# Trophic cascade in Lake Shel-oole, MT: A baseline study for high school environmental science students

by
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# DEDICATION

I would like to dedicate this to my father, Rick Skillman, for giving me a passion for studying environmental science.

# ACKNOWLEDGEMENTS

A special thank you goes out to Marni Rolston who has put up with all my questions and emails through the years. I would like to acknowledge Scott Powell and all the professors who have taught me wonderful topics to use in my own environmental science class. This will help me both professionally and personally. I would like to acknowledge Dr. Kleindl for being my instructor through this project.

It was very important for me to have extensive help both physically and mentally for this degree and I would like to say a special thanks to my mom, sisters, and friends for editing my papers and collecting data with me.

My last thank you goes out to my husband, Christian, for helping me stay awake, being patient with me on the weekends, unloading the kayak repeatedly, and collecting data with me when I wasn't physically capable of doing it alone.

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# ABSTRACT

Teachers implement hands-on, inquiry-based learning into their classrooms because it is more effective for all types of learners both with comprehension and retention (Thuneberg et al., 2018). This is the method that I have adapted into my classroom. Shelby High School environmental students are in a unique situation that allows them to study an introduced species to an ecosystem study the long-term effects. In North Central Montana, there is a small lake named Shel-oole. Yellow perch were first sampled in Lake Shel-oole in 1994 and were able to flourish in this environment. In 2017, there was more than the average amount of precipitation and the population grew substantially. Yellow perch began to compete for food causing smaller fish size (for anglers), but fish size can also have a negative impact on the lake clarity from trophic cascade. Montana Fish, Wildlife and Parks devised a solution to decrease yellow perch numbers through the introduction of a top-level predator, the largemouth bass, and removal of 897 yellow perch. They do not have any data on the abiotic and biotic factors of the lake ecosystem other than fish sampling. The first goal of this study is to measure limnological data to determine if Lake Shel-oole is a suitable habitat to sustain a largemouth bass population. The second goal is to use this data to set up a baseline for a long-term research study question for students: Is Lake Shel-oole an environment where largemouth bass will be able to have a sustainable population and cause a trophic cascade? Limnological data were recorded in June and July of 2022, including dissolved oxygen levels, water clarity, pH levels, and temperature levels with equipment that students will use in future studies. Bathymetry data was recorded in June and July of 2022, using sonar and C-Maps to determine if this would be a viable site for largemouth bass. Dissolved oxygen levels ranged from 3.2 to 7.3 mg/L. Water clarity ranged from 66.5 cm to 77.5 cm from the surface. PH of Lake Shel-oole was approximately 8.0 and surface water temperature ranged from 18.0°C to 23.7°C. Bathymetry data indicated that the depth of Lake Shel-oole ranged from < 0.30 m to 4.3 m (6.7 m in years with more precipitation). Students will collect field samples using the same method. Six different classroom or field labs will take place to give them hands-on experience. Based on my results, it is likely that Lake Shel-oole is a suitable location for a sustainable largemouth bass population. However, this data acts as a baseline to for long term yearly data collection by local students to study and draw conclusions on the effects of introducing a new species into an ecosystem.

# TROPHIC CASCADE IN LAKE SHEL-OOLE, MT: A BASELINE STUDY FOR HIGH SCHOOL ENVIRONMENTAL SCIENCE STUDENTS

## Introduction

Introducing a new species into a biome, whether deliberate or accidental, can have profound effects on an ecosystem. There have been many studies that focus on the adverse effects of these introduced species (Carpio et al., 2019; Pejchar et al., 2009; Pysek et al., 2010; Pringle, 2005; Persson et al., 2007; Finlay et al., 2007). There is a loss of biodiversity, trophic cascades, and an impact that affects the fishing economy and angling opportunities (Carpio et al., 2019; Pejchar et al., 2009; Pysek et al., 2010; Pringle, 2005; Lafferty et al., 2016, Rahel et al., 2018). Lake Victoria, for instance, had more than 500 species of cichlids before the introduction of the Nile perch, a top-level piscivore, in 1950, and by the early 2000s, there were less than half of the cichlid species (Pringle, 2005). As Nile perch established themselves, zooplankton increased "sixfold" due to the lack of cichlids that fed on them creating a tri-trophic cascade (Wanink, 1999; Goudswaard et al., 2008).

However, there are also positive examples as well, such as the reintroduction of wolves into Yellowstone National Park which created more biodiversity and improved ecosystem functions (Ripple et al., 2012). Each is an example of the effects of trophic structure of an ecosystem after deliberately introducing a new species. The trophic cascade response to the food web has been well established in the literature (Ripple et al., 2012; Carpenter et al., 2008; Lafferty et al., 2016). Tropic cascades have been used as a management tool in large lake ecosystems (Carpio et al., 2019; Carpenter et al., 2008; Ives et al., 2007; Walters et al., 2001, Schmitz et al., 2006, Persson et al., 2007). However, there are few examples of trophic cascade management and monitoring in small lakes in the western United States.

In Toole County, Montana, Lake Shel-oole yellow perch (*Perca flavescens*) were first documented in 1994 (MFWP, 2021). A substantial increase of yellow perch developed in 2018 until 2021when Montana Fish, Wildlife and Parks (MFWP) decided to manage the population. Overpopulation causes shorter yellow perch lengths from competition of food, smaller fish are less desired by anglers (K.Vivian, personal communication, November 22, 2021; Gallardo et al., 2016; Persson et al., 2007). To combat this angling size and perch population structure problem, MFWP introduced largemouth bass into this lake to exert top-down control of the perch population. Adding a top predator can be effective if stocked in large numbers, but the prey population might be more effective in letting the predator system grow (Carpenter et al., 2008; Persson et al., 2007). MFWP added largemouth bass, but five months before, they also removed 897 yellow perch (K.Vivian, personal communication). Yellow perch were the top fish predator in Lake Shel-oole. Largemouth bass would become the top piscivore in the lake and reduce the number of yellow perch. As a result, yellow perch size would increase, and an additional angling opportunity would be present in Lake Shel-oole.

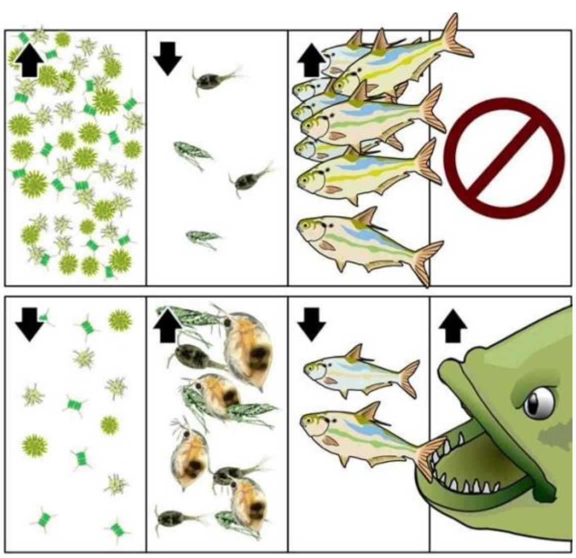

Figure 1: A simple food chain showing what Lake Shel-oole's main trophic levels were before (top) and what they hope to be in the future (bottom) (Lombard, 2016).

However, there may be other unintended changes to the lake through trophic cascade effects (Figure 1). The smaller yellow perch feed on *Daphnia* spp., which in turn reduce *Daphnia* predation fed on phytoplankton (Hoffman et al., 2001; Uusi-Heikkila et al., 2022). Increased phytoplankton density reduces water clarity (Hoffman et al., 2001; Carpenter et al., 2007). Having piscivorous fish feeding on the yellow perch will reverse this cascading trophic pressure (Hoffman et al., 2001; Carpenter et al., 2007; Schmitz et al., 2006; Persson et al., 2007). *Carpenter* et al., (2008) found that regime shifts occur but gradually change after adding a top predator. Because food webs are complicated, it may take years to understand the full effect of introducing a new species (Carpenter et al., 2008; Ives et al., 2007; Walters et al., 2001, Schmitz et al., 2006, Persson et al., 2007).

I am a high school environmental science teacher at Shelby High School. Hands-on, inquiry-based learning is the base of my teaching methods. Rather than giving a presentation and expecting students to remember the knowledge based on an auditory/visual lesson, I have them observe an effect and determine the cause using critical thinking. Science standards for Montana public schools are adapted from Next Generation Science Standards (NGSS). These standards are built on around three dimensions – crosscutting concepts, engineering practices and disciplinary core ideas, science (NGSS, 2013). This teaching method is based on cause-and-effect models or claim-and-evidence models. An example: I give student this graph (Figure 2) from the scientific article Trophic cascades in Yellowstone: The first 15 years after wolf reintroduction by Ripple and Beschta in 2010. The students will work with a partner or group and try to determine the cause and effect with guided discussion. After discussion, students can then read the article to provide the detailed study and help them retain the information. Science is not the only subject that uses this method. Teachers in each subject are finding this method to be a better approach for student comprehension and retention (Thuneberg et al., 2018).

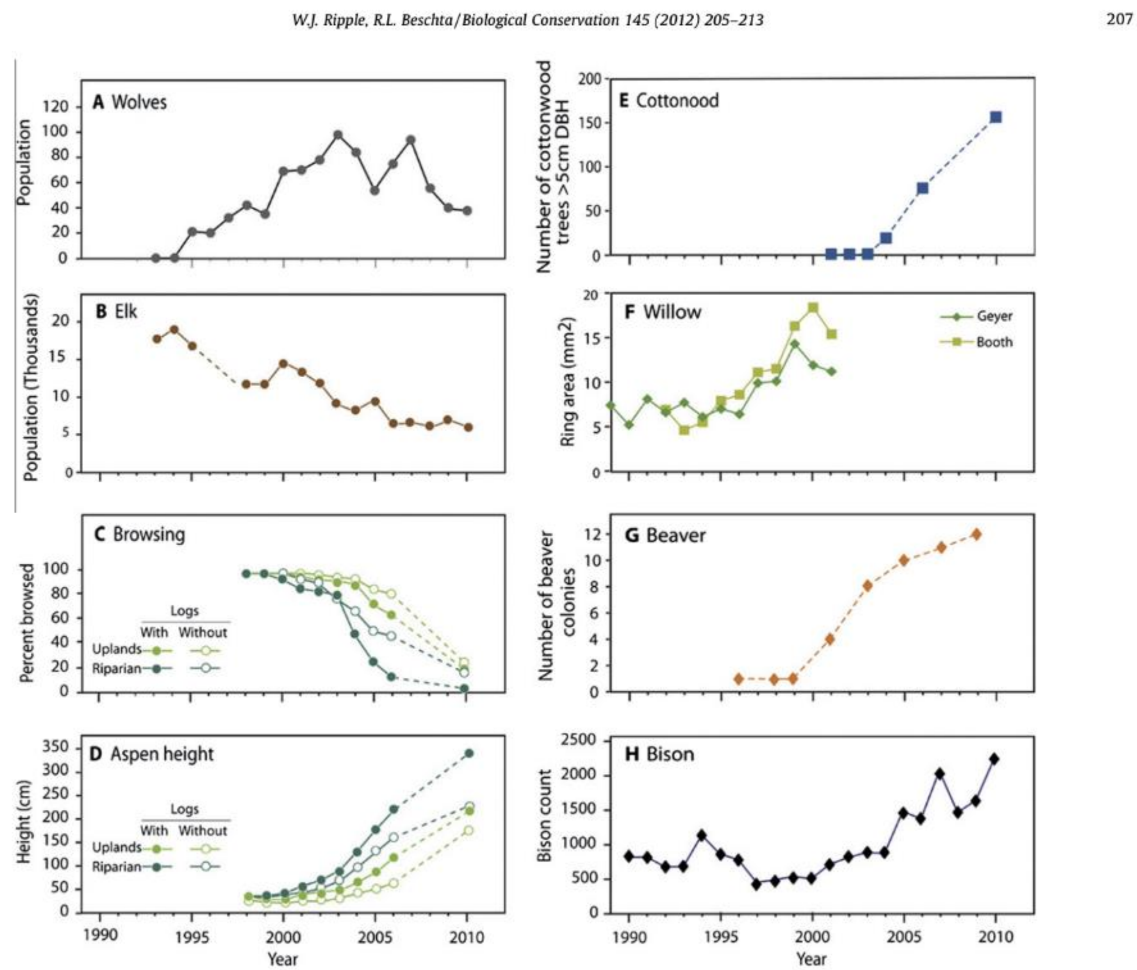


Figure 2: Trophic response from the reintroduction of wolves into YNP (from Ripple & Beschta, 2010).

