but a broad range of aquatic and terrestrial species.



That is what we do at Western Rivers Conservancy. We buy land to create sanctuaries along the most outstanding rivers in the West – places where fish, wildlife and people can flourish.

With a talented team in place, combining more than 150 years of land acquisition experience and offices in Oregon, Colorado, California, and Washington, Western Rivers Conservancy is well positioned to fulfill its mission in 11 western states.

Yet if we are to conserve the great rivers of the West, we need to know which rivers these are. To develop an inventory of the highest quality rivers, we turned to Tim Palmer—a noted author and photographer with 35 years of experience exploring hundreds of streams throughout the West.

The principal goal of the survey was to develop a list of the most outstanding natural rivers—the great rivers of the West. Criteria included free-flowing length, natural flow regime, water quality, biological health and habitat, ecological and regional diversity and recreational suitability, among other attributes. A committee of noted scientists and other experts reviewed the survey design, and state-specific experts reviewed the results for each state.

The result is a state-by-state list of more than 250 of the West's outstanding streams, some protected, some still vulnerable. The Great Rivers of the West is a new type of inventory to serve the modern needs of river conservation—a list that Western Rivers Conservancy can use to strategically inform its work.

This is one of 11 state chapters in the report. Also available are a summary of the entire report, as well as the full report text.

With the right tools in hand, Western Rivers Conservancy is seizing once-in-a-lifetime opportunities to acquire and protect precious streamside lands on some of America's finest rivers.

This is a time when investment in conservation can yield huge dividends for the future. We invite you to join forces with us as we work to buy and conserve high-quality lands on the Great Rivers of the West. Please visit our website at www.westernrivers.org, or you may contact me at sdoroff@westernrivers.org or 503-241-0151 to learn more.

For Our Rivers,

Sue Doroff President

Introduction

Great Land, Great Rivers

Rivers and streams may be the most valuable of all natural resources in the western United States. They provide for a wide range of human needs—everything from drinking water and recreation to hydroelectricity and agriculture. At the same time, they offer crucial habitat and migration routes for fish and wildlife—often in otherwise arid landscapes. Even more fundamentally, they sustain vital natural processes—the hydrologic cycle, the flow of groundwater, and the growth of forests—that nourish all of life.

An extraordinary network of rivers flows from mountaintops to deserts, lowlands, and seashores. Among thousands of streams, several hundred remain as exemplary natural waterways.

Bound for the Pacific Ocean, rivers of the coastal states flow through remarkably varied terrain—from high elevations to sea level, and through drylands as well as the greatest temperate rainforests on earth. In California, the Smith River is the only sizable undammed river in the state and still supports runs of wild salmon. In the Sierra Nevada, the Kings, North Fork of the Kern, and other streams flow magnificently from alpine headwaters to lower foothill elevations. In Oregon, the Elk and Illinois are criterion natural rivers of the Pacific Coast Range, and the Rogue is one of few rivers that winds without development or roads as it cuts through these farwestern mountains. In Washington, an incomparable suite of stillwild rivers drops from towering Mount Olympus, and in the glaciercarved North Cascades, the Skagit and Sauk River systems are among the finest for salmon, steelhead, and deep forest frontage with long, free-flowing mileage.

In the Rocky Mountains, a few rivers remain with exceptionally long reaches of undammed, watery pathways through the rugged terrain, and others are critical to fish and wildlife even though they are shorter. The Salmon of Idaho, perhaps America's premier river for combined length and natural mileage, runs for more than 400



Truckee River, near Reno

miles through a geographic maze of eight major mountain ranges and still supports one of the West's most notable runs of salmon. The Selway is even wilder, pulsing down from its headwaters in the Bitterroot Mountains. Montana has the forks of the Flathead each remarkable for its clarity, beauty, and habitat of rare bull trout and wildlife including grizzly bears and wolves. The Yellowstone flows for more than 600 miles without large dams, its nature still largely intact from Rocky Mountain heights to the heart of the Great Plains. In Wyoming, rivers of the renowned Greater Yellowstone Ecosystem include outstanding tributaries to the upper Snake and its incomparable riparian corridor beneath the craggy peaks of the Tetons. In Colorado, the Yampa has one of the finest cottonwood forests in the West and still supports endangered warm-water fishes of the Colorado River basin.

The drylands and deserts also have their riverine highlights. The Green of Utah flows for nearly 400 miles with native fish habitat through spectacular canyonlands, and the Virgin River is centerpiece to Zion National Park and a greater region of redrock canyons. Nevada has mountain streams where the rare Bonneville and Lahontan cutthroat trout survive. New Mexico has the fabled Rio Grande and the still-wild upper Gila; Arizona has the biologically rich Verde and the one-and-only Grand Canyon of the Colorado River.

