Lower Long Tom River Habitat Improvement Plan

2018




Developed by:
Confluence Consulting, LLC and Long Tom Watershed Council

Table of Contents

Executive Summary

The purpose… The Long Tom Watershed Council's primary purpose for this project is to bring together stakeholders along the lower Long Tom River to identify ideas and concerns, complete technical work, and document results in a plan that addressed three goals:

- Goal 1. Improve fish habitat areas and connections between them
- Goal 2. Find solutions for the barriers to fish passage
- Goal 3. Increase channel capacity via more natural processes and minimize use of chemicals and mechanical means

The U.S. Army Corps of Engineers is also updating its maintenance approach to the river, and collaborating with the watershed council in exploring options. This Habitat Improvement Plan for the Long Tom River is the result of technical work and outreach in 2016-18.

The watershed council is proactive, collaborative, and voluntary… Since 1998, the people of the Long Tom Watershed Council have focused on improving local water and habitat conditions for fish and wildlife, using the wisdom and volunteerism of the diverse human community that calls this area home. The Long Tom River is a key west-side tributary in the Willamette River system and the watershed council has a history of coordinating volunteerism, grants and organizations to do our part for watershed health and function. See more in the Introduction section.

Trout and salmon migrate here… The Long Tom River is a priority watershed within the Willamette River system because of its potential high-quality juvenile salmon rearing habitat, as well as spawning and rearing habitat for cutthroat trout, lamprey and other native species, especially in the lower basin below the Corps of Engineers' Fern Ridge Dam. Currently the local migration of trout, Chinook salmon, lamprey and other species is constrained due to three low-head check-dams on the Long Tom River that create passage barriers below Fern Ridge Reservoir. Additionally, the river has been channelized and has thus lost some natural capacity to provide habitat. See more in the Fishery section.

Lots of data-gathering and good discussion… The outreach process included:

- 4 public meetings with educational presentations and personal invitations to hundreds of stakeholders
- 6 multi-stakeholder Project Steering Committee meetings
- Interviews with riverside landowners and local decision-makers
- An on-line survey
- Engineering studies, artistic visualization work, and Technical Team meetings
- Field visits and conversations with riverside landowners
- Feedback from local jurisdictions, agency representatives, scientists and river managers

Results for Goal 1 - Habitat improvement ideas… To improve habitat, 60 sites with opportunity to reconnect the river with low-lying areas were evaluated and three general types of projects were determined: isolated historic segments of the mainstem Long Tom River, isolated historic braided side channels, and isolated floodplain areas that could be inundated easily if landowner desired. The sites were prioritized based on: landowner interest, technical feasibility, ecological condition, potential improvement, potential cost, and links to priority USACE maintenance sites. Ideal projects would be those with higher scores in feasibility and ecological priority. Personal outreach and site visits were conducted and of the potential project sites identified, one site has already won the first phase of habitat restoration design funding. Additional areas can be visited and assessed if landowners contact the watershed council. See more in the section on Goal 1.

Results for Goal 2 - Fish passage solution ideas… In terms of fish passage, the focus was the first barrier for fish migrating upstream – the check dam at Monroe. This is a run-of-river dam, which means it slows the flow of water but does not actually store water; the check dam is actually submersed at high flows. This low-head dam has an ineffective fish ladder and blocks almost all fish species at most life stages (juvenile and adult) and under most flow conditions. There were 4 main solution ideas – an updated fish ladder, a bypass channel, removing the dam, and modifying the dam in some way. A new version of modification was discovered after the last public meeting - a rock-ramp built downstream. This will be added to the alternatives for review. Once fish passage is restored there are opportunities to assist private landowners with updated fish screens and to meet other regulations that may newly apply as federal exemption was not an option. See more in the section on Goal 2.

Results for Goal 3 - Ideas for more habitat-friendly maintenance… To improve the habitat impact of activities aimed at maintaining the Corps channel structure, the team focused first on upcoming maintenance "hot spots" where some action would likely be needed near- or mid-term. Both landowner interviews and discussions with experienced scientists and river managers were conducted. Input from 10 riverside landowners with larger properties indicated a willingness to improve habitat-friendly practices and partner with the watershed council or Corps. A team of local scientists and two other jurisdictions that manage channelized rivers suggested actions including prioritizing temperature reduction and building upon areas fish utilize now. Recommendations are being incorporated into the Corps Operations & Maintenance Plan for the Long Tom River (estimated 2019). See more in the section on Goal 3.

Funding assistance… Funding for this project was provided by a grant from Oregon Watershed Enhancement Board with match from the Army Corps of Engineers and Long Tom Watershed Council members, and a contribution for artistic rendering from the South Benton Area Recreation Alliance.

Project Contacts… Please reach out anytime to any of the project team staff – Dana Dedrick, dana@longtom.org and Jed Kaul, jkaul@longtom.org, at the Long Tom Watershed Council, 541-338-7060, www.longtom.org, or key partner Cameron Bishop, USACE, Cameron.L.Bishop@usace.army.mil.

Introduction

In 2014, the Long Tom Watershed Council (LTWC or "watershed council") and US Army Corps of Engineers (USACE) increased conversations focused on lower Long Tom River management including localized flooding and channel maintenance issues, both concerns for local farmers and USACE. Improving fish passage has been a focus for the Long Tom Watershed Council for nearly two decades. The Long Tom Watershed Council's assessment of watershed conditions from 2000 identified fish passage and habitat improvements as priority actions for the watershed council to pursue. In addition, the watershed council's 2005 Conservation Strategy outlines channel connectivity and fish passage goals including addressing passage at the Corps owned mainstem barriers. The watershed council has been actively engaged with private landowners in improving habitat and fish passage conditions in the watershed since 1998, expanding to the Willamette River in 2013. As of 2017 these cooperative partnerships have achieved habitat improvement on over 2,000 acres and 40 streamside miles, and improved over 35 fish passage barriers and instream habitat sites. Refer to Figure 1.

The watershed council is working with the USACE local liaison, who represents the stewardship side of the Corps, to facilitate conversations about restoration ideas along the channel and link those with actual opportunities the maintenance staff and landowner community could work on. The Corps is very supportive of the watershed council's efforts to conduct outreach to the community to build a common understanding of river processes including flood concerns. The Corps also supports the development of alternatives for future habitat improvement actions including fish passage at the Corps owned and managed Monroe, Stroda and Ferguson drop structures. In 2014, the Corps produced an internal report, "Long Term on the Long Tom" that outlines their decisions over the past 117 years, the impacts of those decisions for the landscape we see today and opportunities for partnerships to explore new ideas for management of the basin while maintaining the Corps' mission. A Corps funded study from 2015 examined channel capacity and found that there is more capacity than previously thought and that maintenance issues are in isolated locations. This takes some of the time pressure off management decisions. However, there is recognition of the need for an updated Corps maintenance plan and that is forthcoming (2019).

This report and plan is the result of watershed council's stakeholder engagement process (November 2016-November 2017) to explore options for improving habitat in the lower Long Tom River including options for future Corps maintenance. This plan is intended to report on the data analysis and stakeholder engagement process completed for this plan, and results will be used to develop future habitat improvement actions. This plan also outlines questions and answers to some issues and ideas raised by the community and provides responses.

The report is focused on three key areas:

1. Overview of restoration opportunities for reconnecting historic side channels and oxbows based on inundation mapping conducted by contracted engineering services and projects to pursue with willing landowners.
2. Results of the Long Tom Watershed Council's community interviews, on-line survey and meeting room survey to gauge interest in and support of improving fish passage at Monroe, support for improving Long Tom River habitat and connectivity, and interest in working with the USACE streamside property management alternatives.
3. Main alternatives for improving fish passage at the Monroe drop structure.

Study Goals and Opportunities

The Long Tom Watershed Council's primary goals for this project are to bring together Lower Long Tom River stakeholders to identify the best ideas to:

1) Improve habitat,

2) Address fish passage blockages, and

3) Increase channel capacity via more natural processes and minimize use of chemicals and mechanical means.

Stakeholders and Contributors

Many people contributed time and energy to participation with the development of this plan. The Long Tom Watershed Council is the final author of the Plan and questions should be directed to the Watershed council. The Long Tom Watershed Council would like to thank:

Project Steering Committee Contributors
Paul Canter
Ken Chikasuye
Rick Hohnbaum
Steve Horning
Pat McDowell
Amy Nystrom
Todd Nystrom
Stan Salot
Gary Smith
Adam Stebbins
Tony Stroda
Ellen Tappon
RJ Theofield
Dave Turner

Funders
Oregon Watershed Enhancement Board, grant
Long Tom Watershed Council members, donations
US Army Corps of Engineers, Portland District
Dick & Gretchen Evans, Private Citizens

Technical Contributors
Greg Apke, Oregon Department of Fish & Wildlife
Chris Bailey, City of Albany
Cameron Bishop, US Army Corps of Engineers
Alex Farrand, Oregon Department of Fish & Wildlife
Rebecca Flitcroft, USFS PNW Research Station
Stan Gregory, Oregon State University
Karen Hans, Oregon Department of Fish & Wildlife
Graham Hilson, US Army Corps of Engineers
Johann Hogervorst, US Forest Service
Jeff Kinney, City of Albany
Karen Kelley, City of Albany
Marc Liverman, NOAA Fisheries
Anne Mullan, NOAA Fisheries
Paul Sclafani, US Army Corps of Engineers
Ryan Turner, City of Eugene

Hydraulic Modeling Contractor
Peter Gruendike, River Design Group
Chris Smith, P.E. River Design Group

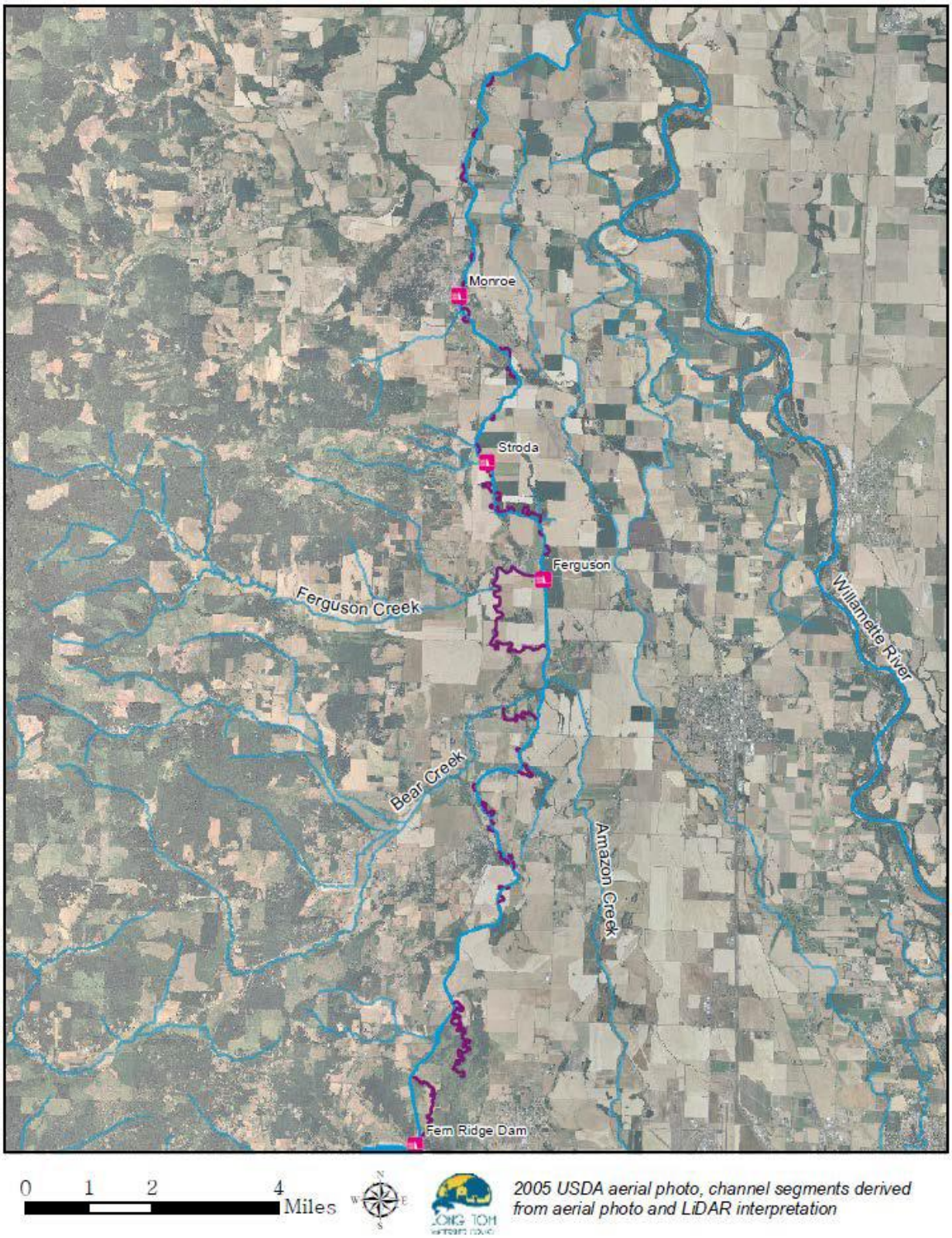


Figure 1. The lower mainstem Long Tom River flows north from Fern Ridge Reservoir to join the Willamette River between Corvallis and Monroe, Oregon. The three run-of-river drop structures (dams downstream of Fern Ridge Dam) are shown, as well as some of the historic channel segments cut off during channelization 1940-41.

Background on the Lower Long Tom River

Restoration of migratory fish in Oregon's Willamette River Valley requires a comprehensive, systematic approach. The Long Tom River is a priority watershed within the Willamette River system because of its potential high-quality juvenile salmon rearing habitat, as well as spawning and rearing habitat for cutthroat trout, lamprey and other native species, especially in the lower basin below the Corps of Engineers' Fern Ridge Dam. Please see references for importance of Long Tom River fisheries and impacts on them in the section on Long Tom Fisheries.

