Aquatic Invasive Species
Early Detection and Monitoring Program

Monitoring Report **2019**

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Abstract:

Annual report of aquatic invasive species sampling effort by Montana Fish, Wildlife, & Parks and partners for the 2019 sampling season

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The Montana Fish, Wildlife & Parks (FWP) Aquatic Invasive Species (AIS) Bureau implements an AIS Management Plan through coordination and collaboration, prevention of new AIS introductions, early detection and monitoring, control and eradication, and outreach and education. The goal of the AIS Management Plan is to minimize the harmful impacts of AIS through the prevention and management of AIS into, within, and from Montana.

I. Early Detection and Monitoring – Background

Early detection and monitoring are essential aspects of any effective aquatic invasive species program. Montana Fish, Wildlife, & Parks (FWP) implemented a statewide Aquatic Invasive Species (AIS) Early Detection and Monitoring Program in 2004. Early detection allows FWP biologists to locate small or source AIS populations, while monitoring allows FWP to study existing population trends and investigate suspect findings. FWP monitors for all aquatic invasive species, including zebra/quagga mussels (ZM/QM), Asian clams (AC), New Zealand mudsnails (NZMS), faucet snails (FS), Eurasian watermilfoil (EWM), flowering rush (FR), curlyleaf pondweed (CLPW), fragrant waterlily (FWL).

II. New for 2019

Canyon Ferry Delisting

Canyon Ferry Reservoir was listed as "suspect" for containing invasive Dreissenid mussels in 2016. Intense sampling began the fall of 2016 and continued for the last three years. Standards have been developed by the Western Regional Panel for Invasive Species that provide uniform guideline for delisting waterbodies following a dreissenid detection. These standards indicate that a "suspect" water can be delisted following 3 years of intensive monitoring with no dreissenid detections. From 2017 through 2019, shoreline surveys, plankton samples, environmental DNA (eDNA), SCUBA and snorkeling surveys, artificial substrate sampling, and mussel detection dogs yielded no dreissenid detections. Following the 2019 season and no further detections, FWP petitioned to remove mandatory inspections and decontaminations upon leaving the reservoir waters. Following a public comment period, a potential delisting will occur in February 2020. Similarly, after five years of sampling on Tiber Reservoir without any adults or additional veligers, its "Positive" classification will be dropped (potential delisting in 2022). FWP will continue to intensely sample the lake to looking for evidence of mussels and other AIS in the system.

FWP dive Team

Historically, FWP has used SCUBA diving as a confirmatory tool in aquatic invasive species detection using non-departmental dive teams that must be brought in and deployed. Dive teams such as the United States Fish and Wildlife Service (USFWS) are not always available, leading to delays in response. For this reason, an FWP dive team was created utilizing divers in the agency. This will provide a resource for agency needs including rapid response, AIS control, confirmatory searches, and special projects. Training and protocols have been completed and an active team will be available starting in the 2020 field season.

III. Early Detection and Monitoring Methods

Risk Assessment

FWP assesses risk for AIS introductions to waterbodies annually. Annual plans are dynamic due to constantly evolving variables used in determining risk. Sites are prioritized based upon variables such as previous years sampling efforts, water calcium levels, water quality data and information collected by FWP including, angler/boater pressure, boater movement data from watercraft inspection stations, monitoring conducted by other state and federal agencies, surface-water hydrology, and other assorted variables.

Figure 1: Pathogen testing in 2018 at Holter Lake during a fish spawning event.

Sampling Methods

Montana utilizes a variety of techniques in monitoring for AIS populations. FWP routinely monitors for all taxa while conducting standard monitoring. Since there are a variety of aquatic invasive species, different sampling techniques are used to increase the likelihood of early detection of each of these species. Sampling methods include the use of plankton nets, kick nets, plant rakes, shoreline surveys, visual surveys, artificial substrate samplers, rock picking, mussel detection dogs, eDNA, snorkeling, and SCUBA. All of Montana's monitoring methods are described in its monitoring standard operating procedures (Montana Fish, Widlife, & Parks, 2018) and have been scientifically reviewed, updated annually as needed, and are coordinated with partners and neighboring states.

Other Sampling efforts

AIS Sampling Prior to Fish Transfers

The movement of fish can be a vector for transferring AIS including species of plants, snails, clams, mussels and pathogens. FWP moves large numbers of fish through both its hatchery and wild fish transfer programs. Hatcheries cannot receive certification to sell or move fish without passing an AIS inspection and fish health inspection. To accomplish this, the FWP Fish Health Laboratory and the Aquatic Invasive Species Laboratory work closely together to inspect all federal, state and commercial hatcheries annually as well as waterbodies that fish biologists use for wild fish stock transfers. AIS inspections include both on-site AIS surveys and disease/pathogen testing in fish as discussed above. AIS program protocols include monitoring for all aquatic invasive species taxa whenever possible. Specifics about pathogen results can be obtained by contacting the Fish Health Coordinator, Ken Staigmiller (kstaigmiller@mt.gov).

Due to recent findings of New Zealand mudsnails in out-of-state hatcheries, FWP is conducting a review of hatchery sampling protocols and reviewing standard operating procedures for each individual facility

to ensure the highest probability of detection of new populations of invasive species. This plan will be implemented in the 2020 field sampling season.

Investigate Public Reporting of AIS

FWP investigates reports of invasive species. FWP offices often receive calls when a member of the public or other sampling entity finds an unusual or unknown organism. Samples are often brought to offices where regional staff will either identify them or send them to the AIS staff in Helena. If an organism can't be identified or verified, FWP staff will travel to the location to investigate the report.

IV. 2019 AIS Sampling Results

In 2019, FWP sampled 278 waterbodies in Montana. Most of these waters received all-taxa AIS surveys. Additional sampling details for Tiber Reservoir and Canyon Ferry Reservoir are available in Appendix A and Appendix B, respectively. For more specific information on individual waters or areas, send a specific information request to Craig McLane (cmclane@mt.gov) or download the survey data through FWP's GIS data page at http://gis-mtfwp.opendata.arcgis.com/datasets?q=AIS.

