

Hebgen Reservoir Toxic Algae Plan



In cooperation with the Gallatin County Health Department,
Montana Department of Environmental Quality, Montana
Fish Wildlife and Parks, and the US Forest Service

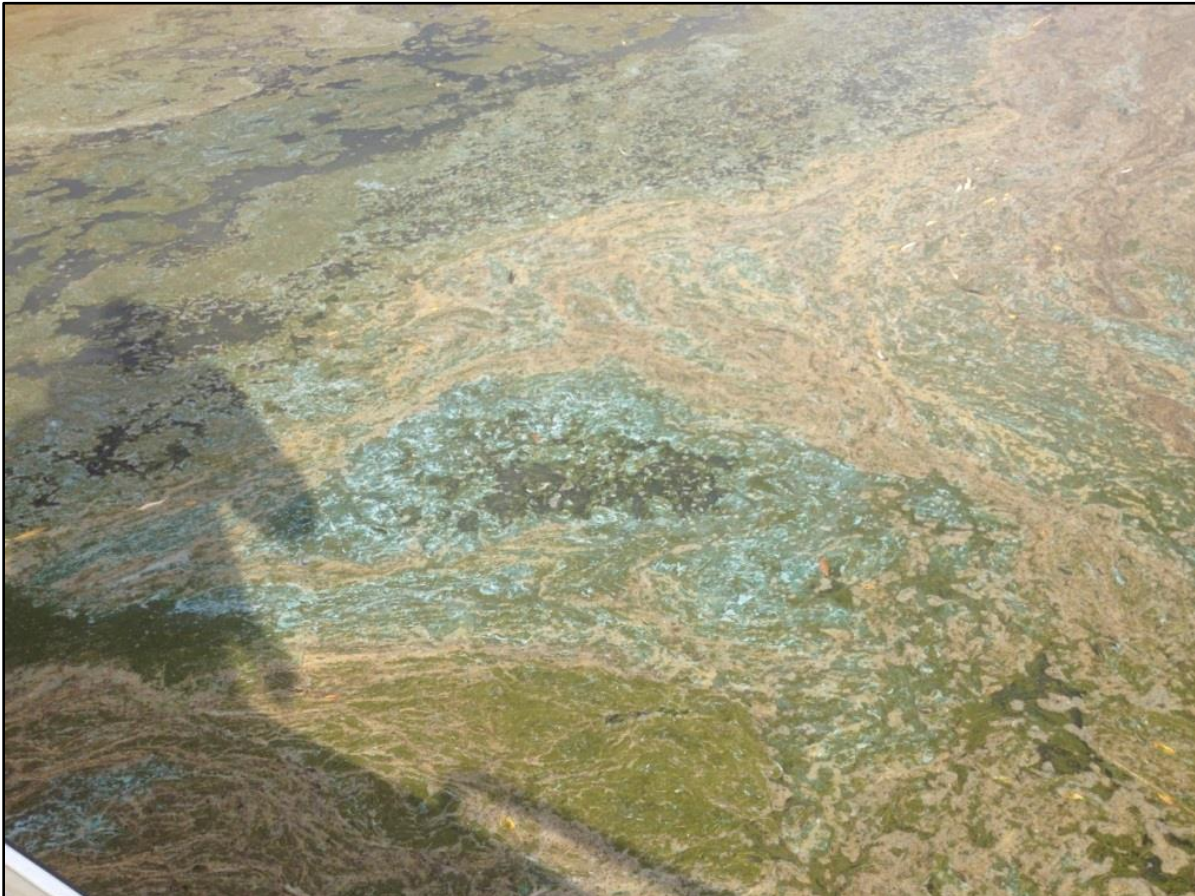
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Section 1.0 – Introduction

Outbreaks of toxic algae in Hebgen Reservoir have been reported in 1977, 1985, 1986, 1987, and 1988. Several cattle and pets have died after drinking lake water. The responsible organism for production of the toxic material in Hebgen is probably the blue-green alga *Anabaena flos-aquae* although other potentially toxic forming algal species are present in the reservoir: *Aphanizomenon sp.*, *Microcystis sp.*, and *Lyngbya sp.* The toxins produced by these organisms can be very lethal; laboratory tests have produced death in test organisms in as little as three minutes and as long as 48 hours.

