2007Project Sponsors ISRP Response Report

Date: [4-30-2009]

Project Number	2007-007-00
Proposer	CTWSRO
Project Title & Brief Description	Determine Status and Limiting Factors of Pacific Lamprey in Fifteenmile Creek and Hood River subbasins, Oregon
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ISRP Review History:

Original Narrative submission date: 10/31/2008
http://www.nwcouncil.org/fw/projectselection/accord/200700700.pdf
[Link changed by Council staff on 10/19/09 prior to posting on the web; previous link was to a password-protected section of PISCES. Same document available at both links.]

Date ISRP Review comments were received: *[Insert date and paste link to comments]*

ISRP Review results: *[Check appropriate box]*
Meets scientific criteria.

X Meets scientific criteria (qualified).

☐ Response requested - meets scientific criteria (qualified).

☐ Response requested – does not meet scientific criteria.

Response to ISRP Summary: [P*lease check appropriate box and respond below in: Response to ISRP Comments]*

☐ The narrative will be revised and resubmitted by (insert target date).

X A response to ISRP comments are provided in this document below.

[*Your response should include 1) areas of agreement with ISRP comments, i.e. additional information, and/or any changes in the project scope of work and, 2) areas of disagreement, i.e. state why you believe there is sufficient data or sound science to proceed, and/or provide additional information which supports your perspective].*

Response to ISRP Comments:

Sections B-D:

ISRP Comment: *"The title of the project should reflect that nearly half of the project's effort would be in the Hood River"*

To more accurately reflect the scope of work, we will change the title to include Hood River Basin: Determine Status and Limiting Factors of Pacific Lamprey in Fifteenmile Creek and Hood River subbasins, Oregon.

ISRP Comment: "*The technical background would also be improved with a summary of Pacific lamprey life history and habitat requirements…*"**and** "*The extended freshwater residence suggests that Pacific lamprey are especially vulnerable to a variety of disturbances during the larval stage, but apart from the mention of a known loss of lamprey related to an episode of chemical spill induced mortality, the contaminant problem is not mentioned*."

Pacific lamprey life history summary from Kostow 2002, Whydowski and Whitney 2003.

Larvae/Ammocoete

Larval lamprey live in freshwater from 4 to 7 years. Ammocoetes are filter feeders (on algae, mostly diatoms) that bury themselves in fine silt and mud substrates in low velocity (<0.3m/s) margins of streams and backwaters. Water temperatures of rearing habitat range from 11ºC to 17.8ºC but ammocoetes have been found in water as warm as 25ºC. They move gradually downstream, primarily at night, seeking courser sand/silt substrates and deeper water as they grow. Due to the extended freshwater residence of lamprey and the tendency for contaminants to accumulate in sediment, ammocoetes may be particularly vulnerable to persistent organic pollutants (polycyclic aromatic hydrocarbons, polychlorinated byphenyls, dichlorodiphenyltrichlorethanes, and other organocholorine pesticides) or accidental chemical spills (oxyfluorfen) in the aquatic environment.

Juvenile/Macropthalmia

Larvae begin metamorphosis into the adult phase by developing eyes, an oral disc and supra-oral lamina (teeth). In the Columbia River Pacific lamprey complete metamorphosis from ammocoetes to juveniles in October or November . Some macropthalmia migrate immediately to the sea during the fall of transformation and others migrate the following spring. Young adults migrate at night by drifting downstream with stream current during periods of high flow rather than actively swimming. Once in the Pacific Ocean, transformed lamprey are parasitic on various species of fish from 20 to 40 months. Young adults have been found as far as 100km offshore and typically are found at mid-water depths (70-250m).

Adult

Adult Pacific lamprey begin to migrate to freshwater between March and October. They overwinter in deep pools and spawn the following spring. Pacific Lamprey do not feed after entering fresh water and persist through the winter until spawning by using lipid reserves. Adult lamprey spawn in low gradient stream reaches, in gravel, at the tailouts of pools and riffles. Lamprey eggs are deposited in redds by spawning adults. Velocities over nests generally range from 0.5 – 1.0 m/s and water depths range between 30 cm and 4 m. Once spawning begins, a female deposits all her eggs in about 12 hours. It is believed that that all lamprey die soon after spawning but some individuals may be iteroparous.

