# Cutthroat Trout (*Oncorhynchus clarki*)

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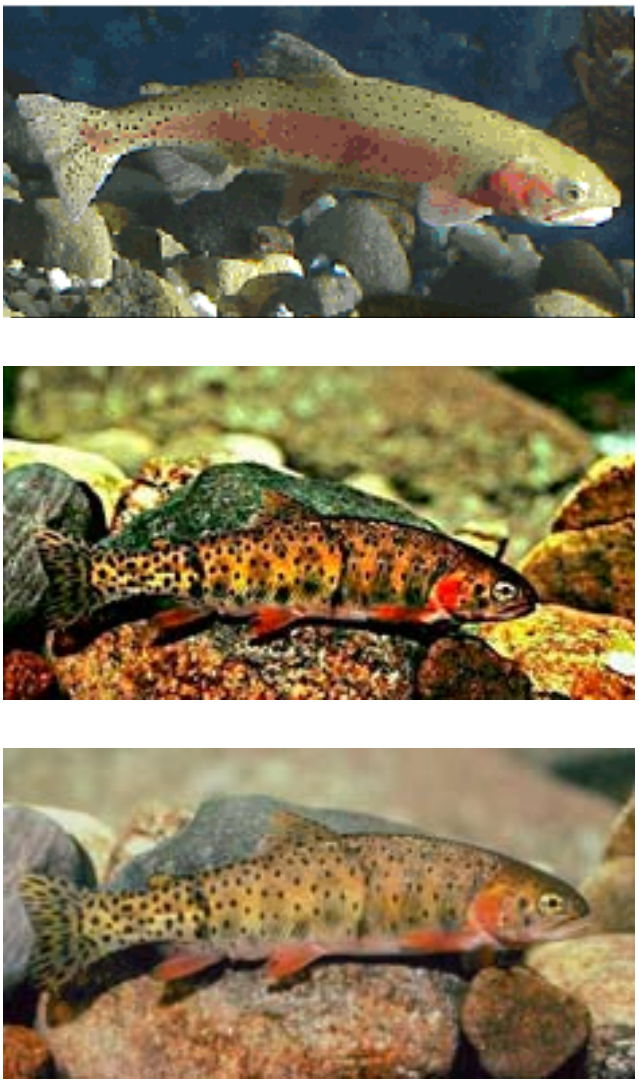
## Introduction

Cutthroat trout are freshwater fish in the family Salmonidae, as are rainbow trout, salmon, bull and brook charr, whitefish, and grayling. Although there is some debate as to the exact number of subspecies, all subspecies are native to western North America and inhabit clear, cold streams with naturally fluctuating flows, low levels of fine sediment, well-vegetated streambanks, and diverse, abundant instream cover.

In recent decades, both the distribution and abundance of cutthroat trout have declined, likely due to a combination of degraded or fragmented aquatic habitats throughout its historic range and the introduction of nonnative fish species. Many subspecies are currently on State and Federal lists as endangered, threatened, or species of special concern. Current listings are available on the Web site of the U.S. Fish & Wildlife Service at *http://www.fws.gov/endangered/wildlife.html*.

The purpose of this leaflet is to provide information to help landowners recognize opportunities to conserve or improve habitat for cutthroat trout and assist with the development, implementation, and monitoring of a management plan for the species. The success of any fish/wildlife management action plan requires a clear statement of management goals, awareness of the habitat requirements of the target species or fish/wildlife group, accurate assessment of habitat conditions, effective tools, and adequate resources to address habitat limitations, follow-up monitoring of fish/wildlife responses, and adaptation of the management plan in response to new information and technology. The leaflet also identifies resources and additional sources of information available to develop and carry out cutthroat habitat management plans.



*Wyoming Bureau of Land Management*

**Subspecies of the cutthroat trout including the lahontan cutthroat (top), westslope cutthroat (middle), and Colorado River cutthroat (bottom). Not all subspecies are easily identifiable by coloration alone as they frequently resemble closely related trout.**

