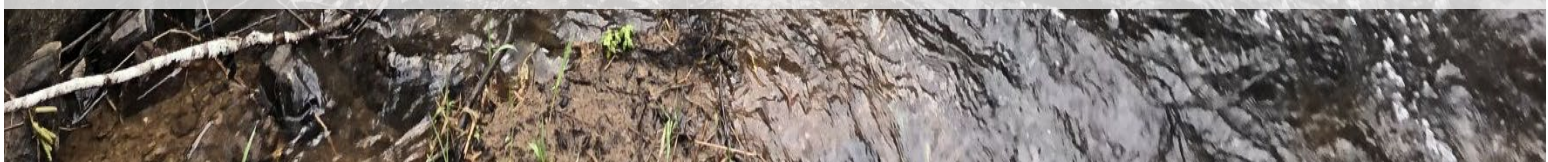




Culvert Repair Programmatic Agreement 2020 Annual Report

**Oregon Department of Fish and Wildlife | Oregon Department of Transportation
January 2022**



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Executive Summary

The Oregon Department of Transportation (ODOT) and the Oregon Department of Fish and Wildlife (ODFW) are implementing a five-year Culvert Repair Programmatic Agreement (CRPA) project that allows ODOT to make specific short-term repairs to culverts without having to meet full fish passage criteria at the repair location. This enables ODOT to make critical repairs of aging culverts in a cost-effective manner, while providing a benefit to Native Migratory Fish (NMF) over the status quo by improving fish passage at each site repaired. In addition, ODOT paid \$2.5 million into an ODFW-managed account that will fund the highest priority fish passage restoration projects off the state highway system.

ODOT's culvert inventory has revealed that approximately 10,500 culverts are in poor or critical condition and require repair or replacement in the near term to maintain the safety and integrity of the state highway system. Based on current estimates, it would require over \$18.5 billion to replace all the culverts under the state highway network. The typical design life of a culvert can range from 25 to 75 years. Based on current funding allocations, it would take over 1,500 years to replace all the culverts owned and maintained by ODOT. Culvert repair work on fish-bearing streams has largely been deferred over the past 18 years due to the inability to meet fish passage design criteria with a repair and the lack of available funding for full fish passage criteria replacements. Culvert repairs typically can be completed for up to \$250,000. Culvert replacement projects that meet fish passage criteria can cost from \$1.5 million to over \$12 million each.

In 2020, eight culverts were repaired under the CRPA. The total cost for these repairs was \$1,635,372. The estimate to replace these culverts was \$36.8 million. ODOT was able to defer over \$35 million of cost to address these culverts by using the CRPA. However, this cost avoidance should be evaluated relative to the design life provided by the approach. The repairs have added approximately 10-25 years of life to these culverts, whereas full replacements would have provided a new design life of ~75 years. However, even given the difference in life span for the two approaches, life cycle costs are much lower for the repair option.

Fish passage improvements at the culvert repair projects used a combination of eliminating jump heights, increasing water depths, and decreasing water velocities. These projects improved access to over 29 miles of potential habitat. Additionally, part of the \$2.5 million allocated to passage restoration was used to fund fish passage projects off the state highway system. A solicitation process was not conducted in 2020, however, three selected for funding in 2019 were completed in 2020. Access to 22.3 miles of habitat was improved through these Compensation Projects.

The CRPA continues to showcase how interagency coordination and collaboration creates positive outcomes. This mutually beneficial agreement allows ODOT to make progress in maintaining the aging state highway system, while also providing on- and off-highway ecological benefits to NMF. Taxpayer dollars are used efficiently for culvert repair work, and hundreds of miles of potential habitat for NMF are made more accessible.

Definitions

- **Backwatered:** When the water surface through the outlet of the culvert and downstream are equal.
- **Baffles:** A structure used to restrain the flow of water in a culvert to provide migrating fish a place to rest and create water depth during low flows.
- **Culvert:** A concrete, metal or plastic pipe used to convey water, utilities, livestock, wildlife, or equipment, from one side of the road to the other.
- **Fish passage:** The ability, by the weakest NMF and life history stages determined by ODFW to require passage at the site, to move volitionally, with minimal stress, and without physical or physiological injury upstream and downstream of an artificial obstruction.
- **Fish rocks or fish blocks:** Are large rocks (or concrete blocks) placed in a stream or culvert to improve habitat, create scour holes, and areas of reduced velocity. Placing structures in the stream also creates eddies or vortices in their wake.
- **High priority barriers:** Any barrier found on the ODFW Fish Passage Priority List. Or determined by professional opinion to be a significant barrier to NMF migration.
- **Hydraulic conditions:** The conditions of the stream crossing in the context of water velocity, depth, complexity, vertical profiles, and capacity.
- **In water work period:** Guidelines for timing of in water work, developed by ODFW and established to avoid impacts to the vulnerable life stages of native migratory fish including migration, spawning, and rearing.
- **Invert:** The bottom portions of a culvert. Usually, the first area of wear due to interaction with water and sediment transport.
- **NMF:** Native Migratory Fish species defined in OAR 635-412-0005 that includes 32 species of fish that migrate as for their lifecycle needs.
- **Perched condition:** When the outlet of the culvert is elevated above the downstream water surface creating a freefall condition.
- **Poor and critical culvert condition:** A culvert that scores a poor or critical has structural deficiencies that pose a danger to the traveling public, the environment, and the community connections, which warrant repair or replacement before a possible failure occurs.

- **Roughened channel:** An artificially built channel downstream of a culvert designed to alleviate a perch and match conditions in the surrounding streambed.
- **Soil arch:** The compacted soil that surrounds the culvert. This compacted soil holds the load of the above material and roadway traffic, relieving the pressure from the culvert itself.
- **Tributary:** A river or stream flowing into a larger river or lake.
- **Weir:** A low dam built across the stream channel or culvert designed to raise the water level upstream.

Background

ODOT and ODFW are implementing a five-year programmatic agreement for culvert repair in Oregon spanning 2018 to 2022. The Oregon Fish and Wildlife Commission approved the CRPA as a programmatic approval under Oregon fish passage rules (OAR 635-412-0020(3)b). This allows ODOT to make specific short-term critical repairs to aging culverts without meeting full fish passage criteria at the repair location, but still providing a benefit to NMF over the status quo by improving fish passage at each site repaired.

This agreement follows and expands on a previous three-year pilot project for western Oregon. Under the first pilot CRPA, **ODOT was able to avoid over \$70 million to repair instead of replacing these failing culverts** [ODOT 2019](#). This new five-year agreement expands the service area to a statewide scale and allows the CRPA to be used on high priority fish passage barriers. With both CRPAs, ODOT and ODFW continue to advance the Oregon Plan for Salmon and Watersheds habitat restoration goals, while allowing repairs to critical transportation infrastructure in locations where fish passage can be improved in a cost-effective manner.

As a condition of the agreement, ODOT agreed to pay \$2 million into an ODFW-managed account to fund high priority fish passage projects off the state highway system to offset delays in meeting full fish passage criteria at culvert repair locations. This payment allows ODOT to use the agreement on 40 projects, with the opportunity for ODOT to pay an additional \$50,000 for each culvert repaired once the first 40 are complete. Based on the number of expected projects under the agreement, ODOT has provided an additional \$500,000. ODOT also committed to continue funding the ODOT Fish Passage Program to address the highest priority fish passage projects on the state highway system. In addition, ODOT funded two transportation liaison positions within ODFW, to coordinate the agreement's implementation and develop a database of ODOT culverts that includes fish presence, passage information, and a prioritization model.

The CRPA agreement is a crucial tool allowing ODOT to make meaningful progress by addressing culvert infrastructure problems, while demonstrating a benefit to NMF. ODOT and ODFW have measured success by documenting the number and cost of culverts repaired under this agreement, as well as the benefits of incremental fish passage improvements provided at the repair sites. Additionally, NMF gain major benefits through off-highway high-priority fish passage compensation fund projects.

The rules, laws, and other reference material regarding NMF passage regulations can be found below:

- [Oregon Fish Passage Rules.](#)
- [Oregon Plan for Salmon and Watersheds.](#)
- [Oregon Fish Passage Statutes.](#)

Programmatic Goals

The CRPA includes several key goals and sideboards for ODOT to conduct the culvert repair pilot program.

The goals of the CRPA include:

- a) Provide improved fish passage conditions at each culvert repair site.
- b) Address statewide fish passage priority barriers using the \$2.5 million fish passage fund in the most expeditious and efficient way practical.
- c) Improve state highway infrastructure conditions at each culvert repair site to address public safety.
- d) Generate information on the costs, impacts, efficiency, and effectiveness of the CRPA project approach.
- e) Develop a work plan to further identify resources and gather information on fish presence and barriers.

