Forest Practices Technical Note Number 3

Version 1.0

Replacing Stream Crossing Structures Outside Normal In-Water Working Periods

Effective September 10, 2001

Edited January 24, 2019 to recognized updated rule references

Edited by Keith Mills, Staff Geotechnical Specialist

Technical Information Supplied by: Jeff Boechler, Oregon Department of Fish and Wildlife; Tom Rosetta, Oregon Department of Environmental Quality; Gary Johnston, Willamette Industries Co.; Rod Shepard, Boise Cascade Co.; Randy Hereford, Starker Forests; Jim Paul, Staff Hydrologist, ODF; and John Seward, SOA Geotech, ODF

Introduction

The "Road Hazard and Risk Reduction Project" is a key element of the ***Oregon Plan for Salmon and Watersheds***. As part of this project, forest landowners have surveyed their roads. These surveys have found that many existing culverts cannot adequately pass stream flows during large floods, or allow fish to move upstream. Replacement of these older culverts is a key element of the Road Hazard and Risk Reduction Project, and is needed to improve long-term protection of fish habitat and water quality. Due to the many culverts that are not up to current standards, a great deal of time is needed for this work. Though necessary, these road repairs have considerable potential to increase erosion, sedimentation, and turbidity that can adversely affect fish and their habitat.

Forest Practices Rules address measures to control erosion whenever stream crossing structures are constructed or replaced (see pages 6 and 7). These measures are needed regardless of the project timing. When possible, projects should be completed during the dry summer months. However, given that the number of qualified operators and the time they have available is limited, and that there are many structures needing repair, landowners have asked for guidance for stream crossing projects that occur outside of summer months. This note provides information on the necessity of applying higher erosion control standards on these "wet-season" projects. The risk to resources that occurs if repairs are postponed or omitted because of the short normal work period must be a factor when evaluating work outside of in-water working periods. The more quickly these projects are completed, the better the overall resource protection.

It is the policy of the Oregon Department of Forestry (ODF) to allow operators to conduct road repairs during wet-season working periods when it can be accomplished with no more overall impact to fish resources or water quality than "dry-season" construction season repairs. This document includes specific guidance for developing written plans and conducting road repair operations outside of the normal construction periods. Repairs are encouraged on Type N streams during these periods. There may also be opportunities for repairs on Type F or Type SSBT streams. However, unless stream-crossing failure is imminent, repairs very close to stream segments containing species listed under the Endangered Species Act should be delayed until the next in-water-working period for that location.

Planning for Wet Season Road Repairs

Text in this font indicates where specific operations planning or on-the-ground actions are needed.

IN-WATER WORKING PERIODS

The Oregon Department of Fish and Wildlife has established ***Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources***. In-water work periods are established to minimize potential impacts to fish and wildlife species and their habitats. The specified periods are based on protecting the most vulnerable life stages of salmon, steelhead, other trout, and specific sensitive, threatened, or endangered fish and wildlife species. The life stages considered in establishing these guidelines include migration and rearing to some degree, but are more specifically intended to minimize impacts to eggs and fry (the life stages most vulnerable to sediment related impacts) during and after spawning.

The in-water working guidelines recognize that there are some circumstances where in-water work outside of the preferred work period is appropriate with suitable site conditions, project timing and if additional resource protection measures are used on the project. In western Oregon, "normal working periods" usually include only the dry summer months, and are, in some cases, too short to allow the needed culvert replacement work. Working periods outside of normal working periods will be referred to as ***wet-season working periods*** in this document.

FISH SENSITIVITY TO IN-STREAM WORK

Working in the stream channel and on stream banks has a high potential to affect fish and their habitat. In western Oregon, many of the most critical periods for fish also correspond to the wet season, when wet soils, cold temperatures, limited daylight hours, and high stream flows make construction more difficult. In general, construction effects have the potential to affect fish in this order, with the first being the greatest:

1. Direct disturbance - destruction of redds/fry;
2. Fine sediment deposition on redds/fry;
3. Stream flow diversion that causes scour or deposition on spawning areas; and
4. High turbidity affecting feeding.

