US Army Corps
of Engineers ®
Walla Walla District

SWEETWATER CREEK ECOSYSTEM RESTORATION

Feasibility Report with
Integrated Environmental Assessment

Appendix E

Conservation Measures

Implementation of the action alternatives would comply with the Endangered Species Act (ESA) through the 2019 *Idaho Habitat Restoration Programmatic Biological Assessment for the Salmon River Basin, Clearwater River Basin, Hells Canyon Subbasin, and the Lower Snake-Asotin Subbasin (Idaho)* and the associated 2019 *Programmatic Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Habitat Restoration Projects in the Salmon River Basin (HUC 170602), Clearwater River Basin (HUC 170603), Hells Canyon Subbasin (HUC 17060101), and Lower Snake-Asotin Subbasin (HUC 17060103*) (Programmatic Biological Opinion). To minimize the magnitude and duration of short-term adverse effects on ESA-listed species and critical habitat, and to avoid a chance of long-term adverse effects, all projects conducted under the Idaho habitat restoration project programmatic consultation must comply with specific conservation measures found in the Programmatic Biological Opinion. These conservation measures for the ESA-listed Snake River DPS steelhead were incorporated into the impact analysis and will be implemented to maintain compliance with the biological opinion. They are listed below.

1 PRE-CONSTRUCTION AND PROJECT DESIGN CONSERVATION MEASURES

Timing of in-water Work. In-water work will occur only from August 1 to October 30.

Fish Screens. All water intakes in which fish could be entrained and injured, including pumps used to isolate an in-water work area, will have a fish screen installed, operated, and maintained according to the criteria in NMFS (2011b or most current version).

Site Assessment for Contaminants. If an action involves excavation of more than 20 cubic yards of material in an area with past mining impacts or other land uses known to cause chemical contamination, then the Project Sponsor will complete a site assessment for contaminants.

Site Layout and Flagging. Prior to construction, the action area will be flagged to identify the following: (1) Sensitive resource areas, such as areas below the ordinary high water mark (OHWM), spawning areas, springs, and wetlands; (2) equipment entry and exit points; (3) road and stream crossing alignments; (4) staging, storage, and stockpile areas; and (5) no-spray areas and buffers for herbicides.

Temporary Erosion Controls. Temporary erosion controls shall be in place before any significant disturbance of soils, or loss of ground cover, and will be installed downslope of project activity within the riparian buffer area until site rehabilitation is complete. Once the site is stabilized, temporary erosion control measures must be removed.

Emergency Erosion and Chemical Spill Controls. The non-federal Sponsor will ensure that the following materials for emergency control of erosion and chemical spill control are onsite: (1) An adequate supply of sediment control materials (e.g., silt fence, straw bales2); and (2) an oil-absorbing floating boom and absorbent pads whenever surface water is present.

Temporary Access Roads. The Project Sponsor will ensure the following conservation measures are applied to temporary access roads:

1. Do not build temporary access roads where grade, soil, or geomorphic features suggest slope instability, including slopes greater than 30 percent.

2. Minimize the removal of riparian vegetation when creating temporary access roads.

3. Minimize the number and length of temporary access roads, and design roads to avoid erosion and soil compaction.

4. At temporary stream crossings, equipment will cross the stream in the wet only under the following conditions:

    a. No stream crossings may occur at sites where: (1) Adults are actively spawning, or immediately upstream (300 feet) of actively spawning adults; (2) holding adult ESA-listed fish are present; or (3) eggs or alevins are in the gravel.

    b. Do not place temporary crossings in areas that may increase the risk of channel re-routing or avulsion, or in potential spawning habitat (e.g., pools and pool tailouts).

    c. If temporary stream crossings are anticipated to exceed two round trips, use existing stream crossings, or install temporary bridges and culverts to allow for equipment and vehicle crossing to minimize impacts to ESA-listed fish species and habitat, unless otherwise approved by a NMFS and USFWS biologist.

    d. Equipment and vehicles may cross the stream in the wet only where the streambed is bedrock and where the streambed is naturally stable, at existing hardened fords, or where mats or off-site logs are placed in the stream and used as a crossing. Vehicles and machinery will cross streams at right angles to the main channel wherever possible.

    e. Where necessary to minimize impacts to the stream, and temporary stream crossings are anticipated to exceed two round trips, install temporary bridges and culverts to allow for equipment and vehicle crossing over wetted streams to access construction areas.

