

Great Rivers of the West:
NEW MEXICO



WESTERN RIVERS
CONSERVANCY

Report prepared by Tim Palmer and Ann Vileisis



TIM PALMER

Rio Chama. Cover: Rio Grande.

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 sodoroff@westernrivers.org or 503-241-0151 to learn more.

For Our Rivers,

A handwritten signature in blue ink, appearing to read 'Sue Doroff'. The signature is stylized and fluid.

Sue Doroff
President

Introduction

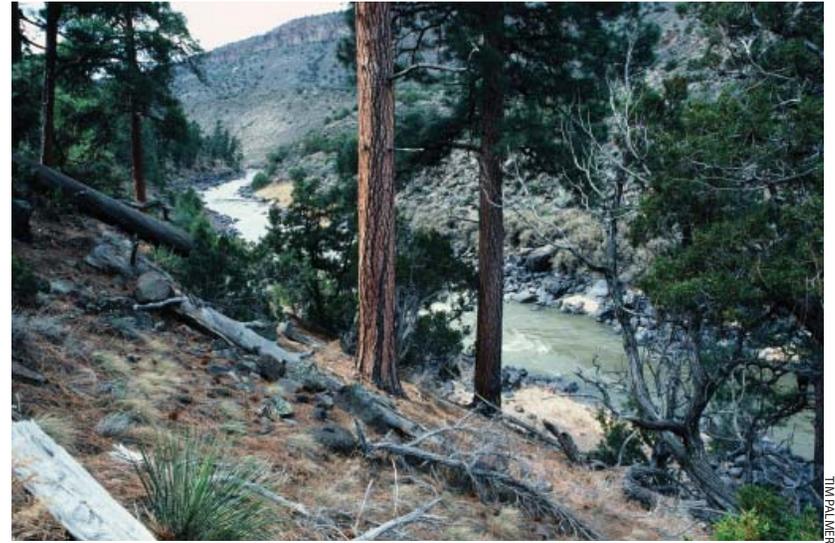
Great Land, Great Rivers

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 far-western mountains. In Washington, an incomparable suite of still-wild rivers drops from towering Mount Olympus, and in the glacier-carved 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



Rio Grande in Upper Box

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.



Pecos River

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

Western Rivers Conservancy (WRC) is dedicated to protecting 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 high-quality 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



Rio Grande

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

Surveying New Mexico's Great Rivers

New Mexico is the third-largest state in the West and among the driest. Like the other desert states, New Mexico has few perennial streams produced by precipitation that falls within its bounds; however, unlike Utah and Arizona, New Mexico receives only nominal flows from major water-producing mountain ranges elsewhere.

In the south-easternmost limits of what we consider the "West," New Mexico is divided into four geographic areas. The southern limits of the Rocky Mountains dip into the north central part of the state and provide the snow and runoff, accounting for much of the streamflow. The Colorado Plateau occupies the northwestern portion, with sandstone mesas and also a mix of dry mountain country. The southern limits of the Basin and Range account for the largest part of the state, rippling across its southwest and south-central mass. Finally, the Great Plains lie across the entire eastern quarter of the state with dry prairies and rugged narrow valleys formed by streams draining toward the Mississippi and lower Rio Grande. The ecoregions of the state mirror these landforms with

deserts, scrub-covered mountains, a few outliers of Rocky Mountain forests, and prairies that are like much of the rest of the Great Plains, only drier at this southern latitude.

