NRCS Natural Resources Conservation Service

Fish Passage

Oregon Conservation Practice Job Sheet 396

Client Name: _____

Culvert with no upstream fish passage

Dam with no upstream fish passage

Definition

Modification or removal of barriers that restrict or impede movement or migration of fish or other aquatic organisms.

Purposes

Improve or provide upstream and downstream passage for fish and other aquatic organisms.

Where Used

This practice applies to all watercourses and outlets of ponds, lakes and wetlands where barriers impede passage for fish and other aquatic organisms.

Fish passage barriers can be *natural* (e.g., waterfalls, beaver dams) or *artificial* (e.g., road culverts, surface water diversions). If native fish have evolved around the presence of natural barriers – they should be left in place. Beaver dams are an example of a natural barrier that should be left in place. Beaver dams may block weak-swimming fish at all flows or strong swimmers during only extreme flows, yet they create very diverse habitat for fish and numerous other species of aquatic and terrestrial wildlife.

Artificial barriers, on the other hand, should be completely removed or the stream should be rerouted around them to avoid installing expensive, high-maintenance fishways (fish ladders). However, for some surface-water diversion dams or weirs, a fishway may be the only alternative. A concurrent "passage" problem at these diversion structures is the loss of fish that become entrained in the diverted flow. This problem is best addressed by installing screens, using Practice Standard 587, *Structure for Water Control.*

Conservation Plan

This practice is commonly applied concurrently with Practice 395 - Stream Habitat Improvement and Management as part of a conservation plan.

Often, artificial barriers (especially culverts) are associated with unstable stream conditions. When this occurs, the Fish Passage practice should be part of a long-range goal to restore geomorphic stability and habitat features to the stream by combining it with Stream Habitat Improvement and Management, (395), Channel Stabilization (584), and Streambank and Shoreline Protection (580).

Structures installed under this practice must be designed not only for upstream passage of fish, but also for downstream passage of high flows and bedload. The Oregon Department of Fish and Wildlife (ODFW) requires that road crossings maintain their structural integrity during a 100-year flow event.

Fish Passage Criteria

There are many native species of anadromous and resident fish that use Oregon State streams. Their ability to negotiate instream obstructions varies by

species and by size of individual fish within a species. This practice will follow the passage criteria established by ODFW for native fish species. Also, additional criteria may be required by federal agencies for fish that are protected under the Endangered Species Act. This practice will also provide passage for other aquatic species which spend a majority of their time in freshwater stream systems.

ODFW has prioritized fish passage barriers where passage would provide the greatest benefit to native migratory fish. This table can be found at: http://www.dfw.state.or.us/agency/commission/minutes/07/jan/D_4_statewide%20fish%20passage%20priority%20list.pdf.

Since August 2001, the owner or operator of an artificial obstruction located in waters in which native migratory fish are currently or were historically present **must** address fish passage requirements *prior to* installation, major replacement, a fundamental change in permit status (e.g., new water right, renewed hydroelectric license), or abandonment of the artificial obstruction. Native migratory fish include native salmon, trout, lamprey, sturgeon, suckers, and a few other species. Addressing fish passage requirements entails the owner/operator obtaining from the ODFW: 1) approval for a passage plan when passage will be provided, 2) a waiver from providing passage, or 3) an exemption from providing passage. Laws regarding fish passage may be found in ORS 509.580 through 910 and in OAR 635, Division 412 http://www.dfw.state.or.us/OARs/412.pdf.

Fish passage criteria and design are normally based on the migration timing and swimming ability of the weakest individual of the weakest species and life history stage of native migratory fish which are present that require upstream access. Maximum velocities for upstream passage through culverts are based on the *prolonged swimming speed* (medium energy, sustainability in minutes) of the target fish. Passage should be designed for the weakest fish in the system - commonly, salmon fry (<60 mm or 2.2 inches). For these small fish, velocities over 1.1 ft/sec are considered impassable. For adult trout (>150 mm or 6 inches), chum, and pink salmon, velocities must not exceed 4 ft/sec for culverts up to 100 feet long; 3 ft/sec for 100-200 feet and 2 ft/sec, if over 200 feet. For adult chinook, coho, sockeye and steelhead, velocities must not exceed 5, 4, and 3 ft/sec, respectively, for the same culvert sizes. Thus, it is important to identify this information for the location in question by contacting your local ODFW fisheries biologist.