5. When the project is completed, all temporary access roads will be obliterated, and the soil will be stabilized and revegetated.

Choice and Use of Equipment. Heavy equipment will be selected (when possible) and operated in a manner that minimizes adverse effects to the environment (e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).

Vehicle Staging. All equipment shall be cleaned and leaks repaired at least 150 feet from any natural waterbody or wetland prior to entering the project area. The Project Sponsor will

remove external oil and grease prior to arriving onsite. Thereafter, equipment will be inspected daily for leaks or accumulations of grease, and any identified problems fixed before operation within 150 feet of any natural waterbody or wetland.

Invasive Species. Inspect and, if necessary, wash vehicles and equipment to prevent introducing terrestrial invasive species prior to bringing equipment on the work site. Inspect and sanitize water craft, waders, boots, and any other gear to be used in or near water to prevent the spread of invasive species or whirling disease.

Erosion and Sediment Control. Erosion and sediment control are paramount considerations for all ground-disturbing construction activities, particularly when activities occur in or near waterways. The Project Sponsor will describe all temporary and permanent erosion and sediment control measures to be used during the project on the Project Information Form.

1. A supply of emergency erosion control materials will be on hand; and temporary erosion controls will be installed and maintained in place until site restoration is complete unless site conditions, soils, etc., prevent effective use of temporary erosion controls.

2. Ground disturbance will not occur during wet conditions (i.e., during or immediately following rain events), depending on local soil conditions.

3. Sequence or schedule work to reduce exposed bare soil subject to wind erosion.

4. Vegetation may be grubbed only from areas where permanent ground alteration will occur. Vegetation is to be cut at ground level and root wads retained where temporary clearing occurs.

5. Wood fiber mulch and tackifier (hydro-applied) may be used to reduce erosion of bare soil.

6. Permanent soil stabilization outside the OHWM is best accomplished with reestablishment of native vegetation where possible.

7. For all projects, sediment will be removed from erosion controls once the sediment has reached one-third of the exposed height of the control.

Re-watering Stream Channels. For stream channels which have been isolated and dewatered during project construction: (1) Reconstructed stream channels will be "pre-washed" into a reach equipped with sediment capture devices, prior to reintroduction of flow to the stream; and (2) stream channels will be re-watered in a manner to minimize a sudden increase in turbidity. Additional site-specific conservation recommendations should be employed as necessary to reduce the magnitude, frequency, and duration of turbidity plume events in excess of 50 nephelometric turbidity units (NTUs) over background levels.

Prevention of Chemical Contamination from Construction Equipment and Materials. In order to minimize the potential for introducing hazardous materials to the aquatic system, the Project Sponsor will adhere to the following measures:

1. No uncured concrete or form materials will be allowed to enter the active stream channel.

2. All vehicle staging, fueling, storage and washout areas will be located at least 150 feet away from aquatic areas and adequately buffered such that runoff is incapable of being delivered to surface waters or wetlands.

3. Any waste liquids generated at the staging areas will be temporarily stored under cover on an impervious surface such as tarpaulins until such time they can be properly transported to and treated at an approved facility for treatment of hazardous materials.

4. Spill containment kits adequate for the types and quantity of hazardous materials stored at the site are required.

5. All vehicles will be thoroughly cleaned before use at the site.

6. Hydraulic fluids used in any vehicle that will be operated in live water will be non-toxic to salmonids.

Stockpile Materials. Any LWD, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration.

Pesticide and Preservative-treated Wood. Treated wood may not be used in a structure (e.g., bridge) that will be in or over water or permanently or seasonally flooded wetlands.

2 CONSTRUCTION CONSERVATION MEASURES

Work Area Isolation. Any work within the wetted channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is 300 feet upstream from spawning habitats.

Removing Fish from Instream Work Areas. When work area isolation is required, a fish biologist will determine how to remove ESA-listed fish, with least harm to the fish, before in-water work begins. This will involve either passive movement of fish out of the project reach through slow dewatering, or actively removing the fish from the project reach.

