CEMVP-PD-C August 5, 2013

MEMORANDUM FOR: District Commander

SUBJECT: Environmental Assessment for Lake Ashtabula Winter Drawdown, Barnes County, North Dakota.

1. The public review period for the draft environmental assessment for the subject project expired on 12 May 2013. Six individuals, groups, or agencies provided written comments on the draft Environmental Assessment (EA). These comments are included in Appendix B of the EA. All comments received were reviewed. Comments with specific questions were answered with responses that are included in Appendix B. There are no unresolved issues.

2. Governments and agencies that provided comments included the U.S. Fish and Wildlife Service, the North Dakota Department of Health, and the North Dakota Department of Game and Fish. The U.S. FWS wanted to ensure the fish hatchery at the dam would not lose water supply through the intake in Lake Ashtabula. The proposed plan would not lower the water elevation below the intake. U.S. FWS did not have other comments. The ND Department of Health supported the monitoring plan and water quality criterion. The ND Department of Game and Fish concurred with the proposed plan and had no other comments.

3. The Standing Rock Sioux Tribe requested further consultation on the project in a letter dated May 1, 2013. We contacted them and discussed their concerns for effects to cultural resources and the need for additional surveys. A plan to conduct additional surveys had been included in the draft EA. They expressed support for the survey plan in a subsequent letter dated July 19, 2013.

4. The two public comments were similar and stated concerns about the increased risk of a fish kill. One individual stated that lowering the water elevation would not provide flood reductions, but would negatively affect property values. The concerns raised are valid concerns that were evaluated thoroughly. By monitoring water quality and using an adaptive management approach, the risk of a fish kill can be significantly decreased. However, some risk remains. Also, it is true that increased drawdown may have minimal affect on flood stage during some years; however, there may be a minor benefit during some flood events.

5. The proposed project would have no effect on any federally-listed threatened and endangered species.

6. The Finding of No Significant Impact is enclosed for your signature. I recommend it be signed at this time.

Terry J. Birkenstock

Enclosure

Terry J. Birkenstock
Deputy Chief, Regional Planning and
Environment Division North

Report Documentation Page

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DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

Regional Planning and Environment Division North

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, Corps of Engineers, the St. Paul District, has assessed the environmental impacts for the following proposed project:

LAKE ASHTABULA WINTER DRAWDOWN
BARNES COUNTY, NORTH DAKOTA

The purpose of the proposed action is to amend the Baldhill Dam Water Control Manual to allow a maximum winter drawdown to elevation 1255.0 feet (Datum NGVD 1929). The current maximum drawdown elevation is 1257.0 feet. The additional drawdown will be used to provide more flood storage in Lake Ashtabula to reduce the effects of spring flooding. The lake would only be drawn down to the lower elevation when snow cover in the basin ensures that the lake can be refilled to the normal summer pool elevation. The July 2013 Environmental Assessment describes the proposed action and includes an evaluation of the associated impacts.

This Finding of No Significant Impact is based on the following factors as discussed in the Environmental Assessment: the increased drawdown would produce minor positive effects on flooding and public health and safety in Valley City; the increased drawdown would have minor negative effects on aquatic habitat, biological productivity, surface water quality, and cultural resources; the increased drawdown would have no effect on endangered and threatened species. The increased drawdown moderately heightens the risk of a fish kill in Lake Ashtabula. The Corps of Engineers will mitigate the increased risk by monitoring the lake during drawdowns to ensure water quality remains sufficient to support fish. If water quality levels drop below a predetermined threshold, the drawdown will be halted.

For the reasons above, the proposed action does not constitute a major federal action significantly affecting the quality of the environment. Therefore, an environmental impact statement will not be prepared.