New Detections in 2019

In 2019, new detections of AIS included the following locations:

- Asian Clam
  - *Lake Elmo*
- New Zealand Mudsnails
  - *Bitterroot Fish Hatchery (first detection west of the Continental Divide)*
  - *Clark Canyon Reservoir*
  - *Rainbow Dam Reservoir*
- Faucet Snail
  - *Browns Lake*
- Curlyleaf pondweed
  - *USFS ponds on Slip n' Slide Creek near Gardner, MT (first detection within Yellowstone River drainage)*
  - *Bozeman Creek*
  - *Ester Lake*

Statewide Sampling Efforts

Figure 2 illustrates MT samples received and processed by the FWP lab in 2019. Samples are collected and submitted by FWP staff and partner entities. FWP is dedicated to working closely with partners around the state and developing new partnerships to encourage AIS sampling on a local level. Figure 3 illustrates the statewide emphasis on AIS monitoring, including sites for 2019. Most sampling sites include plankton sampling as well as all-taxa surveys looking for invasive plants, snails and other invertabrates. FWP surveys all high risk sites annually, with more frequent samples collected at highest

risk sites. Lower risk sites are visited less frequently depending on risk of AIS introduction. Figure 4 shows mussel veliger sampling effort by FWP and partners for each waterbody sampled in 2019. The program goal is to comprehensively monitor the state every year, which includes all types of waterbodies (lakes, reservoirs, ponds, creeks, rivers, etc.) and for all taxa.

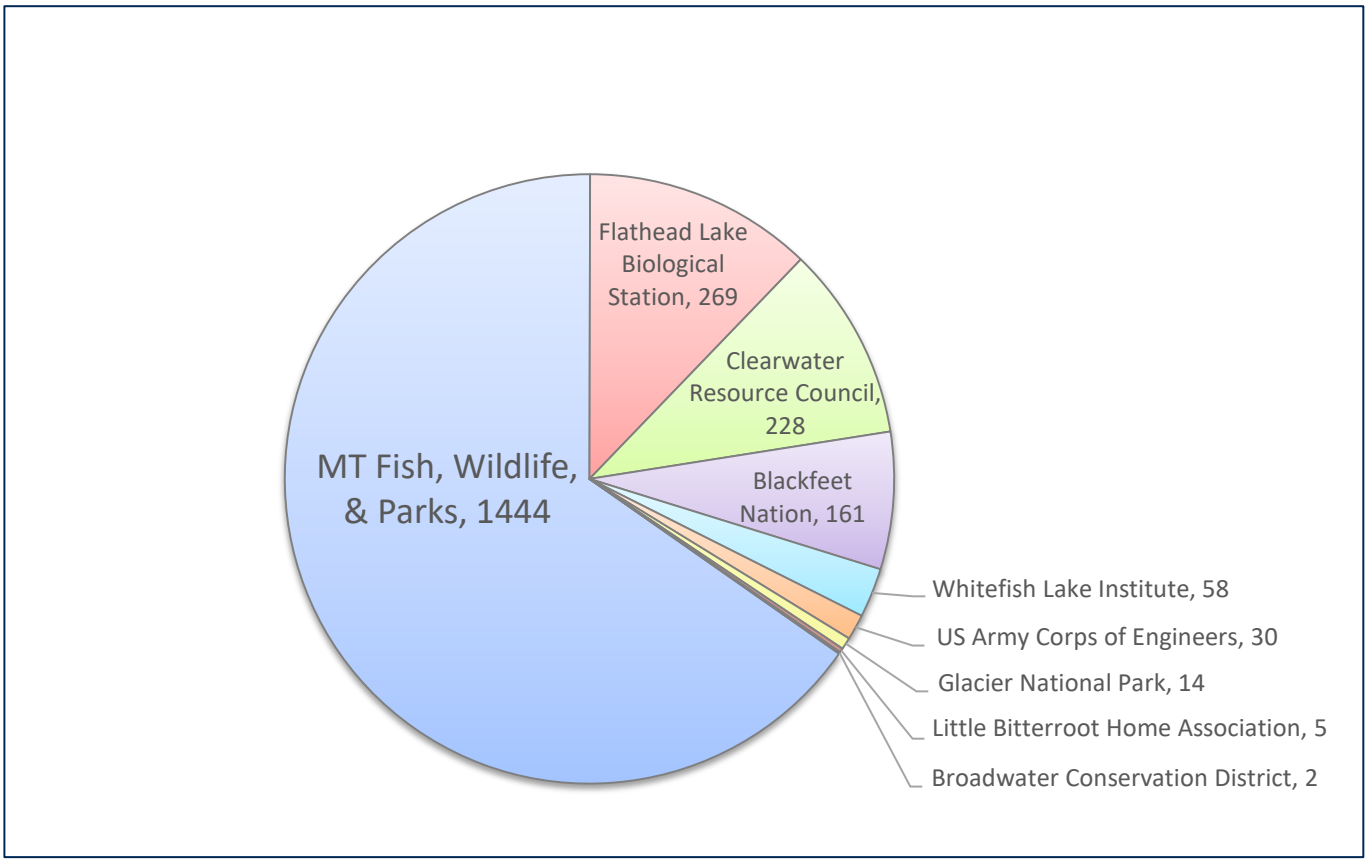


Figure 2: 2019 Aquatic Invasive Species Plankton Sampling Effort by All Reported Entities

Plankton sampling for ZM, QM, and AC veligers (microscopic larvae) has increased each year by FWP and volunteers but nearly tripled in recent years with the positive detection of mussel veligers in Tiber Reservoir and a suspect veliger detection in Canyon Ferry Reservoir. Partners are increasing efforts in invasive species detection as well.