Shelby High School environmental students are in a unique situation that allows them to study an introduced species to an ecosystem and the positive or negative effects. I will be using this hands-on, inquiry-based teaching method on a long-term research study for students to answer this question: Is Lake Shel-oole an environment where largemouth bass will be able to have a sustainable population and cause a trophic cascade? Each year they will take the previous year data to see if there is an effect on Lake-Shel-oole phytoplankton biomass, yellow-perch length, yellow perch populations, largemouth bass populations, phytoplankton biomass among other abiotic and biotic data.

This research will take years to complete, so for the first year of this research project for students, two goals need to be met:

Goal 1: To determine if Lake Shel-oole will be able to support a sustainable largemouth bass population.

Goal 2: To establish Lake Shel-oole baseline abiotic and biotic limnological data for environmental students to utilize in a long-term research study.

## Background

### Yellow Perch

Yellow perch (*Perca flavescens*) is a recreational angling fish planted in many lakes (Radomski, 2003; Isermann, 2005). Colby et al. (1987) discussed how lakes have one of two distributions of yellow perch. There is either a high abundance of small yellow perch or a low abundance of large perch. High levels of small perch are associated with high levels of competition for food, favoring larger fish, and slowly the mean size increases. However, when larger yellow perch are present, cannibalism occurs, which allows for the competition to decrease. Isermann et al. (2005) found that in some South Dakota lakes, anglers prefer to harvest yellow perch with a total length of 25.4 cm or greater, which is intermediate size, supporting an angling target size for MFWP and the community.

### Largemouth Bass

Largemouth bass (*Micropterus salmoides*) are added to lake systems for angling opportunities and/or a top-down control mechanism (Yasuno et al., 2020; MFWP, 2021).

Fishermen prefer largemouth bass greater than 30 cm or when they are about four old (Wilde, 1997; Radomski, 2003). Largemouth bass will eat macroinvertebrates until they reach about 30 cm and above then they become piscivorous (Tabor & Wurtsbaugh 1991; Christensen & Moore, 2007; MFWP, 2021).

Project

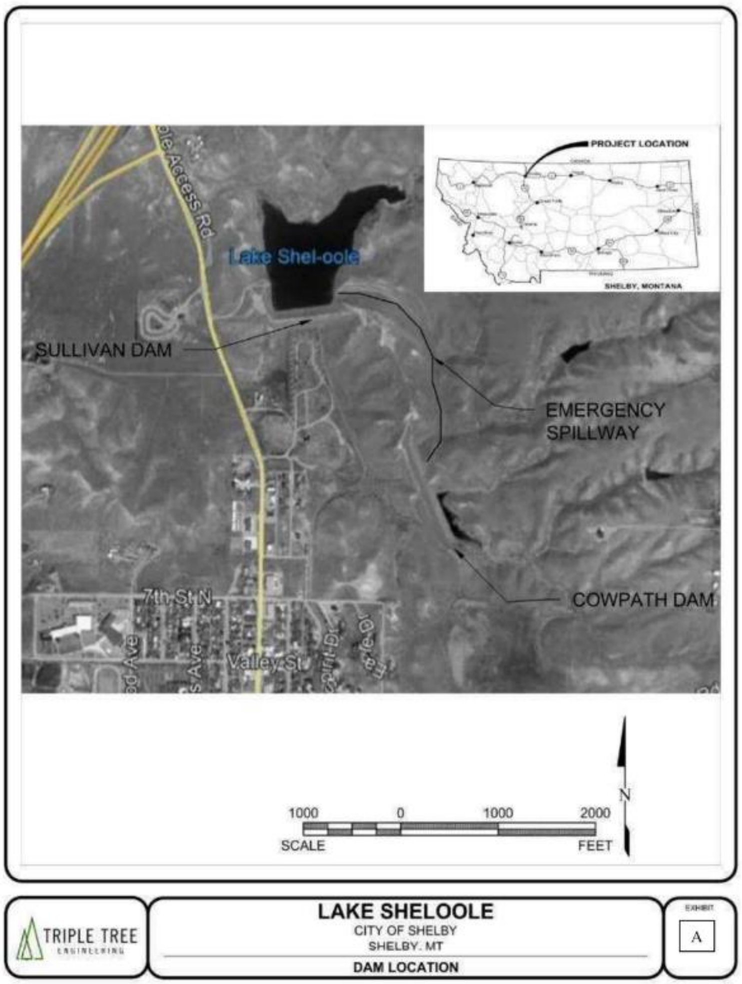


Figure 3: Lake Sheloole Map by Triple Tree Engineering, 2021. Lake Shel-oole is located at T 32N R 2W Sec 15 (48.52609, -111.85301)

My study site is Lake Shel-oole; a 24.1-acre man-made lake in Toole County in North Central Montana (Figure 3) (MFWP, 2021; Triple Tree Engineering, 2021). A sustainable population of yellow perch have existed since 1995. In 2017 Lake Shel-oole was refilled due to heavy high precipitation and run-off (Figure 4). This caused the perch population to increase. Due to the large numbers of yellow perch, the length of perch decreased to 15 cm to 20 cm in length, making them undesirable to anglers (MFWP, 2021). The population size changes slowly due to competition for food, creating a population of stock size yellow perch. A project was proposed by MFWP in 2021, called the Lake Shel-oole Largemouth Bass Fish Introduction (LSLBI) to address perch overpopulation. The project's intent was to exert top-down pressure on the yellow perch population to reduce population and increase medium perch size to add another angling opportunity (MFWP, 2021).

Figure 4: Lake Shel-oole on the left in 2017 (left, mapio.net) and 2022 (right, personal picture). The trees are above the water in 2022, which shows how much lower it is this year.

The LSLBI project manager, fish biologist Katie Vivian (personal communication, November 22, 2021), stated that predator largemouth bass were picked because of their ability to handle very warm water, high turbidity, lower dissolved oxygen levels and are well-adapted for small lakes/ponds. The LSLBI project hopes for a sustainable largemouth bass population after the initial stocking.

For the LSLBI, MFWP first removed 897 yellow perch from Lake Shel-oole on March 23, 2021 (MFWP, 2022; K.Vivian, personal communication, November 22, 2021). Then, on

September 15, 2021, 2065, largemouth bass, at an average length of 8.23 cm, were stocked in Lake Shel-oole (MFWP, 2022). According to the project environmental assessment, no significant impacts besides helping with the yellow perch size structure were anticipated (MFWP, 2021). MFWP has not collected data on Lake Shel-oole except for fish sampling, which could help determine if it worth stocking largemouth bass in the first place.

To collect data to complete goal one and two, I took data measurements to determine if Lake Shel-oole was a good location to stock with largemouth bass and to create a baseline of abiotic and biotic data for students to build upon in the following years. Here is an explanation of why each measurement was part of the baseline:

Bathymetry

The depth of lakes can determine abiotic and biotic features including locations of fish distribution, or spawning areas as well as areas that may contain lower dissolved oxygen levels (Maravelias, 1999; Piasecki et al., 2015). Largemouth bass tend to be found in shallow, vegetated areas of lakes that have different structures to hide in, usually at less than 6 m and prefer complex structure (Peat et al., 2016; Essington & Kitchell, 1999; Prince & Maughan,1979).

Water Clarity

Water clarity is important aspect to study because it can affect the behavior of fish distribution and prey capture. McMahon and Holanov (1995) found largemouth bass forage best in twilight light intensities near the surface in waters that have a water clarity that is less than 5 m. When water clarity decreases, it does take away available water column availability for feeding. Water clarity can be affected by wind, rain, agriculture, phytoplankton biomass, and suspended sediments. Because I want students to study Lake Shel-oole to determine if a trophic cascade occurs, water clarity is imperative to study because of the effect phytoplankton biomass has on water clarity.

Dissolved Oxygen

DO levels are important to monitor for fish survival. For students to reach conclusion about the research question, DO levels will be an indicator, like water clarity, to determine if there is less phytoplankton. Higher DO levels mean less phytoplankton due to production of oxygen from plants that have more sunlight from having a higher water clarity (Bernes et al., 2015) . DO levels need to be above 2.0 mg/L, ideally between 3.0 mg/L to 6.0 mg/L, to maintain a healthy largemouth bass fish population (Hasler et al., 2009). Largemouth bass have a critical threshold of dissolved oxygen (DO) less than 2 mg/L (Hasler et al., 2009). The lowest measurements of dissolved oxygen occur in the peak of summer when temperatures are highest.

pH

Acidification can affect the survival and health of fish. Largemouth bass optimal pH levels are 6.5 to 8.5 (Stuber et al., 1982). In an experiment on small mouth bass, *Hill* et al. (1988) found that at pH levels of 5.0 to 5.7, survival went down to 43%.

Lake Stratification

Lake stratification is important for nutrient and oxygen cycling, which will determine the amount of DO, nutrients, water temperature available to largemouth bass at different depths, thus their ability to survive. It is common for lakes in Montana to stratify into two layers: the warmer and less dense epilimnion and the colder and denser hypolimnion. These two layers are separated by a thermocline, which has a sharp change in temperature, oxygen, and nutrients (Fafard, 2018, Kirillin & Shatwell, 2016). It is also typical for lakes in Montana to be dimictic, where the layers of the lake mix only once in spring and once in the fall as ambient temperatures change with the seasons (Shatwell, Adrian, Kirillin, 2016). Very deep lakes are monomictic lakes and rarely mix, while shallow lakes can be polymictic and mix intermittently during summer (Shatwell, Adrian, Kirillin, 2016).

Lake Temperature

Lake temperature is important for fish survival and varies between species of fish. Largemouth bass prefers 24°C to 30°C (75.2 to 86 degrees Fahrenheit), which is warm (Peat et al., 2016). They can be in waters below 24°C, but it can affect juvenile largemouth bass. Juvenile largemouth bass cannot get their body weight up if summer months are colder than 15 degrees Celsius. (Peat et al., 2016).

Fish Data Analysis

This data will be collected from sampling completed by MFWP. Students will get the new data each year as MFWP sample. This will help to observe trends in fish numbers and average length. They can use this information to make graphs and perform statistical analysis to understand trends of an ecosystem after a new species is introduced.

Site Description

Lake Shel-oole (See Figure 3) was constructed after a large flood occurred in June of 1964 in Montana that affected towns of the Eastern Rocky Mountain front. Although Shelby wasn’t devastated like some areas, flooding filled the basements of houses with a few feet of water (M. A. Harwood, personal communication, January 10, 2022). Lake Shel-oole was filled with water after the construction of Sullivan's Dam and Cowpath Dam in 1969 to prevent flooding (Triple Tree Engineering, 2021). Sullivan’s Dam includes a controlled and backup spillway (Triple Tree Engineering, 2021).

The area around Lake Shel-oole is in Toole County on the northern city limit of Shelby, MT. The elevation is 999.7 m (3,280 feet) (Shelby, 2019). The annual average precipitation is 24.5 cm to 35.6 cm (10 - 14 inches). The average frost-free number of days is 100 - 140 days. The soils are composed of the well-drained, clay loam Sunburst soils created from is clayey till parent material. Other areas are the well-drained Neldore soils created from weathered shale parent material leading to soil that is clay, parachannery clay, very parachannery clay and bedrock. There are a few other types of soil that make up small percentages of the area which include bascovy, hillon, kevin, rock outcrop, volborg, richey, vanda. (NRCS, 2019).