Date 9 AUG 13

Daniel C. Koprowski
Colonel, Corps of Engineers
District Engineer

PAO
for McGuire PD-C
Clark PD-C
Birkenstock PD
Crump PD
Willging OC
DesHarnais DPM
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ENVIRONMENTAL ASSESSMENT

LAKE ASHTABULA WINTER DRAWDOWN
BARNES COUNTY, NORTH DAKOTA

July 31, 2013

U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT,
ST. PAUL, MINNESOTA

US Army Corps
of Engineers
St. Paul District

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ENVIRONMENTAL ASSESSMENT
LAKE ASHTABULA WINTER DRAWDOWN
BARNES COUNTY, NORTH DAKOTA
July 31, 2013

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Executive Summary

The Corps of Engineers, St. Paul District, proposes to amend the Water Control Manual for Baldhill Dam to allow a maximum winter drawdown to elevation 1255.0 feet (Datum NGVD 1929). The increased drawdown would provide additional storage for spring flood waters, which could potentially decrease flooding in Valley City, ND. The current maximum allowable drawdown elevation is 1257.0 feet, and the new allowable drawdown would be 1255.0 feet. During some flood events, drawdown to 1255.0 feet could lower peak flood stage in Valley City by up to 0.2 feet. This estimate of flood stage reduction is only an approximation. Each flood is unique, and in some years, additional drawdown may have no benefit to flooding downstream. Large drawdowns can only be implemented in years when the snow cover reaches high levels early in the winter. Many flood events occur during years when the snowpack develops later in the winter, leaving too little time to draw the lake down to the lower target elevation. Drawdown to elevation 1257.0 feet has been attempted only six times in the last thirty years, and an increased drawdown to elevation 1255.0 feet would be implemented even less frequently. For these reasons, it is expected that the actual flood benefits would be relatively infrequent.

The current maximum drawdown to 1257.0 feet has some adverse environmental effects, such as exposure of lakebed, water quality impacts, and potential impacts to cultural resources. Increasing the maximum drawdown elevation to 1255.0 feet would increase the adverse effects to natural and cultural resources. As compared to drawdown 1257.0, drawdown to 1255.0 would dewater an additional 518 acres of lakebed, and the lake would lose 5,900 acre-feet, or 19% of its volume. This additional drawdown would increase the risk of a fish kill by lowering dissolved oxygen levels. The risk of a fish kill would be reduced through a monitoring program that would trigger a halt to the drawdown when levels dropped below a critical threshold. Larger drawdowns were also considered, but these were eliminated because they would cause greater adverse impacts and would provide minor benefits for flood reduction. By amending the Baldhill Dam Water Control Manual to change the maximum allowable drawdown elevation from 1257.0 to 1255.0, the risks to natural and cultural resources can be minimized while providing flood reduction benefits to Valley City.

CHAPTER 1. INTRODUCTION

1.1 BACKGROUND

Baldhill Dam is located on the Sheyenne River in the Red River of the North Basin, 16 miles upstream of Valley City, North Dakota, and 35 miles upstream of the mouth of the Sheyenne River near Fargo, North Dakota. The dam forms Lake Ashtabula, which stores 70,600 acre-feet of water at normal conservation pool elevation 1266.0 feet Datum NGVD 1929 (all future elevations are cited in NGVD29), and the lake is 27 miles long at normal pool level.

The project was authorized by the 1944 Flood Control Act, and construction was originally completed in 1951. The purpose of the project is two-fold: water supply (92%) and flood control (8%). The St. Paul District, Corps of Engineers (Corps) currently operates the project for water supply, flood damage reduction, recreation, and natural resources. During flood control operations, Baldhill Dam is primarily operated for the downstream community of Valley City.

At the time of authorization, the three major water supply issues were 1) Municipal water supply for Valley City, Lisbon, and Fargo, 2) Rural water supply to permit an increase in stock raising, and 3) Stream-pollution benefits (e.g. dilution of sewage waste and packing plant effluent). Therefore, Baldhill Dam was constructed with its primary intent being water supply. Since completion of the project in 1952 there have been ten requests for a release based on water supply. The lowest resulting pool elevation due to a request was 1264.07 feet on 1 October 1976. The permitted water rights for Lake Ashtabula are allocated to the following communities, in the listed amounts: Fargo, 35,880 acre-feet; Grand Forks, 20,023 acre-feet; Valley City, 6,686 acre-feet; West Fargo, 954 acre-feet; Lisbon, 373 acre-feet.