Programmatic Sideboards

The CRPA allows repairs to culverts that meet all the following criteria:

- Culverts must be located on ODOT-owned or operated stream crossings and can be located anywhere in the state.
- Culvert repairs may provide (up to) an additional 25 years of culvert life.
- Repaired culverts must include fish passage improvements.

- Culverts can be rated as a high priority for fish passage, as determined by ODFW, provided all feasible passage improvements are conducted at the site.
- Culverts that provide access to Habitat Category 1 are excluded. OAR 635-415-0025 (1) defines Category 1 Habitat and includes habitat that is irreplaceable, essential habitat for a fish or wildlife species, population, or unique assemblages of species.
- Slip lining is excluded from repair options.
- Culverts with tide gates are excluded.

Note: Culverts that are not within current or historic NMF habitat are not subject to fish passage laws and regulations and may be repaired outside of this agreement. In addition, ODOT may choose to implement full ODFW criteria fish passage or use the existing exemption or waiver process for fish passage for culvert repair or replacement outside the CRPA.

Purpose and Need

Figure 1: Repair and Replacement Costs vs Funding Summary

Description: Image summarizes typical culvert repair costs, typical replacement costs meeting fish passage criteria, and the resulting deferral.

Repair and Replacement Costs vs Funding

- Typical culvert repairs: \$50 K– \$250 K
- Typical culverts replaced to meet fish passage criteria: \$1.5M to \$12M
- Resulting in deferred repair and replacement



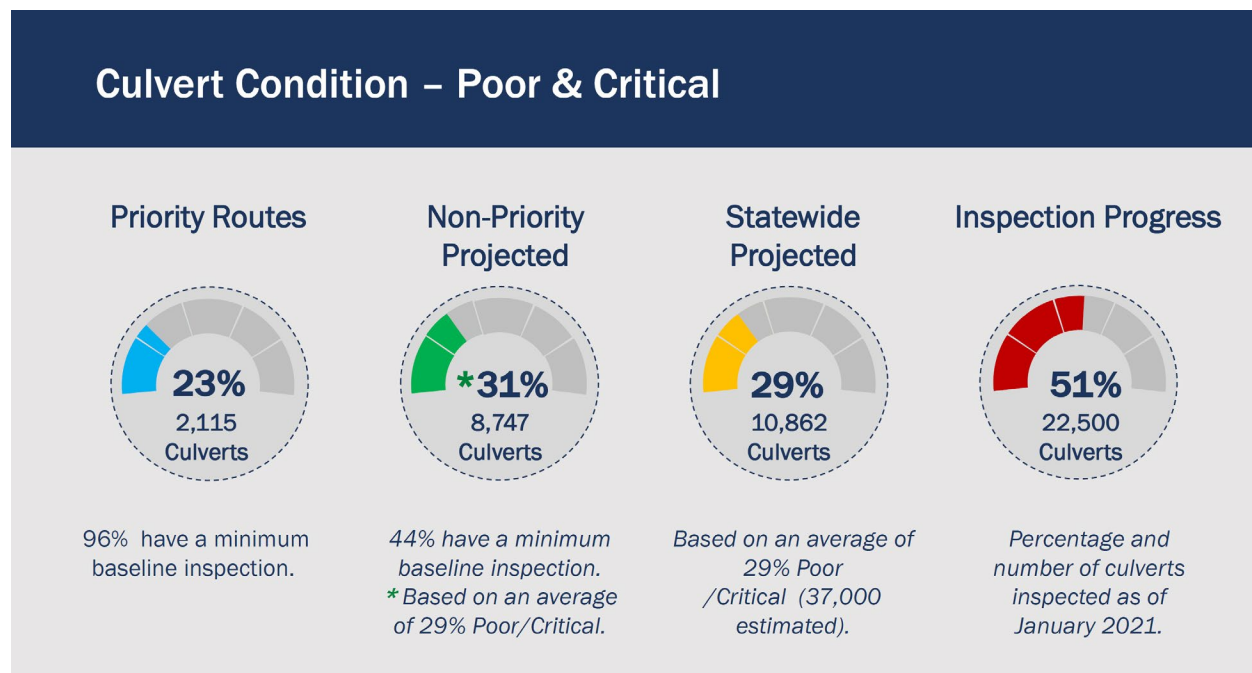
Culvert Inventory

There are approximately 35,000 culverts under the state highway system; most were installed between 1930 and 1970, and are nearing the end of their design life. ODOT began developing systematic information on culvert infrastructure and condition in 2013. By the end of the 2020 field season, ODOT completed culvert inventory on 51 percent of the state highway system, including all the Highway Management Team's priority routes. Priority routes are the most important highways for freight movement, connectivity with major population centers, and emergency response.

The culvert inventory estimated approximately 29 percent, or roughly 10,862, of ODOT's culverts are in poor or critical condition and need to be repaired or replaced in the near term to maintain the safety and integrity of the state highway system (Figure 2). The cost to replace all these culverts in kind would be well over \$1 billion. This cost would be substantially higher for the installation of larger culverts or bridges to meet fish passage criteria.

Figure 2: Culvert Inventory and Condition Summary

Description: Image summarizes culvert Inspection Progress and gives metrics for percentage estimates for poor and critical condition.



Declining Transportation Funds

As the increased need for culvert repair and replacement is coming to light, federal funds for highway projects have been drastically reduced. The ODOT Large Culvert Program receives \$12 million annually for culvert replacements. Based on current costs, it would require over \$18.5 billion to replace all the culverts under the state highway network. The typical design life of a culvert can range from 25 to 75 years. Based on current funding allocations, it would take over 1,500 years to replace all the culverts owned and managed by ODOT. Even with a new infusion of transportation funds from Oregon House Bill 2017, the need to be efficient with funding requires creative approaches for managing Oregon's culvert infrastructure.

Fish Passage Rules and ODOT's Fish Passage Program

Oregon's fish passage law was updated in 2001. This law and the implementing regulations (OAR 635-412-0005(9) a-d) require culvert owners to address fish passage whenever there is new construction, replacement, or major repair of a culvert in habitat currently or historically occupied by NMF. To meet fish passage design criteria, most existing culverts need to be replaced with much larger culverts or bridges.

ODOT has a proven record of enhancing fish passage and contributing to the Oregon Plan for Salmon and Watersheds. ODOT's Fish Passage Program will continue to reopen access to salmon habitat by installing large culverts and bridges in locations ODFW identifies as high priorities for fish passage. From 1997-2020, ODOT completed 156 voluntary fish passage projects and improved access to over 531 miles of NMF habitat. This is a voluntary investment in fish passage, because these projects were not completed due to a trigger event, an action such as construction which requires that fish passage be provided, or other regulatory requirements. ODOT continues to be committed to addressing high priority fish passage barriers on the state highway system, and as part of the CRPA agreement, has dedicated at least \$4.2 million annually towards these projects.

The Whiskey Creek culvert replacement project, Figure 3, completed by the ODOT Fish Passage Program, is one example of ODOT's commitment to improving fish passage and supporting the Oregon Plan for Salmon and Watersheds. The project replaced an undersized 5-foot diameter corrugated metal culvert with a 22-foot-wide concrete box culvert. The Whiskey Creek fish passage project opened over 15 miles of high-quality spawning and rearing habitat for ESA-listed Mid-Columbia summer steelhead, redband trout, and lamprey species at a cost of \$1.9 million. The original culvert was undersized for the stream channel, causing localized flooding and channel scour.

Figure 3: Whiskey Creek Culvert Replacement Project, Before and After

Description: The top panel of three photos show Whiskey Creek before the replacement. The first photo shows the original culvert creating high velocities at the inlet during high flows, the second photo shows localized flooding during high flows, and the third photo shows the outlet perch during low flows of the original culvert. The bottom photo is after the culvert replacement, showing a 22-foot concrete box culvert with the stream flowing through it and volitional fish passage continuing upstream of the culvert from the installation of rock weirs.



CRPA Process and Timelines

As a condition of the CRPA agreement, the agencies developed a streamlined project timeline. Construction of culvert repair needs to coincide with regulated in-water work periods (IWWP), which usually occur during low flow summer months. The timelines developed allow for full opportunity to scope potential projects, conduct site visits, develop plans, and allow for contracting processes.

