Stream Habitat Improvement and Management (ACRE)
Code 395

Montana Conservation Practice Specification Sheet

GENERAL SPECIFICATION

Stream Habitat Improvement and Management shall be planned and installed in accordance with the Field Office Technical Guide (FOTG), Section IV, Practice Standard. This document provides additional parameters, references, recommendations, and requirements for developing site-specific plans for this practice.

PURPOSE

1. Provide suitable habitat for desired aquatic species and diverse aquatic communities.
2. Provide channel morphology and associated riparian characteristics important to desired aquatic species.
3. Provide aesthetic values and recreation opportunities associated with stream habitats such as angling and fish viewing.

INVENTORY

A thorough investigation of the species and life stages present in the stream and their biology is required prior to planning.

The stream ecosystem will support a diverse biotic community only if it is dynamically stable. Every effort should be made to maintain or restore the natural dimension, pattern, and profile of the stream. Designs and improvements will be confined to the bankfull floods (1 to 3 year events). These considerations require that planners classify and evaluate stream reaches above and below the site to establish current conditions. The reach of stream evaluated must be at least one-half mile above and one-half mile below the site, using a classification such as Rosgen (1996). This will establish the physical parameters of the stream.

Some streams in Montana have a high sediment bedload in the natural condition. Classifying the stream will aid in determining whether the sediment is a result of upstream imbalances or a naturally high bedload system. Overall, sediment should be neither aggrading (depositing) nor degrading (scouring) in the stream. Sediment in high bedload streams may move in pulses downstream during periods of floods or high flows. Bedload must be allowed to move through the system. Aggrading or degrading sediments in the channel may indicate upstream imbalances.

Large woody material—such as logs or large branches—are required in some systems to prevent bank erosion, provide nutrients in water, habitat for fish, or moderate velocity during floods. Logs should be left in place in most cases unless determined to be causing significant degradation of the stream system.

INVENTORY CONTINUED

If the watershed above the site is in poor condition, then improvements at the site may be difficult to establish and impractical to implement.

The Stream Visual Assessment Protocol or the Montana NRCS Riparian Assessment will be used after classifying the stream to evaluate aquatic conditions. This will provide baseline stream conditions and give some insight into what practices are needed for habitat improvement.

Water quality data for fish and other organisms is necessary to establish current versus needed conditions. Temperature will determine what species of organisms can survive in the stream.

The Water Quality Indicators Guide will assist in determining general conditions in the stream for planning purposes.

Entrenchment may be so severe in some cases that widening must occur before a new floodplain can re-establish itself in the bottom of the gully. These gullies will be difficult to improve or restore.

If the system has a dam above the site, it will not have a natural runoff regime and restoration or improvements may be impossible or drastically altered.

The NRCS "Stream Corridor Restoration Handbook", also found under the National Engineering Handbook (NEH), Part 653, can be used to select and design some practices.

MANAGEMENT TO BENEFIT HABITAT

All work must be compatible with the needs of target species and with the geomorphology of the stream. See Rosgen (1996), pages 8-15 through 8-33, or other approved references.

> NOTE: The best way to provide habitat for fish and other aquatic species is to restore the appropriate geomorphological stream type for the site.

This may require restoration of appropriate stream channel features such as riffles, pools, sinuosity, bank stability, slope, width/depth ratio, entrenchment, connection to floodplain, etc. These stream features must be evaluated and may be placed to enhance or restore the stream system dynamics and be consistent with stream classification. Re-alignment, or other substantial modifications of a stream in order to restore the physical dimension, pattern and profile will require multiple disciplinary input and concurrence from the Army Corps of Engineers.

Prescribed grazing or deferment must be employed if cattle are using the stream and riparian system.

Grow riparian vegetation to shade the water surface, which will reduce algae growth and cool the water. Buffers planted next to the stream in three zones will also reduce or prevent pollution and sediment from entering the stream.

Allow vegetation to grow on the point bars to catch sediment and maintain the channel.

Allow floods (1 to 3 year) to reach the floodplain.