## Description

Coloration of cutthroat trout subspecies is variable, but cutthroat trout are visually distinguished from other trout species by the two prominent red slashes on the lower jaw. Generally, the back and sides of

the cutthroat trout are lightly spotted; dorsal, adipose, and tail fins can be heavily spotted. Mature fish have elongated bodies, normally having a length several times the width of their bodies. This body form allows the fish to easily maneuver in complex currents associated with their habitats. Depending on where the fish is found, mature sizes range in length from 6 to 22 inches and weigh 4 ounces to 6 pounds. The size of a cutthroat trout at maturity may also depend on its life history. There are three primary life history patterns: residential individuals remain in tributaries where they are born; fluvial fish migrate to rivers for some of their life; and adfluvial forms migrate to lakes for some portion of their lives. Additionally, the coastal cutthroat subspecies may be anadromous, migrating to the ocean in the spring, and returning to freshwater to spawn. Mature fish may range from 6 inches (in populations that remain in small headwater streams throughout the life cycle) to 20 inches (in populations that migrate to and from the ocean). Table 1 lists the nine genetically distinct cutthroat trout subspecies.

## Causes of decline

Historically, size, structure, and abundance of cutthroat trout in some waters (Pyramid Lake, Nevada) was strongly influenced by angling pressure. Harvest restrictions in place today appear to adequately protect populations of cutthroat trout from severe harvest pressure.

Nonnative species have taken a huge toll on native populations of cutthroat trout. Brook trout (*Salvelinus fontinalis*) compete with juvenile cutthroat trout for food. Once brook trout dominate stream habitats, cutthroat trout populations rarely recover. Other nonnative species, such as lake trout, brown trout, and northern pike, prey on native cutthroat trout.

Hybridization with introduced fish is also a major threat to native cutthroat trout populations. In fact, the yellowfin cutthroat trout, originally found near

**Table 1** Genetically distinct subspecies of cutthroat trout

| Subspecies | Scientific name |
|---|---|
| Bonneville cutthroat | *Oncorhynchus clarki utah* |
| Coastal cutthroat | *Oncorhynchus clarki clarki* |
| Greenback cutthroat | *Oncorhynchus clarki stomias* |
| Lahontan cutthroat | *Oncorhynchus clarki henshawi* |
| Paiute cutthroat | *Oncorhynchus clarki seleniris* |
| Rio Grande cutthroat | *Oncorhynchus clarki virginalis* |
| Westslope cutthroat | *Oncorhynchus clarki lewisi* |
| Yellowstone cutthroat | *Oncorhynchus clarki bouvieri* |
| Colorado River cutthroat | *Oncorhynchus clarki pleuriticus* |

*Steven M. Seiler*

**The rainbow trout (top) readily hybridizes with cutthroat trout, such as the yellowstone cutthroat (middle). The resulting hybrid coloration (bottom) is highly variable.**

the headwaters of the Arkansas River, was wiped out from this location when rainbow trout were introduced. Cutthroat trout readily hybridize with rainbow trout and other cutthroat trout subspecies. Hybridization, however, is difficult to ascertain since, in many cases, it takes genetic testing to verify the problem.

Habitat loss is a major cause of declines of all subspecies of cutthroat trout. Land uses known to contribute to cutthroat habitat degradation include timber harvest, urbanization, road development, mining, and agricultural/livestock production. Poor land management practices can result in increased soil erosion, stream channel instability, and decreased water quality and quantity in cutthroat habitats. Most populations of cutthroat trout possess complex life histories that require that the fish move among diverse habitats. Hydroelectric and irrigation diversion dams reduce streamflows, alter water temperature, and create barriers that prevent movements of cutthroat trout between important habitats. In recent years, cutthroat trout have been unable to use miles of spawning habitat due to dewatering of streams for irrigation and barriers created by dams and poorly installed road culverts.

Physical barriers (dams), as well as environmental barriers (poor water quality) that prevent upstream and downstream movement, are detrimental to all salmonids, including cutthroat trout.

## Range

Cutthroat trout historically have inhabited the rivers and lakes of much of the Western United States. Subspecies can be found in Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Once common throughout this range, cutthroat have declined in overall distribution and abundance during the last century. For example, various studies have estimated that the westslope cutthroat trout now only occupies between 19 and 27 percent of its historic range in Montana and about 36 percent of its historical range in Idaho.

## Life history

Cutthroat trout exhibit both resident and migratory life history strategies through much of their current range. Resident forms complete their entire life cycle in the tributary streams in which they spawn and rear. Migratory cutthroat trout live in lakes, reservoirs, rivers, or the ocean and return to tributary streams to spawn. Resident and migratory forms can be found together and may interbreed.

