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Couer d'Alane Tribe Water Resources

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COLLEGE OF THE ENVIRONMENT

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MAKE WAVES.

Internship Title: Coeur d'Alene Tribe Water Resources

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STUDENT SIGNATURE Jeremy Hays

DATE: 8/19/22

Internship and Learning Objectives

During my Internship with the Coeur d'Alene (CDA) Tribe (The Tribe Lake Management Department. I planned to learn about the extent, impact, and the effectiveness of treatments for aquatic invasive plants. I have primarily worked with the Coeur d'Alene Tribe's Water Resources Specialist, Ben Scofield, executing aquatic plant surveys on the Southern end of Coeur d'Alene Lake and several connected lakes and rivers. These surveys are performed twice a summer, before and after a harvester removes submerged vegetation, at the same sites to determine overall species composition and the distribution of Eurasian watermilfoil (*Myriophyllum spicatum*) and its hybrid, as well as the effectiveness of the harvest treatments. When I refer to milfoil throughout this report, I am referring to Eurasian watermilfoil and its hybridized forms. During my time with the Water Resources Department, I also learned the lake faces other ecological challenges.

Introduction

Coeur d'Alene Lake is a large dynamic system with a number of unique elements. On top of containing some aquatic invasive weeds, the lake faces rising nutrient levels from agriculture/forestry/land development and heavy metal contamination from historic mining and smelting activity in the Silver Valley on the Coeur d'Alene River. Various land use around the lake has increased the nutrient load reaching the lake. Algal blooms in Coeur d'Alene Lake haven't reached harmful levels yet, but many in The Tribe's Water Resources Department feel it's only a matter of time.

My work with the Tribe's Water Resources Department has mostly consisted of sampling vegetation sites on the pretreatment surveys. The sampling included point-intercept surveys of plants as well as a sonar survey to determine the plant biovolume. These sites are mechanically harvested to remove milfoil and other plants from several high use areas. Control sites were also sampled before and after the treatments to observe the natural changes in plant communities over the same period. At this point in the season the post treatment sampling has just begun so there isn't much definitive information on this season's treatment effectiveness.

Coeur d'Alene Lake Conditions

Water Level and Bathymetry

Coeur d'Alene Lake is a long lake, running south to north for about 25 mi and varying from about half mile at some choke points to 5 miles in some bays. The main tributaries are the St Joe River flowing into the lake at its South end and the Coeur d'Alene River flowing into the middle of the lake from the east. The Spokane River is the outlet of Coeur d'Alene Lake at the north end of the lake flowing out to the west. The narrow nature of the lake and position of the main inlets and outlet cause water to move through the lake fairly efficiently. The water has a very low residency time for a lake of its size. The Spokane River has been dammed 9 miles from the lake since 1902 to generate electricity for the surrounding areas. The dam controls the

water levels mainly in the summer. During the summer months the water is kept above its natural levels. The lake is then naturally drawn down in the fall and through winter.

The Southern end of the lake is the shallower and increases in depth moving north. It reaches its deepest point towards the Northern quarter of the lake at a narrow choke point off of Driftwood Point and remains deep in its northern arm.

Lake Management Plan

The Coeur d'Alene Tribe owns the southern third of Coeur d'Alene Lake. In 2009 the Idaho Department of Environmental Quality (DEQ) developed a joint lake management plan with the CDA Tribe. Certain limits were set for various water quality factors and nutrient loads. The CDA Tribe left this Lake management plan in favor of their own in 2018 due to disagreements over the response that should be taken when limits were exceeded. While the Tribe wanted to take proactive action to reduce nutrient inputs into the lake, Idaho DEQ advocated more monitoring of the situation and setting new levels at which to reassess.

Tributaries

Coeur d'Alene River

The Coeur d'Alene River flows into the lake at around its north to south midpoint. The Coeur d'Alene River flows through Kellogg ID, where there was historic mining and smelting of silver, lead, and zinc. The waste from much of the mining and smelting process was put directly into the river resulting in high levels of contamination from a number of heavy metals. The main metals of concern are lead, cadmium, zinc, and arsenic, though other metals released can be toxic at highly elevated levels. Over time the metals have made their way downstream into, Coeur d'Alene Lake and a series of lakes adjacent to the river. These smaller lakes, generally referred to as lateral or chain lakes, are especially contaminated to varying degrees.

St Joe River

The St Joe River flows into the southern end of Coeur d'Alene Lake. It has created natural levees that separate the area south of the main lake into several smaller chain or lateral lakes that are very shallow in nature and vary in depth, DO, and how they cycle nutrients. The levees that separate the river and lakes have been worn down by wind induced wave action in large part due to the increased summer water levels the dam brings. The St Joe isn't considered impaired but does have increased nutrients from lumber and agriculture in its drainage.

