Hydraulic Code Rules (WAC 220-110) Pertaining to Forest Practices

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Version 4 (9/26/13)

220-110-080 Mitigation requirements for hydraulic projects

All projects must meet the requirements in WAC 220-110-080 – Mitigation requirements for hydraulic project approvals and the requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Generally, mitigation is an action taken to lessen the impact of another action. The department defines mitigation as sequentially avoiding impacts, minimizing impacts, or compensating for remaining unavoidable impacts. The department mitigates impacts to fish life from hydraulic projects through the application of the requirements in this chapter.

(2) FISH LIFE CONCERNS

Most work in or near water can negatively impact fish life. Best management practices such as proper design and siting, construction timing, isolation of the work area, sediment and erosion control planning, water-quality management, and re-vegetation can avoid and minimize many of these impacts. However, remaining impacts may require compensation to offset the loss of fish habitat function and area by habitat type.

(3) MITIGATION REQUIREMENTS

(a) The department must determine the project impact, severity of impact, and amount of mitigation required to achieve no net loss based on the best available information.

(b) The permittee or authorized agent must pay for any surveys, studies or reports required by the department to determine if the proposed mitigation will protect fish life.

(c) All work subject to this chapter must achieve no net loss through a sequence of mitigation actions.

(d) Mitigation includes all of the action steps in the mitigation sequence. The department and the applicant must consider and implement mitigation actions in the following sequential order:

(i) Avoid the impact altogether by not taking a certain action or parts of an action.

(ii) Minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts.

(iii) Rectify the impact by repairing, rehabilitating, or restoring the affected environment.

(iv) Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action.

(v) Compensate for remaining impacts by replacing, enhancing, or providing substitute resources or environments.

(e) The department may require advanced mitigation.

(4) COMPENSATORY MITIGATION

(a) Compensatory mitigation is not required for hydraulic projects that do not cause measurable adverse impacts after other actions in the mitigation sequence are completed.

(b) The department must determine compensatory mitigation actions needed to offset impacts remaining after other actions in the mitigation sequence are completed.

(c) When compensatory mitigation is necessary to offset impacts, the department prefers compensatory mitigation actions that restore impacted functions on-site or immediately adjacent to the impact site. However, the department will consider off-site mitigation if it is more cost effective and it provides more benefit to the fish species or fish stock impacted by the work. The department may not limit the scope of compensatory mitigation options to areas on or near the project site, or to habitat types of the same type as contained on the project site. The department must fully review and give due consideration to compensatory mitigation proposals that improve the overall biological functions and values of the watershed or bay and accommodate the mitigation needs of the infrastructure development or non-infrastructure development, including proposals or portions of proposals that are explored or developed in RCW 90.74.040.

(d) The department will base mitigation credits and debits on a scientifically valid measure of fish habitat function, value, and area. Mitigation must compensate for temporal losses, uncertainty of performance, and differences in habitat functions, types and value.

(e) The department will consider use of credits from an approved programmatic option such as a fish conservation bank, a joint 404/401 mitigation and fish conservation bank or in-lieu fee program as a form of compensation only after the standard mitigation sequencing has occurred at the impact site. These credits should benefit the same fish stocks or fish species as those impacted by the hydraulic project.

(f) The department may require monitoring to determine the extent and severity of impacts and the effectiveness of the compensation projects. The department may require corrective measures needed to achieve performance goals and objectives specified in the HPA.

(g) The environmental baseline for purposes of calculating compensatory mitigation requirements under this chapter is habitat conditions at the time the HPA application is submitted.

(h) The department will evaluate impacts caused by a hydraulic project by comparing the condition of the habitat before project construction or the performance of work to the expected condition of the habitat after project completion.

(i) Routine maintenance and repair work on an existing structure does not require compensatory mitigation unless:

(i) The maintenance and repair work causes a new loss of habitat function or area not associated with the original construction.

(ii) The work increases or changes the footprint of the existing structure.

(j) Rehabilitation and replacement of a structure does not require compensatory mitigation unless:

(i) The new design or other changes cause a new net loss of habitat function or area not associated with the original construction.

(ii) Construction activities associated with the rehabilitation and replacement project causes a new net loss of habitat function or area not associated with the original construction.

(iii) The rehabilitated or replaced structure does not comply with the technical requirements in this chapter or does not provide equal or greater protection for fish life when compared to the technical requirements this chapter.

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(k) Removal of a man-made or engineered structure does not require compensatory mitigation. However, the department may require bank resloping, revegetation, and other job site stabilization measures following structure removal.

(l) The department may require the project proponent to submit a monitoring and contingency plan to ensure the compensatory mitigation meets the performance goals and objectives. This plan may be part of a larger mitigation plan.

(5) MITIGATION PLAN

(a) The department may require a mitigation plan for projects with unavoidable adverse impacts and those with ongoing, complex, and experimental mitigation actions.

(b) The department must notify the applicant in writing if a mitigation plan is required and specify what the plan must include.

(c) The person may use a mitigation plan to propose compensatory mitigation within a watershed. A mitigation plan must:

(i) Contain language that guarantees long-term viability of the created, restored, enhanced, or preserved habitat, including assurances for protecting any essential biological functions and values defined in the mitigation plan;

(ii) Contain language for long-term monitoring of any created, restored, or enhanced mitigation site; and

(iii) Be consistent with the local comprehensive land use plan and any other applicable planning process in effect for the development area, such as an adopted sub basin or watershed plan.

(d) The department is not required to grant approval to a mitigation plan that does not provide equal or greater fish habitat functions and values within the watershed or bay.

(e) When making a permit decision, the department must consider whether the mitigation plan provides equal or greater fish habitat functions and values, compared to the existing conditions, for the target fish species or fish stocks identified in the mitigation plan. This consideration must be based upon the following factors:

(i) The relative value of the mitigation for the target fish species or fish stocks, in terms of the quality and quantity of habitat functions and values provided;

(ii) The compatibility of the proposal broader resource management and habitat management objectives and plans, such as existing resource management plans, species recovery plans, watershed plans, critical areas ordinances, the forestry riparian easement program, the riparian open space program, the family forest fish passage program, and shoreline master programs;

(iii) The ability of the mitigation to address scarce functions or values within a watershed;

(iv) The benefits of the proposal to the broader watershed landscape, including the benefits of connecting various habitat units or providing population-limiting habitats or functions for target fish species;

(v) The benefits of early implementation of habitat mitigation for projects that provide compensatory mitigation in advance of the project's planned impacts; and

(vi) The significance of any negative impacts to non-target fish stocks, fish species or resources.

(f) A mitigation plan may be approved through a memorandum of agreement between the project proponent and the department.

(i) The department will require a memorandum of agreement between the project proponent and the department if mitigation actions including monitoring exceed the life of the HPA.

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220-110-100 Common construction requirements

WAC 220-110-100 has common construction requirements that apply to many kinds of hydraulic projects. All projects must meet the requirements in WAC 220-110-080 – Mitigation requirements for hydraulic project approvals and the requirements in WAC 220-110-100 through 220-110-440 that are included in the HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Common construction requirements can apply to many hydraulic projects. However, not all common construction requirements will be applied to a specific project. Common construction requirements include job site access, equipment use, construction materials, sediment and erosion control containment, in-water work area isolation, fish removal, and job site repair and revegetation.

(2) FISH LIFE CONCERNS

Construction and other work can negatively affect fish life. Some activities may kill or injure fish while others can cause behavioral changes that reduce fish growth and survival. Some activities can damage the habitat used for spawning and egg incubation, rearing, feeding, hiding from predators and migration.

