INTERAGENCY AGREEMENT
DEPARTMENT OF NATURAL RESOURCES (DNR)

NO. *93-096801*

This Agreement is made and entered into between the Washington State Department of Natural Resources, hereinafter referred to as DNR, and The Evergreen State College, hereinafter referred to as ESC.

DNR and ESC enter into this agreement under Chapter 39.34, Interlocal Cooperation Act.

The Evergreen State College
2700 Evergreen Parkway NW
Olympia, WA 98505

Phone: (360)867-6000
Email: francisk@evergreen.edu

IT IS MUTUALLY AGREED THAT:

1.0 Purpose. The purpose of this agreement is to provide funds for an ESC environmental studies graduate student to assist in the scientific field and laboratory research projects of DNR's Aquatic Assessment and Monitoring Team (AAMT). The projects support DNR's strategic priorities to strengthen the health and resilience of our lands and waters, collaborate and engage the public, and protect and enhance the vitality of Puget Sound specifically around leasing and management of State Owned Aquatic Lands (SOAL). This Agreement is for work and deliverables to be completed from July 1, 2017 through June 30, 2019.

2.0 Scope of Work. The ESC shall furnish the necessary personnel, equipment, material and/or services and otherwise do all things necessary for or incidental to performing work set forth in the Attachment A – Scope of Work.

3.0 Period of Performance. The period of performance of this Agreement shall begin on January 1, 2018 and end on June 30, 2019, unless terminated sooner as provided herein.

4.0 Payment. Pay for the work provided is established under RCW 39.34.130. The parties estimate that the cost of accomplishing the work will not exceed forty eight thousand, and fifteen dollars $48,015. Payment for satisfactory performance of work shall not exceed this amount unless the parties mutually agree to a higher amount before beginning any work that could cause the maximum payment to be exceeded. Pay for services shall be based on the rates and terms described in Attachment B – Budget. Tuition dollars itemized in this budget will be applied to tuition costs for student Jessica Olmstead beginning winter quarter, 2018 and continue for each quarter included within the biennium ending June 30, 2019. This will require retroactive billing for the winter 2018 quarter from the time agreement is signed and executed.

5.0 Billing Procedures. The ESC shall submit invoices to DNR monthly. Payment for approved goods and/or services will be made by check, warrant or account transfer within 30 days of receipt of the invoice. Upon expiration of the Agreement, invoices shall be paid, if received within 30 days after the expiration date. However, invoices for all work done within a fiscal year must be submitted within 30 days after the end of the fiscal year.

Each invoice submitted to DNR shall include information needed by DNR to determine the exact nature of all expenditures and completed work. At a minimum, each invoice shall specify the following:

- Agreement number.
- Rate of contracted service or deliverable
- The total number of hours worked for each employee
- Tuition rate per quarter and total January 2018-June 2019
- The total amount of overhead costs
- Any other relevant information
- The total invoice charge.

6.0 Records Maintenance. ESC shall maintain books, records, documents and other evidence, to sufficiently document all direct and indirect costs incurred by ESC in providing the services. These records shall be available for inspection, review, or audit by personnel of the ESC, other personnel authorized by the DNR, the Office of the State Auditor, and federal officials as authorized by law. ESC shall keep all books, records, documents, and other material relevant to this Agreement for six years after agreement expiration. The Office of the State Auditor, federal auditors, and any persons authorized by the parties shall have full access to and the right to examine any of these materials during this period.

Records and other documents in any medium furnished by one party to this agreement to the other party, will remain the property of the furnishing party, unless otherwise agreed. The receiving party will not disclose this material to any third parties without first notifying the furnishing party and giving it a reasonable opportunity to respond. Each party will use reasonable security procedures and protections to assure that records and documents provided by the other party are not erroneously disclosed to third parties.

