Interior Basins

Species Summaries

LISTING STATUS: red (ESA listed as Threatened or Endangered), yellow (not ESA listed but federal sensitive species or state species of concern (majority of states), green (not listed in majority of states)

CURRENT RANGE: red (10 percent or less), yellow (11-25 percent), green (>25 percent)

HISTORICAL RANGE: red (<1,000 miles), yellow (1,000-10,000 miles), green (>10,000 miles)

TROUT UNLIMITED

Lahontan Cutthroat Trout

Category	Status	Explanation
Listing status		ESA Threatened Sensitive species (USFS, BLM) Species of Special Concern (CA, NV, OR)
Current range		<1 percent of lake habitat currently occupied by self-sustained population; 4 percent stream habitat occupied
Historical range		Moderate distribution historically, 59,500 acres of lake habitat
Climate change		Drought from reduced snowpack and wildfires are major issues
Energy development		Little impact in Sierra Nevada range
Non-native species		Non-native trout and salmon pose continual threats
Water demand		Agricultural uses threaten flows in this increasingly dry region
Data issues		Agency protocols differ among states for data collection, but generally good data for this region

Humboldt Cutthroat Trout

Category	Status	Explanation
Listing status		ESA Threatened Sensitive species (USFS, BLM) Species of Special Concern (CA, NV, OR)
Current range		<9 percent of historical stream habitat
Historical range		Moderate distribution historically, 6,800 stream miles
Climate change		Drought, stream warming and wildfires are major issues
Energy development		Gas pipeline borders several populations
Non-native species		A relatively large # of un-hybridized populations, but brook trout and other non-native trout pose continual threats
Water demand		Agricultural uses threaten flows in this increasingly dry region
Data issues		Agency protocols differ among states for data collection, and many populations are sampled infrequently

Oncorhynchus clarkii henshawi

Bonneville Cutthroat Trout

Category	Status	Explanation
Listing status		Sensitive species (USFS,BLM) Species of Special Concern (ID, NV, UT, WY)
Current range		31 percent of historical habitat currently occupied
Historical range		Moderate distribution historically, 6,800 miles
Climate change		Drought and wildfires are issues, particularly for small populations
Energy development		Most of the energy development and identified reserves are outside of currently occupied watersheds
Non-native species		Introduced rainbow trout pose hybridization risk; brown trout invading many streams as temps warm
Water demand		Agricultural demand and large metropolitan area
Data issues		Interagency work group maintains good pop data; habitat conditions and barriers need improved monitoring

Paiute Cutthroat Trout

Category	Status	Explanation
Listing status		ESA Threatened Species of Special Concern (CA)
Current range		Historical distribution unoccupied, but current distribution occurs in comparable stream miles upstream
Historical range		Occurs in just 12.5 miles of habitat (9 miles historically)
Climate change		Drought, declining snowpack, and wildfires are major issues
Energy development		No known significant energy development issues
Non-native species		Introduced rainbow trout pose hybridization and competition risk
Water demand		No known significant water demand issues
Data issues		No known significant data issues

Robert J. Behnke

Lahontan Cutthroat Trout *(Oncorhynchus clarkii henshawi)* **and Humboldt Cutthroat Trout** *(O. c. humboldtensis)*

What is generally referred to, managed as and federally listed as the Lahontan cutthroat trout actually encompasses two described subspecies with distinct evolutionary histories (1). Together they represent one of the oldest lineages of cutthroat trout and have had ample time to respond to a dramatically changing landscape, having occupied the Lahontan basin at least several 100,000 years ago (2), if not even longer (3). The western form (*O. c. henshawi*) adapted to life in pluvial Lake Lahontan, which at its maximum (about 13,000 years ago) covered over 8,500 square miles. As this lake subsided, Lahontan cutthroat trout continued to persist in the relict desert terminal lake/river systems, where until recently it maintained large lake-river spawning runs and grew to enormous sizes as top predator. In fact, during his 1843 expedition Fremont referred to Lahontan cutthroat trout as "Salmon-trout" and a Lahontan cutthroat trout from Pyramid Lake set the world-record for a cutthroat trout at 41 pounds before the population here was lost in the 1940s. The genetic and morphological distinctions of the Humboldt cutthroat trout (*O. c. humboldtensis*) reflect its isolation and assumed adaptation to the river and stream environments of northern Nevada and southern Oregon.

