



FISH PASSAGE ENHANCEMENT PROGRAM



APWA 2019 PROJECT OF THE YEAR SUBMISSION

Thurston County Public Works

Division: <\$5 million

Category: Environment





PROJECT OVERVIEW

Thurston County, home to hundreds of salmon bearing streams, has successfully implemented the first comprehensive program to replace fish blocking culverts in the region.

The Thurston Board of County Commissioners directed Thurston County Public Works to develop the program after reviewing the damaging environmental impacts of fish blocking culverts and the challenges Washington State faced managing and replacing culverts on state roadways.

A total of \$4.5 million was budgeted from the Thurston County Real Estate Excise Tax (REET) to pay for the initial start of the program and the first project cycle (2017-2018).

The foundation of the program, which resulted in the opening of more than 7.5 miles of fish habitat in 2018, was the development of a holistic process for prioritizing culvert replacement.

County culverts were inventoried, cataloged and scored based upon anadromous fish access and potential habitat, barrier status, culvert condition and maintenance history.

The result was a database of fish blocking culverts in Thurston County. Priority culverts were then identified, field tested, and recommended for construction based upon the highest collective return of fish habitat for the budget cycle.

Of the more than 3,000 culverts in use on Thurston County roadways, engineers and environmental specialists identified 150 potential fish blocking culverts and successfully completed five projects under the Fish Passage Enhancement Program in 2018, on budget and on time.

Program leads at Thurston County worked with three design engineering firms and three construction firms to complete

fish passage enhancements at the five separate sites. Enhancements include the removal of eight fish-blocking culverts, installation of three prefabricated bridges and completion of two large fish-passable culverts. Riparian areas and streambeds were also enhanced at each project site to improve fish passage.

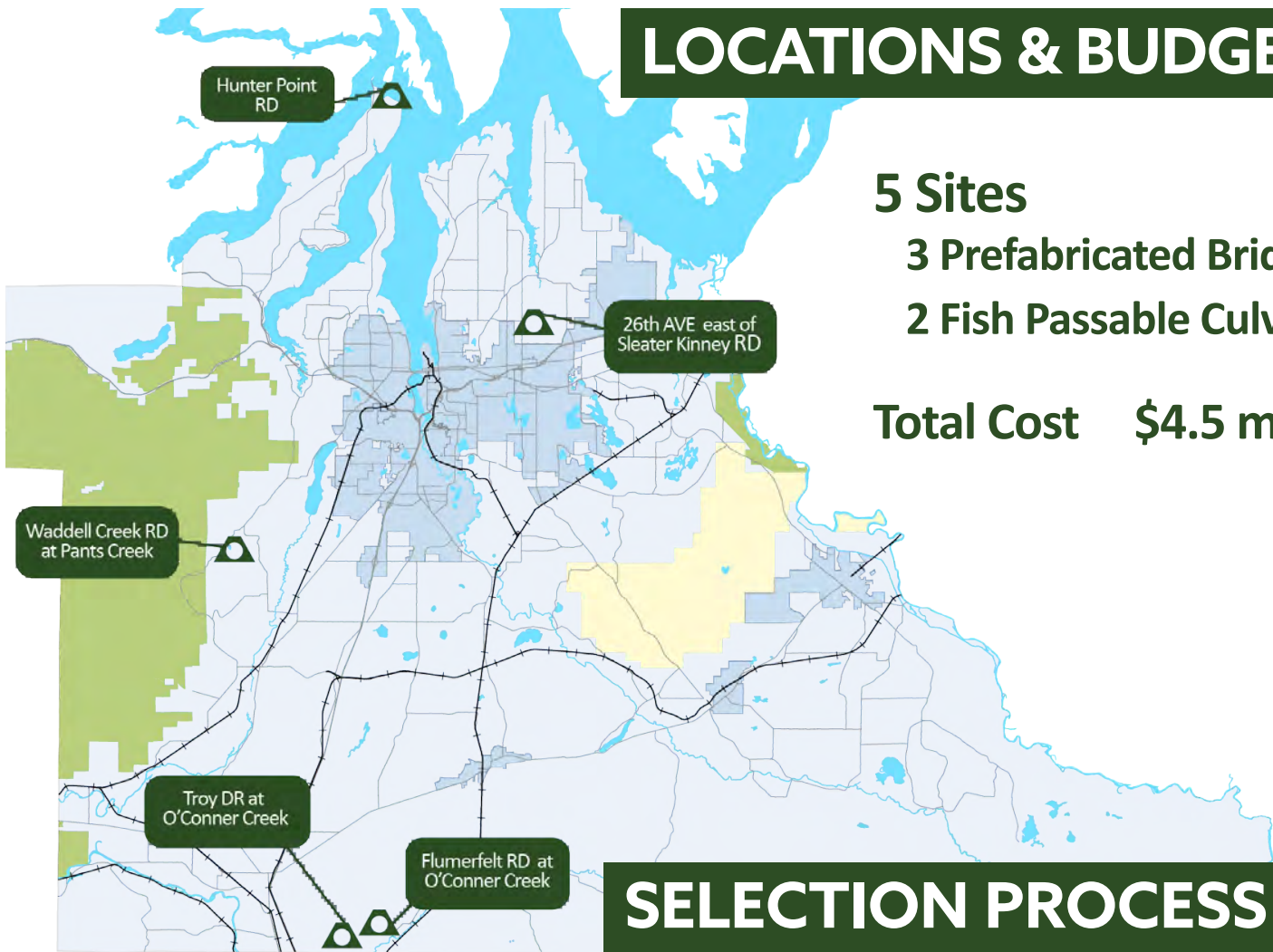
Replacement of the outdated culverts opened passable stream habitat that allows fish to spawn and rear their young in areas not available to anadromous fish for decades.