7.0 Rights to Data. Unless otherwise agreed, data originating from this Agreement shall be 'works for hire' as defined by as defined by Title 17 U.S.C., Section 101 and shall be owned equally by the ESC and DNR). Data shall include, but not be limited to, reports, documents, pamphlets, advertisements, books, magazines, surveys, studies, computer programs, films, tapes, and/or sound reproductions. Ownership includes the right to use, copyright, patent, register and the ability to transfer these rights.

8.0 Independent Capacity. The employees or agents of each party who are engaged in performing this Agreement shall continue to be employees or agents of that party and shall not be considered for any purpose to be employees or agents of the other party.

9.0 Amendments. This Agreement may be amended by mutual agreement of the parties. Amendments shall be in writing and signed by personnel authorized to bind each of the parties.

10.0 Termination for Convenience. Either party may terminate this Agreement upon 30 calendar days' prior written notice to the other party. If this Agreement is terminated, the parties shall be liable only for performance rendered or costs incurred in accordance with the terms of this Agreement prior to the effective date of termination.

11.0 Termination for Cause. If for any cause either party does not fulfill in a timely and proper manner its obligations under this Agreement, or if either party violates any of the terms and conditions, the aggrieved party will give the other party written notice of the failure or violation. The aggrieved party will give the other party 15 working days to correct the violation or failure. If the failure or violation is not corrected within 15 days, the aggrieved party may immediately terminate this Agreement by notifying the other party in writing.

12.0 Disputes. If a dispute arises, each party will make a good faith effort to resolve issues at the lowest possible level in their respective agencies. If they cannot resolve an issue, they will elevate the issue within their respective chains of command to resolve it.

In the event that a dispute arises under this Agreement, it shall be determined by a Dispute Board in the following manner: Each party to this Agreement shall appoint one member to the Dispute Board. The members so appointed shall jointly appoint an additional member to the Dispute Board. The Dispute Board shall evaluate the facts, Agreement terms, applicable statutes and rules, and make a determination of the dispute. The determination of the Dispute Board shall be final and binding on both parties. The cost of resolution will be borne as allocated by the Dispute Board. Alternatively, the parties may pursue a third party dispute resolution as the parties mutually agree to in writing.

13.0 Governance. This contract is entered into the authority granted by the laws of the State of Washington and any applicable federal laws. The provisions of this agreement shall be construed to conform to those laws.

If there is an inconsistency in the terms of this Agreement, or between its terms and any applicable statute or rule, the inconsistency shall be resolved by giving precedence in the following order:

(1) Applicable state and federal statutes and rules;
(2) Scope of Work; and
(3) Any other provisions of the agreement, including materials incorporated by reference.

14.0 Assignment. The work to be provided under this Agreement and any claim arising from this Agreement cannot be assigned or delegated in whole or in part by either party, without the express prior written consent of the other party. Neither party shall unreasonably withhold consent.

15.0 Waiver. A party that fails to exercise its rights under this agreement is not precluded from subsequently exercising its rights. A party's rights may only be waived through a written amendment to this agreement.

16.0 Severability. The provisions of this agreement are severable. If any provision of this Agreement or any provision of any document incorporated by reference should be held invalid, the other provisions of this Agreement without the invalid provision remain valid.

17.0 Insurances.

(1) Self Insurance Liability Program *(Between two state agencies except University of Washington)*

DNR and Contractor are part of the State of Washington and protected by the State's self-insurance liability program as provided by Chapter 4.92.130. DNR and Contractor have entered into an agreement to provide the services herein. This agreement will terminate on the date listed in the period of performance.

Each party to this agreement will be assigned, and assume responsibility for any damages to third parties that are attributable to the negligent acts or omissions of the individual party. The DNR and Contractor agree, to the extent permitted by law, to defend, protect, save and hold harmless the other party, its officers, agents, and employees from any and all claims, costs, damages, and expenses suffered due to each party's own actions or those of its agents or employees in the performance of this agreement.

18.0 Complete Agreement in Writing. This Agreement contains all the terms and conditions agreed upon by the parties. No other understanding, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind any of the parties.