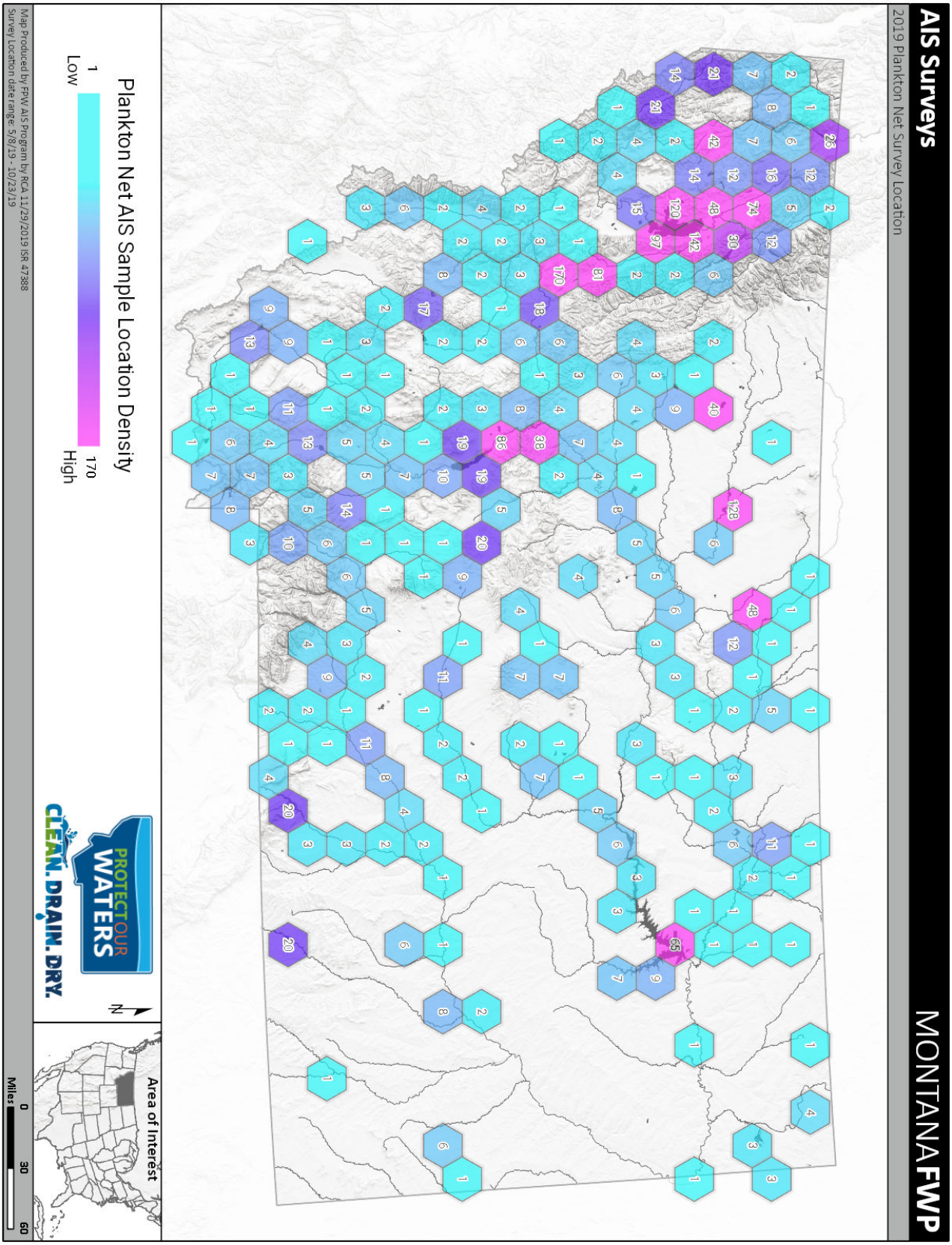


Figure 3: Map of AIS plankton sampling intensity, 2019

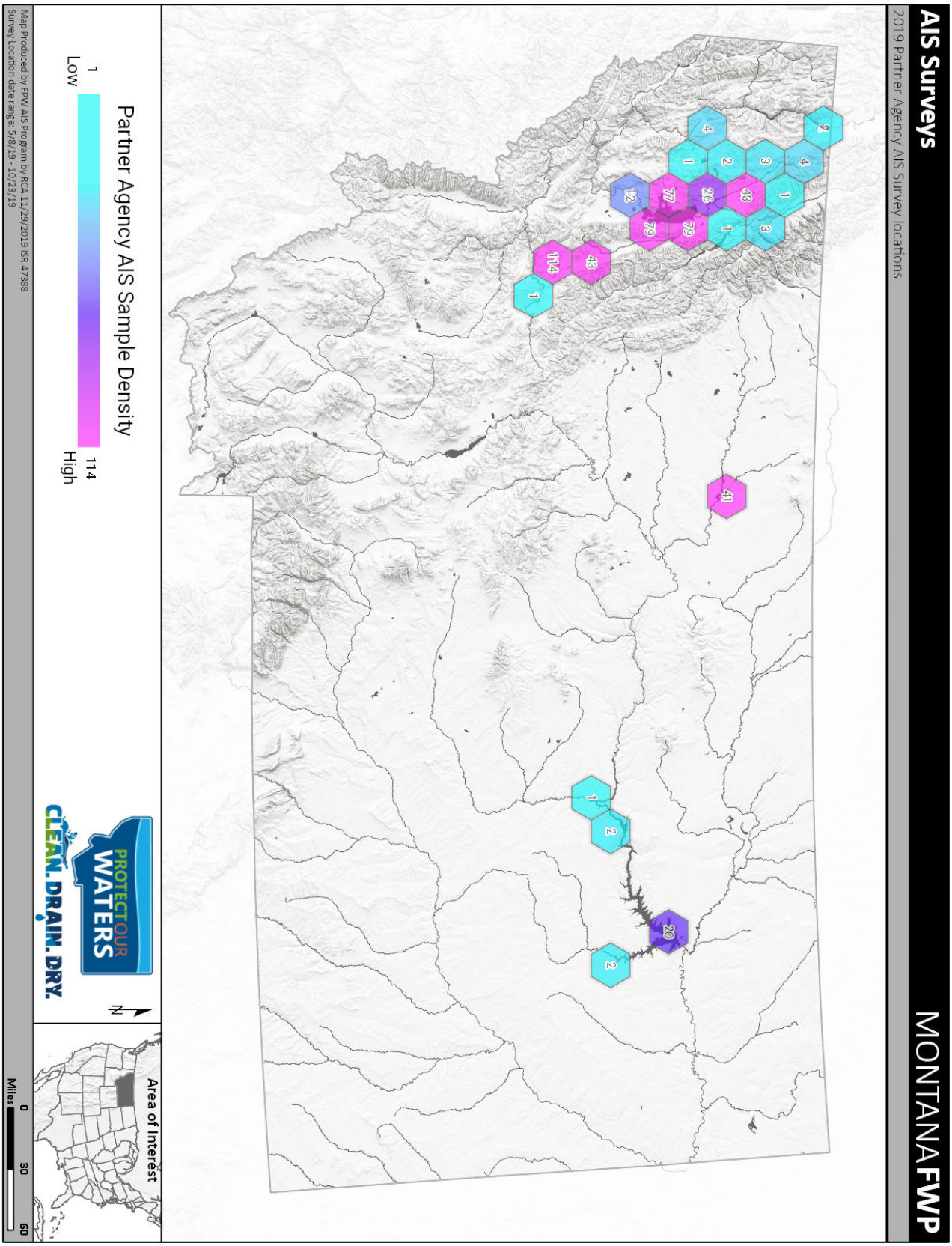


Figure 4: Mussel veliger sampling effort by partners in 2019. See Appendix A for sampling details for each waterbody.

The following tables show the locations of known AIS and the results from monitoring of those waters. Waters with no detections for a species in 2019 does not indicate that those lakes no longer have those species, but that none of that species were collected during sampling efforts. Locations details of AIS in MT can be found in Appendix C and Appendix D.

Dreissenid Mussels (Zebra mussels (Dreissena polymorpha) and Quagga Mussels (Dreissena bugensis)) and Asian Clam (Corbicula fluminea)

	Adult Dreissenid Mussels	Dreissenid Mussel Larvae (Plankton Sampling)	Dreissenid mussel eDNA	Adult Asian Clam	Asian Clam Larvae (Plankton Sampling)
Tiber Reservoir	NO	NO	NO	NO	NO
Canyon Ferry Reservoir	NO	NO	Not sampled	NO	NO
Other Statewide Locations	NO	NO	NO	YES - *New in 2019*	NO

Asian Clam (Corbicula fluminea)

Water body where historically found	Results of 2019 Sampling
Lake Elmo	YES

New Zealand mudsnails (Potamopyrgus antipodarum)

Water body where historically found	Results of 2019 Sampling
Beaverhead River	YES
Bighorn River	NO
Bluewater Creek	YES
Clark Canyon Reservoir	YES
Darlington Ditch 1	YES
Ennis Lake	YES
Gardner River	YES
Hauser Reservoir	YES
Jefferson River	NO
Madison River	YES

Water body where historically found	Results of 2019 Sampling
Missouri River (below Holter)	YES
Nelson Spring Cr	Not Sampled
Odell Creek	Not Sampled
Poindexter Slough	Not Sampled
Quake Lake	NO
Rainbow Dam Reservoir	YES
Ruby River	NO
Upper Holter Lake	YES
Yellowstone River	YES

Faucet snail (Bithynia tentaculata)

Water body where historically found	Results of 2019 Sampling
Browns Lake	YES
Georgetown Lake	YES
Lake Frances (New in 2018)	NO