The environmental conditions that produce the toxins resulting from algae are unknown. In order to limit risk to the public, livestock, and wildlife, a program of monitoring Hebgen Reservoir and public notification is presented here. This program satisfies the requirement for a Toxic Algae Monitoring Program that is required by the Section 401 Water Quality Certificate that is part of the Federal Energy Regulatory Commission (FERC) License for NorthWestern Energy's Missouri-Madison Hydroelectric Project FERC No. 2188 (Order Issuing New License September 27, 2000).



This program is composed of two parts: a monitoring plan and an action plan. The monitoring plan covers annual sampling activities. The action plan describes activities that will be taken to educate the public and protect public health, livestock, and wildlife during a toxic event. The action plan is composed of three stages; (1) Information and Education, (2) Response, and (3) Closure of affected areas.

The monitoring program is the responsibility of NorthWestern Energy (NWE) and is carried out with the review, consensus and cooperation of the agencies represented on the Hebgen Toxic Algae Committee, consisting of Gallatin County Health Department, Montana Department of Environmental Quality, Montana Fish Wildlife and Parks, and the US Forest Service, as well as the FERC. NWE will assist agencies with other parts of this program such as public notification when appropriate.

Section 2.0 – Program Update Procedure

This program document will be reviewed each year by NWE and the Hebgen Toxic Algae Committee and updated with current positions, names, addresses, and phone numbers. The date on the program document will indicate the date of last review.

Section 3.0 – Monitoring Plan

Section 3.1 – General Program Overview

The monitoring program is designed to monitor and evaluate rate of growth, composition, and toxicity of algal blooms in Hebgen Reservoir and transmit the information to the proper local and state agencies for appropriate response.

The Monitoring Person (contracted through NWE) will investigate reports of floating algal mats, and conduct regular reconnaissance monitoring of Hebgen Reservoir. NWE's Water Quality Specialist will deploy and maintain the water quality buoy, manage the monitoring program, identify the composition of algal samples, coordinate sampling activities, and disseminate information to agencies for their use for public notification and any other management actions they may choose.

Section 3.2 – Frequency of Monitoring

Weekly monitoring will occur from Memorial Day through September 30. The last date of monitoring each year may be extended several weeks if large amounts of algal mats are present in Hebgen Reservoir.

Section 3.3 – Water Quality Buoy

NWE's Water Quality Specialist will set up, deploy, and maintain a buoy housing, a water quality instrument, and cellular communications each season. The instrumentation consists of a Hydrolab datasonde that will monitor physical conditions (water temperature, turbidity), chemical composition (dissolved oxygen concentration and saturation), and density of blue-green algae cells. The Hydrolab has a central cleaning system made of wipers and brushes that wipe away particles to minimize sensors fouling over time. NWE's Water Quality Specialist will service the instrument in 2-4 week intervals to minimize any fouling and associated erroneous measurements.



The blue-green algae sensor measures the fluorescence intensity of phycocyanin (pigments found in blue-green algae cells). The fluorescence sensor gives instantaneous results of relative abundance of blue-green algae cells. The true number of cells is not known without quantitative analysis. Therefore, the intent of using the blue-green algae sensor is to track the relative abundance and growth rate of blue green algae throughout the summer.

The buoy is deployed in the narrows area of the Grayling Arm on the reservoir. It is programmed to collect measurements every 15 minutes. The data is stored locally and sent via cellular modem to the NWE office 6 times daily. NWE's Water Quality Specialist compiles the information sent from the buoy to evaluate algae growth. If a data indicates a large increase in blue-green algae over a relatively short duration, either the Water Quality Specialist or the Monitoring Person will investigate to evaluate if an algae bloom is present.

Section 3.4 – Monitoring Route

The Monitoring Person will complete weekly investigations around the lake. The normal reconnaissance route (**Figure 1**) will be traveled each week to focus on the Grayling Arm but encompass other areas of Hebgen Reservoir. In the event of positive toxicity results, the route may be expanded to include other areas of the reservoir. The normal route will contain the following inspection points:

Normal Route:

1. Corey Spring area (north shore Grayling Arm)
2. Savage Bay (south shore Grayling Arm)
3. Rainbow Point Boat Access (south shore Grayling Arm)
4. Kirkwood Marina
5. Yellowstone Holiday Marina
6. South Madison Arm Mile Marker 2.7

Expanded route:

7. Horse Butte W. Point Bay
8. Madison Arm Resort (south shore of Madison Arm)
9. Lonesomehurst

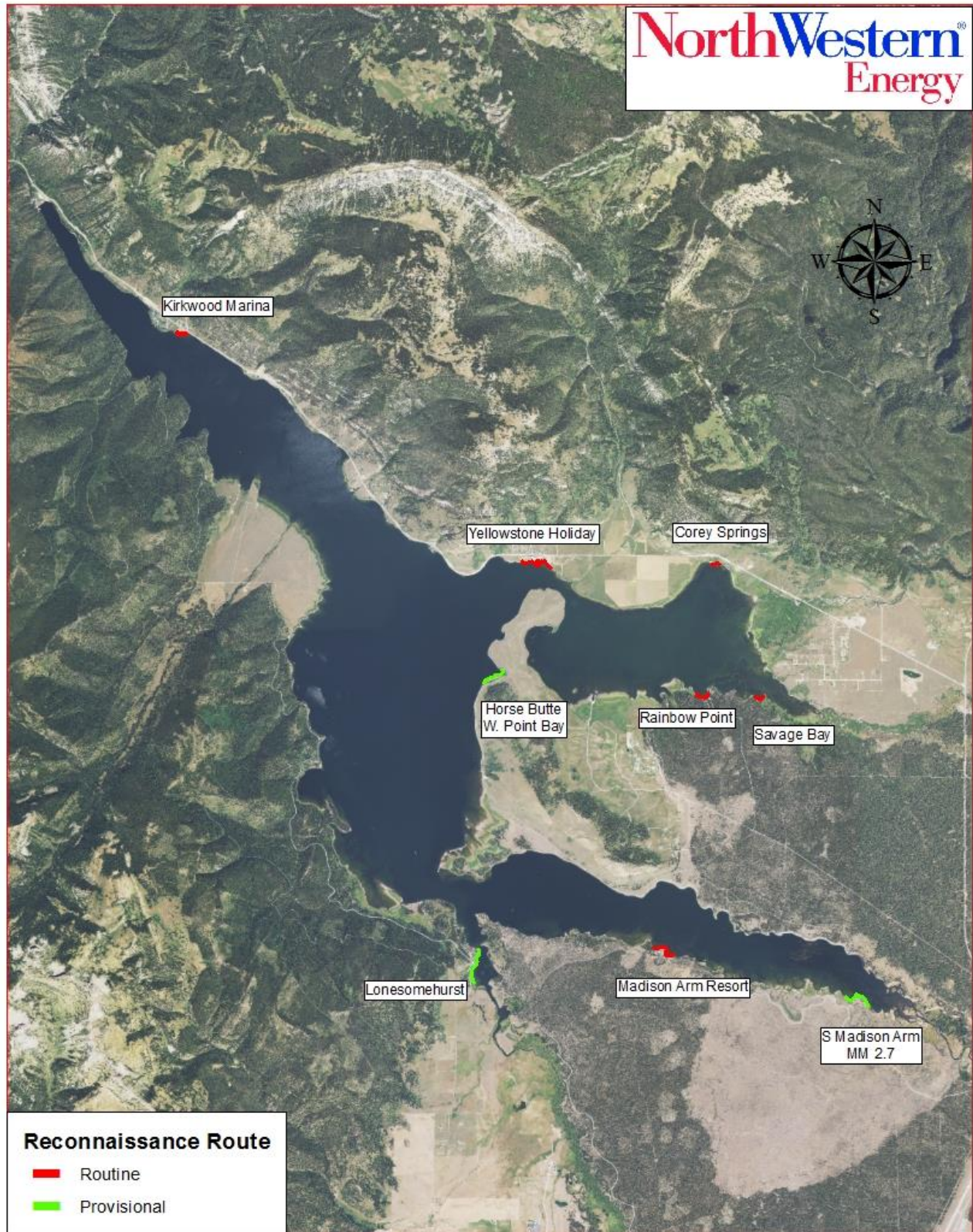


Figure 1. Algae Monitoring Reconnaissance Route

Section 3.5 – Documentation

The Monitoring Person will document each trip by filling out the Toxic Algae Trip Sheet (**Figure 2**). The completed sheet and accompanying photos will be sent by e-mail to the NWE Water Quality Specialist following each monitoring trip.