Stabilizing the stream crossings also reduced erosion, improved downstream water quality and helped reduce flooding and maintenance issues associated with high flow rain events.

Results of the program have been swift, with the first fish in nearly 100 years passing underneath Hunter Point Road on its way upstream in November 2018.

“The foundation of the program was the development of a holistic process for prioritizing culvert replacement.”

LOCATIONS & BUDGET



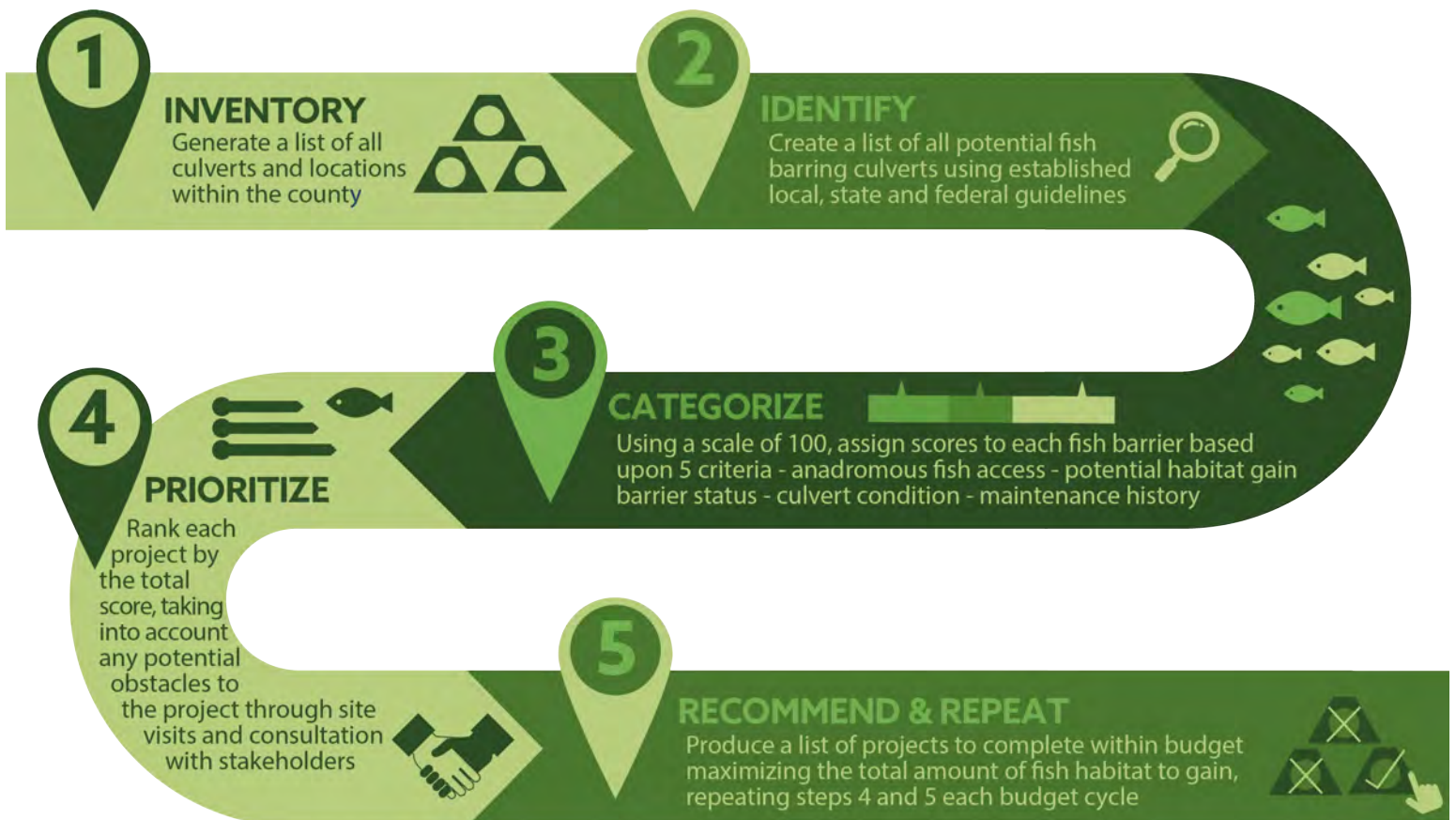
5 Sites

3 Prefabricated Bridges

2 Fish Passable Culverts

Total Cost \$4.5 million

SELECTION PROCESS





CONSTRUCTION MANAGEMENT

Early estimates suggested that only a handful of culvert restoration projects could be constructed within the \$4.5 million allocated in the 2017-2018 budget cycle. However, program managers started by requesting preliminary designs for the 20 highest scoring projects identified in the pre-planning process. The move increased early design costs and lengthened the pre-construction timeline. However, it was crucial in maximizing habitat recovery. From the preliminary designs, program managers were able to select a mix of projects that would result in the largest increase in passable stream miles and habitat for spawning salmon. The preliminary designs also created a roadmap for future projects and support for grant applications in future budget cycles.

Of the 20 preliminary designs, nine were chosen for alternative analysis and included options for prefabricated structures. Thurston County has been on the forefront of installing prefabricated structures within the public transportation system and directed potential designers to integrate them into each alternative analysis.

After consultation with permitting agencies and a second round of stakeholder meetings, five projects were selected to move forward to the final design and construction phase. Prefabricated structures identified during alternative analysis, including three bridges, were ordered and delivered to the Public Works site and integrated into the construction bid process. Potential contractors were provided planning designs of prefabricated structures in each project proposal and invited to inspect the structures at the Public Works site before completing project bids.

After reviewing bids for each individual project, program

managers settled on a mix of three contractors to complete all five projects. Brumfield Construction Inc. was chosen to complete the 80-foot prefabricated bridge installation and enhancements at Hunter Point Road. The largest in scale of the projects selected, the site was historically the location of a large ravine crossed by a rail trestle. Significant excavation work was required to reconstruct the ravine slopes and streambed.

Boss Construction Inc. was selected for installation of a 55-foot prefabricated bridge at Troy Drive and a 35-foot prefabricated bridge at Flumerfelt Road. Both projects required the removal of multiple culverts and excavation for stream profile improvements.