Water body where historically found	Results of 2019 Sampling
McWennegar Slough	Not Sampled
Upsata Lake	YES

Eurasian watermilfoil (Myriophyllum spicatum)

Water body where historically found	Results of 2019 Sampling
Beaver Lake	YES
Cabinet Gorge Reservoir	YES
Clark Fork River (below Thompson Falls Reservoir)	YES
Fort Peck Dredge Cuts	YES
Fort Peck Lake	YES
Jefferson River	YES
Jefferson Slough	YES

Water body where historically found	Results of 2019 Sampling
Madison River (downstream of I-90)	YES
Missouri River (upstream of Canyon Ferry Res.)	YES
Missouri River (Downstream of Fort Peck Dam)	YES
Nelson Dredge	YES
Noxon Rapids Reservoir	YES
Pond 4 - Canyon Ferry	Not Surveyed

Curlyleaf Pondweed (Potamogeton crispus).

Water body where historically found	Results of 2019 Sampling
Beaverhead River	YES
Bitterroot River	YES
Blackfoot River	NO
Bozeman Creek	YES
Cabinet Gorge Reservoir	YES
Canyon Ferry Lake	YES
Clark Canyon Reservoir	NO
Clark Fork River	YES
East Gallatin River	YES
Ennis Lake	YES
Ester Lake	YES
Flathead Lake	YES
Flathead River	YES
Fort Peck Lake	NO
Gallatin River	YES
Hauser Reservoir	YES
Hebgen Lake	YES
Helena Valley Regulating Reservoir	YES

Water body where historically found	Results of 2019 Sampling
Holter Reservoir	YES
Jefferson River	YES
Kicking Horse Reservoir	Not Sampled
Kootenai River	YES
Lake Helena	YES
Madison River	YES
Marias River	NO
Missouri River	YES
Newlan Reservoir	NO
Noxon Rapids Reservoir	YES
Pablo Reservoir	Not Sampled
Pond 4 - Canyon Ferry	Not Sampled
Post Creek	Not Sampled
Quake Lake	NO
Rainbow Dam Reservoir	YES
Smith River	YES
Tiber Reservoir	NO

Flowering Rush (Butomus umbellatus)

Water body where historically found	Results of 2019 Sampling
Cabinet Gorge Reservoir	YES
Clark Fork River	YES
Flathead Lake	YES

Water body where historically found	Results of 2019 Sampling
Flathead River	YES
Noxon Rapids Reservoir	YES
Thompson Falls Reservoir	YES