(3) STAGING AREAS

(a) Establish staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, hazardous material storage, etc.) in a manner and at a location that will prevent contaminants including but not limited to, petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials from entering waters of the state.

(4) JOB SITE ACCESS

(a) Avoid and then minimize the number of temporary access roads. Use existing roadways or travel paths whenever possible.

(b) Design and locate temporary access roads to avoid sediment from erosion entering waters of the state.

(c) Mark boundaries of clearing limits associated with site access and construction to avoid and minimize damage or removal of riparian, wetland and aquatic vegetation.

(5) EQUIPMENT USE

(a) Avoid and minimize damage or removal of riparian, aquatic and wetland vegetation by confining the use of equipment to specific access and work corridors.

(b) Unless there are geological, engineering or safety constraints, use hand-held equipment or tools rather than heavy equipment.

(c) Unless there are geological, engineering or safety constraints, keep equipment out of the water.

(d) If wet or muddy conditions exist, in or near a riparian or wetland area, use equipment that reduces ground pressure.

(e) Check equipment daily for leaks and complete any necessary repairs in an upland location prior to using the equipment in or around the water.

(f) Backfill trenches, depressions and holes daily if they will be inundated by water of the state.

(6) VESSEL OPERATION

(a) Prevent impacts to the bed and submerged aquatic vegetation from vessel grounding, anchoring, and propeller wash.

(b) Maintain anchor cable tension so anchor cables do not drag on the bed of waters of the state.

(7) CONSTRUCTION MATERIALS

(a) Store all construction and deconstruction material in a manner and at a location that will prevent contaminants including but not limited to, petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials from entering waters of the state.

(b) Do not stockpile construction material in the wetted area of rivers, streams and lakes or below mean higher high water line in marine waters.

(c) Use only clean, suitable material as fill material (e.g., no trash, debris, car bodies, asphalt, concrete, etc.).

(d) Sufficiently cure structures containing concrete prior to coming into contact with waters of the state to prevent leaching.

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(i) Construct forms for any wet concrete to prevent leaching of wet concrete. Place impervious material over any exposed concrete not lined with forms that will come in contact with waters of the state. Forms and impervious materials must remain in place until the concrete is cured.

(e) Do not use wood treated with creosote, pentachlorophenol, or chromated copper arsenate (CCA) in any hydraulic project. Wood treated with other preservatives may be used, provided the wood meets Western Wood Preservers post-treatment requirements. The wood must be sufficiently cured prior to installation to minimize leaching.

(f) Completely contain sawdust, trimmings, or drill shavings from treated wood with tarps or other methods during installation or removal of structures.

(g) Unless there are engineering constraints, do not use tires in any hydraulic project (e.g., floatation, fenders, and hinges). Where they exist in waters of the state, the department will work with the property owner to replace tires with authorized materials.

(8) CONSTRUCTION-RELATED SEDIMENT, EROSION AND POLLUTION CONTAINMENT

(a) When appropriate, work in the dry (e.g. when no natural flow is occurring in the channel, or when flow is diverted around the work site).

(b) Protect all disturbed areas from erosion. Maintain erosion and sediment control until repair of the job site is complete.

(c) If high flow or high tide conditions inundate the project area, stop all project activities except those needed to prevent erosion and siltation of waters of the state.

(d) Prevent contaminants from construction, including but not limited to, petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or harmful materials from entering or leaching into waters of the state.

(e) Route wastewater from work activities and water removed from within an isolated work area to an upland area above the limits of anticipated floodwater. Remove fine sediment and other contaminants prior to discharging the wastewater to waters of the state.

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(f) Deposit waste material such as construction debris, silt, excess dirt, or overburden resulting from the project to an upland area above the limits of anticipated floodwater.

(g) Deposit all trash from the project in an approved upland disposal site.

(h) Prevent the transport and introduction of invasive species by thoroughly cleaning vessels, equipment, boots, waders and other gear.

(9) IN-WATER WORK AREA ISOLATION USING BLOCK NETS

(a) Do not install block nets at sites with heavy vegetation, large cobble or boulders, undercut banks, deep pools, etc., due to the difficulty of securing and/or maintaining nets. Install a downstream block net if fish may re-enter the work area from downstream.

(b) Install block nets at sites that have reduced flow volume or velocity, uniformity of depth and good accessibility.

(c) Once the first block net is secured at the upstream end, use a second block net to herd fish downstream and out of the project area.

(d) The department must determine the size of block net opening. This will be dependent on the bypass design, the purpose of the block net and the fish species likely to be present.

(e) Install block nets at an angle to the direction of flow (not perpendicular to the flow) to avoid entrapping fish in the net.

(f) To anchor block nets, bags filled with clean gravel must be placed along the bottom of the nets.

(g) Secure block nets along both banks and the channel bottom to prevent failure as a result of debris accumulation, high flows, and/or flanking.

(h) In order to keep fish out of the work site, leave block nets in place until the work is complete and conditions are suitable for fish.

(i) Check block nets a minimum of three times a day for entangled fish and accumulated debris.

(10) IN-WATER WORK AREA ISOLATION USING A TEMPORARY BYPASS

(a) For projects where construction takes place within the wetted perimeter, isolate fish from the work area by using either a total bypass to reroute the entire stream through a temporary channel or pipe, or a partial bypass such as a cofferdam to exclude fish from a certain area, such as along one stream bank.

(b) The hydraulic capacity of the stream bypass must be equal to or greater than the peak flow event expected during the time the bypass will be in operation. Conduct a hydrologic analysis to determine the magnitude of this flow event.

(c) Provide fish passage during times of the year when fish are expected to move.

(d) Sequence the work to minimize the duration of dewatering.

(e) Use the least impacting method to temporarily bypass or exclude water from the work area that is feasible for the type of work involved. Consider the physical characteristics of the site and the anticipated volume of water flowing through the work area.

(f) Design the temporary bypass to minimize the length of the dewatered stream channel.

(g) Flows downstream of the project site must be maintained to ensure survival of all downstream fish, during all phases of bypass installation and decommissioning.

(h) Install the temporary bypass prior to initiation of other construction work in the wetted perimeter.

(i) The department may require the installation of a cofferdam or similar device at the upstream and downstream end of the bypass to prevent backwater from entering the work area.

(j) Return diverted water to the channel immediately downstream of the work area. Dissipate flow energy from the diversion to prevent scour / erosion to the channel and bank.

(k) If the diversion inlet is a gravity diversion that provides fish passage, place the diversion outlet in a location that facilitates gradual and safe reentry of fish into the stream channel.

(l) If the diversion inlet is a pump diversion in a fish-bearing stream the pump intake structure must have a fish screen installed, operated, and maintained in accordance with RCW 77.57.010 and 77.57.070. Screen the pump intake by one of the following:
A. Perforated plate: 0.094 inch (maximum opening diameter).

B. Profile bar: 0.069 inch (maximum width opening).
C. Woven wire: 0.087 inch (maximum opening in the narrow direction).

(m) The minimum open area for all types of fish guards is 27%. The screened intake must have enough surface area to ensure that the velocity through the screen is less than 0.4 feet per second.

(n) The fish screen must remain in place whenever water is withdrawn from the stream through the pump intake.

(o) Maintain fish screens to prevent injury or entrapment of fish.

(p) Remove fish screens on dewatering pumps in the isolated work area only after all fish are safe and excluded from the work area.

(q) Isolate pump hose intakes with block nets so that fish do not get near the intake.