Earthwork. Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.

Rock. Riprap may be used to protect culvert inlet/outlets within the road prism when culvert upgrades or installation are a component of the restoration project. Rock for instream structures will not be mined from the stream.

Construction Water. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate. Diversions for construction water will be appropriately screened (NMFS 2011a), will not exceed 10 percent of the available flow, and will have the appropriate state of Idaho permitting (i.e., temporary water right).

Discharge Water. Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.

Stationary Power Equipment. Generators, pumps, cranes, and any other stationary equipment operated within 150 feet of any natural waterbody or wetland will be maintained as necessary to prevent leaks and spills from entering the water.

Power Equipment. Gas-powered equipment with tanks larger than 5 gallons will be refueled in a vehicle staging area placed 150 feet or more from any natural waterbody or wetland.

Work from Top of Bank. Heavy equipment will work from the top of the bank. Heavy equipment will only work from the stream channel if the channel has been dewatered or is naturally dry.

High Flows. Project operations will cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

Unnatural Debris Removal. During and upon project completion, all temporary work structures, devices, equipment, materials, collected silt, excess debris, construction and other man-made debris, shall be completely removed from within the project footprint, if practical and within the scope of work (e.g., does not increase the area to be dewatered, or expose fish to greater turbidity than what was originally projected, etc.).

3 POST-CONSTRUCTION CONSERVATION MEASURES

Site Restoration. When construction is finished, all streambanks, soils, and vegetation will be cleaned and restored as necessary using stockpiled LWD, topsoil, slash, and native channel material to renew ecosystem processes that form and maintain productive fish habitats.

Revegetation. Each area requiring revegetation will be replanted prior to or at the beginning of the first growing season following construction. Reestablishment of vegetation will be achieved in disturbed areas to at least 70 percent of pre-project conditions within 3 years

Site Access. The Project Sponsor and lead action agency will retain the right of reasonable access to the site of actions funded, permitted, or carried out using this Opinion, such that the Project Sponsor can monitor the success of the project.

Obliteration. When the project is completed, all temporary access roads will be obliterated, the soil will be stabilized, and the site will be revegetated.

4 CONSERVATION MEASURES FOR INSTREAM STRUCTURES

Grade Control through Boulder Weirs or Roughened Channels. The Project Sponsor may install boulder weirs and roughened channels for grade control at culverts, to mitigate headcuts, and to provide passage at small dams or other channel obstructions that cannot otherwise be removed. Structures will be constructed from rock or wood.

For boulder weirs, roughened channels, and other grade control structures that have an aggregate height of greater than 3 feet, NMFS will review the design plans and engineering calculations. The Project Sponsor should provide NMFS with the following information, plus any additional information requested:

1. A longitudinal profile of the stream channel thalweg for 20 channel widths upstream and downstream of the structure shall be used to determine the potential for channel degradation.

2. A minimum of three cross-sections; one downstream of the structure, one through the reservoir area upstream of the structure, and one upstream of the reservoir area outside of the influence of the structure, to characterize the channel morphology and quantify the stored sediment.

The following conservation measures apply for grade control structures:

- All structures will be designed to fish passage standards described in NMFS fish current passage criteria (NMFS 2011a or most recent version).
- Boulder weirs will be installed low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).
- Boulder weirs are to be placed diagonally across the channel, or in more traditional upstream pointing “V” or “U” configurations with the apex oriented upstream. The apex should be lower than the structure wings to support low flow consolidation.
- Boulder weirs are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. This can be accomplished by providing plunges no greater than 6 inches in height, allowing for juvenile fish passage at all flows.
- Key weirs into the stream bed to minimize structure undermining due to scour, preferably at least 2.5 times their exposure height. The weir should also be keyed into both banks, if feasible greater than 8 feet.
- Include fine material in the weir material mix to help seal the weir/channel bed, thereby preventing subsurface flow. Geotextile material can be used as an alternative approach to prevent subsurface flow.

- Rock for boulder weirs shall be durable and of suitable quality to ensure permanence in the climate in which it is to be used. Rock sizing depends on the size of the stream, maximum depth of flow, planform, entrenchment, and ice and debris loading.
- Full spanning boulder weir placement shall be coupled with measures to improve habitat complexity (LWD placement, etc.) and protection of riparian areas.
- The use of gabions, cable, or other means to prevent the movement of individual boulders in a boulder weir is not allowed.