- February 28, the year before construction (> 16 months from target IWWP): ODOT provides a list of potential CRPA projects to ODFW for review. ODFW conducts desk scoping for species and life history designations.
- June 1, the year before construction (12-13 months to IWWP): ODFW reviews and approves the draft list based on criteria of agreement, including;
 - a. NMF species historically and currently present.
 - b. Migratory timeframes of concern.
 - c. Existing fish passage impediments.
 - d. Recommendations to improve fish passage conditions.
 - e. Recommended in-water work window.
- October 1, the year before construction (10 months to IWWP): ODFW and ODOT staffs conduct site visits to all potential projects. During these site visits, ODOT and ODFW collaboratively develop culvert repair and fish passage improvements for each site. Team members base the design plan on site conditions and constraints, hydraulic conditions, and the needs of NMF. Site visit summary forms are filled out and signed by both agencies, helping to guide design.
- February 28, the year of construction: (5 months to IWWP): ODOT provides culvert repair and fish passage design concepts to ODFW for review and comment. If Endangered Species Act (ESA) species are present, designs are also sent to the National Marine Fisheries Service (NMFS) for review and approval.
- March 31, year of construction (3-4 months to IWWP): ODFW (and or NMFS) reviews each incremental passage design and documents concurrence with the design approach.
- [Construction during IWWP](#): Projects constructed with oversight by ODOT and ODFW staff.
- Post-construction: Projects are continually monitored at 1, 3, and 5-year increments, usually following high flow events, by ODOT and ODFW staff to ensure that fish passage improvements are functioning as designed. If fish passage improvements do not function as intended, then ODOT and ODFW collaborate on an approach to fix fish passage elements during the next available IWWP or as approved by regulatory agencies.

A discussion on these timelines is provided under the lessons learned section of this report.

ODOT Major Culvert Maintenance Engineer

In 2018, the Geo-Environmental section of ODOT designated the Major Culvert Maintenance (MCM) Program to oversee culvert repairs across the state. A senior culvert maintenance hydraulic engineer manages the MCM program, which helps identify potential projects,

recommends appropriate repair actions, and funds culvert retrofit projects. The program also guides engineers and designers specific to the CRPA agreement and works closely with the ODOT Fish Passage and Large Culvert programs. Due to the addition of this position, ODOT was able to identify and address timesaving and efficiency-increasing procedural processes. This led to the creation and implementation of new CRPA initiation forms for scoping, design and submittals, and the creation of a quality assurance and review process for submittals. These forms and procedures were developed and tested in 2018 with full implementation in 2019.

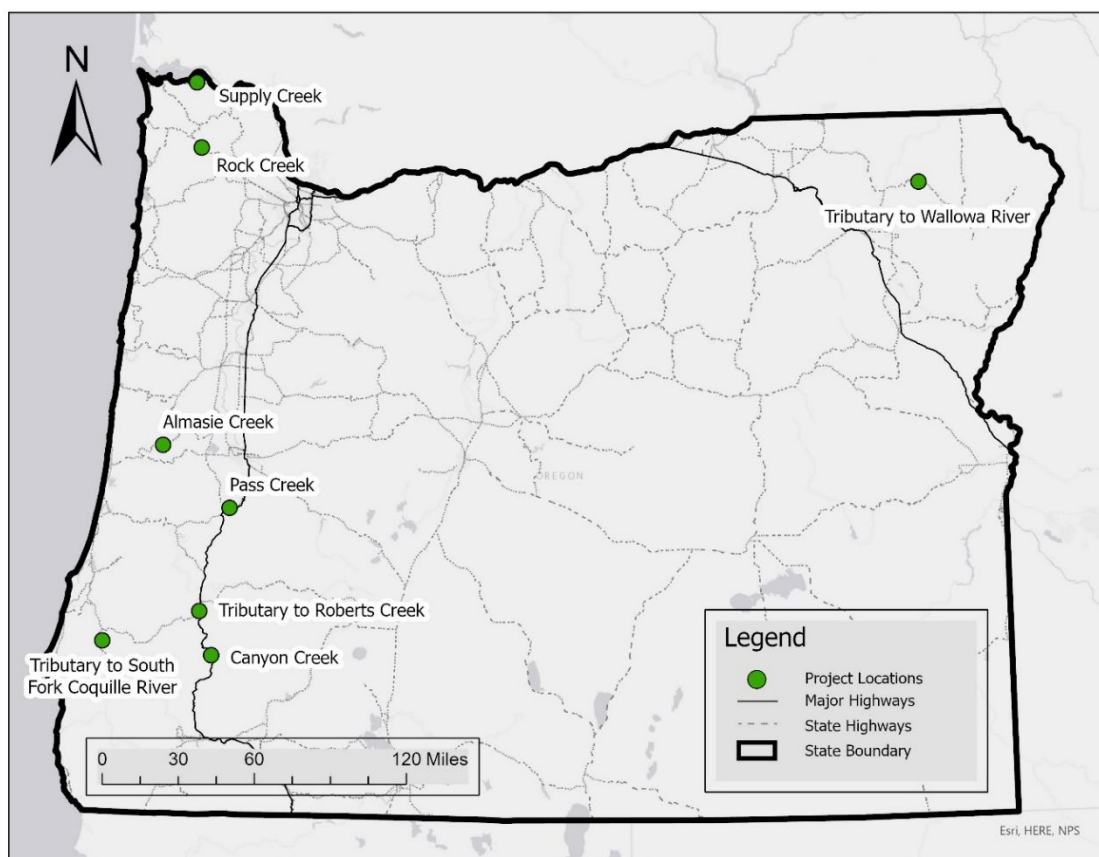
2020 Culvert Repair Projects

The CRPA report includes projects the year construction starts; however, projects are not always finished in one year. Likewise, construction is not necessarily initiated the year projects are approved and these projects are included in subsequent reports.

- In 2020, ODFW approved ODOT to repair four culverts under the CRPA.
 - ODOT began construction at all four locations during the year.
- Four additional projects constructed in 2020 were approved in previous years.
- In total, eight CRPA projects started construction in 2020, and are included in this report (Figure 4).
- One project, OR 8 MP 4.97 Johnston Creek, had culvert repairs completed in 2019 and fish passage improvements in 2020. This project was reported on in the 2019 CRPA annual report.

Figure 4: Locations of CRPA Projects that Began Construction in 2020

Description: Map of Oregon showing the locations of the eight CRPA projects discussed in the report.



Culvert Cost Analysis and Repair Summary

The cost to repair eight culverts in 2020 was \$1,613,372. The estimated cost to replace these culverts was \$35.9 million. Through the CRPA, ODOT deferred costs of **almost \$36 million** to address these culverts, see Table 1. However, this cost avoidance should be evaluated relative to the design life provided by the approach. The repairs have added approximately 10-25 years of life to these culverts, whereas full replacements would have provided a new design life of 75+ years. However, even given the difference in life span for the two approaches, life cycle costs are much lower for the repair option.

The 2020 projects were repaired using several different techniques.

- Five of the projects used an invert pave to add a layer of reinforced concrete in the bottom of the culvert to seal the invert. This helps to keep water in the culvert barrel, and provide a connection to complete the culvert circumference, thereby improving the structural capacity of the pipe.
- One project used centrifugally cast concrete (CCCP). In this technique, a thin layer of strong concrete is cast by a spinning head to line the full diameter of the culvert.
- One project used a cured-in-place liner (CIPP) that adds a new continuous layer around the circumference of the culvert, resulting in improved structural capacity.
- And one project filled voids underneath and repaired the existing concrete invert.

The CCCP and CIPP seal the entirety of the pipe, keeping water inside the barrel and the structurally compacted soil outside the culvert intact.

Table 1: 2020 Culvert Repair Cost Analysis

Description: Table depicts the stream and location, the culvert dimensions, type of repair, cost of repair, and the approximate cost of a full replacement.