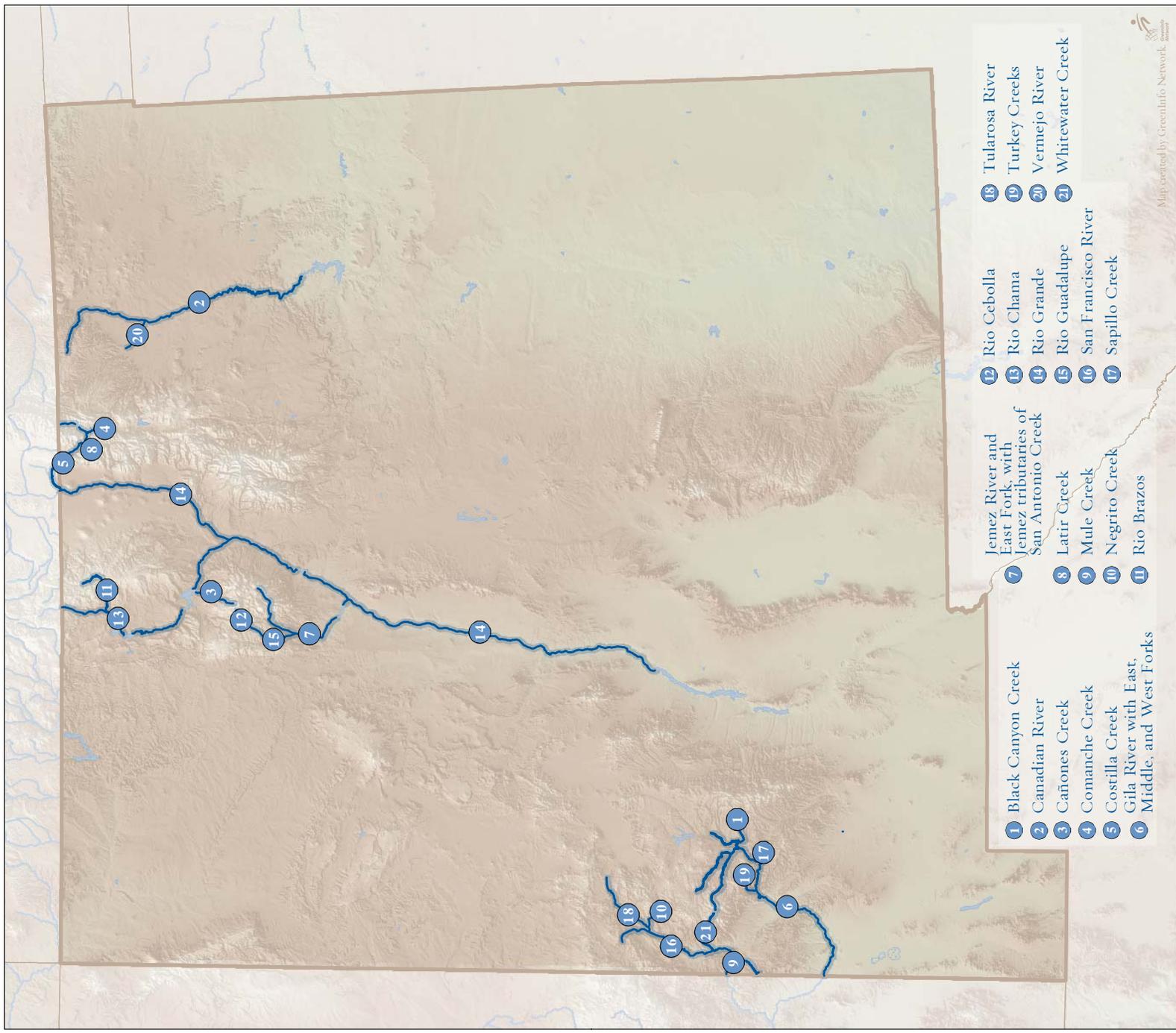
The undisputed centerpiece of the rivers estate here is the Rio Grande. Beginning in the mountains of southern Colorado, it flows into New Mexico and then runs the whole way through the state to Texas. It carves a spectacular canyon, but its life-force is utterly crippled by diversions and dams. Endangered fish as well as the longest cottonwood forest in the West are now dying-out as a result.

The unrivaled river gem in this state is the Gila and its tributaries, which flow wild and undammed from west-central mountains into Arizona. In contrast, the heavily dammed and developed San Juan arcs through the northwestern corner of the state, degraded by overgrazing and girded by the rigs and roads of the oil and gas industry. The Pecos flows with clean snowmelt from the southern Sangre de Cristo Mountains in northern New Mexico but then staggers southward through the state with dams, heavy diversions, and oil wells all the way to Texas. In the far east, the Canadian is the key river of New Mexico's Great Plains, flowing through one splendidly remote region in the north before being dammed and reduced to a weed-infested trickle.

Reaches of 5 New Mexico streams have been designated in the National Wild and Scenic Rivers system. One of the very first, the Rio Grande, is designated for 50 miles through its incomparable basalt canyon near Taos; a four-mile section of its tributary, the Red River, was also included. A beautiful section of the Rio Grande's largest tributary, the Rio Chama, is protected for 25 miles between El Vado Dam and Abiquiu Reservoir. An 11 miles reach of the more remote and forested East Fork Jemez is included, and 21 miles of the 900-mile-long Pecos are protected, just downstream from its mountain source.