Locations where fish have spawned are called ***redds***, and are very sensitive to these disturbances. Direct disturbance occurs when equipment is operated on redds, or when fill material is placed on these redds. Such activity is likely to destroy the eggs or fry within the redds. In-stream and streambank activity can cause erosion and turbidity, especially when soils are wet. Soil eroded into streams is called ***sediment***. Sediment tends to deposit in areas with lower flow. If it settles on top of redds, it can smother the incubating eggs and fry in the redds. Sediment delivered to streams can cause ***turbidity*** (discolored or muddy water) that may limit feeding by young fish.

SPAWNING PERIODS

"Typical" western Oregon spawning periods are listed below. These times are general, and local variation does occur (times may vary between sub-populations, even within the same watershed).

Spring Chinook - - September through early November
Fall Chinook - - October through December
Coho - - November through February
Chum - - November through December
Steelhead - - January through May
Cutthroat - - December through May

While in the gravel, eggs and very young fish are vulnerable and sensitive to disturbance. The time it takes for small fish to leave the gravel varies by species and is dependent on water temperature. At higher temperatures, it takes less time for fish to emerge from redds. Generally, most Pacific salmon and steelhead emerge in the spring or early summer following spawning. Steelhead and cutthroat emergence may continue into the summer months (due to later spawning times).

IDENTIFYING REDDS/CRITICAL RESOURCES

Visually surveying stream reaches for the presence of redds is generally not an accurate method for determining the absence of redds. Redds are often undetectable soon after spawning. Therefore, it is necessary to assume that redds are always present in Type F or Type SSBT streams during the established vulnerable periods, if the gravel size is suited to spawning use. Redds are not likely to be found in continuous bedrock stretches, or in locations with cobbles larger than 6 inches in diameter, but are common in locations with gravel bottoms. **Within about 100 feet upstream and 300 feet downstream of the operation area, Type F or Type SSBT streams should be carefully inspected for gravel or small cobble streambed conditions. If these conditions exist, redds are assumed to be present during the "wet-season."**

EROSION AND SEDIMENT DELIVERY

Sediment delivery to streams depends on a number of factors. Clay and silt soils (called ***fines***) are the most easily eroded, especially after being disturbed by machine activity. The larger the area that is disturbed, the greater the potential for erosion. Eroded sediments can be "filtered" if the muddy water flows over a large area of porous soils, or is trapped in a settling pond or

behind a sediment barrier. The greater the flow of water over the disturbed area and the larger the disturbed area, the greater the movement of sediment. Direct in-stream excavation or filling releases stored fine sediments. Mud from road surface runoff is a secondary factor delivering sediment to streams from wet-season construction and hauling projects.

Reducing and Preventing Effects on Fish and Their Habitat

In addition to timing projects to avoid sensitive resource periods, the impacts to streams and fish habitat can be reduced by:

- Avoiding direct disturbance to the most sensitive locations,
- Reducing the period of time that in-stream and streambank work occurs, and operating only during periods when soils are not very wet and stream flows are not high,
- Reducing the area disturbed during the operation,
- Keeping streamflow away from disturbed soils, and
- Stabilizing and/or re-vegetating disturbed areas as rapidly as possible.

AVOIDING DIRECT DISTURBANCE

Direct disturbance (by machine or other construction activity) on gravels where redds could be present is not acceptable. Therefore, in no case should equipment be operated on streambed gravel or small cobbles during periods between spawning and fry leaving redds. Generally, in-stream machine activity should be restricted to areas with a continuous bedrock or large cobble substrate, or to areas of pre-existing stream crossing fill material. **Any construction-related stream crossings by equipment should be limited to areas of bedrock or cobbles larger than 6 inches in diameter, or across a temporary bridge that does not disturb potential redds.**

Typically, only one crossing of a stream is needed to get equipment to the other side before a temporary crossing is in place. ***Wet-season placement of new culverts in Type F or Type SSBT streams that do not have existing culverts would likely result in unacceptable impacts and, therefore, should not be installed unless a true emergency (high public safety risk or likelihood of even greater resource damage if repairs are postponed) exists.***