These are just a few of the rivers and tributaries that still flow with exceptional natural assets throughout the American West. Much of value remains, yet much of natural worth has been lost during the past two hundred years, and even some of the best-protected waterways are threatened by mismanagement, development, or pollution from near or distant sources.

To protect and restore the finest rivers that remain are goals of top importance for the future of the West, yet no recent comprehensive survey has been completed to identify the best natural rivers that remain. That is the intent of this report prepared by the Western Rivers Conservancy.

Great Rivers of the West: The Western Rivers Conservancy Survey of Eleven States

Where the outstanding rivers of the western United States. Based in Portland, Oregon, but working throughout an eleven-state region, this nonprofit, private organization purchases riverfront property from willing, private landowners and assures that the land will be conserved as open space. In this way, the group has successfully protected dozens of critical riverfront tracts along streams such as the Sandy, Illinois, Chetco, and Willamette Rivers in Oregon; the Hoh River and Icicle Creek in Washington; the Snake River in Hells Canyon of Idaho and Oregon; the Sun River in Montana; the Smith River and Chico Creek in California. However, both the need and the opportunity to protect rivers far exceed the ability of this—or any organization—to accomplish all that should be done. Many rivers and their landscapes must be safeguarded so that natural ecosystems can continue to function and provide for people's needs in the future.

To clarify its mission and focus its efforts, the WRC in 2005 adopted a strategic plan to "protect outstanding river ecosystems in the western United States" and to "conserve the great rivers of the West." These are described as "healthy, natural rivers where ecological functions are still intact." The plan emphasized "whole ecosystem protection" and recognized the importance of headwaters, riparian lands, estuaries, and regions that have "a high density of highquality rivers." To plot this ambitious course, the WRC recognized the need to complete a survey to identify the highest quality rivers. Simply stated, if the organization is to save the "great rivers of the West," it needs to know which rivers these are.

To develop the survey, the WRC hired Tim Palmer—a noted author of ten books about rivers and river conservation, a planner trained in landscape architecture, a photographer, and an inveterate rivers enthusiast with thirty-five years of experience exploring hundreds of rivers throughout the West. A committee of noted river scientists and other western river experts reviewed the survey design as it was being developed, and state-specific experts reviewed the results for each state.

The survey examined rivers of Washington, Oregon, California, Idaho, Montana, Wyoming, Utah, Colorado, Nevada, Arizona, and New Mexico. For pragmatic reasons, Hawaii and Alaska were excluded.

Rather than start from scratch, the WRC survey built on past river inventories. These include significant studies following the National Wild and Scenic Rivers Act of 1968, such as the Nationwide Rivers Inventory (NRI), and a wide variety of other more recent studies, inventory lists, articles, and research papers. Typically, for each state, 15 to 20 such sources were consulted. Each of these had its own "take" on the definition of quality (e.g. native fish abundance, water quality, recreation values), and some lists addressed only specific regions within a state. None told the whole story, but in aggregate, these earlier efforts all pointed the way or offered useful evidence. If a particular river was identified as excellent by half a dozen different sources, for example, it was considered likely to be a "better" natural river than one that was identified only once. To specifically consider rivers' biological values, several experts—usually fisheries biologists or ecologists—were interviewed for each state. Their perspective and firsthand knowledge of local rivers provided essential insights for this survey's analysis.

The Great Rivers of the West does not include of all rivers deserving protection. That would be a far larger list. To state this important point another way, if a river does not appear in this report, it implies no agreement that dams, pollution, new roads, or development can occur without significant public losses in river qualities and ecosystem functions. This survey, however, is the WRC's attempt to identify the very best rivers that remain with outstanding natural values. Furthermore, restoration efforts for rivers that are not even mentioned in this survey might someday reinstate their natural qualities so that they, too, will again become "great rivers of the West."

Based on this survey, the Western Rivers Conservancy will be able to better identify prime opportunities for its involvement. However, no land will be acquired for open space simply because a river appears on our list. And in cases where open space may eventually be bought to conserve the rivers, acquisition would be only from willing sellers who voluntarily agree upon all terms. The work of the Western Rivers Conservancy and of other conservancies and land trusts simply gives property owners an opportunity to have their land protected if they want to do so.

The need for river protection is becoming more urgent as western streams are increasingly affected by pressures of a rapidly growing population; of the 10 fastest growing states in the nation on a percentage basis, seven are in the West. Such growth intensifies needs for water and energy and spurs suburban development of farm and ranchlands. The urgency of conserving rivers is also heightened by the aggravating effects of global warming and by neglect of problems that have been accumulating for many years across the watersheds of the West. In this challenging context,



Jarbidge River

it is the aim of this survey to inform the conservation of the best remaining rivers of the West.