As in the other desert states, the collection of perennially flowing rivers here was limited to begin with, and then it has been severely diminished by a history of abuse, neglect, and—most important today—by the growing needs of a booming population. The natural rivers that remain are a small fragment of what once was, and all require increased attention and care if they, too, are not to be lost. ■

New Mexico's Great Rivers: List



Great Rivers of New Mexico



Other Rivers and Streams



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New Mexico's Great Rivers: River Narratives

New Mexico's "A" RIVERS

Costilla Creek with Comanche and Latir Creeks

Flowing from the crest of the Sangre de Cristo Mountains, Costilla Creek and its southern tributaries, Comanche and Latir Creeks, wind through undeveloped mountains and foothills, and Costilla is among the best Rio Grande cutthroat streams in the state.

Costilla Creek begins at the Colorado border on the flanks of the Sangre de Cristo and runs south, flowing beneath the towering ridge of New Mexico's tallest mountain range for 14 miles with one small dam and only unimproved roads through private land, the Turner Ranch. The 8-mile long Comanche Creek joins from the south, flowing entirely within Carson National Forest, including heavily logged and roaded areas in its upper basin. With Comanche's added flow, Costilla runs northwestward for 5 miles directly through a dramatic gap in the towering Sangre de Cristo Mountains to the confluence of Latir Creek. This small, 7-mile stream makes its own dramatic descent from the 12,708-foot Latir Peak. With the added flow, the Costilla continues westward through conifer-clad, rounded hills to the base of the mountains and then a final 14 miles across a volcanic plain to the Rio Grande.

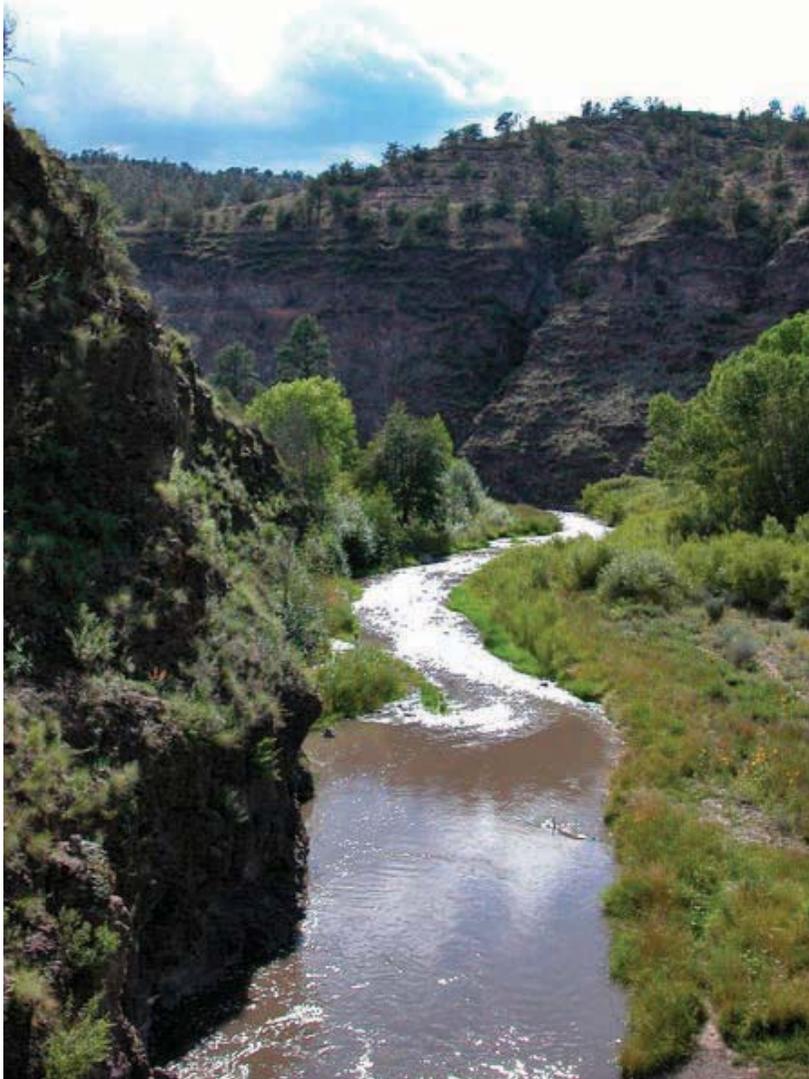
In its spectacular mountain setting, Costilla Creek offers one of the best remaining habitats for the imperiled Rio Grande cutthroat trout. One of the most ambitious cutthroat reintroduction programs is underway here on private rangeland. The native Rio Grande sucker and Rio Grande chub also live here. Under provisions of the federal Clean Water Act, Costilla Creek is the only designated "outstanding resource waters" in the state.