Fragrant waterlily (Nymphaea odorata)

Water body where historically found	Results of 2019 Sampling
Beaver Lake	NO
Blanchard Lake	NO
Browns Lake	NO
Duck Lake (in NW MT)	NO
Elbow Lake	Not Sampled
Holland (reported in 2018)	YES
Lake Inez	YES
Lake Mary Ronan	NO

Water body where historically found	Results of 2019 Sampling
Loon Lake	YES
Placid Lake	YES
Salmon Lake	YES
Savage Lake	YES
Seeley Lake	YES
Swan Lake	NO
Upsata Lake	YES

Aquatic Invasive Species Laboratory

FWP operates an Aquatic Invasive Species Laboratory in Helena, MT with a satellite lab in Kalispell, MT. These labs process plankton samples for FWP crews, partners and Missouri River Basin states. The lab also processes samples from outside the basin as a confirmatory service for other labs. Figure 6 and Figure 7 illustrate the volume of samples handled by the lab each year. The lab has discovered new populations of *Dreissena spp.* veligers as well as *Corbicula sp.* (Asian clam) veligers for multiple downstream states. The lab undergoes routine internal and external quality control testing.

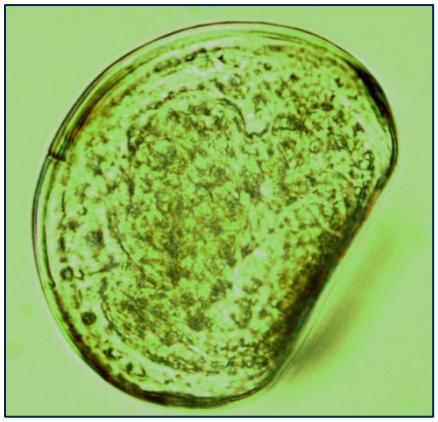


Figure 5: Photograph of Zebra mussel veliger found in an out-of-state sample processed in 2017 by FWP AIS Laboratory in Helena. Length of veliger = 111 µm.

Sample Prioritization and Lab Process Turn-around Time

All 2019 samples were completed by January 2020. In 2019, samples were typically processed in a shorter timeframe than prior years. The FWP AIS laboratories continue to work on methods to improve sample processing time with annual increases in quantity of samples.

Table 1 Lab turnaround time for samples grouped by risk levels.

	Priority Category	Number of 2019 Samples in Category	Avg. Turnaround Time by Priority (Days)
Risk 5 and Hatcheries	5	253	3
MT Risk 4	4	655	8
MT Risk 3 Lake	3a	937	16
MT Risk 3 River	3b	189	13
Out-of-State	3c	1055	44
MT Risk 2	2	198	66
MT Risk 1	1	43	61
Other	None	22	52

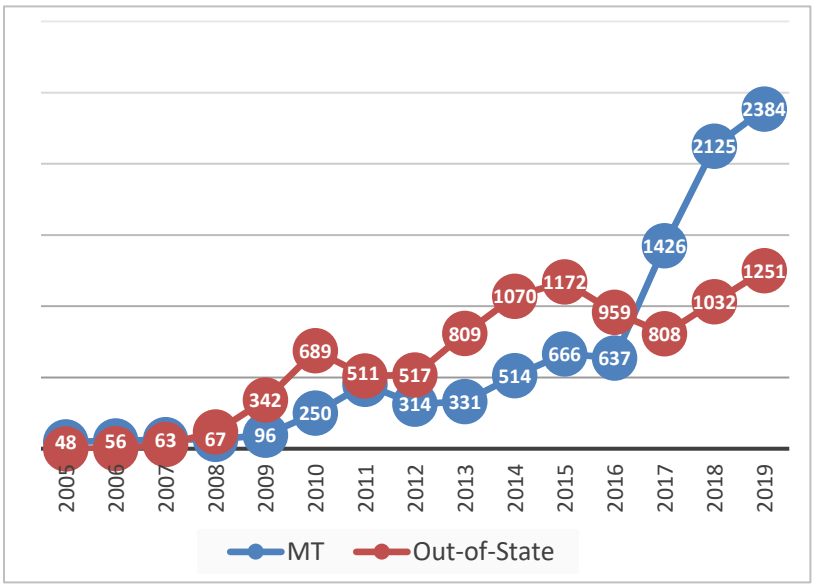


Figure 6: Number of plankton samples processed by year: in-state (FWP and partners) vs. out-of-state.

Mussel Response at Tiber and Canyon Ferry Reservoirs

After the declaration of a statewide natural resource emergency in the fall of 2016 following the first detection of larval Dreissenid mussels within the state, Montana stepped up its fight against invasive species significantly. These efforts included plankton tow sampling, artificial substrate sampling, ponar dredge sampling (Figure 8), mussel detection dogs (Figure 9) underwater inspections using scuba divers (Figure 10) and snorkelers, shoreline searches, and the use of eDNA sampling. This year, FWP processed 111 plankton tow samples from Tiber and 91 samples from Canyon Ferry with microscopy for the presence of invasive mussel larvae. No adult mussels or larvae were found throughout all sampling efforts.

In an effort to find adult Dreissenid mussels and to further the development of eDNA for Dreissenid mussel early detection, FWP partnered with Flathead Lake Biological Station to collect and process eDNA samples from Tiber Reservoir in July. No Dreissenid mussel DNA was detected through this effort in 2019.

Figure 7: Ponar dredge used to sample sediment in Tiber Reservoir

FWP is continually evaluating and adapting the early detection and monitoring program based on best available science. FWP will continue to improve coordination of sampling efforts with partners while also encouraging recruitment of others.