Eggs

In Oregon, Pacific lamprey produce between 98,000 and 238,400 eggs. Eggs are about 1mm diameter and hatch in two to three weeks depending on water temperature. Upon hatching early larvae spend another week to a month in the redd. They eventually emerge from the natal redd at night and move downstream to areas with fine silt deposits and a mild current where they burrow into the silt. At this age they are about 1cm long. Successful spawning grounds appear to be those located in riffle/gravel areas close to pools or other silt deposits so that the initial movement into burrows by the tiny larvae is successful.

ISRP Comment: *"It would also have been helpful to have summarized at least some data on lamprey escapement trends (see http://www.fpc.org/lamprey/lamprey_home.html) elsewhere in the Columbia Basin to provide scope and justification for the study*." **And** "*Another strong justification for this project is the opportunity to learn if Pacific lamprey will become re-established upstream in the Hood River after removal of Powerdale Dam*."

Data suggests that Pacific lamprey have declined in abundance through much of their range since the 1950's (Close 1995). Historic data from mainstem dam counts indicate that the most precipitous declines appear to be in the upper Columbia and Snake basins. Lamprey counts over Bonneville Dam, the only mainstem dam that lamprey pass before entering Fifteenmile and Hood River Basins, also show a declining trend in abundance. Data from lamprey counts is available from 1939 through 1969 and from 1997 through 2008 (http://www.fpc.org/adultsalmon/adultqueries/Adult_Annual_Totals_Query_Results.asp). The average escapement over Bonneville Dam from 1939 through 1969 was 103,690 (26,203 to 379,509) and from 1997 through 2008, average escapement was 43,451 (14,562 to 117,029). Abundance estimates at Shears Falls in the Deschutes River has been useful to determine population status and compare trends with that of Bonneville Dam lamprey escapement. These estimates may also be used to link fluctuations in escapement with environmental variables. Lamprey abundance has never been estimated at Fifteenmile Creek. But, similar to Shears Falls on the Deschutes River, Seufert Falls on Fifteenmile Creek provides an opportunity for collecting adult lamprey during spawning season for a mark-recapture abundance estimate.

This study will also provide the opportunity to learn if Pacific lamprey colonize habitat upstream of Powerdale Dam in Hood River after removal. Powerdale dam is scheduled to be removed from Hood River in 2010. This will allow lamprey access habitat not available since 1923. Lamprey spawning and rearing distribution can be recorded post-dam removal to track colonization patterns.

ISRP Comment: "*The closely related Project # 200201600 "Evaluate the Status of Pacific Lamprey in the Deschutes Basin" is briefly mentioned, and the proposal indicates that survey methods developed for that project will be modified for use in this study. Results from that project (which was initiated in 2002) should be included because this proposal is so closely patterned after the Deschutes lamprey project. Relationships to other locally related FWP projects are also briefly described, and some collaboration/coordination activities are mentione*d."

Larval lamprey sampling and associated habitat

In a related project, Evaluate the Status of Pacific Lamprey in the Deschutes Basin (# 200201600), methods in which this proposal are fashioned after, provided valuable information

on Pacific lamprey outmigration timing, distribution and habitat association in tributaries of the Deschutes River on tribal lands, as well as estimates on adult escapement upstream of Sherars Falls on the Deschutes River. Survey methods that will be used in the proposed study in common with the Deschutes Basin study include electrofishing to determine distribution of ammocoetes, habitat association, and escapement estimates.

Pacific lamprey ammocoete distribution surveys will be conducted in Fifteenmile Creek and Hood River. Surveys will begin near the mouth or nearest possible access point and work upstream until ammocoetes are no longer present. All suitable ammocoete habitats will be sampled using an AbP-2 Wisconsin electrofishing unit specifically designed for ammocoete capture (O'Neal 1987). The electrofisher unit will be set to deliver a constant 125 V at a rate of 3 pulse/s with a pulse train of 3:1 (Pajo and Weise 1994). Captured lampreys will be anesthetized with MS-222, measured to the nearest millimeter, and weighed to the nearest hundredth gram. *Lampetra* species will be identified using caudal pigmentation (Richards et al. 1982). Fish will be released at the sampling location after recovery from anesthesia. Data collected from these surveys will be compared with results from previous years' surveys to determine 1) if and how upper ammocoete distribution has changed, and 2) if and how length and age structure have changed in areas of interest. If there is evidence of shrinking distribution or failed larval recruitment.