Headcut stabilization shall incorporate the following measures:

- Armor head-cut with sufficiently sized and amounts of material to prevent continued upstream movement. Materials can include both rock and organic materials which are native to the area.
- Focus stabilization efforts in the plunge pool, the head cut, as well as a short distance of stream above the headcut.
- Minimize lateral migration of channel around head cut ("flanking") by placing rocks and organic material at a lower elevation in the center of the channel cross section to direct flows to the middle of channel.
- Provide fish passage over a stabilized head-cut through a series of log or rock weir structures or a roughened channel.
- Construct headcut stabilization structures using streambed simulation bed material, which will be washed into place until there is apparent surface flow and minimal subsurface material, to ensure fish passage immediately following construction if natural flows are sufficient.
- Construct headcut stabilization structures with stream simulation materials and fines added and pressure-washed into the placed matrix. Successful washing will be determined by minimization of voids within placed matrix such that ponding occurs with little to no percolation losses. This will ensure fish passage during low flows immediately following construction.
- Whenever possible, also address the cause of the head cut as a part of the restoration action.

Large Wood, Boulder, and Gravel Placement. This action includes large wood and boulder placement, engineered logjams (ELJs), gravel placement and tree removal for large wood projects. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (i.e., large wood removal), riparian timber harvest, or other riparian and channel modifications, and in areas where natural gravel supplies are low due to anthropogenic disruptions.

For instream structures, the Project Sponsor will use materials that are appropriate for the particular channel type, project objectives, and site conditions. In most cases, wood for instream structures will come from outside of riparian areas. In projects where logs will be hauled to the site, the logs shall be obtained from upland areas.

The Project Sponsor will include sketches or engineering plans in the Project Information Form.

The following conservation measures apply to large wood and boulder projects:

- Place large wood and boulders in areas where they would naturally occur, and in a manner that closely mimics natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low-gradient meadow streams.
- Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, windthrow, and tree breakage.
- No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.
- The partial burial of large wood and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.
- Large wood includes whole conifer and hardwood trees, logs, and rootwads. Large wood size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 times bankfull channel width in length, while logs without rootwads should be a minimum of two times bankfull width long.
- The Project Sponsor will procure logs from an upland area to use as large wood. However, if a NMFS biologist approves, riparian trees may be dislodged or felled for constructing instream habitat in areas where the project: will not significantly impact stream shading or streambank stability; sufficient natural recruitment of native woody vegetation is expected; the threat of invasive vegetation filling created gaps is minimal and replanting with native woody species is planned; and, the trees to be felled are not providing suitable habitat for ESA-listed terrestrial species.
- Structures may partially or completely span stream channels or be positioned along streambanks.
- Stabilizing or key pieces of large wood will be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish.

Consider orienting key pieces such that the hydraulic forces upon the large wood increase stability.

- Anchoring large wood alternatives may be used in preferential order:
    - Use adequately-sized wood sufficient for stability.
    - Orient and place wood in such a way that movement is limited.
    - Use ballast (gravel or rock) to increase the mass of the structure to resist movement.
    - Use vertical piles of untreated wood.
    - Use large boulders as anchor points for the large wood.
    - Secure large wood with manila, sisal, or other biodegradable ropes with lashing connections to large rock to increase its weight. For streams that are entrenched (Rosgen Channels F, G, A, and potentially B), or for other streams with very low width to depth ratios (less than 12), an additional 60 percent ballast weight may be necessary due to greater flow depths and higher velocities.
    - Anchoring large wood by cable is not included in this programmatic.