Smaller Western Tributaries

There are numerous smaller tributaries that feed into the lake from the west and south many of these tributaries drain out of highly productive wheat farmland. While these are of concern to the lakes quality, the volume of the two major tributaries causes them to be the largest sources of problem nutrients.

Lake Stratification and Internal Loading

Thermal stratification occurs every summer in Coeur d'Alene Lake and most summers in the smaller lateral lakes of the Coeur d'Alene and St Joe Rivers. The temperature gradient creates a difference in density between the water layers that prevents mixing. The lower layer (hypolimnion) receives little to no light thus has no primary production to generate oxygen. Throughout the summer, any oxygen that reaches the hypolimnion are depleted by the decomposition of detrital plants, animals and algae that accumulate on the bottom of the lake. The depletion of oxygen in the colder bottom of the lake presents problems for native cold water fish species. The top layer (epilimnion) of the lake reaches higher temperatures, which can't hold as much oxygen. Between these factors, the epilimnion becomes uninhabitable for native cold-water species. Several introduced sport fish thrive in these conditions. This stratification and low oxygen zones not only poses an ecological problem to native fish species. When oxygen levels in the hypolimnion become very low, it can release nutrients bound in the sediments. This process known as internal loading can also release the contaminating heavy metals into the water. These nutrients and metals remain trapped in lower layers of the lake as long as its remains stratified, but will mix into the water column when the lake turns over, or gets mixed by wind.

Plant Communities

The plant community composition is usually depth dependent. Milfoil, Elodea sp, Thin-leaf pondweed, and Richardson's pondweed all growing in dense patches from about 1-3 m deep. These patches can be dense enough that they can resemble the floor of the lake and confound the sonar results. Shallower than 1 m there was generally less overall density and generally greater diversity with emergent species becoming common. The seasons of the plants themselves varies. Thin-leaf pondweed grew earlier in the season and at the time of this report is starting to die off en masse. Milfoil has a later season peak and over the weeks has been coming up high into the water column. The timing of the plants is also very temperature dependent. This season was exceptionally late due to a cool spring followed by a heavy June rain storm that added a late shock of cold runoff into the lake.

Eurasian and Hybrid Watermilfoil

Eurasian Watermilfoil is a tenacious plant that has several means of reproduction that allow it to move effectively through aquatic systems and make it difficult to effectively eradicate. It produces seeds at the water's surface that disperse through the water. It also produces turions, or "winter buds." These are special structures developed by the plant to separate and survive over winter in a dormant state. Some turions can exist in this dormant state for up to 5 years before growing into a new plant. Milfoil can also reproduce from small fragments. Propellers can easily chop these plants into hundreds of pieces with each fragment capable of growing a new stalked plant.

The first confirmed detection of Eurasian Watermilfoil in Coeur d'Alene Lake was in 2004, but was it almost certainly present years earlier. Eurasian milfoil has hybridized with the native northern milfoil species, to the point that hybridized milfoil is far more common than either species. Eurasian and hybrid milfoil likely colonized more lake area than the Northern milfoil did, but there is limited data on submerged plant communities prior to the arrival and detection of the Eurasian species. Determining the species of milfoil in the field is very challenging. The current and most reliable method of determining the species is to send samples to labs for genetic analysis.

Eurasian and Hybrid milfoil in the right conditions can become a monoculture and colonize large areas, displacing other native plant species. This can be observed in some areas of Coeur d'Alene Lake, but more frequently it was seen interspersed with native plants. It functions much like the native plants in many ecological aspects. It provides shade and shelter for fish though they seem to be mostly introduced sports species. The native colder water species are driven deeper or into cool tributaries surrounding the lake so it benefits them very little. Milfoil can accumulate large amounts of biomass in dense areas that can contribute to microbial activity and some oxygen depletion during senescence.

Curly-leaf Pondweed

Curly-leaf pondweed (*Potamogeton crispus*) had been detected in the lake in 2018 at a boat launch at the north end of Coeur d'Alene Lake. It was detected again in a plant survey in 2020 at Windy Bay near the middle of the lakes north-south axis. In a survey near Windy Bay we detected curly-leaf pondweed at the Sun Up Bay boat launch. This is an unsurprising but concerning location to find this invasive species. Boats pulled out of the water could transport fragments wherever it is launched next. This could move the invasive species around the lake or to an altogether new body of water. Divers went to Sun Up Bay to look at the extent of Curly-leaf establishment, but were unable to locate any.

Treatments

Herbicide

Herbicide treatments were attempted for several years in an effort to reduce and perhaps eradicate milfoil with limited effect. The herbicide requires fairly high concentrations be maintained for 3 days to achieve maximum effect. The size of the lake poses a major challenge with herbicide treatments. Dilution in such a large body of water is expected. The plants are limited to certain areas, but water cycling tends to move the water and herbicide fairly quickly through the lake and away from the plants. Frequent winds contribute to the high rates of water cycling throughout the lake. There is also the concern that the herbicide could harm non target species.