During the winter months Lake Ashtabula is drawn down to provide flood storage for spring runoff. Winter drawdown is constrained between elevations of 1262.5 feet and 1257.0 feet. The current operating plan requires the pool to be drawn down to elevation 1262.5 feet by March 1st but does not allow the pool to be drawn down lower than elevation 1257.0 feet. Discharge is set to prescribed levels starting on October 1st to achieve the minimum drawdown by March 1st. An adequate volume of water is held in the reservoir to support fish habitat and the U. S. Fish and Wildlife Service (USFWS) fish hatchery, which has an intake pipe in the lake at elevation 1250.0 feet. The authorized Top of Flood Control elevation is 1271.0 feet and is equivalent to the elevation of the crest of the Baldhill Dam emergency spillway. A maximum recorded water surface elevation of 1270.5 feet was reached in 2004.

As part of the Sheyenne River project, the dam was modified in 2004 to bring the dam in compliance with dam safety criteria. At the same time, the top of the flood control pool was raised five feet, increasing flood storage capacity. The dam safety component of the modification was required to make the dam safe for a revised Probable Maximum Flood (PMF). The spillway capacity was increased, and the dam was raised to elevation 1283.5, allowing for a PMF water elevation of 1278.5 with five feet of freeboard. The pool raise component of the modification was implemented specifically for flood control purposes and to reduce flood damages for communities downstream of the dam, including Valley City.

1.2 PROJECT PURPOSE AND NEED

In recent years, communities downstream from Baldhill Dam—Valley City in particular—have experienced severe flood events. Floods have occurred in 1993, 1996, 1997, 2009, and 2011. The National Weather Service (NWS) defines flood stage at Valley City as 15 feet above gage datum (corresponding elevation 1214.27 feet). Damaging discharge begins at a flow of 3,200 cfs with corresponding elevation of 1214.57 feet. This is approximately equivalent to the 10 percent chance flood event. Average annual flood damages in Valley City are estimated at more than $1,600,000. While the pool is typically drawn down to elevation 1262.5 feet, in years with higher snow depth, the pool can, at maximum, be drawn down to elevation 1257.0 feet prior to spring runoff. Increasing the maximum allowed drawdown beyond elevation 1257.0 feet would provide increased floodwater storage capacity, potentially reducing flood damages downstream.

During the winter of 2010-2011, unusually high snow depths led to concerns of flooding on the Sheyenne River and an attempt to draw the reservoir down lower than elevation 1257.0 feet by an additional two feet to elevation 1255.0 feet. Doing so would have provided some additional storage for floodwaters, potentially reducing anticipated flood damages. However, because the approved Water Control Manual provides that the reservoir may not be drawn down lower than 1257, a number of steps were required prior to implementation. These steps included the development of a water quality monitoring plan, external coordination with resource agencies, and internal coordination with Corps of Engineers personnel. Completing these steps in a timely fashion was challenging.

Based on climate change predictions, the wetter conditions that have occurred in North Dakota in recent years are not likely to change. Therefore, it is expected that wet conditions will continue to occur in the future that will require consideration of increased drawdowns of Lake Ashtabula. Rather than attempt to implement a plan for greater drawdowns on a yearly basis, it is logical to update the drawdown rules in the Water Control Manual now so they can be efficiently implemented in the future. Therefore, the purposes of this effort are to complete a timely and thorough evaluation of various drawdown rule alternatives, select one for implementation, and coordinate the effort with relevant agencies and the public during the process.

CHAPTER 2. EXISITNG CONDITIONS / AFFECTED ENVIRONMENT

The existing conditions discussed here focus on those that may be affected by the proposed project.