Section 3.6 – Sampling Criteria

Under conditions of warm temperatures and elevated nutrient concentrations, blue-green algae can be concentrated along shoreline areas. The algae may float to the surface and form a surface layer. The algae then die and break open releasing their contents to the water. If toxins are present inside the cell, then the toxin may be released to the water.

The first attribute to look for is the surface scum of algae that looks like green latex paint, grass clippings, or pea soup. The second characteristic is a turquoise color that indicates that cell mortality has occurred. The color change indicates that a toxic condition may exist.

Section 3.7 – Detailed Activities

At each point on the reconnaissance run, the Monitoring Person will look for floating mats of algae. If floating mats of algae are turquoise and look like latex paint, they will be sampled and shipped or delivered to the NWE Water Quality Specialist for identification. (Collect a 250 – 500 ml sample of the algae and put on ice in cooler. Deliver or Ship to: NorthWestern Energy Attn: Jordan Tollefson, 208 N Montana Ave Ste 200, Helena, MT 59601)

The NWE Water Quality Specialist will inspect the sample for the presence of *Anabaena flos-aquae* and other potentially toxic algal species such as *Aphanizomenon sp.*, *Microcystis sp.*, and *Lyngbya sp.* Algal blooms that are dominated by any of these blue-green algal species may be indicative of toxin problems.

If an algal sample is dominated by *Anabaena flos-aquae* or another potentially toxic blue-green algal species, the NWE Water Quality Specialist will notify the Monitoring Person. The Monitoring Person will collect a sample of reservoir water at the site of the bloom. The Monitoring Person will run an Abraxis field test strip for Microcystin or Anatoxin-a on the sample. If the results of either of these tests returns a positive result, an additional sample will be collected at the site of the bloom according to the directions in **Section 3.8** below, and shipped to GreenWater Laboratories in Palatka, FL for the appropriate toxin analysis. NorthWestern Energy will notify the Gallatin City-County Health Department (GCCHD), the Montana Department of Environmental Quality (MTDEQ), Montana Fish Wildlife and Parks (MTFWP) and the US Forest Service (USFS) that a sample has been taken. NorthWestern Energy will notify the same agencies with the results of the analytical testing within four days of sampling. If the analysis indicates toxins are present at harmful levels (**Table 1**), a confirmation sample will be taken within one day if algal conditions are still present. Warning signs (**Section 5.2**) will be posted after the first positive test. The GCCHD will have responsibility for issuing public notices and generating public information with assistance from the USFS and NorthWestern Energy.

HEBGEN LAKE TOXIC ALGAE TRIP SHEET				
Date: _____	Time Start: _____	Time Finish: _____		
General Weather Conditions: (clouds, temperature, wind) _____				
LOCATION:	Visit (Y/N)	Bloom (Y/N)	Sample (Y/N)	Test Result (If Applicable)
Kirkwood Marina	_____	_____	_____	_____
Yellowstone Holiday Marina	_____	_____	_____	_____
Corey Springs	_____	_____	_____	_____
Savage Bay	_____	_____	_____	_____
Rainbow Point	_____	_____	_____	_____
Madison Arm Resort	_____	_____	_____	_____
Provisional points if algae presence warrants them:				
Horse Butte W Point Bay	_____	_____	_____	_____
S. Mad Arm MM 2.7	_____	_____	_____	_____
Lonesomehurst	_____	_____	_____	_____
Other	_____	_____	_____	_____
Notes:				
Monitor Initials:				

Figure 2. Toxic Algae Trip Sheet

Toxicity sampling will continue weekly throughout any toxic event as long as the positive result from Abraxis field test kits persist. **Table 1** defines the levels of algal toxicity in relation to the initiation of Action Plan stages.

Table 1. Algal toxicity levels in relation to Action Plan stages.

Algal Toxin	Action Plan Stage 1	Action Plan Stage 2	Action Plan Stage 3
Anatoxin-a	Non-Detect	Detection - 8 µg/L	> 8 µg/L
Microcystin	8 µg/L	8 µg/L - 20 µg/L	> 20 µg/L

Section 3.8 – Sampling Methods

Positive field test kit results indicate that toxins may be present. A sample will be collected and submitted for laboratory analysis from each location that returns a positive field test kit result.