Cutthroat trout spawn in the spring when water temperature is above 50º Fahrenheit and flows are high. Cutthroat trout construct a typical salmonid redd (a pit in the stream substrate, excavated by the fish's tail) in which to lay eggs. The female selects the sites and excavates the redd. The female lays between 200 and 4,400 eggs (depending on the size of the female) below the streambed surface. Eggs are then fertilized by the attending male.

Eggs hatch in about a month and young spend 2 weeks in the gravel while they absorb their yolk sack before emerging. After emergence, fry (recently hatched fish) immediately begin feeding, typically in surrounding habitat but they may swim to other locations. Juvenile fish typically require 3 to 5 years to mature.

## Habitat requirements

### *General*

Cutthroat trout live in clear, cold headwater lakes, streams, and rivers. Like all salmonids, cutthroat trout require diverse, yet well-connected habitats with structural components like boulders and large wood that provide good hiding cover.

Cutthroat trout seek out sediment-free gravel substrate in riffles and pool crests. They require cold water, though exact temperature tolerances are variable between subspecies.

*NRCS*

**Cutthroat trout require diverse habitats with ample hiding cover.**

### *Food*

Cutthroat trout feed within or just downstream of riffles where aquatic invertebrates are abundant. Cutthroat trout are opportunistic feeders and primarily consume invertebrates, small fish, and zooplankton. Reliance on insects is greater in juveniles than adult trout. Many invertebrates eaten are the larval and pupal stages of mayflies, stoneflies, and caddisflies. As trout grow, their diet becomes more diverse and food items become larger.

### *Cover*

Cutthroat trout thrive in streams with complex habitat cover provided by large wood, overhanging vegetation, undercut banks, boulders, and pools. Adults will often conceal themselves in deep pools with submerged wood or boulder cover during the day and move away from such cover at night.

Tree canopy cover is important for maintaining shade, thus moderating stream temperature, and for providing wood and leaf material to the stream. Stream shade becomes less important as stream width increases. In addition, a well-vegetated riparian area contributes to channel stability and is an important source of insect prey. Riparian areas are amongst the most biologically diverse habitats in many landscapes. Thus, their ecological contributions are important to both aquatic and terrestrial species.

### *Spawning habitat*

Both migratory and resident forms of cutthroat trout spawn in headwater or tributary streams that are cold and clear, with loose, clean gravel. The female prefer spawning sites with suitable substrate (gravel less than 3.35 in. in diameter), water depth (3.5 to 11.8 in), and water velocity (6.2 to 23.6 in/s).

## Overwintering habitat

In the fall and winter, cutthroat trout seek habitats with abundant wood and/or rock cover. To survive the winter, adult cutthroat trout need deep, slow-water pools that do not fill with anchor ice. Juveniles overwinter in the interstitial spaces between rocks or boulders. During this time, their activity levels decrease, and survival depends on the availability of suitable food, as well as shelter from predators, freezing water, and high flows.

## Habitat assessment

Aquatic ecosystems and the processes they support are functionally interconnected throughout a watershed. Restoring stream conditions along a relatively small stream reach may not necessarily improve cutthroat trout habitat if the rest of the watershed continues to be degraded. Depending on the size of the property in question and the watershed in which it lies, landowners may need to collaborate with neighbors to expand the scale of restoration efforts. The best approach to cutthroat trout habitat protection or recovery is to sustain a fully functional, well-vegetated (trees, shrubs, wetland plants) flood plain within a barrier-free stream network of the watershed. This includes maintaining natural stream flows, minimizing erosion in uplands, protecting flood plains, wetlands, and riparian areas, and managing streamside forests and riparian areas for aquatic species.

Landowners wishing to improve freshwater habitat should first evaluate the existing conditions. A quick visual assessment will often yield clues about the general health of a stream reach. A simple evaluation of canopy cover in the riparian area, bank stability, water clarity, and other easily recognizable features often suggest actions that can be taken to improve stream and riparian habitat.

*Virginia Department of Forestry*

**Quick visual assessments will identify existing conditions, such as streambank erosion, that could be detrimental to cutthroat trout habitat.**

The Stream Visual Assessment Protocol (SVAP) developed by the Natural Resources Conservation Service (NRCS) is a simple tool that requires little specialized equipment or experience. Table 2 summarizes some of the components and characteristics of streams evaluated by the SVAP. Using SVAP, the landowner can evaluate and score each stream habitat component separately and then average all the scores together to determine an overall rating of stream condition. If the landowner does not feel that he/she has the expertise to make this assessment, assistance can be solicited from the local NRCS biologist. Individuals interested in obtaining a copy of the SVAP can visit Web site *http://www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf*.