Management of the Long Tom River has occurred since the construction of the Fern Ridge Dam and filling of the reservoir. Fern Ridge Dam was the first project completed as part of the US Army Corps of Engineers' Willamette Valley project in 1941. Flood control is its primary purpose. Not long after Fern Ridge Dam was constructed it became clear that the Long Tom River below the dam lacked the channel capacity to convey the maximum release from the dam. Prior to Fern Ridge Dam, the Long Tom River was a low-gradient river with multiple braided channels. In 1943, the Army Corps' Long Tom River Channel Rectification and Improvement Project was implemented to increase the capacity of the channel downstream from Fern Ridge Dam. This plan led to the construction of a straighter, deeper and wider armored channel with a series of three concrete drop structures. The drop structures were built with the intent to reduce channel velocity and decrease erosion, while still moving water downstream efficiently. The three drop structures, installed at Monroe (RM 6.7), on the Stroda property (RM 10.2), and just upstream of Ferguson Road (RM 12.7), range in height from 7.5-11.5 feet. Refer to Figure 2 to view location of drop structures, historic Long Tom River channel and current Long Tom River channel.

The Monroe drop structure spans the 85 foot width of the River. When the Monroe drop structure was built, at the location of an existing dam, an existing privately-owned mill race and fish ladder were left in place. The millrace and fish ladder are private property, while the structure that spans the river east of the fish ladder is owned and maintained by the Corps. There are no active water rights associated with either the dam or fish ladder/millrace. The fish ladder is only functional for strong swimming fish species and only during a narrow range of flows. Because the Monroe drop structure is the lowest structure in the Long Tom River system, it is the first passage blockage encountered by aquatic species migrating from the Willamette River. The Stroda drop structure also impedes fish passage, but the Watershed Council has identified a solution for passage at this site and has landowner permission to implement it after the Monroe structure is addressed. At the upstream-most structure near Ferguson Road, Cox Butte, adult and potentially juvenile salmonids can access an historic channel remnant to bypass the barrier.

The US Army Corps of Engineers historically conducted channel maintenance, including vegetation management and dredging to maintain the shape of the constructed channel and maximize flow conveyance. These management actions have been minimal since the mid-1990s due to environmental concerns over chemical spraying, permitting for dredging and lack of agency funds to continue the intensive management. The Corps is responsible for conveying flood flows and is partnering with the Long Tom Watershed Council to explore alternatives for future management of the lower Long Tom River.

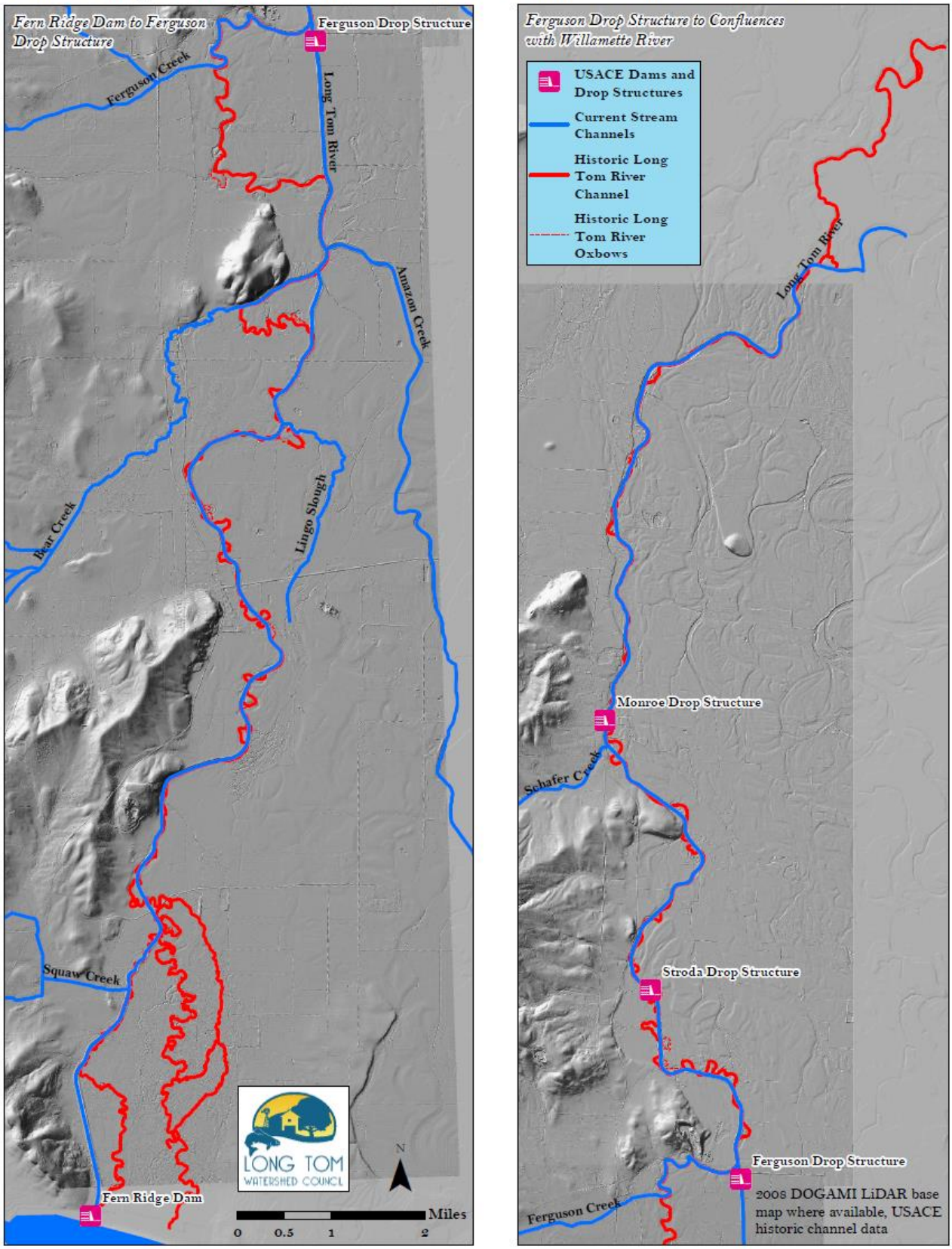


Figure 2. Lower Long Tom Current and Historic Channels, Oxbows and USACE structures.

Long Tom Fisheries

Several local and regional conservation planning documents highlight the importance of restoring channel connectivity in the Long Tom River to benefit aquatic species and describe which aquatic species would benefit from improved access to high quality habitat. Each of these plans are outlined below. Full text of these plans is generally available on-line.

- The "Long Tom Watershed Council Conservation Strategy" (2005), lists the Monroe, Stroda and Ferguson drop structures as the highest priority fish passage enhancement sites in the watershed.
- The "Draft Willamette Subbasin Plan," Northwest Power and Conservation Council (2004), outlines how "altered subbasin processes, modified riparian and aquatic habitat, and limited access to historical spawning and rearing areas have affected the productivity, capacity, and diversity of cutthroat trout (at all life stages) and juvenile spring Chinook salmon in the Long Tom Subbasin" (pg 3-285). Specifically noted as limiting factors in the mainstem Long Tom River are fish passage at Monroe, the straightening and revetting of the river below Fern Ridge Dam and the installation of the grade control structures, which has reduced complex habitat and pools. The plan also notes that riparian areas in the lower subbasin are reduced in width, connectivity, and quality and that the loss of connections to floodplain and wetland areas has reduced the quality and quantity of high flow refuge habitat available to juvenile Chinook salmon and cutthroat trout (pp 3-286 - 3-288).
- The "OWEB Basin Priorities" (2005) lists improving fish passage at the Monroe drop structure and restoring flows to historic channels as priority restoration activities in the Long Tom Watershed (pp. 111 & 114).
- The National Marine Fisheries Service (NMFS) Biological Opinion for the Willamette Basin Flood Control Project (2008) cites the simplification of lowland channels in the lower Long Tom subbasin as likely to result in a small decrease in the abundance and productivity of Middle Fork Willamette, McKenzie, and Calapooia populations of spring Chinook and steelhead (pg. 4.9 - 26). The three drop structures are listed as limiting factors for upper Willamette River spring Chinook populations (pg 4.9 - 28).
- The Upper Willamette River Conservation and Recovery Plan for Steelhead and Chinook Salmon (ODFW and NMFS, 2011) lists land use practices including stream cleaning, straightening and channelization, revetments, riparian area degradation, lack of large wood recruitment, and/or loss of floodplain connectivity and access to off-channel habitat as secondary limiting factors to upper Willamette River spring Chinook recovery in west-side tributaries like the Long Tom River (pg. 5 - 27).

Fishery Background (excerpted from the US Army Corps of Engineers report "Long Term on the Long Tom," February 2014)

At least 22 species of native fish and 13 species of non-native fish are found within the Long Tom Watershed. Their distribution is influenced by significant human alterations to the habitat accessibility including Fern Ridge Dam and the three downstream drop structures, from north (downstream) to south: Monroe, Stroda, and Ferguson/Cox Butte. Other fish passage barriers such as culverts and grade control structures have also altered migration patterns and genetic flow among the different populations of cutthroat in the Long Tom.

SPRING CHINOOK

Juvenile upper Willamette spring Chinook salmon, listed as threatened under the federal Endangered Species Act, are found in the Long Tom River from its mouth to the Monroe drop structure. Their distribution and abundance is poorly understood. These fish, which are migrants from Willamette tributaries flowing from the Cascades (likely the McKenzie and Middle Fork Willamette Rivers), use the lower Long Tom for rearing habitat. During winter months, they seek slower moving water as refuge from the mainstem Willamette and for feeding opportunities.

Juvenile spring Chinook have been collected at the base of the Monroe drop structure in late December and in downstream segments of the Long Tom in late February.

COASTAL CUTTHROAT

Coastal cutthroat trout are found in all streams in the Watershed, from the Willamette River to small, headwater tributaries. Cutthroat trout in the Long Tom exhibit a range of migration patterns, from living within a few hundred meters of stream for their entire life, to migrating several kilometers during different times of the year. These patterns help define three broad life history types of cutthroat trout found in the Long Tom basin: resident, fluvial, and adfluvial.

- Resident cutthroat may live in 100-200 meters of stream during their entire life, which is typically 5-7 years. Resident cutthroat are typically thought to live in headwater stream sections, as opposed to larger, downstream reaches, likely because suitable spawning habitat is only present in these headwater areas.
- Fluvial life history cutthroat migrate between river segments seasonally. These migrations can vary in distance from 1-20+ km. In the lower Long Tom Watershed, fluvial life history cutthroat have been shown to migrate between tributaries during different times of the year, likely to find spawning or cold-water refuge habitat.
- Adfluvial life history cutthroat migrate long distances during different times of the year, using Fern Ridge Reservoir for foraging and rearing when water temperature allows. Cutthroat are found in the reservoir once water temperatures drop in the fall and then migrate upstream to cool headwater streams in mid-summer. This life history was created when Fern Ridge dam was constructed – adfluvial life history cutthroat likely exhibited fluvial life history characteristics prior to installation of the dam.

PACIFIC LAMPREY

Anadromous Pacific lamprey are present in the Long Tom Watershed below Fern Ridge Dam. They use the Long Tom for spawning after spending their adult lives in the Pacific Ocean. Documentation of their distribution in the watershed is limited. A fixed radio telemetry receiver station on the lower Long Tom River downstream of Monroe operated by the Grande Ronde Tribe and Cramer Fish Sciences detected one of their tagged adult pacific lamprey in 2010. Pacific lamprey were collected during surveys in the lower Long Tom River below Monroe in May and June of 2000, 2001, and 2002. Long-time residents report two-foot long "eels" kegged up below the Monroe drop structure in the 1960's and 1970's, indicating that the drop structures are likely impediments to lamprey passage during some flows. Brook lamprey, which are stream residents, are found throughout the Watershed.

OREGON CHUB

The Oregon chub is a small native minnow that inhabits side channels in slack water. It is an indicator for the many species in the basin that thrived in the historic Willamette's broad multi-channeled floodplain. There are no known populations of Oregon chub, federally-listed as threatened, in the Long Tom watershed at present, although historical descriptions of the Lower Long Tom River suggest that the area provided significant habitat prior to dam construction and channel modification. Oregon chub require slow-moving side channel or oxbow habitat, which is found in segments of the historic Long Tom River downstream of Fern Ridge Dam. Surveys by ODFW and other agencies found potential chub habitat in some of these historic segments of the Long Tom River below Fern Ridge Dam but no Oregon chub.

OTHER FISH SPECIES

Other species of native fish that call the Long Tom Watershed home include sculpin, redside shiner, sand roller, dace, threespine stickleback, mountain whitefish and white sturgeon (undocumented but likely present in the lower Long Tom River). Non-native fish present in the Watershed include largemouth bass, smallmouth bass,

black crappie, white crappie, brown bullhead, yellow bullhead, channel catfish, goldfish, mosquitofish, common carp, warmouth and pumpkinseed sunfish.

Fish Distribution and Migratory Passage

Fish sampling efforts on the lower Long Tom River have focused on characterizing species utilizing the fish ladder at Monroe, as Monroe is the first barrier encountered by fish migrating upstream.

Cutthroat trout - Monitoring conducted by Oregon Department of Fish and Wildlife (ODFW) during the early 1990s found large (greater than 33.3 cm/13 inch) cutthroat trout were able to navigate the fish ladder (Table 1). These large fish could only access the ladder under optimal flow conditions – enough water to attract them to the ladder, but not so much water that velocities would be overpowering. These large, strong fish had the capacity to power over the flows in the ladder upstream where they were captured by a screw trap and measured before being released back to the stream. No juvenile fish or fish smaller than 11 cm/4 inch were captured.