Today, less than 9 percent of historic stream/river habitat is occupied and the Lahontan cutthroat trout has been lost from almost 99 percent of its historic lake habitat. Logging, dams and over-fishing were early threats in the west (the Tahoe/Truckee/Pyramid Lake system once supported a commercial fishery that supplied San Francisco and other cities) and throughout the range habitat fragmentation, degradation and non-native species continue to impact populations. It was one of the first species listed under the 1973 Endangered Species Act. Though non-native salmonids pose a threat throughout the range, fortunately most remaining populations have not been compromised with hybridization, leaving important genetic resources and opportunity for recovery of both the river and lake forms, with some unique twists. For instance, the U.S. Fish and Wildlife Service and Paiute Tribe are working to restore the genetic legacy of Pyramid Lake Lahontan cutthroat trout, using hatchery broodstock developed from a small stream in Utah where Lahontan cutthroat trout were transplanted prior to their extirpation in Pyramid Lake. Elsewhere in the range, management agencies, landowners and groups including TU are working to restore habitat, remove non-native trout and reconnect streams to recover the migratory life history in native populations.

Oncorhynchus clarkii utah

Bonneville Cutthroat Trout *(Oncorhynchus clarkii utah)*

Bonneville cutthroat trout are native to the Bonneville basin of Utah, southeastern Idaho, southwestern Wyoming and eastern Nevada. Ancient Lake Bonneville was the largest of the Ice Age lakes of western North America covering about 20,000 square miles with a maximum depth of nearly 1,000 feet. Lake Bonneville formed over 30,000 years ago, but greatly enlarged when a lava intrusion along the Bear River diverted it southward from the Snake River into the Bonneville Basin, supplying the basin with additional water as well as the spotted fish that continued to evolve into today's Bonneville cutthroat trout. When the ancient lake breached its northern rim at Red Rock Pass about 14,500 years ago, it briefly overflowed back into the

Snake River via the Portneuf River. As the climate changed, the floor of the ancient lake gradually dried and turned into desert, leaving remnants such as the Great Salt Lake. The major tributaries surrounding the lake continued to flow and support populations of Bonneville cutthroat trout. In addition to the Bear River at the northern end of the basin, this also included the Weber and Jordan rivers to the east, the Sevier River to the south and small streams flowing from the Deep Creek Mountains to the west.