(r) Prior to restoring water to the work area, stabilize the bed with clean material sized to match undisturbed sediments.

(s) Complete all in-water and channel restoration work prior to re-watering the work area.

(11) IN-WATER WORK AREA ISOLATION USING A COFFERDAM STRUCTURE

(a) Model to determine the impact of the cofferdam on water-surface elevations during all anticipated flows. The department may not require modeling for short-term cofferdams on low flow streams.

(b) Consider the infiltration rate of seepage flow from the riverbed and from banks when designing the cofferdam.

(c) Install and remove cofferdams in a manner that ensures water quality is maintained.

(d) Dissipate flow energy from the diversion to prevent scour / erosion to the channel and bank.

(12) IN-WATER WORK WITHOUT A BYPASS OR COFFERDAM

(a) In the following instances, the department will not require the use of a cofferdam, bypass or similar structure to separate the work area from waters of the state:
A. When installing a cofferdam, bypass or similar structure would cause greater impacts to fish life than it would prevent;

B. When the work area is in deep or swiftly flowing water;
C. When turbidity is not a concern;
D. When fish can be excluded by nets or screens, or
E. When fish are not present.

(13) FISH REMOVAL

(a) All persons participating in fish capture and removal must have training, knowledge, and skills in the safe handling of fish.

(b) A person with at least one-hundred hours of electrofishing experience must be on-site to conduct or direct all electrofishing activity.

(c) The department and affected tribes may assist with capturing and moving fish life from the job site if personnel are available.

(d) Place block nets up and downstream of the in-water work area as specified in sub-section 9 of this section)

(e) Capture and safely move fish life from the work area to the nearest suitable free-flowing water.

(14) JOB SITE REPAIR AND REVEGETATION

(a) Restore the disturbed bed, bank, and riparian areas similar to their pre-project natural condition.

(b) Remove any temporary fills in their entirety and return the affected areas to their pre-project elevation and contours. Removal must occur by the end of the in-water work window if fill material could erode into or result in delivery of sediment-laden water into waters of the state.

(c) Abandon temporary roads in wet or flood-prone areas by the end of the in-water work period.

(d) By the end of the in-water work period, remove all temporary stream crossings and restore the bed and banks to pre-project condition.

(e) Remove all materials or equipment from the site and dispose of all excess spoils and/or waste materials properly upon completion of the project.

(f) Backfill trenches, depressions and holes if they will be inundated by water of the state.

(g) All structures removed and/or replaced must not reenter water of the state unless authorized by the department.

(h) Do not return in-stream flows to the work area until all in-channel work is completed and the bed and banks are stabilized to minimize sediment delivery to the stream or stream channel.

(i) Replace native riparian, aquatic and wetland vascular plants (except noxious weeds) damaged or destroyed by construction using a proven methodology.

(j) The department must approve planting densities and maintenance requirements for replanting on a site-specific basis.

(k) Complete replanting during the first dormant season (late fall through late winter) following project completion. Maintain plantings for a minimum of three years to ensure a minimum of 80 percent survival. Failure to achieve the 80 percent survival in year three will require submission of a plan with follow up measures to achieve requirements or reasons to modify requirements.

(l) The department may waive the requirement to plant vegetation where the potential for natural revegetation is adequate, or where geological, engineering or safety factors preclude it.

(m) The department may require fencing or other structures as necessary to prevent access to revegetated sites by livestock, wildlife or unauthorized persons until the plantings are well established.

(n) The department may require a vegetation monitoring and contingency plan per WAC 220-110-100.

(o) Remove temporary erosion and sediment control methods after job site repairs are complete.

(15) PERMITTEE NOTIFICATION

(a) If a fish kill occurs or fish are observed in distress at the job site, immediately cease all activities causing harm. Immediately notify the department of the problem. If the likely cause of the fish kill or fish distress is water quality related, also notify the Washington Military Department Emergency Management Division at 1-800-258-5990. Activities related to the fish kill or fish distress must not resume until the department gives approval. The department may require additional measures to mitigate impacts.

(b) The department may require the permittee to notify the department before starting work, during work, and upon project completion to allow for pre-project consultation and inspection.

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220-110-130 Streambank protection and lake shoreline stabilization

All projects must meet the requirements in WAC 220-110-080 – Mitigation requirements for hydraulic project approvals and the requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Streambank protection and lake shoreline stabilization structures are permanent or temporary structures constructed for the purpose of preventing erosion or stabilizing the bank. There are both hard and soft approaches to bank protection. Hard approaches armor the bank with material such as riprap, concrete or timber and are intended to resist shear forces experienced at a specific site and prevent erosion of the bank. Soft approaches attempt to mimic natural processes with the use of biotechnical methods such as live plantings, rootwads, and large woody material (LWM). Soft approaches to streambank protection are generally less impacting to fish life than are hard approaches. Some projects integrate both hard and soft approaches.

(2) FISH LIFE CONCERNS

Streambank protection and lake shoreline stabilization alter the bed or beach and the physical processes that form and maintain fish habitat. Direct loss of habitat may include loss of cover, spawning beds, large woody material, riparian function, floodplain connectivity, and alteration to the channel/beach that decreases the complexity and diversity of fish habitats.

(3) BANK PROTECTION AND LAKE SHORELINE STABILIZATION DESIGN - GENERAL

(a) If waters of the state breach an existing structure and the breach is not repaired during the next two work windows, the department must consider the OHWL behind the structure the existing condition.

(b) The department may require an analysis performed by a civil, geotechnical or structural engineer licensed in the state of Washington to justify the replacement and repair of a structure that extends waterward of the existing structure.

(c) An HPA application for a new structure must include a qualified professional's rationale for the proposed technique including:

(i) An analysis performed by a civil, geotechnical or structural engineer licensed in the state of Washington of the level of risk to existing buildings, roads, or services being threatened by the erosion;

(ii) Technical rationale specific to the design developed such as a reach and site assessment to identify the mechanism of the bank failure and cause of erosion; and,

(iii) Evidence of erosion and/or slope instability to warrant the work.

(d) Minimize adverse impacts to fish life by using the least impacting technically feasible alternative. Typically, soft approaches are less impacting than hard approaches. The common alternatives below are in order from least to most impacting:

(i) Upland drainage control;

(ii) Vegetation protection, enhancement, and replacement;

(iii) Relocation of improvements or structures;

(iv) Beach nourishment;

(v) Large woody material placement;

(vi) Biotechnical methods;

(vii) Bioengineering methods;

(viii) Upland retaining walls;

(ix) Bulkheads and rock revetments placed landward of the OHWL; and

(x) Bulkheads and rock revetments located at the OHWL.

(c) The department may require bioengineering methods to protect a streambank or stabilize a lake shoreline.

(i) The department may require the incorporation of large woody material or native vegetation into the design of the structures.

(4) STREAMBANK PROTECTION DESIGN

(a) Revetments

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(i) Limit the length of the structure to the length necessary to protect the eroding bank.

(ii) The structure must minimize impacts to the active floodplain or stream channel.

(iii) Use natural materials and designs that promote natural dynamics of the channel.

(b) Groins

(i) Design and install groins to redirect flow away from an eroding bank.

(ii) Do not place groins in tight-radius bends.

(iii) Size and space groins so they dissipate flood flow energy and promote sediment deposition between them.

(iv) Impermeable groins must not exceed fifteen percent of the bankfull channel width. Permeable groins must not exceed twenty percent of the bankfull channel width.

(v) Groins must not exceed the height of the adjacent bank. The crest must be sloped down and away from the bank.