The average wind speed from May 29th to October 5th, when there is open water, is 5.3 km/h (8.6 miles per hour) (weatherspark, 2022). In June 2022, high winds average from 6.4 km/h to 6.0 km/h (9.7 to 10.3 mph) (weatherspark, 2022).

Native grasses, forbs, and shrubs surrounding Lake Shel-oole include Common Rabbitbrush (*Chrysothamnus nauseosus*), Big Sagebrush (*Artemisia tridentata*), Tall Dandelion (*Asteraceae spp*), Prairie sagewort (*Artemisia frigida*), Yarrow (*Achillea millefolium*), Brittle Prickly-Pear Cactus (*Opuntia fragilis*), Buckwheat.spp, Fescue.spp, Wild Licorice (*Glycyrrhiza lepidota*). Non-native plants include Crested Wheatgrass (*Agropyron cristatum*) and Common Sweet Clover (*Melilotus officinalis*). There are cottonwood trees and a type of willow species. Wildlife includes black cormorants, American avocets, pelicans, mallard ducks, loons, coots, songbirds, muskrats, painted turtles, and yellow perch for fishing. There has not been a lot of research performed on Lake Shel-oole besides sampling of fish (Skillman, 2018).

Lake She-oole has many man-made features to make this an area of interest to promote visitation. There is a paved 8.1-kilometer walking trail around the lake called roadrunner trail. The trail is maintained through grants applied for by the chamber of commerce (City of Shelby, 2020). A mountain biking trail was constructed in 2021 around the south side of the dam (J.Goroski, personal communication, July 21, 2021). A floating dock was also secured through a chamber of commerce grant to allow for more access to fishing in Lake Shel-oole (J.Goroski, personal communication, July 21, 2021). There is a large archery range alongside the lake for members of the archery club, which allows for practice in the elements.

It is important to note that there are two other species of fish in Lake Shel-oole - white suckers (*Catostomus commersonii*) and rainbow trout (*Oncorhynchus mykiss*) (MFWP, 2021). Rainbow trout are discussed in the Lake Shel-oole Largemouth Bass Fish Introduction, but nothing about the effect from adding a piscivorous fish. This may be due to their documented low survival rate in Lake Shel-oole (MFWP, 2022). Rainbow trout have been stocked in Lake Shel-oole since 1971. Stocking of rainbow trout from 1998 until 2011 was halted due to water levels and low survival rates (MFWP, 2021; Muller 2011). Low water levels cause food shortages in the winter for rainbow trout according to Montana fish biologist David Yerk (Muller, 2011). Lake Shel-oole was stocked with 500 rainbow trout on June 25th, 2019, at a length of 11.4. cm (4.5 inches) and 500 more on May 28th, 2020, at a length of 8.9 cm (3.49 inches) (MFWP, 2022). The last sampling performed by MFWP on May 23, 2021, exhibited that rainbow trout were still maintaining a small population (K. Vivian, personal communication, November 22, 2021, MFWP, 2022).

## Methods

### Bathymetry

I created a benthological contour map of Lake Shel-oole a Lowrance HDS 5 Gen 2 fishing sonar mounted to a 14-foot fishing kayak. I kayaked from one side of the lake to the other to log routes that are 5 meters apart to allow for the transducer to pick up lake bottom depths. A slg2 file was recorded at 200 kHz with the transducer and saved to an SD card. Each file was recorded for less than 4 GB to be uploaded to the web program C-Map Genesis. This program takes slg files from compatible sonar equipment and converts them into contour maps to help anglers map water bodies that may not have information on them. The files are then merged to create a full map with different layers. Another feature is C-Map social maps, which allow for you to check and see if someone has already mapped that waterbody and you can upload it to a SD disk to use in your sonar. Lake Shel-oole has never been logged in C-Map social maps.

### Water Clarity

I made a 20.3 cm diameter Secchi disc from a white bucket lid and painted black and white quadrants on the top. I attached a hook eye to the center on the top. I screwed on a large socket on the bottom to increase the weight to sink the disc. Paracord was attached to the hook eye to measure the depth when clarity is lost. I lowered the Secchi disc into the Southern section of the lake that had a depth of 3.8 meters of the side of my kayak. I measured the clarity depth as soon as the disk was no longer visible. The length of the rope was measured to the nearest centimeter and recorded in Table 1.

### Dissolved Oxygen

To measure DO levels, I used a Milwaukee 600 dissolved oxygen probe, calibrated each day before going out on Lake Shel-oole. After calibration, the accuracy of this instrument is ±1.5% at 25°C. Measurements were taken on June 5, July 1, and July 8 of 2022 in mid-afternoon. My results were adjusted, following the meters manual, to account for temperature and elevation. The temperature was taken a Lowrance HDS 5 Gen 2 sonar. Shelby is located at 999.7 meters above sea level, and the temperature of the lake became increasingly warmer through June and July, so different adjustments were used for each measurement.

pH Level

I measured pH levels with a pH Flinn Scientific probe that students would use. The probe I used initially failed when out in the field (see table 1). I selected a different probe from the school. It was the same type and likely purchased in the same year. The measurements were recorded in Table 1. After I calibrated the probe, I dipped into the water in the same location where I measured water clarity, off the side of the kayak. The probe's measurements went back and forth by ~0.5 rapidly back and forth. Students will be using these probes in future studies due to classroom budget, so I used an average each time, but the data will not be as accurate with these instruments.

Lake Temperature

Lake temperature was taken with Lowrance HDS 5 Gen 2 fishing sonar mounted on the kayak and recorded in Table 1.

Lake Stratification

To determine what type of stratification occurs in Lake Shel-oole, DO levels were taken at different depths – close to the surface, then at 1 meter until the cord was fully extended at 3.0 m and recorded in Table 1. Only surface temperature (one depth) could be measured due to lack of equipment.

Fish Sampling

MFWP biologist, Katie Vivian provided excel data on fish sampling from 1971 until 2021. Sampling is taken when there is rainbow trout stocked in Lake Shel-oole so there are breaks in the sampling years. The data before 1995 was disregarded because it was on stocked rainbow trout numbers, and the concern is yellow perch. I reorganized the data and put it into Table 2.

## Results

The surface water temperature ranged from 18.0°C to 23.7°C, increasing across the summer (Table 1). Dissolved oxygen levels ranged from 3.2 to 7.3 mg/L. Water clarity ranged from 66.5 cm to 77.5 cm. PH levels were about 8.0.

Table 1: Data for temperature, clarity, D.O. pH level and the range for these dates.

| | **June 5, 2022** | **July 1, 2022** | **July 8, 2022** |
|---|---|---|---|
| **Temperature (°C)** | 18.0 | 23.2 | 23.7 |
| **Clarity (cm)** | 66.5 | 70.6 | 77.5 |
| **Dissolved Oxygen (mg/L) from the lowest depth to just below the surface** | 3.4-5.29 | Not properly calibrated | 3.2-7.3 |
| **pH** | Failed Instrument | ~8 | ~8 |

The bathymetric data show the deepest depth was 4.3 m (14 feet on map), and the shallowest depths are less than 0.30 m (1foot) (Figure 5). A couple of locations were not logged by the sonar, due to sonar error or route error. The deepest depths are located closest to the land-filled dam. The more times a map is logged with sonar, the more data is collected and merged in C-Maps, the map becomes more accurate.

Sonar and C-Map also produced a vegetation map of the lake bottom (Figure 6) was created with the same logged data as the bathymetric data. The whole lakebed floor has some vegetation at any depth. The vegetation cover provides habitat structure and more dissolved oxygen.

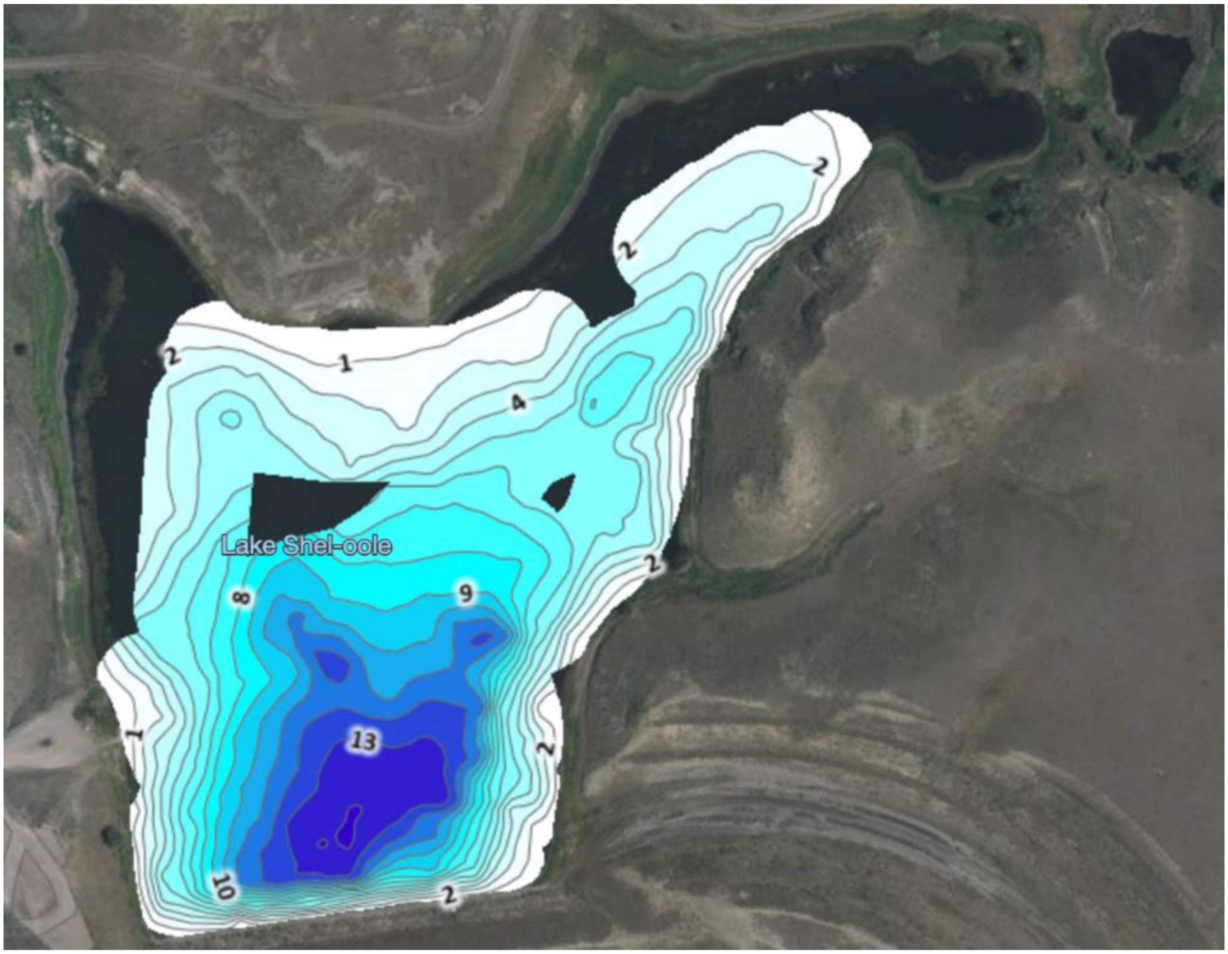


Figure 5: Bathymetric map of Lake Shel-oole using Lowrance HDS 5 Gen 2 sonar and the web program C-Map. Units are in feet because that is what the sonar logs in.

