SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior
National Park Service
Olympic

Study#: OLYM-00462
Permit#: OLYM-2019-SCI-0057
Start Date: Aug 19, 2019
Expiration Date: Dec 31, 2019
Coop Agreement#:
Optional Park Code:

Name of principal investigator:
Name: Ms Emilia Omerberg **Phone:**4156091215 **Email:**emilia.v.omerberg@evergreen.edu

Name of institution represented:
The Evergreen State College

Additional investigators or key field assistants:

Study Title:
Assessment of Mercury Contamination in Zooplankton of Three Washington Lakes.

Purpose of study:
Due to the heavy impact on human health and other top predators, many researchers focus on the bioaccumulation of mercury in aquatic systems. Bioaccumulation is the phenomenon by which persistent contaminants accumulate within individuals and within food webs (McIntyre & Beauchamp, 2007). Some detail the many ways to test for mercury bioaccumulation at different levels of the trophic system, including examining feathers of birds (Solonen et al. 1990), adult mosquitoes (Hammerschmidt et al. 2005), varying fish tissues (McIntyre and Beauchamp 2006), and whole bodies of zooplankton (Pickhardt et al. 2002, Long et al. 2018) for mercury concentration.

Consuming fish is a direct pathway for mercury poisoning in humans. Consequently, examining mercury levels in fish is an important facet of bioaccumulation (Pickhardt et al. 2002). However, catching and testing large quantities of fish can be difficult, requiring a lot of resources and person power. Because of this, testing other parts of the ecosystem that can act as indicators of the levels of mercury in organisms in higher trophic positions may be a more efficient option (Mittelbach et al. 1995). Pickhardt et al. (2002) describe Daphnia as playing a fundamental role in the bioaccumulation of mercury and suggest Daphnia can be used as an indicator for mercury load up the system.

The theoretical system of bioaccumulation beginning with Daphnia can be described as follows. Daphnia are at the bottom of the trophic system and are consumed by organisms above them (Pickhardt et al. 2002, Mittelbach et al.1995, Eagles-Smith et al. 2008, and McIntyre and Beauchamp 2006). As plankton-eating fish consume Daphnia, they acquire and accumulate the mercury load of the Daphnia. As pisciverous fish then consume the planktivorous fish, this transfer and accumulation of mercury continues up the trophic ladder. It continues on with apex predators such as birds of prey and humans (McIntyre and Beauchamp 2006 and Solonen et al. 1990).

Pickhardt et al. (2002) found that increased algal blooms decreased the amount of mercury that accumulates up the trophic system. Others found similar results (Chen et al. 2005 and Chen et al. 2012). Researchers also found that increased algae concentrations spread out the mercury load within the system. When the zooplankton consumed the algae, they consumed a reduced load of mercury and this pattern is continued up the trophic system.

This fundamental study conducted by Pickhardt et al. (2002) showed how to measure mercury in Daphnia; however, it did not address the seasonal variation that has been observed in mercury contaminant load of fish (for example, in Farkas et al. 2003, and Ward et al. 1999). Studies of mercury contamination in fish have pointed to seasonality as a factor that changes mercury load (Farkas et al. 2003 and Niimi 1983). Interestingly, in these studies, the effect of seasonality on mercury contamination in fish is best explained by the condition factor of the fish (Fulton's condition factor,

$K=(100\times w)/(l\times 3)$ where w and l are the recorded as net weight and total length of a fish, respectively (Farkas et al. 2003)). It was suggested that increased levels in the spring correlated with increased feeding rates and, therefore, increased condition factor of the fish. It is unclear if the seasonal variation of mercury load in fish is increased food consumption, or if the food itself has increased mercury load. It has also been suggested that fall spikes in methylmercury availability after lake turnover increases mercury load in prey and up the trophic ladder (Slotton et al. 1995).

The purpose of this study is to asses the mercury concentration in zooplankton in lakes over a seasonal change and thermal the destratification of the three lakes.

Subject/Discipline:
Ecology (Aquatic, Marine, Terrestrial)
Water Quality

Locations authorized:

Samples were collected from the public boat launch located next to the ranger station on Lake Ozette.

Transportation method to research site(s):
I used a car to get to the ranger station then proceeded to collected samples from a kayak.

Collection of the following specimens or materials, quantities, and any limitations on collecting:
Permittee may examine mercury contamination in zooplankton in Lake Ozette in Olympic National Park. Permittee may collect temperature profiles, zooplankton tows and phytoplankton tows from Lake Ozette for analysis.