19.0 Contract Management. The Project Coordinator for each of the parties shall be the contact person for this agreement. All communications and billings will be sent to the project coordinator.

20.0 Project Coordinators.

(1) The Project Coordinator for the Agency is Kevin Francis, Telephone Number: (360)867-6000, email address: francisk@evergreen.edu

(2) The Project Manager for DNR is Cinde Donoghue. Telephone Number (360) 902-1718

By signature below, the Agencies certify that the individuals listed in this document, as representatives of the Agencies, are authorized to act in their respective areas for matters related to this instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement.

CONTRACTOR	**STATE OF WASHINGTON DEPARTMENT OF NATURAL RESOURCES**
3.14.18	3/8/18
Signature / Date	Signature / Date
Brant Eddy	MICHAL RECHNER
Name	Name
Purchasing & Contracts Manager	ACTING DIVISION MANAGER
Title	Title
2700 Evergreen Pkwy NW, Olympia WA 98506	1111 WASHINGTON ST SE OLYMPIA WA 98504
Address	Address
360-867-6358	(360) 902-1075
Telephone	Telephone

SCOPE OF WORK

Identifying presence of buried Pacific lamprey ammocoetes in river-bedlands using eDNA sediment analysis

Introduction

The purpose of this agreement is to provide funding to the Evergreen State College for supporting an environmental science graduate student to assist in research regarding management of habitats and resources on State Owned Aquatic Lands (SOAL). This Agreement is for work and deliverables focused on delineating and characterizing Pacific lamprey larvae habitat in bed-lands of selected WA river bed(s). It is to be completed under the guidance of scientists in the Aquatic Assessment and Monitoring Team (AAMT) from July 1, 2017 through June 30, 2019.

The AAMT consists of a team of scientists attempting to answer some essential questions regarding natural resource management of aquatic lands in WA. Research AAMT is involved in provides scientific review of proposed projects, scientific support for other Aquatics Division programs, and monitoring for adaptive management research. Applications to lease aquatic lands for authorized uses require an environmental review process to determine whether the proposed location and project design minimizes environmental impacts. The Aquatics Reserves program receives assistance from AAMT in developing criteria for selecting new areas or expanding existing marine or freshwater reserves, for evaluating best sites to protect and restore as refugia from effects of climate change. Long term monitoring of leased lands is conducted to evaluate effectiveness of habitat stewardship measures and inform adaptive management decisions.

A resource management issue AAMT has recently become involved in concerns the potential for impacts to Pacific lamprey (*Entosphernus tridentatus*) and their habitat from existing and proposed uses on riverine bedlands.

Background

Pacific lamprey are, like salmonid species, anadromous. They spend one to three years of their adult lives in marine waters, then swim up rivers and streams to spawn in gravelly bottomed streams similar to salmon (February through July). After hatching the lamprey larvae, called ammocoetes, are reared in freshwater. They drift downstream into low velocity flows then burrow into sandy substrate where they remain anywhere from two to seven years, filter feeding on algae and slowly growing. Risk of exposure to sediment disturbance and water contamination is high during this period of their lifecycle. When the ammocoetes begin to metamorphose, they spend several months (usually between July- November) in the in the early juvenile (macropthalmia) phase developing eyes, a toothed- sucker mouth, and breathing holes before migrating to the ocean. In marine waters, they are parasitic, attaching to other fish and marine mammals with their sucker mouths, feeding on blood and body fluids. Pacific lamprey were

once quite abundant in Washington rivers, however, their numbers have decline precipitously since the 1980s. Studies have indicated dams and other fish passage barriers contributed to the decline in lamprey numbers. Fish ladders and other modifications designed for salmonid passage do not accommodate the lamprey. Increased volumes of water withdrawals for agriculture and residential use, along with stream channelization have changed hydrology, sediment transport and deposition patterns. These alterations change the river substrate characteristics- potentially resulting in loss of suitable habitat for spawning and rearing, ultimately reducing lamprey survival