(vi) Key groins into the bank to assure integrity during high flows.

(c) Barbs

(i) Design and install barbs so they do not confine the channel.

(ii) Barbs must not exceed twenty-five percent of the bankfull channel width.

(iii) The height of the barbs must be below the height of the OHWL and equal to or above the mean low-water level.

(iv) Key barbs into the bank to assure integrity during high flows.

(d) Engineered log jams

(i) Design and construct a log jam with the size and species of large woody material necessary to ensure the log jam will remain intact and stable.

(e) Floodplain roughness

(i) Design floodplain terraces to contain the ten-year recurrence interval peak flow, and to overtop during greater flows.

(ii) Locate large woody material or vegetative roughness elements in the floodplain perpendicular to the down-valley slope, on either side of banks vulnerable to avulsion (such as tight bends).

(iii) Anchor large woody material to the floodplain if flotation or high shear stresses may occur at flood flows.

(f) Flow spreaders

(i) Construct flow spreaders from rock, soil, wood, live plants (i.e. cottonwood boles), or vegetated soil berms.

(ii) Vegetative soil berms must incorporate fabric to hold soils in place while vegetation becomes established.

(iii) Size and install rock or other armor materials to protect against scour.

(iv) The top of the spreader must be at or near the elevation of the design flood, with allowances for increased water elevation due to backwatering caused by the spreader itself.

(v) Construct flow spreaders in series, to prevent stream channel formation.

(vi) Locate flow spreaders to prevent water from flowing around the spreader and scouring the bed or banks.

(5) LAKE SHORELINE STABILIZATION DESIGN

(a) Stabilize banks in areas with low to moderate wave action using vegetative stabilization or bioengineering techniques.

(b) Stabilize banks in areas with moderate to high wave action using a combination of vegetation and natural hard structures such as LWM.

(c) Where required, stabilize banks in areas with high wave action using “hard” engineering (i.e., engineer designed hard structures) to ensure effective erosion protection. A technical rationale explaining why softer bioengineering or integrated techniques cannot be used must be included in the HPA application, specific to the design proposed.

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(d) Unless there are engineering, safety or environmental constraints, the toe of the structure must be located landward of the OHWL.

(e) Ensure hard engineering will not create erosion or floodplain connectivity problems off-site.

(6) BANK PROTECTION AND LAKE SHORELINE STABILIZATION CONSTRUCTION

(a) The department may require the proponent to establish the horizontal distance of the structure from a permanent benchmark(s) (fixed objects) prior to commencing work on the project. The benchmarks must be located, marked and protected to serve as post project reference for ten years.

(b) Restrict streambank protection to the minimum size necessary to protect eroding banks.

(c) Restrict the placement of material waterward of the OHWL to that necessary to protect the toe of the bank, or for installation of mitigation features (e.g. logs and rootwads) approved by the department.

(d) Design the toe to protect the integrity of bank protection or shoreline stabilization material.

(e) Bury the base of the structure to a depth sufficient to prevent undermining. In cases where scour depth is sufficiently deep, choose a design that adjusts to changing scour depth without compromising the function of the bank protection.

(f) When bank sloping, do not release overburden material into the waters of the state.

(g) Do not use lake or river bed gravel for exterior armor unless the department has specifically authorized it.

(h) If the department approves rock for construction, use clean riprap.

(i) Use construction material sufficiently large enough to prevent high water or wave action from washing it away.

(j) Bank protection or shoreline stabilization material and filter blanket material must be placed from the bank or a barge. Dumping onto the bank face can occur only if the toe is established and the material can be confined to the bank face.

(k) Stockpile excavated materials in a manner and at a location that will prevent the excavated material from entering waters of the state.

(l) Retain all natural habitat features in the work area and below the OHWL that are larger than four inches in diameter including trees, stumps and logs, and large rocks within the reach.

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220-110-190 Water crossing structures

All projects must meet the requirements in WAC 220-110-080 – Mitigation requirements for hydraulic project approvals and the requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions. A person can find appropriate methods to design water crossing structures in the Department's *Water Crossing Design Guidelines*, as well as other published manuals and guidelines.

(1) DESCRIPTION

Water crossings are structures constructed to facilitate the movement of people, animals, or materials across or over water from bank to bank. These structures include bridges, culverts, fords and conduit crossings. This chapter covers bridges, culverts, and fords. WAC 220-110-270 covers conduit crossings. Generally, people use bridges to cross over larger streams and rivers, or over unstable channels; they use culverts to cross over smaller streams with an average channel width less than fifteen feet and they use fords when other stream crossing options would result in a greater impact to fish and their habitats.

(2) FISH LIFE CONCERNS

A person must design water crossing structures in fish-bearing streams to allow fish to move freely through them at all flows when fish are expected to move. All water crossings, even those in streams with no fish, must retain upstream and downstream connection in order to maintain natural channel processes. These processes include the movement and distribution of wood and sediment and the shifting of channel patterns. Water crossings that are too small in relation to the stream can block or alter these processes.

Fords have a high potential to generate and deliver sediment and may impede fish passage. However, under limited circumstances, fords may be considered when they provide better protection to fish and their habitats than other water crossing structures.

(3) PERMANENT WATER CROSSING STRUCTURES - GENERAL

(a) The water crossing design must provide unimpeded passage for all species of adult and juvenile fishes.

(b) The water crossing design must maintain the physical characteristics of a natural stream channel throughout the water crossing. The department will make an exception where there are manmade features in the floodplain that are outside the

control of the applicant and they are unlikely to be removed. If channelization, encroachment, or other human-made changes have degraded the channel in the vicinity of the crossing, the design must have a similar slope, cross section and velocity distribution expected under prevailing conditions in the reach.

(i) Similar slope: The slope should be that of an equilibrium channel and not over-steepened.

(ii) Similar cross section: The cross section must have the same channel bed width, a thalweg, and overbank areas, as necessary.

(iii) Similar velocity distribution: The cross section must have a varied velocity distribution for passage of fish at all sizes and abilities; particularly, low velocity margins and a high velocity central zone.

(c) The water crossing design must ensure that upstream and downstream channel processes and functions are unconstrained by the structure so they do not cause discernible impacts to fish life. All water crossings must provide for the processes and functions listed in provision (i) to (ix) below. By complying with the provisions under subsections (4) and (6) of this chapter the applicant is assumed to provide these processes and functions.

(i) Low flow continuity from upstream through the water crossing structure to downstream. Crossings in stream channels that normally dry out or have disconnected pools during the low flow period need not provide continuity.

(ii) Flood flow conveyance. The water crossing structure must pass the one-hundred year peak flow or other design flood flows approved by the department with consideration of the debris likely to be encountered.

(iii) Floodplain continuity. The natural dynamics of a floodplain must be maintained, including connectivity with side channels and off-channel habitats.

(iv) Large wood transport. The water crossing must be designed and constructed to pass large woody material expected to be transported by the channel upstream.

(v) Sediment transport. The water crossing must be designed and constructed to pass sediment.

(vi) Hydraulic diversity. Hydraulic diversity must be maintained because it influences fish habitat in several ways including fish dispersal, habitat use, and competitor/prey relationships.

(vii) Stream margin habitat. The water crossing must be designed and constructed to maintain the shallow, low velocity stream margin habitat typical of non-channelized streams.

(viii) Sediment gradation continuity. The water crossing must be designed and constructed to maintain sediment gradation downstream.

(ix) Natural evolution of the channel planform and longitudinal profile. The water crossing must allow the natural evolution of the channel planform and profile.