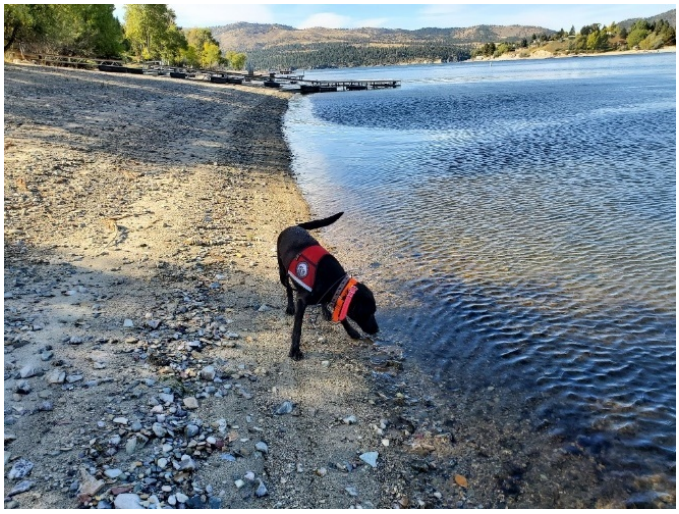


Figure 9: Ismay from Montana Black Dog Services works to detect adult Dreissenid mussels at Canyon Ferry Reservoir and Tiber Reservoir

Figure 8: USFWS Divers prepare to dive in search of adult mussels in Tiber Reservoir

AIS Control Efforts

Bitterroot Fish Hatchery New Zealand mudsnail eradication

In 2019 FWP early detection monitoring identified New Zealand mudsnails in the Bitterroot Fish Hatchery near Hamilton. The Bitterroot Fish Hatchery is a private facility that is permitted through FWP to sell fish to private pond owners and is inspected annually for fish health pathogens and AIS. FWP quarantined the facility and provided decontamination requirements to eradicate New Zealand mudsnails from the hatchery building and property. Following control efforts and additional inspections, the quarantine can be lifted following successful eradication. FWP also provided recommendations to improve hatchery biosecurity and protect the facility from re-infestation. FWP is continuing to work with the owners who have cooperated fully to eradicate this population and mitigate further risk.

Figure 10: FWP staff steam cleaning interior of hatchery building.

FWP crews spent the late 2019 field season inspecting privately owned ponds stocked with fish from this facility. FWP has plans to continue these surveys during the 2020 field season with the hopes to visit all the ponds that received fish from this facility in the last three years.

Beaver Lake Eurasian watermilfoil eradication

In 2019, FWP partner with Whitefish Lake Institute to work on eradicating Eurasian watermilfoil in Beaver Lake. Eurasian watermilfoil was found in Beaver Lake in 2011, and the city of Whitefish and Whitefish Lake Institute has worked since then controlling the population with diver hand pulling the plants. In 2018, no plants were found, but in 2019 crews found plants in location that historically had Eurasian watermilfoil. Crews surveyed and remove plants twice in 2019(Figure 13) and also installed benthic barriers in the densest location. FWP will continue to focus on this population to ensure it is eradicated.

Figure 11: FWP staff using suction dredge at Beaver Lake.

Curlyleaf pondweed control in US Forest Service ponds

The US Forest Service (USFS) recently received a land donation with several small reservoirs from a private donor. The reservoirs are located in the Slip and Slide Creek drainage a tributary of the Yellowstone River near Gardner, MT. The USFS was worried that some of the plants might be invasive species so FWP surveyed the reservoirs and found well established curlyleaf pondweed populations in them. There are no reported populations of curlyleaf pondweed within the Yellowstone River Drainage in MT so this population is particularly alarming with its location so high up in the drainage. While in its early development stages, FWP and USFS are working this year to develop and implement a plan to control the population and reduce its risk from spreading into the Yellowstone River.

Lake Elmo Asian Clam Control

There were no confirmed populations of Asian clams in Montana until FWP staff found them in Lake Elmo during an AIS monitoring workshop in June, 2019. The population within the lake seems well established with multiple age classes (Figure 11) throughout the lake. Clams were not found in any other locations other than in Lake Elmo. While most of the specimens found were empty shells, several live juveniles were found. FWP including Region 5 is working on a

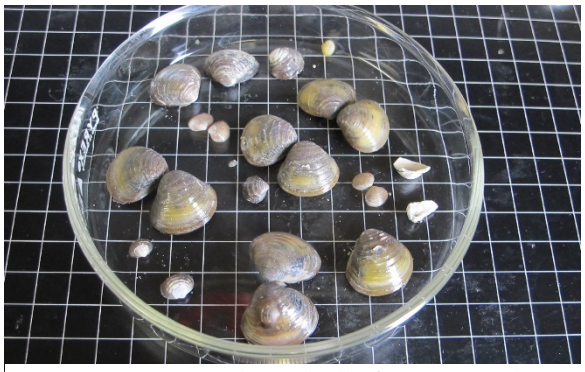


Figure 12: Asian clam shells found in Lake Elmo, 2019

plan to control this population. Currently FWP is examining the potential to drain the lake as much as possible to kill any clams still alive.

V. Looking Forward

Fish, Wildlife, & Parks is evaluating the AIS Early Detection and Monitoring Program to identify opportunities to improve efficacy and efficiency. These improvements will lead to more reliable sampling efforts, data collection, and sampling handling. Plans to improve FWP's monitoring program include:

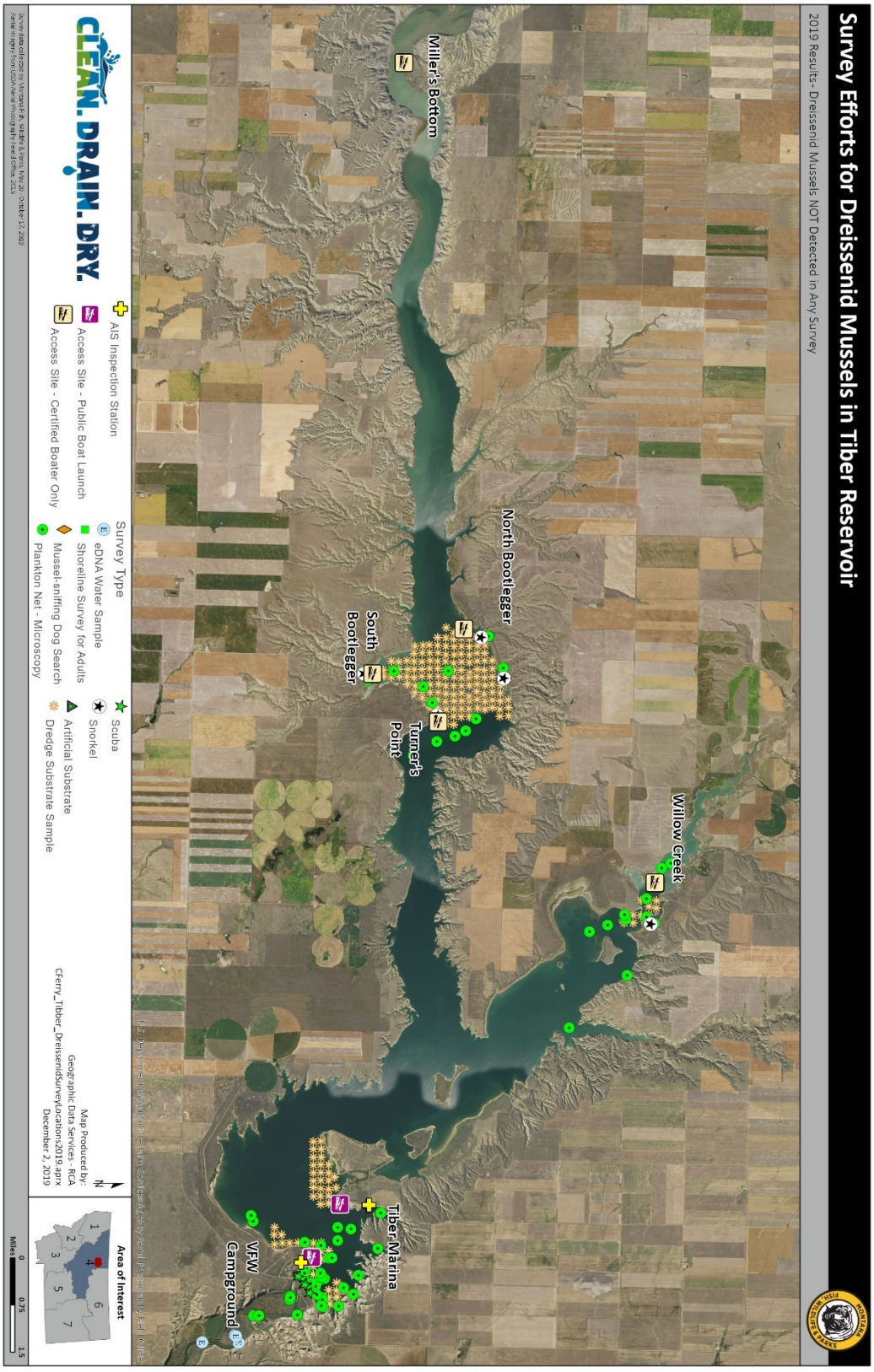
- Continue state and regional coordination meetings better engage partners and stakeholders.
- Expand partners implementing mobile data collection with the use of FWP's Survey123 form.
- Help partners improve their all-taxa AIS monitoring efforts through trainings and technical expertise.
- Survey for AIS in known geothermal areas.

Statewide monitoring efforts by FWP and partners continues to become more effective and expand capacity. These efforts are critical to the early detection and monitoring of invasive species and are an important aspect of the AIS program and the statewide AIS Management Plan. While these efforts do not guarantee discovery of all AIS species as they are introduced, they significantly increase the potential to discover new populations before they become established or spread beyond their current boundaries. Limiting the establishment or spread of AIS allows time for new research in control and eradication methods emerge and allows for greater efficiency in monitoring and early detection methods. These advances will ultimately save the state time and money protecting its aquatic resources and infrastructure.