Gila River

Gila River with Middle, West, and East Forks, with Black Canyon, Sapillo, and Turkey Creeks

The Gila is clearly the finest natural river in New Mexico, and with its network of three forks and other wild tributaries, its upper basin in New Mexico is the largest relatively intact river system south of the Greater Yellowstone Ecosystem in Wyoming. The main stem and tributaries flow for many miles with nominal or no road intrusion—much of it protected as wilderness—and no large dams have been built.



Gila River

As the upriver extension of the main stem of the Gila, the Middle Fork begins with its highest tributary, Iron Creek, on the flanks of Whitewater Baldy, 10,895 feet, in the heart of the Mogollon Mountains in Gila National Forest. With Iron Creek, the Middle Fork

flows for 44 miles to the confluence of the East Fork. All but the last six of those miles are roadless and in the Gila Wilderness.

Directly south of the Middle Fork, the West Fork similarly flows for 28 miles to its confluence with the Middle Fork, all of it in wilderness down to a recreation site at the mouth. In the same region of wild country, the East Fork rises on Kemp Mesa and drops 28 miles that are mostly roadless to its junction with the Middle Fork. This marks the beginning of the main stem. An East Fork tributary, Black Canyon Creek, flows for 18 wild miles with only one minor road crossing.

The dead-end, paved Highway 15 (to Gila Cliff Dwellings National Monument) crosses the Gila at the Middle Fork-East Fork confluence, but then the main stem flows 28 miles southwestward through the Gila Wilderness. Within this reach, Sapillo Creek joins from an equally wild 8-mile lower canyon on the south side and Turkey Creek joins from an entirely wild watershed on the north side. In the vicinity of the town of Cliff, a 24-mile reach of the main stem has road access through a broad valley, including 13 miles through private land. Beyond there, the river enters the Gila National Forest again and flows for another 9 miles with no roads as the stream cuts through the northern end of the Big Burro Mountains. From there, the river flows for its final 28 miles to the Arizona state line through a mix of BLM and private property that includes the small communities of Red Rock and Virden and a notable canyon called the Gila Lower Box. Unexpectedly, at Virden, the river goes underground for 6 miles. It reemerges near the town of Duncan, 5 miles past the Arizona line (see the Arizona section of this report).

With its upriver extension of the Middle Fork and Iron Creek, the Gila flows for about 130 miles in New Mexico and another 58 miles in Arizona as a natural stream before encountering the more intensive development, damming, and diversions that characterize much of the river's once-great route across Arizona.

Apart from its obvious qualities as the largest network of natural streams in the Southwest, the Gila system is considered "continentally outstanding in terms of its biological distinctiveness" in *Freshwater Ecoregions of North America: A Conservation Assessment*. Fourteen native fishes live in the basin. Of these, the desert sucker, spike dace, Gila trout, and Apache trout occur only in the headwaters. The Gila

trout is a federal listed endangered species. Unlike the lower basin, where non-native fish have proliferated, native fish are found more plentifully above the confluence with the San Francisco. Gila trout used to be widespread but are now restricted to upper streams, especially the West Fork and Black Canyon Creek. The Gila riparian corridor is considered the richest in New Mexico for birds, and southern bald eagles are residents here.

The upper Gila system has been recommended for National Wild and Scenic River designation by the New Mexico Wilderness Alliance.

In its upper 190 miles, the Gila in New Mexico and eastern Arizona is one of the longest valuable reaches of undeveloped river in the Southwest, and with its tributaries it forms a network of wild and semi-wild basins that can no longer be found elsewhere.

NEW MEXICO'S "B" RIVERS

Canadian River

The best river of the southern Great Plains, the Canadian flows for about 125 nearly roadless miles across the grasslands of northeastern New Mexico before encountering its first large dam.