Interested landowners should contact local natural resource professionals to determine if cutthroat trout presently or historically occurred in their area and, if so, in what life stages (spawning, rearing, foraging, overwintering, and/or migrating). Landowners can then assess whether suitable cutthroat trout habitat is available on their property. Table 3 is an example of an inventory chart for assessing cutthroat trout habitat. For planning purposes, rate the habitat components for the designated planning area based on the descriptions given. Habitat and stream community components that are limited or absent are likely limiting cutthroat trout habitat quality. Management plans should address the habitat components that are determined to be limiting cutthroat trout habitat potential. Table 3 also offers management suggestions to raise the quality or availability of each habitat component that is considered limiting. Cutthroat trout often exhibit a patchy distribution; therefore, they are not likely to occupy all available habitat simultaneously, even if it is of high quality.

**Table 2** SVAP components of stream health

| | **High score** | **Above average score** | **Below average score** | **Low score** |
|---|---|---|---|---|
| Channel condition | Natural channel; no evidence of erosion | Evidence of past channel alteration | Altered channel | Channel is actively downcutting or widening |
| Hydrologic alteration | Flooding every 1.5–2 years | Flooding every 3–5 years | Flooding every 6–10 years | No flooding |
| Riparian zone | Natural vegetation extends >2 active channel widths on each side | Natural vegetation extends 1 active channel width on each side | Natural vegetation extends third of active channel width on each side | Natural vegetation extends <1/3 the active channel width on each side |
| Bank stability | Stable | Moderately stable | Moderately unstable | Unstable |
| Water appearance | Very clear or clear but tea-colored | Occasionally cloudy | Considerable cloudiness | Very turbid or muddy |
| Nutrient enrichment | Clear water | Slightly greenish water | Greenish water | Pea green, gray, or brown water |
| Barriers to fish movement | No barriers | Water withdrawals limit fish movement | Drop structures less than 1 foot | Drop structures more than 1 foot |
| Instream fish cover | More than 7 cover types available | Five to six cover types available | Two to three cover types available | Zero to one cover type available |
| Pools | Deep and shallow pools abundant | Pools present but not abundant | Pools present but shallow | Pools absent |
| Riffle embeddedness | Gravel or cobble particles are less than 20% covered with fine sediment | Gravel or cobble particles are 20–40% covered with fine sediment | Gravel or cobble particles are more than 40% covered with fine sediment | Riffle is completely covered with fine sediment |

**Table 3** Assistance programs

| Program | Bull trout habitat improvements | Land eligibility | Type of assistance | Contact |
|---|---|---|---|---|
| Conservation Reserve Program | Plant riparian buffers | Cropland (including field margins), riparian pastureland, highly erodible land | 50% cost-share for establishing permanent cover, annual rental payments in return for establishing long-term, resource-conserving covers, additional financial incentives are available for some practices | NRCS or FSA State or local office |
| Environmental Quality Incentives Program | Conservation practices to improve water quality, reduce erosion and sedimentation | Cropland, rangeland, grazing land, and other agricultural land in need of treatment | Up to 75% cost-share and incentive payments to implement conservation practices to a maximum term of 10 years | NRCS State or local office |
| Partners for Fish and Wildlife Program | Plant riparian vegetation, install fencing and off-stream livestock watering facilities, remove exotic plants, restore instream habitat, reestablish migratory fish passageways | Most degraded fish and/or wildlife habitat, especially for listed species | Up to 100% financial and technical assistance to restore wildlife habitat under minimum 10-year cooperative agreements | U.S. Fish & Wildlife Service local office |
| Waterways for Wildlife | Develop watershed-level habitat management plan, plant riparian buffers, improve instream habitat, improve water quality, reduce erosion and sedimentation | Private land | Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals | Wildlife Habitat Council |
| Wildlife at Work | Develop habitat management plan, plant riparian buffers, remove exotic plants and animals, improve instream habitat | Corporate lands | Technical assistance on developing habitat projects into a program that will allow companies to involve employees and the community | Wildlife Habitat Council |
| Wildlife Habitat Incentives Program | Develop habitat management plan, plant riparian buffers, improve instream habitat | High-priority fish and wildlife habitats | Up to 75% cost-share for conservation practices under 5- to 10-year contracts | NRCS State or local office |

