

National Fish and Wildlife Foundation NFWF Project ID: 1201.16.054844 ConocoPhillips SPIRIT of Conservation and Innovation 2016 - Submit Final Programmatic Report (New Metrics) Grantee Organization: Kenai Watershed Forum
Project Title: Crooked Creek Fish Passage Improvement

Project Period 5/01/2017 - 9/01/2019

Project Location Description
(from Proposal)

Project
Summary (from Proposal)

Project Status and
Accomplishments

Site: Crooked Creek, Kenai Peninsula, Alaska at Sterling Highway Mile 110.5; Alaska Department of Fish and Game (ADFG) Anadromous Waters Catalog water body #244-30-10050-2024 / ADFG Barrier ID#20300979.

Latitude: 60.302012 N

Longitude: -151.271451 W

The purpose of this project is to determine the efficacy of a fish passage barrier removal and restoration to be completed by the Alaska Department of Transportation on Crooked Creek, (Kenai Peninsula, Alaska) at a major highway crossing (Sterling Highway, mile 110.5) in 2018. This will be done by quantifying and comparing the amount of juvenile Chinook and Coho salmon (juvenile fish) that migrate along an identified reach of Crooked Creek prior to and after completion of construction activities. The project addresses the presence and/or absence of juvenile fish over three-year observation period during the summer field seasons from 2017 through 2019. Continuous biological monitoring of juvenile fish movement during this time frame will be completed using in-situ antenna and Passive Integrated Transponder (PIT) tag technology.

SCROLL DOWN FOR UPDATE; We are currently in the construction and installation phase of this project. We have had several planning and design meetings with members of the United States Fish and Wildlife Service (USFWS) and the Alaska Department of Fish and Game (ADFG), including a site visit to Crooked Creek on April 12th during which we identified four PIT tag array deployment sites. From these agencies, we acquired field equipment and gear that we will be able to use on loan for the duration of this project. In addition, detailed site designs have been created, as well as PIT tag

array designs which are currently being used for the construction of custom arrays for each deployment site. The installation of all arrays will be completed by the end of May, at which point a member of the USFWS will conduct 1-2 days of training in sampling and tagging procedures.

While we are making great headway, it should be noted that this project has experienced a major, unforeseen setback. As stated in the original grant proposal, this project is being conducted in order to assess the movement of juvenile coho within a stretch of Crooked Creek 1 year before, during, and after a major culvert replacement along the Sterling Highway. However, it has been brought to our attention that the Alaska Department of Transportation (ADOT) has had to postpone this particular culvert replacement until the summer of 2019. As a result, we were not able to begin sampling until this year. We will remain in contact with the ADOT to ensure that we continue to receive current information regarding the timing of this culvert replacement.

UPDATE (4/17/19) As of April 2019, four PIT tag arrays have been installed in the previously determined locations. The installation occurred in 2018, after which we began PIT tagging in fall 2018. USFWS provided PIT tagging instruction and, in total, about 1400 tags were deployed during this tagging session with intent to continue tagging throughout 2019 so as to ensure that about 1400 tags are in the system at all times. Consideration of tag loss through mortality and smolt outmigration has been incorporated into this planning. Bimonthly site visits are conducted to each of the four PIT tag arrays in order to download data, ensure consistent power supply, and conduct site maintenance. The Kenai Watershed Forum is remaining in contact with USFWS and ADFG throughout the data management and analysis processes, as well as tagging.

KWF has also stayed in consistent contact with ADOT and associated individuals in an effort to stay up-to-date on culvert replacement timing, whose replacement date could occur as early as spring 2019.

FINAL UPDATE 9/2/19: The perched, twin culverts around which this project centered have been replaced by a single, large culvert, creating access to several miles of upstream habitat. All four PIT tag arrays remain in the stream, documenting movement of tagged juvenile coho within the system post culvert replacement.

KWF and its partners see great value in this project; KWF has acquired additional funding from an external source and intends to extend this project beyond the limited time frame of this NFWF grant in order to gather further information surrounding the movements of tagged coho post-culvert

replacement. Equipment will be removed from the system in 2020. KWF has been and will continue to work diligently with local USFWS staff to analyze data collected throughout this project.

Knowledge gained through this project about juvenile coho movement as it relates to the culvert replacement has been disseminated to the public via local interviews, public presentations, volunteer education, and social media posts-efforts that KWF will continue in subsequent years. KWF also plans to use simplified lessons learned from this project in educational outdoor lessons for local school

children, in an effort to foster a sense of stewardship within local children.