These fish are culturally a very important species to tribal people of the Pacific Northwest, particularly tribes of the Columbia River Basin including the Yakama, Kalispell, Umatilla, Cowlitz, Nez Perce, Warm Springs and Colville tribes. The native people prize these fish, consuming the rich meat, and extracting the fat for medicinal purposes. They tribes have been strongly advocating for the protection and restoration of Pacific lamprey, and have been actively implementing restoration efforts. They rescue lamprey whose passage upriver has been blocked by dams or dewatering, then transport and release them upstream above the barriers. In 2003, the Pacific lamprey was petitioned for listing under the Endangered Species Act. The petition was denied because of insufficient information on the distribution and age structure of the population (USFWS, 2003). Since then, other federal and state entities in the Pacific Northwest have been partnering to design and implement studies to characterize lamprey habitat and their population dynamics at all life stages. A Pacific Lamprey Restoration Plan for the Columbia River Basin was developed by the Columbia River Treaty Tribes (CRITFC 2011) with a primary goal to inform and prioritize restoration efforts by coordinated research and monitoring efforts.

Common to all the research objectives identified is a need to obtain information on the current distribution and abundance of lamprey and the status of their current and historic habitat. For DNR Aquatics, the benthic habitat conditions and distribution of ammocoetes is particularly relevant. Because ammocoetes are relatively poor swimmers, they are presumed to burrow into sediment not too far downstream of where they spawn. Potential ammocoete presence can be deduced from combining information on known spawning areas, location of passable obstacles and substrate data. Electrofishing has been the most widely accepted method used to verify ammocoete presence in shallow, wadeable waters. Pulses of low and higher frequency waves are applied to "coax' the larvae out of their burrows, then to immobilize them once they're in the water for capture and measuring (Dunham et al., 2013). In deeper water, a water-suction dredge method has shown promise as a more efficient method of capturing a representative sample of ammocoetes (Taverny et al., 2012). Although recent studies indicate that these methods have low mortality rates, non-invasive sampling methods have been investigated using environmental DNA (eDNA) to detect ammocoetes in river systems.

Environmental DNA is the genetic material shed from organisms into their surrounding environment. eDNA from fish is sloughed from skin, across mucous membranes, waste, and reproductive excretions into water. Water samples can be collected and the DNA can be analyzed to determine which species have recently been in the area, or analyzed for specific target species (McKelvey, et al., 2016). Identifying presence of benthic organisms through sediment sampling, rinsing, and filtering followed by eDNA analysis of the filtrate has been demonstrated (Thomsen & Willerslev, 2015; Bhadury et al., 2006; Chariton et al., 2010).

Goals

To design and implement field sampling methods to test and validate the laboratory findings of using eDNA analysis of sediment to identify presence of the pacific lamprey *Entosphernus tridentatus*.

Quantitative polymerase chain reaction (qPCR) will be used to identify DNA in environmental samples taken in the field and also to determine if the abundance of lamprey larvae can be quantified for a defined area. This research will address data gaps for species recovery efforts. It is currently unknown if eDNA and qPCR are reliable methods to determine distribution and abundance of Pacific lamprey larvae in field collected river sediment samples.

Objectives and Deliverables

Objective 1 Identify probable ammocoete habitat

Tasks 1

- Consider known required lamprey larvae habitat characteristics, such as substrate type, sediment grain size, water flow rates, and bottom depths with known spawn areas and fish passage obstructions using available GIS data to identify and map potential sample locations.
- Conduct site visits to ground-truth site, collect and document habitat characteristics and prioritize potential sites according to known required lamprey habitat characteristics.
- Interview resource managers familiar with potential sites and others knowledgeable about historical use of area to refine site selection.

Deliverables 1

- Create a GIS data layer with potential habitat locations.
- Produce annotated map indicating sites that are priority sites following ground-truthing.
- Include information from interviews in attribute data for sites selected.