The proximity of the project to potential redds has a big influence on in-stream effects. The closer the project is to redds, the greater the potential for resource damage. **Small Type N streams, well above fish-bearing stream reaches, provide opportunities for construction or repair outside of normal working periods. Bridges can be constructed with the lowest impact to Type F or Type SSBT streams, especially if there is no in-stream pier needed.**

PROJECT TIME FRAME

Completing the project quickly has many benefits. It reduces costs, reduces periods of road closure, and reduces the time period when in-stream disturbances and resulting sedimentation could occur. **In most cases, experienced operators can remove and replace culverts**

in one day. In-stream bridge construction work should take no more than three days. In-stream work must occur during periods of relative low flow.

Low flows occur after several days of little or no rain or snowmelt, when streamflow is clear and the active channel (gravel bottom) is not entirely under water. For larger streams, low flows may not occur until weeks after major rainstorms.

In-channel work should not occur during the periods of greatest fish sensitivity (such as adjacent to fish when they are actually developing redds and spawning). Early fall work can often be completed before fish spawning takes place. However, it is difficult to re-establish vegetation on disturbed areas in the late fall (except for low elevation areas). Heavy mulching is an alternative, if drainage water is kept off the site. In western Oregon, the highest flows are less likely during spring months, and it is easier to re-vegetate construction sites during the spring. **However, incubating eggs and fry are more likely to be present in stream gravel during the spring months.**

It is the operator's responsibility to watch weather and stream channel conditions during the operation. Operations should not be commenced during periods when rain is in the forecast. If mud is moving from the work area into the stream, the operator needs to cease operating and use more effective erosion control measures to prevent mud from moving into the stream before any additional reconstruction activity. Operators must remain flexible if they are to work during the wet season, and be able to wait for periods of low flow and workable on-site conditions.

REDUCING SIZE OF DISTURBED AREAS

Reducing sediment generation is essential for all wet-season stream crossing structure projects. **Working completely within an area of pre-existing fill is an acceptable activity if it is not likely to directly disturb redds, and if the appropriate erosion controls are used to keep sediment out of streams. Using the right equipment will reduce disturbance around the stream channel.** For example, a big excavator or crane that can stay off of stream banks while working can eliminate disturbance to the active channel.

KEEPING STREAMFLOW AWAY FROM DISTURBED AREAS

Streamflow can move a lot of mud off the construction site and into the stream. It is necessary to keep some or all of the streamflow away from the work area, and especially away from fine fill material during excavation. **Pumping streamflow (for smaller streams) or construction of a flumed temporary channel should be used when replacing culverts in Type F or Type SSBT streams during the wet season. Temporary channels may be constructed using a culvert, half-round, or ditch armored with clean rock. Pumping or temporary channels should not impede fish passage for longer than two days.** Temporary channels are only possible if the valley is wide enough to permit construction of a bypass channel, and construction of the bypass channel is possible without causing resource damage.

For very small streams, a check dam can be used to hold flow above crossings if the project can be completed quickly. A check dam to store sediment at the base of a crossing can also be used to trap additional sediment, but these sediments must be removed before the check dam is removed. In addition, stabilization of any remaining exposed areas must be completed immediately at the end of the project.

STABILIZATION OF DISTURBED AREAS

The equipment work area next to the stream is also subject to accelerated erosion. Armoring the work area with clean gravel (or, in limited cases, logs) can greatly reduce erosion and sediment delivery. **Using clean, free-draining rock when placing any fill in the flowing stream will also reduce sediment production. Free-draining fills are also less likely to fail, since they are stronger and less likely to retain water. Finally, rip-rap should be placed around the inlet and outlet of culverts.**