Stream Name	Hwy and MP	Diameter (ft)	Length (ft)	Repair	Full Fix Cost (approximate)	Repair Cost
Unnamed Tributary to Roberts Creek	I-5, 119.88	8	251	Invert Pave	\$6,500,000	\$290,000
Pass Creek	I-5 167.17	8	204	Invert Pave	\$5,750,000	\$280,000
Canyon Creek	I-5, 96.82	10x20	348	Fill voids and Repair Paved Invert	\$10,000,000	\$165,372
Unnamed Tributary to Wallowa River	OR 82, 39.47	5x7	86	CCCP	\$850,000	\$95,000
Rock Creek	US 26, 27.85	8	166	Invert Pave	\$6,100,000	\$285,000
Supply Creek	US 30, 79.72	7	275	Invert Pave	\$5,500,000	\$288,000
Almasie Creek	OR 36, 16.41	6	60	Invert Pave	\$725,000	\$60,000

Stream Name	Hwy and MP	Diameter (ft)	Length (ft)	Repair	Full Fix Cost (approximate)	Repair Cost
Unnamed Tributary to South Fork Coquille River	OR 542, 8.73	3	48	CIPP	\$456,000	\$150,000

Fish Passage Improvements Summary

2020 CRPA projects used several fish passage improvement techniques during construction. Table 2 summarizes the fish passage improvements at each culvert location. Most of these techniques were used to buffer high water velocities, provide resting and variable flow conditions in the culvert, and provide more water depth during low flow to facilitate passage. Rock weirs, roughened channels, and a channel regrade were also used to reduce jump heights at culvert outlets.

The total miles of potential NMF habitat upstream made available was 29.37 miles. The project descriptions for each culvert repair are provided below.

Table 2: Fish Passage Improvement Analysis

Description: Table depicts the stream and location, the potential miles of habitat to end of fish use or next full barrier upstream, passage improvement, and the potential NMF species above the repaired passage (columns five–eight).

Stream Name	Hwy and MP	Maximum Potential NMF Habitat Miles	Passage Improvement	Cutthroat Trout	Coho Salmon	Steelhead/ Rainbow Trout	Other NMF Species
Unnamed Tributary to Roberts Creek	I-5, 119.88	0.7	Baffles	Present			
Pass Creek	I-5, 167.17	1.96	Fish Blocks	Present	Present and ESA Listed	Present	Lamprey

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Stream Name	Hwy and MP	Maximum Potential NMF Habitat Miles	Passage Improvement	Cutthroat Trout	Coho Salmon	Steelhead/ Rainbow Trout	Other NMF Species
Canyon Creek	I-5, 96.82	13.14	Fish Blocks	Present	Present and ESA Listed	Present	
Unnamed Tributary to Wallowa River	OR 82, 39.47	0.55	Concrete weirs			Present	Redband Trout and Pacific Lamprey
Rock Creek	US 26, 27.85	6.48	Baffles and Downstream roughened riffle	Present	Present And ESA Listed	Present	Pacific and Western Brook Lamprey
Supply Creek	US 30, 79.72	3.66	Boulder Weirs and Corner Baffles	Present	Present and ESA Listed	Present	Pacific Lamprey
Almasie Creek	OR 36, 16.41	2.01	Fish Rocks	Present	Present and ESA Listed	Present	Chinook Salmon, Lamprey
Unnamed Tributary to South Fork Coquille River	OR 542, 8.73	0.87	Flexible Baffles and Channel Rebuild	Present	Present and ESA Listed		

Project Descriptions

I-5 MP 119.88 Unnamed Tributary to Roberts Creek Culvert Repair

Completed August 2020, Figure 5.

Pre-treatment Fish Passage Condition

This 251-foot long, 96" diameter culvert drains an unnamed tributary to Roberts Creek, a tributary to the South Umpqua River. The tributary passes under I-5, approximately 3 miles south of Roseburg in Douglas County, Oregon.

The culvert's structural condition was deteriorating due to barrel and invert damage, and in need of repair. The active channel width at the site was estimated at 12 feet. Hydraulic calculations determined that during 5% daily exceedance flows (high fish passage design flow) the culvert had velocities of 4.90 fps, and depth at the outlet was 2-5/8 inches at the 95% daily exceedance flows (low fish passage design flow). This compares to an ODFW fish passage design criteria maximum velocity of 2 fps at high fish passage design flow, and a minimum water depth of 6 inches at low fish passage design flow.

Post-treatment Fish Passage Condition

The culvert was repaired with a 6-inch paved invert treatment and staggered fish baffles were placed every 15 feet to decrease velocity and create hydraulic variation. Hydraulic calculations estimated a post-treatment high fish passage design flow velocity of 4.01 fps, and a low fish passage design depth of 3 inches. The reduction in velocity and increase in depth improved access to approximately 0.7 miles of potential habitat for cutthroat trout.

Figure 5: Unnamed Tributary to Roberts Creek Before and After

Description: Two images, the first displays water running through the culvert pre-repair. The second shows water running through the culvert post-repair.



I-5 MP 167.17 Pass Creek Culvert Repair

Completed August 2020, Figure 6.

Pre-treatment Fish Passage Condition

This 204-foot long, 96" diameter culvert conveys Pass Creek under I-5 approximately 8 miles southwest of Cottage Grove in Douglas County, Oregon. Pass Creek is a tributary to Elk Creek in the Umpqua River basin.

The culvert's structural condition was deteriorating due to distortion, barrel damage, and invert damage, and in need of repair. The active channel width at the site was estimated at 15 feet. The culvert was determined to have shallow depths during periods of low flow, creating a partial fish passage barrier.

Post-treatment Fish Passage Condition

The culvert was repaired with a 6-inch paved invert and staggered fish blocks were placed every 5 feet to increase flow depths and create hydraulic shadow. The increased water depth and addition of hydraulic shadow improved access to approximately 1.96 miles of potential habitat for cutthroat trout and steelhead/rainbow trout.

Figure 6: Pass Creek Culvert Repair Before and After

Description: Two images, the first is the pre-repair view looking inside the culvert from the outlet end. The second image is looking inside the culvert post-repair from the inlet end.



Note on Pass Creek Culverts

This project on Pass Creek is part of a series of culvert improvements done along a two-mile stretch of I-5. Culverts at mile points 165.90, 165.79, 166.69, and 167.04 were repaired under the CRPA in 2017, 2018, 2018, and 2019; respectively. Pass Creek flows south along I-5. Therefore, the increasing mile points correspond to movement upstream in the Pass Creek watershed. The amount of potential habitat above individual culverts is reported in each CRPA report, and the amount of potential habitat above the furthest downstream culvert repaired under the CRPA (MP 165.90) is 4.89 miles.

I-5 MP 96.82 Canyon Creek Culvert Repair

Completed September 2020, Figure 7.

Pre-treatment Fish Passage Condition

This 348-foot long, 120x240" closed bottom arched culvert conveys Canyon Creek under I-5 approximately 1.6 miles south of Canyonville in Douglas County, Oregon. Canyon Creek is a tributary to the South Umpqua River.

The culvert's paved bottom was severely deteriorated and had several voids, causing water to flow under the culvert. The active channel width at the site was estimated at 25 feet. Pre and post project hydraulic calculations of velocity and depth were not determined for this culvert. Moderate and high velocities were observed during winter months. To improve fish passage, the project proposed to reduce velocity during moderate and high flows and retain a V-shaped notch in the bottom of the culvert for fish movement during low summer flows.

Post-treatment Fish Passage Condition

Concrete repairs were made to the culvert invert and staggered fish blocks were placed every 10 feet on river left inside the culvert to decrease velocity and maintain the existing low flow notch. The decreased velocity and low flow channel improved access to approximately 13.14 miles of habitat for cutthroat trout, federally listed coho salmon, and steelhead/rainbow trout.

Figure 7: Canyon Creek Culvert Repair Before and After

Description: Two images, the first shows the outlet end of the culvert pre-repair with water running through it. The second image shows the outlet end of the culvert post-repair with water running through it and fish blocks.



OR 82 MP 39.47 Unnamed Tributary to Wallowa River Culvert Repair

Completed August 2020, Figure 8.

Pre-treatment Fish Passage Condition

This 86-foot long, 63x87" closed bottom arched culvert drains an unnamed tributary to the Wallowa River. The tributary passes under OR 82, approximately 7 miles northwest of Wallowa in Wallowa County, Oregon.

The culvert was partially filled with larger rock material and its invert was rusted through in multiple spots, resulting in the culvert being impassable during low flow conditions. Hydraulic calculations determined that high fish passage design flow conditions at the culvert had velocities of 4.38 fps and had less than two inches of depth during low fish passage design flow levels.

Post-treatment Fish Passage Condition

The rock and gravel material were removed from the culvert and a sprayed on concrete liner was used to repair the invert. Eight-inch-high weirs placed every 12 feet were installed to decrease high flow velocity and increase low flow depths. Hydraulic calculations estimated a post-treatment design high flow velocity of 3.12 fps and design low flow depth exceeding 8

inches. The decreased velocity and increased depth improved access to approximately 0.55 miles of habitat for steelhead/rainbow trout, redband trout, and Pacific lamprey.