This 906-mile-long river rises in the plains, and the upper main stem is separated by more westerly basins from the Rocky Mountains' runoff. But these tributaries, including Ponil Creek and the Vermijo River, later feed the Canadian with their runoff from the east face of the Sangre de Cristo Mountains. At the Vermejo confluence, the finest reach of the Canadian begins.

This "wild" section of the Canadian first flows through 20 miles of private land with some unimproved road access between the Vermejo confluence (downstream from Maxwell) and the community of Taylor Springs. Below there, the river becomes wilder, with a mix of private and state-owned land for 19 miles. Then the river enters the Kiowa National Grassland, a federally owned tract managed by the Forest Service for grazing and recreation. The river flows for 23 miles through the grassland in a deepening narrow valley with only



Canadian River

occasional dirt road access. Below there, the Canadian winds for another 26 miles in a deeply inset, remote, mostly roadless setting consisting of private ranches and state-owned land.

Then, the Mora River enters from the west—another largely undeveloped river of the New Mexico plains. This major tributary rises in the southern Sangre de Cristo and then flows through a heavily roaded upper reach, but below Valmora it begins a 50-mile undeveloped stretch with only remote and unimproved ranch roads for access.

Below the Mora River confluence, the Canadian continues for about 37 more miles with only one crossing of Highway 419 and several remote ranch roads, ending in the backwater of Conchas Dam. Below the dam, the flows are often reduced to a trickle.

No other plains river in New Mexico is as undeveloped and wild as the Canadian, and considering the entire southern Great Plains, only the Purgatoire in southern Colorado has similar values.



Canadian River

Furthermore, this 125-mile reach of the Canadian—from the Vermejo River near Maxwell to Conchas Dam—is the longest, single, relatively unroaded section of perennial river in the state.

The Canadian flows over very unstable sand and mud substrates, and its channels frequently shift and change. Subject to high turbidity and extreme temperature and flow fluctuations, the river offers a harsh environment for aquatic life. Invasive tamarisk has invaded many of its floodplains; some restoration efforts are underway to remove it.

Cañones Creek

The remarkable canyon of Cañones Creek is incised within a dramatic volcanic landscape. The canyon is completely wild until its lower end and supports a viable population of rare, native Rio Grande cutthroat trout.

The small river begins with headwaters on the north side of the Valles Caldera, a topographic depression ringed by a collection of volcanic cones that is now managed as a National Preserve. Immediately entrenching itself in the igneous terrain, the river runs rapidly north for 14 roadless miles to Canoñes and then to its mouth in Abiquiu Reservoir.

Almost entirely in Sante Fe National Forest, the river is part of a unique geologic area and a rare refuge for native trout. A trail follows along the creek for eight miles.

San Francisco River, with Tularosa River and Negrito, Whitewater, and Mule Creeks

Much like the upper Gila, but without the long wilderness reaches, fewer native fish, and more private inholdings along its shores, the San Francisco River flows through the high, undeveloped mountains of west-central New Mexico, picking up wild tributaries as it goes, finally joining the Gila in eastern Arizona.

The San Francisco begins in Arizona and flows east eight miles to New Mexico. Then, for 80 miles, it winds east and then mainly south with some highway and four-wheel-drive access but also with two nearly roadless reaches of 24 miles each. The river dramatically skirts the northern escarpment of the San Francisco Mountains and heads south along the eastern base of the Saliz Mountains and then brushes against the western slopes of the larger Mogollon Mountains. South of Pleasanton, the river leaves Highway 180 and plunges through a 28-mile-long roadless wilderness of steep-sloped canyonlands, much like the wild sections of the Gila, which lies to the east. The canyon turns sharply west, and the last 8 miles of this reach run into Arizona, where the San Francisco then flows for another 28 miles with the unpaved San Francisco River Road alongside. A final 10-mile reach takes the river to its confluence with the Gila.

All in all, this river of about 160 miles has some road access, but is only lightly developed. Nearly the entire length of the San Francisco lies in the Gila National Forest of New Mexico and the

Apache National Forest of Arizona, though there are inholdings and sections of private land along the river. Native Gila trout are rare, if present in the river, but a few other native fishes, including the spike dace, loach minnow, and native suckers, survive here.