## Habitat management recommendations

Protecting and enhancing aquatic habitat are the most effective ways to maintain or restore cutthroat trout populations. Any management plan should attempt to minimize the physical, chemical, biological, and hydrological disturbances that land management activities may have on cutthroat trout habitat or surrounding riparian areas. Landowners should also make every effort to maintain instream flows and healthy riparian areas for cutthroat trout and their food sources during all seasons of the year. On occasion, channel conditions may be so poor that structural improvements to the stream channel are warranted. Construction of instream improvements requires technical expertise and experience. Poorly designed and constructed improvements usually lead to further degradation of habitat or loss of channel and watershed stability. Consultation with and assistance from Federal, State, or local fish and wildlife or land management agencies is critical in identifying appropriate management actions and permit requirements.

### *Riparian areas*

Riparian areas are transitional zones between terrestrial and aquatic systems exhibiting characteristics of both systems. They perform vital ecological functions linking terrestrial and aquatic systems within watersheds. These functions include protecting aquatic ecosystems by removing sediments from surface runoff, decreasing flooding, maintaining appropriate water conditions for aquatic life, and providing organic material vital for productivity and structure of aquatic the ecosystems. They also provide excellent wildlife habitat, offering not only a water source, but food and shelter, as well.

Riparian areas are beneficial to cutthroat trout in a number of ways. The structurally and functionally diverse mix of riparian vegetation traps sediment contained in surface runoff, thereby reducing siltation of spawning substrates. The buffer also filters nutrients and contaminants in surface runoff, thus protecting water quality. Vegetation roots and foliage also serve to stabilize streambanks, which is particularly important during high flow events. Trees and shrubs provide shade that maintains cool water temperatures and habitat for riparian species including terrestrial insects that serve as food for juvenile cutthroat trout and other fish. Lastly, riparian vegetation, especially trees and shrubs, provides wood and organic matter to the stream for use by fish and other aquatic species. The wider and more structurally diverse the riparian area or buffer, the more value it will have for cutthroat trout.

If riparian areas are degraded or no buffer exists, native grasses, sedges, forbs, shrubs, and trees should be planted. The ideal riparian buffer zone incorporates the native plant community appropriate to the site. Riparian areas adjacent to cutthroat trout habitats are mostly forested. Managing riparian areas or buffers for mature stands of trees spaced sufficiently far apart to allow an understory of grasses and shrubs will improve cutthroat trout habitat over time. Trees should be close enough to the stream so that some of the tree's roots are exposed to supply cover and allow stable undercut banks to develop. This proximity to the channel also assures that some trees will fall into the stream, providing wood for habitat complexity.

Landowners can take an active role in maintaining and restoring riparian buffers by planting native woody species as seedlings or saplings. On the other hand, the landowner may choose to take a passive approach to restoration and simply allow natural recruitment of woody species along the streambank. If the landowner takes the more active approach, the following guidelines are recommended:

*NRCS*

**Riparian buffers reduce runoff into streams and provide shade and debris for waterway.**

- Seek assistance in determining the appropriate mix of locally adapted, native plant species and the current flood regimes of the stream and its watershed. Using plants adapted to the area will increase their survival and save time, money, and frustration. If it is not practical to plant the full complement of vegetation desired in the riparian area, plant the dominant species for the site, such as alder, willow, or conifer species, and other species will naturally be recruited over time.
- Typically, plant species at the edge of a stream are different from those farther away. The topography, aspect, soil, and hydrology of the riparian area provide diverse layers of different plant species. Landowners should seek the assistance of local soil and water resource professionals in choosing the species, number of plants, and location in the riparian zone for planting.

### *Large wood*

Large woody material in the form of fallen trees, limbs, and branches plays a major role in providing instream cover for cutthroat trout and channel complexity for stream processes such as pool formation and sediment deposition. In forested streams, logs provide cover for cutthroat trout when they fall into the stream from adjacent streambanks. In areas where logging has removed riparian forests, wood can be imported from outside the riparian zone and placed in the stream channel. Appropriately placed logs, especially those with intact root wads, will mimic the natural recruitment of fallen trees into the stream channel and cause stream channel movements and adjustments during rain events. Occasionally, logs are anchored in place, but in most situations it is best to simply place logs in streams and allow natural flows to reposition them over time. As with any instream structure, wood placement should be designed by technical specialists who understand the dynamics of stream systems. Projects should be implemented at the appropriate times to avoid impacts to cutthroat trout.