Figure 8: Unnamed Tributary to Wallowa River Culvert Repair Before and After

Description: Two images, the first shows the outlet end of the culvert pre-repair with water running through it and accumulated large cobbles. The second image shows the outlet end of the culvert post-repair with water running through it and concrete weirs.



US 26 MP 27.85 Rock Creek Culvert Repair

Completed August 2020, Figure 9.

Pre-treatment Fish Passage Condition

This 166-foot long, 96" diameter culvert conveys Rock Creek under US 26 approximately 37 miles southeast of Seaside in Clatsop County, Oregon. Rock Creek is a tributary to the Nehalem River.

The culvert was in critical condition, with large voids from a rusted invert leading to the piping of water under the culvert. Hydraulic calculations determined that during periods of high fish passage design flows, the culvert had velocities up to 5.77 fps. During periods of low fish passage design flow, models estimated less than three inches of water depth in the culvert. Also, the culvert outlet was perched at low flow, and a trash rack not meeting fish passage design criteria was present upstream of the culvert.

Post-treatment Fish Passage Condition

The culvert was repaired with a 6-inch paved invert and six baffles were placed every 25 feet to reduce velocities inside the culvert. An existing riffle was treated with additional boulders at the tail of the outlet pool to create additional roughness and reduce the perch during low flow. Hydraulic calculations estimated a post-treatment velocity of 1.65 fps during high fish passage design flows, and depths of over 2 ½ feet during low fish passage design flow. The decreased velocity, increased depth, and reduced perch improved access to approximately 6.48 miles of habitat for cutthroat trout, federally listed coho salmon, steelhead/rainbow trout, and lamprey.

Post-project monitoring showed that the designed backwater resulting from placement of boulders downstream of the outlet did not function to the degree intended. In 2021, additional material was added to the riffle, and additional backwater at the outlet was observed during low flow.

In addition, a beaver dam was constructed on the first baffle in the inlet of the culvert during Spring of 2021. This resulted in a large backwater of the channels upstream of the culvert and had potential to saturate the road fill prism. Due to safety concerns of potential highway failure resulting from saturation, the beaver dam was removed in the summer of 2021. The dam was subsequently re-built and removed again before winter of 2021. To address the issue long term, a beaver deceiver and or beaver dam analogue are being designed for installation in the 2022 in water work window. Staff from both agencies will continue to monitor this site at frequent intervals to monitor beaver activity and fish passage conditions.

Figure 9: Rock Creek Culvert Repair Before and After

Description: Two images, the first image shows the perched outlet of the culvert pre-repair with water running through it. The second image shows the unperched outlet of the culvert post-repair with water running through it.



US 30 MP 79.72 Supply Creek Culvert Repair

Completed September 2020, Figure 10.

Pre-treatment Fish Passage Condition

This 275-foot long, 84" diameter culvert conveys Supply Creek under US 30 approximately 2.3 miles west of Knappa in Clatsop County, Oregon. Supply Creek is a tributary to Gnat Creek.

The culvert had severe barrel and invert damage, was a fish passage velocity barrier, and had a perched outlet. The active channel width at the site was estimated at 17 feet. Hydraulic calculations determined that during periods of high fish passage design flow, the culvert outlet had velocities of 6.74 fps, and during periods of low fish passage design flow, had less than three inches of depth. Also, the culvert inlet was partially plugged with rock and other debris.

Post-treatment Fish Passage Condition

The culvert was repaired with a 6-inch paved invert, eight baffles were placed every 30 feet to reduce velocities inside the culvert, a roughened riffle was constructed upstream of the culvert to increase depth, and boulder weirs were constructed downstream of the culvert to reduce the outlet perch. Hydraulic calculations estimated a post-treatment high fish passage design flow velocity of 6.43 fps, and low fish passage design flow depths of nearly 4 inches. The decreased

velocity and increased depth improved access to approximately 3.66 miles of habitat for cutthroat trout, federally listed coho salmon, steelhead/rainbow trout, and lamprey.

Post project monitoring showed some settlement and scour in the roughened riffle upstream of the culvert. In 2021, boulders were added to the channel segment to provide hydraulic shadow, and to increase channel roughness. In addition, a tree fell across the culvert outlet during winter of 2020, creating a large jump for upstream migrating fish. The tree was removed, and the site continues to be monitored by staff from both agencies to ensure passage conditions continue to function as intended.

Figure 10: Supply Creek Culvert Repair Before and After

Description: Two images, the first shows the culvert outlet pre-repair with water running through it. The second displays the culvert outlet post-repair with water running through it and the constructed rock weir with water running over it.



OR 36 MP 16.41 Almasie Creek Culvert Repair

Completed August 2020, Figure 11.

Pre-treatment Fish Passage Condition

Two 60-foot long, 72" diameter culverts drain Almasie Creek under OR 36 approximately 16.4 miles northeast of Mapleton in Lane County, Oregon. Almasie Creek is a tributary to Lake Creek in the Siuslaw River Basin.

The culverts had voids and damage in the inverts and were velocity barriers at high flows. The active channel width at the site was estimated at 15 feet. Hydraulic calculations were not

determined for these culverts, but velocity during 5% exceedance flows along with depth during 95% exceedance flows were targeted for fish passage improvement.

Post-treatment Fish Passage Condition

The culverts were repaired with a 6-inch paved invert and fish rocks were installed to reduce velocities inside the culverts. The decreased velocities and increased depths improved access to approximately 2.01 miles of habitat for cutthroat trout, federally listed coho salmon, steelhead/rainbow trout, and Chinook salmon.

Figure 11: Almasie Creek Culvert Repair Before and After

Description: Two images, the first shows the inlet end of the culverts pre-repair with water running through them. The second image shows the inlet end of the culverts post-repair with water running through them and fish rocks.



OR 542 MP 8.73 Unnamed Tributary to South Fork Coquille River Culvert Repair

Completed August 2020 Figure 12.

Pre-treatment Fish Passage Condition

This 48-foot long, 36" diameter culvert drains an unnamed tributary to the South Fork Coquille River. The tributary passes under OR 542, approximately 9 miles north of Powers in Coos County, Oregon.

The culvert was in critical condition due to voids, channel scour, and barrel damage, and in need of repair. The active channel width at the site was estimated at 5 feet. Hydraulic calculations determined that during high fish passage design flow the culvert had a velocity of 4.9 fps. During low fish passage design flow, the culvert had an estimated 12" perch at the culvert outlet.

Post-treatment Fish Passage Condition

The culvert was repaired with a cured-in-place pipe-liner and flexible baffles were placed every 10 feet to reduce velocities inside the culvert. A 105-foot section of stream immediately downstream of the culvert was rebuilt to eliminate the 12" perch. Hydraulic calculations were not estimated for post-treatment conditions. However, the decreased velocity and elimination of the perch improved access to approximately 0.87 miles of habitat for cutthroat trout and federally listed coho salmon.

Figure 12: Unnamed Tributary to South Fork Coquille River Culvert Repair Before and After

Description: Two photos, the first shows the pre-repair outlet end of the culvert with water present in the outlet pool and irrigation pipe running through the culvert. The second photo shows the post-repair outlet end of the culvert with water present in the outlet pool and irrigation pipe removed from the culvert.



Monitoring Strategy and Adaptive Management

ODFW and ODOT developed a monitoring strategy that evaluates fish passage performance at each of the repaired culverts. Monitoring documents pre-project conditions, post-project conditions (photographs shown in Project Descriptions), and initial evaluation of fish passage improvements (see Project Descriptions). ODOT monitors the fish passage improvements at each project to verify that they function as intended. As part of the CRPA agreement, monitoring is completed post-construction in years 1, 3, and 5 after winter and spring channel-forming high flow events.

ODOT is responsible for ongoing maintenance to ensure the improved passage continues to function at all CRPA sites. However, once monitoring deems the fish passage improvement at a culvert is successful, assessments are less frequent. In 2020 and previous years, monitoring has involved an ODFW liaison and the ODOT aquatic resources lead visiting each site at least twice a year during different flows to determine if the CRPA project is successful or in need of modifications. When monitoring reveals a site where fish passage improvements do not meet the designed standard, additional work is planned to bring the sites into compliance. ODOT is currently developing a standardized monitoring form to aid in tracking and reporting the results of each repair.

Lessons Learned

Several opportunities to improve the implementation of the agreement were apparent in 2020 and are discussed below.

Information Management

Scoping and identifying projects for the CRPA each year is challenging and takes extensive amounts of time. ODOT's culvert inventory is unfortunately incomplete and does not contain substantial information on fish presence or habitat availability for all culverts on the highway system. Due to this information gap, field visits with ODFW and ODOT biologists are required to make final determinations regarding fish presence at each proposed repair location. With a more complete data set, identification and selection of repair projects could be accomplished more efficiently.