2.1 HYDROLOGIC CONDITIONS

Many floods have occurred since construction of Baldhill Dam, with the first flood occurring before the dam was completed. Spring flooding of the Sheyenne River usually occurs during March or April and occasionally continues into May. The primary source of the flood flows is from snow melt. The depth of frost in the ground at break-up time and the condition of the river channel also affect the magnitude of the spring floods. Frozen earth contributes to larger runoff by preventing infiltration. A channel blocked by ice or drifts of packed snow forces river stages higher. Table 2-1 gives a summary of peak discharges and elevations.

Table 2-1. Historic Peak Discharges and Pool Elevation

Table 2-1
Historic Peak Discharges and Pool Elevation

Month / Year	Inflow to Reservoir (cfs)			Outflow (cfs)	Elevation/Stage (ft)	
	Cooperstown Peak[1]	Dazey Peak[1]	24 hr Peak Inflow[2]	Peak Outflow[1]	Peak Pool Elevation[2]	Peak Stage Valley City[1]
May 1950	7,830	na	na	3,150	1269.46	14.60
Mar 1966	3,040	1,880	3,800	3,250	1267.90	14.27
Apr 1969	5,050	2,510	5,170	4,580	1267.50	17.62
Apr 1979	4,680	~ 9,000[3]	8,810	4,740[4]	1268.55	na
Jul 1993	2,780	1,450	6,100	3,720[5]	1268.57	17.30
Apr 1996	6,760	1,900	8,100	5,460	1267.41	18.78
Apr 1997	5,280	2,780	6,557	4,510	1267.51	18.01
Apr 2004	3,610	2,550	5,450	3,740	1270.50	14.70
April 2009	6,170	3,330	8,950	6,140	1269.54	20.69[6]
April 2011	8,050	3,030	10,800	6,910	1270.45	20.66[6]

1. Taken from *USGS Water Resources Data*, North Dakota.
2. Taken from Water Control's web site for Baldhill reservoir data.
3. Estimated by USGS from floodmark.
4. Reported by USGS. Water Control records indicate 4,990 cfs and have not been updated.
5. Reported by USGS. Water Control records indicate 4,375 cfs and have not been updated.
6. Taken from NWS website.

Climate change has become an area of concern due to the potential for effects on numerous aspects of the environment, especially those related to water resources. The U.S. Global Change Research Program projects that precipitation in the northern Great Plains will increase, particularly in winter and spring (U.S. Global Change Research Program 2009). In North Dakota, rainfall is projected to increase by about 10%-30% by 2090, depending on modeling assumptions. Also, more frequent extreme events such as heat waves, droughts, and heavy rainfalls are projected there. These changes suggest that flood events may increase in frequency and magnitude in coming decades.

2.2 BALDHILL DAM OPERATION

Water levels on Lake Ashtabula are managed for the purposes of water supply and flood risk reduction. Water levels during the summer are normally held at elevation 1266.0 feet. Table 2-2 shows the upper and lower constraints to pool elevation, as well as the target conservation pool and drawdowns.

Table 2-2. Pool Elevation Constraints

Table 2-2
Pool Elevation Constraints

Pool Condition	Elevation (feet)	Volume (acre-feet)	Area (acres)
PMF Top of Pool	1278.5	157,500	8,500
Top of Flood Control	1271.0	101,300	6,750
Conservation Pool	1266.0	70,600	5,500
Normal Drawdown	1262.5	52,250	4,375
Maximum Drawdown	1257.0	31,000	3,237
Dead Storage	1238.0	< 2,500	403

To accommodate inflow from spring runoff, water levels in Lake Ashtabula are drawn down below the normal summer elevation during the fall and winter. Water levels are regulated through tainter gates and low-flow gates. The tainter gates release water from high in the water column (the gate sill is at elevation 1252.0 feet), and the low flow gates release water from near the bottom of the lake (the gate sill is at elevation 1238.0 feet). During the winter, dissolved oxygen (DO) levels typically are depleted lower in the water column first, and water closer to the surface typically has higher dissolved oxygen levels. Thus, it is preferable to draw the water off the bottom during the winter in order to retain the more oxygenated surface water to support fish. Also, operating the tainter gates during the winter becomes problematic because they can freeze in place, eliminating their operability and the ability to regulate water levels above elevation 1252.0 feet, (the sill of the tainter gate spillway). For these reasons, winter operation of Baldhill Dam to control water levels is limited to the use of the low-flow gates.