Lessons Learned Several critical lessons were learned by KWF that will help the organization develop a more fluid system for operation, should the organization continue this type of work in the future. Throughout the project development phase, KWF staff members worked with members of outside agencies to develop a project plan prior to submitting a grant proposal. Due to circumstances beyond the control of KWF, equipment secured by KWF from other agencies prior to proposal submission was no longer available at the time of project initiation. KWF notified NFWF staff of this setback immediately and worked quickly to amend the grant budget accordingly, so as to have sufficient funding to account for this setback. KWF obtained all necessary equipment and was able to work with agency members to install all necessary working parts.

In addition, there was a slight delay in timing of the culvert replacement by ADOT. However, the replacement around which this project focused was not detrimental to the timing of the project, and KWF was able to remain flexible, having sufficient time to tag juvenile coho prior to and after the culvert replacement. While an adjustment to the timeline of a project as large as a highway culvert replacement is not unusual, it is important for other conservation organizations carrying out similar projects to seek grant opportunities such as this that provide ample time to account for project timeframe discrepancies.

KWF works in partnership with USFWS to analyze data collected throughout the duration of the project. Because KWF intends to continue this project into 2020, they will continue this partnership and will include future data collected in the analysis. Through this analysis, KWF staff members are expanding upon their knowledge surrounding the statistical analysis program, R, as well as how to interpret the results of this analysis. For other conservation organizations seeking funding for similar projects, it is advisable that they partner with outside sources on stages of their project that they are less familiar with so as to complete that stage in a cost-effective and efficient manner.

While out in the field, KWF staff members used previous knowledge of thermoelectric generator operation to troubleshoot issues with these devices in order to keep PIT tag antennas operating consistently. Several lessons were learned in de-/reconstructing these devices efficiently negative ten degrees Fahrenheit. KWF remained in partnership with USFWS, whose staff members were periodically consulted for troubleshooting assistance.

In conclusion, this juvenile coho monitoring project provided KWF staff with an opportunity to expand their knowledge in the field and to further solidify partnerships within the community. The opportunity to collaborate with agencies like USFWS, ADFG, and ADOT throughout a single project is rare, but is critical for future work similar to this. While KWF staff learned several lessons throughout this experience, the project itself has opened up future opportunities for the organization to continue to solidify these partnerships and continue work such as this in other streams.

Activities and Outcomes

Funding Strategy: Habitat Restoration

Metric: COP - Riparian restoration - Miles restored

Required: Recommended

Description: Do not include areas counted under the wetland acres restored metric. In the notes section of this metric please indicate what species is benefiting and the dominant habitat type being restored

Starting Value 43.00 Miles restored

Value To Date 43.00 Miles restored

Target value 43.00 Miles restored

Note:

Funding Strategy: Planning, Research, Monitoring

Metric: COP - Tool development for decision-making - # tools/ techniques tested Required:

Recommended

Description: Enter the # of innovative tools, techniques, methods field tested/verified and the purpose of the innovation

Starting Value 1.00 # tools/ techniques tested

Value To Date 1.00 # tools/ techniques tested

Target value 1.00 # tools/ techniques tested

Note:

Funding Strategy: Planning, Research, Monitoring

Metric: COP - Tool development for decision-making - # tools/ techniques implemented Required:
Recommended

Description: Enter the # of innovative tools, techniques, methods implemented

Starting Value 1.00 # tools/ techniques implemented

Value To Date 1.00 # tools/ techniques implemented

Target value 1.00 # tools/ techniques implemented

Note:

The following pages contain the uploaded documents, in the order shown below, as provided by the grantee:

Upload Type File Name Uploaded By Uploaded Date

Final Report Narrative - Standard	FinalReportNarrativeTemplate_KWHarings, Margaret F_201 9.doc	10/11/2019
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Photos - Jpeg Kasilof River Watershed.jpg Harings, Margaret 10/11/2019 Other Documents

NFWF_FinalReport_Photos_2019.docx Harings, Margaret 10/11/2019

The following uploads do not have the same headers and footers as the previous sections of this document in order to preserve the integrity of the actual files uploaded.