Out of Barrel Treatments

Three projects completed in 2020 included out of barrel treatments to improve fish passage. Some out of barrel treatments include rock weirs or a roughened channel at culvert outlets to address jump heights into the culvert. The installation and performance of out of barrel treatments installed provided several lessons learned and will help inform future implementation of similar treatments. These lessons include:

- A project inspector should be on-site to ensure the project is constructed as designed and to ensure that the contractor uses the correct materials as described in the specifications.
- An engineer, hydrologist, and or biologist should be on-site during weir construction to help field fit structures to provide the desired hydraulic relief while also allowing for low flow passage channels for fish migration. Weirs can become additional passage barriers if not installed correctly.
- Continuously monitor the weir at low and high flow events. Many of these structures require several high-water events to seal fully and settle. They may require adaptive management work to ensure the weirs continue to function in years following installation.
- Utilize appropriate size and type of streambed substrate materials to prevent subsurface flow, localized scouring, and loss of weir materials during high flow events.
- Designing and constructing the weirs to backwater the culvert outlet at elevations that include the repair work in the culvert, such as the new concrete layer, fish rocks, and other infrastructure. Install weirs at a higher backwater elevation above the invert than designed. This can help account for settling, especially in tidal areas, areas of heavy machinery work, and areas with fine substrates. In addition, tapering the invert pave of the culvert can reduce the potential for increased jump heights at the culvert outlet.

In-Barrel Treatments

All culvert CRPA projects implemented in 2020 included in-barrel treatments for fish passage improvements. These treatments included weirs, baffles, or fish rocks or blocks. All in-barrel treatments were effective at improving fish passage. Lessons learned about in-barrel treatments include:

- Fish rocks need to be inspected before installed to ensure they are sized to match the approved design specifications.

Pre-project Meeting with the Contractor

Early and often coordination between agency staff and contractors has shown to help the project delivery process. This can include a pre-construction meeting between the agencies and selected contractor to discuss plans for:

- Temporary water management.
- Fish salvage timing.
- Equipment staging.
- Site-specific constraints.
- Project area access.
- Materials needed, as described in the specifications.

This meeting allows the contractor to ask site-specific questions and develop a detailed plan with ODOT construction personnel prior to work beginning.

Hydraulic Modeling

As part of engineering design for culvert improvements, culvert capacity and channel scour are evaluated for the proposed repair to ensure the site is suitable for in and out of barrel treatments. CRPA projects can benefit from advanced hydraulic modeling including fish passage conditions. Due to advanced hydraulic modeling not being available for all projects, documentation of water velocities was not available for some locations. In turn, these projects lacked numeric evidence that velocity was a fish passage issue, and that it was improved after repair. When advanced hydraulic modeling is completed for both pre and post repair conditions, ODOT and ODFW can ensure that there is capacity for in-barrel treatments, along with documenting what flow conditions are an issue for fish passage and will be improved with proposed treatment.

Timelines

Overall, the timelines identified in the CRPA agreement streamlines project development and delivery compared to full culvert replacement projects. On some projects, the timelines have been more difficult to meet, and are usually associated with sites requiring extended time for scoping, right of way, engineering, and planning.

Desk and field scoping of potential projects continues to become more efficient as ODOT region and statewide staff become more familiar with the sideboards of the agreement. Engineering guidance has been developed specific to these types of culvert retrofits, and overall design

timelines have improved. For projects that do not require right of way easements or purchase, utility relocation, or other work outside of the culvert barrel, this timeline has been found to be effective in streamlining coordination and project delivery.

A few projects have been delayed outside of the timeline specified in the agreement. Federally funded corridor projects, some with over 100 culverts, take much longer to scope and design compared to single culvert projects. Projects requiring right of way for channel work or access for temporary water management can be delayed up to a year or more. Federal permitting processes can also delay design and approval due to increased review and turnaround times. And some repair approaches, such as centrifugal cast concrete, require special equipment and knowledge to install, leading to limited or no bids during the public bidding process. Culvert emergency repairs typically do not allow for full scoping and or design based on the need to implement the project for public safety reasons.

As more projects are completed under the CRPA, ODOT and ODFW staff are finding more ways to cross walk the timelines of the agreement to federally funded corridor projects. Projects potentially requiring right of way, utility, or federal permitting coordination are identified early in the desk and field scoping process, allowing for extended timelines, and planning. More contractors are bidding on culvert repair projects as technologies and construction approaches become more prevalent in the contracting field. This timeline should be revisited in future agreements; however, overall, it has been found to be effective in streamlined project development and delivery.

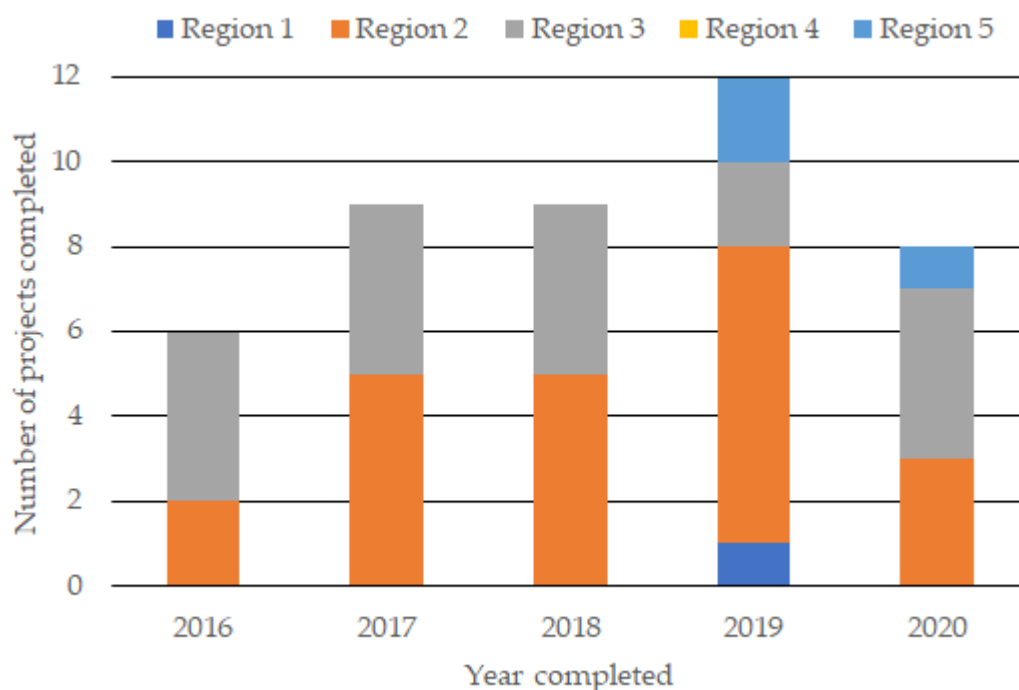
Outreach

The majority of CRPA projects completed in 2020 came from ODOT Regions 2 and 3, and the only region yet to have a CRPA project was Region 4 (Figure 13). The CRPA is a beneficial tool designed to be used statewide.

Additional outreach efforts from both ODOT and ODFW can help highlight the unique and successful approaches of this partnership. Future repair agreements will need support from both agencies, and outreach targeting the cost efficiency and benefits to NMF can help inform future funding and staffing needs. Likewise, outreach efforts showcasing the agreement to the general public can help provide transparency into the effort to maintain the state highway system in an ecologically and fiscally responsible manner.

Figure 13: Number of CRPA Projects Completed by Region and Year, 2016 – 2020.

Description: A stacked bar graph with a top centered legend, year completed on the horizontal axis, number of projects completed on the vertical axis, and a vertical bar stacked by the number of projects completed by region for each year from 2016 – 2020.



Compensation Projects

A solicitation process for Compensation Projects was not conducted in 2020, however, three projects selected for funding in 2019 were completed in 2020. NMF benefitting from these projects included steelhead and redband trout in Rudio Creek (Figure 14); Warner sucker and redband trout in Deep Creek (Figure 15); and coho, Chinook, steelhead, and cutthroat trout in Salt Creek (Figure 16). The implementation of additional projects was expected in 2020, however, unforeseen difficulties associated with COVID-19 resulted in project delays and grant agreements were extended for several projects. Access to 22.3 miles of habitat was improved through the Compensation Projects completed in 2020, for a total of 475.1 miles and 3000 acres since the first solicitation in 2015.