Harvesting

Currently harvesting is the main treatment applied. Once a year, various sites around boat launches are harvested with a boat designed to remove aquatic vegetation. This process is limited in that the harvester can only reach about 5 ft deep, and the plants can measure up to 3 meters. This harvesting does reduce the amount of vegetation that gets attached and moved around or out of the lake by boats and other watercraft. It also helps deal with the nuisance that milfoil and other weeds can present boats and swimmers. There were numerous appreciative boat owners and lake goers.

Drawdown Effects

Milfoil struggles to establish in the winter drawdown zone. It is likely that the turions milfoil produces aren't able to survive out of the lake over winter. The reduction in the variation of the water level likely extends the range of plants into the shallower reaches of the lake, and increases the density of submerged vegetation there. Allowing the lake to follow more natural levels may help to limit Milfoil to its deeper range.

Survey

The aquatic plants survey was conducted on several sites in the Southern end of Coeur d'Alene Lake and the adjoining lateral lakes of the St Joe River. Many of the survey sites were around high use areas and boat launches. Several others were located in areas where heavy milfoil had been noted doing visual surveys from a boat. These sites were sampled on square grids of varying resolution. At each point on the grid, 2 rake samples were taken, and we recorded the depth, species present, dominant species, and rake fullness. We completed the pre-treatment survey of the treatment and control sites, but as of the writing of this report, the post treatment surveys are ongoing.

After the treatment surveys are completed a larger scale littoral survey of the lake will be conducted. This will be on a 250 m grid as well as select areas with known aquatic plants.

Results and takeaways

Most of the data collected thus far will go into a report developed over the winter. The summer is a busy time for the Coeur d'Alene Lake Management Department, mainly collecting data. I have learned a lot about the complex issues that face the lake. From my short time sampling aquatic plant communities, it seems very difficult to predict the composition and density of the plants. Depth was a determining factor, but weed beds were often very patchy and could end or change abruptly with little indication of a difference in habitat. My Advisor Ben also noted a fairly transient nature to the weed beds. Some of the areas previously thick with milfoil had only traces.

The interconnectedness of the lake's issues surprised me. It never would have occurred to me that large amounts of milfoil could contribute to the release of toxic metals from the lake bed upon senescence. Prior to this experience I was entirely unaware of the extent that Coeur d'Alene Lake was compromised. My family owns property on a chain lake off the Coeur d'Alene

River, so I was aware of the toxic runoff due to the Bunker Hill mine. I suppose I had naively thought the size of Coeur d'Alene would dilute the contaminants enough, but unfortunately that isn't the case.

A large issue seems to be that the political atmosphere creates a hesitancy to admit the lake is facing any problems. Coeur d'Alene Lake itself was going to be designated as part of the Bunker Hill Superfund Site before intervention by the Governor in the early 2000's due to fear that it would give the lake a stigma and hurt tourism. While economic gains are valued above the quality of our environment, I believe we will continue to see degradation of some of our most beautiful natural resources.

Date	In	Out	Notes	In	Out	Notes	Hours
6/27/2022	8:20 AM	4:00 PM	Zebra Veliger Survey				7.66
6/28/2022	8:20 AM	2:10 PM	Temp Loggers				5.83
6/29/2022	8:00 AM	4:00 PM	Temp Loggers				8
6/30/2022	8:00 AM	4:30 PM	Water Quality Buoy, Data Entry				8.5
7/7/2022	8:20 AM	3:00 PM	Deployed Water Quality Buoys				6.66
7/12/2022	8:00 AM	4:30 PM	Data Entry				8.5
7/13/2022	8:00 AM	4:30 PM	Hepton Lake Survey				8.5
7/14/2022	8:00 AM	4:30 PM	Hepton Lake Survey				8.5
7/19/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
7/20/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
7/21/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
7/26/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
7/27/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
7/28/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
8/2/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
8/3/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
8/4/2022	8:00 AM	4:30 PM	Pretreatment Survey				8.5
8/9/2022	8:00 AM	4:30 PM	Water Quality sampling				8.5
8/10/2022	8:00 AM	4:30 PM	Data Entry, Eagle Aviary				8.5
8/11/2022	10:00 AM	1:00 PM	Report	3:00 PM	7:00 PM	Report	7
8/15/2022	11:00 AM	6:00 PM	Report				7
8/16/2022	8:00 AM	4:30 PM	Fixed Water Quality Buoy, Check plants				8.5
8/17/2022	8:00 AM	4:30 PM	First Post Treatment Survey				8.5
8/18/2022	9:00 AM	2:00 PM	Report	4:00 PM	8:00 PM	Report	9
8/19/2022	5:00 PM	9:30 PM					4.5
						Total	200.15

I verify that the hours above were completed by Jeremy Hays during his internship with the Coeur d'Alene Tribe Water Resources Program.

Print Ben Scofield

Signature Ben Scofield