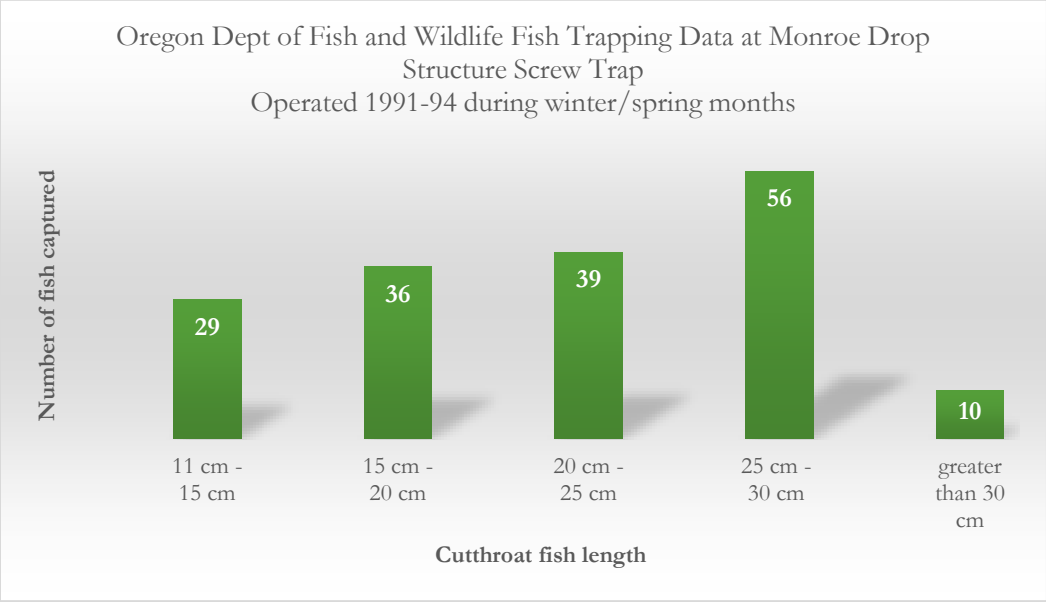


Figure 3. Fish Sampling results at Monroe dam

Spring Chinook - More recently in sampling conducted by LTWC, USACE, and ODFW during 2009 and 2014, juvenile spring Chinook were collected consistently within 50 meters downstream of the Monroe drop structure, but none above. Juvenile spring Chinook have been found nearly 30 miles from the mainstem Willamette River in other west-side tributary rivers. This, and professional opinion, indicate these fish would likely use the Long Tom Watershed tributaries far upstream of Monroe for rearing habitat if they could gain access to that habitat provided historically. **Figure 4** shows a simple summary of the current fishery and barrier conditions.

The Monroe drop structure is a total barrier for juvenile salmonids, including ESA listed upper Willamette spring Chinook salmon, a total barrier at most times for cutthroat trout, and an unknown barrier for other species.

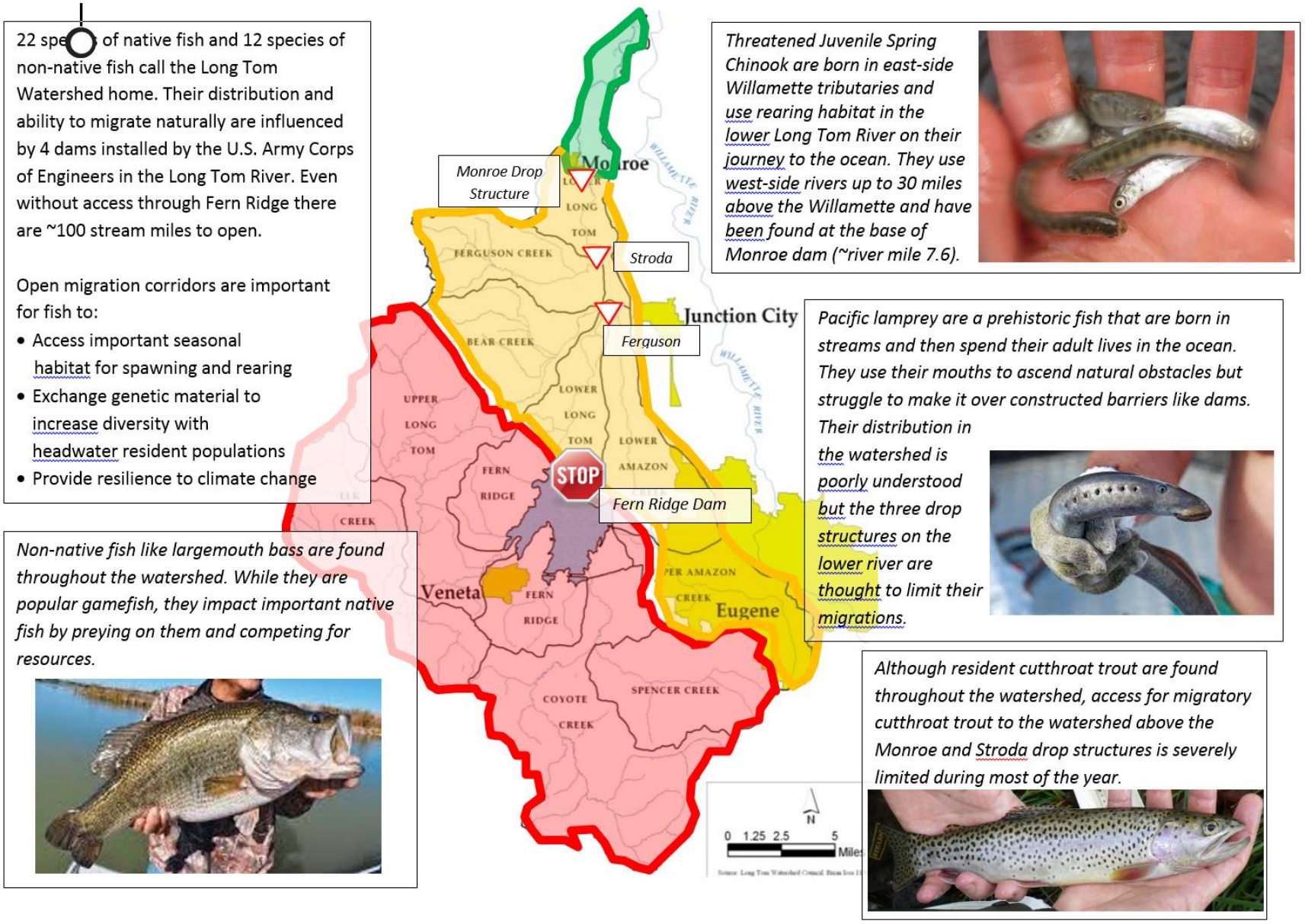


Figure 4. Fish populations in the Long Tom Watershed and their current distribution as impacted by 4 mainstem dams.

Long Tom Wildlife

Wildlife Background (excerpted from the US Army Corps of Engineers report "Long Term on the Long Tom", February 2014)

Historical habitat conditions along the lower Long Tom River were a mosaic of emergent wetland, forested wetland, wet prairie and closed canopy riparian forests. Emergent and forested wetland provided habitat for numerous wildlife species including red-legged frog, western pond turtle and beaver. Cavity nesting birds found within the riparian forests include tree and violet-green swallows, western bluebirds and purple martins.

Although significant acreage of closed canopy riparian forest, emergent wetland, forested wetland and wet prairie habitats have been lost since European settlement; the watershed still supports wildlife species. Historically, the river's floodplain would have supported wildlife species associated with more open prairie habitat, including western meadowlark, grasshopper sparrow, short-eared owl and the federally listed streaked horned lark. The wet prairie habitat formerly associated with the floodplain found throughout the lower Long Tom has been diminished and degraded by agricultural practices.

The lower Long Tom River currently provides habitat to several game species. Roosevelt elk can be found from the upper reaches of Bear and Ferguson Creek to the main channel of the Long Tom River south of Franklin Road. Black-tailed deer can be seen throughout the lower Long Tom River basin. Some waterfowl species have been observed during the breeding season within the Lower Long Tom River such as wood duck and mallards. Fur bearing mammals (e.g. beaver, muskrat, mink, etc.) are also found throughout the reach.

CONSERVATION STRATEGY SPECIES

The Oregon Department of Fish and Wildlife (ODFW) has identified imperiled species through the State's ecoregions as Conservation Strategy Species (CSS). The lower Long Tom River is located within the Willamette Valley Ecoregion and the Coast Range Ecoregion, and is home to a number of species identified by ODFW as CSS. The table below outlines Oregon Conservation Strategy Species found within the Bear and Ferguson basins, tributaries of the Long Tom River downstream of Fern Ridge Dam, upstream from Monroe.

Table 1. Oregon Conservation Strategy Species found within Bear and Ferguson basins (Long Tom Tributaries downstream of Fern Ridge Dam and upstream from Monroe

Scientific Name	Common Name	State Listing	Federal Listing
Reptiles and Amphibians			
Emys marmorata marmorata	Western pond turtle	SC	SC
Crotalus viridis	Western rattlesnake	SC	None
Aneidesferreus	Clouded salamander	SV	None
Ascaphus truei	Coastal tailed frog	SV	SC
Rana aurora	Northern red-legged frog	SV	SC
Bufo boreas	Western toad	SV	None
Birds			
Melanerpes formicivorus	Acorn woodpecker	SV	SC
Patagioenas fasciata	Band-tailed pigeon	None	SC
Spizella passerine	Chipping sparrow	None	None
Chordeiles minor	Common nighthawk	SC	None
Branta canadensis occidentalis	Dusky Canada goose	None	None
Ammordramus savannarum	Grasshopper sparrow	SV	None

Empidonax traillii brewsteri	Little willow flycatcher	SV	None
Strix occidentails caurina	Northern spotted owl	LT	LT
Contopus cooperi	Olive-sided flycatcher	SV	SC
Pooecetes gramineus affinins	Oregon vesper sparrow	SC	SC
Asio flammeus	Short-eared owl	None	None
Sitta carolinensis aculeate	Slender-billed nuthatch	SV	None
Eremophila alpestris strigata	Streaked horned lark	SC	Proposed LT
Sialia mexicana	Western bluebird	SV	None
Sturnella neglecta	Western meadowlark	SC	None

SC-Species of Concern SV- Sensitive Vulnerable LT- Listed Threatened

Habitat Improvement Projects Completed

Numerous habitat projects have been completed in the area in the last few decades, many specifically to improve habitat for resident cutthroat trout, and which will provide additional habitat to migrating salmon and trout. These are shown in **Figure 5**.

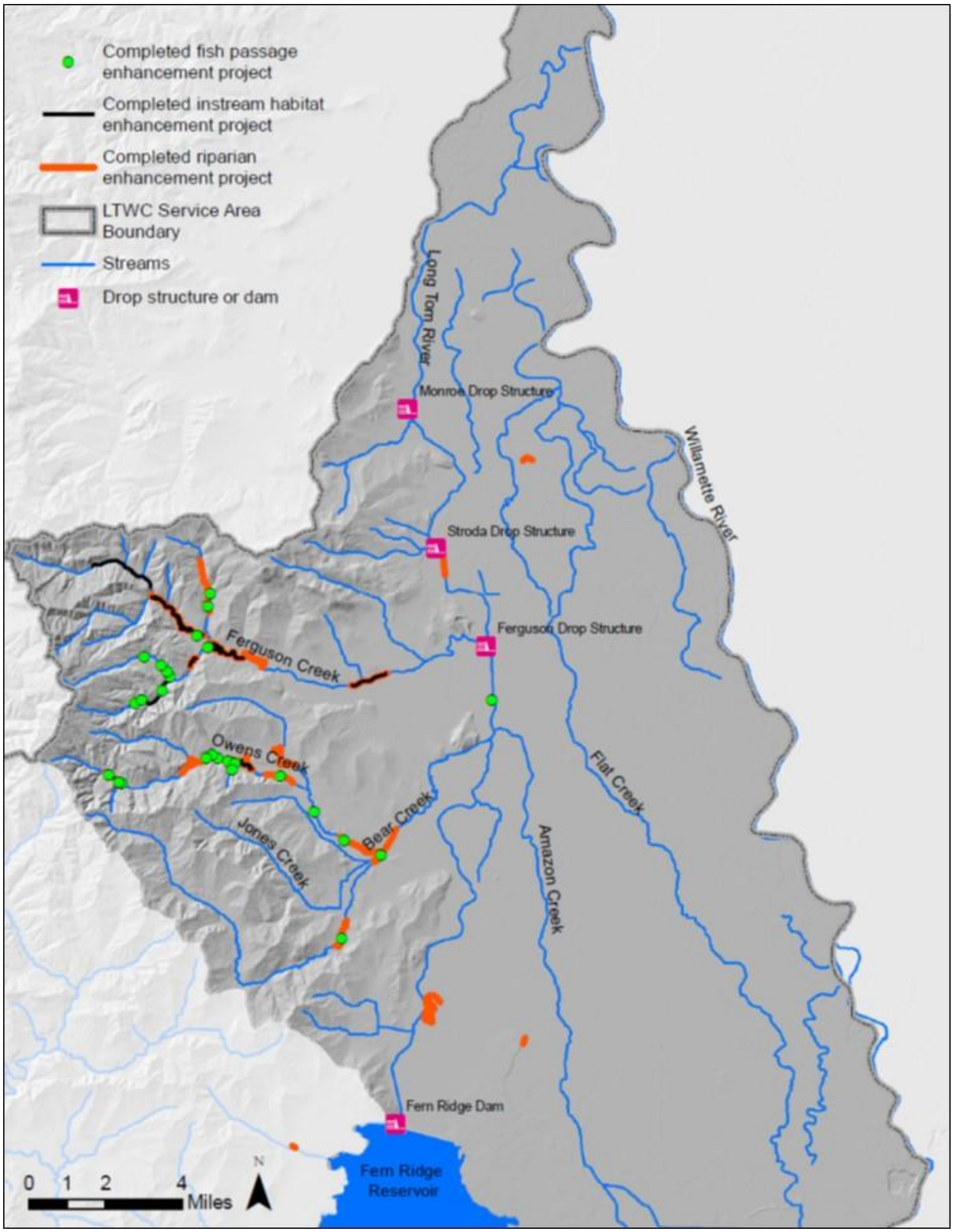


Figure 5. Overview of LTWC-sponsored stream habitat improvement projects completed in Bear and Ferguson subwatersheds from 1998-2017

Outreach

Project Steering Committee 2016-18

A Project Steering Committee of people invested in the river's future management was formed to assist the Long Tom Watershed Council in guiding progress toward all three goals of this plan – habitat, fish passage, and maintenance improvement. Participants in the committee included representatives from the following:

- Three agriculture landowners, one for each river section (lower, middle, upper)
- Three riverside landowners (non-ag) one for each river section (lower, middle, upper)
- City of Monroe
- Junction City Water Control District
- Benton County
- USACE
- Recreation interests

Members of the Steering Committee participated in 7 meetings over the project's year of development and 4 public meetings (from November 2016 to November 2017). Thank you Volunteers!