### *Fishways*

Human-created instream structures, such as dams, weirs, diversions, and culverts, hinder the ability of cutthroat trout and other fish to move freely within a watershed and to access critical habitats. If possible, human-made fish barriers should be removed or modified to allow fish passage. If these actions are not feasible, fishways can be installed to facilitate the passage of fish through or around a barrier. Fishways can be as simple as developing a series of pools and small rock "steps" over or around the barrier, which allow fish to swim into a pool, rest, and then swim up another step into the next pool, until they have cleared the barrier. Impassable culverts can be retrofitted with baffles or replaced with new culverts that allow fish to pass. For more detailed information regarding fish passage, refer to *http://wdfw.wa.gov/hab/engineer/habeng.htm* or *http://www.salmonidaho.com/screenshop/*.

*NRCS*

*Washington Department of Fish and Wildlife*

**Permanent (above) and temporary (below) fishways allow for the passage of migrating trout. Dams and culverts significantly reduce the amount of connected habitat available for use by cutthroat and other trout species.**

### *Livestock fencing*

Fencing to exclude livestock from streambanks, riverbanks, and lakes can reduce the collapse of undercut banks and reduce soil erosion and siltation caused by livestock trampling. Fencing livestock from waterways can also reduce the amount of livestock waste entering a water body, and thus protect water quality. If fencing is not a desirable option, consider seasonally rotating livestock and adjusting grazing plans to avoid impacts on cutthroat trout habitat during critical times of the year (spawning season). Providing attractants such as salt blocks and watering tanks at some distance from the surface water may also help. If livestock use the stream as a water source, a fenced chute can be built to allow livestock to access a limited section of the stream, or water can be pumped to a holding area that is accessible to the livestock.

*NRCS*

**Fencing out livestock from riparian areas and streambanks can reduce the collapse of banks and reduce soil erosion associated with livestock trampling.**

## Available assistance

Technical and financial assistance for management of fish and wildlife habitat is available to landowners through a variety of government agencies and other organizations. Landowners and managers should enlist the expertise of State and local natural resource professionals to help assess habitat quality and management practices for sustaining cutthroat trout populations and enhancing habitat. Some Federal assistance programs available through various sources are listed in table 4. State fish and wildlife agencies or groups such as Trout Unlimited may have additional assistance programs, publications, or other useful tools with a more local focus.

**Table 4** Assessment of habitat components and management suggestions

| Habitat component | Optimal conditions | Abundant | Limited | Absent | Management suggestions to improve limited or absent habitat component |
|---|---|---|---|---|---|
| General | Clean, cold water in diverse, connected habitat | | | | Limit activities in the watershed that may alter stream hydrology, increase fine sediments, alter the flood plain, or remove riparian vegetation, particularly in spawning and rearing streams |
| | | | | | Along streams, protect and restore native trees and shrubs to keep water temperatures cool |
| | | | | | Maintain a buffer of woody vegetation at least 80–100 ft or two channel widths between streams and agriculture fields to reduce siltation and nonpoint source pollution from fertilizer and pesticide runoff |
| | | | | | Fence livestock from streamside riparian vegetation |
| Food | Adults: Invertebrates, small fish, zooplankton | | | | Increase populations of forage fish and insects by carefully managing riparian buffers of native trees, grasses, forbs, and shrubs and protecting large woody material in the stream |
| | Juveniles: Invertebrates, such as mayflies, stoneflies, and caddisflies | | | | Increase populations of aquatic insects by keeping gravel beds from being embedded with fine sediment |
| Cover | Large wood, overhanging vegetation, undercut banks, boulders, and pools | | | | Preserve and plant native trees and shrubs along streams |
| | | | | | Maintain woody material and/or boulders in the stream reach |
| Spawning habitat | Very cold water and loose, clean gravel less than 3.35 in. in diameter, water depth of 3.5–11.8 in and water velocity of 6.2–23.6 in/s | | | | Protect spawning areas from trampling by livestock |
| | | | | | Reduce sediment inputs to streams |
| | | | | | Maintain the stream's natural hydrology (flow) |
| Overwintering habitat | Large, deep pools with abundant wood and/or rock cover; adequate sources of food | | | | Maintain woody material or other habitat elements in the stream to create deeper pools |

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