Surveying Nevada's Great Rivers

Nevada is the fifth-largest state in the West and the driest. Nearly all desert, its 110,567 square miles lie squarely in the rain shadow of the towering Sierra Nevada, immediately upwind, and also at drier latitudes than the more northern portions of the West. Eighty percent of the land here is owned by the federal government—a far greater proportion than in any other state. Most of this falls under the jurisdiction of the Bureau of Land Management, but extensive acreage also lies in Toiyabe and Humboldt National Forests and in military reservations and weapons test sites.

The entire state of Nevada lies in the Basin and Range geographic province, and its landscape is characterized by a distinctive pattern of long, thin, paralleling mountain ranges, aligned north-south, and interspersed with wide valleys. These lowlands are almost all landlocked—surrounded by higher country uplifted by seismic action. Rather than making their way to the ocean, most Nevada streams flow into these low basins and evaporate.

Four ecoregions are present here. In the north, the Intermountain Semi-Desert is typical of the drylands found in Idaho and Oregon. The Intermountain Semi-Desert and Desert is drier and covers much of the state, especially the lower terrain. The Nevada-Utah Mountains Semi-Desert, with spare forests of juniper, pinyon, and a few other conifers at high and snow-prone sites, covers higher terrain, shaded canyons, and the north faces of some mountains. The American Semi-Desert and Desert, coincident here with the Mojave Desert, lies in the south.

Most of Nevada's precipitation comes as snow on the mid-and upper slopes of the mountains, especially in the higher ranges, including the Independence, Ruby, and East Humboldt Mountains in the northeast, the Snake Range of east-central Nevada, and the White Mountains at the California border in the southwest. Hundreds of small streams—and no large ones—carry the ephemeral runoff guickly off the steep mountains and into parched, arid valleys where landlocked lakes historically formed in the spring. Nearly all the streamflows and accessible groundwater, however, has long been tapped by ranchers who graze cattle and grow hay wherever possible. Most of Nevada's streams are completely diverted before they reach their traditional ending points in the lakes, playas, and associated wetlands that once supported a host of wildlife. Miningoccurring in mineral-rich belts throughout much of the state-has also taken a toll on streams by diverting their flows, excavating their watersheds, and using them to process waste.

However, at upper elevations, many of the small streams still have good water quality and flow through wild country, if only for a few miles. The Nevada Department of Wildlife has listed 87 streams as outstanding trout waters—an indicator of cold, clean water. These are mostly in the northern part of the state, though few of them have native fish.

There are several notable exceptions to Nevada's typical highcountry-to-playa stream pattern. The Jarbidge, Bruneau, and Owyhee Rivers rise in the northeastern mountains and escape the Basin and Range's landlocked pattern by flowing out to Idaho and eventually to the Snake River and Pacific Ocean. Headwaters here in the high peaks of the Independence, Bull Run, and Jarbidge Mountains form the sources of streams that later become great wild rivers of southeastern Idaho and southwestern Oregon.

In Nevada, simply finding a perennial stream of more than 10 miles in length is rare. The only long river in the state is the Humboldt, which flows 300 miles from east-to-west across the northern tier; Interstate 80 parallels much of its route. Other roads, railroads, power lines, towns, and farmland line this corridor as well and preclude its inclusion here as a natural river. Never growing large--385 cubic feet per second is average where its flows are strongest--the Humboldt is repeatedly diverted throughout its course, and is mostly depleted before reaching its terminus at the Humboldt Sink. Some Humboldt tributaries, especially from the north, are not as altered, and some still support remnant populations of the native Lahontan cutthroat trout.

Five significant river systems flow into Nevada from large mountains elsewhere. The Truckee, Carson, and Walker come from ample snowfalls in California's Sierra Nevada. The Truckee is the second-largest river in Nevada and, after providing water for sprawling Reno and for extensive irrigated agriculture, it goes on to supply the biologically important and landlocked Pyramid Lake. The East Fork of the Walker flows with longer, largely undeveloped mileage than any other river in Nevada before reaching its end in the surrounding desert's low spot of Walker Lake. The Colorado is nominally a Nevada river as it forms the state boundary with Arizona; however, all but about 44 of its Nevada miles are impounded by Hoover and Davis Dams, and what is left is radically altered by the dams, by land development, levees, and exotic species. Finally, the Virgin River flows into Lake Mead of the Colorado after originating with flows from the Zion National Park area of southwestern Utah. These highly affected remnants of the Virgin and Colorado are the only sizeable rivers in the Mojave Desert.

Biological highlights of Nevada streams are surviving bull trout in the headwaters of the Jarbidge, and the Lahontan cutthroat trout--a magnificent fish that still lives in a few isolated Nevada streams and now in some others where the fish are stocked. These fish populated the ice-age Lake Lahontan, which covered much of the central and northern state. As the lake receded—and then as the remaining streams were diverted and dried up—the fish that could once move throughout a vast waterway system were forced into smaller and smaller isolated enclaves. The Quinn River basin in the northwest corner of the state and the Marys in the northeast are two of these basins that still harbor the Lahontan cutthroat in upper-watershed streams, largely in public ownership but often grazed with damaging effects on the streams. Past approaches to protect remnant populations of the fish had addressed specific isolated streams, but biologists are not considering the stewardship of "meta-populations" of the trout, with hopes of increasing their ability to migrate, mix, and thrive with more available habitat. This approach would involve protection and enhancement of larger streams.