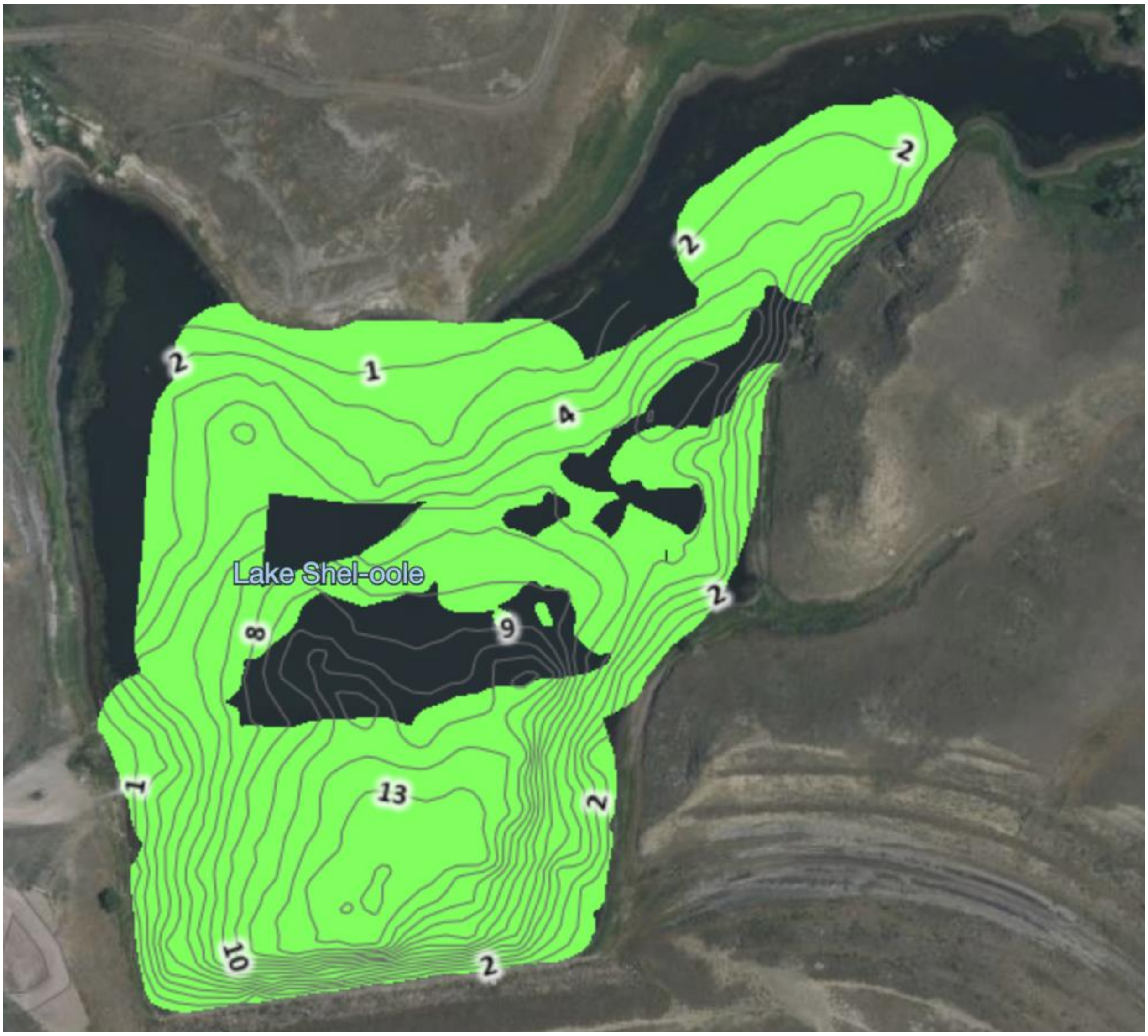


Figure 6: Vegetation map of Lake Shel-oole using Lowrance HDS 5 Gen 2 sonar and the web program C-Map.

MFWP sampling data (Table 2) shows numbers of yellow perch and rainbow trout from 1994 to 1996, 2012 and 2019-2021. MFWP used net type 9 traps and net type 2 every year during sampling except 2021. MFWP did not sample Lake Shel-oole from 1996-2012 until after water levels rose and they re-stocked Lake Shel-oole with more rainbow trout. Sampling did not occur again until 2019 after flooding occurred in 2018. The data did not give an exact number of how many yellow perch were caught in 2020 and showed that 0 rainbow trout were captured.

Thirty perch were caught in 30 minutes with fishing rods, while the sampling nets were sitting in the water. They killed 60 fish for health. In 2021, MFWP removed 897 perch and 127.5 lbs. of fish were transferred. Three rainbow trout were also caught and recorded.

Table 2: The number of yellow perch and rainbow trout caught sampling in 1994, 1995, 1996, 2012, 2019, 2020, 2021

| Year | Number Of Yellow Perch | Number Of Rainbow Trout |
|---|---|---|
| **1994** | 1 | 1 |
| **1995** | 95 | 10 |
| **1996** | 65 | 3 |
| **2012** | 132 | 37 |
| **2019** | 743 | 0 |
| **2020** | Unknown from data, but collected 30 perch in 30 minutes while waiting on nets to fill | 0 |
| **2021** | Unknown, but removed 897 | 3 |

## Discussion

The first goal was to determine if Lake Shel-oole will be able to support a sustainable largemouth bass population. According to the data collected for goal one, it is indicated that largemouth bass will likely be able to sustain their populations.

The second goal was to collect or analyze abiotic and biotic data (or limnology) of Lake Shel-oole to begin a baseline for students to perform a long-term study. A bathymetric map was made of the lakebed to help determine the depth and structure of Lake Shel-oole. Dissolved oxygen levels, pH, water clarity, and lake surface temperature in the summer months were taken to start a baseline for my study. This is just the steppingstone to a long-term study with students who will be able to see the outside world as a laboratory, which will be created through field labs and research.

### Bathymetry

According to the data collected, Lake Shel-oole falls into this category of being shallow. The bathymetric map (See Figure 5) shows in 2022, Lake Shel-oole's lowest depth was 4.3 m

(14 feet). At the highest watermark, this depth may be ~6.7 m (22 ft) in summers at times when Lake Shel-oole is full. According to Figure 5, most of the lake is relatively shallow, with just one deep spot. Largemouth bass prefer to be in waters less than 6 m. Most years this the whole lake is less than 6 m.

Submerged macrophytes cover most of the lake bottom, although at smaller heights <30 cm (from monitoring the sonar) (Figure 6). Because Lake Shel-oole is man-made and on the prairie, there are not many large rocks in the water to add complexity to the bottom of the lake or on the sides of the shore. The sides of the shores have many old trees still coming out of the water although they are out at the current low water levels (See Figure 4). This could help with some structure but may not necessarily be required because largemouth bass are not avoiding a large fish predator, but they still prefer vegetation regardless of predators (Stuber et al., 1982).

Students will recruit people to drop off their Christmas trees on Lake Shel-oole in the winter to add complexity to the lake when the ice melts, with the permission of the city.

<u>Water Clarity</u>

Water clarity is important for largemouth bass prey capture. The clarity of Lake Shel-oole has a range in the summer from water clarity ranged from 66.5 cm to 77.5 cm. This indicates that there might be a high number of phytoplankton and/or suspended sediments. Clarity can be caused by abiotic or biotic factors like phytoplankton or suspended sediments (Bruckner, 2022).

Water clarity can be affected by surrounding land use (Olmanson et al., 2016) and wind and rain (Zhang et al., 2018). Lake Shel-oole is in an area surrounded by agriculture runoff that can affect clarity. However, the average rainfall is low on Lake Shel-oole, at only 5.8 centimeters per year, making it unlikely that rainfall is affecting the clarity of this lake (weatherspark, 2022). Zhang et al.(2018), found that wind was the largest determining factor in total suspended sediments affecting water clarity. Largemouth bass prefer foraging on the surface in lower water clarity.

Dissolved Oxygen

The lowest measurements of dissolved oxygen occur in the peak of summer when temperatures are highest. DO levels in Lake Shel-oole are at a range from 3.4 to 5.29 mg/L, well within the preferred range. However, if there is high predator density, then prey fish will venture into lower oxygen levels, even if it is not ideal to avoid predation (French et al., 2018). Because of wave action, the highest DO content is within the top 66.0 cm, which would make largemouth bass vulnerable to bird predators.

Dissolved oxygen levels vary throughout the day, leading to instability for fish in the water. A very small stream provides surface water for the lake that would help with levels of dissolved oxygen, but it is unlikely for a stream this size (~50 cm stream width) to provide a lot of dissolved oxygen into the lake. Another important note is that wind is a large influence on this shallow lake.

Temperature and DO content do not have a significant health effect on different ages of largemouth bass (Moss & Scott, 1961). This suggests largemouth bass would sustain their numbers in Shel-oole regardless of lower dissolved oxygen and higher temperatures unless dissolved oxygen drops below 2 mg/L

pH Levels

The pH levels of Lake Shel-oole are about 8. Most likely, at these pH levels, largemouth bass will be able to survive in Lake Shel-oole since it more alkaline than acidic.

Lake Temperature

Surface temperatures of Lake Shel-oole in the summer range from 18.0°C to 23.7°C. Lake Shel-oole's temperatures are not likely to fall below this in the summer and unlikely to affect juvenile largemouth bass who require water temperatures to be above 15°C to survive winter.

Lake Stratification

Temperature is a large part of how a lake stratifies, along with wind, depth, and surface areas of lakes (Woolway et al., 2021, Kirillin & Shatwell, 2016). As temperature increases on the surface area of a lake, there is more stability in the water column (less mixing) due to the large density difference between the hypolimnion and epilimnion. Wind can change the temperature of the water and increase turbidity, creating mixing even if the temperature on top is at a higher temperature. (Woolway et al., 2021, Shatwell, Adrian, Kirillin, 2016, Kirillin & Shatwell, 2016). Due to Lake Shel-oole's location on the Eastern side of the Rocky Mountains, high winds are common and can mix this shallow lake regardless of the temperature. Due to Lake Shel-oole's largest depth currently being 4.3 m and 6.7 m in years when the lake contains more water. This is likely polymictic. This would mean a frequent mixing of temperature and DO, which keeps the lake from falling below the 2.0 mg/L mortality threshold. This will be good for largemouth bass because they have options to go deeper in the lake to avoid predators and will survive the lower oxygen levels.

Continued Course of Study for Local Students

These baseline data will serve as the foundation for the next 10 years of our environmental science. We will build upon and expand from this study to further determine the sustainability of largemouth bass and effects of trophic cascade, . Each year students will collect these baseline data and expand into other sampling. These will be conducted in six labs/projects that will be implemented using the hands-on, inquiry-based method that NGSS promotes. All yearly labs will lead toward a conclusion after the tenth year.

Lab One: will take place in the classroom. The students will receive the data from MFWP on the fish sampling that will take place in August on Lake Shel-oole. They will learn how to use excel to make a graph of the numbers and average lengths of the largemouth bass population. Each year a class will add to this data. They will graph the numbers and average lengths of the yellow perch population. This portion is the practice dimension of NGSS. Students will interpret what they observe or the concept dimension of NGSS. The last dimension is the core ideas. This dimension is the bridge to other subjects in school. Students are bridging technology, math, environmental science, and biology in one lesson.

Lab Two: will be in the field. They will measure DO levels, pH, Secchi disk readings for water clarity, lake temperature as I did for this study. The main purpose will be to teach them how to properly execute their methods. The lesson will cover safety, sampling error (equipment or human), data documentation, and integrity in their work. During this lab they will perform macroinvertebrate sampling and phytoplankton biomass sampling. For macroinvertebrate sampling they will use classroom-made nets attached to wooden dowels and recycled water bottle traps and determine the health of the lake using the collected macroinvertebrates and the biotic index (Appendix B for example of biotic index chart). For phytoplankton biomass sampling we will make phytoplankton nets in the classroom from a lab created by NASA (Appendix C).

Lab Three: will occur in January. Students will help MFWP during a kid ice-fishing tournament. As they help, they will collect lengths and weights of fish and document the data for the classes following.

Lab Four: will take place in January. This lab will be adapted from Robert Stewart's lab (Appendix D). Students will collect data using a Vexilar 12 sonar and collect data point depths by placing the transducer directly on the ice. Using this method, rather than the Lowrance sonar, there will not be a need for a boat and help students understand how rigorous data point collection can be. Students will use their data to make bathymetric map in QGIS, giving them an introduction to GIS and map-making.