Final Programmatic Report Narrative

Instructions: Save this document on your computer and complete the narrative in the format provided. The final narrative should not exceed ten (10) pages; do not delete the text provided below. Once complete, upload this document into the on-line final programmatic report task as instructed.

1. Summary of Accomplishments

In four to five sentences, provide a brief summary of the project's key accomplishments and outcomes that were observed or measured.

The Kenai Watershed Forum (KWF) monitored the movement of juvenile coho salmon (*Oncorhynchus kisutch*) in Crooked Creek on the Kenai Peninsula beginning in 2018. This project occurred before, during and after a twin culvert replacement at the Sterling Highway overpass of Crooked Creek, which successfully opened up 43 miles of upstream spawning and rearing habitat for anadromous and resident species in the creek. Monitoring was conducted using passive integrated technology (PIT) tags and four PIT tag arrays. By installing these arrays at two sites upstream of and two sites downstream of the culvert replacement project, the movement of PIT tagged juvenile coho was successfully monitored within stream sections, as it related to the culvert replacement. While this grant came to completion on September 1, 2019, KWF and its partners have seen great value in this project and through additional funding acquired via outside sources, they will be continuing these monitoring efforts through 2020.

2. Project Activities & Outcomes

Activities

- Describe and quantify (using the approved metrics referenced in your grant agreement) the primary activities conducted during this grant.
 - **Riparian restoration (miles restored)**
 - Through the completion of the culvert replacement that occurred throughout this project, access to 43 miles of upstream spawning and rearing habitat was restored for both juvenile and adult salmon, as well as resident fish within Crooked Creek. Prior to replacement, two twin culverts were in place at the Sterling Highway overpass of Crooked Creek. They had been assessed and surveyed utilizing the Alaska Department of Fish and Game's (ADFG) *Culvert Inventory and Assessment for Fish Passage in the State of Alaska: A Guide to the Procedures and Techniques used to Inventory and Assess Stream Crossings 2009-2014* by ADFG prior years. Following the culvert assessment and survey, these culverts were given a rating of "red", indicating that they served as a fish passage barrier to upstream movement. Over time, water pouring from these perched culverts scoured out a significant pond immediately below the culverts. During the culvert replacement, this pond was filled, the river banks reinforced, and the creek was restored to its original channel. Adult Chinook salmon (*Oncorhynchus tshawytscha*) were observed migrating up through the culvert immediately following the re-watering of the culvert.
 - **Tool development for decision making**
 - This project built upon the knowledge base of PIT tagging techniques, PIT tag array technology, and in-situ implementation. KWF began working closely with members of ADFG and the United States Fish and Wildlife Service (USFWS) to develop field protocol for monitoring the movement of juvenile coho throughout the culvert replacement. The culvert replacement was delayed by the Alaska Department of Transportation (ADOT) and as a result, KWF was permitted a grant amendment to allow for adjustment of the project timeline. KWF worked closely with USFWS to build upon their prior knowledge of PIT tagging technology to strategically identify PIT tag array locations that would allow the dual antenna setup at each site to endure freezing, thawing and flooding cycles for several years. PIT tag antennas were installed in 2018 with support from USFWS and the help of numerous volunteers. Methodology was quickly developed and refined for the remaining three array installations to increase efficiency.
 - PIT tagging events occurred throughout September 2018 and 2019. KWF worked closely with USFWS to develop PIT tagging protocol based on national standards and determined that tagging juvenile coho during the month of September would be the highest catch-per-unit-effort of the targeted fork length (FL) range, 55-100 mm. This targeted FL range was used in an effort to PIT tag young-of-year juvenile coho, therefore capturing all potential life histories of that cohort. Using statistical modeling, it was determined that a subset of juvenile coho (n=1400) would be tagged in September 2018 and 2019 using 9 mm PIT tags. In turn, KWF utilized knowledge gained throughout this process to educate volunteer assistants during PIT tagging events.
 - Finally, KWF developed efficient protocol for bimonthly site visits for each PIT tag array. At each site visit, all field equipment was assessed for functionality, maintenance was performed as needed, and PIT tag detection data were downloaded from each reader.