In the far north, bull trout survive in the headwaters of the Jarbidge. Though they do not live in rivers, several remnant endemic fishes survive in pools associated with springs and intermittent flows of short streams across the arid expanse of southern and central Nevada. The closest relatives to these rare and endangered "pool fishes" are found in Mexico.

Nevada has no streams included in the National Wild and Scenic Rivers system, and none that have been congressionally mandated for study.

With extremely little water to begin with, the problems of Nevada's streams are severe. Diversions occur commonly even on the public lands, and grazing is also widespread or dominant throughout the BLM and Forest Service estate here; having a large percentage of the land in public ownership has by no means guaranteed sustainable management of habitat for wildlife.

With the sprawling cities of Las Vegas and Reno, where 90 percent of residents live, Nevada has had the highest growth rate in America on a percentage basis. As the demands for water have rapidly increased, the Truckee, Colorado, and Humboldt Rivers have all been intensively tapped, and the pumping of groundwater sharply depletes instream flows. Mining is also a powerful political force in the state, and the industry has used water and altered



Lake Mead from Hoover Dam

streams as needed.

While much of the interior West is politically conservative and reluctant to protect rivers through regulation or government initiative, Nevada may be the most resistant, with organized groups openly defying federal natural resource laws and even threatening federal officials.

Though much land in Nevada is publicly owned, it has often not been effectively managed for public values, such as wildlife and fisheries. Furthermore, much of the critical fish and wildlife habitat lies in valleys where water is accessible—typically the lands that were selected by homesteaders for private ownership. A new landtrust approach to conservation may be effective here.

In Nevada, the challenges for conservation are certainly greater than in most places, yet a number of the state's rivers offer important values and are worthy of protection for fish, wildlife, increasing numbers of recreational visitors, and the up-and-coming generation of a rapidly growing local population.

ist Great Rivers: Nevada's



Great Rivers of Nevada

Nevada's Great Rivers: River Narratives

NEVADA'S "A" RIVERS

Baker, Lehman, and Snake Creeks, and Big Wash (Wheeler Peak streams)

These four streams flow from the Wheeler Peak area, located in Great Basin National Park. At 13,063-foot, Wheeler is the secondhighest mountain in Nevada and the highest whose summit is not shared with another state. Cold, undammed, and mostly wild, these streams drop with spectacular scenery from their highcountry sources through aspen groves and coniferous forests eastward to the Snake Valley sink at the Utah state line. Bonneville cutthroat trout are being reintroduced.

Baker Creek drains the south side of Wheeler Peak. Its upper four miles are paralleled by trail, then a campground access road follows the creek down to the mouth of its canyon, where the stream subsequently spills across the valley and is tapped for irrigation. Lehman Creek flows from the north side of the peak in a similar fashion, its lower reach paralleled by the main access road to Great Basin National Park. With an unimproved road along much of its length, Snake Creek flows for 12 miles from Pyramid Peak—a sub-peak just south of Wheeler—to its canyon mouth just west of Garrison, Utah. Southernmost of the group, Big Wash and its North Fork drop from the faces of Washington and Lincoln Peaks with trails along upper reaches and a four-wheel-drive route at the lower end.

All four streams are listed as outstanding trout streams by the state Department of Wildlife. The National Park Service plans to reintroduce Bonneville cutthroat trout into 18 miles of streams in the park, including these. Ancient bristlecone pines grow on higher



Wheeler Park

slopes, and all streams have good riparian corridors. Excellent hiking trails lead to the upper basins and high peaks.

Bruneau River

One of the longest and healthiest perennial streams in Nevada, the Bruneau drops from the Jarbidge and Independence Mountains through remote canyons with nominal roads, almost no development, and few diversions as it flows north toward the extraordinary wild desert and canyon country of southern Idaho.

The river begins on the south side of the Jarbidge Mountains highlands and in eight miles encounters the small Charleston Reservoir and the community of Charleston. Below there, the river winds for 40 miles through rugged mountain country, mostly within the Humboldt Toiyabe National Forest but with some private land also along the river. A small, unimproved road follows much of this course.

The Bruneau's trubutaries carry snowmelt and groundwater from mountains that reach to nearly 10,000 feet; these headwaters are the source for most of the river's volume, even as it flows into Idaho, where the Bruneau is known as a premier wild river and a rare desert stream with cold, clear water supporting native redband trout (see the Idaho section of this report). Here at the Nevada headwaters, a cluster of seven tributaries are listed as outstanding trout waters by the Nevada Wildlife Department. Native bull trout populate some of these streams. One trout stream, Sheep Creek, becomes a principal tributary to the Bruneau and is an exceptional canyon waterway in its own right.