Lab Five: will take place in the spring. Students will perform the same methods as in second lab. Students will compare their data from the fall and spring and perform statistical analysis on their findings to see if there is a significant difference in their data and hypothesize what the effect could be.

Lab Six: will be to sample with MFWP when they do their annual spring sampling. Students will write notes in the field on the methods used during this process and write a paper on the methods when they are back in the classroom.

The long-term goal of monitoring this project will take 10 years and that is why creating a baseline in this project will allow students to be set up for a start each year moving forward. An important practice in NGSS standards is obtaining, evaluating, and communicating information. To establish learning and promote NGSS standards, students' summative assessment will be to turn in their original research scientific article into the International Journal of High School Research (IJHSR). The IJHSR is and open access, "leading high school research journal" and publishes six issues a year (Terra, 2020). I will collaborate with our school's AP English and Literature teacher to help students to write an organized, communicative article to share their knowledge with the scientific community, which is an integral part of the scientific method.

Thinking outside the box and challenging students to come to conclusions through inquiry-based learning is the base of science classrooms today. Student engagement is the easiest indicator to me to know that students are actively learning. This study is designed to engage students and make them aware of how important the science in the environment is. As Clay P. Bedford, President of Kaiser Aerospace and Electronics said, “You can teach a student a lesson for a day, but if you teach him to learn by creating curiosity, he will continue the learning process as long as he lives.”