Granite Construction was chosen to complete fish passable culvert installations at Waddell Creek Road and 26th Avenue. The Waddell Creek Road project included the installation of the first aluminum box culvert in Thurston County.

Originally slated for a prefabricated bridge installation, the high water table at Waddell Creek Road made for unsuitable soils that would not easily meet the seismic requirements for a bridge. The aluminum box culvert selected for the site acts as a buried bridge. The 16-foot wide structure has a solid bottom base that creates stability and meets the structure width the site required.

All contractors finished work at each site on budget and on time. After final review in December, all projects received official completion status. The sites are now integrated into the Thurston County Public Works Maintenance Program to ensure they are sustained and remain viable assets.

PROJECTS & TIMELINE

Hunter Point Road \$1.32 million

Historically the site of a ravine crossed by a rail trestle. An undersized culvert and tons of fill dirt installed in the early 20th century caused numerous hydraulic problems, erosion and barred fish passage. The largest of the 5 selected projects.

- Removed fish barring culvert
- Reconstructed ravine slopes
- Installed 80-foot prefabricated bridge, increasing stream channel width four-fold

Troy Drive \$816 thousand

The site contained two undersized culverts perched too high off the streambed for fish to access 75 yards away from the Skookumchuck River, a major Steelhead source.

- Removed 2 fish barring culverts
- Installed a 55-foot prefabricated bridge
- Improved the streambed profile to reduce upstream slope

Flumerfelt Road \$906 thousand

Upstream from the Troy Drive project, consisted of three undersized stacked culverts flagged by WDFW for replacement. A known, long-standing fish blockage and channel obstruction.

- Removed 3 fish barring culverts
- Installed a 35-foot prefabricated bridge
- Improved the streambed profile to reduce upstream slope

Waddell Creek Road \$785 thousand

The outlet for the culvert under the road was six feet above the creek and discharging water at high velocity onto the rocks at the edge of the waterway. Another well-documented fish blockage site.

- Removed fish barring culvert
- Installed 16-foot wide fish passable aluminum box culvert.
- Reconstructed stream channel within the new culvert
- Rebuilt the roadway above the new culvert

26th Avenue \$591 thousand

Rated as a 100% blockage site due to a broken undersized culvert, the small tributary provides access to rearing habitat within an urban setting that has maintained a healthy riparian zone.

- Removed the 1.5-foot undersized culvert
- Installed a 12-foot fish passable oval-shaped culvert
- Reconstructed the stream channel within the new culvert
- Rebuilt the roadway 10 feet above the new fish passable culvert

2017

JANUARY

Inventoried & categorized fish blocking culverts

FEBRUARY

Initiated communication with stakeholders

MARCH/APRIL

Performed site visits at high priority culvert locations

Prioritized culverts & finalized comprehensive culvert database

MAY

Submitted RFP's for design, including initial design requests for 20 projects

AUGUST

Signed design contracts, including alternative analysis for 9 projects

2018

FEBRUARY

Alternative analysis received

Consulted with permitting agencies

MARCH

Selected final 5 projects

Completed environmental permit applications

APRIL

Prefabricated structures bid/ordered

Finished designs for 5 final projects received

MAY

Published construction bids for all 5 projects

JUNE

Environmental permits received

Prefabricated structures delivered

JULY

Construction begins at all 5 project locations

Construction bids awarded to 3 separate firms

NOVEMBER

Construction completed at all 5 project locations

DECEMBER

Final inspections all 5 projects completed



Hunter Point Road



Hunter Point Road - After



Troy Drive



Troy Drive - After



Flumerfelt Road



Flumerfelt Road - After

SAFETY PERFORMANCE

No time loss for injury was reported at any of the five sites throughout project delivery. In addition, all five sites met OSHA & ASHTO safety standards. All contractors were required to attend an initial safety meeting and preconstruction meeting. In addition, contractors and county staff were required to attend weekly update meetings on site throughout construction. On site safety and construction inspectors were also provided by Thurston County Public Works.