(d) The department prohibits culvert baffles and downstream control weirs except to correct fish passage problems at existing structures.

(e) To determine the average bankfull width for water crossing structure design, a person must use a minimum of three typical bankfull widths, measured in a stream reach that is characteristic of a natural stream. A person must measure widths that describe normal conditions at straight channel sections and outside the influence of any culvert, bridge abutments or other artificial or unique channel constriction.

(f) A person must remove all structural elements of the replaced water crossing structure including abutments, piers, pilings, sills, foundations, armor rock, aprons, wing walls, guide walls, culverts and approach fills, unless authorized by the department.

(4) BRIDGE DESIGN

(a) An HPA is required for construction or structural work associated with any bridge structure waterward of or across the OHWL of state waters. A HPA is also required for bridge painting and other maintenance where there is potential for wastage of paint, sandblasting material, sediments, or bridge parts into the water.

(b) A full span design must pass the one-hundred year peak flow or other design flood flow approved by the department.

(c) The design must pass ice, large wood and associated woody material and sediment likely to move under the bridge during the one-hundred year flood flows or the design flood flow approved by the department.

(d) Where there are existing flood control levees at the bridge construction site, or other infrastructure that is not the property of the bridge owner, the department may approve a shorter bridge span than required in this section.

(e) A bridge in a watercourse with an active floodplain must have a span wide enough to prevent a significant increase in the main channel average velocity. This velocity must be determined at the one hundred-year flood flow or the design flood flow approved by the department.

(f) A person must design (size) the bridge to account for the lateral migration expected to occur during the bridge's lifespan to minimize the need for bank armoring.

(g) The design must have at least three feet of clearance between the bottom of the bridge structure and the water surface at the one-hundred year peak flow. The department may grant an exception based on engineering justification provided by the applicant.

(h) The design and alignment of the bridge must not cause bed scour and bank erosion.

(i) Unless there are geological, engineering or safety constraints, the bridge design must avoid the need for scour protection. Where mid-channel piers are necessary, design them so no additional scour protection is required. If scour protection is unavoidable, the design must minimize the scour protection to the amount needed to protect piers and abutments. The design must specify the size and placement of the scour protection so it withstands expected peak flows.

(j) The waterward face or all bridge elements that may come in contact with waters of the state, including but not limited to abutments, piers, pilings, sills, foundations, armor rock, riprap, aprons, wing walls, and approach fill must be landward of the OHWL. The requirement excludes mid-channel piers.

(k) Bank armoring associated with bridge design and construction must be limited to the amount necessary to support abutment and fill at a safe angle of repose.

(5) BRIDGE CONSTRUCTION

(a) A person must use a cofferdam structure or similar structure to separate mid-channel construction within waters of the state.

(b) If excavation or other construction activities take place waterward of the OHWL the work area must be isolated from the stream flow by using a cofferdam, bypass or similar structure.

(c) A person must minimize damage to the bed when placing the bridge structure.

(d) A person must use biotechnical slope protection outside the bridge shadow. The department may grant exceptions for chronic instability, adverse road geometry, or other conditions outside the control of the owner.

(6) CULVERT DESIGN

(a) Stream simulation design

(i) A stream simulation culvert must be designed and constructed to comply with the following requirements:

(A) The stream channel must generally have a channel bed width that is fifteen feet (≤15 ft.) or less. However, the department may approve a stream simulation culvert in channels with a channel bed width greater than fifteen feet.

(B) The width of the channel-bed inside a stream simulation culvert at the elevation of the streambed must be equal to or greater than one and two-tenths times the average channel bed width plus two feet (1.2 BFW + 2 ft.).

(C) The stream simulation culvert must be set at the same gradient as the prevailing stream gradient.

(D) The slope of the bed inside a stream-simulation culvert must not exceed the slope of the upstream channel by more than twenty-five percent.

(E) The stream simulation culvert must be countersunk a minimum of thirty percent and a maximum of fifty-percent of the culvert rise.

(F) The particle size of sediment placed inside the stream-simulation culvert must be plus or minus twenty percent of the median particle size found in a representative reference reach of the same stream. The department may approve exceptions if the proposed alternative sediment is appropriate given the circumstances.

(b) No-slope design

(i) A no-slope culvert must be designed and constructed to comply with the following requirements:

(A) The stream channel must generally have a channel bed width that is eight feet (≤8 ft.) or less and a gradient less than three percent (< 3%). However, in some site-specific situations the department may approve no-slope in channels with a gradient up to five percent (5%).

(B) The culvert is installed at zero gradient.

(C) The length of the culvert must not exceed seventy-five feet.

(D) The width of the channel-bed inside a no-slope culvert at the elevation of the streambed must be equal to or greater than the average channel bed width.

(E) The no-slope culvert is counter sunk a minimum of twenty percent of the culvert rise at the culvert outlet downstream and a maximum of forty-percent of the culvert rise at the culvert inlet upstream.

(F) The no-slope culvert must be filled to the depth of the countersink stated in (6)(b)(i)(E) with material similar to what is found in the adjacent channel streambed unless either of the following conditions exist:

a. The culvert is located in a wetland or in an area where the channel-bed is predominately fine sediment and the culvert will be backwatered, or

b. The culvert will fill quickly because of the frequent rate of sediment transported through the culvert and will not cause excessive cutting or slumping of the upstream channel.

(ii) Combining the requirements for culvert width and countersinking, the culvert must meet the following requirements:

(A) For a circular culvert, the minimum culvert diameter must be equal to or greater than the average channel bed width plus twenty-five percent.

(B) For a culvert with an oval cross section (elliptical, pipe arch, or “squashed” pipe) the horizontal width must be equal to or greater than the average channel bed width plus twenty-five percent.

(C) For a box or pipe arch culvert, the span must be equal to or greater than the average channel bed width.

(c) Requirements for Other Permanent Culvert Design

(i) The department will approve alternative culvert designs provided the design complies with Subsection (3) General Design Requirement for Water Crossing Structures and the design provides equal or greater protection for fish life as the stream simulation and no-slope design methods.

(d) Temporary Culvert Design Requirements

(i) The department must determine allowable placement of temporary culvert and time limitations based on the specific fish resources of concern at the proposed water crossing location.

(ii) The design of the temporary crossing must maintain structural integrity at the peak flow expected to occur while the crossing is in place.

(iii) Where fish passage is a concern, the temporary culvert must provide unimpeded fish passage.

(iv) A person must remove the temporary culvert and block all approaches to vehicular traffic prior to the expiration of the HPA.

(7) CULVERT CONSTRUCTION

(c) A person must establish the culvert invert elevation with reference point(s) or benchmark(s) created prior to starting work on this project. The reference point(s) must be clearly marked and preserved for post-project compliance. Prior to backfilling, the invert elevation, as stated on the plans, must be confirmed relative to the reference points with at least a construction-grade leveling device (such as an optical auto-level or laser level).

(d) A person must install the culvert in the dry or in isolation from the stream flow by using a bypass channel or culvert, or by pumping the stream flow around the work area. The department may grant exception if installing the culvert in the flowing stream reduces siltation or turbidity.

(e) A person must embed the top of footings of bottomless culverts sufficiently below potential scour depth to prevent exposure of the footing surface and undermining.

(f) The owner(s) must maintain to ensure it complies with Subsection (3) General Design Requirement for Water Crossing Structures.

(g) If the culvert becomes a hindrance to fish passage, the owner must obtain a HPA and provide prompt repair.