The following conservation measures apply for ELJs:

- The ELJs will be patterned, to the greatest degree possible, after stable natural log jams.
- Grade control ELJs will be designed to arrest channel down-cutting or incision by providing a grade control that retains sediment, lowers stream energy, and increases water elevations to reconnect floodplain habitat and diffuse downstream flood peaks.
- Stabilizing or key pieces of large wood that will be relied on to provide streambank stability or redirect flows will be intact and solid (little decay).
- If possible, acquire large wood with untrimmed rootwads to provide functional refugia habitat for fish.
- When available, trees with rootwads attached should be a minimum length of 1.5 times the bankfull channel width, while logs without rootwads should be a minimum length of two times the bankfull width.
- The partial burial of large wood and boulders may constitute the dominant means of placement, and key boulders (footings) or large wood can be buried into the streambank or channel.
- Angle and offset. The large wood portions of ELJ structures should be oriented such that the force of water upon the large wood increases stability. If a rootwad is left exposed to the flow, the bole placed into the streambank should be oriented downstream,

parallel to the flow direction so the pressure on the rootwad pushes the bole into the streambank and bed. Wood pieces that are oriented parallel to flow are more stable than members oriented at 45 or 90 degrees to the flow.

- If large wood anchoring is required, a variety of methods may be used. These include buttressing the wood between riparian trees, or the use of manila, sisal, or other biodegradable ropes for lashing connections. Rock may be used for ballast but is limited to that needed to anchor the large wood.

The following conservation measures apply to gravel augmentation projects:

- Gravel can be placed directly into the stream channel, at tributary junctions, or in other areas in a manner that mimics natural debris flows and erosion.
- Augmentation will only occur in areas where the natural supply has been eliminated, significantly reduced through anthropogenic disruptions, or used to initiate gravel accumulations in conjunction with other projects, such as simulated log jams and debris flows.
- Gravel to be placed in streams shall be a properly sized gradation for that stream, clean alluvium with similar angularity as the natural bed material. When possible, use gravel of the same lithology as found in the watershed. Reference Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USFS 2008) to determine gravel sizes appropriate for the stream.
- Crushed rock is not permitted.
- After gravel placement in areas accessible to higher streamflow, allow the stream to naturally sort and distribute the material.
- Do not place gravel directly on bars and riffles that are known spawning areas, which may cause fish to spawn on the unsorted and unstable gravel, thus potentially resulting in redd destruction.
- Imported gravel will be free of invasive species and non-native seeds. If necessary, wash gravel prior to placement.

Reconnection of Historical Side Channels. Conservation Measures associated with side channel projects include the following:

- Side channel habitat will be constructed to prevent fish stranding by providing a continual positive grade to the intersecting river or stream, or by providing a year-round water connection.
- Ditches previously constructed to drain wetlands will be filled with native material, primarily obtained from the spoil material generated when the ditch was first

constructed. The final contour will approximate the natural topography to the degree the available material allows.

- Side-channel improvements can include minor excavation (<10 percent) of naturally accumulated sediment within historical channels.
- Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.
- Excavation depth will never exceed the maximum thalweg depth in the main channel.
- Restoration of existing side channels including one-time dredging and an up to two-time project adjustment, including adjusting the elevation of the created side channel habitat.
- Adequate precautions will be taken to prevent the creation of fish passage issues or stranding of juvenile or adult fish.
- Excavation and construction work for side channels will be conducted in isolation from the main channel.

Set-back or Removal of Existing Berms, Dikes, Levees, and Fill, and Revegetation. Conservation Measures for set-backs, berms, dikes, levees, fill, and revegetation include:

- Design actions to restore floodplain characteristics (i.e., elevation, width, gradient, length, and roughness), in a manner that closely mimics, to the extent possible, those that would naturally occur at that stream and valley type.
- Any non-native levee material removed will be hauled to an upland site. Native material may be spread across the floodplain provided it does not restrict riparian vegetation establishment, floodplain capacity, and does not result in stranding of juvenile salmonids.
- Remove drain pipes, fences, and other man-made structures to the greatest degree possible.
- Where it is not possible to remove or set-back portions of dikes and berms, or in areas where existing berms, dikes, and levees support abundant riparian vegetation, openings may be created with breaches. Berms, dikes, or levees shall always be breached in a manner that ensures flows will naturally recede back into the main channel to minimize the likelihood of fish entrapment.
- When full removal is not possible and a setback is required, the new structure locations should be prioritized, if possible, to the outside of the meander belt width or to the outside or the channel meander zone margins.