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Personal Communication

Mary Ann Harwood - Toole County Commissioner

Jade Goroski- Chief Financial Officer of Shelby, MT

Katie Vivian - Regional Fish Biologist

# APPENDICES

## APPENDIX A

## MFWP FISH SAMPLING DATA

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 6 | 22 | 1994 | 1 | 6 Hours | 2 | S | | | RB | 001 | 12.2 | 0.87 | -0.1058 | 0.78 | 110.99 | |
| Lake Shel-oole | 148935 | 6 | 22 | 1994 | 2 | 7 Hours | 9 | T | | 1/4 inch trap | | | | | | | | 1 YP, 1 RB, 35 Fathead minnows, 15 Lake chubs |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | YP | 020 | 12.5 | 1.24 | 0.0370 | 1.09 | 113.87 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | WSU | 057 | 14.5 | 1.35 | 0.1324 | 1.36 | 99.52 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | WSU | 057 | 14.1 | 1.17 | 0.0967 | 1.25 | 93.64 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.2 | 0.61 | -0.1058 | 0.78 | 77.82 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.4 | 0.70 | -0.0847 | 0.82 | 85.07 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 14.2 | 1.04 | 0.0913 | 1.23 | 84.27 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 11.4 | 0.54 | -0.1939 | 0.64 | 84.38 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.5 | 0.69 | -0.0742 | 0.84 | 81.86 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.6 | 0.80 | -0.0639 | 0.86 | 92.68 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.6 | 0.74 | -0.0639 | 0.86 | 85.73 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | WSU | 057 | 15.4 | 1.50 | 0.2093 | 1.62 | 92.64 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | YP | 020 | 8.6 | 0.38 | -0.4876 | 0.33 | 116.78 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | YP | 020 | 11.6 | 0.87 | -0.0678 | 0.86 | 101.70 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | CR | 021 | 11.1 | 0.90 | | | | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | YP | 020 | 8.3 | 0.30 | -0.5374 | 0.29 | 103.39 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.1 | 0.60 | -0.1165 | 0.76 | 78.46 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 11.6 | 0.53 | -0.1713 | 0.67 | 78.62 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.9 | 0.70 | -0.0333 | 0.93 | 75.58 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 10.2 | 0.42 | -0.3383 | 0.46 | 91.52 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.7 | 0.78 | -0.0536 | 0.88 | 88.25 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 11.4 | 0.53 | -0.1939 | 0.64 | 82.82 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 13.3 | 0.80 | 0.0063 | 1.01 | 78.84 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 13.2 | 0.93 | -0.0035 | 0.99 | 93.75 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 10.2 | 0.42 | -0.3383 | 0.46 | 91.52 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 10.3 | 0.37 | -0.3256 | 0.47 | 78.31 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 12.7 | 0.80 | -0.0536 | 0.88 | 90.51 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 11.5 | 0.54 | -0.1825 | 0.66 | 82.21 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 13.4 | 0.92 | 0.0160 | 1.04 | 88.66 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | YP | 020 | 8.4 | 0.33 | -0.5206 | 0.30 | 109.42 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 6.5 | 0.09 | -0.9234 | 0.12 | 75.45 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 7.3 | 0.14 | -0.7727 | 0.17 | 82.95 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 7.8 | 0.20 | -0.6866 | 0.21 | 97.20 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 8.1 | 0.21 | -0.6376 | 0.23 | 91.17 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 1 | 1 | 2 | S | | | RB | 001 | 7.5 | 0.13 | -0.7376 | 0.18 | 71.04 | |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 2 | 1 | 9 | T | | 1/4 inch trap | | | | | | | | 22 RB, 1050 Fatheads, 95 YOY YP, 2 Sticklebacks, 50 Lake Chubs |
| Lake Shel-oole | 148935 | 7 | 14 | 1995 | 3 | 1 | 9 | T | | 1/2 inch trap | | | | | | | | 10 RB |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 1 | 1 | 9 | T | | 1/4 inch trap | RB | 001 | 14.4 | 1.20 | 0.1095 | 1.29 | 93.26 | 1 AD WSU, 15 YRL & AD YP, @ 250 Fathead minnows, 25 Brook Sticklebacks, 10 Lakechubs |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | RB | 001 | 16.6 | 1.80 | 0.2941 | 1.97 | 91.44 | 65 YP, 1 Painted Box Turtle |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | RB | 001 | 17.3 | 2.08 | 0.3478 | 2.23 | 93.39 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.6 | 0.25 | -0.6610 | 0.22 | 114.53 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.7 | 0.28 | -0.6426 | 0.23 | 122.97 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.9 | 0.30 | -0.6067 | 0.25 | 121.28 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.1 | 0.24 | -0.7564 | 0.18 | 136.98 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.4 | 0.26 | -0.6984 | 0.20 | 129.82 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.2 | 0.33 | -0.5544 | 0.28 | 118.28 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.5 | 0.40 | -0.5040 | 0.31 | 127.65 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.2 | 0.28 | -0.5544 | 0.28 | 100.36 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.9 | 0.30 | -0.6067 | 0.25 | 121.28 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 6.5 | 0.15 | -0.8803 | 0.13 | 113.86 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 12.7 | 1.18 | 0.0593 | 1.15 | 102.94 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 11.6 | 0.84 | -0.0678 | 0.86 | 98.19 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.2 | 0.30 | -0.5544 | 0.28 | 107.52 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.8 | 0.24 | -0.6245 | 0.24 | 101.10 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.2 | 0.28 | -0.5544 | 0.28 | 100.36 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 7.5 | 0.20 | -0.6796 | 0.21 | 95.63 | |
| Lake Shel-oole | 148935 | 6 | 18 | 1996 | 2 | 1 | 9 | T | | 1 inch trap | YP | 020 | 8.1 | 0.27 | -0.5716 | 0.27 | 100.68 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 8.6 | 0.31 | -0.4876 | 0.33 | 95.26 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 8.5 | 0.33 | -0.5040 | 0.31 | 105.32 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 9.2 | 0.40 | -0.3930 | 0.40 | 98.86 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 8.7 | 0.39 | -0.4714 | 0.34 | 115.46 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 8.6 | 0.37 | -0.4876 | 0.33 | 113.70 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 7.1 | 0.20 | -0.7564 | 0.18 | 114.15 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 8.8 | 0.31 | -0.4553 | 0.35 | 88.45 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 7.8 | 0.26 | -0.6245 | 0.24 | 109.52 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | YP | 020 | 6.8 | 0.21 | -0.8170 | 0.15 | 137.79 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 10.8 | 0.40 | -0.2641 | 0.54 | 73.47 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 11.5 | 0.49 | -0.1825 | 0.66 | 74.59 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 10.3 | 0.35 | -0.3256 | 0.47 | 74.08 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 11.5 | 0.42 | -0.1825 | 0.66 | 63.94 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 11.2 | 0.36 | -0.2168 | 0.61 | 59.31 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 12.4 | 0.58 | -0.0847 | 0.82 | 70.49 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | RB | 001 | 11.6 | 0.50 | -0.1713 | 0.67 | 74.17 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | WSU | 057 | 14.7 | 1.54 | 0.1499 | 1.41 | 109.05 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | WSU | 057 | 16.0 | 1.85 | 0.2581 | 1.81 | 102.11 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | WSU | 057 | 15.1 | 1.56 | 0.1842 | 1.53 | 102.08 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | WSU | 057 | 16.2 | 1.83 | 0.2740 | 1.88 | 97.38 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 2 | 1 | 2 | S | South of Tree Island in Middle of Reservoir | WSU | 057 | 13.7 | 1.06 | 0.0600 | 1.15 | 92.33 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.3 | 0.35 | -0.3778 | 0.42 | 83.53 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.8 | 0.30 | -0.4553 | 0.35 | 85.59 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.1 | 0.18 | -0.7564 | 0.18 | 102.73 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.9 | 0.16 | -0.7965 | 0.16 | 100.15 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.6 | 0.15 | -0.8589 | 0.14 | 108.38 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.4 | 0.37 | -0.3628 | 0.43 | 85.31 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.5 | 0.20 | -0.6796 | 0.21 | 95.63 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.8 | 0.15 | -0.8170 | 0.15 | 98.42 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.0 | 0.18 | -0.7763 | 0.17 | 107.55 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.1 | 0.18 | -0.7564 | 0.18 | 102.73 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.6 | 0.15 | -0.8589 | 0.14 | 108.38 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.2 | 0.17 | -0.7368 | 0.18 | 92.74 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.4 | 0.19 | -0.6984 | 0.20 | 94.87 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.5 | 0.21 | -0.6796 | 0.21 | 100.41 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.0 | 0.17 | -0.7763 | 0.17 | 101.57 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.4 | 0.19 | -0.6984 | 0.20 | 94.87 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.8 | 0.15 | -0.8170 | 0.15 | 98.42 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.9 | 0.23 | -0.6067 | 0.25 | 92.98 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.3 | 0.19 | -0.7175 | 0.19 | 99.13 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.8 | 0.15 | -0.8170 | 0.15 | 98.42 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.3 | 0.27 | -0.5374 | 0.29 | 93.06 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.0 | 0.16 | -0.7763 | 0.17 | 95.60 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.6 | 0.14 | -0.8589 | 0.14 | 101.16 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.2 | 0.40 | -0.3930 | 0.40 | 98.86 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.3 | 0.17 | -0.7175 | 0.19 | 88.70 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.7 | 0.45 | -0.3187 | 0.48 | 93.74 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.5 | 0.36 | -0.3480 | 0.45 | 80.21 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.5 | 0.32 | -0.5040 | 0.31 | 102.12 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 4.9 | 0.06 | -1.2767 | 0.05 | 113.45 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.8 | 0.24 | -0.6245 | 0.24 | 101.10 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.2 | 0.19 | -0.7368 | 0.18 | 103.65 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.9 | 0.15 | -0.7965 | 0.16 | 93.89 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.8 | 0.16 | -0.8170 | 0.15 | 104.98 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.6 | 0.30 | -0.4876 | 0.33 | 92.19 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.0 | 0.17 | -0.7763 | 0.17 | 101.57 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 10.6 | 0.53 | -0.1943 | 0.64 | 82.90 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.4 | 0.39 | -0.3628 | 0.43 | 89.92 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.0 | 0.34 | -0.4238 | 0.38 | 90.21 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.0 | 0.34 | -0.4238 | 0.38 | 90.21 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.2 | 0.17 | -0.7368 | 0.18 | 92.74 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.6 | 0.22 | -0.6610 | 0.22 | 100.78 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.5 | 0.22 | -0.6796 | 0.21 | 105.19 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.6 | 0.21 | -0.6610 | 0.22 | 96.20 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.4 | 0.40 | -0.3628 | 0.43 | 92.23 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.0 | 0.32 | -0.4238 | 0.38 | 84.91 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.6 | 0.27 | -0.4876 | 0.33 | 82.97 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.3 | 0.16 | -0.7175 | 0.19 | 83.48 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.4 | 0.41 | -0.3628 | 0.43 | 94.53 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.8 | 0.50 | -0.3043 | 0.50 | 100.77 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.7 | 0.30 | -0.4714 | 0.34 | 88.81 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.6 | 0.27 | -0.4876 | 0.33 | 82.97 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.0 | 0.31 | -0.4238 | 0.38 | 82.25 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.5 | 0.26 | -0.5040 | 0.31 | 82.98 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.7 | 0.30 | -0.4714 | 0.34 | 88.81 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 10.1 | 0.45 | -0.2620 | 0.55 | 82.27 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.6 | 0.31 | -0.3333 | 0.46 | 66.78 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.3 | 0.18 | -0.7175 | 0.19 | 93.92 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.1 | 0.34 | -0.4083 | 0.39 | 87.05 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.7 | 0.30 | -0.4714 | 0.34 | 88.81 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.6 | 0.46 | -0.3333 | 0.46 | 99.09 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.0 | 0.32 | -0.4238 | 0.38 | 84.91 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.6 | 0.39 | -0.3333 | 0.46 | 84.01 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 6.8 | 0.14 | -0.8170 | 0.15 | 91.86 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 9.6 | 0.38 | -0.3333 | 0.46 | 81.86 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 8.7 | 0.29 | -0.4714 | 0.34 | 85.85 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | YP | 020 | 7.3 | 0.17 | -0.7175 | 0.19 | 88.70 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.5 | 0.70 | -0.0742 | 0.84 | 83.05 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.8 | 0.80 | -0.0434 | 0.90 | 88.42 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.1 | 0.60 | -0.1165 | 0.76 | 78.46 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.5 | 0.67 | -0.0742 | 0.84 | 79.49 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.7 | 0.71 | -0.0536 | 0.88 | 80.33 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.0 | 0.62 | -0.1272 | 0.75 | 83.11 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.5 | 0.54 | -0.1825 | 0.66 | 82.21 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.2 | 0.48 | -0.2168 | 0.61 | 79.08 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.6 | 0.50 | -0.1713 | 0.67 | 74.17 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.1 | 0.40 | -0.2285 | 0.59 | 67.69 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.4 | 0.45 | -0.1939 | 0.64 | 70.32 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.6 | 0.52 | -0.1713 | 0.67 | 77.14 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.6 | 0.50 | -0.1713 | 0.67 | 74.17 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 12.1 | 0.54 | -0.1165 | 0.76 | 70.61 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.3 | 0.44 | -0.2053 | 0.62 | 70.59 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.7 | 0.55 | -0.1601 | 0.69 | 79.52 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 10.7 | 0.40 | -0.2761 | 0.53 | 75.54 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 10.1 | 0.32 | -0.3511 | 0.45 | 71.82 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 11.4 | 0.46 | -0.1939 | 0.64 | 71.88 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | RB | 001 | 10.7 | 0.40 | -0.2761 | 0.53 | 75.54 |
| Lake Shel-oole | 148935 | 5 | 30 | 2012 | 3 | 1 | 2 | S | Mouth of West Thumb Set SE to NW | WSU | 057 | 16.1 | 2.10 | 0.2661 | 1.85 | 113.80 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 9 | T | E End of Dam off Point Just N of Channel | YP | 020 | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 9 | T | E End of Dam off Point Just N of Channel | crayfish | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 9 | T | S Shore 50 yds W of Old Dead Trees | YP | 020 | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 9 | T | S Shore 50 yds W of Old Dead Trees | crayfish | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.5 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 9.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.5 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 9.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.5 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.5 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 9.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.5 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 7.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 9.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 8.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.0 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.3 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.7 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 9.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.4 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.2 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.1 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.6 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 9.0 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 9.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 9.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.1 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.4 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.1 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 5.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 9.0 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 6.0 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.1 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.6 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.09 | -1.0401 | 0.09 | 98.71 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.11 | -1.0161 | 0.10 | 114.17 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.8 | 0.12 | -0.8170 | 0.15 | 78.74 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | 0.12 | -0.9926 | 0.10 | 117.96 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.11 | -1.0401 | 0.09 | 120.65 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.08 | -1.0401 | 0.09 | 87.74 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.12 | -1.0894 | 0.08 | 147.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.10 | -1.0401 | 0.09 | 109.68 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.08 | -0.9694 | 0.11 | 74.55 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.09 | -1.0161 | 0.10 | 93.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.08 | -1.0161 | 0.10 | 83.03 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.07 | -1.0894 | 0.08 | 85.99 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.3 | 0.12 | -0.9241 | 0.12 | 100.77 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.07 | -1.0401 | 0.09 | 76.78 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.09 | -1.0894 | 0.08 | 110.56 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.10 | -0.9694 | 0.11 | 93.19 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.14 | -1.0401 | 0.09 | 153.55 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.12 | -0.9694 | 0.11 | 111.83 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.10 | -0.9694 | 0.11 | 93.19 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.08 | -1.0401 | 0.09 | 87.74 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.4 | 0.08 | -1.1404 | 0.07 | 110.52 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | 0.08 | -0.9926 | 0.10 | 78.64 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.10 | -1.0645 | 0.09 | 116.02 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.09 | -0.9694 | 0.11 | 83.87 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.0 | 0.14 | -0.7763 | 0.17 | 83.65 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.09 | -1.0161 | 0.10 | 93.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.06 | -1.0645 | 0.09 | 69.61 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.10 | -1.0161 | 0.10 | 103.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.05 | -1.0401 | 0.09 | 54.84 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.09 | -1.0161 | 0.10 | 93.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.09 | -1.0401 | 0.09 | 98.71 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | 0.08 | -0.9926 | 0.10 | 78.64 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.09 | -1.0645 | 0.09 | 104.42 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.09 | -1.0645 | 0.09 | 104.42 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.09 | -0.9694 | 0.11 | 83.87 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.08 | -1.0161 | 0.10 | 83.03 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.3 | 0.10 | -0.9241 | 0.12 | 83.97 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.08 | -1.0161 | 0.10 | 83.03 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | 0.11 | -0.9694 | 0.11 | 102.51 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.5 | 0.12 | -0.8803 | 0.13 | 91.09 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.3 | 0.12 | -0.9241 | 0.12 | 100.77 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.4 | 0.10 | -0.9020 | 0.13 | 79.81 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.08 | -1.0645 | 0.09 | 92.81 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.2 | 0.15 | -0.7368 | 0.18 | 81.83 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.3 | 0.10 | -0.9241 | 0.12 | 83.97 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | 0.08 | -0.9926 | 0.10 | 78.64 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.2 | 0.10 | -0.9466 | 0.11 | 88.42 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.2 | 0.09 | -0.9466 | 0.11 | 79.58 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.10 | -1.0161 | 0.10 | 103.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.10 | -1.0645 | 0.09 | 116.02 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.2 | 0.20 | -0.7368 | 0.18 | 109.11 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.08 | -1.0645 | 0.09 | 92.81 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.07 | -1.0401 | 0.09 | 76.78 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.8 | 0.14 | -0.8170 | 0.15 | 91.86 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | 0.08 | -1.1146 | 0.08 | 104.16 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.3 | 0.23 | -0.5374 | 0.29 | 79.27 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.2 | 0.11 | -0.9466 | 0.11 | 97.27 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.4 | 0.06 | -1.1404 | 0.07 | 82.89 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.08 | -1.0645 | 0.09 | 92.81 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | 0.06 | -1.1146 | 0.08 | 78.12 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.08 | -1.0894 | 0.08 | 98.27 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.1 | 0.24 | -0.5716 | 0.27 | 89.50 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | 0.09 | -0.9926 | 0.10 | 88.47 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | 0.08 | -1.0645 | 0.09 | 92.81 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.6 | 0.17 | -0.6610 | 0.22 | 77.88 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | 0.26 | -0.5040 | 0.31 | 82.98 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.3 | 0.10 | -0.9241 | 0.12 | 83.97 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.10 | -1.0161 | 0.10 | 103.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | 0.09 | -1.1146 | 0.08 | 117.18 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.08 | -1.0894 | 0.08 | 98.27 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | 0.09 | -1.1146 | 0.08 | 117.18 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.0 | 0.19 | -0.5890 | 0.26 | 73.75 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.7 | 0.20 | -0.6426 | 0.23 | 87.83 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.09 | -1.0161 | 0.10 | 93.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.9 | 0.20 | -0.6067 | 0.25 | 80.85 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.6 | 0.26 | -0.4876 | 0.33 | 79.90 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.08 | -1.0894 | 0.08 | 98.27 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.2 | 0.25 | -0.5544 | 0.28 | 89.60 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | 0.07 | -1.1146 | 0.08 | 91.14 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.10 | -1.0401 | 0.09 | 109.68 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.2 | 0.24 | -0.5544 | 0.28 | 86.02 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.2 | 0.19 | -0.7368 | 0.18 | 103.65 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.8 | 0.21 | -0.6245 | 0.24 | 88.46 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.10 | -1.0401 | 0.09 | 109.68 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.7 | 0.27 | -0.4714 | 0.34 | 79.93 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.6 | 0.20 | -0.6610 | 0.22 | 91.62 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.7 | 0.21 | -0.6426 | 0.23 | 92.23 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.4 | 0.20 | -0.6984 | 0.20 | 99.86 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.10 | -1.0161 | 0.10 | 103.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.8 | 0.22 | -0.6245 | 0.24 | 92.67 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | 0.08 | -1.0894 | 0.08 | 98.27 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.4 | 0.24 | -0.5206 | 0.30 | 79.58 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.0 | 0.24 | -0.5890 | 0.26 | 93.16 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.8 | 0.09 | -1.0401 | 0.09 | 98.71 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.1 | 0.24 | -0.5716 | 0.27 | 89.50 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.2 | 0.25 | -0.5544 | 0.28 | 89.60 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.5 | 0.22 | -0.6796 | 0.21 | 105.19 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | 0.10 | -1.0161 | 0.10 | 103.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.7 | 0.22 | -0.6426 | 0.23 | 96.62 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.0 | 0.24 | -0.5890 | 0.26 | 93.16 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.3 | 0.26 | -0.5374 | 0.29 | 89.61 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.2 | 0.12 | -0.9466 | 0.11 | 106.11 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.6 | 0.30 | -0.4876 | 0.33 | 92.19 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.4 | 0.28 | -0.5206 | 0.30 | 92.84 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.5 | 0.21 | -0.6796 | 0.21 | 100.41 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.6 | 0.21 | -0.6610 | 0.22 | 96.20 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.6 | 0.22 | -0.6610 | 0.22 | 100.78 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.9 | 0.22 | -0.6067 | 0.25 | 88.94 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.0 | 0.32 | -0.4238 | 0.38 | 84.91 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.0 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.6 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.0 | 0.38 | -0.4238 | 0.38 | 100.83 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.7 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.4 | 0.43 | -0.3628 | 0.43 | 99.14 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.6 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.6 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.0 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.1 | 0.38 | -0.4083 | 0.39 | 97.29 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.4 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.1 | 0.36 | -0.4083 | 0.39 | 92.17 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.2 | 0.41 | -0.3930 | 0.40 | 101.33 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.7 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.6 | 0.38 | -0.3333 | 0.46 | 81.86 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.1 | 0.38 | -0.4083 | 0.39 | 97.29 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.6 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 6.1 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 10.1 | 0.49 | -0.2620 | 0.55 | 89.59 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 10.2 | 0.49 | -0.2482 | 0.56 | 86.78 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.1 | 0.38 | -0.4083 | 0.39 | 97.29 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.3 | 0.40 | -0.3778 | 0.42 | 95.47 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.8 | 0.40 | -0.3043 | 0.50 | 80.61 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.2 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.4 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.7 | 0.48 | -0.3187 | 0.48 | 99.99 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.5 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 7.3 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 5.9 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.8 | | | | |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 9.0 | 0.35 | -0.4238 | 0.38 | 92.87 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 11.2 | 0.64 | -0.1170 | 0.76 | 83.79 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 11.1 | 0.56 | -0.1296 | 0.74 | 75.47 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 11.0 | 0.58 | -0.1423 | 0.72 | 80.49 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 14.0 | 1.2 | 0.1960 | 1.57 | 76.42 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 14.7 | 1.25 | 0.2644 | 1.84 | 67.99 |
| Lake Shel-oole | 148935 | 5 | 7 | 2019 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | WSU | 057 | 16.6 | 2.00 | 0.3051 | 2.02 | 99.06 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | 1 | 1 | 2 | S | Set E to W Parallel to Dam | YP | 020 | 6.4 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | 2 | 1 | 2 | S | Middle Lake Centered of Boat Ramp Fence and Far Bay | YP | 020 | 7.7 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | 3 | 1 | 2 | S | E Side at Mouth of Bay E End Starting @ N Shore Dead Tree | YP | 020 | 8.3 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.3 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.0 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 8.0 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | 30 additional fish caught in 30 mins w/ 2 poles | YP | 020 | 7.2 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.5 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | fish randomly measured from 3 nets | YP | 020 | 8.1 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.1 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | 3 nets set for 1 hr | YP | 020 | 7.1 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.2 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | 60 fish killed for fish health | YP | 020 | 5.7 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.1 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.3 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.2 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 5.7 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.2 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.8 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.8 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 5.9 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.7 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 5.8 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.3 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.7 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.2 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.3 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 7.9 | | | | | |
| Lake Shel-oole | 148935 | 9 | 22 | 2020 | | | | | | YP | 020 | 6.9 | | | | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | YP Transfer - Sheloole to Wadsworth Pond | YP | 020 | 6.3 | 0.09 | -0.9241 | 0.12 | 75.57 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.7 | 0.2 | -0.6426 | 0.23 | 87.83 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.9 | 0.12 | -0.7965 | 0.16 | 75.11 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.7 | 0.16 | -0.6426 | 0.23 | 70.27 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.6 | 0.14 | -0.6610 | 0.22 | 64.14 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.3 | 0.12 | -0.7175 | 0.19 | 62.61 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.2 | 0.12 | -0.7368 | 0.18 | 65.46 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.0 | 0.10 | -0.9926 | 0.10 | 98.30 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 5.8 | 0.10 | -1.0401 | 0.09 | 109.68 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.6 | 0.10 | -0.8589 | 0.14 | 72.26 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.2 | 0.12 | -0.7368 | 0.18 | 65.46 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.9 | 0.20 | -0.6067 | 0.25 | 80.85 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 8.0 | 0.20 | -0.5890 | 0.26 | 77.63 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.6 | 0.18 | -0.6610 | 0.22 | 82.46 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.2 | 0.12 | -0.7368 | 0.18 | 65.46 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.2 | 0.14 | -0.7368 | 0.18 | 76.37 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.7 | 0.15 | -0.6426 | 0.23 | 65.88 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.5 | 0.16 | -0.6796 | 0.21 | 76.50 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.7 | 0.10 | -0.8378 | 0.15 | 68.83 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.7 | 0.18 | -0.6426 | 0.23 | 79.05 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 8.3 | 0.22 | -0.5374 | 0.29 | 75.82 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.9 | 0.22 | -0.6067 | 0.25 | 88.94 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.9 | 0.22 | -0.6067 | 0.25 | 88.94 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.7 | 0.18 | -0.6426 | 0.23 | 79.05 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.6 | 0.16 | -0.6610 | 0.22 | 73.30 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.1 | 0.10 | -0.9694 | 0.11 | 93.19 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.2 | 0.08 | -0.9466 | 0.11 | 70.74 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.6 | 0.14 | -0.6610 | 0.22 | 64.14 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.5 | 0.12 | -0.8803 | 0.13 | 91.09 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 8.2 | 0.21 | -0.5544 | 0.28 | 75.27 | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 6.7 | | -0.8378 | 0.15 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.4 | | -0.6984 | 0.20 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.5 | | -0.6796 | 0.21 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 1 | 1 | 9 | T | | YP | 020 | 7.1 | | -0.7564 | 0.18 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 3 | 1 | 9 | T | | RB | 001 | 11.9 | | -0.1381 | 0.73 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 3 | 1 | 9 | T | | RB | 001 | 11.5 | | -0.1825 | 0.66 | | |
| Lake Shel-oole | 148935 | 3 | 23 | 2021 | 3 | 1 | 9 | T | | RB | 001 | 15.0 | | 0.1625 | 1.45 | | |
| Lake Shel-oole | 148935 | | | | | | | | | | | | | | | | 127.85 lbs of fi |
| Lake Shel-oole | 148935 | | | | | | | | | | | | | | | | 897 total fish m |