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(8) PERMANENT FORD DESIGN

(a) A person must design and maintain a ford so the ford does not create a channel constriction, impede fish passage, block debris passage or degrade water quality to the detriment to fish life.

(b) The department will authorize construction of new fords in limited situations when it is the least impacting water crossing option. The following are examples of situations where the department may authorize a ford:

(i) Where there is no maintenance access during winter months or early spring and the crossing has a high risk of failure from rain-on-snow events.

(ii) The road is seasonally inaccessible due to snow pack, weather, or other conditions that seasonally limit access to the water crossing structure;

(iii) The stream has extreme seasonal flow variations and low flows during anticipated ford use;

(iv) The channel has low bank height and low gradient approaches;

(v) The stream has dynamic floodplains, such as alluvial fans; or

(vi) The stream is subject to mass wasting events, debris transport, or extreme peak flows.

(c) Permanent fords must not impede fish passage.

(d) Fords must be located outside of all known or suspected fish spawning areas such as pool tailouts.

(e) Fords must only be used during periods of no or low stream flow (whether dry or frozen) to minimize the delivery of sediment to the stream.

(f) Traffic should be separated from flowing water by utilizing vented fords or other appropriate alternatives.

(9) TEMPORAY FORD DESIGN

(a) The department may permit temporary fords only during the time of year that avoids high stream flows or expected fish spawning or migration.

(b) If fill is associated with the driving surface of a temporary ford, it must consist of

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clean washed gravel between one-quarter and four inches in diameter.

(c) If the natural streambed is composed of material smaller than gravel, then the temporary ford design must maintain a positive separation between the watercourse bed and all fill associated with the ford to ensure that material used in ford construction is removable.

(10) FORD CONSTRUCTION

(a) Fords must be constructed during periods of low or no stream flow or in isolation from flowing water.

(b) Fords must be constructed perpendicular to the stream flow, or as close to perpendicular as practicable.

(c) Fords must be constructed using material approved by the department.

(i) If the streambed does not have a firm rock or gravel base, install clean, washed rock or gravel to reduce sedimentation. Concrete, pavement or other debris should not be used to construct hardened fords. Placement of material should be limited to the approaches and crossing.

(d) A person must countersink the prism of the ford below the watercourse bed. A person must design the prism to withstand overtopping flood events, and natural debris.

(e) Fill associated with the driving surface of a permanent ford must consist of material that will not attract spawning fish.

(f) A person must protect the driving surface of ford approaches from erosion to ensure that erodible fines do not enter waters of the state.

(g) Fords must be regularly inspected and maintained to provide for fish passage and maintain water quality.

(11) WATER CROSSING ABANDONMENT (REMOVAL)

(a) Water crossing removal must be compliant with the following provisions. In all instances a person must protect the job site from erosion and revegetate the site.

(i) When removing temporary crossings, a person must remove the temporary culvert, bridge, ford and any imported fill. The site must be restored to a similar width, depth, gradient and substrate composition as the channel segments upstream and downstream from the crossing. If water-rounded granular

materials were used for fill, and they are similar to those found in the existing channel bed, the Department may allow the materials to remain on the site.

(ii) When removing permanent crossings, a person must remove all the components of a bridge or culvert crossing (approach fill, sills, stringers, deck, riprap, guardrails, etc.). The department may approve leaving trees or other vegetation, fill materials when appropriate, or untreated log bridge stringers. The site must be restored to the original contours or a configuration approved by the department.

(iii) When removing an existing bridge in preparation for a new bridge crossing, a person must remove all the existing bridge components (approach fill, sills, stringers, deck, riprap, guardrails, etc.) within the floodplain. The department may approve the partial removal of certain components when the impacts of leaving them are minor. The site must be restored to the original contours or a configuration approved by the department.

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220-110-200 Fish passage improvement structures

The requirements in this section apply to fish ladders, weirs constructed for fish passage management, roughened channels, trap-and-haul operations, and hydraulic design culvert retrofits. All projects must meet the requirements in WAC 220-110-080– General mitigation requirements for HPAs, and any requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Fishways facilitate the passage of fish through or around a barrier. They restore upstream and downstream fish access to habitats that have become isolated by human activities (e.g., placement of culverts, dams, and other artificial obstructions). Fishways can be mitigation measures for adverse effects associated with flow control structures.

(2) FISH LIFE CONCERNS

Barriers can block fish from using productive upstream spawning and rearing habitat. The primary goal is to remove fish passage barriers and to ensure unimpeded passage of fish at all life stages, as well as to maintain natural channel processes and function. However in some situations, it is not possible to remove the barrier and fish ways may provide an alternative mitigation measure. The department generally does not recommend the use of fishways because they can be partial barriers to fish passage. Fish passage structures that primarily consider the passage of one species or class of species may unintentionally limit the passage of other fish species. Species selection can alter species composition and community relationships upstream of the passage barrier, with important implications for conservation of individual species and biodiversity.

(3) FISH PASSAGE IMPROVEMENT STRUCTURE DESIGN

(a) The department may not authorize fish passage structures over permanent natural barriers unless it is necessary to restore native fish species.

(b) The HPA application must have site and biological information relevant to the specific project, such as information on species present, hydrology and topography, and existing adjacent structures.

(c) The department may require compensatory mitigation if the fish passage structure cannot pass all for all fish species present at all mobile life stages.

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(d) The design must consider site-specific conditions that could affect the function of the fishway, including; meander migration or vertical change in streambed elevation; debris and bedload movement; tampering, vandalism and poaching.

(e) The fish passage structure design must withstand the maximum expected flow.

(f) The fish passage structure must not result in significant migratory delays or mortality to fish life due to disorientation, distraction, predation, stress, or injury for target species.

(g) The fish passage structure must have the capacity to accommodate expected run sizes to prevent crowding and delay of target fish species migration.

(4) TEMPORARY FISH PASSAGE IMPROVEMENT STRUCTURES DESIGN

(a) The department may require the installation of a temporary fish passage structure to provide passage through temporary obstructions. The department may not require a fish passage structure if a barrier exists for such short duration that it is determined by the department that no lasting impacts to fish life will occur.

(b) An owner must maintain a fish passage structure in an effective condition. If the structure becomes a hindrance to fish passage for target species, the owner must obtain a HPA and provide prompt repair.

(c) The department may approve temporary fishways when permanent structures are damaged or are under construction, maintenance, or repair, for enhancement projects, or for seasonal water diversion structures such as irrigation diversion dams.

(d) Temporary fishways must remain operational for the duration of the temporary obstruction and must be maintained and adjusted as necessary to provide efficient passage of fish life.

(5) FISH LADDER DESIGN

(a) The department may authorize a fish ladder under the following situations:

(i) The fish ladder will enable fish passage at an existing barrier, but only until the existing barrier structure is replaced.

(ii) The department determines that a bridge, culvert, or roughened channel is not practicable due to the nature of the obstruction such as a flow control structure or the slope of the stream.

(b) The fish ladder design must be appropriate for the slope of the channel, water surface elevations, species present, flow regime, and conditions of the channel.

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(c) The fish ladder design must prevent fish from leaping out of the structure.

(d) The fish ladder pool volume must provide the hydraulic and fish capacity necessary for passage of all target adult and juvenile fish.

(e) The fish ladder entrance:

(i) Must provide sufficient streaming flow attraction during high and low flows, without excessive velocity or turbulence, to ensure fish can locate and enter the fish ladder without significant delay.

(ii) Must minimize distractions that lure fish away from the entrance to prevent fish from becoming trapped, injured, or stranded.