The base method for toxin samples will be analytical analysis utilizing the ELISA kits or via high pressure liquid chromatography. Collect 250 mL of water into clean, screw cap container at each site where conditions indicate the toxic algae may be present. The sample should completely fill the bottle with no air space in the bottle. Label the sample container using a permanent marker: (1) Project (Hebgen Reservoir Toxic Algae), (2) Location, (3) Time, Date, and (4) Sampler Name. The sample will be placed in a cooler on ice and kept in the dark as soon as possible after collection. An appropriately sized cooler will be used to insure that the samples remain upright during the shipping process. Fill out the laboratory Chain of Custody (CC) Form. Put the CC form in a Ziploc and place inside of cooler. Seal cooler with tape. Affix address label to the outside of cooler. Ship on next available carrier to arrive at the laboratory the day after sampling.

The Monitoring Person will notify the NWE Water Quality Specialist or the NWE Hydro License Compliance Manager. NWE staff will notify the laboratory of the shipped samples, the Gallatin City-County Health Department (GCCHD), MTDEQ, MTFWP, and the US Forest Service.

Section 3.9 – Sample Shipping

Samples will be shipped to the following laboratory:

GreenWater Laboratories
205 Zeagler Drive Suite 302
Palatka, FL 32177
(386) 328-0882

Section 3.10 – Notification

If potentially toxic algae are identified during the monitoring, the Monitoring Person will notify the following NWE staff:

Water Quality Specialist: **Jordan Tollefson** – office: (406) 443-8907, mobile: (406) 565-3879

Or

Hydro License Compliance Manager: **Andy Welch** – office: (406) 444-8115, mobile: (406) 565-7549

If a sample is dominated by potentially toxic algae and returns a positive Abraxis field test result, a sample will be submitted to the analytical laboratory. In this event, the NWE will notify the following:

Gallatin County Department of Health:

Environmental Health Specialist: **Nick Haskell** – (406) 582-3141

Director of Environmental Health Services: **Brittney Krahn** – (406) 582-3120

Local Water Quality District Manager: **Cameron Enright** – (406) 595-3686

For the Gallatin County Department of Health outside of normal business hours:

Off Hours Gallatin Sheriff Dispatch call (406) 582-2100 to page the On-Call GCCHD representative

Montana Department of Environmental Quality:

Water Quality Specialist: **Tiffany Lyden** – (406) 444-3576

Water Quality Specialist: **Ella Lunny** – (406) 444-6740

Montana Fish, Wildlife, and Parks:

Pollution Biologist: **Trevor Selch** – (406) 444-5686

Fisheries Technician: **Travis Lohrenz** – (406) 682-7807

US Forest Service – Gallatin National Forest:

Fisheries Biologist: **Alliston Stringer** – (406) 522-2544

Natural Resource Specialist: **Brian Thompson** – (406) 823-6985

Natural Resource Specialist: **Will Bennett** – (406) 823-6985

Watershed Program Manager: **Jake Chaffin** – (406) 587-6734

NWE Contractors:

Algae Monitoring Person: **Elizabeth Emeline** – (406) 853-0370

Hebgen Reservoir Attendant: **Brett Pearson** – home: (406) 646-7298 and (406) 646-7435, mobile: (406) 646-1161

Section 4.0 – Action Plan Stage 1 – Annual Information and Education – Notice Level

The Information and Education Plan describes activities that are necessary to maintain public awareness of algal conditions in Hebgen Reservoir.

Section 4.1 – Letter to Landowners

A letter will be sent to all landowners on the 2188 Recreation Committee Hebgen Reservoir Mailing List each year. The letter will explain the potential for toxic algae and detail the proper response if a landowner sees a potential problem. NWE and Gallatin City-County Health Dept. will coordinate the sending and content of this letter.

Section 4.2 – Letter to Grazing Lessees

The Forest Service will send a letter to Forest Service grazing lessees (Watkins Creek Allotment) that have livestock watering in the reservoir each year. The letter will explain the potential for toxic algae and the proper response to protect livestock.

Section 4.3 – Annual General Public Service Announcements

Public service announcements may be sent to the West Yellowstone radio station (KEZQ 96.5 FM and KWYS 920 AM – (406) 646-7361) and newspaper (West Yellowstone News – (406) 646-9719). NWE and the GCCHD will coordinate the notices. Public notice signs (**Figure 3**) will be posted on the shoreline of Hebgen (GPS locations of signs and descriptions are located in **Figure 4**), calling attention to the potential threat of toxic algae. Signage will be developed by the Gallatin City-County Health Dept. and placed by the US Forest Service and/or NorthWestern Energy.