5 CHANNEL RECONSTRUCTION/RELOCATION

Channel reconstruction consists of re-meandering or movement of the primary active channel, and may include structural elements such as streambed simulation materials, streambank structures, and hydraulic roughness elements. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder weirs shall be preferentially used in step-pool and cascade stream types. Material selection (large wood, rock, gravel) shall also mimic natural stream system materials.

The reconstruction or relocation of existing stream channels will be accomplished through excavation and structure placement (large wood and boulders), or by rerouting streamflow into historic or newly constructed channels that are typically more sinuous and complex. The Project Sponsor will design the overall project to restore floodplain characteristics (i.e., elevation, width, gradient, length, and roughness), in a manner that closely mimics, to the greatest degree possible, those that would naturally occur at that stream and valley type.

Construction work and excavation should only take place in dry channels. If necessary to create dry conditions for excavation work, streamflow will be diverted to an existing channel, side channel, or pipe. Where minimal work in the wet will demonstrate reduced impacts to stream function and aquatic habitat other than coffer-damming and/or diversion flow, then work in the wet may occur.

Conservation measures associated with channel reconstruction/relocation projects include:

- To the greatest degree possible, remove nonnative fill material from the floodplain to an upland site.
- When necessary, loosen compacted soils once overburden material is removed. Overburden or fill comprised of native materials, which originated from the project area, may be used within the floodplain where appropriate to support the project goals and objectives.
- Ensure that structural elements fit the geomorphic context of the stream system. For bed stabilization and hydraulic control structures, constructed riffles shall be preferentially used in pool-riffle stream types, while roughened channels and boulder weirs shall be preferentially used in step-pool and cascade stream types. Material selection (e.g., large wood, rock, gravel) shall also mimic natural stream system materials.
- Construct the streambed using Stream Simulation Design principles as described in Section 6.2 of the 2008 USFS document Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings (USFS 2008), or another appropriate design guidance document.

- All channel reconstruction work and excavation will occur in dry channels. If dewatering of the existing channel is necessary, streamflow will be rerouted through a pipe or bypass channel prior to work beginning.
- Fish passage will be provided for any ESA-listed adult or juvenile fish likely to be migrating through the action area during construction. However, a bypass channel or pipe may be used in small streams on a case-by-case basis, subject to NMFS review.

6 RIPARIAN HABITAT

Conservation measures associated with planting of riparian vegetation include:

- Use only native plant species.
- Use certified noxious weed-free seed (99.9 percent), hay, straw, mulch, or other vegetation material.

Livestock Restrictions.

Conservation Measures associated with fencing include:

- To the extent possible, fences will be placed outside the channel migration zone and allow for lateral stream movement.
- Minimize vegetation removal, especially potential LWD recruitment sources, when constructing fence lines.
- Where appropriate, construct fences at water gaps in a manner that allows passage of LWD and other debris.
- When using pressure treated lumber for fence posts, complete all cutting/drilling offsite (to the extent possible) so that treated wood chips and debris do not enter water or flood prone areas. Pressure-treated lumber will not be used for fence posts in areas with frequent water contact. In these instances, alternative materials such as steel, concrete, and rot resistant wood (e.g., locust) will be used.
- Riparian fencing is not to be used to create livestock handling facilities.

Removal of Non-native Invasive Plants

Three mechanisms are proposed for control of invasive plants. These methods may be combined using an integrated weed management plan.

- Manual – Includes hand pulling and grubbing with hand tools; bagging plant residue for burning or other proper disposal; mulching with organic materials; shading or covering unwanted vegetation; and controlling brush and pruning using hand and power tools such as chain saws and machetes.

- Mechanical – Includes techniques such as mowing, tilling, disking, or plowing. Mechanical control may be carried out over large areas or be confined to smaller areas (known as scalping). Ground-disturbing mechanical activity will be restricted adjacent to streams, lakes, ponds, wetlands and other identified sensitive habitats. For slopes over

- Chemical – The Project Sponsor may also propose to kill invasive weeds with herbicides. Herbicides will be applied in liquid or granular form using wand or boom sprayers mounted on or towed by trucks, backpack equipment containing a pressurized container with an agitation device, injection, hand wicking cut surfaces, and ground application of granular formulas. Herbicides will be mixed with water as a carrier (no oil-based carriers will be used) and may also contain one of several additives (see adjuvant paragraph below) to promote saturation and adherence, to stabilize, to enhance chemical reactions, or to provide a dye. Aerial treatment is not part of this proposed action. Treatment of aquatic weeds with herbicides is also not part of the proposed action.