Figure 14: Rudio Creek Project Before and After

Description: Two photos, the first shows the Rudio Creek fish barrier and the second photo shows the site after removal.



Figure 15: Starveout Diversion Project Before and After

Description: Two photos, the first shows the east channel of Deep Creek above the diversion dam and the second photo shows the east channel after removal of the diversion dam.



Figure 16: Salt Creek Project Before and After

Description: Two photos, the first shows the Salt Creek lower pushup dam and the second photo shows the site after removal.



Conclusion

In 2020, the CRPA agreement continued to be a valuable method of extending the working life of failing and degraded culverts on the ODOT highway infrastructure, while providing enhanced passage for NMF.

Annual cost avoidance of over \$15 million dollars was realized through the ability to fix culverts under a streamlined programmatic process. Access to over 29 miles of habitat were enhanced for NMF at culvert enhancement locations.

Continued monitoring and reporting on the success of the CRPA program will inform future adaptations and program development. The agreement demonstrates successful interagency cooperation in maintaining the highway system for the traveling public, saving taxpayer dollars, and improving access to critical aquatic habitat for NMF.

Appendix 1: Culvert Repair Programmatic Agreement

Link or actual graphic?

**ODOT CULVERT REPAIR
PROGRAMMATIC AGREEMENT PILOT PROJECT
Final 12-8-2017**

The parties to this Programmatic Agreement, (hereafter "Agreement") are the Oregon Department of Fish and Wildlife (ODFW), and the Oregon Department of Transportation (ODOT), both agencies of the State of Oregon.

I. PURPOSE

1. It is the policy of the State of Oregon to provide for upstream and downstream passage for native migratory fish in all waters of this state in which they are currently or have historically been present, as described in Oregon Revised Statute (ORS) 509.585, Oregon Administrative Rule (OAR) 635-412-0020, and envisioned by the Oregon Plan for Salmon and Watersheds (Executive Order 99-01).
2. It is the Mission of ODOT to provide a safe, efficient transportation system that supports economic opportunity and livable communities for Oregonians.
3. Pursuant to ORS 509.585 and OAR 635-412-0020, certain actions, or "trigger events,"¹ at "artificial obstructions"² where native migratory fish (as defined in OAR 635-412-0005(32)) are currently or were historically present require the review and approval of fish passage by ODFW or the Oregon Fish and Wildlife Commission (OFWC) prior to those trigger events occurring. OAR 635-412-0020(3)(b) allows ODFW to grant "programmatic approval" of a fish passage plan for multiple artificial obstructions of the same type.
4. ODOT owns and operates a number of culverts as part of its transportation system. ODOT desires the opportunity to conduct repair activities on their culverts to meet the original life expectancy of the culvert structure. These activities (Appendix A) may constitute a fish passage trigger event as defined by OAR 635-412-0005(9).
5. This Agreement is intended to serve as the ODFW fish passage approval for the short-term repairs of ODOT culverts associated with this pilot project that meet the requirements and conditions of this Agreement (including Appendix A).
6. The goals of this Agreement include:
 - a) Provide improved fish passage conditions at each culvert repair site
 - b) Address statewide fish passage priority barriers using the fish passage fund (defined in Section III(3) of this agreement) in the most expeditious and efficient way practical
 - c) Improve State highway infrastructure conditions at each culvert repair site to address public safety
 - d) Generate information on the costs, impacts, efficiency, and effectiveness of the culvert repair pilot project approach
 - e) ODOT and ODFW will develop a work plan and identify resources to develop information on fish presence and barrier status on the State highway system and include this information in the ODOT State Highway Drainage Facility Management System (DFMS)

¹ "Trigger events" for the purposes of this Agreement shall mean, with respect to an "artificial obstruction" (defined in OAR 635-412-0005(3)) located where native migratory fish are currently or were historically present: "construction" activities (defined in OAR 635-412-0005(9)), "fundamental changes in permit status" (defined in OAR 635-412-0005(25)), or "abandonment".

² "Artificial obstruction" means any dam, diversion, dike, berm, levee, tide or flood gate, road, culvert or other human-made device placed in the waters of this state that precludes or prevents the migration of native migratory fish.

II. APPLICABILITY

1. This Agreement applies to ODOT, including its independent contractors, when repairing ODOT owned culverts. It does not apply to other State or local agencies, or private persons.
2. This Agreement applies when ODOT culvert repair actions covered by this pilot project constitute a "trigger event" to Oregon's Fish Passage Policy. The Agreement identifies and determines how ODOT shall proceed as per the terms of this Agreement. ODOT remains responsible to address and comply with fish passage laws for activities and situations not covered by this Agreement.
3. Under this Agreement only ODFW may determine that native migratory fish are not currently and were not historically present at a site; however ODOT may assume presence of native migratory fish.
4. This Agreement applies to culverts that meet all of the following criteria:
 - a) Culverts located within the State of Oregon;
 - b) Culverts not identified on the ODOT ten year passage implementation plan.³
 - c) Culverts located in or which would prevent access to Habitat Category 1⁴ habitat are excluded.
 - d) Culverts with tide gates are excluded.
 - e) Full traditional culvert slip-line repair treatments are excluded.

III. PROVISIONS OF THE AGREEMENT

1. ODOT will be permitted to conduct the culvert repair activities described in appendix A through the 5-year term of this Agreement. Culvert replacements are not authorized by this Agreement.
2. ODOT will ensure that fish passage improvements⁵ occur at each culvert repaired under this Agreement, with the goal of maximizing native migratory fish passage to the extent feasible at each site. Culverts identified as a high fish passage priority on the current ODFW-ODOT Culvert Fish Passage Priority list are eligible for repair under this programmatic provided that fish passage is significantly⁶ improved as part of the repair project.

³ ODFW and ODOT will jointly develop a 10 year passage implementation plan for ODOT to address fish passage at High Priority sites utilizing the ODOT Fish Passage Program funds. Projects not identified on this implementation plan are eligible for the Culvert Repair Programmatic Agreement.

⁴ Habitat Category I is defined in OAR 635-415-0025(1) and include habitats that are irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site specific basis, depending on the individual species, population or unique assemblage.

⁵ Fish passage improvements may include but are not limited to the following treatments: weirs, baffles, fish rocks, roughened channels, rock weirs, or other treatments within or outside the culvert that decrease water velocities, increase water depths, or reduce jump heights. ODFW-ODOT Liaison will work with ODOT to ensure site specific fish passage improvements are appropriate for the fish species and site conditions. If fish passage exists and cannot be further improved at ODOT's culvert repair site, fish passage improvements may occur at the next passage barrier up or downstream of ODOT's culvert as negotiated on a case by case basis. The goal of addressing passage up or down stream of ODOT's culvert is to ensure that a cumulative net benefit is realized by the fish population at the trigger site.

⁶ For High Priority Fish Passage Barriers ODOT will address everything possible and necessary at the project site to improve fish passage without replacing the structure itself. This includes improving outlet conditions (where applicable) to address jump height into the culvert and/or provide a backwater condition at the culvert outlet.

3. ODOT will provide ODFW fish passage restoration funds to offset the delay in full fish passage at the repair culverts as a result of this Agreement. This passage restoration fund account will be funded with \$2 million dollars at the beginning of the agreement to offset the delay in passage for the first 40 culverts repaired under the agreement. For each culvert repaired after the first 40, ODOT will contribute an additional \$50,000 dollars to the fund. ODOT anticipates repairing approximately 20 culverts each year under the five year agreement for a projected total of 100 culverts repaired and \$5 million dollars of restoration funding.
4. ODFW will manage and administer these funds to specifically address high priority fish passage projects statewide regardless of ODOT ownership and independent of geographic location. ODFW will use generally accepted accounting practices to manage these funds and shall ensure these funds are allocated in the most expeditious and cost effective means while maximizing benefit to native migratory fish.
5. ODOT will continue to fund at least \$4.2 million annually into the ODOT Fish Passage Program for the term of this agreement. This funding is separate and in addition to the ODFW fish passage restoration funds described in section III (3) and funding for the liaisons described in section III (8) of this agreement. The ODOT Fish Passage Program funding will be used to address the ten year passage implementation plan administered by ODOT.
6. During the year prior to the target year for proposed culvert repairs: By February 28th (typically 16 months in advance of the target in-water work window), ODOT will provide ODFW a list of potential culverts to be repaired during the following year's in-water work period under the terms of this Agreement for each year of the Agreement. ODFW will review and approve the list based on criteria in Section II.4.a-e above, by June 1st, or within 90 days of receiving the list. By October 1st ODFW will provide ODOT with the following information for each potential repair project at the repair site:
 - a) Native Migratory Fish Species historically and currently present
 - b) Migratory timeframes of concern
 - c) Existing fish passage impediments
 - d) Recommendations to improve fish passage conditions
 - e) Recommended in-water work window
7. ODOT and ODFW will collaboratively develop fish passage improvements for each repair site, based on site conditions and constraints, hydraulic conditions, and the needs of Native Migratory Fish. ODOT will provide fish passage design concepts to ODFW for review and comment by February 28th of the year of proposed culvert repairs. ODFW will review each incremental passage design and document concurrence with the design approach by March 31st, or within a month of receiving the fish passage design concepts.
8. ODOT will fund two ODFW/ODOT Liaison positions to help implement this Agreement.
9. Culvert repair actions not authorized by this Agreement require specific approval by ODFW if the repair actions meet the trigger definition. This Agreement does not preclude ODOT from pursuing other options to address or comply with fish passage laws at ODOT structures.
10. ODOT is responsible for obtaining all other state and federal permits and permissions necessary for completion of activities approved by the Agreement.