The San Francisco has several outstanding tributaries. The Tularosa River flows for 28 miles from the Continental Divide to join the San Francisco at Reserve. Highway 12 follows along most, but not all of this undeveloped stream. Negrito Creek flows 18 miles from its South Fork headwaters to the lower Tularosa, all of it nearly roadless. Whitewater Creek begins on the west side of Whitewater Bald (just west of the Gila River's Iron Creek source) and flows for 15 miles— its upper two-thirds completely roadless—to the San Francisco. After the San Francisco bends westward toward Arizona in its long roadless reach, Mule Creek—another nearly roadless tributary—enters from the south. The lower half of this creek lies in national forest but the upper half runs through private land. In Arizona, the San Francisco picks up the Blue River, described separately in the Arizona section of this report.

The upper San Francisco basin has deep canyons with ponderosa pines, junipers, cottonwoods, and Arizona sycamores, and upper reaches support the Arizona trout, an endangered species. Wildlife includes bighorn sheep, whitetail deer, and mule deer. Along the lower river, many hot springs are found. The San Francisco River Box, Canyon Hot Springs, and Natural Bridges have been identified by the state as significant natural areas.

NEW MEXICO'S "C" RIVERS

Jemez River and East Fork, with Jemez tributaries of San Antonio Creek, Rio Guadalupe, and Rio Cebolla

With its source within the geologically unique Valles Caldera just west of Los Alamos, the East Fork Jemez flows west and joins the Jemez, a popular recreation river.

The 14-mile long East Fork gathers it flows from the slopes of 9,000,



Rio Chama

10,000, and 11,000-foot volcanic cones, and then passes through high wetland meadows and rhyolite cliffs—an area inhabited by the rare Jemez salamander and the endangered peregrine falcon.

The East Fork and the similar San Antonio Creek, which drains the northern part of the caldera, join to form the main stem Jemez, which flows south through a deep, forested canyon for 13 miles, where the Rio Guadalupe enters from the northwest. This stream, along with its upriver extension Rio Cebolla, offers a 28-mile-long reach popular for recreation and best known for its spectacular box canyon.

The upper East Fork and San Antonio lie within the Valles Caldera National Preserve; much of the rest of the upper Jemez basin lies within Santa Fe National Forest.

Downstream from the mouth of the Rio Guadalupe, the main stem Jemez enters Jemez Pueblo land and flows through this and several other Indian reservations in a dry, braided channel to the Rio Grande at Algodones, north of Albuquerque.

Rio Brazos

With a long roadless and nearly roadless reach draining the highlands west of the Sangre de Cristo Mountains, the Rio Brazos flows through a remarkable box canyon that is wild, remote, and beautiful.

The small river begins south of the Colorado state line in the rugged San Juan Mountains just outside Carson National Forest east of Chama, and then flows south and westward. A 9-mile reach has dirt roads nearby, followed by a spectacular 13-mile roadless section through a narrow box canyon where walls rise 1,800 feet above the river and large trees remain unlogged on the canyon slopes. The lower 9 miles have road access and some development near Ensenada before the river meets the Rio Chama.

The entire river appears to be in private ownership.

Rio Chama

One of the more popular and perhaps most scenic paddling trips in New Mexico, the Rio Chama flows with clear water for 25 roadless miles.

The Chama starts in southern Colorado, with its East and West Forks flowing from the South San Juan Wilderness. The river enters New Mexico, paralleled by Highways 17 and then 64, until it runs into El Vado Reservoir.

Below the reservoir, the excellent recreational section of the Rio Chama begins, and it runs for 25 miles through a mountain canyon with ponderosa pines, junipers, and grasslands along the shores until it meets the backwater of Abiquiu Reservoir. This is the only canyon in northern New Mexico with brightly colored sedimentary rocks rather than blackened basalt that typifies the Rio Grande and other canyons of igneous origin. The float trip between the two reservoirs is considered one of the most scenic river trips in the Southwest.

Unlike most western rivers, flows in this reach are not depleted, but rather augmented by water projects. Runoff from the San Juan River is diverted south to the Rio Grande via the Rio Chama; the flows in this river are artificially increased by up to 100,000 acre-feet per year. With a lush riparian zone, this canyon offers outstanding wildlife habitat, though the river's aquatic life has been completely altered by the cold water and unnatural flow regime below El Vado Dam.

Below Abiquiu Dam, the river is still scenic but has Highway 84 alongside and faces increasing development pressure.

Rio Grande

The principal hydrologic artery of New Mexico, the Rio Grande flows through spectacular canyons in the northern reaches of the state and has nourished the West's longest continuous cottonwood bosque in its mid-reaches, extending both north and south of Albuquerque.