Application of Herbicides

- Herbicides approved for use under this consultation and associated application restrictions and buffers can be found in the appended Biological Opinion.

- All mixing of herbicides will occur at least 150 feet from surface water or well heads to minimize the risk of an accidental discharge.

- All hoses used to add dilution water to spray containers will be equipped with a device to prevent back-siphoning.

- Applicators will mix only those quantities of herbicides that can be reasonably used in a day.

- All empty containers will be triple rinsed and rinsate disposed of by spraying near the treatment site at rates that do not exceed those on the treatment site.

- No chemical herbicides will be used within a 100-foot radius of any potable water spring development.

- Herbicides will be applied at the lowest effective label rates, including the typical and maximum rates given. For broadcast spraying, application of herbicide or surfactant will not exceed the typical label rates.

- Dyes (e.g., Insight) will be used in riparian areas, and other locations as appropriate to provide visual evidence of treated vegetation. Dyes should be used around any sensitive areas, or where larger areas are sprayed (especially when using boom sprayers, for example), to reduce overlap and overapplication. Hilight, however, will not be used within 50 feet of the water's edge.

- The Project Sponsor will use herbicides and surfactants with the least toxicity to ESA-listed fish and other non-target organisms whenever possible.
- The Project Sponsor will use caution when applying herbicides near streams or roadside ditches that drain directly into streams. Herbicides containing glyphosate without surfactants or toxic additives, such as Rodeo®, will be the product of choice under appropriate site conditions.
- The Project Sponsor will avoid the use of picloram, clopyralid, chlorsulfuron, dicamba, imazapic, triclopyr, and metsulfuron-methyl within annual floodplains where the water table is within 6 feet of the surface and soil permeability is high (silt loam and sand soils).
- The Project Sponsor will ensure that herbicides are not applied when wind speeds are less than 2 mph if the potential for temperature inversions exists.
- Most weed patches are expected to have overland access. However, some sites may be reached only by water travel, either by wading or inflatable raft (or kayak). The following measures will be used to reduce the risk of a spill during water transport: (1) No more than 2.5 gallons of herbicide will be transported per person or raft, and typically it will be 1-gallon or less; (2) herbicide will be carried in 1-gallon or smaller plastic containers. The containers will be wrapped in plastic bags and then sealed in a dry-bag. If transported by raft, the dry-bag will be secured to the watercraft.
- On the Project Completion Form, the Project Sponsor will list all herbicides use and acres treated.

Streambank Stabilization. The following conservation measures apply to streambank stabilization projects:

- Without changing the location of the bank toe, damaged streambanks will be restored to a natural slope and profile suitable for establishment of permanent woody vegetation. This may include sloping of unconsolidated bank material to a stable angle of repose, or the use of benches in consolidated, cohesive soils.
- Streambank restoration projects shall include the placement of a riparian buffer strip consisting of a diverse assemblage of species native to the action area or region, including trees, shrubs, and herbaceous species, as appropriate to site conditions. Certified seed sources that are free of noxious or invasive species will be used.
- Large wood may be used as an integral component of streambank protection treatments. Large wood will be placed to maximize near bank hydraulic complexity and interstitial habitats through use of various large wood sizes and configurations of the placements.

- Structural placement of large wood should focus on providing bankline roughness for energy dissipation versus flow redirection that may affect the stability of the opposite bankline.
- Wood that is already within the stream or suspended over the stream may be repositioned to allow for greater interaction with the stream.
- Large wood anchoring will not utilize rebar, cable, or chain. Wooden posts, manila, sisal, or other biodegradable ropes may be used for structural and lashing connections.
- Rock will not be used for streambank restoration, except as ballast to stabilize large wood, unless it is necessary to prevent scouring or downcutting of an existing flow control structure (e.g., culvert or bridge support, headwall).
- Fencing will be installed as necessary to prevent access and grazing damage to revegetated sites and project buffer strips.
- Surface fertilizer will not be applied within 50 feet of any stream.