Fish screens may be required by Oregon law and are often included as a condition of a water right or permit issued by a state agency, such as Oregon Department of State Lands (DSL) or Oregon Water Resources Department (OWRD).

DAMS AND OTHER AREAS WHERE UPSTREAM AND DOWNSTREAM STREAMBED ELEVATIONS ARE DIFFERENT: [See ORS 635-412-0035 (2)]. If NRCS is working with a landowner with a dam, then a fishway or ladder must be built according to specific criteria with regards to flow velocities through the fishway and attraction flow, baffles, fishway pools, entryways and trash racks.

CULVERTS: Shall be designed using the Stream Simulation Option [See ORS 635-412-0035 (3)(a)] or to an Alternative Option (as approved by ODFW with justification) [See 635-412-0035 (3)(b)].

TIDEGATES AND OTHER OBSTRUCTIONS IN ESTUARIES, FLOODPLAINS OR WETLANDS: [See 635-412-0035 (4) and (5)]. Obstructions in estuaries, floodplains and wetlands must provide upstream and downstream passage and/or passage during tidal cycles determined by the ODFW fisheries biologist.

Additional requirements for passage at fish traps [635-412-0035 (6)], obstruction removal [635-412-0035 (8)], exclusion barriers [635-412-0035 (9)], and during construction 635-412-0035 (10)] can also be found at the link above. There are also requirements for experimental fish passage structures [See 635-412-0035 (11)] as well.

ODFW has specific requirements for certain native fish species, such as sturgeon, suckers, lamprey, trout and salmon and pikeminnow. These specific native fish requirements will be applied to all fish passage designs. Links to the specific native fish requirements can be found at: http://www.dfw.state.or.us/OARs/412.pdf [635-412-0035 (7)].

Operation and Maintenance

This practice will be inspected periodically and restored as needed to maintain the stated purpose for passage. Additional operation and maintenance requirements will be listed in individual Supporting Practices.

Site-specific requirements are listed on the Job Sheet with instructions for filling out the Job Sheet on the Specification. Additional specifications will be used for Fish Passage from individual Supporting Practices.

NRCS
Natural Resources Conservation Service

FISH PASSAGE

Conservation Practice Specification 396

Customer:	Company:	Application Date:

Program: ☐ CRP ☐ CREP ☐ CSP ☐ EQIP ☐ FLEP ☐ FRPP ☐ GRP ☐ WHIP ☐ WRP ☐ NONE

Contract #:	Planned Finishing Date:

Legal Description: Township Range Section	¼ Section: ☐ NW ☐ NE ☐ SW ☐ SE

Stream Name:	HUC:	Receiving Water:

Listed Fish: ☐ Chinook ☐ Coho ☐ Chum ☐ Steelhead ☐ Bull Trout ☐ Suckers ☐ Other: _____

Site Concerns:

- ☐ Active Bank Erosion
- ☐ Loss of Diversion Flow
- ☐ Active Bed Scour
- ☐ Road Failure
- ☐ "Push-up" Berm
- ☐ Channel Avulsion
- ☐ Structure Failure
- ☐ Inadequate Fish Habitat
- ☐ Other: _____

Streambed Composition:

- ☐ Sand
- ☐ Silt
- ☐ Muck
- ☐ Gravel
- ☐ Cobble
- ☐ Boulder
- ☐ Concrete

Target Fish:

- ☐ Fry Salmonid (< 60mm)
- ☐ Fingerling Salmonid (60-150mm)
- ☐ Adult Trout (> 6" or 150mm)
- ☐ Adult Pink or Chum
- ☐ Adult Other Salmonid
- ☐ Other: _____

Fish Screens:

- ☐ Present – Not ODFW/ NMFS Criteria
- ☐ None – Not Needed
- ☐ Present – Meets ODFW/ NMFS Criteria
- ☐ Present – Needs Repair
- ☐ None – Must Be Repair

ESA Consultation Completed? ☐ Yes ☐ No

Permits Obtained (Check Appropriate Boxes) ☐ DSL ☐ ACOE ☐ Other (Specify): _____

Purpose(s) of Practice:

☐ **Improve upstream and downstream passage for fish and other aquatic species**

☐ **Provide upstream and downstream passage for fish and other aquatic species**

Other (explain):

Passage Barrier Evaluation Procedure: List tools or methods used to assess habitat conditions (e.g., Stream Visual Assessment Protocol, ODFW culvert assessment, or Other habitat inventory, etc.).