(iii) Must be large enough to accommodate all expected debris and ice without damage or loss of passage efficiency.

(iv) Must provide a stable flow pattern and uniform velocity at the entrance pools and transition channels to allow fish to pass through the structure unimpeded.

(v) Must provide multiple entrances if a single entrance cannot attract and provide passage to all adult and juvenile fish. If the work area has multiple zones where fish accumulate, each zone must have a minimum of one entrance.

(vi) May be required to have artificial light to optimize fish passage.

(f) Fish ladder auxiliary water system:

(i) May be required to have an auxiliary water system (AWS) to supply supplementary water to ensure fish are attracted to the fish ladder.

(ii) Must have a diffuser design that discourages attraction of fish life to it and to protect fish from injury.

(iii) Must minimize the size the spaces between diffuser to exclude and prevent injury to the smallest fish present.

(iv) Must not use an auxiliary water supply from external sources that could confuse the homing instinct of fish.

(v) The department may require screening of the AWS may be to prevent harm to fish life.

(vi) The department may require a trash rack at the AWS intake.

(g) Fish Ladder Exit:

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(i) Must have a water depth at the exit that is comparable to the depth within the fish ladder.

(ii) Must hast the fish ladder exit located to ensure fish can safely exit the structure, without susceptibility to predators, without becoming disoriented, and with the ability to continue their upstream migration.

(iii) Must have the fish ladder exit designed to protect it from damage by debris.

(6) FISH LADDER CONSTRUCTION

(a) Ground or ground smooth to the touch, all edges and surfaces exposed to fish, with all edges aligning in a single smooth plane, to reduce the potential for contact injury.

(7) FISH LADDER MAINTENANCE

(a) Continuously supply the fish ladder with sufficient water to safely and efficiently pass fish at least ninety percent of the time, both upstream and downstream of the obstruction. If target fish species are present and actively migrating, sufficient water must be available to pass fish through the fish ladder, or the fish must be able to safely pass without the need of a fish ladder.

(b) An owner must inspect the fish ladder for proper function at a frequency determined by the department.

(i) Place wood and sediment retrieved during inspection and maintenance downstream of the fishway.

(c) Individuals performing operations or maintenance must be sufficiently trained to operate the fish ladder.

(d) The department may require shutdown of the fish ladder during high flows if the flow exceeds the fish passage design flow. However, a fish ladder must not be inoperable due to high flows for a period greater than seven days during the migration period for the target fish species.

(8) FISH PASSAGE WEIR DESIGN

(a) Design the weir to control the water surface elevation at weir to provide fish passage over or through an obstruction.

(b) Design the weir to minimize impacts to natural channel geometry.

(c) Design the weir to ensure continued fish passage for all species present at all mobile life stages.

(i) The department may grant exceptions in cases when it is implementing a program to restore native fish species or to protect native fish species from

the introduction of non-native fish species, and fish passage blockage is an intended component of the project.

(9) ROUGHENED CHANNEL DESIGN

(a) The department may authorize a roughened channel to facilitate the passage of fish around abrupt hydraulic drops, through culverts, or at diversion sites for water withdrawal.

(b) Only qualified professionals should design roughened channels.

(c) The department may require a roughened channel to bypass around an obstruction where non-leaping fish are present or when other types of fish passage improvement structures would not sufficiently pass fish.

(d) Roughened channels must meet the minimum hydraulic requirements of a hydraulic design culvert such as velocity, drop, turbulence, and flow requirements.

(e) Roughened channels must minimize impact on the existing fish life and their habitat in the channel.

(f) The size and gradation of roughened channel bed material must resist erosion at the design flood and must result in a dense structure that prevents subsurface flow.

(10) TRAP-AND-HAUL OPERATIONS

(a) The department requires an HPA for installation, maintenance and removal of fish traps for trap-and-haul activities.

(b) The fish trap design must withstand the maximum expected flow.

(c) Operate the fish trap in a manner that prevents crowding and delay of target fish species migration.

(11) HYDRAULIC DESIGN CULVERT FISH PASSAGE DESIGN

(a) The department may permit an existing hydraulic design culvert to remain until the end of its design life or until another more appropriate culvert design can be constructed; or, under exceptional circumstances, where other culvert methods cannot apply.

(b) Before obtaining a permit to retrofit a culvert or construct a fish passage improvement structure using the hydraulic design method, a person must submit hydrology data and hydraulic design documentation prepared by a licensed professional engineer that demonstrates compliance with this section to the satisfaction of the department.

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(c) The hydraulic design fish passage structure must include consideration of flood capacity for current conditions and future changes likely to occur within the stream channel, and debris and bedload passage.

(d) Plans submitted to the department for retrofit of a culvert or to construct a fish passage improvement structure using the hydraulic design method must address the following design criteria:

(i) Minimum water depth at any location within a hydraulic design passage structure, without a natural bed, must be at least eight-tenths foot.

(ii) The minimum depth of flow in the passage structure is determined by:

A. The low flow design, which is the two-year seven-day low flow discharge for the subject basin.

B. When flow information is unavailable for the site, the department may authorize the use of calibrated flows from a comparable gauged site or the depth of the culvert when no water is flowing.

(iii) Maximum water velocity may not exceed the values in Table 1 at any point within a culvert. Measure maximum water velocity at the high fish passage design flow.

Table 1: Maximum Velocity Design Criteria for Hydraulic Design Culvert Installation

Culvert Length	Maximum Velocity
10 – 100 ft	4.0 feet per second
100 - 200 ft	3.0 feet per second
> 200 ft	2.0 feet per second

(e) The maximum hydraulic drop within the culvert or at the culvert inlet or outlet may not exceed one-half foot. When a drop has a submerged jet (the lowest part of a is below the downstream water surface) or is part of a natural or roughened channel design, this drop limit may be exceeded when approved by the department.

(f) Water turbulence within the culvert must not be a barrier to passage of target fish species.

(g) The department may modify or approve design flow criteria for specific proposals as necessary to address unusual fish passage requirements.

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220-110-220 Large woody material placement, repositioning, and removal in freshwater areas

All projects must meet the requirements in WAC 220-110-080 – General mitigation requirements for HPAs, and any requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Large woody material (LWM) is trees and tree parts that mainly enter stream channels from streambank undercutting, wind throw, and slope failures. Public agencies and others reposition and remove large woody material where it is necessary to address a threat to life, the public, or property. LWM is placed in streams for the restoration or creation of fish habitat.

(2) FISH LIFE CONCERNS

Large woody material provides shelter for fish from high flows and predators. Sediment trapped by large woody material may create spawning areas for salmon and trout. Large woody material also provides habitat for aquatic insects that fish eat.

Large woody material plays a major role in the shape of stream channels by forming pools and increasing stream meandering and sediment storage. Large woody material dissipates flow energy, resulting in improved fish migration and channel stability.

(3) LARGE WOODY MATERIAL PLACEMENT, REPOSITIONING AND REMOVAL – GENERAL

(a) The department will approve the repositioning or removal of large woody material within the watercourse where it is necessary to protect life, the public, property, or where it is necessary to construct or mitigate for a hydraulic project. The department will require the placement of the wood directly back in the channel or in the floodplain, side channels, or along banks.

(b) The department will approve placement of large wood back in the channel to provide stable, functional fish habitat. This may include placing channel-spanning logs, creating log jams, or introducing a single large log or rootwad to the channel.

(4) LARGE WOODY MATERIAL PLACEMENT, REPOSITIONING OR REMOVAL CONSTRUCTION

(a) Station equipment on the bank, bridge, or other approved location when placing, repositioning, or removing large woody material.