Objective 2 Develop sample methods and plan sampling design

Tasks 2

- Determine number of locations to sample.
- Determine the number of samples collected from location
- Evaluate statistical power of sampling design and identify statistical models intending to apply for data analysis.

- Adapt the sampling protocol to collect samples for eDNA analysis from laboratory conditions to field conditions (e.g. distance or elevation apart samples are collected, equipment needed to ensure non-contamination).
- Develop protocol for efficient seining to separate lamprey larvae from sediment
- Design field data collection form.
- Propose scheduling of sample dates. Sampling will be timed to occur outside of the expected lamprey and salmonid spawning season to avoid any disruption of the spawning activity. This will also minimize the potential for eDNA from adult fish to be included in the sampling effort to detect larvae
- Determine the additional environmental parameters to be measured (e.g. stream flow, depth, turbidity, temperature)

Deliverables 2

- Produce a document that contains narrative describing sampling protocol, map indicating sampling sites and schematic of sampling design.
- Create field collection forms including all sample parameters as mobile web app or printed on rite-in-rain paper.
- Generate a calendar with proposed sample dates and back-up dates

3) *Objective 3 Analyze and interpret results*

Tasks 3

- Compare findings from eDNA analysis and ammocoete counts from seining sampling at distance locations within each site and samples between site.
- Apply proposed statistical models to evaluate accuracy of eDNA sediment analysis to predict ammocoete presence along a distance gradient in the field.
- Compare findings of eDNA and ammocoete counts to habitat characteristic prioritization.
- Apply proposed statistical models to evaluate relationship between habitat characteristics and ammocoete density.

Deliverables 3

- Create tables, charts and plots to convey detection of ammocoete densities at river reach sites and along distance gradients.
- Report and interpret statistical findings.
- Produce maps and make spatially explicit data available.
- Discuss results, data interpretation, resource management implications, recommendations and potential next steps in research and experimentation.

References

Carim KJ, Dysthe JC, Young MK, McKelvey KS, & Schwartz, MK (2017) A Noninvasive tool to assess the distribution of Pacific Lamprey (*Entosphenus tridentatus*) in the Columbia River Basin *PLoS One* 12(1):e0169334. doi:10.1371/journal.pone.0169334

CRITFC (2011) *Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin*, Columbia River Inter-Tribal Fish Commission December 19, 2011 283 pps

Dunham J, Chelgren ND, Heck MP, & Clark, SM (2013). Comparison of Electrofishing Techniques to Detect Larval Lampreys in Wadeable Streams in the Pacific Northwest. *North American Journal of Fisheries Management*, *33*(6):1149-1155, doi:10.1080/02755947.2013.826758

McKelvey KS, Young MK, Knotek WL, Carim KJ, Wilcox TM, Padgett-Stewart, TM & Schartz MK (2016). Sampling large geographic areas for rare species using environmental DNA: a study of bull trout Salvelinus confluentus occupancy in western Montana. *Journal of Fish Biology*, *88*(3):1215-1222

Taverny C, Lassalle, G, Ortusi I, Roqueplo C, Lepage M, & Lambert P (2012) From shallow to deep waters: habitats used by larval lampreys (genus *Petromyzon* and *Lampetra*) over a western European basin *Ecology of Freshwater Fish 21*: 87-99, doi:10.1111/j.1600-0633.2011.00526.x

USFWS (2003). Endangered and threatened wildlife and plants; 90-day finding on a petition to list three species of lampreys as threatened or endangered. Federal Register 69: 771582004.

ATTACHMENT B

BUDGET

	hourly rate	hours during academic session	hours during non-academic session	academic weeks	off academic weeks	wages during academic session	wages during non-academic session	cost
	13.5	20	20	44	12	$11,880	$3,240	$15,120
L&I	0.2407							$3,639
FICA	.0765							$248
overhead	0.11							$21,319
tuition								23,200
								$48,519