The target drawdown elevation is based on the amount of expected spring runoff from snow melt in any given year. The degree of the drawdown must be balanced with the ability to refill the pool in the spring in order to ensure the primary purpose of water supply. Normally the pool is drawn down to elevation 1262.5 feet by the end of February following the schedule in Table 2-3 and shown in Figure 2-1. Spring runoff typical begins in late March or early April.

Table 2-3. Normal Pool Drawdown Schedule.

Table 2-3 Normal Pool Drawdown Schedule			
Date	**Storage Volume (acre-feet)**	**Pool Elevation (feet)**	**Discharge Above Inflow**
October 1st	70,600	1266.0	> 65 cfs
November 1st	66,680	1265.3	> 65 cfs
December 1st	62,800	1264.6	> 65 cfs
January 1st	59,000	1263.9	> 60 cfs
February 1st	55,500	1263.2	> 55 cfs
March 1st	52,250	1262.5	

Table 2-4. Target Drawdown Elevations Based on Snow Water Equivalent.

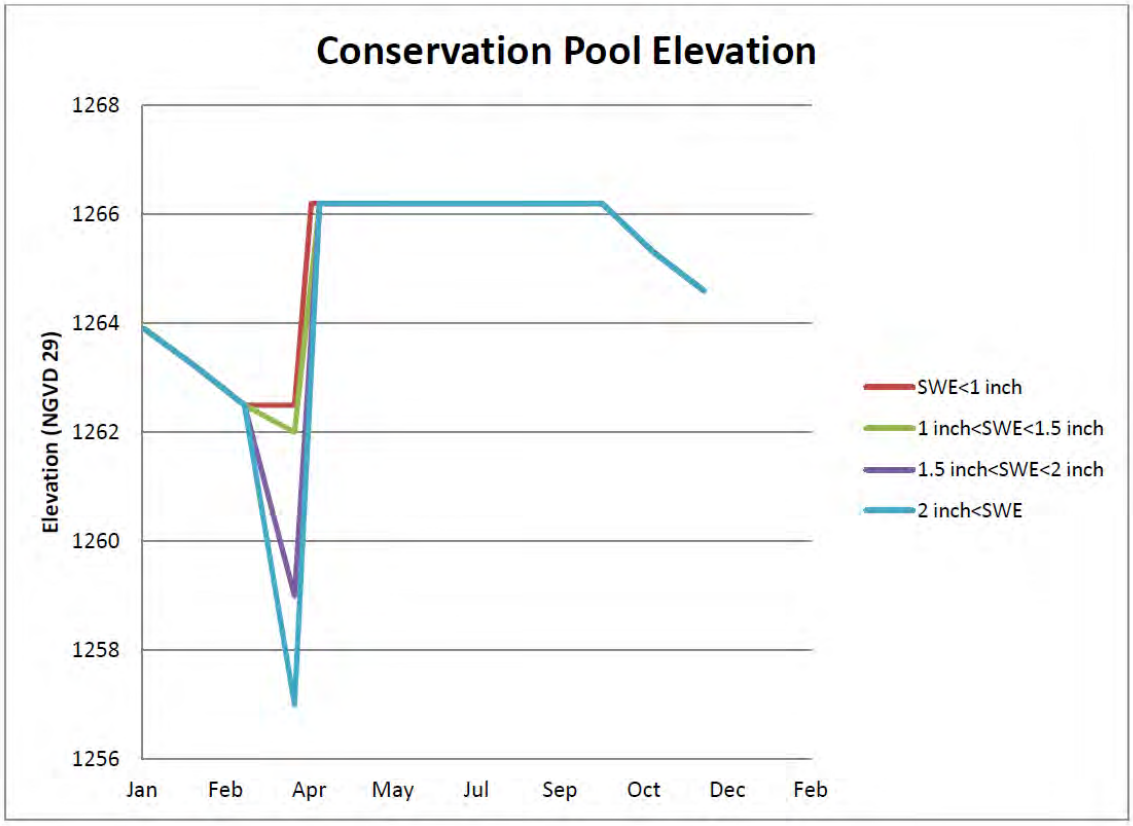
Table 2-4 Target Drawdown Elevations based on SWE			
Snow-Water Equivalent	**Pool Storage (acre-feet)**	**Flood Storage Available (acre-feet)**	**Target Pool Elevation (feet)**
< 1.0 inch	52,250	49,000	1262.5
> 1.0 but < 1.5	50,000	51,300	1262.0
> 1.5 but < 2.0	37,600	63,700	1259.0
> 2.0 but < 3.0	31,000	70,300	1257.0