Section 4.4 – Public Notice Signs

Public notice (**Figure 3**) signs will be posted at the following locations around the lake (**Figure 4**):

NORTH SIDE OF LAKE

- | | | |
|---|-------------|--------------|
| 1. Hebgen Dam: | N 44.86423° | W 111.33362° |
| New post is near fishing pier and rest area. Also placed a sign on older Hebgen sign. | | |
| 2. Kirkwood Marina: | N 44.84207° | W 111.30257° |
-

New signpost is near boathouse.

3. **MM 13.3 Day Use Area:** N 44.82847° W 111.27350°
New signpost is next to Day Use sign on old highway.
4. **MM 13.5 Day Use Area:** N 44.82520° W 111.27033°
New signpost is near picnic table down from highway.
5. **MM 14.1 Day Use Area:** N 44.81983° W 111.26195°
New signpost is on right near the willows. This is the site that curves around with lots of small access lanes through the brush to the lake.
6. **MM 14.9 Day Use Area:** N 44.81060° W 111.25240°
New signpost is just off highway near lake.
7. **Happy Hour Bar:** N 44.80558° W 111.24155°
Sign is posted by owner next to door leading out of bar. Sign is sort of behind a gambling machine and not likely to be seen, but it's where the owner posted it.
8. **MM 16.8 Day Use Area:** N 44.80343° W 111.22408°
New signpost is on right between road and bay of lake.
9. **Yellowstone Holiday Marina:** N 44.80293° W 111.21698°
Sign is on existing post to the right of boat ramp.

NORTH SIDE OF HORSE BUTTE

10. **Savage Bay:** N 44.77898° W 111.16337°
FS Rd 6936 – New signpost is right before beach. Take Rainbow Point Rd, then turn right on Horse Butte Rd. Take small road to right.
11. **Rainbow Point Boat Launch:** N 44.77972° W 111.17490°
New signpost is near boat ramp and also attached a sign to main FS Campground signboard near restrooms. Additionally, posted 4 signs on the existing entrance signposts to campsite loop roads, A, B, C & D. **(Total signs: 6)**

SOUTH AND WEST SIDE OF HORSE BUTTE

12. **N. Madison Arm Rd. and Hwy 191:** N 44.72365° W 111.10598°
Sign is posted on FS Sign post. This is just north of the Madison River on Hwy 191.
13. **N. Madison Arm “Windy Point”:** N 44.73915° W 111.16078°
New signpost. Traveling west on N Madison Arm Road from Hwy 191, turn south at junction with a sign showing directions. NF Rd #6697ga. You will come to the lake. Go farther staying left till find lake shore again.
14. **N. Madison Arm “4-wheel Point”:** N 44.74195° W 111.17332°
New signpost is at the end of short road with steep downhill approach. It is located on most southern road near lake. NF Rd #6697h
15. **Horse Butte Day Use Area:** N 44.74895° W 111.18625°
Posted a sign on the old FS Day Use signboard.

-
16. **Horse Butte Plateau:** N 44.74837° W 111.18835°
New signpost is in the sagebrush clearing.
17. **Horse Butte Peninsula Area:** N 44.75298° W 111.21123°
New signpost is near main road (where it branches off on a loop to the shoreline). This site is east of the actual peninsula point. Old fire staging area.
18. **Horse Butte West Point Bay:** N 44.78330° W 111.22300°
New signpost is at road junction at deepest part of bay. Here is the access to the “thumb” of Horse Butte across from Yellowstone Holiday.

SOUTH SIDE OF MADISON ARM

19. **S. Madison Arm and Hwy 191:** N 44.71157° W 111.10277°
Sign is on FS signpost. (This is just south of the Madison River on Hwy 191)
20. **S Madison Arm MM 2.7:** N 44.72750° W 111.13923°
New signpost is down road on right at MM 2.7 at split in road.
21. **S Madison Arm MM 3:** N 44.72828° W 111.14455°
New signpost is down the road on right.
22. **S. Madison Arm MM 4.3:** N 44.73052° W 111.16297°
New signpost is near lake. This is the burned area just east of Madison Arm Resort.
NF Rd #291E
23. **Madison Arm Resort:** N 44.73533° W 111.18628°
New signpost is at boat ramp.
24. **Junction of Mad Arm Rd/ Duck Bay Rd:** N 44.73007° W 111.21517°
Used existing FS Sign Board to post sign.
25. **S. Madison Arm West Point:** N 44.74195° W 111.23018°
New signpost is at the end of Stoddard Point Rd. 1399 Stoddard Point Rd.