Steering Committee meetings served multiple purposes:

- Provide early and regular input from a diverse stakeholder group to help identify and vet ideas to guide the outreach process.
- Opportunity for discussion of topics with key stakeholders that may not have enough time to dive into the details during Public Meetings
- Review and provide thoughtful comment on agendas, presentations, and visuals for public meetings
- Providing perspective from varied viewpoints to help frame public meetings

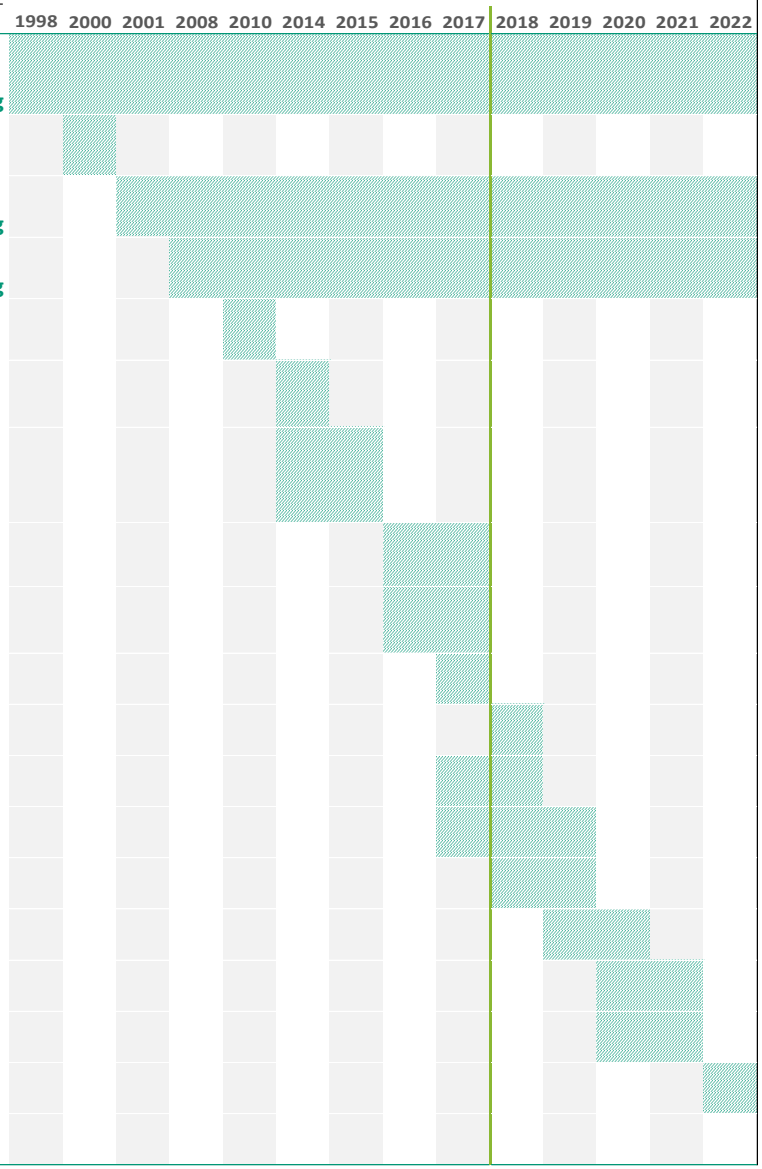
History of Outreach and Action

The Long Tom Watershed Council has conducted outreach, stakeholder engagement, and scientific study in the local area since 1998. **Figure 6** is a timeline that outlines the Watershed Council and community history that brought this habitat and fish passage improvement planning project to this point.

.

Figure 6. Long Tom Watershed Council Fish Passage Timeline

Significant Action	Year	DURATION (Years)	PERCENT COMPLETE
Long Tom WC uses stakeholder outreach, education and volunteer action to decide work and bring funding to area	1998	25	on-going
Long Tom WC Assessment identifies fish passage and habitat as a priority	2000	1	100%
Long Tom WC begins work improving habitat throughout the watershed	2001	23	on-going
300 culverts surveyed, 40 fixed to improve fish passage, benefits to trout and other resident fish	2008	15	on-going
Stroda Drop Structure (upstream from Monroe) design completed	2010	1	100%
Increased relationship with Corps culminates in Community member and Council awards from Corps	2014	1	100%
Long Tom River Habitat Plan idea developed with Corps and key stakeholders. Funded by OWEB and signficant gift from family with local ties.	2014	2	100%
Community and stakeholder outreach for Long Tom Habitat Plan development	2016	2	35%
Long Tom Habitat Plan Steering Committee Meetings, Public Meetings, Interviews and Survey	2016	2	100%
Long Tom Habitat Plan draft available	2017	1	100%
Long Tom Habitat Plan final available	2018	1	25%
Development of Monroe Drop Structure Alternatives	2017	2	10%
Coordination with City of Monroe on municipal water	2017	3	10%
Corps Section 1135 process to examine alternatives	2018	2	0%
Selection of preferred alternative for Monroe Dam	2019	2	0%
Fund-raising to implement preferred alternative	2020	2	0%
Secure project permits	2020	2	0%
Prepartion of final designs, contracting, construction	2022	5	0%
Site maintenance	2022	indefinite	0%



Public Meetings 2016-17

First Public Meeting, November 2016, Monroe Community Library, Summary

The project's kick-off meeting included: An overview of the project goals/objectives, History of the Long Tom River management by the US Army Corps of Engineers; An overview of how inundation maps are developed and how they are useful to project planning and development, by a River Design Group engineer, and An overview of the fishery of the Long Tom River given by the Watershed Council. The meeting included a request for additional volunteers to participate with the project's Steering Committee.

Second Public Meeting, January 2017, Monroe Community Library, Summary

The focus of this meeting was on the key question the Watershed council asked River Design Group to help the Watershed council answer: *Where are the low areas that would be easiest to connect to the River to benefit fish if a landowner shared that goal?* Pete Gruendike with River Design Group provided an explanation inundation maps developed for the project - in particular, flow level portrayed and explained that we are most interested in winter flow conditions because we are looking for opportunities to improve fish access to habitat during a time of year when fish are seeking refugia in slower moving, side-channel, off-channel areas. He shared ideas for areas for additional investigation with potential habitat management areas including locations to enhance floodplain connectivity that have existing beneficial habitat (i.e. forested).

The meeting also provided a break-out session for landowners to review the maps with Long Tom Watershed Council, USACE and River Design Group staff and discuss project opportunities and set-up site visits.

Third Public Meeting, April 2017, Monroe Community Library, Summary

The project's third meeting featured professor emeritus in the Department of Fisheries at Oregon State University, Stan Gregory. Stan was a leader of the Stream Team at Oregon State for more than two decades. Stan described the fish that utilize the Long Tom River, what habitat characteristics they seek out and how modification of the Monroe drop structure would impact the ability of fish to utilize upstream habitat.

This meeting also included a presentation on dam removal projects implemented in a Willamette River tributary. The Calapooia Watershed Council removed three mainstem dams between 2007 and 2011 to improve fish passage and restore stream processes. These projects were all similar in size to the Monroe Drop Structure. Denise Hoffert, the Calapooia Watershed Council's project manager for the implementation of these projects, described how these dam removals impacted the river and fishery since their implementations.

Fourth Public Meeting, November 2017, Monroe Community Library, Summary

The project's fourth meeting focused on alternatives to the Monroe drop structure. The alternatives were presented at four stations, each with a poster listing how they addressed criteria outlined by the Project Steering Committee, sample visuals to better understand the projected outcome of that alternative, and space for comments and feedback. The meeting attendees split into 4 groups to rotate through each station. Each station included a representative from the Watershed council or Corps to provide an overview and answer questions. Stakeholders in attendance were provided the opportunity to provide input on their preferred alternative(s) and to outline their remaining questions. These 4 Alternatives are presented in this document in the chapter on the Monroe drop structure. Stakeholders were asked to provide a feedback color for each alternative in terms of how much they liked the alternative as a solution for the Monroe site. That feedback is also presented in this document.

Community Member Interviews

Following the project's first three public meetings, the watershed council undertook semi-structured interviews about the Habitat Plan's three goals with 21 stakeholders from various perspectives. The purpose of these interviews was to gauge community interest from a diverse range of stakeholders and decision-makers regarding support of the watershed council and the Corps to engage in the following:

a. Pursue technical assistance for improving fish passage at the Monroe Drop Structure;
b. Conduct outreach to landowners to undertake projects to improve habitat conditions on their own lands, including projects that could allow for more floodplain connectivity.

The survey also asked 10 riverside landowners about their vision for future US Army Corps of Engineers channel maintenance actions and whether they would partner with the Corps and/or watershed council on future maintenance or enhancement projects.

METHODS

Watershed council staff and contractor identified participants by reviewing meeting sign-in sheets and riverside property owners. 35 potential participants were selected based on geographic location (riverside landowners with the potential to be impacted by river projects) and recent meeting attendance showing interest in the project. It was also determined that interviews should be conducted with as many Monroe City Council members as could be reached. All interviews were conducted using the same list of questions and prompts and all interviews were conducted via phone. Notes were typed into the questionnaire during each call and a separate document was created for each interview. These results were then provided to the watershed council's contractor for compilation. Each individual's responses are confidential however the aggregate results are reported here, and full results in Appendix B.

RESULTS

A total of 21 community interviews were conducted. Some questions have responses that do not add up to this total. This is because some people answered to more than one category. Themes that emerged from these interviews include:

- There is strong support for landowners participating in voluntary restoration actions on their property.
- There is strong interest in beautification and improvement of Monroe's waterfront as well as providing recreation access for boating, swimming, fishing and recreating.
- There is support for improving fish passage at the Monroe drop structure if changes at the site do not create issues for the City of Monroe's water supply or impact agricultural operations with irrigation withdrawals from the River.
- From landowners with Corps-managed riverfront property, there was support for exploring options for future channel maintenance.
- There were many questions about the technical aspects of making a change to the Monroe drop structure (e.g. expected changes to flow velocities, predicted erosion). These will be addressed in the project's future technical design phases.
- There were questions about the fish usage in the River and a lack of awareness of current Long Tom River fish species and population numbers, as well as about physical aspects of the river and sediment.
- There were questions about what the River would look like following construction of a fish passage project at the drop structure. *To address this request, the Watershed Council worked with volunteer Flora Lin Chin to develop conceptual sketches of the River under different scenarios. These are based on current photographs of the river and included throughout this document.*
- See additional results in the section on Goal 2 - Improving Fish Passage.

On-line Survey

In addition to the Community Interviews, in November 2017, an on-line version of the survey regarding the Habitat Plan's three goals was opened for three weeks. The survey availability was announced at the fourth public meeting, and the link was sent via email to the 1,500 families on the LTWC mailing list as well as anyone who had attended the public meetings on the habitat plan. The survey asked the same questions used in conducting the individual interviews. This was provided because watershed council staff could not conduct interviews with all people with an interest in the project. Providing an on-line survey allowed the watershed council to offer a larger stakeholder pool the opportunity to participate in sharing their ideas and concerns about habitat improvements in the Long Tom Watershed.

Twenty-six (26) people took the on-line survey and of those, 11 provided their contact information. There was concern at the project's fourth public meeting that outside interests might participate in the survey to attempt to skew the results, but from the responses, it does not appear that is the case. The range of responses is similar to that from the Community Interviews. And the themes from the responses generated is similar to the in-person interviews. A summary from the on-line interviews is provided as Appendix C.

Outreach Results Summary

Throughout this process - at public and project meetings as well as during community interviews, site visits, and survey responses - there was widespread support for habitat improvement. There was also widespread support for fish passage with caveats around how that it would be implemented; please see more in the section on Goal 2 Fish Passage. In terms of ongoing channel maintenance by the Army Corps, there was strong support among riverside landowners, with a majority being agricultural landowners, for "river management alternatives that would increase water quality and habitat benefits as long as flood risk reduction and water flow were met."

The Long Tom River may best be summarized by a community member who described it as "a river that provides multiple benefits; that provides habitat and scenic beauty and supports local agriculture". The timing of this plan also coincided with some updated visioning for the City of Monroe related to the Long Tom River and community well-being. The City of Monroe's updated vision includes multiple aspirational statements around "fronting an accessible and beautiful river," the "value of nature and sustaining the ecosystem services," and "celebrating its natural environment."

This plan examines ways to continue and improve the realization of multiple benefits from the Long Tom River, while updating our delivery and quality of habitats the river provides within the greater Willamette River ecosystem.

Goal 1 - Habitat Reconnection and Improvement

Overview

Many natural channel segments and floodplain areas along the lower Long Tom River floodplain between Fern Ridge Reservoir and the Willamette River confluence were cut off or altered as part of the U.S. Army Corps of Engineers (Corps) channel relocation and rectification project in the 1940s and 50s. Greater scientific understanding since then has shown the watershed benefits from improving connectivity between floodplain adjacent to a floodplain such as the Long Tom River. These benefits would include increased water storage, decreased localized flooding and bank erosion, and improved habitat conditions for native fish and wildlife.

This project's goal was to identify and prioritize lower Long Tom River sites where natural river function could be restored and fish and wildlife habitat improved. Priority was based on a site's ability to: restore channel connectivity, increase access for fish and wildlife, and decrease fish stranding. A floodplain inundation model was used to identify low-lying areas where the river could access historic channel segments or floodplain areas if constrictions (culverts, berms) were modified or removed. Sixty project sites were identified during this analysis. Outreach was begun in 2017 to identify landowners interested in collaborating with the watershed council and Corps to seek grant funding to design habitat improvement projects. In November 2017, two identified projects were submitted to a grantor and successfully funded for design and engineering.

How Potential Habitat Projects were prioritized

Step 1 – Inundation Mapping

LTWC coordinated with River Design Group (RDG), a river engineering firm based in Corvallis, to complete a floodplain inundation analysis for the Long Tom River from Fern Ridge Dam downstream to the confluence with the Willamette River. The resulting maps provide a tool for evaluating potential river-floodplain habitat enhancement opportunities and for prioritizing landowner outreach.

The RDG analysis included these steps:

1. Existing hydraulic model was modified to include additional hydrologic and topographic data.
2. The bankfull water surface was converted to a grid and then overlaid with the combined topographic – bathymetric surface model.
3. Computer analysis tools were used to calculate the difference between the water surface grid and the underlying elevation surface model to create the inundation depth.