Jarbidge and East Fork Jarbidge Rivers

The finest wild stream in Nevada, the East Fork Jarbidge is roadless and dam-free for about 20 miles, much of it in the Jarbidge Wilderness. The main stem flows slightly longer, but much of its length has a minor road alongside and abandoned mines in its basin. As with the upper Bruneau (the adjacent basin to the west), the Jarbidge's Nevada headwaters are the principal water source for an exquisite canyon river that lies downstream in Idaho and offer a long, continuous reach of aquatic habitat—rare in Nevada.

The main stem Jarbidge begins on the flank of Cougar Peak,



Jarbidge River

which rises 10,559 feet above sea level, and tumbles down for fourmiles with only trail access. After passing Jarbidge Peak (10,789 feet) and a number of abandoned mines, the river meets up with a minor county road, which parallels the rest of its length in Nevada and five miles in Idaho. Beyond there, the river is roadless for almost its entire length (see the Idaho section of this report). In Nevada, all but the lower six miles are in the Humboldt Toiyabe National Forest.

The East Fork Jarbidge begins on the north flank of Mary's River Peak (10,5995 ft.), flows north through the Jarbidge Wilderness for 13 miles (followed by a trail), and then for another ten miles in a steep, roadless canyon to the Idaho state line and two more miles beyond. Its final four miles are paralleled by a road to the confluence with the main stem in Idaho. No other river in Nevada flows damfree and roadless for this length.

These rivers both support bull trout—extremely rare in this area—and also redband trout and the only population of Dolly Varden trout in Nevada.

NEVADA'S "B" RIVERS

Lamoille Creek

One of the most beautiful headwater streams of the landlocked basins that typify most of Nevada, Lamoille Creek is also one of the longest free-flowing and undeveloped rivers in the state.

It plunges down from highcountry of central Nevada's Ruby Mountains for 12 miles. Below the mouth of its canyon it continues to flow for 24 miles to the Humboldt River.

A highlight of mountain scenery in Nevada, the Lamoille headwaters can be reached by a paved road southeast of Elko. From the end of the road, the Ruby Crest National Recreation Trail climbs the final mile to the creek's source above Lamoille Lake. Much like a high canyon in the southern Rocky Mountains, the area is blanketed in aspen groves and evergreens, with cottonwoods thriving along the stream. The state Department of Wildlife lists the creek as an outstanding trout fishery; it is populated with introduced rainbow and brook trout.

Though there are diversions downstream through the Lamoille Valley, this stream's continuous and perennial flow of 36 undammed

and undeveloped miles make it among the longest relatively intact rivers in Nevada.

Marys River

This is one of the best tributaries to the extensive Humboldt River system and has a riparian corridor and a remnant population of native Lahontan cutthroat trout.

The river begins high in the Jarbidge Mountains where its upper reaches within a wilderness area back-up against the headwaters of the Jarbidge and East Fork Jarbidge Rivers.

After flowing 15 miles through the Humboldt Toiyabe National Forest, the stream enters BLM and private land for the rest of its length to the Humboldt River. In about 12 miles the narrow mountain valley reaches a broader corridor with a riparian belt that is wide relative to most other Nevada lowland streams. Tightly meandering southbound past several private ranches for about 45 more river miles with a nearly continuous corridor of riparian vegetation, it reaches the Humboldt River at Deeth, just west of Wells.

Upper reaches still support native and reproducing populations of the rare Lahontan cutthroat trout.

Walker River, East

The East Walker has one of the longer reaches of perennial freeflowing water in Nevada, including a wild section of canyon and other undeveloped reaches.

Fed by snowmelt of the Sierra Nevada, the East Walker's headwaters rise in the Hoover Wilderness along the eastern border of Yosemite National Park. The stream is impounded in Bridgeport Reservoir in California, then flows without large dams for about 100 miles to Weber Reservoir, east of Yerington. More than half of this route is largely wild or undeveloped.

Below Bridgeport Reservoir, the East Walker flows northeast for 16 miles through a canyon with Highway 182/338 alongside. After



Walker River

the river enters Nevada, it flows through private ranchland in the Sonoma valley and then leaves a Forest Service road and drops for 16 miles through a wilderness canyon in the Humboldt-Toiyabe National Forest, with one large private tract. Beyond the forest boundary, the river runs for 48 miles—flowing through another short canyon and then meandering through an opening valley with wetlands south of Yerington to its confluence with the West Walker.