If exotic plants are to be removed in the riparian zone, suitable native replacement vegetation must be evaluated prior to implementation.

POOLS

Pools can be created if needed to restore the stream system. Generally, five to seven bankfull widths between pools in low bedload systems is adequate. Pools will be created by placing boulders, current deflectors, root wads, bank revetments, rock weirs, and low stage plunges or ledges.

Ledges or plunges are meant to create a pool on the lower side by scouring a plunge pool below the structure. They are to be no taller than one-quarter of the bankfull stage height. Maximum height of the waterfall must be no taller than 18 inches, so that fish can migrate upstream if necessary.

Randomly placed boulders in riffles and glides will create a pool around them.

Vortex rock weirs are cross-section structures made of large angular rocks buried in the streambed no higher than 10% of bankfull stage height. They work well in high bedload systems.

Vortex rock weirs are placed in the riffle section and will provide in-stream cover, deepen feeding areas in the riffle reach, provide a wide range of velocities at high flow without creating backwaters and sediment deposition, act as grade control structures without upstream lateral erosion, maintain a low width/depth ratio which reduces the likelihood of bar formation and maintain sediment transport capacity.

Current deflectors increase the water velocity to sour a pool under or near them. Pools can be soured in the center of the stream, under banks at the outside of curves, or straight sections. Current deflectors are usually made of logs and rocks.

RIFFLES

Riffles can be improved by scouring fine sediment from the gravel using current deflectors or placed boulders. Riffles aerate the water and grow aquatic insects for food sources for higher organisms.

SPAWNING HABITAT

Gravel beds are used by many species for egg laying substrate. The eggs are protected from predators, kept in place by micro-spaces of low velocity, are oxygenated, and rotated in gravels. Gravel 6 to 50 mm (1/4 to 2 inches) in diameter is the preferred substrate for smallmouth bass, shiners, and trout.

Gravel beds can be **improved** by scouring away fine sediments with current deflectors or placed boulders.

Gravel beds can be **created** by placement of gravels in lower velocity (between 0.6 and 0.9 m/sec.) areas with low gradient (less than 1.5%) usually between riffles and pools. Banks must be stable so that the bed is not covered by fine sediments.

Gravels can be captured by installing V-shaped traps with the apex pointing downstream. Another option is the log sill trap placed across the flow, very low in the profile. These require moderate velocities and may fill with fine sediments if banks are unstable in upstream sections.

SHADING

Shading of water is necessary to reduce or maintain temperature and reduce sunlight penetration that limits algae growth. Vegetation along the banks, such as trees and shrubs, can shade large areas of the creek. Large sedges, rushes, and grasses also provide shade and over hanging cover for fish.

COVER

Bank Cover: Natural bank cover such as grass overhanging into the water provides excellent places for fish to hide, rest, and forage. Maintenance of bank vegetation is essential to the health of the stream system and is of extreme importance. Prescribed grazing must be used if livestock have access to the stream.

Submerged Cover: Dead trees can be placed along the bank to create cover and shelter for fish. Such structures must be anchored to the bank by cables to prevent them from floating away. If these are placed on meanders they may cause bank erosion and may need additional bank stabilization measures. If placed on straight sections, they will provide adequate cover. Both of these are normally used on clay/silt bottom types.

Floating Cover: Logs can be floated and anchored along the banks to create overhanging cover for fish. These should be placed in areas of slow velocities.

Artificial Bank Cover: These structures are built with logs or lumber and rocks into the bank and extending over the water to create cover along the bank. Soil can be placed over the top to grow grass if built to accommodate the weight. Used in conjunction with a deflector to maintain a pool underneath, these are very effective on straight sections or along outside of long curves.

Placed Boulders: Boulders also provide low velocity areas for resting and foraging.

Large Woody Material: Naturally occurring logs in the stream provide cover and shelter for fish as well as modify the velocities during floods. They also provide a source of invertebrates for baseline ecosystem production.

BARRIERS

Barriers can be both beneficial and detrimental depending upon the intended use.