BARRIER DESCRIPTION

Measurements made in ☐ meters ☐ feet ☐ inches.

Listed as barrier? ☐ Unknown ☐ No ☐ Yes by ☐ ODFW ☐ Tribe ☐ Other

Miles to next barrier _____.

1A. EXISTING CULVERT (Fill out information for the first culvert, print out page, clear data and fill information out for second culvert. Repeat if necessary.)

Number:	Shape:	Material:	Span:	Length:
☐ 1.1 ☐ 2.3 ☐ 1.2 ☐ 2.4 ☐ 1.3 ☐ 3.3 ☐ 1.4 ☐ 3.4 ☐ 2.2 ☐ 4.4	☐ ARCH ☐ BOX ☐ ELL ☐ RND ☐ SQSH ☐ OTHER	☐ CAL ☐ SPA ☐ CPC ☐ SPS ☐ CST ☐ SST ☐ MRY ☐ TMB ☐ PCC ☐ OTHER ☐ PVC	_____	_____
			Rise: _____	
			Outfall: _____	% Slope: _____

Bed Material:	Apron:	FIll Depth:	Damaged:
☐ Bed Rock ☐ Boulders ☐ Cobble ☐ Gravel ☐ Sand ☐ Silt ☐ Clay	☐ At Outlet ☐ None ☐ At Inlet ☐ Both Ends	_____ Tidegate: ☐ Yes ☐ No Water Velocity: _____ Ft/Sec _____ M/Sec	☐ Collapsed ☐ Drop at Inlet ☐ Gradient Change ☐ Multiple Materials ☐ Not Damaged ☐ Obstruction ☐ Rebar Showing ☐ Rusted Through ☐ Unknown

Downstream Gradient _____ (%)	Downstream Gradient _____ (%)	Invert Elevations: Inlet _____ Outlet _____
Average Bankful Width: _____	_____ Angle of stream to inlet culvert (degrees)	_____ Angle of stream to outlet of culvert (degrees)

1B. CULVERT SOLUTION

☐ Complete removal, no replacement with another structure

Replaced with:	Replaced with:	Shape:	Material:
☐ Bridge ☐ Complete Removal	☐ No Slope Culvert ☐ Hydraulic Design Culvert ☐ Stream Stimulation Culvert	☐ ARCH ☐ BOX ☐ ELL ☐ RND ☐ SQSH ☐ OTHER	☐ CAL ☐ SPA ☐ CPC ☐ SPS ☐ CST ☐ SST ☐ MRY ☐ TMB ☐ PCC ☐ OTHER ☐ PVC

_____ Span	_____ Rise	_____ Length	_____% Slope	Embedded Depth: _____ Inlet _____ Outlet

Downstream Bed Controls:	Upstream Bed Controls:		Baffles Installed – Type:	Weirs Installed:
☐ Log #_____ ☐ Rock #_____	☐ Log #_____ ☐ Rock #_____	☐ Retrofitted in Place	☐ Angled #_____ ☐ Corner #_____ ☐ Notched #_____	☐ Concrete #_____ ☐ Metal #_____ ☐ Wood #_____

Notes:

Clear Form

2A. EXISTING DAM (WEIR)

Height: _____	Face: ☐ Vertical ☐ Ogee ☐ Sloped	Base: ☐ Concrete Apron ☐ Natural Bed ☐ Riprap Apron ☐ Other	Plunge Pool Depth: _____
Construction/Form: ☐ Temporary "Push-Up" Berm ☐ Concrete (Solid) ☐ Wood (or Log) ☐ Large Rock ☐ Concrete (w/Stoplogs) ☐ Metal (w/Stoplogs) ☐ Other			Reservoir Depth: _____

2B. DAM SOLUTION

☐ Roughened Channel w/Rocks ☐ Roughened Channel w/Logs ☐ Complete Removal ☐ Pool and Weir Fishway	☐ Other: _____ ☐ Bypass Channel ☐ Denil Fishway ☐ Alaska Steepass	# of Weirs/Bed Controls: _____