The results from this work are illustrated in five inundation maps depicting the predicted floodplain in the 24-mile study area, broken into 5 river reaches, and are included in Appendix A. **It is important to note that the inundation maps do not demonstrate existing or desired conditions.** The maps illustrate low lying areas where channel connectivity could be more easily restored if a landowner wanted to improve habitat conditions or partner with the watershed council and/or Corps to improve overall river capacity. The inundation depths shown on the maps are based solely on the difference between the modeled water surface elevations and the combined bathymetric-LiDAR topographic surface model. The illustrate where water could be if obstructions that can impede water from flowing from the river into low lying areas of the floodplain such as berms, levees, revetments, etc. were not present. In addition, some of these lower elevation portions of the floodplain may be frequently inundated due to precipitation events, overland runoff and elevated water table but still lack surface connections to the river.

Step 2 – Project Types

The reach maps were used by the Long Tom Watershed Council and Corps to identify and prioritize potential floodplain reconnection projects and as outreach materials to engage landowners along the lower Long Tom River.

Using the floodplain inundation maps, three general types of project areas were determined:

1. Isolated historic segments of the mainstem Long Tom River
2. Isolated historic braided side channels
3. Isolated floodplain areas (lacking defined channels) inundated during modeled flows.

In all, 60 project sites greater than 0.4 acres were identified. Maps for each site were drawn using a software program: ArcMap. Project boundaries were determined by the mapped extent of floodplain inundation. In the lower reaches of the river, below river mile eight, identifying specific project sites was more difficult. The floodplain is under water during modeled flows, largely due to the backwater effects of the Willamette River. The modeled water surface spreads out, making it difficult to define project boundaries. To more easily identify potential project sites in this reach, areas of inundation less than five feet deep under modeled flows were removed.

Step 3 – Discuss with Landowners

During the project's first two public meetings, landowners were asked if they were interested in having the Watershed council and the Corps visit potential project areas identified on their lands. Outreach by telephone and in-person was conducted to landowners that have worked with the watershed council or shown interest on projects in the past. Outreach was conducted to 21 potential project sites and 19 sites received site visits. Overall, landowners were willing to consider floodplain connectivity enhancement projects on their lands. This was largely due to the project sites being seasonally under water, and not suitable for agriculture or other land uses. In many cases the areas currently act as ponds that are seasonally connected by culverts to the river. Potential future projects would likely result in these ponds draining earlier in the dry season and would strand fewer fish. This project option was frequently seen as a benefit to landowners wishing to decrease mosquito habitat on their properties.

Step 4 – Evaluate feasibility and value

After potential projects were determined, the feasibility and ecological value of restoring floodplain connectivity at each site was evaluated and assigned points. This prioritization did not consider impacts related to potential cultural resources or rare plant or animal populations within project sites, or opportunities for upland or wetland prairie enhancement. The impacts to these resources and opportunities to enhance function will be addressed during future site specific project planning.

The feasibility assessment included the following five criteria and scoring metric:

1. **Landowner interest** *(0 or 1 point)* Any landowners contacted that weren't interested in a project on their property were moved to the bottom of the project list. An interested landowner scored one point; unknown scored zero points.
2. **How many landowners within project footprint?** *(0 or 1 point)* More landowners can make project objectives and implementation complicated. More than two land owners was a good metric for decreasing the probability of a project and was scored zero points. Less than or equal to two landowners was scored as one point.
3. **Are there priority USACE maintenance actions within project area?** *(0-3 points)* The chance to partner on a project with the Corps could benefit habitat while also accomplishing Corps channel maintenance objectives. We overlaid areas where Corps modeling predicts: low freeboard, higher than

design velocities, and areas with active bank erosion. All projects areas with portions that fell into, or were parallel to one of these three categories received one point. If a project area fell within, or was parallel to two maintenance coverage areas, two points—and so on.

4. **Is the site downstream of Monroe?** *(0 or 1 point)* Areas upstream of the Monroe Drop Structure are not accessible to ESA listed fish species (juvenile Chinook salmon) in the basin. Sites downstream of the drop structure have the potential to provide habitat for ESA-listed fish. Under existing conditions, these sites could strand fish as flows recede. Following project implementation, these areas could become important winter fish habitat. Downstream sites are more likely to receive grant funding for channel reconnection work. Project sites below the Monroe drop structure were scored one point; sites upstream of Monroe were given zero points.
5. **Potential construction costs.** *(0-2 points)* We ranked construction costs (not including potential vegetation management activities such as weed treatment or planting) as low, medium, and high. For low cost we expect only a culvert removal and minimal bank armoring—two points. A medium cost project would include a culvert or bridge to reconnect the site (we used aerial imagery to determine if an established road system is currently present)—one point. High cost projects would include a crossing and setback levees or extensive design work (e.g. a floodway or braided channel reconnection)—zero points.

The ecological prioritization analyzed four criteria:

1. **Acreage of project site.** *(0.04-15.4 points)* The score was calculated by dividing the acreage of the site by 10. For example, a 20-acre site would score two points.
2. **Intact native habitat within project site.** *(0-5 points)* The percentage of the project site containing native habitat was estimated. Native habitat was defined as forest, wetland, or open water with little to no non-native vegetation or agricultural activity. For sites that we did not visit we used aerial imagery to estimate the percentage of the project site that had intact native habitat. Native prairie habitat on unvisited sites could have been misclassified using our methodology. (0% or project site = 0 pt., 0-20% = 1 pt., 21-40%= 2 pts., 41-60%= 3 pts., 61-80% = 4pts., 81-100% = 5 pts.).
3. **Intact habitat adjacent to the project site.** *(0-3 points)* Using the same definition as above for intact, native habitat, we quantified the percentage of the border of the project site that was adjacent to or within 100 meters of intact habitat. (0% of project site boundary touching or within 100 meters of intact habitat=0 pt., 0-33% =1 pt., 34-67%= 2 pts., 68-100%=3 pts.)
4. **Longer period of inundation.** *(0-3 points)* Depth of inundation within the project site was used as a proxy for longer periods of inundation, and therefore more potential for use by aquatic species. (0% of project site inundated >5'=0 pts, 1-33%=1 pt., 34-67%=2 pts., 68-100%=3 pts.)

Results

The results from tallying the metrics for feasibility points for the 60 project sites are in the table below. In the feasibility category there were a total of eight points possible. Scores for ecological prioritization metrics for the 60 sites ranged from 0.6-18.4. Since the range of scores for the ecological prioritization was significantly wider, a rank was assigned to each site in each category (feasibility and ecological) to equalize the importance of both categories. The ranks in each category for each site were then summed to produce a combined ranking. For example a site that was ranked #4 for feasibility and #6 for ecological priority has a combined rank score of 10. Project site with #2 feasibility and #5 ecological prioritization had a combined rank score of 7, which was the lowest combined rank, and therefore the project that best represented a high feasibility and high ecological priority.

Table 2. Summary of Potential Habitat Project Prioritization Results

Feasibility Results	Ecological Prioritization Results
1 site = 7 points	14 sites = 0.6 – 4.0 points
2 sites = 6 points	20 sites = 4.3 – 7.8 points
11 sites = 5 points	18 sites = 8.0 – 9.8 points
21 sites = 4 points	8 sites = 10.1 – 18.4 points
15 sites = 3 points	
7 sites = 2 points	
3 sites = 1 point	

The maps are a tool to begin prioritization and landowner conversations, and other analyses are done prior to project development and implementation. These results were used to prioritize outreach to landowners in 2017 and will continue to be used for outreach and project development with willing landowners.

If you own riverfront property and are interested in learning more about opportunities for voluntary habitat projects on your property, you can contact the Long Tom Watershed Council at 541-338-7055 and ask to speak with the habitat projects manager, Jed Kaul.

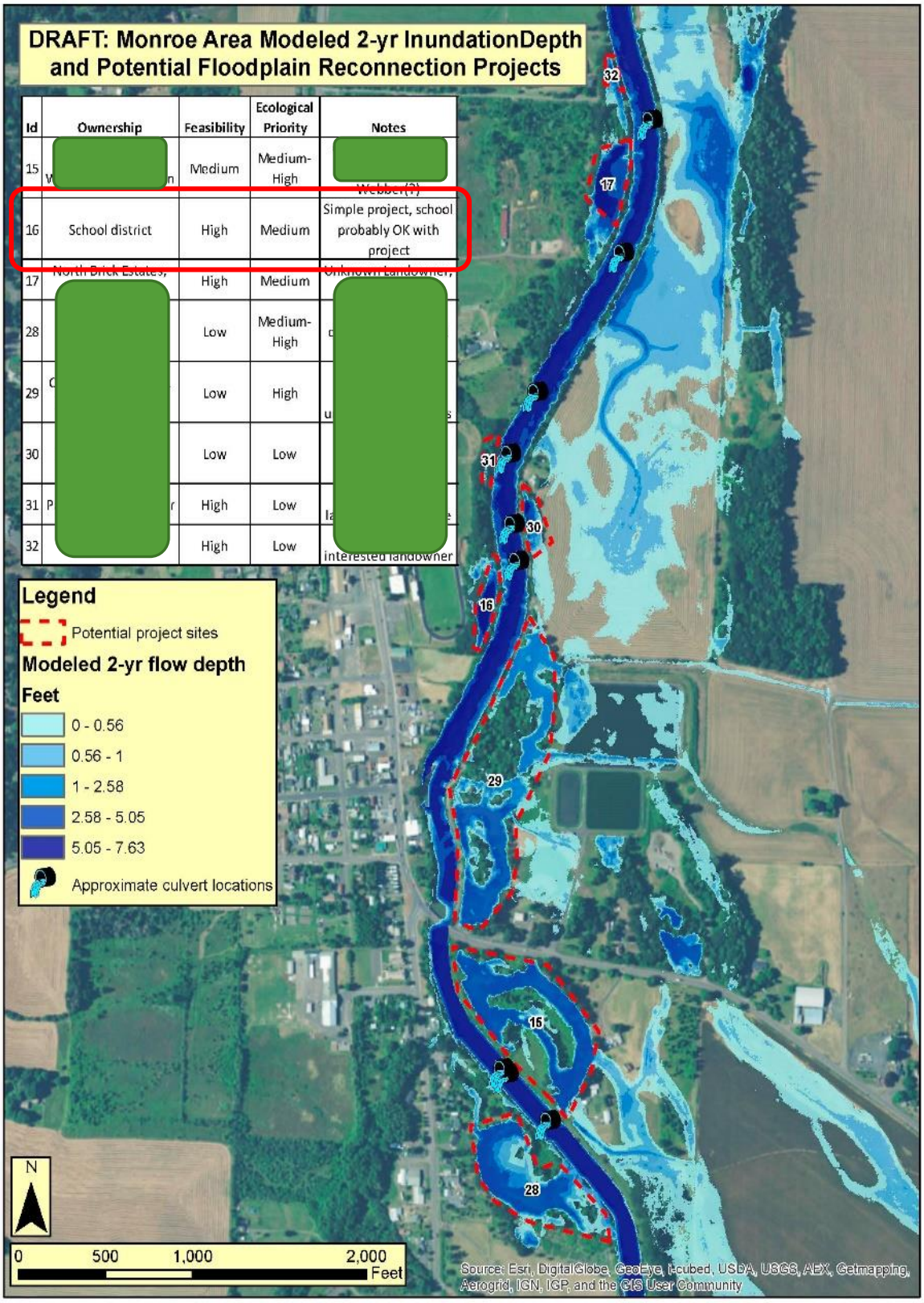


Figure 7. Location of some potential habitat projects identified by hydraulic modeling and field visits. Any further progress would require additional discussion with interested landowners first.

Goal 2 – Improving Fish Passage

Overview

The Long Tom Watershed Council's assessment of watershed conditions (completed in 2000) identified improving fish passage as a priority for the basin. The Long Tom watershed is common in having significant barriers to fish passage that negatively impact native resident and migratory aquatic species. Throughout Oregon, following the federal listing of many salmon species under the Endangered Species Act in 1999, communities began to evaluate how the human built infrastructure (culverts, dams, tidegates) impacts migratory fish.

The Long Tom Watershed Council prioritized the mainstem barriers (Ferguson, Stroda and Monroe) for identifying potential fish passage options. Over the years, the watershed council has worked on culvert replacement and habitat improvement projects on tributary streams to benefit resident cutthroat trout. However, the biggest impediments to improved fish access to quality habitat have remained on the mainstem river and with increased partnership experience with the US Army Corps of Engineers, and the experience in other areas with small low-head dam modification or removal, a solution is now possible.

Fish Passage Goals

The Watershed Council would like to restore access to the 106 miles of mainstem and tributary habitat currently blocked by the three drop structures. Goals for the future of the Monroe drop structure site include:

- Restore access for juvenile spring-run Chinook salmon, cutthroat trout of all life stages, and two species of lamprey at all life stages.
- Improve conditions for cutthroat, Oregon chub, redside shiners, dace, sculpin, stickleback, western pond turtles and red-legged frogs.
- Eliminate the safety and liability hazard from the low-head dam in the town of Monroe.
- Enhance the aesthetic appeal and recreation potential of the Monroe waterfront areas.
- Collaborate with City of Monroe, area farmers and Corps of Engineers to achieve win-win outcomes.

Figure 8. Ferguson Drop Structure – USACE Photo Point 7. Feb 9 2017

Figure 9. Monroe Drop Structure, looking southeast, Long Tom River, Monroe, Oregon

Figure 10. Monroe Drop Structure, looking west, at lower flows, Long Tom River, Monroe, Oregon

Figure 11. Monroe Drop Structure, looking west, at higher flows, Long Tom River, Monroe, Oregon

Improving Fish Passage at the Monroe site

Improving fish passage at the Monroe drop structure[1] will include consideration of the structure's location next to the town of Monroe. This includes community interest in the site's future, from practical to aesthetic, some interest from Monroe in the history of the site including a mill and hydropower generation, and private ownership of the existing defunct fish ladder. This will also include the complexity of differing opinions regarding the river.