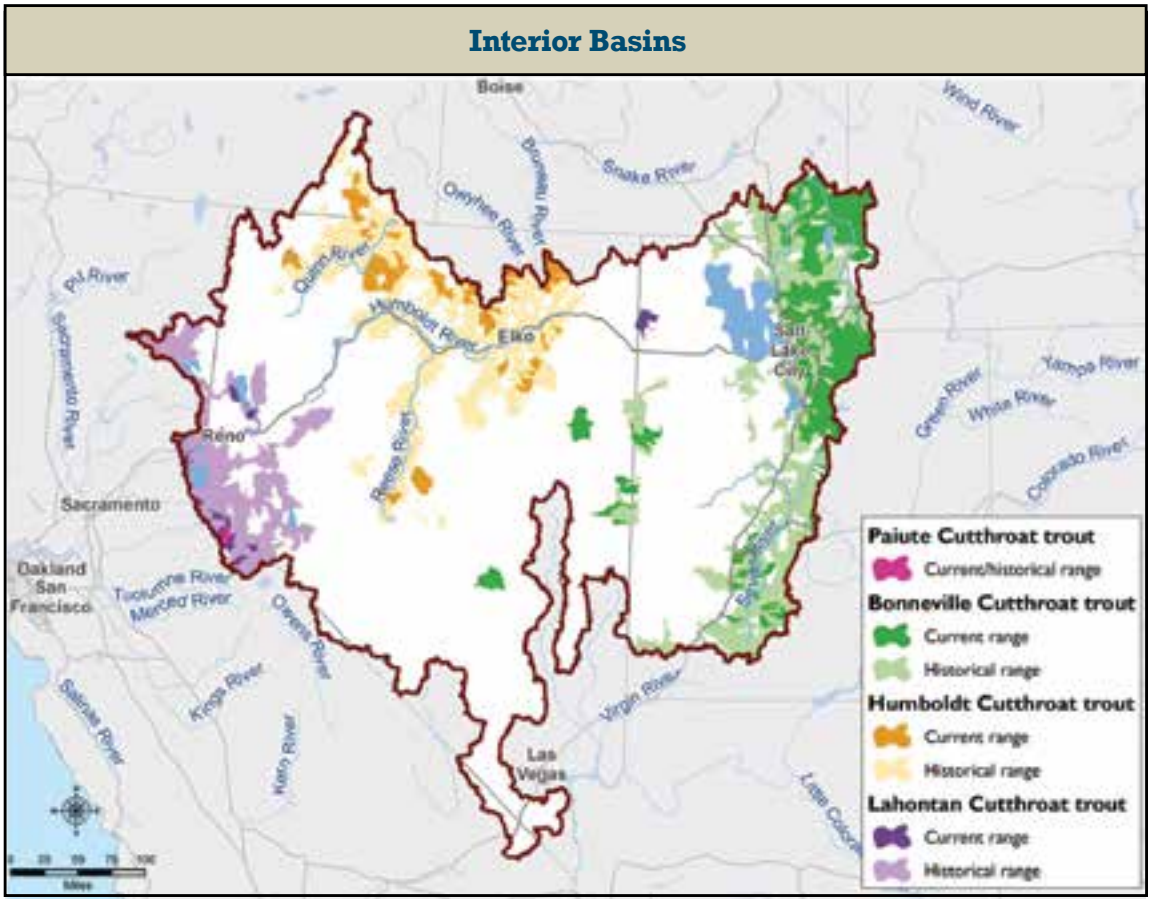
When the Bonneville basin was settled by Europeans many of these waters were overharvested. The once bountiful population in Utah Lake was harvested to extinction in the 1930s and has never returned. Today Bonneville cutthroat trout occupy about 30 percent of their historical stream habitat and over 50 percent of that is in the Bear River basin. The Bear River system still supports large migratory populations that move between the habitats in the mainstem and interconnected headwater tributaries for spawning. Bear Lake is the largest remaining occupied lake system. Some strongholds still persist in the Weber, Provo and Spanish Fork systems of northern Utah. The distribution of Bonneville cutthroat trout in the Sevier River system has also been severely reduced: small fragmented populations now occupy less than 10 percent of their historical range and the average population extent is only about 4 miles. These small populations in the Sevier basin and the equally small and isolated populations in the Deep Creek Mountains are highly vulnerable to environmental changes such as wildfire and drought although their isolation has protected them from non-natives and preserved their genetic integrity. The larger migratory populations in the Bear and Weber River systems are more resilient to climate change but they are under pressure from introduced rainbow and brown trout. Much of their mainstem habitat has also been degraded and fragmented by roads and urban and agricultural development. Bonneville cutthroat trout continue to be a popular sportfish where large individuals still exist.

Oncorhynchus clarkii seleniris

Paiute Cutthroat Trout *(Oncorhynchus clarkii seleniris)*

Paiute cutthroat trout historically occurred in just 9 miles of habitat on Silver King Creek, a tributary to the East Fork of the Carson River on the eastern side of the Sierra Nevada Mountains. This fish has one of the smallest historic ranges of any North American trout, as the entire distribution of Paiute cutthroat trout could fit inside the island of Manhattan. A steep, downstream canyon isolated Paiute cutthroat trout from its distant Lahontan cutthroat trout relative and a series of waterfalls prevented further colonization upstream until sheepherders fortuitously moved the species above the falls in the 1910s. Had this not occurred Paiute cutthroat trout may have been lost, as the subsequent introduction of other trout species eliminated Paiute cutthroat trout from its historical habitat below the falls.

Paiute cutthroat trout were listed as Threatened under the Endangered Species Act in 1973 and the fragmented distribution created by non-native trout species remains the major threat to species. The Silver King Creek basin is largely US Forest Service Wilderness Area and has little development. An intensive effort is underway to reintroduce the species to the downstream portion of Silver King Creek, to restore it to its historic range. As with the other native trout in the Interior basins, limited stream flows and increased severity of drought or wildfire



Historical and current distributions of native trout and char in the Interior Basins Region.

make Paiute cutthroat trout vulnerable to climate change.