With more generous flows than most Great Basin streams, the East Walker also has one of the wildest river canyons and one of the longest undammed and relatively natural river corridors in Nevada. It supports some native fish, including redsides, suckers, and dace, but the Lahontan cutthroat trout have been replaced by introduced and reproducing brown and rainbow trout. The river remains excellent habitat and has become a popular trophy fishery.

The West Walker River is more developed and farmed than this branch. The two join and flow to Walker Lake—once a stellar

Lahontan trout area. With over-appropriation of its waters and diversions upstream, the lake is receding.

NEVADA'S "C" RIVERS

Owyhee River, South Fork

This major Owyhee tributary (about the same length as the main stem above the South Fork confluence) flows for roughly 100 miles across northern Nevada with no dams and with only limited road access serving isolated ranches. This is the principal headwaters for the extraordinary canyon-bound river that lies downstream in Idaho and Oregon.

Originating at the far southern end of the high, snow-raking Independence Mountains, the South Fork flows northwest, winding through the rugged, dry foothills and then across the vast expanse of the Owyhee Desert. Low diversion structures may divert a portion of the stream's flow at widely scattered ranches. Unimproved roads also follow the river's remote route, but none closely parallel it.

Eight separate small tributaries flowing from the Independence Mountains are listed by the state Department of Wildlife as outstanding trout fisheries. The cold flows of these and other streams are crucial to the Owyhee in its long path across northern Nevada, southwestern Idaho, and southeastern Oregon (see the Idaho and Oregon sections of this report).

Truckee River

For about 25 miles the lower Truckee flows from Wadsworth to Pyramid Lake through the Pyramid Lake Indian Reservation. Though it has two small dams, this final section of the river is an undeveloped, open corridor through the desert, heavily diverted upstream but still supporting stocked, reintroduced Lahonton cutthroat trout and supplying Pyramid Lake with nearly all its water.

From peaks in the Sierra Nevada, the Truckee flows down into



Truckee River

Lake Tahoe (the second deepest lake in the United States and larger in volume than all other lakes and reservoirs in California combined) as its the principal source, runs through a forested valley, through the town of Truckee, and out of the Sierra (and California) via a canyon route shared with Interstate 80, a railroad, and other highways. After flowing into Nevada, the river becomes the attractive and refreshing centerpiece of downtown Reno and an expanding urban greenway. Then it continues eastward with I-80 alongside until Wadsworth. Here the river turns decidedly north on its final leg to Pyramid Lake. This is the only reach in Nevada where the river is not crowded by highways and development.

Through the open valley separating the Pah Rah Range and the Truckee Range, the river winds with groves of cottonwoods, though the heavy diversions and dams upstream have depleted the flows and consequently limited the regermination of the forest. The exotic tamarisk has also invaded heavily, but restoration projects on the Reservation are reinstating some of the original types of plantilfe. The river supports a stocked population of Lahonton cutthroat trout, which historically grew three feet long. The Truckee also supplies Pyramid Lake, which holds the record for the largest Lahonton cutthroat. Long-standing efforts to reestablish the native trout have met with limited success, but tribe and state officials continue with restoration activities and stocking. Among the 3 major rivers that once had plentiful Lahontan cutthroats—the Truckee, Walker, and Carson—the Truckee has received the most restoration attention and likely has the best chance of success, in part owing to new initiatives to reestablish the native fish in upstream Lake Tahoe.

Pyramid Lake is also the only remaining habitat of the cui-ui, an endemic, endangered sucker that once migrated far up the Truckee River but now is limited to the lake and its fringes and to a transport program that lifts the fish over Marble Bluff Dam at the mouth of the river. These fish are especially important to Indians of the Pyramid Lake Reservation.

Owing to withdrawals upstream, the lake has been shrinking, and has dropped a total of 90 feet. For years local Indians negotiated for improved flows of the Truckee in order to restore adequate levels to the lake, to reinstate its unique fishery, and to save the imperiled cui-ui. A 1995 Truckee operating agreement appears to be having some effect, with gradually increasing levels in the lake.

Conclusion

E streme aridity notwithstanding, Nevada still has many streams, along with surprising variety given such spare water supplies. But very little attention has been given to river conservation here. We found few lists of quality streams compiled by others; the largest, by far, is a list of outstanding trout waters, which primarily reflects introduced fish that, in many cases, could be detrimental to native fish. There is no state-wide river conservation group, and few organizations have organized for local or regional protection. We did, however, find six lists of rivers totaling 104 streams. Included are and A list of seven rivers, a B list of three, and a C list of two. Two clusters of high-quality streams became evident as a result of the survey.

Wheeler Peak streams of Great Basin National Park

The four streams discussed here as Wheeler Peak watersheds--Baker Creek, Lehman Creek, Snake Creek, and Big Wash—form an excellent suite flowing from the high mountains of Great Basin National Park. Fisheries biologists are reintroducing Bonneville cutthrout trout here at the westernmost part of their historic range.