APPENDIX B

Biotic Index Chart

| CLASS I (Pollution Intolerant) | Biotic Value | Number Found | |
|---|---|---|---|
| Stonefly nymph | 10 | x | = |
| Mayfly nymph | 10 | x | = |
| Dobsonfly larva | 10 | x | = |
| Caddisfly larva | 10 | x | = |
| Riffle beetle | 10 | x | = |
| Water penny | 10 | x | = |

TOTAL for CLASS I

| CLASS II (Somewhat Pollution Tolerant) | Biotic Value | Number Found | |
|---|---|---|---|
| Beetle larva | 8 | x | = |
| Sowbug | 8 | x | = |
| Scud | 6 | x | = |
| Clams, Mussels | 6 | x | = |
| Crayfish | 6 | x | = |
| Cranefly larva | 6 | x | = |
| Dragonfly nymph | 6 | x | = |
| Damselfly nymph | 6 | x | = |
| Black fly larva | 6 | x | = |

TOTAL for CLASS II

| CLASS III (Pollution Tolerant) | Biotic Value | Number Found | |
|---|---|---|---|
| Midge fly larva | 5 | x | = |
| Snails | 4 | x | = |
| Leech | 2 | x | = |
| Aquatic worms | 0 | x | = |

TOTAL for CLASS II

TOTAL for ALL CLASSES

÷

10

=

Biotic Index

Based on the Biotic Index, the water quality in this location is

______________

| Water Quality | Biotic Index |
|---|---|
| Excellent | >80 |
| Good | 60-79 |
| Fair | 40-59 |
| Poor | <40 |

# APPENDIX C

## Building a Plankton Net

Visit to an Ocean Planet

### BUILDING A PLANKTON NET

#### OVERVIEW

Students will build a simple *plankton* net from a nylon stocking, then (optionally) use it to collect plankton in ponds, lakes, streams, bays, oceans, or even aquariums.

#### CONCEPTS

- Plankton are floating or drifting plants and animals, generally microscopic, that live near the surface of the ocean or other bodies of water.
- Scientists must use special equipment to gather plankton.

#### MATERIALS

- Microscope (optional)

For each net:

- Thin wire, 50 cm (20 in) in length
- Duct tape
- Electrical tape (optional)
- Nylon stocking or a leg cut from panty hose
- Heavy thread and needle
- Small bottle
- String
- Scissors
- Key ring
- Image of completed plankton net

#### PREPARATION

The activity outlines the construction of a simple plankton net. The students can work in groups, pairs, or alone. Have them bring in the materials that they will need. They may wish to use knee-high stockings. If so, they need to make the wire circle smaller. Make a net to use as a display to help guide the students' construction.

You may choose to tow for plankton in ponds, lakes, streams, bays, oceans, even aquariums. Although you can buy plankton nets from science supply stores, it is cheaper and more fun to have the students make them. Ideally, you could organize a field trip once your nets are finished to gather plankton.

There are several methods that you can use to tow for plankton. The standard method involves pulling the net behind a slowly moving boat. Lower the net vertically into the water until the bottle (at the end of the net) is filled with water. Then pull until the net is extended and begin to tow. After a few minutes, bring the net in and let it hang for a few minutes. Wash all the plankton into the bottle by running fresh water from the outside of the net. You will capture more plankton if the boat moves slowly. If a boat is not available, you can tow the net as you walk along a dock. You can also throw the net from a bridge or a pier into a fast-moving current.

**PROCEDURE**

**Engagement**

Plankton are the plants and animals that drift on the ocean's currents and in lakes and rivers. They are abundant is the surface waters where sunlight and nutrients are readily available. *Phytoplankton* are the microscopic plants that convert sunlight and nutrients to starch and other organic matter.

In this activity, you will make a simple plankton net from wire and a nylon stocking [Fig. 1]. The net is a funnel-shaped, fine-mesh net that is towed through the water.

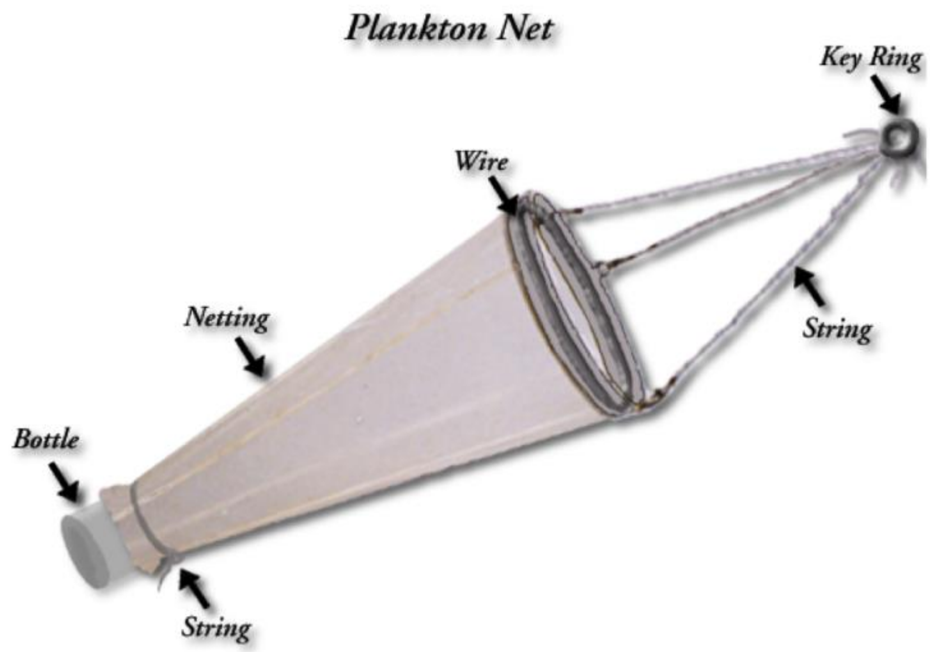


Figure 1. **Plankton net construction**. A simple net can be constructed to capture microscopic plankton. The net is towed using a key ring and three strands of string which are tied onto a wire hoop. The hoop itself holds open a cylinder of fine mesh netting, shaped like a wind sock. The bottom of the plankton net is bound to a plastic bottle with a string. After the net is pulled through seawater, the particles which do not pass through the net will be concentrated and trapped within the bottle.

**Activity**

1. Bend the wire into a circle and use the electrical tape or duct tape to fasten the loose ends together.
2. Roll the mouth of the stocking several times around the wire ring. Sew the stocking to the wire using the heavy thread and needle. Alternatively, use duct tape to secure the stocking all the way around the wire.
3. Cut off the foot of the stocking, and then place the end of the stocking around the outside of the mouth of a small bottle. Use a piece of heavy string to tie the stocking securely to the top of the bottle. Use duct tape to reinforce the connection between the bottle and string.
4. Cut three pieces of string, each about 50 cm long, to make the *bridle* to tow your net. Tie them at equal intervals around your ring. Tie the three loose ends of string to a key ring. This is the bridal ring. Your plankton net is complete [Fig. 1].
5. To tow for plankton, tie a length of string to your bridal ring and pull your net through the water. The plankton will collect in the bottle. Remove the bottle by untying the string. View your plankton through a microscope.
6. Why did we use nylon stockings as part of the net? What would happen if you made a plankton net out of burlap? Why is it important to use a fine mesh when constructing a plankton net?