Sampling locations for ammocoete habitat associations will be randomly selected within the known ammocoete distribution. A hierarchical, random, stratified sampling design will be implemented, similar to a study conducted by Torgersen and Close (2000) in the John Day River. The methodology consists of three tiers:

Tier I -- Reach: Perennial streams will be divided into 10 Rkm reaches from mouth to the upstream extent of perennial flow or impassible barriers. Reaches will be identified using 1:75,000 quadrant maps digitized in Arc View\. Within each reach, one 60 m long sample locale will be randomly selected. A Global Positioning System (GPS) point will be recorded for each reach.

Tier II -- Transect: Six perpendicular transects will be spaced at 10 m intervals within each survey reach (tier I).

Tier III -- Sub-sample: Two, one meter squared sub-samples will be randomly located along each transect (tier II). When wetted channel width was less than 3 m, sub-samples were located successively upstream with approximately 1 m between sub-samples.

An AbP-2 backpack electrofisher will be used to capture ammocoetes within each sub-sample using the same setting described above. Captured ammocoetes will be anesthetized with MS-222 and measured for total length and weight. After recovering from anesthesia, ammocoete will be released to their original collection site. Other species encountered during electrofishing were enumerated and recorded.

Habitat and water chemistry data will be collected at each tier including: bankfull channel width, channel slope, channel unit type (riffle, pool, etc.), conductivity, dissolved oxygen, mean depth of fine substrate, mean water depth, presence of depositional area, presence of wood, velocity, water temperature and wetted channel width. Associations with ammocoete presence and physical habitat characteristics will be analyzed using multiple logistic regression. Results will

be related to ammocoetes distribution and stream habitat characteristics within the range of habitats available in Fifteenmile and Hood River Basins.

Adult escapement estimates
A systematic approach was developed to collect adult Pacific lamprey using a long-handled dip net at Sherars Falls fish ladder in the lower Deschutes River. A similar method o r method adapted to Seufert Falls on Fifteenmile Creek will be developed. Each fish ladder pool was dipped twice per hour, 4 - 8 hours per night. Dipping occurred in the same location during each sampling event. Sampling occurred 5 randomly selected nights per week from July – mid September. Captured adult Pacific lamprey were fitted with a floy tag, fin clipped, weighed, and total length measured**.** Sequentially numbered floy tags were anchored approximately 0.5 cm inferior to the posterior of the dorsal fin. Each lamprey received a secondary mark which consisted of a fin clip at the posterior end of the dorsal fin. Once marked, lamprey were transported approximately 2 Rkm downstream and released. Subsequently captured lamprey were inspected for tag presence and fin clip. Recaptures were recorded and released upstream of the fish ladder. A primary tag retention rate was calculated based on tag presence or tag wound and fin clip. Adult Pacific lamprey abundance was estimated using Chapman's modification of the Petersen estimate (Seber 1982).

In conjunction with marking and recapturing adult lamprey at Sherars Falls, a single access site creel survey was conducted to estimate tribal harvest of adult Pacific lamprey. This method will be used at Seufert Falls. Interviews were conducted five randomly selected nights per week from July – mid September. Creel surveys occurred from 9 pm until tribal fisherman completed collection or 3 am, whichever occurred first. Samplers examined all harvested lamprey for marks and recorded total lengths. Numbers of marked (non-expanded numbers) and unmarked lamprey were recorded on datasheets. Creel numbers were expanded to estimate total harvest and 95% confidence intervals generated.

ISRP Comment: "*Limiting factors downstream from the Fifteenmile and Hood River basins, notably upstream passage of adults over the mainstem Columbia River dams (see ISAB 2008-5), also need attention in any management plan to restore lamprey*."

CTWSRO recognizes that passage through main stem Columbia River dams may be a limiting factor for Pacific lamprey. The intent of this proposal is to gather information on Pacific lamprey population status in Fifteenmile and Hood River and to identify factors that limit lamprey production within those basins. Our intention is not to address larger Columbia Basin limiting factors. We will interpret our results in the context of the broader spatial scale and include discussion from recent and forthcoming studies on lamprey passage at main stem dams.