The fall/winter drawdown can range from elevation 1262.5 feet down to elevation 1257.0 feet. If at some time before March 1st the average snow-water-equivalent (SWE) in the basin exceeds 1.0 inch, a new drawdown target elevation will be established. New target values are assigned as the snow-water equivalent increases (Table 2-4). Snow water equivalent is the major factor that

determines drawdown elevation. However, the target drawdown level may be altered by other conditions, such as the fall soil moisture and the National Weather Service spring flood forecasts. If fall moisture levels were unusually low, the pool may be drawn down less than indicated by the SWE because much of the spring melt water will soak into the soil rather than run off into the reservoir. If the NWS forecasts indicate that spring flooding will be minimal, the drawdown elevation may be adjusted to reflect the lower flood risk.

For maximum drawdown to occur, the basin average snow-water content must be greater than 2.0 inches. Therefore, maximum drawdown does not occur often. In the last thirty years, the pool has only been drawn down to elevation 1257.0 feet or below a total of three times (1996, 1999, 2011) and has only been drawn down to within a 0.5 feet of 1257.0 feet six times (additional three years: 1997, 2001, and 2009). In these cases the pool was drawn down in response to a high snowfall and the expected increase in spring runoff.

Figure 2-1. Snow Water Equivalent (SWE) and Drawdown Schedule



2.3 SOCIAL AND ECONOMIC CONDITIONS

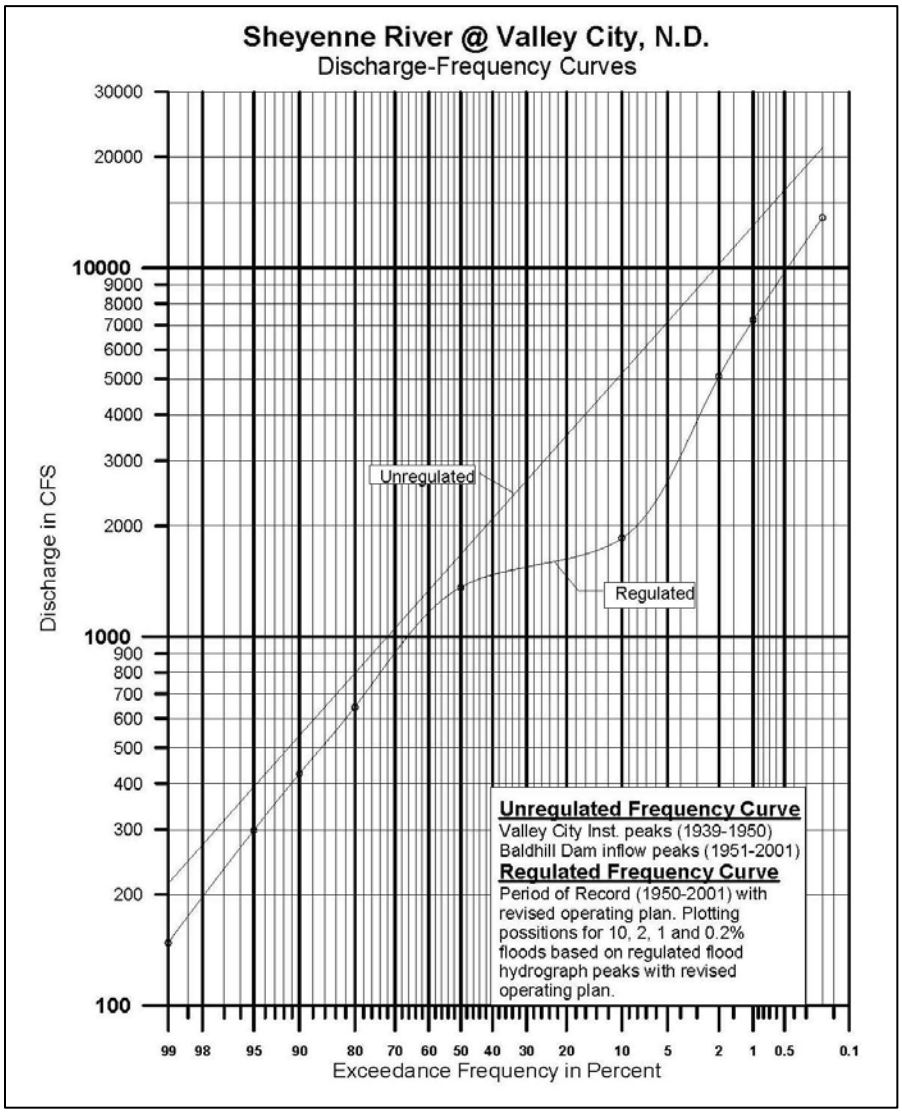
2.3.1 Flooding

Several communities are situated downstream of Baldhill Dam and are subject to Sheyenne River floods. These communities include Valley City, Lisbon, Fort Ransom, and Kindred. As the first community downstream of the dam, Valley City is most affected by flood storage

drawdowns at Baldhill Dam. The population of Valley City was 6,585 as of 2010. As of 2000, the populations of Barnes and Griggs Counties were 11,775 and 2,754, respectively. Median household income as of 1999 for Barnes and Griggs Counties was $31,166 and $29,572, respectively.