Name of repository for specimens or sample materials if applicable:

Repository type: Will be destroyed through analysis or discarded after analysis
Objects collected:
300 ml of concentrated zooplankton
10 ml of zooplankton stored in Ethanol
300 ml of concentrated phytoplankton
1500 ml of water for chlorophyll a analysis

NPS General Conditions for Scientific Research and Collecting Permit (available at the RPRS HELP page) apply to this permit. The following specific conditions or restrictions, and any attached conditions, also apply to this permit:

Permittee must follow all rules and regulations of Olympic National Park. Researchers should practice "Leave No Trace" when camping or traveling in the wilderness.

Permittee must provide accurate location of this activity as soon as possible (and no later than end of the field season). Use of GPS coordinates (preferably UTM using NAD 83) is preferred.

Permittees are required to make contact with area rangers in the locations of their studies and to coordinate their activities with the rangers. Rangers must be notified of researcher's vehicles and consult as to where vehicles can be parked. Rangers must be briefed on the researcher's activities, particularly those involving collections.

This permit authorizes activity on National Park Service lands but does not apply to and does not authorize any activity on private lands within the park boundary. Such private holdings occur in the Ozette Lake, Lake Crescent, Quinault, Elwha, Oil City, Lake Dawn and other regions of the park. Researchers are ultimately responsible for recognizing when they are, or potentially will be, on private lands. Park staff are available to help identify private lands. Trespass onto private lands without permission of the property owner is prohibited. Please respect private land boundaries.

All foods or other odorous substances must be stored in a manner safe from bears or other wildlife. The use of bear-proof containers is strongly recommended and may be borrowed (with prior arrangement) from the Wilderness Information Center (360-565-3100). Use of bear-proof containers is mandatory along the coastal strip and in the Seven Lakes Basin.

Wilderness use permits are required for backcountry camping in the park. Permits may be reserved online beginning March 15 each year at http://www.nps.gov/olym/planyourvisit/wilderness-reservations.htm or call the Wilderness Information Center (360-565-3100). Reservations are especially critical for "Quota Areas" where limits are placed on overnight use. Quota areas include: Ozette Coast Area; Royal Basin; Flapjack Lakes; Lake Constance; Grand Valley; Badger Valley; Seven Lakes Basin/ High Divide Area; Mink Lake; Hoh Lake; and CB Flats. Fees for wilderness permits are waived for researchers.

Front-country camping along roads is not allowed in the park except in established National Park Service campgrounds. Front country camping is available on a first-come, first-served basis, but fees for established campgrounds are not waived.

Recommended by park staff(name and title):

Matthew Dubeau, Research Coordinator

Reviewed by Collections Manager:

Yes X No ____

Approved by park official:

Janet G Coles

Date Approved:

12/20/2019

Title:

Chief of Resources Management

I Agree To All Conditions And Restrictions Of this Permit As Specified
(Not valid unless signed and dated by the principal investigator)

(Principal investigator's signature)

12/26/19
(Date)

THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

GENERAL CONDITIONS
For
SCIENTIFIC RESEARCH AND COLLECTING PERMIT

United States Department of the Interior
National Park Service

1. **Authority** - The permittee is granted privileges covered under this permit subject to the supervision of the superintendent or a designee, and shall comply with all applicable laws and regulations of the National Park System area and other federal and state laws. A National Park Service (NPS) representative may accompany the permittee in the field to ensure compliance with regulations.

2. **Responsibility** - The permittee is responsible for ensuring that all persons working on the project adhere to permit conditions and applicable NPS regulations.

3. **False information** - The permittee is prohibited from giving false information that is used to issue this permit. To do so will be considered a breach of conditions and be grounds for revocation of this permit and other applicable penalties.

4. **Assignment** - This permit may not be transferred or assigned. Additional investigators and field assistants are to be coordinated by the person(s) named in the permit and should carry a copy of the permit while they are working in the park. The principal investigator shall notify the park's Research and Collecting Permit Office when there are desired changes in the approved study protocols or methods, changes in the affiliation or status of the principal investigator, or modification of the name of any project member.

5. **Revocation** - This permit may be terminated for breach of any condition. The permittee may consult with the appropriate NPS Regional Science Advisor to clarify issues resulting in a revoked permit and the potential for reinstatement by the park superintendent or a designee.

6. **Collection of specimens (including materials)** - No specimens (including materials) may be collected unless authorized on the Scientific Research and Collecting permit.

The general conditions for specimen collections are:

- Collection of archeological materials without a valid Federal Archeology Permit is prohibited.