3A. EXISTING BRIDGE

Material: ☐ Log Stringer ☐ Steel ☐ Wood ☐ Other: _____	Footings: ☐ Concrete ☐ Wood ☐ Earthen ☐ Other: _____	*Distance from Bridge Bottom* to OHW : _____	Length: _____ Width: _____

3B. BRIDGE SOLUTION

☐ Complete removal, no replacement with another structure

Replaced with: ☐ Bridge ☐ Culvert ☐ Ford

Replaced with: ☐ No-slope Culvert ☐ Stream Stimulation Culvert ☐ Hydraulic Design Culvert	Shape: ☐ Arch ☐ Box ☐ ELL ☐ RND ☐ SQSH ☐ Other	Material: ☐ CAL ☐ CPC ☐ CST ☐ MRY ☐ PCC ☐ PVC ☐ SPA ☐ SPS ☐ SST ☐ TMB ☐ Other	Span: _____ Rise: _____ Length: _____

Downstream Bed Controls: Log #_____ Rock #_____	Upstream Bed Controls: Log #_____ Rock #_____	☐ Retrofitted in Place

Notes:

ADDITIONAL HELP:

- Assessment of fish barriers: ODFW Fish Passage - Barrier Inventories
- Culvert design: http://www.wa.gov/wdfw/hab/engineer/cm/culvert_manual_final.pdf
- FishXing software (free): http://stream.fs.fed.us/fishxing/

- NMFS fish passage and screening criteria: http://www.nwr.noaa.gov/Salmon-Hydropower/FERC/upload/Fish_Passage_Design.pdf
- Oregon Restoration Guide: http://www.oregon.gov/OWEB/docs/pubs/habguide99-complete.pdf
- ODFW Guidelines and Criteria for Stream-Road Crossings: http://oregon.gov/ODF/privateforests/docs/RdStrmCrossRestorGuideA-E.pdf

ODFW Fish Passage Criteria: http://www.fws.gov/midwest/Fisheries/StreamCrossings/images/PDF/ODFW%20Fish%20Passage%20Criteria%20-%202004.pdf

Fish Passage – Photo Points

Take a photo of the barrier before and after project implementation (either replacement or removal).

Pre – Project
Post – Project

Supporting Practices *(Specifications that will be used to implement these activities are provided under the appropriate NRCS conservation practice standards indicated below and provided separately).*

☐ **Dam 348**	☐ **Grade Stabilization Structure 410**	☐ **Streambank and Shoreline Protection 580**
☐ **Ponds 378**	☐ **Access Road 560**	☐ **Open Channel 582**
☐ **Stream Habitat Improvement and Management 395**	☐ **Stream Crossing 578**	☐ **Channel Stabilization 584**

Notes:

Implementation Procedure/Guidelines: List methods or guidelines used to designing habitat elements (e.g., ODFW Fish Passage Criteria or Guidelines.)

Operation and Maintenance: Client agrees to annual monitoring of this practice to determine: 1) if passage objectives for targeted aquatic species are being met, 2) if facilitating practices are functioning or need repair, and 3) if modifications are needed for maintaining unobstructed flows through the structure. Also refer to O&M requirements listed in individual Supporting Practices.

Refer to Design Engineering Drawings and Specifications in Casefile

Engineer or Technician Preparing Designs: _____

Approved: /s/_____ Date: _____

PRACTICE APPROVALS:

1. Planning Approval:

Practice Code No.	PRACTICE	LEAD DISCIPLINE	CONTROLLING FACTOR	UNITS	JOB CLASS				
					I	II	III	IV	V
396	Fish Passage	*BCSD-AqBio*	Barrier Type: ☐ Culvert ☐ Dam/Weir ☐ Bridge	N/A	All	0	0	0	0
This practice is classified as Job Class (check one) for Controlling Factor (check box):									

Approved by: /s/ _____

Job Title / I & E JAA: _____ Date: _____

2. Supporting Practice Design Approval: Choose one of the following below or use the blank lines at the bottom for other supporting practice design Job Class information.