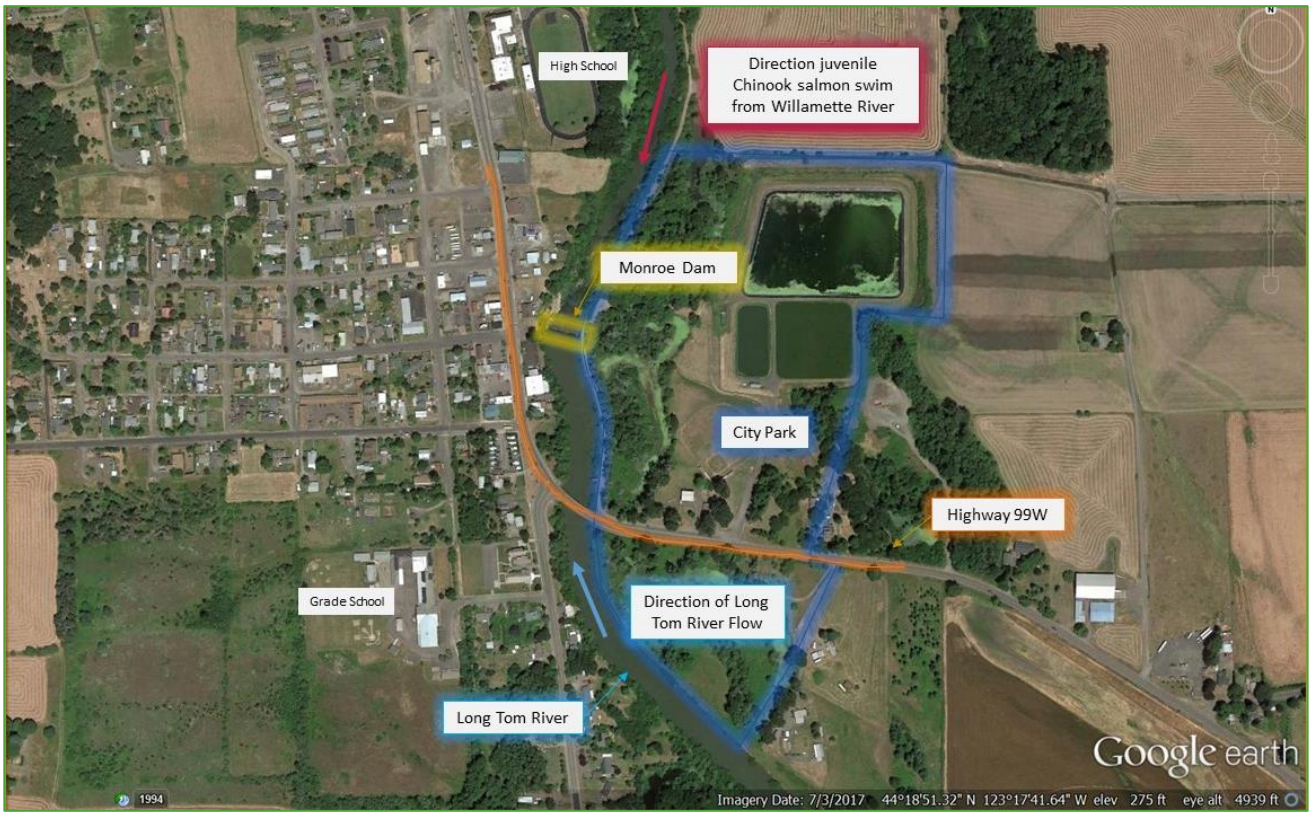


Figure 12. Overview map of the Long Tom River flowing through the Monroe area. The majority of the City of Monroe is west of the river, while a major city park is on the east side.

Public Input on Monroe Drop Structure

As mentioned in the Outreach section, stakeholder interviews were conducted to evaluate general interest and support. As part of the outreach for this Habitat Plan, public input on the future management of the Monroe Drop Structure was solicited in three ways:

1. Stakeholder Interviews
2. On-line survey
3. Public meeting "dot" survey

[1] Note on nomenclature: Throughout this study, the structure at Monroe is referred to alternately as the "Monroe Drop Structure" and "Monroe Dam". These names refer to the same structure. The Corps of Engineers has called all three Long Tom River structures (Ferguson, Stroda and Monroe) "drop structures". However, the design and function of all three is not any different from a low-head dam and is the term more common to the community to describe the structure.

The results of these various activities are included in this report and appendices. In summary, there is widespread stakeholder support for improving fish passage at the Monroe drop structure. This support was almost always delivered with two caveats: 1. Municipal water supply at Monroe must be maintained and 2. Local agriculture should not suffer any negative outcomes. The figure below shows the results from Question 4 in the community interviews and on-line survey that demonstrates 18 of the 21 interviewees either support improving fish passage or are neutral (n = 3) and the on-line survey responses with 22 participants supporting improving passage and 3 disagreeing.

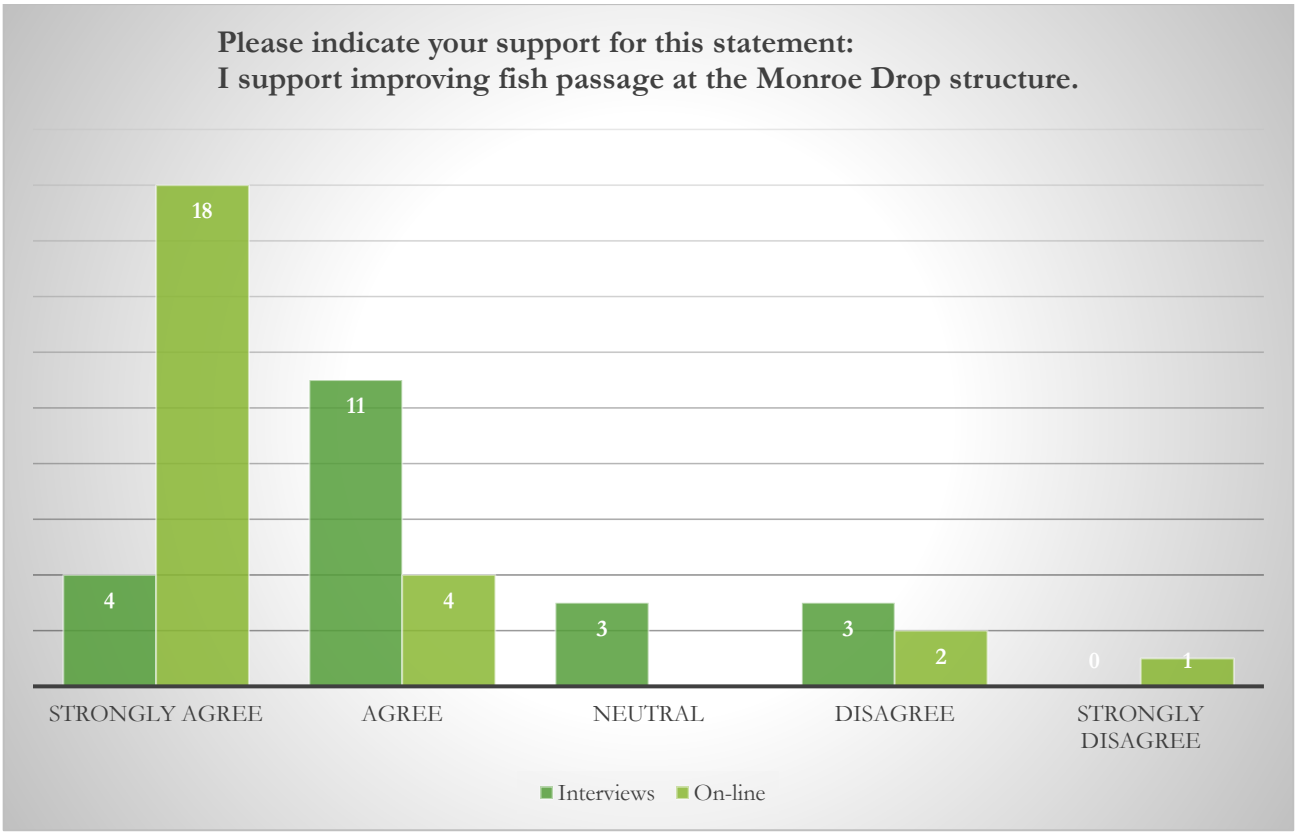


Figure 13. Responses to a key question regarding the Monroe Drop Structure, summarized from the Community Interviews and On-line Survey, in which each person chose only one answer.

The Project Steering Committee spent considerable time discussion ideas and concerns regarding fish passage and ultimately helped to outline key criteria that alternative solutions could be evaluated with. In addition, the Steering Committee helped identify and clarify questions regarding agricultural and municipal concerns around making changes to the Monroe drop structure. These were researched and that information is included in the Responses to Questions section.

Initial Fish Passage alternatives

To aid the community in understanding potential alternatives for future river conditions at the Monroe site the project team provided some conceptual ideas to solicit feedback and gauge community interest. After some iterations with the Project Steering Committee, four conceptual alternatives emerged that outlined options to improve fish passage at the drop structure. A fifth alternative was identified after the public meeting process but before this Plan was finalized so it is mentioned afterward and will be considered during the next phase. The four

initial alternatives are outlined in the accompanying tables. There are variations on these designs, but the broad concepts include:

- **Notch or otherwise modify dam** (see Table 4) – Remove center portion of the drop structure. Install boulders and riffles to prevent river from eroding the channel.
- **Bypass Channel to work around dam** (see Table 5) – Leave existing drop structure in place. Utilize culverts and lengthen/reconstruct existing side channel to divert flows around the dam in attempt to pass fish around the drop structure.
- **Fish Ladder** (see Table 6) – Leave existing drop structure in place. Re-build a new fish ladder that meets current fish passage criteria.
- **Remove Drop Structure** (see Table 7) – Remove the drop structure and potentially install boulders and riffles to minimize upstream channel erosion.
- **Fifth alternative - A rock ramp or boulder riffle to backwater the dam or modified dam**

Each of the four initial alternatives explored for this preliminary phase is outlined in the following section.

Table 3. Notch Dam

Notch the Dam by removing center. Install boulders & riffles to prevent river from eroding the channel.

Biological Factors	• FISH - Improves fish passage for salmon, trout, lamprey and other species. May be some limitation to how well fish passage is improved due to the flow concentrating too much during higher flows. • SEDIMENT - Restores sediment distribution. • FLOW - Same winter flows and height of water. In summer, water would not pond so it would look like downstream conditions look currently. Summer river flow provided by releases from Fern Ridge dam.
Social and Community Factors	• CITY RIVERFRONT– Potential for notched dam to be a river feature that provides more highly desired aesthetic. • CITY WATER - Include technical solution so City can adjust drinking water intake because water surface elevation upstream from dam site will lower 7'. Simple option is a stronger pump and longer hose. City working on longer term water sources. • CITY PARK – No change; can improve stagnant water in park by letting channel dry out in summer. • IRRIGATION WATER - Irrigation water availability remains the same. Adjust 3 ag pumps to reach new lower water level in summer. • AG PUMP SCREENS - Ag producers with unscreened pumps will likely be required (by federal gov) to install screens so juvenile salmon aren't sucked into pumps. Producers with screens would upgrade next time they replace. • AG BUFFERS - Regulations on buffers for chemical spraying next to streams could be designated. Not enforced. Spraying enforcement is complaint driven. • BOATING – Limited or no improvement for recreational boating (may still need to portage around). • LIABILITY – Potentially decreased liability for City/Corps with lower risk for accidental death/drowning.
Cost and Feasibility of Funding	• COST – Expensive. For a dam this size, notching is typically same cost as removal. Include boulder/riffles as needed to avoid river erosion • GRANTS - Unsure of willingness of grantors to fund because it's a partial solution. • MAINTENANCE - Part of dam still in place and requires maintenance over time. • LIABILITY - Potential remaining liability to City/Corps as part of dam still in place.
Details to be addressed in next phase	• FEASIBILITY - Assess integrity of existing concrete; can it be notched? • FISH - Determine notch size to maximize fish passage. • FISH - Determine range of flow conditions that make fish passage possible/impossible. • BRIDGE - Assess potential impacts to upstream Highway 99 bridge footings and solution (project is in contact with ODOT on this). • ENGINEERING DESIGN - Hydraulic and armoring analysis to determine safety/longevity of notched dam. • ENGINEEERING DESIGN - Model new water surface elevation to determine number of irrigators impacted and cost associated with adjusting intakes/pumps.

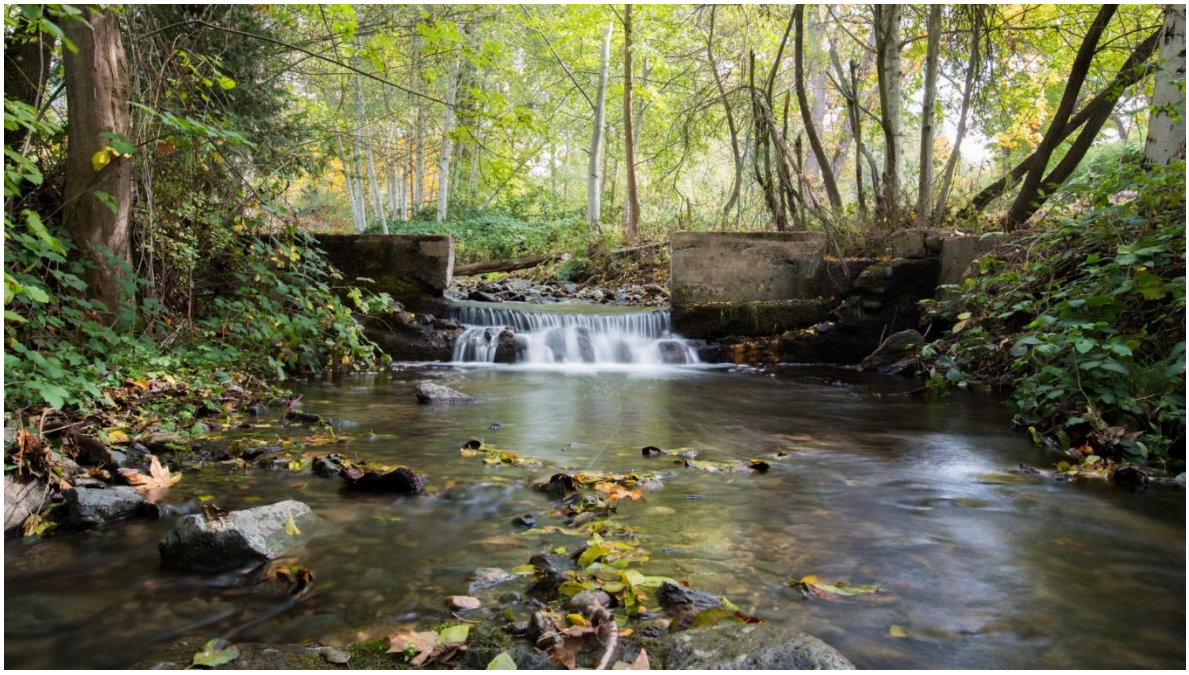


Figure 14. Example of a notched dam.