Section F:

ISRP Comment: "*A rationale for PIT-tagging 100 lamprey adults in Fifteenmile Creek (page 10) was not presented. The ISRP concluded this was too few PIT-tagged individuals for meaningful results and the sponsors are strongly encouraged to re examine the statistical basis for this target. Communication with scientists working with PIT tagged salmon would be helpful in this regard*."

In a mark-recapture experiment, precision of estimation associated with any given sample size depends on the size of the population from which it is drawn. To ensure an adequate level of

accuracy the population size must be known to predict how many fish should be tagged. Since we do not have any knowledge of the size of the lamprey population in Fifteenmile Creek we will tag as many as possible. Since this project is slated to continue through the duration of the Accords, we felt a **minimum** of 100 PIT tags per year would allow us to characterize use of Fifteenmile Creek by adult lamprey. We will adapt methods as needed to produce the most accurate population estimate possible.

ISRP Comment: *"It was not clear from the project description how lamprey redds…would be distinguished from the redds of other fishes during the spring, especially redds not occupied by actively spawning adults. What is the probability that a redd could be misclassified, and what steps will be taken to correct for misclassification?*

All staff working on this project will be trained in lamprey redd identification and shown the difference in other local species of nest-building fishes. Lamprey redds are very distinct and do not resemble redds of other fishes spawning at that time. . Steelhead typically spawn in water temperatures between 3.9_C and 9.4_C (Bjornn and Reiser 1991) whereas Pacific lamprey do not begin spawning until the water temperatures are higher (for example, 10ºC to 17ºC in Cedar Creek, Stone 2006). While they may spawn at different times due to water temperature, steelhead redds may remain visible when lamprey build nests. Streamnet.org reports that in Fifteenmile Creek. Pacific lamprey nests are smaller than steelhead nests ($0.1m^2$ and ~5 m^2, respectively, Stone 2006 and, Bjornn and Reiser1991) and likely remain visible for a shorter duration. In addition, lamprey will carry smaller rocks to the edge of the nest in their oral disks creating a different pattern than salmonid redds (Kostow 2002).

ISRP Comment: *"With respect to Objective 5 – Describe redd characteristics and habitat in stream reaches in Fifteenmile and Hood River subbasins – the primary goal seems to be to identify preferred spawning locations within the two drainages, assuming that redd density will be highest where preferred spawning habitat is most plentiful. As currently written, the project description assumes equal access to all available areas. That could be incorrect if there is a partial barrier to adult migration such as a culvert or some natural barrier that hinders adult access. The goal of establishing adult distribution is definitely worthwhile, but it will be difficult to characterize preferred spawning reaches in the subbasins if there are partial migration blocks.*"

One of the project goals is to document lamprey spawning areas in Fifteenmile Creek and Hood River. We make no claim on identifying preferred spawning areas although we may analyze spawning areas in relation to spatial or environmental characteristics measured at the sites. If our data lends itself to such analyses we will certainly consider partial migration barriers.

ISRP Comment*: "...determining larval lamprey distribution …the project description does not state what time of year (or how often per year) the juvenile lamprey surveys would take place. This could be quite important if any seasonal redistribution of ammocoetes occurs over time. Also, the project description does not mention if river lampreys or western brook lampreys are present in these subbasins, and if so how ammocoetes of each species will be identified. Despite these questions, however, the sampling methods for juveniles appear to be grounded in experience with this species."*

Documenting ammocoete distribution in Fifteenmile Creek and Hood River will begin in late spring when water temperatures begin to rise above 8ºC. In past electrofishing surveys in Deschutes River tributaries ammocoete catch appeared to increase with increasing temperatures