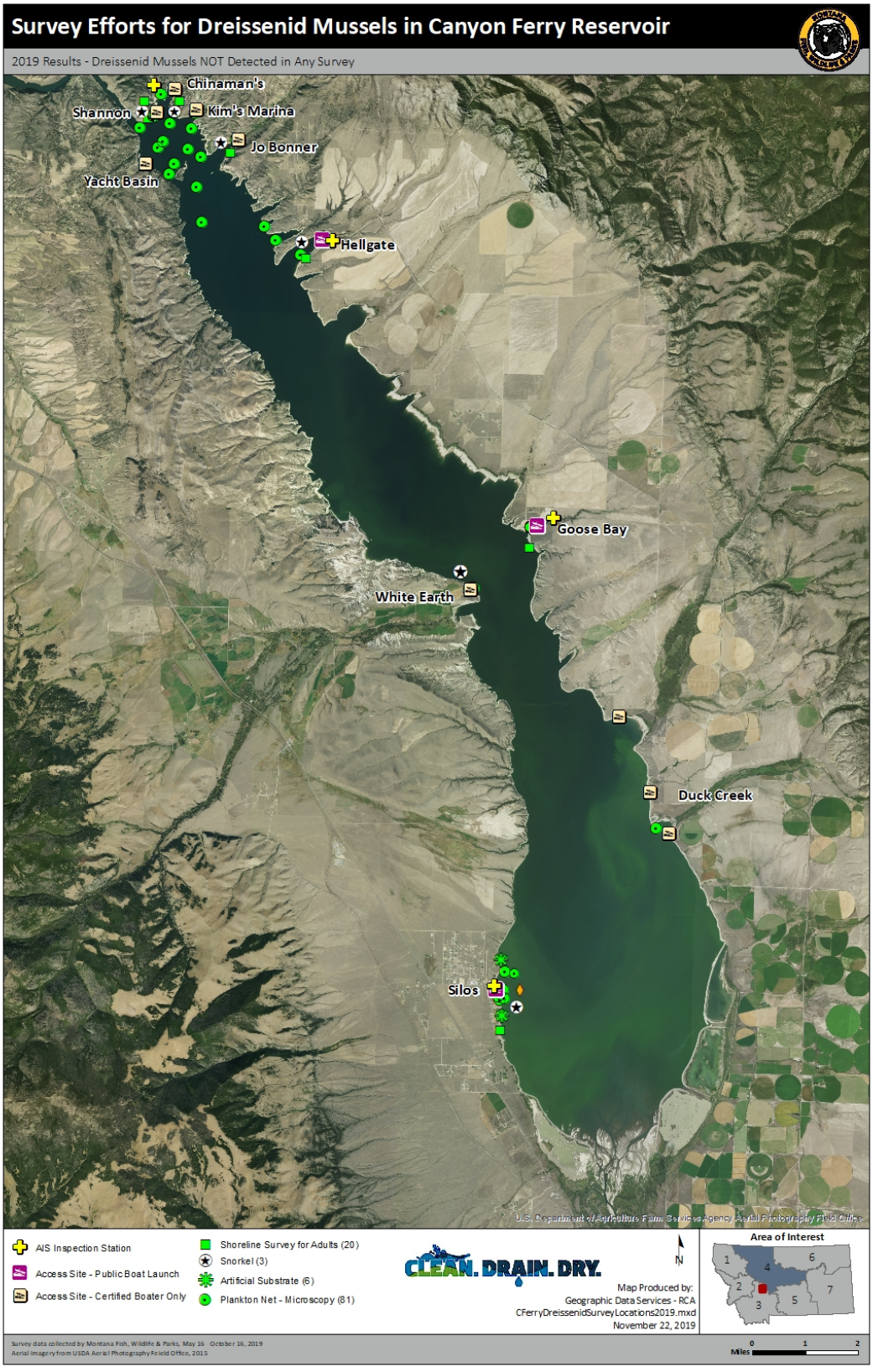
VI. Bibliography

Montana Fish, Widlife, & Parks. (2019). *Aquatic Invasive Species Management Program Field Sampling and Laboratory Standard Operating Procedures.* MT Fish, Wildlife, & Parks, Aquatic Invasive Species Bureau, Helena.

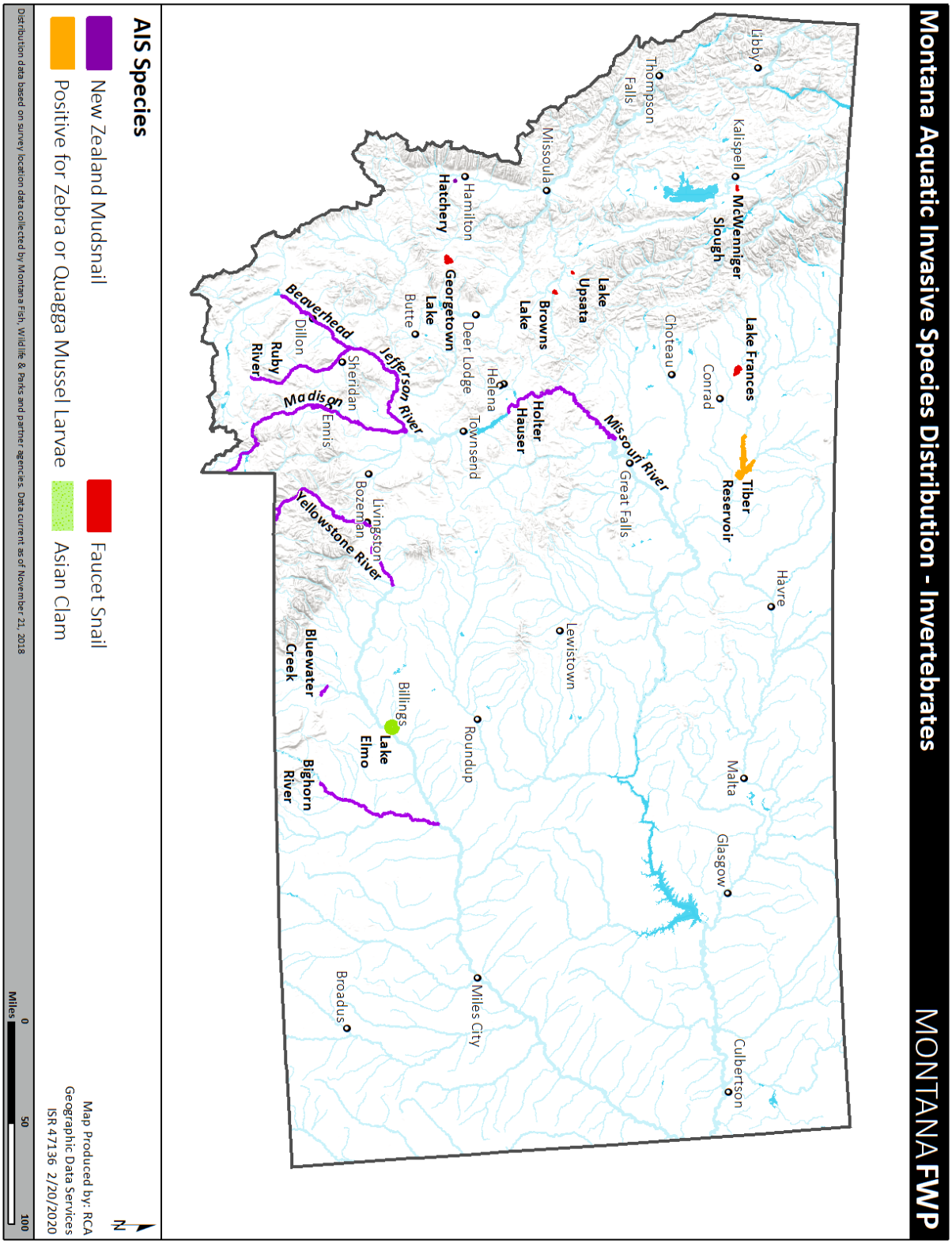
Appendix A. Mussel response sampling events on Tiber Reservoir



Appendix B. Mussel response sampling events on Canyon Ferry Reservoir



Appendix C. Map of invasive mollusks in Montana



Appendix D. Map of invasive plants in Montana