26th Avenue



26th Avenue - After



Waddell Creek Road



Waddell Creek Road - After



ENVIRONMENTAL CONSIDERATIONS

The Fish Passage Enhancement Program is an environmental program. The primary factor in project selection was the highest collective return of fish habitat. None of the sites were selected based solely on transportation or maintenance needs.

In the 2017-2018 budget cycle, the five projects selected collectively added 7.5 miles of passable stream habitat for salmon, allowing fish to spawn and rear their young in areas not available to anadromous fish for decades. In the case of Hunter Point Road, salmon had not been seen upstream of the culvert in nearly 100 years. Stabilizing these five stream crossings also reduced erosion, improved downstream water quality, and, in some cases, helped reduce flooding and maintenance issues associated with high flow rain events.

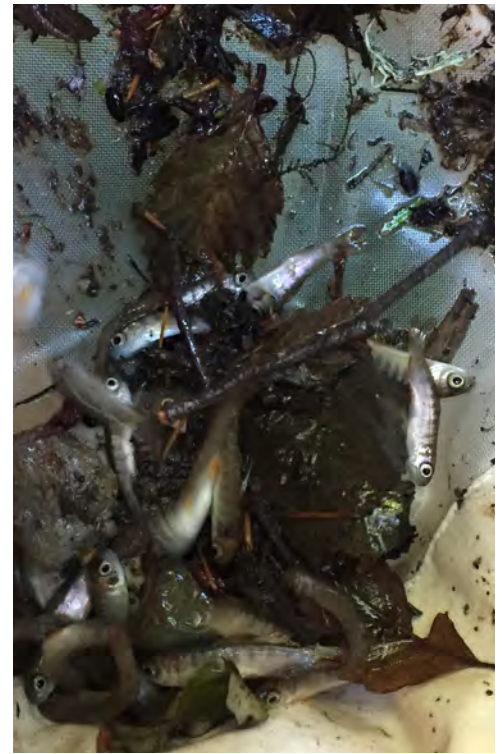
Due to the nature of the program, each site required extensive environmental planning. Each site was also unique and required a different approach to structure, fish management, and addressing biological needs.

All work within the ordinary high water mark (OHWM) was performed during the fish work window at each site. Fish were captured and removed from the sites prior to working within the OHWM. Channel substrate was selected for each site based on pebble count and the local species of concern. All sites were planted and banks stabilized using native

plants and LWD. Construction contractors and County Staff were also educated on each project location and how the salmon benefit from the project. Site visits after construction noted the presence of returning salmon upstream at four of the five project locations.

Additional environmental considerations were undertaken at Flumerfelt Road, due to the discovery of Olympic Mudminnow during the fish moving phase of the project. Olympic Mudminnow is a species of concern and a priority species for Washington State. This species is only found in Washington State and only four species exist worldwide. As a result, the project became a test of best available science and adaptive management.

The County contacted Washington Department of Fish and Wildlife (WDFW) and researched the best approach to protect this unique species. They decided to change the proposed substrate from Salmon spawning gravel to a mud bottom that would encourage grass to grow. The bridge is within an area that had a very slow water flow and very high ground water table which provides cold ground water. That is one reason Olympic Mudminnow have sustained in this segment of the watershed. This alternative approach to the site not only improved passage for rearing Salmonids, it provided valuable habitat for Olympic Mudminnow.



Fish in Thurston

Anadromous Species

- Chinook Salmon
- Chum Salmon
- Coho Salmon
- Steelhead Trout
- Pacific Lamprey

Resident Species

- Cutthroat Trout
- Rainbow Trout
- Sculpin
- Stickleback
- Olympic Mudminnow



COMMUNITY RELATIONS

Since Thurston County had developed a new initiative within Public Works, outreach and education was a key aspect of the program. The County coordinated several meetings with local Tribes, regulatory agencies and the public to explain the new approach and unveil selected projects.