Jarbidge, Bruneau, and South Fork Owyhee Rivers

The second suite of rivers drain from the Independence, Jarbidge, and Bull Run Mountains of north-central Nevada and supply most of the runoff to the Jarbidge, Bruneau, Owyhee, and South Fork Owyhee Rivers. These streams all continue flowing downstream to become exquisite wild canyon rivers in Idaho or Oregon. The Nevada Department of Wildlife has listed some 20 tributaries of these rivers as outstanding trout streams—the greatest such concentration in that state. Watershed protection here is essential



Mt. Wheeler in Great Basin State Park

for conserving both the viability of these relatively natural streams in Nevada and also the vital, cold-water sources for important wild rivers downstream.

Sources for the Nevada Survey

Nevada Rivers were evaluated using the following sources. Please see Appendix 1 for criteria.

1. Existing Inventories Of High-Quality Rivers

- National Wild and Scenic Rivers
- National Wild and Scenic Study Rivers
- National Wild and Scenic Study Rivers
- State-designated wild and scenic rivers
- Nationwide Rivers Inventory (National Wild and Scenic Rivers Act)
- U.S. Forest Service rivers recommended for protection
- Bureau of Land Management rivers recommended for protection
- Bureau of Outdoor Recreation, Western U.S. Water Plan
- Columbia Interior Basin Ecosystem Management Plan

2. Interviews with biologists and local experts

- Glenn Clemmer, director, Nevada Natural Heritage Program.
- Jim Heinrich, fisheries biologist, Nevada Department of Wildlife.
- Kim Tisdale, fisheries biologist, Nevada Department of Wildlife.

3. The Nature Conservancy, priority sites for aquatic conservation. These are streams identified by the Nature Conservancy in 1985 as high priority for conservation of aquatic diversity, as listed in American Rivers, Outstanding Rivers List (1991).

4. Nevada Department of Wildlife, outstanding trout waters (NW). These are streams designated by the Nevada Department of Wildlife (formerly the Nevada Department of Fish and Wildlife) as outstanding trout waters for angling, as listed in American Rivers, Outstanding Rivers List (1991). This designation does not indicate anything about the viability of native fish.

5. Trout Unlimited (TU). These are streams identified by Trout Unlimited as important for conserving native fish in Nevada.

6. Western Rivers Conservancy, roadless reaches (WR-1). Roadless reaches of 10 miles or longer, identified on DeLorme atlas of Nevada.

7. Western Rivers Conservancy, nearly roadless reaches (WR-2). Nearly roadless reaches of 20 miles or more, identified on DeLorme atlas of Nevada.

Appendix 1: Assessing the Quality of Rivers

To assess the qualities of rivers, the WRC survey used two sets of criteria. The first set were minimum requirements to be considered for a base-list of the best natural rivers. The second set addressed quality indicators—the specific values that indicated which rivers were the very best.

MINIMUM CRITERIA

Five minimum criteria were considered:

1. Free-flowing current. Free-flowing reaches of rivers are those that remain with their currents, riverbeds, shorelines, valleys, and canyons unblocked by dams. These reaches continue to benefit from floods' scouring and replenishment, they lack dams as barriers to fish migration, and they are more likely to retain ecological functions. Dams are so ubiquitous throughout the West that in many states only limited free-flowing reaches of rivers remain.

2. Reasonably natural flow regime. Natural flow regimes permit the full complement of native flora and fauna to thrive. Reaches that are de-watered or heavily diverted usually lack much of their native fish and wildlife and were not included in this survey, though rivers with minor diversions were considered. The more-natural the flow regime, the better.

3. Good water quality. High water quality is a foundation for much of the life in rivers. Heavily polluted reaches were not considered.

4. Non-urbanized shorelines. Most urban riverfronts no longer have intact corridors of riparian plant life; rather they are encased by impervious surfaces that contribute to extreme flow fluctuations and tend to aggravate problems of sedimentation and pollution. Conversely, undeveloped and undisturbed shorelines with their green band of riparian vegetation provide shade, temper flow and temperature, filter sediments, and offer habitat for wildlife. For this reason, urban rivers—though extremely important to society—were not included in this survey of the best natural streams. But occasional small towns and rural development did not bar a river from inclusion.

5. Outstanding natural features. One or more of these should be present. These include superlative scenic, geologic, hydrologic, fish, and wildlife qualities. (Historic and cultural values were excluded because they are an indicator of human activity and do not necessarily represent natural values.)

QUALITY CRITERIA

Beyond the minimum requirements (which yielded a very long list of rivers), the following four quality criteria were used to determine which rivers best retain their natural values:

1. Biological health. In keeping with the strategic plan of the WRC, this was the most important criterion. The best rivers should have intact and functioning ecosystems, with most of the native fish and wildlife species present. This survey identified rivers with exceptional biological diversity, healthy fisheries, and natural riparian corridors.