Barriers are desirable to restrict invasion of exotic species and maintain native species diversity.

Barriers can also be used to restrict the movement of desirable fish into irrigation diversions, ditches, pumps, or any area where unintentional entrapment could occur.

Barriers to free ranging fish can be detrimental and will stop annual migrations, spawning, and daily foraging.

STREAM BARBS

These structures are used where stream bank stabilization is needed to stop lateral channel migration, maintain the channel, provide resting places for fish, catch sediment, and grow vegetation. These are best built out of large angular rocks. They must be low enough to allow the stream to flow over the top during floods.

WATER QUALITY

The following water quality parameters are optimum conditions for fish and some deviations are expected:

WARM WATER ECOSYSTEMS:

- temperature 70 to 90 degrees F
- pH 7.2 to 8.4
- oxygen > 5 ppm
- carbon dioxide up to 20 ppm
- alkalinity 10 to 400 ppm
- hardness 10 to 400 ppm

WATER QUALITY CONTINUED

COLD WATER ECOSYSTEMS:

- temperature 50 to 70 degrees F
- pH 6.5 to 8.2
- oxygen > 5 ppm
- carbon dioxide up to 20 ppm
- alkalinity 10 to 400 ppm
- hardness 10 to 400 ppm

POLLUTION:

The Water Quality Indicators Guide and Stream Visual Assessment Protocol will be used to evaluate non-point sources due to sediment, salinity, manure, fertilizers, pesticides, and to plan adequate treatment.

WATERSHED

Upstream considerations may dictate what can be done to improve the reach. Excessive runoff, sedimentation, pollution, seasonal elimination of water flow, diversions, unrestricted recreational use, poorly managed grazing, and other considerations, which cause catastrophic aberrations in the stream, will have devastating effects on any attempt to manage, restore, maintain, or improve stream habitat.

POTENTIALLY APPLICABLE PRACTICES

Riparian Forest Buffers	(Code 391)
Riparian Herbaceous Cover	(Code 390)
Streambank and Shoreline Protection	(Code 580)
Channel Bed Stabilization	(Code 584)
Fence	(Code 382)
Tree/Shrub Establishment	(Code 612)
Grade Stabilization Structure	(Code 410)
Prescribed Grazing	(Code 528)
Fish Passage	(Code 396)

PLANS and SPECIFICATIONS

Specifications for this practice shall be prepared for each habitat type and locality. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION and MANAGEMENT

If the stream is in a reasonable state of dynamic stability, it should remain so for many years. The upstream watershed conditions will help determine the long-term stability after restoration or improvement. Management of the reach of concern will have to consider the physical, chemical, and biological functions of the stream ecosystem in order to maintain the health of the system.

REFERENCES

Riparian Assessment, Using the NRCS Riparian Assessment Method. USDA, Natural Resources Conservation Service. Environmental Technical Note, MT-2. September 2004. Online at: http://www.mt.nrcs.usda.gov/technical/ecs/environment/technotes/

Rosgen, David. 1996. Applied River Morphology, Wildland Hydrology, Pasgosa Spring, Colorado.

Stream Corridor Restoration Handbook. FISRWG (10/1998). Stream Corridor Restoration: Principles, Processes, and Practices. By the Federal Interagency Stream Restoration Working Group (FISRWG) (15 Federal agencies of the US government). GPO Item No. 0120-A; SuDocs No. A 57.6/2:EN 3/PT.653. ISBN-0-934213-59-3.

Stream Visual Assessment Protocol. National Water and Climate Center, Technical Note 99-1, December 1998. Online at: http://www.nrcs.usda.gov/technical/ECS/aquatic/svapfnl.pdf

The Water Quality Indicators Guide: Surface Waters (SCS-TP-161) online at:http://www.id.nrcs.usda.gov/technical/wq_indicators_guide.html or contact the Terrene Institute, 1717 K. Street NW, Suite 801, Washington, DC 20006.

ADDITIONAL SPECIFICATIONS AND NOTES

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