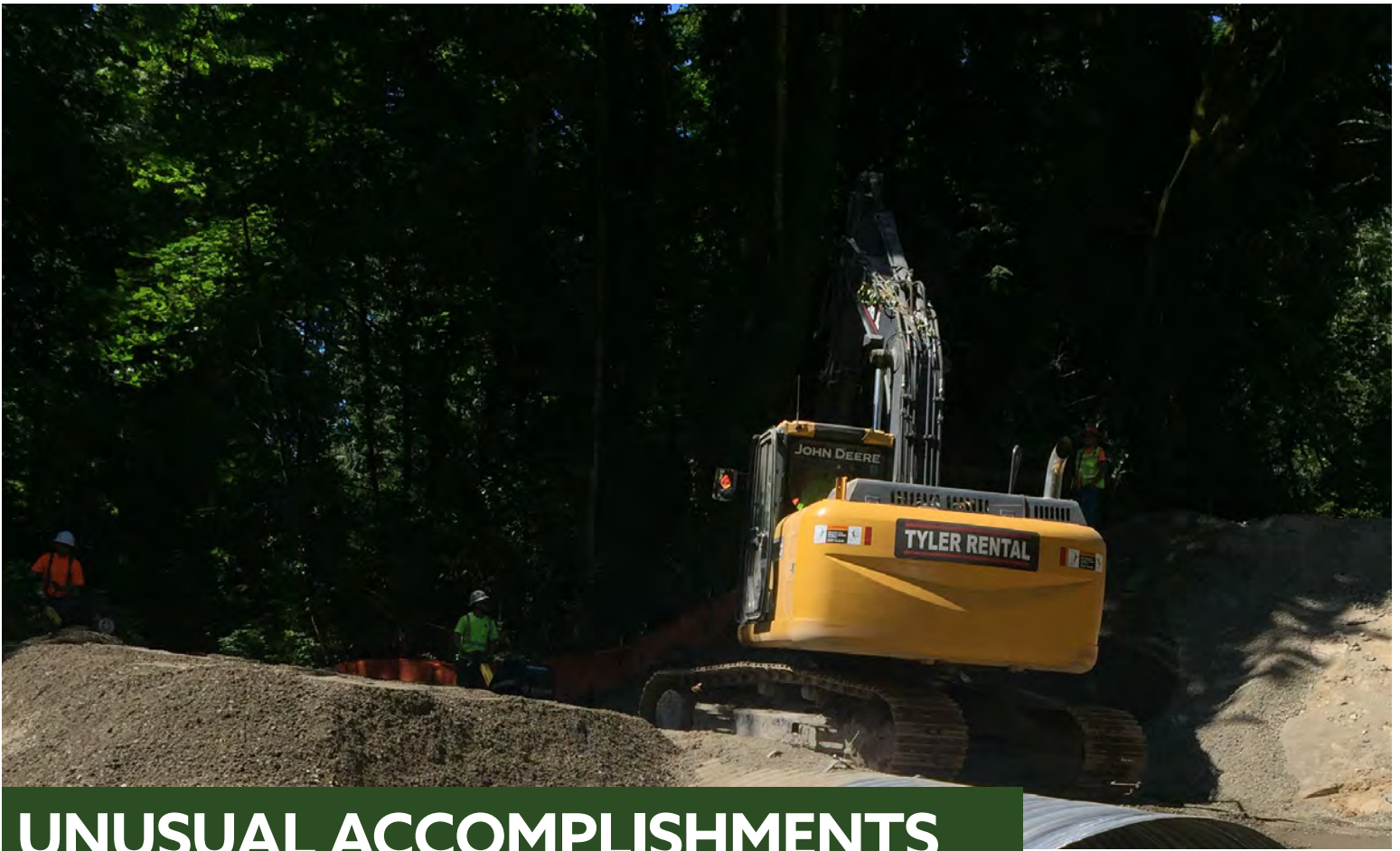
The County followed up with individual site visits from the beginning to the end of each project in 2018. In addition, the Hunter Point Road bridge project hosted a groundbreaking and a ribbon cutting to mark the beginning of the countywide effort and the completion of the first construction season for this new program. Representatives from the Squaxin Island Tribe attended along with local neighbors and members of the press.