To date, no uniform or comprehensive evaluation of the biologically healthiest rivers has ever been compiled for the West, though the Environmental Protection Agency is currently working on this goal, and some states have inventoried at least small (wadeable) streams for biological integrity. Even at state or regional levels, there is little information that indicates cumulative biological values of all rivers. To make determinations in this regard, the survey consulted with biologists working for state fish and wildlife departments, state natural heritage programs, and federal agencies including the U.S. Geological Survey, Fish and Wildlife Service, and Forest Service. We also consulted some of the Nature Conservancy's ongoing ecoregion planning programs. These local experts often provided the best judgments available regarding biological values.

In evaluating rivers' biological health, the survey considered high value fisheries as ranked by state agencies and the American Fisheries Society, valuable fisheries listed by the organization

Trout Unlimited, inventories of riparian conditions, and other biological data. Rivers with intact native assemblages of fish were favored over rivers where introduced species, such as pike, brown trout, and rainbow trout have become dominant (even though these fish may be popular with many anglers).

Wildlife and plantlife are also important indicators for biological health. The survey considered keystone species such as cottonwoods, healthy populations of rare species otherwise in danger throughout much of their ranges, and other fauna and flora of special interest. Federal and state endangered and threatened species and species of special concern were also considered.

2. Wildness and roadless areas. Rivers with the least development generally rank highest in natural quality. For this reason, the survey noted rivers flowing through designated wilderness, through roadless areas, and through publicly owned land. For some states, the survey consulted comprehensive proposals for wildland protection that identified large blocks of undeveloped and roadless terrain. For some states (generally those lacking other lists indicative of wildness), we conducted our own survey of roadless conditions by consulting with DeLorme atlases.

3. Recreation suitability. Though not necessarily an indicator of natural quality, river-based recreation often depends on high natural values. Thus the survey includes recreation as an additional and related category of interest and consideration. Three river-based recreation activities that depend on natural qualities were noted: fishing, river running, and backpacking.

4. Length. Though short rivers or river segments may have great natural values, rivers and tributaries with long free-flowing reaches provide the greatest range of interconnected aquatic habitat. Connectivity is especially important for migratory fishes that depend on a range of habitat conditions for different phases of their life history. In some cases, connectivity is also important for the transfer of nutrients within river systems and from oceans to rivers. For these reasons, the survey considered longer free-flowing reaches better and focused on rivers 25-miles or more in length but did not necessarily exclude short streams.

Threats to the qualities of a river were not considered criteria for selection. This is not a list of the "most endangered" rivers. The survey, however, does note some threats to specific rivers. Consideration of these problems may be important in conservation strategies that will follow.

In addition to these specific criteria, the survey set out to include rivers that represented the full diversity of the West's biology and terrain. Recognizing the importance of biological and natural diversity, we included at least one river from each ecoregion, based on vegetation and shown on the U.S. Forest Service's map, Ecoregions of North America.

RATING THE RIVERS

To analyze these criteria for rivers West-wide, data were obtained and tabulated for hundreds of rivers on a state-by-state basis. The resulting state-by-state tables became the integral foundation for evaluating and ranking waterways for the WRC survey. Each table lists a large number of high-quality rivers considered for the survey (100-300 for each state), the sources that have identified the river for its exemplary natural qualities, the types of qualities that are recognized, and the ecoregion that the river flows through.

Sources consulted include the National Wild and Scenic Rivers system, National Wild and Scenic study rivers, state-designated wild and scenic rivers, the Nationwide Rivers Inventory

conducted by the National Park Service, rivers recommended for protection by the U.S. Forest Service and Bureau of Land Management, and streams identified in other regional planning efforts, such as the Columbia Interior Basin Ecosystem Management Plan. Additional sources were used for specific states, ranging from articles in the American Fisheries Society journal to state lists of the best water quality, top fisheries, and other natural features. Of comparable importance, the survey consulted on-the-ground experts from natural resource agencies and western universities to supplement and corroborate information about the biological values of the rivers.

The tables also list the final rankings given to streams on the basis of comparative analysis. In these rankings, A represents the most valuable natural rivers. B applies to rivers of very high value but that might occur in the same region as an A river and that have somewhat less quality or significance. C rivers lack the superlative qualities of A and B rivers or represent the second- or third-highest ranking stream in their particular region, or they have valuable qualities but also one or more significant problems.

In the main body of this report, state-by-state chapters include narrative sections that begin with an overview of the state's river system, one-page profiles of each A-, B, and C-listed river, and a description of notable river "regions" where clusters of high-quality streams are found. In this regard, advantages can be gained by protecting identifiable clusters of streams in order to safeguard continuous aquatic habitat, to conserve landscape-scale wildlife habitat in adjoining basins, and to minimize "edge" effects that can damage rivers even when the source of degradation might be distant.

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