Figure 15. Conceptual view of Long Tom River at Monroe drop structure following modification

Table 4. Bypass Channel

Leave existing dam. Utilize culverts and lengthen/reconstruct existing side channel to divert flows around the dam in attempt to pass fish around.

Biological Factors	• FISH - May not improve fish passage because difficult to achieve enough "attraction flow" for fish to find the culvert entrances. • SEDIMENT - No change to sediment storage. Sediment would continue to deposit behind the dam. • FLOW - No change in winter flows and height of water. No change to summer flows because water provided by Fern Ridge and side channel has a controlled intake.
Social and Community Factors	• CITY RIVERFRONT – No change to City's river views. • CITY WATER - City's drinking water intake remains the same. City still needs to look for longer term water solutions. • CITY PARK - Potential to increase flushing flows in the existing side channel and decrease the algae and opportunity for mosquitoes. A longer bypass channel conflicts with the walking/jogging paths proposed in recreation plan. (A shorter bypass channel would be too steep/erosive to provide sure fish passage without regular maintenance cost). • IRRIGATION WATER - Irrigation water availability and pump height remain the same. • AG PUMP SCREENS - Ag producers with unscreened pumps will likely be required (by federal gov) to install screens so juvenile salmon aren't sucked into pumps. Producers with screens would upgrade next time they replace. • AG BUFFERS - Regulations on buffers for chemical spraying next to streams could be designated. Not enforced. Spraying enforcement is complaint driven. • BOATING - No improvement for recreational boating. • LIABILITY - No change; ongoing cost/risk for accidental death, drowning.
Cost and Feasibility of Funding	• COST - Construction costs will depend on how much excavation required in the historic channel, potentially expensive like all other solutions. • GRANTS – Not likely since the project will create minimal improvement to fish passage and require maintenance. • LIABILITY - Dam still in place, remaining an ongoing cost/risk for accidental death, drowning liability to City/Corps. • MAINTENANCE - Ongoing maintenance costs to keep culverts free from debris and bypass clear of sediment and brush.
Details to be addressed in next phase	• FEASIBILITY - Many details to consider. This is a complex engineered solution that would require estimating and installing specific gradient for the bypass, culvert sizes and water controls for intake culvert. Determine ongoing maintenance actions to clear debris, keep water flowing in bypass, and fix erosion or other challenges to keep it passable for fish. • CITY RIVERFRONT - Consider location of proposed City footbridge before installing fish bypass.

Figure 14. Existing conditions at Monroe Park. Isolated channel segment.

Figure 15. Sample of constructed channel at Delta Ponds, Willamette River, Eugene, Oregon

Table 5. Ladder

Leave existing dam. Re-build a new fish ladder that meets current fish passage standards

Biological Factors	• FISH - Minimal improvement for fish passage as fish are variable in their ability to use ladders successfully. Juveniles especially have trouble navigating the full length. Hard to create enough "attraction flow" for fish to find ladder entrance over dam turbulence. • SEDIMENT - No change to sediment storage. Sediment would continue to deposit behind the dam. • FLOW - No change to summer flows. Summer river flow provided by releases from Fern Ridge dam. No change in winter flows and height of water.
Social and Community Factors	• CITY RIVERFRONT - No change to City's river views. • CITY WATER - City's drinking water intake remains the same. City still needs to look for longer term water solutions. • CITY PARK – No change. • IRRIGATION WATER - No change to irrigation water availability. • AG PUMP SCREENS - Ag producers with unscreened pumps will likely be required (by federal gov) to install screens so juvenile salmon aren't sucked into pumps. Producers with screens would upgrade next time they replace. • AG BUFFERS - Regulations on buffers for chemical spraying next to streams could be designated. Not enforced. Spraying enforcement is complaint driven. • BOATING - No change to recreational boating. • LIABILITY – No change; ongoing cost/risk for accidental death, drowning.
Cost and Feasibility of Funding	• COST - Expensive. Height of dam and wide variability in flows from summer to winter create complex design requirements. • GRANTS - No grant funding available for this option at this site. • MAINTENANCE - Ongoing maintenance to keep the ladder free of debris. • LIABILITY - Dam still in place, remaining an ongoing cost/risk for accidental death, drowning liability to City/Corps.
Details to be addressed in next phase	• FEASIBILITY - Need clarity about over use of existing ladder and sluiceway and how it can be managed/used. Need clarity on what role the Corps has with it and what rests with private owner.

Figure 16. Sample fish ladder built to more recent NOAA standards

Table 6. Remove Dam

Remove the dam and install boulders & riffles to prevent river from eroding the channel.

Biological Factors	• FISH - Restores full fish passage for salmon, trout, lamprey and all species of fish and all ages (juvenile and adult). • SEDIMENT - Restores sediment distribution. • FLOW – Minimal change in winter flows and height of water (~1' drop). In summer, water would not pond so it would look like downstream conditions look currently. Summer river flow still provided by releases from Fern Ridge dam at ~50cfs minimum.
Social and Community Factors	• CITY RIVERFRONT – Potential for community improvement in river identity and relationship to river; this matches working goals of City's comprehensive and recreation plans. • CITY WATER – Include technical solution so City can adjust drinking water intake because water surface elevation above dam site will lower 7'. Simple option is a stronger pump and longer hose. City working on longer term water sources. • CITY PARK - No change; can improve stagnant water in park by letting channel dry out in summer. • IRRIGATION WATER - Irrigation water availability remains the same. Lower 3 ag pumps to reach new lower water level in summer. • AG PUMP SCREENS - Ag producers with unscreened pumps will likely be required (by federal gov) to install screens so juvenile salmon aren't sucked into pumps. Producers with screens would upgrade next time they replace. • AG BUFFERS - Regulations on buffers for chemical spraying next to streams could be designated. Not enforced. Spraying enforcement is complaint driven. • BOATING - Improvement for recreational boating. • LIABILITY – Solves safety issue of drowning in dam hydraulic.
Cost and Feasibility of Funding	• COST - Expensive, include boulder/riffles as needed to avoid river erosion. • GRANTS – Yes, grant funding available. • MAINTENANCE – Eliminates cost of long-term maintenance. • LIABILITY - Removes liability and associated costs for City/Corps.
Details to be addressed in next phase	• CITY WATER – Design technical solution for City water intake. • BRIDGE - Assess potential impacts to upstream Highway 99 bridge footings and determine fix (project is in contact with ODOT on this). • IRRIGATION - Model new water surface elevation to determine number of irrigators impacted and cost associated with adjusting intakes/pumps. • ENGINEERING DESIGN - Model shear stress, water velocity across range of flow events to assess potential for creating bank instability, and how to mitigate. Boulder installation/design would need to take into account use by watercraft.

Figure 17. Conceptual view of Long Tom River at Monroe following modification/removal of structure, mid-range flows

Figure 18. Conceptual view of Long Tom River at Monroe, looking upstream and south, following modification/removal of structure, mid-range flows

Figure 19. Conceptual view of Long Tom River at Monroe following modification/removal of structure, low summer flows

Feedback on the Alternatives

The project's fourth public meeting, November 29, 2017, included an activity where attendees could place a colored "dot" to demonstrate their **level of support** for each of the four alternatives presented for the Monroe Drop Structure. Meeting attendees were split into 4 groups and rotated between stations where the poster of each alternative (**Tables 3-6**) and relevant visuals (**Figures 14-19**) were presented, along with photos of the current conditions (such as **Figures 9-11**). Before rotating to the next station, participants could then place a dot to indicate:

Green = support this action (if all the caveats can be addressed)

Yellow = could possibly support this action, but still have some questions to be answered

Red = not supportive of this action

This was not "voting" on which alternative to pursue, but an activity to help gauge support for the various alternatives by the community members that participated in the meeting discussions. The results provide a representative snapshot of the community response to the alternatives presented at this time.

Table 7. Community response to Monroe drop structure alternatives at November 29, 2017 public meeting.

	Alternative			
Dot Color	Notch	Bypass	Ladder	Remove
Green	4	9	**19**	**25**
Yellow	19	16	**10**	**4**
Red	16	14	15	15

A Fifth Alternative – "rock ramp"

A fifth alternative was identified when this Plan document was in its final stages, to backfill the dam or modified dam in a way that creates a "rock ramp" or series of riffles or weirs downstream of the dam. This retains some pool upstream while creating a more naturalized way for fish to surmount the dam or a dam of modified height. This can be in place of or in some cases combined with another alternative. This alternative will be further developed, researched, and included in a future phase of solution-finding for fish passage at the Monroe drop structure site.

Figure 20. Example of a rock ramp used to modify a low head dam and create fish passage on the Truckee River near Reno, CA.

Responses to Questions

During the outreach process, the primary areas of question and concern fell in two categories: 1. How would changes at the Monroe Drop Structure impact the City's municipal water supply? 2. How would changes at the drop structure impact agricultural activities, including existing irrigation intakes and chemical applications.

Municipal water supply

The City of Monroe's municipal water supply is provided by the Long Tom River. The City is working to develop an alternate water source due to the high cost of treating river water to drinking water standards, especially during winter months when turbidity is high. However, at this time, the City pumps water from the Long Tom River. If changes were made at the Monroe drop structure that result in the loss of the upstream pool, the City's intake will need to be adjusted and potentially a new pump and intake will need to be constructed. These issues will be further explored during the project's scoping phase in 2018-19. The Watershed Council is committed to working with the City to ensure the drinking water supply is maintained and any changes that are needed as a result of changes at the drop structure will be paid for in part by grants.

Agriculture

During the course of the project's Steering Committee meetings, several questions were raised by agricultural producers in the Long Tom River basin upstream from Monroe over how proposed changes to the Monroe Drop Structure could impact their operations including: existing irrigation pumps and chemical spraying in streamside (riparian) areas. The results from researching these questions is outlined here.

QUESTION: How will fish screens on existing or new pumps be regulated if fish passage is restored to the Long Tom River upstream of the Monroe Drop Structure (that currently blocks salmonids from accessing this habitat)?

The short answer:

- If your diversion/intake is currently screened and meets NOAA 2008 criteria you do not need to do anything, your screen meets current criteria.
- If you apply for a new water right or install a new pump or need to replace a screen, you will need to meet current criteria.
- If you have an unscreened diversion/intake, you will need to install a screen to avoid any potential take under the ESA. However, neither the state (Oregon Department of Fish and Wildlife or Oregon Water Resources Department) or the feds (NOAA Fisheries, Bureau of Reclamation) actively seek out farmers to investigate their screens.
- Enforcement is complaint driven. NOAA and ODFW work with landowners before resorting to enforcement action and that is a last resort.

RESPONSES PROVIDED BY: Marc Liverman, NOAA Fisheries Willamette Branch Chief; Anne Mullan, NOAA Fisheries; Marty Olson, Acting Screens Manager, ODFW Screen Shop; Alex Farrand, ODFW Willamette Fisheries Biologist

The longer answer:

Marc Liverman, NOAA response:

- The Long Tom River is not designated as Critical Habitat for any ESA listed aquatic species.
- The Long Tom River did not historically support a self-sustaining run of spring Chinook.
- The Long Tom River is essential habitat for salmonids protected under the Magnuson Stevens Act.
- There is no agency push to re-examine the critical habitat designation for this basin.

Additional clarification from Anne Mullan, NOAA:

- Fish screens that meet the 2008 NOAA fish screen criteria do not have to be replaced. While there are new criteria, they are not drastically different and mostly apply to special types of screens not often seen for irrigation in this area. The state has similar fish screen criteria, and for some aspects, e.g. mesh size, they are identical.
- The Long Tom is used for rearing; spawning is not known for spring Chinook, but straying into the basin in the future is possible-- as we work toward recovery, and see increased populations, spawners are known to find and use available habitat... as they have in other west side tributaries that were not historically thought to be used for spawning. NOAA is also aware of some differences in timing between irrigation withdrawals and fish **rearing or holding** in tribs they didn't spawn in. Fish are more likely to be affected at low flows, or dropping flows, which can occur during drier years and can overlap with early season irrigation diversions.

Marty Olson, ODFW response:

- As a whole, the state of Oregon would not require new fish screens on existing diversions, even if or when ESA listed species are present in the Long Tom River.
- If a new water right is applied for or if there is a fundamental change in the status of an existing right, ODFW has the opportunity to review the project's OWRD permit, then new screens could be required.
- When existing screens are replaced, they are required to meet current criteria.

Alex Farrand, ODFW response:

- ODFW can only require new screens when a state or federal water permit or application is being reviewed. Existing screens are grandfathered in.
- If fish passage is improved on the mainstem Long Tom River, nothing changes from the ODFW perspective. No new regulations come into effect.
- ODFW has criteria for screens in the Long Tom River tributaries to minimize screen impacts to cutthroat trout. This would not change if passage is improved at the Monroe Drop Structure.
- Karen Hans, ODFW fisheries biologist conducted a pit tag study in the Long Tom River upstream from Monroe. These results should be available from the Watershed council.

QUESTION: How will regulations regarding pesticide application change if fish passage is restored to the Long Tom River upstream of the Monroe Drop Structure (that currently blocks salmonids from accessing this habitat)?

- NOAA does not conduct enforcement on individual farmers. NOAA consults with NRCS and FSA on policy. Changes occur to things like labeling for chemical use and those changes apply nationwide and aren't specific to ESA fish concerns in a particular basin.
- If/when ESA listed species begin to utilize habitat upstream from Monroe Drop Structure, streamside buffers would be in effect for any pesticides that have set-backs (per the label or per the EPA website).
- www.nmfs.noaa.gov/pr/consultation/pesticides.htm
- https://www.epa.gov/endangered-species/salmon-mapper
- http://pmep.cce.cornell.edu/profiles/index.html (helpful website to look up specific pesticides)

Pesticides with restrictions in Oregon, and mapped on the EPA webside include:

- 1,3-dichloropropene
- Bromoxynil
- Carbaryl
- Chlorpyrifos

- Diazinon
- Malathion
- Methomyl
- Metolachlor
- Prometryn

NOAA ESA 10j Alternative

Section 10j is a provision of the Endangered Species Act that designates a population as "experimental" during reintroduction to previously inaccessible habitat. It provides flexibility to NOAA over managing the reintroduced population and allows NOAA to reduce the legal protections required by the ESA, protecting individuals, municipalities and others who may accidentally harm the fish while engaged in otherwise lawful actions. We thought this could potentially be a route to pursue for designation of the Long Tom River's juvenile spring chinook if the Monroe drop structure were removed.