During the construction phase, all five sites posted flagging crews and additional traffic signs to ensure commuters and pedestrians were aware of the construction sites within their neighborhoods. All five projects provided detours and notification to the public to relieve the stress from construction.

Only one location was allowed as a total road closure, with the other four keeping at least one travel lane open for the duration of the project and using temporary traffic lighting where sight distance was limited. This approach minimized the inconvenience of extensive traffic detours, and allowed many of the neighbors to observe the projects throughout construction.

- Project Postcards
- Online Resources
- Flyers & Handouts
- Public Meetings
- Community Events





UNUSUAL ACCOMPLISHMENTS

Each of the selected projects provided opportunities for their own unique unusual accomplishments. At Hunter Point Road, the culvert was perched approximately eight feet off the ground and contained a 12-percent slope. The unnamed stream below contained thousands of anadromous salmonids that were often stranded once when the stream went dry in the summer. Completion of the bridge and streambed allowed rearing salmon access to wetland habitat that had been blocked for nearly 100 years.

At Waddell Creek Road, project managers were able to install the first aluminum box culvert in the county, allowing the stream to function closer to natural conditions. The velocity issue and flooding challenges were also resolved, resulting in safer passage for fish under the road and commuters above the road.

The Troy Drive site is 75 yards away from the Skookumchuck River, a major Steelhead source. Due to close proximity to the river and potential steelhead presence, the site required a shortened 60-day in-stream work window. It is also a spur road off State Route 507 with no outlet that served six residential properties and required one lane to be open throughout construction. Despite these challenges, extra safety precautions and the use of a prefabricated bridge allowed the county to be out of the water within the shortened work window without injuries or complaints.

Flumerfelt Road leads to a series of wetlands for rearing habitat. The project restored habitat for both salmon and the Olympic Mudminnow, discovered during the fish mov-

ing phase of construction. The project was successfully adjusted to accommodate the rare fish species and was finished within the work window.

The 26th Avenue site contained the smallest stream with the least velocity of all five project sites. The blocked stream stored an excess of fines that allowed vegetation to grow within the streambed. With the wider culvert and streambed enhancements, rearing fish have access to quality rearing habitat within an urban setting for the first time in 30 years.





ADDITIONAL CONSIDERATIONS

This innovative and holistic approach to culvert replacement through the Fish Passage Enhancement Program has proven valuable in both maximizing the amount of fish habitat gained in the initial budget cycle and providing a roadmap for projects in future budget cycles.

It is important to note that a strong prioritization method was essential for the development of the program. In order to clearly differentiate program priorities from already known maintenance needs, the Fish Passage Enhancement Program focused specifically on structures that are barriers to anadromous fish. The scoring method designed by program managers has proven to result in prioritizing barrier culverts that can open up valuable upstream habitat. The formula is clear: create an inventory that prioritizes your sites, field review your sites and incorporate prefabricated structures whenever possible.

Thurston County Public Works has built a program that is sustainable not only for their own fish blocking structures but a process additional local agencies can repeat throughout Washington State.

The County developed the approach to meet the standards set by the WSDOT Culvert Case per the direction of the Thurston County Commissioners. The program is proactive, manages fish passage locations and delivers new structures that will provide fish access for the next 75 years.

The approach can be broken down into a five-parts

- **Inventory and score your culverts to build a living database of potential culvert projects**
- **Field review your candidate projects**
- **Present your projects and preferred alternatives to area Tribes, agencies & constituents**
- **Order the prefabricated structures**
- **Construct**

The success of the program has gained the attention of others in the field. Engineers and environmental specialists from Thurston County were invited to present about the program at the Washington State County Leaders Conference in 2018. As a result, other counties across Washington State, faced with the same challenges posed by hundreds of culverts and other fish barriers in their jurisdictions, are using the Fish Passage Enhancement Program as a template for their own programs.

Looking toward the future, the Fish Passage Enhancement Program has also improved the ability for Thurston County to source grant funding for culvert replacement projects. As part of the program, there are 9 culvert replacement projects being considered for the 2019-2020 budget cycle, with a total of 6 currently funded by a mix of county and grant funds.