Other than the San Juan River, which nominally cuts across the northwestern corner of New Mexico, the Rio Grande is the only major river that brings water to New Mexico from the distant highcountry of the southern Rockies. But it doesn't bring much, and its flow is chronically diverted in southern Colorado. Thus, the upper river is sometimes nearly dry where it enters the state.

Springs and tributaries restore some of the flows, and the river cuts an amazing route through the volcanic landscape of north-central New Mexico, running for 56 miles with some of the least-accessible canyon country in the southern Rocky Mountain region. The river passes the perfectly symmetrical Ute Mountain, an ancient volcanic cone 10,093 feet above sea level, and then cuts a dramatically deepening canyon into multiple layers of nearly black basalt.

At the Upper Box the river plunges in extreme rapids and waterfalls. The Red River then enters from the east, delivering a pulse of snowmelt from the Sangre de Cristo crest. After 10 miles of gentler rapids, the Rio Grand drops into the Lower Box, with nearly vertical canyon walls 800 feet high and big whitewater that is a challenging but popular rafting run. Wildlife abounds through many of these remote reaches, and the canyon walls offer ideal nesting sites for raptors.

Below the Lower Box, the river flows gently through private farmland and several Indian reservations for about 25 miles. It then enters another roadless canyon that runs for about 10 miles from Highway 502 to Cochiti Reservoir (with Bandelier Wilderness to the east). Below Cochiti, the river runs for 40 miles through several more Indian reservations and then enters the sprawling city of Albuquerque. Downstream from the city, the river flows about 160 miles to the next large reservoir, Elephant Butte. In this reach, the river shares its valley with many nearby roads (including I-25) and burgeoning suburbs, but it also features several national wildlife refuges, including Bosque del Apache, which offers habitat crucial for endangered whooping cranes and southwestern willow flycatchers. Most important, nearly the entire 200-mile reach from Cochiti Dam to Elephant Butte Reservoir has nourished a massive and aged cottonwood forest—called a “bosque” in New Mexico—



Rio Grande

TIM PALMER

that is acclaimed as the longest continuous riparian forest in the West.

Unfortunately, the trees are not regenerating owing to diversions and the regulation of floods and silt flows upstream at Cochiti. The river is almost entirely diverted in some places, and invasive tamarisk has taken over floodplain habitat. The altered flows have also driven the Rio Grande silvery minnow to near extinction; this is the only endemic fish of the entire basin that still survives in New Mexico. Efforts are now being made to reinstate crucial flood flows and to restore riparian areas that are essential to wildlife. But increasing development of homesites on the floodplains, especially near Albuquerque, makes the goal of restoring this one-of-a-kind riparian forest more and more difficult.

Below Elephant Butte, the river hits another reservoir almost immediately and then runs with severely depleted flows, and with Interstate 25 and several towns and developing cities alongside all the way to El Paso, where the depleted and silty river turns eastward on its long trek to the Gulf of Mexico.

Vermejo River

A major tributary to the Cimarron and then Canadian River, the Vermejo flows from high peaks in southern Colorado and across the western limits of the Great Plains with almost no development along its shores.

This primary water-supplier to the Canadian backs up against the Purgatoire River watershed in southern Colorado and collects the high snowmelt of the Sangre de Cristo Mountains through several wild tributaries, flows into New Mexico via the North Fork Vermejo, Little Vermijo Creek, and Ricardo Creek, and then meanders through foothills and rolling grasslands to the southeast. For about 80 miles the main stem winds through the hills of the Park Plateau, which stands beautifully as the precursor to the steep rise of the Sangre de Cristo. An old railroad parallels the river for much of this distance. At the town of Maxwell the Vermejo joins the Canadian at the beginning of its semi-wild descent across the high plains.

The old railroad and very minor unimproved roads are the only access along most of the river's length. With its dependable springtime runoff from the high mountains, its long distance through undeveloped and seldom-visited country, and its linkage of the Rocky Mountains to the Canadian River and the Great Plains, the Vermejo is an fine example of the ecosystem and geographic connectivity that undammed and undeveloped rivers can provide. ■

Conclusion

Working from 13 lists compiled by other organizations and agencies, plus several interviews and additional research, we found 51 rivers and streams that have been noted for their natural values. From this we developed an A list of 10 rivers and tributaries, a B list of seven, and a C list of nine.