SOUTH SIDE OF LAKE

26. **Lonesomehurst boat ramp/campground:** N 44.73397° W 111.23172°
2 signs posted here: One sign posted on existing FWP post at Boat Launch along with fishery signs. The second sign is posted on new signpost near restroom.
27. **Romsett Summer Homes:** N 44.74403° W 111.24585°
New signpost is on beach near campsites.
28. **Cherry Creek Campground:** N 44.75127° W 111.26408°
New signpost is toward lake from campground sign.
29. **Rumbaugh Point:** N 44.76772° W 111.26852°
New signpost is toward lake from campground sign.
30. **Fisherman’s Point:** N 44.77232° W 111.26852°
-

This is a newly developed Public Fishing Access site. New sign is beside restroom. 8362 Denny Creed Rd.

31. **Spring Creek Campground:** N 44.78440° W 111.27552°
New signpost is set toward lake from campground sign.

32. **Spring Cove:** N 44.78937° W 111.27692°
New signpost and picnic table is set toward lake from pullout.



Figure 3. Toxic Algae Public Notice Sign

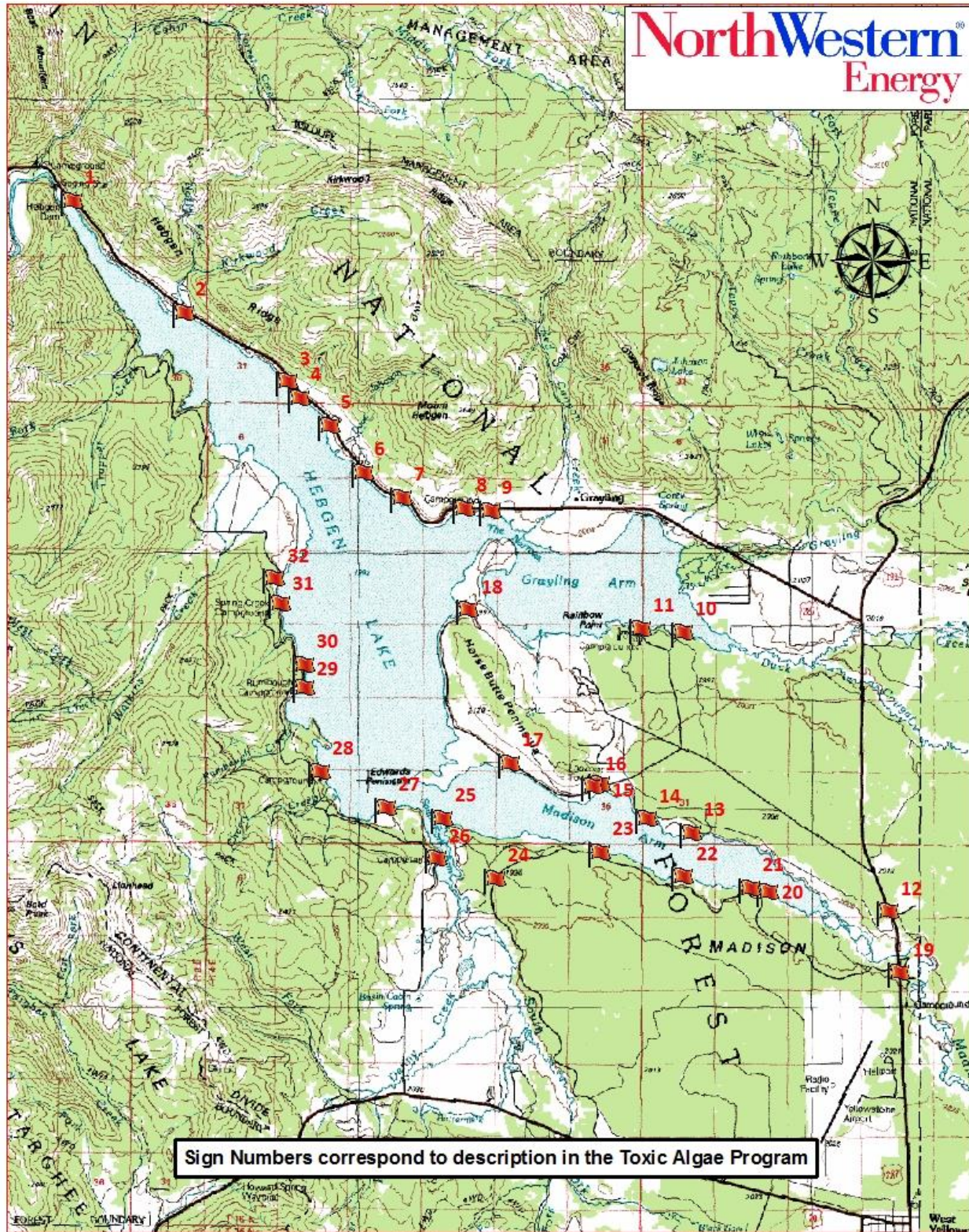


Figure 4. Map of Toxic Algae Public Notice Signs

Section 5.0 – Action Plan Stage 2 – Response – Warning Level

The Response Plan describes activities that will be taken to inform the public and protect public health, livestock, and wildlife resources during a confirmed toxic event.

Section 5.1 – Agency Notification

NWE will notify the GCCHD, MTDEQ, MTFWP, and the USFS if the monitoring program detects algal-produced toxins in the waters of Hebgen Reservoir.

Section 5.2 – Public Warning

The GCCHD will notify the newspapers in West Yellowstone (West Yellowstone News – (406) 646-9719) and Bozeman (Bozeman Daily Chronicle – (406) 587-4491 or (406) 582-2659) and the West Yellowstone radio station (KEZQ 96.5 FM and KWYS 920 AM – (406) 646-7361).

Signs will be posted at specific locations on the shoreline of Hebgen, warning of the toxic event. Signage will be developed by the Gallatin City-County Health Dept. and placed by the US Forest Service and/or NorthWestern Energy staff. Signs (**Figure 5**) will be placed at the same locations as the Public Notice signs (**Figure 4**).

Section 5.3 – Carcass Removal

If livestock mortality does occur, it is necessary to remove the carcass as soon as possible to reduce the probability of a grizzly bear problem. If the mortality occurs on Forest Service leased land it is the responsibility of the grazing lessee to remove the carcass in a timely manner. If the mortality occurs on private land, the landowner is responsible for removal.