(b) Suspend large woody material during placement, repositioning, or removal so it does not damage the bed or banks. A yarding corridor or full suspension is required to avoid damage to riparian vegetation. Where necessary, the department may authorize the cutting of the large woody material to a size that allows suspension during removal, but still retains value as a habitat structure.

(c) Use skid logs or similar methods to avoid bank damage where they cannot suspend large woody material above the bed and banks. Upon completion of the yarding operation, remove skid logs in a manner that avoids damage to streambanks and vegetation, and restore the bank to pre-project condition.

(d) Do not disturb large woody material embedded in a bank or bed except as authorized by the department.

(e) When repositioning or removal of LWM is authorized, fill and smooth over any depressions created in the bed with material that has the same composition as native material. Fill material must be sloped towards the bank at a slope appropriate for the prevailing condition. Reslope and revegetate disturbed banks.

(f) Minimize the release of bedload, logs, or debris downstream when repositioning or removing large woody material.

(g) Do not cut firewood from accumulations of large woody material in stream or river channels.

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220-110-230 Beaver dam management

All projects must meet the requirements in WAC 220-110-080 – General mitigation requirements for HPAs, and any requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

A person may need to remove, breach or modify a beaver dam to prevent damage to private and public land or infrastructure caused by flooding. Removal is normally accomplished using hand tools or equipment such as backhoes.

Installation of a water level (flow) control device may be a preferred alternative to dam removal or breaching of an established dam. A person can install a water level control device to maintain a desirable beaver wetland. These devices are installed at the intended depth, extending upstream and downstream of the dam. This preserves the pond's habitat benefits.

Another alternative to dam removal or breaching is the installation of a beaver exclusion device. These devices prevent beavers from building a dam at the mouth or inside of culverts and blocking water flow.

(2) FISH LIFE CONCERNS

Beavers play an important ecological role in creating and maintaining ponds and wetlands for fish and wildlife habitat. Ponds also provide surface water storage that improves summer flows, as well as improving water quality through sediment retention. It is important to exercise caution when breaching, notching or removing a dam. These activities can negatively affect fish and their habitat by de-watering the upstream pond, stranding fish, releasing sediment and large volumes of water (that can be devoid of oxygen) downstream. The release of sediment can affect downstream spawning areas. The breaching or removal of a beaver dam may not prevent future beaver activity in the area. Persistent breaching or removal of a beaver dam can increase the risk of negative impacts to fish habitat. In these instances, the department may recommend the landowner consider other beaver management techniques.

(3) REMOVAL OR BREACHING A BEAVER DAM

(a) Beaver dams should only be removed or modified when:

(i) The continued existence of the beaver dam poses an imminent threat to the integrity of water crossing structures, or to private and public land or infrastructure;

(ii) The beaver dam has been in existence for one year or less. Older dams will be considered on a site-specific basis.

(b) The department will evaluate whether or not compensatory mitigation is required to offset habitat loss caused by the removal or breaching of any beaver dam more than one year old. The department will not require compensatory mitigation for the removal of beaver dams less than one year old.

(c) The department may allow the use of explosives to remove a beaver dam if they determine it is the alternative with the fewest impacts.

(d) Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

(e) Minimize damage to stream-adjacent vegetation. Revegetate disturbed areas and protect against erosion.

(f) Beaver dam management activities must take place when the work will cause the least impact to fish life. Except in the case of emergency or imminent danger, all work must occur in summer low flow periods when spawning or incubating fish are less likely to be present. Remove or notch beaver dams by hand or with hand-held tools and hand-operated or motorized winches. The department will authorize the use of heavy equipment if there are engineering, safety or environmental constraints.

(g) Remove the dam gradually to allow the water to release slowly and prevent the downstream release of accumulated sediment at the bottom of the pond, or cause damage or erosion to the stream bed and banks. The notch must not extend below the height of the accumulated sediment.

(h) The width of the breach in the beaver dam must not exceed the width of the original stream channel to prevent bank erosion and flooding of adjacent properties.

(i) The department will specify the sequence in which to breach or remove a series of dams to avoid severe flooding and damage to fish habitat.

(j) Leave LWM imbedded in the stream bed or banks undisturbed.

(4) During and immediately after removal, monitor upstream and downstream for stranded fish in isolated pools. Capture and safely move all stranded or isolated fish to the nearest free-flowing water.

(5) WATER LEVEL CONTROL DEVICE INSTALLATION

(a) Design and install water level control devices so that during low flows (when beaver are more actively increasing dam height), the flow passes through the device.

(b) Design and install water level control devices so that during high flows (when fish are moving and beaver are less likely to be adding height to their dam), the device will pass sufficient flow over and around the dam to pass fish.

(c) Install water level control devices in beaver ponds with pool depth of four feet or more. If the water level control device is installed in water shallower than four feet, the design must have an enclosure to protect the water intake.

(d) Maintain the water level control device to ensure it functions as designed.

(6) BEAVER EXCLUSION DEVICES

(a) Design, install, and maintain guards, grates, grills, fences and other beaver exclusion devices to provide unimpeded fish passage and to prevent beavers from plugging a culvert.

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220-110-280 Felling and yarding of timber

All projects must meet the requirements in WAC 220-110-080 – General mitigation requirements for HPAs, and any requirements in WAC 220-110-100 through 220-110-440 that are included in an HPA. The department will require certain technical provisions depending upon the individual proposal and site specific characteristics. Additional special provisions may be included, as necessary to address site-specific conditions.

(1) DESCRIPTION

Timber felling includes "bucking" or cutting the felled tree into predetermined log lengths and also includes limbing of the bucked tree. Yarding is the process of hauling logs from the cutting area to the landing and includes skidding (i.e., dragging the logs across the ground). There are three major kinds of yarding systems; ground based, cable and aerial logging.

(2) FISH LIFE CONCERNS

Felling and yarding of timber can damage the aquatic and streambank riparian habitat.

(3) FELLING AND YARDING

(a) Do not fell trees into or across a watercourse, with identifiable bed or banks, except where the department authorizes the activity in specific provisions of an HPA.

(b) Trees or logs which accidentally enter a watercourse, with identifiable bed or banks, must remain where they enter unless the department specifically authorizes the removal of parts or all of the trees or logs.

(c) Use full suspension when transporting across a watercourse, with identifiable bed or banks, so no portion of the logs or limbs can enter the watercourse or damage the bed and banks. The department requires full suspension to prevent damage to riparian vegetation.

(d) Place cable tailholds across watercourses with identifiable bed or banks, provided they keep the number of yarding roads to a minimum. When changing roads, a person must move the cable around or over the riparian vegetation and banks to avoid damage to the vegetation and banks.

(e) Remove limbs or other small debris that enters the watercourse, with identifiable bed or banks, concurrently with each change in yarding road, or within seventy-two hours after entry into the watercourse or prior to the onset of high flows if anticipated to occur within 72 hours. They must place the limbs and other small

debris above the anticipated limits of floodwater. Remove limbs or other small debris from dry watercourses prior to the normal onset of high flows. A person must not disturb large woody material that was in place prior to felling and yarding of timber.

(f) Take precautions to minimize the release of sediment to waters downstream from the felling or yarding activity. Use sediment control devices, including, but not limited to, loose straw with a filter fabric check dams, as necessary to avoid the release of sediment downstream. Remove accumulated sediment from above check dams prior to their removal.

(g) Do not conduct skidding, ground lead yarding or operate equipment within flowing waters in channels with defined bed or banks.

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