The Baldhill Dam is operated for flood control at Valley City primarily. Other cities downstream of Valley City also benefit, but to a lesser degree. There are also agricultural flood benefits during the summer months. At 2,400 cfs flow in the Sheyenne River, water begins to come out of the channel at Valley City. When the Valley City gage reaches 12.7 feet (~2,800 cfs), the city begins to close storm sewers. The top of the emergency levees is at 18.0 feet (~4,800 cfs). The largest recorded floods occurred in 2009 and 2011 with stages of 20.69 feet and 20.66 feet respectively. In 2009 more than 23,000 feet of emergency levee were constructed, and the city estimated that $57,300,000 in damages were prevented. The cumulative total of flood damages prevented, as a result of Baldhill Dam operation, was $422,727,400 as of FY2012. The flood damages prevented are the result of stage reductions at Valley City, which are displayed in Figure 2-2.

Figure 2-2. Discharge-Frequency Curves at Valley City with and without the Effects of Flood Regulation at Baldhill Dam.



2.3.2 Recreation

Lake Ashtabula is an important water-based recreation area in eastern North Dakota. The Corps operates seven developed recreation sites located around the lake. Camping, boating, hunting, fishing, and other water-oriented activities provide an economic resource for the local economy and are important to the overall well-being of the area. Some areas around the lake have been further developed with cabins and commercial facilities. Recently, the number of dwellings (mostly cabins) around the lake has increased dramatically. The aesthetic, recreational, and educational opportunities associated with the lake are not available elsewhere in the area. Lake Ashtabula provides recreational opportunities for over a half a million visitors each year and has something to offer every season.

2.4 NATURAL RESOURCES

Lake Ashtabula is a 5,430-acre reservoir formed behind Baldhill Dam near Valley City. The State of North Dakota has developed a list of natural heritage sites, which exhibit significant natural or cultural values. These include wildlife and vegetation species, vegetation types, and aquatic resources. As of the 2003, there were 857 natural heritage sites listed in the Sheyenne River basin. No Natural Heritage Database features are listed at the project site as of 2010.