- Collection of federally listed threatened or endangered species without a valid U.S. Fish and Wildlife Service endangered species permit is prohibited.

- Collection methods shall not attract undue attention or cause unapproved damage, depletion, or disturbance to the environment and other park resources, such as historic sites.

- New specimens must be reported to the NPS annually or more frequently if required by the park issuing the permit.Minimum information for annual reporting includes specimen classification, number of specimens collected, location collected, specimen status(e.g., herbarium sheet, preserved in alcohol / formalin, tanned and mounted, dried and boxed, etc.), and current location.

- Collected specimens that are not consumed in analysis or discarded after scientific analysis remain federal property.The NPS reserves the right to designate the repositories of all specimens removed from the park and to approve or restrict reassignment of specimens from one repository to another. Because specimens are Federal property, they shall not be destroyed or discarded without prior NPS authorization.
- Each specimen (or groups of specimens labeled as a group) that is retained permanently must bear NPS labels and must be accessioned and cataloged in the NPS National Catalog.Unless exempted by additional park - specific stipulations, the permittee will complete the labels and catalog records and will provide accession information.It is the permittee's responsibility to contact the park for cataloging instructions and specimen labels as well as instructions on repository designation for the specimens.

- Collected specimens may be used for scientific or educational purposes only, and shall be dedicated to public benefit and be accessible to the public in accordance with NPS policies and procedures.

- Any specimens collected under this permit, any components of any specimens (including but not limited to natural organisms, enzymes or other bioactive molecules, genetic materials, or seeds), and research results derived from collected specimens are to be used for

scientific or educational purposes only, and may not be used for commercial or other revenue - generating purposes unless the permittee has entered into a Cooperative Research And Development Agreement(CRADA) or other approved benefit - sharing agreement with the NPS.The sale of collected research specimens or other unauthorized transfers to third parties is prohibited.Furthermore, if the permittee sells or otherwise transfers collected specimens, any components thereof, or any products or research results developed from such specimens or their components without a CRADA or other approved benefit-sharing agreement with NPS, permittee will pay the NPS a royalty rate of twenty percent(20 %) of gross revenue from such sales or other revenues. In addition to such royalty, the NPS may seek other damages to which the NPS may be entitled including but not limited to injunctive relief against the permittee.

7. **Reports** - - The permittee is required to submit an Investigator's Annual Report and copies of final reports, publications, and other materials resulting from the study. Instructions for how and when to submit an annual report will be provided by NPS staff.Park research coordinators will analyze study proposals to determine whether copies of field notes, databases, maps, photos, and / or other materials may also be requested.The permittee is responsible for the content of reports and data provided to the National Park Service

8. **Confidentiality** - - The permittee agrees to keep the specific location of sensitive park resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

9. **Methods of travel** - Travel within the park is restricted to only those methods that are available to the general public unless otherwise specified in additional stipulations associated with this permit.

10. **Other permits** - The permittee must obtain all other required permit(s) to conduct the specified project.

11. **Insurance** - If liability insurance is required by the NPS for this project, then documentation must be provided that it has been obtained and is current in all respects before this permit is considered valid.

12. **Mechanized equipment** - No use of mechanized equipment in designated, proposed, or potential wilderness areas is allowed unless authorized by the superintendent or a designee in additional specific conditions associated with this permit.

13. **NPS participation** - The permittee should not anticipate assistance from the NPS unless specific arrangements are made and documented in either an additional stipulation attached to this permit or in other separate written agreements.

14. **Permanent markers and field equipment** - The permittee is required to remove all markers or equipment from the field after the completion of the study or prior to the expiration date of this permit. The superintendent or a designee may modify this requirement through additional park specific conditions that may be attached to this permit. Additional conditions regarding the positioning and identification of markers and field equipment may be issued by staff at individual parks.

15. **Access to park and restricted areas** - Approval for any activity is contingent on the park being open and staffed for required operations. No entry into restricted areas is allowed unless authorized in additional park specific stipulations attached to this permit.

16. **Notification** - The permittee is required to contact the park's Research and Collecting Permit Office (or other offices if indicated in the stipulations associated with this permit) prior to initiating any fieldwork authorized by this permit.Ideally this contact should occur at least one week prior to the initial visit to the park.

17. **Expiration date** - Permits expire on the date listed. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s).

18. **Other stipulations** - This permit includes by reference all stipulations listed in the application materials or in additional attachments to this permit provided by the superintendent or a designee. Breach of any of the terms of this permit will be grounds for revocation of this

permit and denial of future permits.