- A data management tool was developed that allowed KWF to efficiently extract PIT tag data from site downloads. A subsequent tool was developed that allowed KWF to track the type of issue and its corresponding timeframe for each antenna. This tool can also be utilized while performing future data analysis throughout the continuation of this project.
- A pressure transducer was installed by KWF in 2017. Data from this transducer will be downloaded, though due to the modification of project objectives (see "discrepancies" below), this data will not be considered in the analysis.
- Briefly explain discrepancies between the activities conducted during the grant and the activities agreed upon in your grant agreement.
 - During the project development phase, equipment was committed to this project by outside entities. This commitment was made in an effort to reduce the overall cost of supplies for the proposed project. However, after the grant was awarded, it was determined that some of the equipment committed by outside sources was no longer available and/or compatible with other committed equipment due to unavoidable circumstances. KWF worked quickly with National Fish and Wildlife Foundation (NFWF) personnel to amend the grant and the corresponding budget to account for this significant change.
 - An initial objective of this study was to compare stream discharge with juvenile coho movement. Due to budget adjustments as well as outside agency input, this aspect of the project was scaled down. However, KWF sees great value in assessing in-stream flow for the purpose of monitoring the effects of climate change, landscape change, and anthropogenic influence (e.g. culvert replacements) and as a result, the pressure transducer installed in 2017 remains in Crooked Creek today.
 - It is common for organizations to experience changes in personnel due to promotions and hiring. KWF experienced one such change during the duration of this project and, following the inclusion of this change in the amendment, the change in project team lead was conducted seamlessly.

Outcomes

- Describe and quantify progress towards achieving the project outcomes described in your grant agreement. (Quantify using the approved metrics referenced in your grant agreement or by using more relevant metrics not included in the application.)
 - **Riparian restoration (miles restored):** As discussed above, access to 43 miles of upstream habitat was successfully restored for salmon as well as resident fish within Crooked Creek through the culvert replacement at the Sterling Highway overpass. Prior to replacement, two perched twin culverts were in place at this location. Due to their elevation, these perched culverts often prevented resident and anadromous fish species from migrating upstream, subsequently serving as a barrier to access for 43 miles of upstream rearing, spawning and resident habitat. These culverts were replaced with a single 35'-diameter culvert, the single largest project of its kind that the State of Alaska has completed. Immediately following the re-watering of the culvert, adult Chinook salmon were observed migrating up through the culvert.
 - **Tool development for decision making:** Several tools were developed and utilized throughout this project. They included protocol for strategic site selection for antenna deployment, PIT tagging, site visitation, data download, data management. Descriptions of these tools can be found under "Activities". During PIT tagging events, mortality rate of tagged fish remained the same as the mortality of tagged fish. KWF and its partners, including the Kenai Peninsula Fish Habitat Partnership, see great value in the continuation of these monitoring efforts beyond the timeframe of this grant. As a result,

KWF acquired additional funding from an external source in order to continue this project through 2020. KWF will continue to work with USFWS to analyze data in an ongoing effort to monitor the movement of juvenile coho within Crooked Creek post culvert replacement. As stated in the prior “discrepancies”, due to budget adjustments as well as outside agency input, the hydrology aspect of the project was scaled down. However, KWF sees great value in assessing in-stream flow for the purpose of monitoring the effects of climate change, landscape change, and anthropogenic influence (e.g. culvert replacements) and as a result, the pressure transducer installed in 2017 remains in Crooked Creek today.

- Briefly explain discrepancies between what actually happened compared to what was anticipated to happen.
 - Initially, this project involved the PIT tagging of both Chinook and coho salmon. However, after further discussion with USFWS, Chinook were removed from the tagging protocol. Chinook and coho have varying life histories and it was deemed more cost effective to target a single species in an effort to capture the behavior of a single species.
 - It was assumed that any PIT tag detected above the culvert was detected as a result of a tagged juvenile coho migrating upstream through the culvert. Following the initial tagging events in 2018, very few juvenile coho (n=8) were detected above the culvert. While these fish may have migrated up through the culvert on their own, it is important to consider the possibility that the tags reached the PIT tag antennas via other means of travel (e.g. tagged fish were consumed by larger resident species that subsequently swam through upstream antennas).
 - As predicted, there was a significant outmigration of juvenile coho salmon observed at the end of May 2018. While some returned, it is likely that many of these PIT tagged coho outmigrated to the ocean or reared for another year or two in a non-natal stream, as is common on the Kenai Peninsula.
 - KWF purchased PIT tag antennas from a company with a longstanding reputation within the fisheries research community. However, they recently switched antenna designs from a heavy-duty design to a more lightweight design. This resulted in easier installation but lower tag detection rates at one site on Crooked Creek due to a nearby, unavoidable power line. KWF worked with the company to troubleshoot ways to increase tag detection, though it was ultimately determined that little could be done at this particular site. However, KWF frequently assesses PIT tag detection rates with changing stream conditions at this site and is working with USFWS to ensure that this lower tag detection rate is accounted for in data analysis.
- Provide any further information (such as unexpected outcomes) important for understanding project activities and outcome results.
 - The timeline of this project experienced an unpredictable adjustment in 2018, when contractors working with the ADOT had to postpone this particular culvert replacement until the summer of 2019. As a result, PIT tag array installation and tagging began in 2018 in order to capture juvenile coho movement relative to the twin culverts before they were replaced. KWF remained in close contact with ADOT and their contracted engineers to ensure that the culvert replacement would occur within the timeframe of this grant so as to observe juvenile coho movement post-culvert replacement.