Practice Code No.	PRACTICE	LEAD DISCIPLINE	CONTROLLING FACTOR	UNITS	JOB CLASS				
					I	II	III	IV	V
560	Access Road	*CED-HE*	☐ 1) Length	ft	500	1,000	**2,500**	**5,000**	**all**
			☐ 2) Culvert Pipe, ID for flow	in	18	36	**48**	**60**	**72**
			☐ 3)Culvert Pipe, ID for fish passage	in	48	72	**84**	**96**	**108**
			☐ 4) Bridge span	ft	None	None	None	**10**	**24**
This practice is classified as Job Class (check one) for Controlling Factor (check box):									
584	Channel Stabilization	*CED-DE*	☐						
			☐						
			☐						
			☐						
This practice is classified as Job Class (check one) for Controlling Factor (check box):									
348	Dam Diversion	*CED-DE*	☐ 1) Hazard	class	a	a	**a**	**a**	**a**
			☐ 2) Streamflow (25 yr. freq.)	cfs	none	500	**1,000**	**1,500**	**2,000**
			☐ 3) Flow Diverted	cfs	none	15	**50**	**150**	**200**
			☐ 4) Height of Drop	ft	none	2	**4**	**6**	**8**
This practice is classified as Job Class (check one) for Controlling Factor (check box):									
410	Grade Stabilization Structure – Full Flow (not Pond/Dam)	*CED-DE*	☐ 1) Flow Capacity	cfs	none	**50**	**300**	**500**	**1,000**
			☐ 2) Net Drop	ft	none	**4**	**8**	**10**	**12**
This practice is classified as Job Class (check one) for Controlling Factor (check box):									
410-A	Grade Stabilization Structure – Rock Checks	*CED-DE*	☐ 1) Design Depth	ft	none	1	**2**	**3**	**4**
			☐ 2) Height of Drop	ft	none	2	**3**	**4**	**6**
This practice is classified as Job Class (check one) for Controlling Factor (check box):									
582	Open Channel	*CED-DE*	☐ 1) Design Capacity (Subcritical Flow Only)	cfs	50	**100**	**200**	**300**	**500**
			☐ 2) Velocity	fps	2	**4**	**6**	**8**	**10**
This practice is classified as Job Class (check one) for Controlling Factor (check box):									

Practice Code No.	PRACTICE	LEAD DISCIPLINE		CONTROLLING FACTOR	UNITS	JOB CLASS				
						I	I	I	I	I
378	Pond	*CED-DE*		1) Hazard	class	a	**a**	**a**	**a**	**a**
				2) Effective Height	ft	<10	**15**	**20**	**25**	**35**
				3) Storage X Effective Ht	ac-ft^2	<92	**500/e**	**1,500/ e**	**3,000/ e**	**all/e**
				4) Drainage Area	mi^2	0.5	**1**	**5**	**10**	**20**
				5) Embankments Over Active Faults	none	none	none	none	none	none
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
578	Stream Crossing	*CED-EG*		1) Flow Capacity	cfs	50	100	**300**	**400**	**1,000**
				2) Velocity	fps	2	4	**6**	8	10
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
395	Stream Habitat Improvement and Management	*BCSD-AqEco*		1) Stream Length	ft	100	500	1,000	1,500	2,000
		CED-HE		2) Flow	cfs	50	100	300	400	1,000
				3) Velocity	fps	4	8	10	12	15
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
580a	Streambank and Shoreline Protection Beaches and Shorelines	*CED-HE*		Height above Mean High Tide or Mean High Water	ft	none	none	1	2	3
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
580b	Streambanks Vegetation	*CED-HE*		Area	ac	5	10	15	**20**	**all**
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
580c	Mechanical	*CED-HE*		1) Full Bank Flow	cfs	100	500	**1,000**	**2,000**	**5,000**
				2) Drainage Area	mi^2	1	10	**50**	**75**	**100**
				3) Height of Bank	ft	3	3	**5**	**8**	**10**
				4) Velocity	fps	2	4	**6**	**8**	**10**
This practice is classified as Job Class (check one) for Controlling Factor (check box):										
This practice is classified as Job Class (check one) for Controlling Factor (check box):										

Design Approved by: /s/ _____

Job Title / Design JAA: _____ Date: _____

CLIENT'S ACKNOWLEDGEMENT STATEMENT:

The Client acknowledges that:

a. They have received a copy of the specification and understand the contents and requirements.
b. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Accepted by: /s/ _____ Date: _____

CERTIFICATION:

I have completed a review of the information provided by the client or have conducted a site visit and certify this practice has been applied according NRCS standards and specifications.

Certification by: /s/ _____ Date: _____

Job Title: _____ Construction JAA: _____