Regional Trends

The Interior basins of the West are basically one giant hydrologic bowl where water flows inward and sinks into the desert, never reaching the ocean. It is an exceptionally beautiful landscape, characterized by extremes. To the west, for instance, the Truckee River originates in the high-elevations of the Sierra Nevada Mountains, flows through iconic Lake Tahoe (North America's largest alpine lake) and 120 miles downstream sinks in the desert at Pyramid Lake, a once world-famous Lahontan cutthroat trout fishery. Over to the east, Bonneville cutthroat trout used to roam throughout the Bear River, which begins in Utah's Uinta mountains and flows almost 500 miles north into Wyoming, west into Idaho and south back into Utah to drain into the Great Salt Lake not far from where it started. The central part of this region is "basin and range country," with literally hundreds of mountain ranges that seemingly pop out of the flat high-desert sagebrush. These ranges reach impressive heights: Wheeler Peak in Great Basin National Park hits over 13,000 feet and peaks of ranges like the Rubies and Toiyabes are 11,000 to almost 12,000 feet. Their cold alpine waters feed interior rivers such as the Humboldt, which meanders across most of northern Nevada, as well as smaller desert streams like Willow and Whitehorse creeks that sink into Oregon's Coyote basin.

Though the range of Paiute cutthroat trout has always been limited, this rugged and contrasting landscape has enabled the Lahontan and Bonneville cutthroat trout to diversify into a range of life histories including stream-resident and river and lake migratory forms. Both of these native trout are able to handle relatively high temperatures and historically were found not only in cold mountain streams but also in the more turbid, warm waters of desert rivers and terminal lakes, the latter of which are generally too saline and alkaline for other trout species.

In early March 2015 – normally about the time of peak flows – water levels in Lake Tahoe were so low the lake failed to connect to the outflowing Truckee River. Photo: Brian Hines

Still, despite this remarkable resiliency, the usual western human influences have threatened the existence of all the cutthroat trout in the interior basins. Starting in the early 1800s, fur trappers depleted even the largest river systems of beavers, 'ecosystem engineers' whose importance in maintaining water on this desert landscape we are only now beginning to understand. Grazing affects almost every cutthroat trout stream in the region and has caused widespread stream habitat degradation. In some of the larger systems, such as the Truckee, Bear and Weber rivers, major irrigation dams and diversions providing water to agriculture, metro areas and hydropower has greatly restricted flows and blocked migratory habitat and led to the loss of important populations like the Pyramid and Walker Lake Lahontan cutthroat trout. Perhaps less obvious but equally impactful are the hundreds of road culverts and smaller diversions that have riddled stream systems throughout the region with barriers and isolated trout in small headwater habitats where their persistence is tenuous. Further, as with the southwest trout, non-native species

TU field crew photos after the Holloway fire in Whitehorse Creek in 2012. Beaver ponds provided critical refuge for Lahontan cutthroat trout (right).

have been a major factor in native species decline here. Kokanee and lake trout – a voracious predator – hamper Lahontan cutthroat trout recovery in many of the larger alpine lakes and throughout the Interior basin brook, brown and rainbow trout occupy many systems and continue to contribute to native population losses.

In contrast to other areas of the country, to date trout in this region have not been impacted significantly by energy development. However, several fracking wells have been installed in recent years and many leases are being proposed near trout streams, making this a potential threat in the future. A large below-ground natural gas pipeline extending from Wyoming to Oregon now closely circumvents several important Lahontan cutthroat trout recovery populations. Mining, a central component of the economy, continues to grow in the region; water needs and exploratory drilling for mine expansions have already had impacts on native trout populations (including one recent extirpation) and will continue to pose threats. At the same time, several large ranching properties encompassing Lahontan cutthroat trout streams are now mine-owned and these ranches are actively focused on improving riparian habitat through better grazing practices, which is greatly benefitting trout in these areas (see Success Story).

Wildfire is becoming an increasingly important threat. Fire has always been an important component of this region and is a disturbance these fish evolved with, but the landscape context has changed

SUCCESS STORY:

Recovering Trout Habitat in Desert Streams

Degradation of trout streams often is caused by many factors. In Nevada's Maggie Creek, decades of intensive grazing, combined with isolation of streams by road culverts and persistent drought, had taken a toll on native Lahontan cutthroat trout. But over the past few decades, a watershed approach to restoration, involving various strategies and a whole host of partners, has improved the resiliency of this important trout population.

BLM Elko District monitoring photos of Maggie Creek in 1980 (left) and 2014 (right). Courtesy of Carol Evans.

Cattle reign supreme in the West, valued by many as an iconic part of this landscape and an important thread of western social culture. But without proper management, cattle can cause problems for trout. When its hot, cows go to water and this has caused many western streams to become wider, shallower and warmer as stream-side vegetation is trampled.

In northern Nevada, grazing affects more than 95 percent of habitat occupied by Lahontan cutthroat trout conservation populations (those being managed for recovery under the Endangered Species Act) and the resulting habitat degradation is a major factor in this unique trout's decline. Invasive cheatgrass adds another dimension to the problem, by creating a fine fuel layer that encourages more wildfires.