Only three 10j designations are in effect for fisheries on the West Coast: Okanogan River, Washington for spring Chinook; Upper Deschutes River, Oregon for steelhead; and San Joanquin River, California for spring Chinook. More information on these 10j listings can be found here:
http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/esa_10j_designations.html

To find out whether this would be an option for the Long Tom spring Chinook population, we spoke with Scott Carlan, NOAA Fisheries Biologist and 10j coordinator with experience implementing ESA 10j designation for steelhead in the Deschutes Basin. His opinion was that NOAA would ultimately decide against implementing a 10j designation for spring Chinook in the Long Tom watershed. The process is applied where the agency is actively supplementing a population (by adding fish to the system) an action that will not take place in the Long Tom. The 10j designation is a process rarely applied and only in systems with significant political pressure to do so. His opinion was that the spring Chinook accessing the Long Tom River during winter months seeking refugia was not a good application for the 10j given the small number of fish to potentially be impacted and the lack of political push to undertake it.

Goal 3 – Improve Habitat Value During Channel Maintenance

The primary goal is to identify ways to improve the habitat value of the ongoing channel maintenance conducted by the US Army Corps of Engineers. There are multiple challenges in maintaining a constructed channel like the Long Tom River. The watershed council looks for opportunities to collaborate with the Corps to add technical information, facilitate collaborative ideas and solutions and provide recommendations toward the component of the Corps mission that is Environmental Stewardship while being mindful of the Flood Risk Reduction mission component.

This aspect of the project and Plan took a back seat to the other goals because an updated capacity evaluation of the Long Tom River revealed less of an immediate problem than had been previously estimated. However, the watershed council is interested in identifying where there are interested landowners and restoration opportunities that can be incorporated into future management actions.

The modifications of the Long Tom River below Fern Ridge Dam cut off side channels and decreased habitat. It created a straightened and deepened channel to concentrate flows while significantly decreasing the River's capacity to handle flows naturally via multiple winding channels; this altered the natural flooding regime. This also changed the way sediment is recruited, carried and distributed throughout the River and contributed to increased water temperature to the point of causing temperature barriers to fish migration and habitat use. The culverts installed in the banks to control flows into the River and balance water levels to meet the Corps' flood risk reduction mission can restrict fish passage and migration or trap fish as flows change between the River and former side channels affected by culvert installation. These same disconnected areas can become stagnant water with diminished value to humans, fish and wildlife and other benefits. Three low-head dams were also built or modified to create velocity checks along the 23.5 mile course of the River until it's newly created confluence with the Willamette River; all three present some sort of fish passage barrier and temporarily pond water.

The Corps' driver for maintenance is to maintain a channel that moves water downstream and achieves the mission of flood risk reduction. The Long Tom River's channel capacity will continue to diminish over time if nothing is done. Diminished channel capacity can lead to increased flooding in areas the river "chooses" randomly. The Corps would like to conduct future maintenance with community input and support. A rough snapshot of the current maintenance priorities for the Long Tom River is included in **Figure 21**. The areas where maintenance is needed in the nearer term can be paired with restoration opportunities to create a win-win alternative. If that is not possible, maintenance techniques can be applied that cause less harm to fish and wildlife and their habitat.

There are opportunities to enhance environmental stewardship including: lowering water temperatures for fish and wildlife benefit, reducing human-caused erosion, reducing pollution from human inputs, increasing channel capacity to handle winter flows, providing floodplain interaction where feasible, increasing off-channel opportunities for fish and wildlife to escape high flows and overcome pollution barriers, increasing fish passage and access to habitat, reconnecting side channels and oxbows. One example of the detailed information that can be utilized is shown in **Figure 22** which the potential for increased shade is shown per section of river (red is highest potential to increase shade). This potential was modeled by computer in 2007 and showed that a Long Tom River shaded to its full potential would provide an overall decrease of approximately 7 degrees Fahrenheit – enough to make conditions significantly less harmful to trout and other salmonids using the river.

During the project, LTWC worked to gain initial input from the community regarding vegetation management and an understanding of the willingness of landowners to partner with the Corps and/or Watershed council in the future. Toward this end, the Watershed council contacted 15 riverside landowners near future maintenance "hot-spots" and was able to interview 10 to discuss ideas and alternatives. The landowner responses demonstrate strong interest in partnering with the Corps and/or LTWC on bank maintenance. People have varying ideas on what condition they want to maintain their banks to – some favor mown vegetation to the channel edge to preserve their viewshed, while others desire to restore native trees and shrubs. Results from this survey are available in Appendix B part 2. This information will be used to inform the Corps as they prepare to look at improved ways of planning for and conducting maintenance on the channel.

In the near future the watershed council will bring together Technical Team members and utilize LTWC staff expertise to evaluate the Corps ongoing channel maintenance ideas and provide recommendations to maximize watershed enhancement goals.

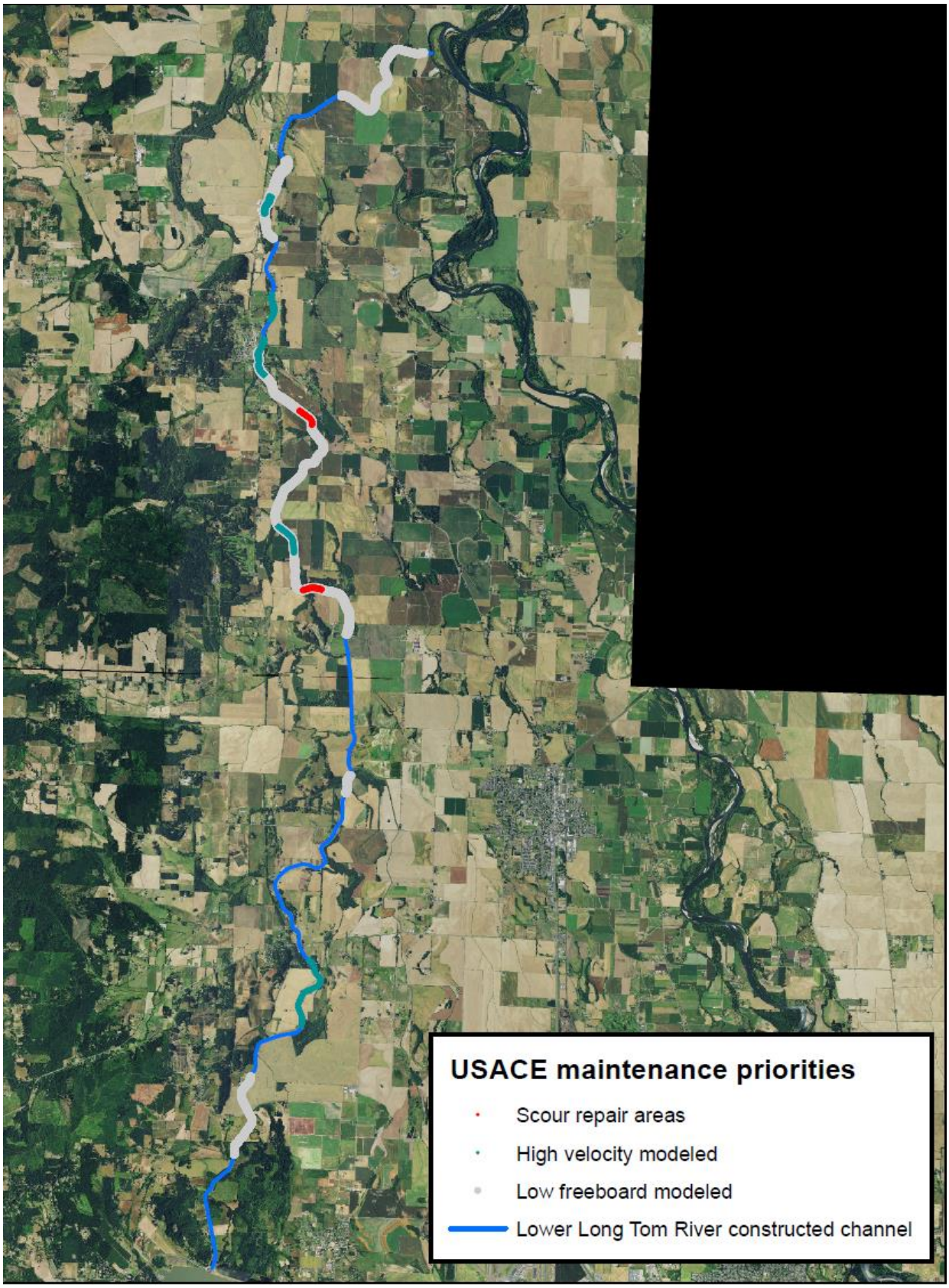


Figure 21. US Army Corps of Engineers priority maintenance areas along Lower Long Tom River

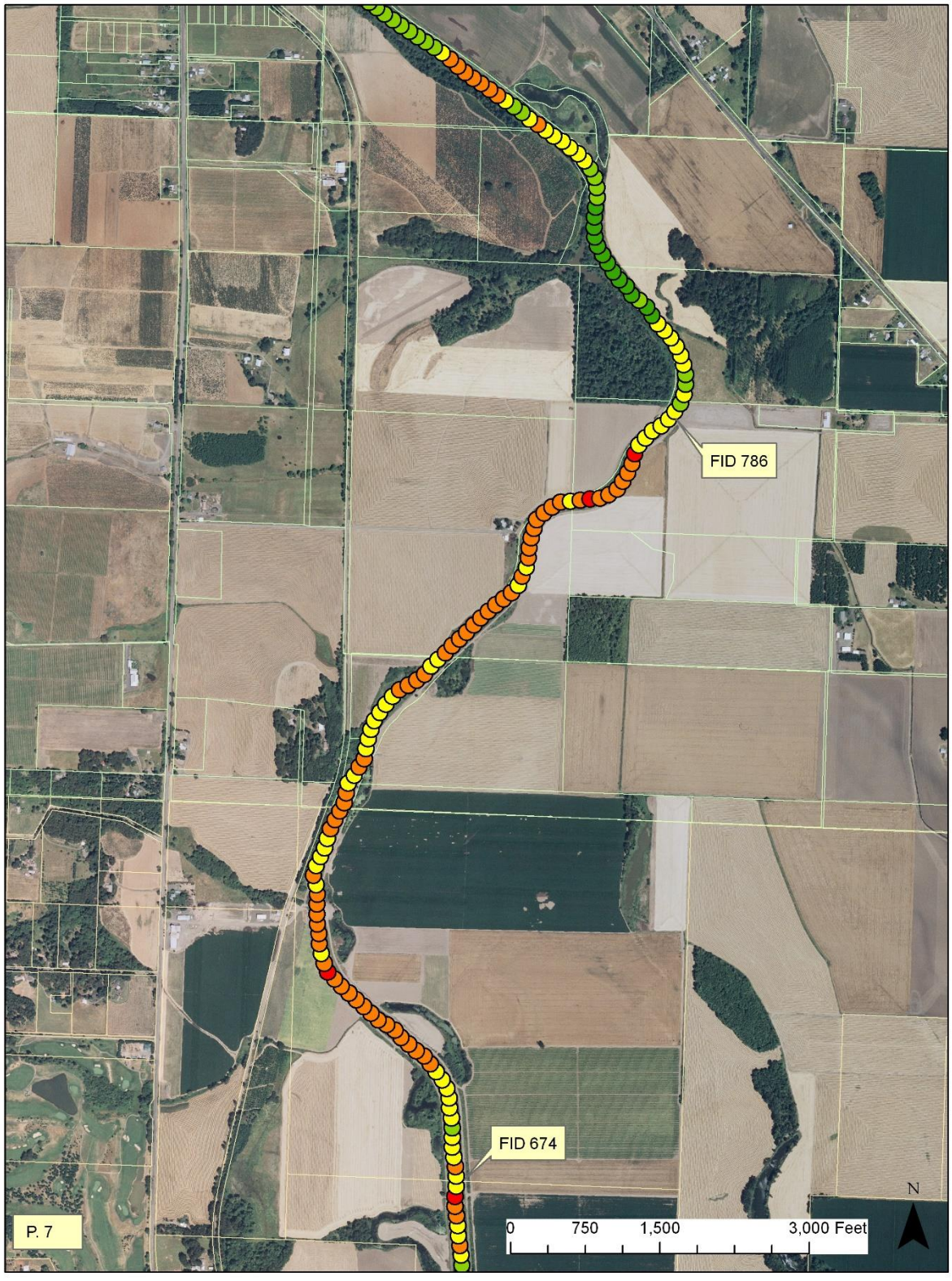


Figure 22. Lower Long Tom River temperature modeling results (2007) with red indicated channel segments with highest potential to improve stream shade and green indicating lowest potential to improve stream shade.

Appendix A - Long Tom River Inundation Mapping Methodology Report

Appendix B – Community Interview Results

Appendix C – On-line Survey Results

Appendix D - USACE Technical Assistance Memo on Monroe drop Structure

On April 28, 2017 the City of Monroe sent a letter to the Portland District of the US Army Corps of Engineers requesting information on the Monroe drop structure through the Technical Assistance Floodplain Management Services program. The City of Monroe specifically requested assistance in determining the flood risk and consequences of a possible failure of the mill race, appurtenant to the Corps-owned Monroe drop structure. The letter requested information on the five following concerns:

1. Unregulated flow <from a mill race failure> could result in downstream flooding as a pool above the Monroe Drop Structure de-waters.
2. The unregulated flow event could increase the risk for serious bank erosion downstream.
3. Changes in permanent water level (backwatering effect) could liberate upstream sediment resulting in significant shoaling that could lead to the river changing course or damage to Corps constructed embankments.
4. Changes in permanent water level upstream could result in the intake for the City of Monroe's water intake being perched.
5. Changes in sediment transport could create water quality concerns for Monroe drinking water and fish and wildlife in the area.

The Corps utilized existing data to create a hydraulic model to help answer these questions and the results of that report are included.