**Explanation**

Plankton are the floating or drifting plants and animals that live in the ocean as well as in fresh water. Most can only be seen under a microscope, yet they are remarkably abundant in the world's ocean. It is estimated that phytoplankton, the plant forms of plankton, *photosynthesize* more than all other land and marine plants combined; some scientists place the figure at 90% of all photosynthesis on Earth. This means they also produce most of the oxygen breathed by humans and other animals.

Phytoplankton are also the basis of the ocean *food chain*. They are grazed upon by small *zooplankton* who are in turn, eaten by small fish and other zooplankton.

Since most plankton are barely visible to the unaided eye, scientists must use a special net to gather these small creatures. The plankton net is a funnel-shaped, fine-meshed net that is towed through the water. The net **concentrates** the plankton from hundreds of gallons of water that pass through it. Good plankton nets made from nylon or silk can cost between $300 and $800.

## Extension

During your experiment, you may want to collect another bottle (with known volume) of water without a plankton net. Filter this **non-concentrated** water sample and look at the plankton through a microscope. Compare the amount of plankton to the concentrated sample collected with the plankton net. Based on the volume of the non-concentrated sample, can students guess the volume of water that filtered through the plankton net?

Because plankton are the basis of the ocean food chain it is important to monitor natural as well as human-caused changes in plankton population. Students can adopt an area (lake, stream, or beach area) to monitor plankton concentrations over time. Try to discover which types of seasonal changes affect plankton population. What kind of non-natural processes might help or hurt plankton growth?

You can use plankton collected with these plankton nets in conjunction with the *Plankton Identification* activity.


## Links to Related CD Activities, Images, and Movies

Image of *Phytoplankton* and *Zooplankton*
Movie of *Plankton net from the R/V Sea Explorer*
Activity *Plankton Identification*

## Vocabulary

| | | |
|---|---|---|
| *bridle* | *food chain* | *photosynthesis* |
| *phytoplankton* | *plankton* | *zooplankton* |

## Source

Adapted from Kolb, James A. Project Director. Marine Science Center. Marine Science Project: FOR SEA. *Marine Biology and Oceanography, Grades Seven and Eight*. Poulsbo, WA. Page 341 - 344.

APPENDIX D

Bathymetric Map Building Lab

**Part 1: Sonar profiling using LUCKY Wireless Fish Finder**
**Water column and bathymetry (3D Map)**

**Learning outcomes**

This exercise will allow you to:
1. Select a target and design a sonar profiling survey.
2. Collect field data (with field being very broadly defined) using a fish finder.
3. Document your survey.
4. Complete a simple analysis of your data.
5. Communicate your findings.

**Equipment**

- **Lucky wireless fish finder**: Device specifically designed to find out the location of fish, depth and bottom contour of water. The unit can be used in ocean, river or lake. (Manual comes inside the fish finder box)

**Brief Background – How does sonar work?**

Sonar technology is based on sound waves. The system uses sonar to locate and define structure, bottom contour, and composition, as well as depth directly below the transducer. The transducer sends a sound wave signal and determines distance by measuring the time between the transmission of the sound wave and when the sound wave is reflected of an object. The sonar tool then uses the reflected signal to interpret location, size, and composition of an object.

**General considerations**

- Choose an accessible pond or lake to do the activity.
- Check the area of the water body so that enough data points can be acquired. We are expecting you to have at least **50 data point locations spaced between 5 to 10 meters**.
- In case you don't have direct access to a pond or lake, you can take bathymetry measurements in at least **4 different bridges**.
- Google Earth is a great tool for the field preliminary study. It allows you to discover near and accessible water bodies, draw some lines, polygons, and measure distance and area.
- Plan the acquisition survey and process ahead of time according to the area and perimeter of the water body. That will allow you to know exactly what other tools you will need in the field.
- Schedule the date and time to do the field work according to the weather and instrument availability. Make sure all the equipment works and charge it if needed. **You are expected to be on site between 6 to 8 hours in total.**
- Make sure to get familiar with the sonar device manual.

**Field work**

- Check the weather before heading to site.
- Make sure all the equipment is charged (Fishfinder and smartphone)
- Bring a field notebook and a pencil to report the acquired data.

- The idea is to collect bathymetry data (water column distances) with respect to X and Y location.
    - **Min of 50 data points (Figure 1)**
    - Use the compass app on smartphone to know the location
    - Datasheet (See example below)
- There are several ways to tackle this activity. Try to be as creative and efficient as possible. Here are some ideas:
    - Paddle / Kayak in a lake
    - Using a remote control boat
    - Two people and a rope
    - Bathymetry data collection alongside a bridge.
- Useful tools
    - Compass app in smartphone
    - Distance app in smartphone
    - Google Earth
- Document your field work with pictures or short video for your PPT file.

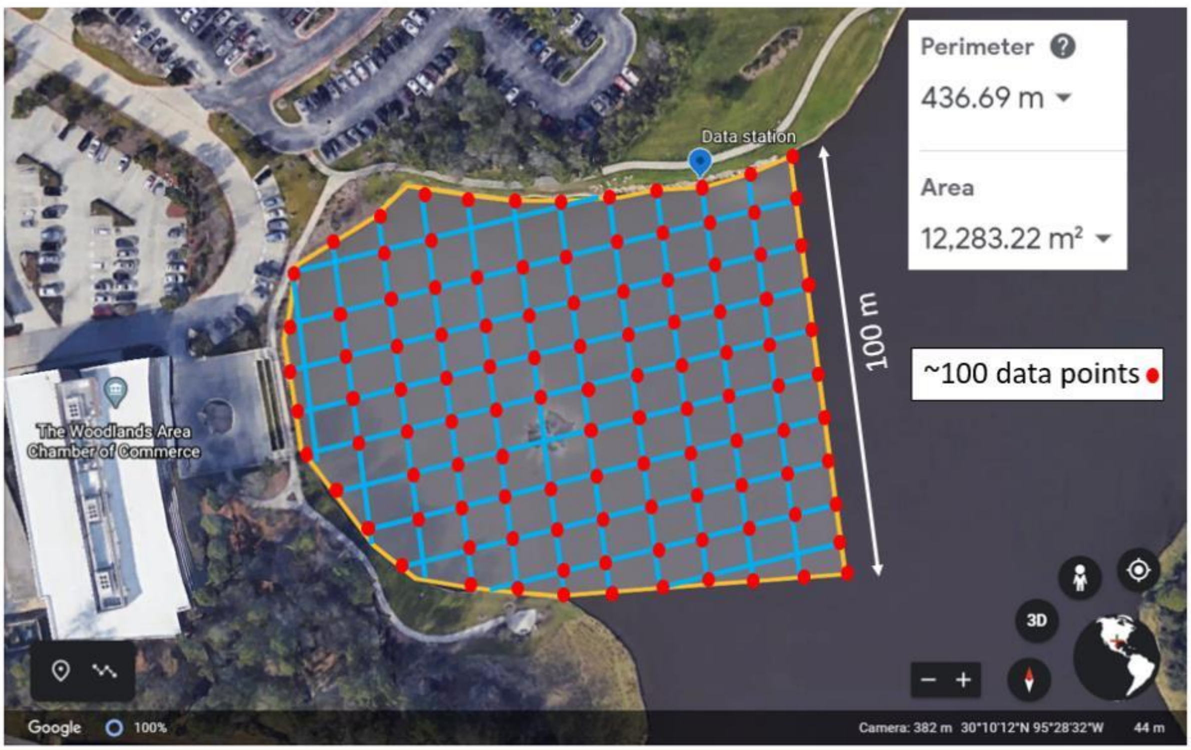


Figure 1: Example of data acquisition survey on Lake Woodlands, TX. Created in Google Earth Online

Data analysis

- **The idea is for you to construct contour maps showing the bathymetry at a particular location, using latitude, longitude, and depth data (Figure 2).**

- In case you acquire bathymetry data in four bridges, you should construct four different 2D depth profiles.
- Matlab is a great tool for mapping generation but we encourage you to use other languages / software packages if preferred.
- **At least three interpolation methods should be tested to compute depth and then compared for the analysis**. Matlab offers five interpolation methods for scattered data using the *griddata function*.
- The resulting maps should be properly georeferenced (North symbol, Longitude, Latitude or UTM coordinates)

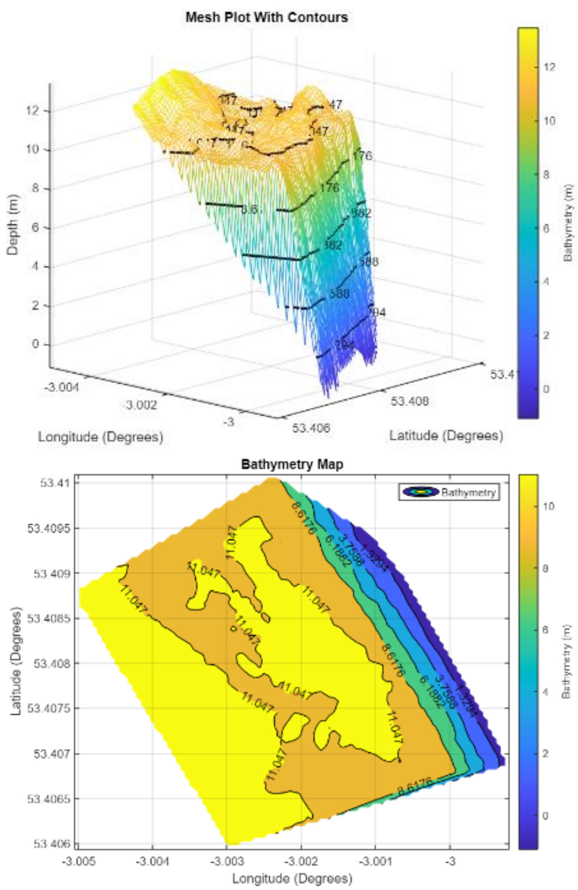

Figure 2. Examples of a 3D and 2D contour map showing bathymetry data at a particular location. (Refer to the Matlab mapping instructions uploaded to Blackboard)

**Questions**

1. What can you say about your data?
2. What is your site area?
3. Which interpolation method provides better representation of your particular bathymetry data? Which map makes more geological sense?
4. How do the final maps compare to your initial analysis and predictions?
5. Were there any potential field safety hazards? How did you take into account potential safety issues?

**Useful links**

- Google Earth
  - https://www.google.com/earth/
  - https://www.youtube.com/watch?v=-XcLcF-huCo
- Coordinates conversion website
  - http://www.rcn.montana.edu/resources/converter.aspx
- Matlab for bathymetric contour mapping (Or any other mapping tool available) (UH Students have access to Matlab Online for Free)
  - https://www.mathworks.com/academia/tah-portal/university-of-houston-972711.html

**Deliverables**

1. Field notes:
   - Survey sketch
   - Datasheet
2. Data and analysis:
   - Data comments
   - First look analysis
3. 5-slides report:

- Pictures or short video of the field work
  - Acquisition plan
  - Equipment
- Results
- Interpretation
- Recommendations

**Tips**

- Make sure to follow the security guidelines of the parks and natural sites that you visit.
- Stay hydrated.
- Keep some power food or snacks handy.
- The use of sunscreen, a hat, and bug repellent is recommended.

- Don’t leave any garbage on site. If possible, leave the site cleaner than how you found it.
- Remember to show the north symbol, latitude, longitude axis labels, and colorbar title in your maps.

**Activity 3: Sonar Profiling_ Datasheet**

Field Geophysicist (s): ________________________________

Date and time: ______________________________________

Weather: ___________________________________________

Equipment: _________________________________________

Bathymetry Datasheet

| Data Point # | X (Latitude) | Y (Longitude) | Bathymetry (m) | Comments |
|---|---|---|---|---|
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