This degradation, however, provides opportunity to make things better for trout. It takes a lot of work, but changing the length and timing of the cattle's stay on different pastures, along with a little fencing and seeding here and there, can be enough to give riparian vegetation a foothold. This is exactly what happened in Maggie Creek over the past few decades. In 1993, the BLM and local mining and ranching partners initiated the Maggie Creek Watershed Restoration Project to enhance 82 miles of stream and almost 2,000 acres of riparian habitat in the basin. Although the project comprised a number of components including riparian plantings and fencing, a conservation easement and water developments, the most important change was application of prescriptive livestock grazing practices to limit grazing during the hottest parts of the year.

The overall result of all of this work is dramatic. The restoration has created a more functional, hydrated floodplain and a healthy riparian zone. Beavers have also been part of the success story. As they moved back into improving riparian habitats, their dam building has expanded wet meadows and riparian areas that help hold water. These ponds are capturing sediment and providing critical wet refuge areas for fish and wildlife in times of unprecedented drought and wildfire.

Another problem facing Lahontan cutthroat trout in Maggie Creek was that poorly designed culverts had severed the connection between the mainstem creek and its tributaries, preventing the movement of trout within the drainage. Partners worked to replace the offending culverts with passage-friendly structures.

According to TU's long-term monitoring of trout responses, the restored habitat connectivity is now allowing Lahontan cutthroat trout to move to desirable habitat for growth and refuge from drought and other disturbances, which will help keep them secure in the future.

Culverts (above left) prevented fish from freely moving from Maggie Creek into Beaver Creek, a major tributary. In 2005 they were replaced with this fish-friendly structure (above) to connect the streams.

dramatically for trout over the last century: with habitat fragmentation, trout have lost their ability to deal with fire by moving to refuge habitats and so the consequences of fire are more severe. Additionally, the invasion of non-native Eurasian cheatgrass has altered the fire regime in the Interior Basins (4). Cheatgrass thrives particularly well in disturbed habitats and it not only invades after fires but, because it is highly flammable, it also contributes to fires. Areas with cheatgrass burn two to four times more frequently than areas with native vegetation. This cycle has led to the establishment of large cheatgrass monocultures, which are associated with some of the largest fires in the region. Over 2 million acres burned across the Interior basins in 2012 alone. Several fires that year impacted valuable native trout streams, such as the 400,000-plus-acre Holloway fire in Oregon, which ripped through one the few – and largest – interconnected stream systems remaining for Lahontan cutthroat trout.

Habitat degradation by grazing compounds the effects of fire in many trout streams. Drought and bark-beetle outbreaks are also increasing the magnitude of fires in higher elevation, forested areas.

The size and frequency of fires are only expected to be exacerbated by climate change, which is already hitting the region hard. Average annual temperatures for the greater southwest region increased 3.40 F over the last century and in Utah and Nevada, average temperatures in 2001-2010 were warmer than for any other decade in the 20th Century (5). Paradoxically, while parts of the southwest have suffered declining precipitation over the long-term, precipitation actually seemed to increase over the 20th Century in many parts of the Interior basin (5). For the last several years, however, much of the region has been gripped in a persistent drought that is not predicted to let up. Much of the Interior basins have experienced less than 50 percent average precipitation this year; in April, the less than 5 percent average observed across the West prompted California to implement mandatory water restrictions for the first time.

The severity of drought is partly due to the fact that, with increasing temperatures, precipitation generally now comes more as rain rather than snow. Snow serves as an important 'release' valve for stored water, so less snowpack (and earlier snow melt) means less water is retained in streams and rivers throughout the year.

In Nevada's Walker River basin (flowing east from the Sierra Nevada mountains), unprecedented declines in water storage and associated unsustainable increases in groundwater pumping, recently prompted the Nevada state engineer to enact a 50 percent curtailment of supplemental irrigation rights. On the bright side, the Walker Basin Restoration Program is developing innovative tactics such as leasing or buying water rights from willing landowners and switching fields over to more water-friendly crops in this corner of Nevada. But if the drought continues as predicted, providing water and income security for the human population of the interior basin, while ensuring flows to protect and restore native trout, will require increasingly complex maneuvering.

An example from an Idaho stream, showing how grazing downstream of an exclusion fence has made this stream wider, shallower and likely warmer. Photo: Warren Colyer.