Temporary sediment storage is not as effective as on-site erosion control, since these projects are already next to flowing water. Filter bags or hay bales may be useful to trap muddy ditch flow for short periods of time, but are only effective for a small volume of runoff. Silt fencing is not usually installed correctly, works only for unconfined overland flow, and may not be appropriate for forestland situations unless combined with hay bales. Heavy mulching of exposed soils with straw or wood chips is an effective means of controlling surface erosion and overland flow, as long as drainage water is not directed over the exposed soils. **Removing stored sediment and post-operation stabilization are also necessary when using sediment traps. When seeding or mulching is used (as opposed to using gravel on all disturbed areas), it is necessary to monitor the site during the first heavy rains to see if these erosion controls are working. If they are not working, more effective erosion control is needed (for example, using clean rock to cover the eroding locations).**

Directly Applicable Forest Practices Rules

OAR 629-625-0100 (1) A properly located, designed, and constructed road greatly reduces potential impacts to water quality, forest productivity, fish, and wildlife habitat. To prevent improperly located, designed, or constructed roads, a written plan is required in the sections listed below.

(2) In addition to the requirements of the water protection rules, operators must submit a written plan to the State Forester before:

(a) Constructing a road where there is an apparent risk of road-generated materials entering waters of the state from direct placement, rolling, falling, blasting, landslide or debris flow;

(b) Conducting machine activity in Type F, Type SSBT or Type D streams, lakes or significant wetlands; or

(c) Constructing roads in riparian management areas.

(3) Operators shall submit a written plan to the State Forester before constructing roads on high landslide hazard locations. Operators and the State Forester shall share responsibility to identify high landslide hazard locations and to determine if there is public safety exposure from shallow, rapidly moving landslides using methods described in OAR 629-623-0000 through 0300. If there

is public safety exposure, then the practices described in 629-623-0400 through 0800 shall also apply.

OAR 629-625-0320 (2) Operators shall design and construct stream crossings (culverts, bridges, and fords) to:
(a) Pass a peak flow that at least corresponds to the 50-year return interval. When determining the size of culvert needed to pass a peak flow corresponding to the 50-year return interval, operators shall select a size that is adequate to preclude ponding of water higher than the top of the culvert; and
(b) Allow migration of adult and juvenile fish upstream and downstream during conditions when fish movement in that stream normally occurs.

OAR 629-625-0430(1) When constructing stream crossings, operators shall minimize disturbance to banks, existing channels, and riparian management areas.
(2) In addition to the requirements of the water protection rules, operators shall keep machine activity in beds of streams to an absolute minimum. Acceptable activities where machines are allowed in streambeds, such as installing culverts, shall be restricted to periods of low water levels. Operators shall submit a written plan to the State Forester for machine activity in Type F, Type SSBT or Type D streams; lakes; and significant wetlands.

OAR 629-625-0440 (2) During wet periods operators shall construct roads in a manner which prevents sediment from entering waters of the state.

Directly Applicable Water Quality Standard

OAR 340-041-(basin)-(2) (c) Turbidity (Nephelometric Turbidity Units, NTU): No more than a ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and [other conditions when DEQ administers].

Written Plans - Stream crossing work outside of in-water working periods will almost always result in a "risk of materials entering waters of the state." **Therefore, written plans will be needed for stream crossing projects conducted outside of normal working periods.** Department of Forestry policy is that written plans are required for stream crossing projects on flowing streams if the project is conducted outside of in-water working periods (including Type N streams). Written plans are required for all crossings of Type F, Type SSBT or Type D streams, regardless of the time of year, as required by OAR 629-625-0100(2)(b).

STANDARD WRITTEN PLAN PROVISIONS (ANY TIME OF YEAR)
The following information should be included and described in written plans for stream crossing structures, regardless of the season of the operation:

- ***Construction Period:*** allowable begin and end dates
- ***Type of Structure*****:** round metal culvert, pipe-arch, open bottom culvert, rail car bridge, steel beam bridge, concrete bridge, wood bridge, other
- ***Basin Acreage:*** usually dot grid calculation acceptable
- ***50-year Peak Flow*****:** in cubic feet per second
- ***Stream Classification*****:** Type and size
- ***Fish Passage Provision:*** (if Type F or Type SSBT to previous culvert, assumed will be Type F or Type SSBT above the new culvert) natural bottom, countersinking, or low gradient. **Natural channel and culvert gradient measured with a level.** (See reference 1, Appendix D, for more detail.)
- ***Fill Material****:* free-draining rock, local fill from borrow, or re-use excavated material (not acceptable for wet season repair)
- ***Rip-rap Placement:*** size (with maximum fines), and where placed
- ***Drawings:*** plans showing channel gradient, or for bridge, span
- ***Cease-operating Provision*****:** for rain or periods of higher stream flow
- ***Bridge Abutment Design:*** **Note that wet concrete is very toxic to fish at any time of the year. If the operation calls for pouring concrete, measures to ensure that stream flow will not touch uncured (wet) concrete must be included in the plan.**

WET-SEASON WRITTEN PLAN PROVISIONS

In addition to the previous information, written plans for operations conducted during the wet-season must contain more information as described below:

- ***Distance from potential redd sites:*** to about 100-foot accuracy
- ***Number of stream crossings required:*** including provisions to keep equipment off of potential redds when they may be present
- ***Define workable periods*** *(necessary conditions for operations to occur):* less than one-half inch rain in last 2 days, normal season stream-flow, no rain (over one-quarter inch) forecast during work period, no mud flowing under equipment
- ***Provisions to keep stream flow off fines:*** flume, check dam, pumping
- ***Maximum time allowed for in-channel work:*** days with streamflow passing over fill/disturbed channel, one day for culverts, three days for bridges
- ***Work area stabilization:*** rock armoring recommended immediately after new structure is placed, rainy weather monitoring is needing for other stabilization (seeding and/or mulching)
- ***Provision to add additional erosion controls if sediment from the operating area*** (exclusive of that generated by actual culvert removal) *results in a visual increase in turbidity*
- ***Monitoring Plans*****:** generally by giving ODF permission for monitoring or by selecting an independent party for monitoring

Coordination with ODFW

Forest Practices Foresters will make a direct contact with ODFW on all wet-season stream-crossing repair projects. Written plans for wet-season repair of stream crossing structures will be provided to Department of Fish and Wildlife district fish biologists for review and comment. If possible, an ODFW biologist will visit the proposed operation site to provide input on the potential for redds near the site, and the sensitivity of the redds during the proposed project time frame.

Monitoring

Forest Practices Foresters should notify the staff monitoring coordinator if the proposed wet-season stream crossing repair is within 300 feet of a Type F or Type SSBT stream. As resources permit, staff will collect turbidity and sediment samples, and will evaluate protection effectiveness. Monitoring will occur during the project and where possible, during the first heavy rains after project completion. This information will **not be used** for enforcement actions, since the written plan alone will be the basis of compliance determinations.

Endangered Species Act Limitation

Some salmon and trout populations in Oregon have been listed as threatened or endangered under the Federal Endangered Species Act (ESA). The repairs discussed are intended to protect fish and their habitat, and may result in minimal impacts for very short periods of time. However, the Oregon Department of Forestry will not be making determinations on whether these practices are consistent with "Take" avoidance under the ESA. The ESA is a Federal Law enforced by the National Marine Fisheries Service or the U.S. Fish and Wildlife Service.

References

1. ***Oregon Guidelines of Timing of In-Water Work to Protect Fish and Wildlife Resources.*** Oregon Department of Fish and Wildlife. June, 2000 (or more recent update)
2. ***Road Management Guidebook.*** Oregon Department of Forestry. 2000
3. ***Written Plans - Forest Practices Note Number 9 (revised)*** Oregon Department of Forestry. 1994
4. ***Oregon Road/Stream Crossing Restoration Guide.*** Oregon Department of Forestry. 1999

Oregon Department of Forestry Field Offices

For more information about the Oregon Forest Practices Act or the Forest Practice Rules, please contact your local Oregon Department of Forestry office which can be found at http://www.oregon.gov/ODF/Working/Pages/FindAForester.aspx *or the headquarters office at 2600 State Street, Salem, Oregon 97310. 503-945-7200.*