Section 5.4 – Necropsy

Montana Department of Livestock should be notified to determine cause of death of affected livestock by necropsy if appropriate.

WARNING

Due to the presence of a toxic algal bloom, the Gallatin City-County Health Department recommends that people not swim in Hebgen Lake and that pets and livestock be kept from entering the lake or from drinking lake water.

An algal bloom, consisting of many different kinds of blue-green algae, is occurring in Hebgen Lake. Tests have identified that some of the algae are producing toxins, which pose a threat to people, pets and livestock. It is recommended that no swimming occur in the lake at this time. Ingestion or prolonged contact with the algal bloom may result in illness, with signs such as muscle weakness, vomiting, diarrhea and/or nausea. If you have ingested Hebgen Lake water and are experiencing these symptoms, you should seek medical attention immediately.

It is also recommended to keep pets and livestock from entering the lake or drinking lake water. If a pet has recently (within several hours) ingested lake water and is showing signs such as vomiting, lethargy, or disorientation, it should be taken to a veterinarian immediately.

For more information, call the Gallatin City-County Health Department at (406) 582-3120.

Figure 5. Warning sign for a Toxic Algal Bloom

Section 6.0 – Action Plan Stage 3 – Closure – Closure Level

Section 6.1 – Agency Notification

The GCCHD will notify NWE, MTDEQ, MDFWP, and the USFS of closure of parts or all of Hebgen Reservoir due to a toxic event.

Section 6.2 – Public Announcement of Closure

The GCCHD will notify the newspapers in West Yellowstone (West Yellowstone News – (406) 646-9719) and Bozeman (Bozeman Daily Chronicle – (406) 587-4491 or (406) 582-2659) and may contact the West Yellowstone radio station (96.5 FM – (406) 646-7361).

Signs will be posted at appropriate locations on the shoreline of Hebgen Reservoir, announcing closure of the Hebgen shoreline. The sign locations will not be limited to the locations shown on **Figure 4**. The closure sign will be developed by the GCCHD at the time of a toxic event to accurately incorporate the conditions occurring at that time. Signage will be placed by the US Forest Service and/or NorthWestern Energy staff.