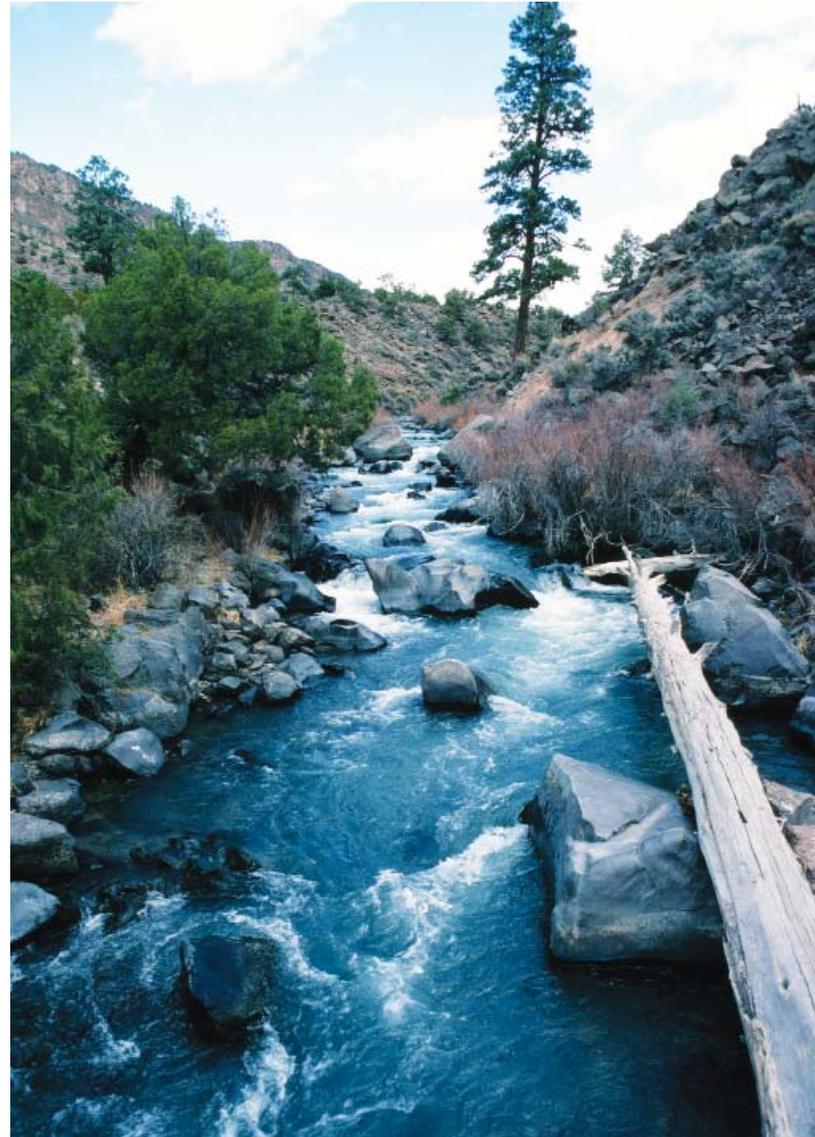
Two clusters of excellent rivers became evident:

Gila River system

The Gila with its three forks and with a number of outstanding wild tributaries, as well as the adjacent San Francisco River system, may be the greatest cluster of fine natural rivers in the Southwest. These are all discussed under the Gila River heading, above.

Jemez River system

The East Fork Jemez and the main stem with its headwater reaches of San Antonio Creek, Rio Guadalupe, and Rio Cebolla make a distinctive set of fine streams flowing from the volcanic uplands west of Los Alamos. Not wild, but clearly undeveloped and almost entirely within the Valles Caldera National Preserve and the Sante Fe National Forest, this suite of rivers offers outstanding values and is covered above under the Jemez river heading. ■



Red River

Sources for the New Mexico Survey

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

- Esteban Muldavin, New Mexico Natural Heritage Program
- Tom Turner, biologist, University of New Mexico
- Brian Shields, Director, Amigos Bravos
- Amy Unthank, U.S. Forest Service, regional fisheries program manager

3. New Mexico Division of Parks and Recreation, priority for natural diversity (B#). These are streams identified by the New Mexico Division of Parks and Recreation (1990) as highest priority for conserving natural diversity.

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

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

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. Wilderness 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 wilderness), 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.

New Mexico's Great Rivers: List