11. All in-water work associated with this Agreement will occur during the appropriate ODFW in-water work window, or as negotiated.
12. This Agreement in no way purports or authorizes take of a federally listed species.
13. Pursuant to OAR 635-412-0035 (1 and 10) ODOT is responsible for following all best management practices during construction/maintenance activities to protect fish, wildlife, and their habitats. These BMP's include but are not limited to, adequately dewatering and isolating worksites, performing fish salvages, and providing adequate downstream passage, bypass, and screening if necessary.

IV. POST-PROJECT OBLIGATIONS

1. **Maintenance.** ODOT is responsible for all maintenance required such that culverts repaired under this Agreement continue to provide the improved level of fish passage that was achieved under this Agreement.
2. **Inspection and Record-Keeping.** ODFW may inspect any road-stream crossing for which ODOT is responsible (ORS 509.625 and OAR 635-412-0020(3)(b)(D)). If inspection of a culvert repair site installed under this Agreement indicates that fish passage improvements are not functioning as intended, ODFW shall notify ODOT. ODOT shall work with ODFW to determine the cause and, during a work period approved by ODFW, expeditiously rectify problems as necessary (OAR 635-412-0020(3)(b)(E)).
3. **Monitoring and Reporting.** ODOT and ODFW will implement a monitoring plan prior to project construction that will include pre and post repair project site analyses of fish passage conditions. ODOT, or its designee, shall monitor and report all repair projects implemented under this agreement to verify that fish passage improvement(s) function as intended. Monitoring shall be completed after winter and spring channel forming high flow events in years 1, 3, and 5 after completion of each culvert repair and fish passage improvement. Monitoring shall identify native migratory fish species and life stages affected at each culvert repair site and the quantity and quality of habitat above each barrier. Monitoring shall consist of a best professional judgment assessment by a qualified fisheries biologist of fish passage conditions. This includes noting any water surface jumps, channel adjustments, streamflow velocity characteristics, channel bed stability, scour occurrence, and other relevant data to ensure the project is functioning as designed for fish passage. Pre- and post-treatment photographs of each site shall be included in the monitoring reports. If monitoring indicates that fish passage is not being provided consistent with project intent, ODOT shall consult with ODFW, determine the cause, and during a work period approved by ODFW, expeditiously rectify problems as necessary (OAR 635-412-0020(3)(b)(E)). If in the final year, post-project assessment reveals a successful project and that fish passage has not deteriorated, then the project will be removed from the post-project monitoring obligations. ODOT remains responsible for the ongoing maintenance necessary to ensure the improved level of fish passage continues to function until the next trigger event.
4. **Annual Report.** By February 1st of each year of the Agreement, ODOT shall provide an Annual Electronic Report on all culverts repaired under this Agreement. The Annual Electronic Report shall consist of:
 - a) Narrative discussion of program activities,
 - b) Map of culverts repaired under program,
 - c) Description and date of repair action(s) performed at each culvert under the Agreement,
 - d) Description of how fish passage was improved at each culvert repaired under the Agreement,

- e) Project specific monitoring results from monitoring efforts identified in # 3 above,
 - f) Estimate of fish habitat upstream of each culvert, and
 - g) List of species present at each culvert.
 - h) Analysis of estimated annual cost savings of culvert repairs made vs. the cost of culvert replacements.
5. Final Report. At the conclusion of the pilot project each agency shall provide a final report.
- a) ODFW shall provide a final pilot project analysis and report on the effect(s) of the pilot project on fish passage. The report will include: site locations, native migratory fish species, quantity and quality of habitat upstream of barriers for both the:
 - I. effects of the culvert repairs and the fish passage improvements made at each repair site, and
 - II. fish passage improvements implemented with the fish passage funds (defined in Section III(3) of this agreement), administered by ODFW.
 - b) ODOT shall provide a final project report on the effect(s) of the pilot project on maintaining the highway infrastructure. The report will include: number of culverts repaired, improvements to infrastructure condition, the cost effectiveness of repairs relative to infrastructure benefits, and an analysis of the cost savings of culvert repairs made vs. the cost of culvert replacements.
 - c) These reports will be used to develop a strategy to address the culvert infrastructure issue(s) on the State highway system and the needs of native migratory fish. Final reports shall be complete by June 30, 2023.
6. Coordination Meetings. Staff from ODOT and ODFW affected by this Agreement, will meet annually, or as otherwise deemed appropriate, to collaboratively review projects implemented under this Agreement and evaluate adaptive management measures, as appropriate.

V. GENERAL PROVISIONS

1. Notice. The parties' contact persons for all notices provided for under this Agreement, except as specifically provided otherwise, are as follows:

Agency	ODFW	ODFW Technical	ODOT	ODOT Technical
Name	Greg Apke	Pete Baki	William Warncke	Wade Holaday, P.E.
Title	ODFW Fish Passage Coordinator	ODFW/ODOT Liaison	ODOT Fish Passage Program Team Leader	ODOT Culvert Maintenance Engineer
Address	4034 Fairview Industrial Dr. SE Salem, OR 97302	4034 Fairview Industrial Dr. SE Salem, OR 97302	4040 Fairview Industrial Dr. SE Salem, OR 97302	4040 Fairview Industrial Dr. SE MS #6 Salem, OR 97302-1142
Phone	503-947-6228	503-947-6234	503-986-3459	(503) 986-4046
E-Mail	greg.d.apke@state.or.us	Pete.Baki@state.or.us	William.M.Warncke@odot.state.or.us	Wade.HOLADAY@odot.state.or.us

Either party may change a designated contact person at any time by providing written notice to the other party.

2. Amendments. Amendments to this Agreement may be made within applicable laws at the mutual agreement and signature of the ODFW Fish Screens and Passage Program Manager and the ODOT Environmental Resources Unit Manager.
3. Term. This Agreement is entered into on the date of last signature by and between ODFW and ODOT, both representing the State of Oregon. This Agreement expires Dec 31, 2022.
4. Termination. This Agreement may be terminated at any time through mutual agreement by the parties or by either party after a 30-day written notice. If terminated, culverts previously

repaired consistent with this Agreement will not be subject to additional fish passage requirements beyond maintenance as described in IV(1), until an additional trigger event may occur.

RUP
1/19/18



1/18/18

Date

Highway Division Administrator
Oregon Department of Transportation



Date

Chair, Oregon Fish and Wildlife Commission

Appendix A

Examples of ODOT culvert repair actions* allowed under the Culvert Repair Programmatic Agreement that currently trigger fish passage laws

Strip line
Spot and localized repairs
Spray on coating
Cured in place technology
Spiral wound
Pave invert
Add or extend end treatments
Replace interior sections of culvert**
Replace road pavement and sub base above culverts

*The intent of the culvert repairs allowed under the programmatic agreement is to provide (up to) an additional 10 to 25 years of culvert life. The actual life of the culvert and repair will depend on site specific conditions. These repairs are considered short-term fixes, not in effect a culvert replacement that provides a new design life.

** This technique is intended to replace 1 to 3 segments of a pipe that have broken or failed prematurely. It is not intended to replace the majority of the pipe.

Culvert repair techniques not listed above are allowed provided they fully meet all requirements of this agreement. Culvert repair techniques not listed above will be discussed by the ODFW and ODOT contacts identified in section V prior to implementation.

Full traditional Slip-line culvert repairs are specifically excluded from this Programmatic Agreement.