(above 10ºC) in late spring (A. Garcia, fisheries technician, CTWSRO, pers. comm.). After establishing initial upper limit of distribution in the spring, the survey near the upper limit will be resurveyed in summer and fall to describe potential seasonal differences. It is presumed that any ammocoetes encountered in Fifteenmile Creeks and Hood River will be Pacific lamprey (*Lampetra tridentata*) but it is possible that river (*L. ayresi*) and western brook (*L. richardsoni*) lamprey are also present judging from distribution described in Whydowsk and Whitney (2003). Lamprey taxonomy in the field is difficult because identification is based on adult characteristics (tooth patterns and life history traits). Size of adults may be used to establish whether other species may exist; adult *L. tridentata* reach lengths of 76.2 cm, *L. ayresi* are between 20 and 30 cm, and *L. richardsoni* are less than 18cm (Whydowski and Whitney 2003). However, some species, such as the river lamprey are rarely seen in freshwater even if they are abundant (Kostow 2002). It may be possible to differentiate between larval *L. tridentata* and L. *ayresi*/ *L. richardsoni.* Docker et al. (1999) found that *L. ayres and L. richardsoni* (subgenus *Lampetra*) were indistinguishable from mDNA analyses but that *L. tridentata* (subgenus *Entosphenus*) could be resolved from the others. While it may be possible to collect tissue samples for genetic analyses we would rather collect basic information (such as adult lengths to indicate multiple species) before committing to expend resources on genetic analyses. Since this is a long-term project, we reserve the option of making the decision to verify species composition based on genetic analyses after initial data are collected.

ISRP Comment: "*The Hood River part of the proposal should establish more explicitly a before and after design to evaluate changes in the abundance and distribution of lamprey after the Powerdale Dam removal. If the status and habitat use of Pacific lamprey is determined in the 7 km below the dam prior to removal in 2010, then future distribution and habitat use after removal could show whether or not significant changes occurred*."

In fall 2009, surveys will occur downstream of Powerdale Dam (rkm 7.2) in order to establish if there are Pacific lamprey currently present in the portion of Hood River where anadromy is continuous. If there is an opportunity to collect more data on lamprey presence and distribution downstream of Powerdale Dam before its removal spring or summer of 2010, we will record additional data. After the dam is removed will continue efforts to document lamprey spawning and rearing habitat in Hood River and compare it with pre-dam removal data.

M&E (section G, and F)

ISRP Comment: "*The limiting factor analysis is based on general stream habitat survey data, which will not be able to detect the presence of agricultural or other pollutants that could cause significant mortality (ref. the oxyfluorfen spill and extensive lamprey mortality noted on page 3 of the project description). It would be prudent to add a monitoring component that could detect the presence of persistent organic pollutants in these two subbasins*. **And** *The sponsors should consider the contaminant component (see above) which could trump many other relationships*"

The collection of water quality monitoring specifically related to organic pollutants is outside the scope of this project. We will however work with Oregon Water Resources and the watershed councils in both basins on this issue. The collection of this sort of data would also be politically sensitive and could restrict our ability to collect pertinent and needed Pacific lamprey life history information.

ISRP Comment: "*Tissue analysis of juvenile lamprey for harmful chemicals would be important, especially since the ammocoetes have an extended freshwater residence. Brain cholinesterase activity should be evaluated to assess effects of some of the modern pesticides, with stomach contents analyzed for a series of pesticides used in the area. The timing of the collections for analyses would depend upon the spray seasons in the area. Ideally, this type of contaminant evaluation should have a comparative aspect to it, i.e., compare multiple locations or river systems (issue may be broader than Fifteenmile subbasin).*"

This is beyond the scope of the proposed project but sounds like a potential graduate project for one of Dr. Schreck's students at Oregon State University, Department of Fish and Wildlife.

ISRP Comment: "*It would also help to add a check of irrigation screens for dead lamprey, as screen-related mortality has been documented in other areas.*"

As part of the project objectives, screens within both basins will be identified and problematic screens identified. We will work with the watershed councils and Oregon Water resources to address concerns regarding problematic screens and checking them for dead juvenile lamprey.

ISRP Comment: *"…the project description does not mention if river lampreys or western brook lampreys are present in these subbasins, and if so how ammocoetes of each species will be identified."*

The lamprey species composition of Fifteenmile and the Hood River Subbasins is unknown. Field staff will be trained to identify lamprey at all life stages. Identification of lamprey in the ammocoete stage is difficult, however; lamprey will be identified based on Richards et al (1982).

Citation

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Stone, J. 2006. Observations on nest characteristics, spawning habitat, and spawning behavior of Pacific and western brook lamprey in a Washington stream. Northwest Naturalist 87(3):225-232.

Wydowski, R. S., and R. L. Whitney. 2003. Inland Fishes of Washington, second edition. University of Washington Press, Seattle.