3. Lessons Learned

Describe the key lessons learned from this project, such as the least and most effective conservation practices or notable aspects of the project’s methods, monitoring, or results. How could other conservation organizations adapt their projects to build upon some of these key lessons about what worked best and what did not?

Several critical lessons were learned by KWF that will help the organization develop a more fluid system for operation, should the organization continue this type of work in the future. Throughout the project development phase, KWF staff members worked with members of outside agencies to develop a project plan prior to submitting a grant proposal. Due to circumstances beyond the control of KWF, equipment secured by KWF from other agencies prior to proposal submission was no longer available at the time of project initiation. KWF notified NFWF staff of this setback immediately and worked quickly to amend the grant budget accordingly, so as to have sufficient funding to account for this setback. KWF obtained all necessary equipment and was able to work with agency members to install all necessary working parts.

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4. Dissemination

Briefly identify any dissemination of lessons learned or other project results to external audiences, such as the public or other conservation organizations.

Lessons learned and project results were disseminated through media outlets, presentations, and social media platforms. Public interviews with local news and public radio hosts were utilized to provide a general project description and report on results obtained up to the date of interview. These remain publicly available online. KWF was also invited to present to a local nonprofit organization and interested parties from the general public. This successful presentation afforded KWF an opportunity to interact with attendees and educate them about the importance of fish passage barrier remediation. This nonprofit has requested a follow-up presentation that would include final project results. To compliment these interviews and presentations, social media accounts were used to engage the public by sharing photos and short project narratives.

Between these public engagement opportunities, KWF also recruited volunteers to assist with antennas installation, site visits, maintenance checks, data management, fish trapping and PIT tagging events. During these outings, KWF staff educated volunteers about the importance of adequate fish passage while also educating them about PIT tagging, anadromous and resident fish identification, data collection, general fieldwork safety, and troubleshooting equipment issues while in the field. In total, KWF staff had the privilege of working with and educating 24 local volunteers throughout the duration of this project.

5. Project Documents

Include in your final programmatic report, via the Uploads section of this task, the following:

- 2-10 representative photos from the project. Photos need to have a minimum resolution of 300 dpi and must be accompanied with a legend or caption describing the file name and content of the photos;
- report publications, GIS data, brochures, videos, outreach tools, press releases, media coverage; a. A public radio interview conducted in December 2018 can be found here: <https://www.kdll.org/post/clearing-under-road-juvenile-fish#stream/0>
- any project deliverables per the terms of your grant agreement.

POSTING OF FINAL REPORT: *This report and attached project documents may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event that the Recipient intends to claim that its final report or project documents contains material that does not have to be posted on such websites because it is protected from disclosure by statutory or regulatory provisions, the Recipient shall clearly mark all such potentially protected materials as “PROTECTED” and provide an explanation and complete citation to the statutory or regulatory source for such protection.*

Figure 1. The uppermost PIT tag array on Crooked Creek on a cold winter day. Winter 2018-2019. Figure

2. A trained volunteer assists with a site visit to download fish passage data. 2018-2019.

Figure 3. PIT tag antenna installation. Fall 2018.

Figure 4. KWF interns assessing PIT tag detection rate for an antenna during a site visit. In the background, the twin culvert replacement occurs. Spring 2019.

Figure 5. Perched culverts along Sterling Highway prior to replacement. Winter 2018-2019. Figure 6. New

culvert installed along Sterling Highway (3.5 stories in diameter). Summer 2019.

Figure 7. PIT tagging juvenile coho with volunteers on a fall day in 2018.