2.4.1 Riparian Habitat

Land use in the riparian zone of the Sheyenne River is predominantly woodland, grassland, and cropland, depending on the location. Land use within a quarter mile of the Sheyenne River is distributed as follows: 33 percent cropland, 18 percent woodland, 36 percent grassland, 1 percent grass-shrub, 10 percent wetland, and 2 percent urban. The wooded riparian habitat of the Sheyenne River is particularly valuable, due to its limited availability. The riparian habitat along the river provides habitat for a variety of wildlife species. The Corps of Engineers actively manages 14 separate wildlife areas at Lake Ashtabula totaling 2,800 acres. The land, which is a combination of grassland, woodland, and shrubland, provides food and habitat for a wide variety of wildlife. Some active management programs consist of annual waterfowl nesting surveys, maintenance of waterfowl nesting structures, renovation and maintenance of wooded areas and shelterbelts, noxious weed control, and construction of a waterfowl brood rearing pond.

2.4.2 Aquatic Habitat and Water Quality

With the construction of Baldhill Dam, riverine aquatic habitat was converted to a lacustrine environment, and the fish community changed accordingly. The dam is now a barrier to upstream fish movement, and the lake may also pose a deterrent to downstream movement. The damming of the river created changes in the downstream hydrology. As with most reservoirs, the operating plan causes an increase in the winter discharge (drawdown for flood storage) and reduced peak spring outflow (flood protection).Variable winter water levels due to drawdowns negatively impact furbearers such as beaver and muskrat, and limit the establishment of aquatic vegetation in shallow areas. Many river organisms are adapted to the normal fluctuations of a free-flowing river. Prior to construction of the project, the Sheyenne River frequently dried up; now, releases from the dam are maintained at 13 cfs or greater to augment flows during dry periods. Maintaining minimum flow levels can benefit some aquatic organisms, while others benefit from the natural fluctuations of high and low flows. The dam both decreases the flood frequency and decreases the frequency of extremely low flow. These changes can affect riparian vegetation, fish spawning, and wildlife utilization, especially downstream.

The conversion from a free flowing river to a reservoir also impacted water quality. During runoff periods, the agricultural upland sources contribute minerals and nutrients, such as nitrogen and phosphorus to the Sheyenne River. These minerals and nutrients accumulate in Lake Ashtabula and cause what is known as eutrophication. Lake eutrophication leads to algae blooms, the potential for oxygen depletion, and changes in the aquatic community, usually with an increase in undesirable species.

The St. Paul District conducts water quality monitoring at its flood control reservoirs in support of Water Control Management as required by Engineering Regulation No. 1130-2-234, *Reporting of Water Quality Management Activities at Corps Civil Works* Projects, 30 April 1986. The Corps of Engineers established five lake monitoring stations in 1990. Samples were obtained in 1991, 1992, and 1995. However, not enough data has been collected to confidently describe the normal ranges of various water quality parameters. In 2012, a five year monitoring program was initiated to collect dissolved oxygen data and develop a better understanding of the relationship between DO, pool levels, dam withdrawals, and ice/snow cover (see Appendix D).

2.4.3 Fish

The Sheyenne River supports a diversity of aquatic species and contains more species of fish than any other North Dakota tributary to the Red River (Bureau of Reclamation, 2007). Twenty-seven species of fish have been reported in Lake Ashtabula (Earth Tech, Inc. 2002). Common fish species include northern pike, walleye, channel catfish, black bullhead, yellow perch, bluegill, white sucker, shiners, white bass, and crappie. The fishery of Lake Ashtabula is typical of eutrophic lakes. The fishery has been declining over the years and is supported by stocking. Lake Ashtabula is the largest reservoir managed by the North Dakota Game and Fish department (NDGF) in the eastern half of the state.

Bullhead species dominate the fishery in Lake Ashtabula in terms of both biomass and numbers. Furthermore, the predatory nature and robustness of the bullhead population is likely influencing the population levels of all other fish species in the lake. The NDGF annually stocks 1-2 inch size fingerling sportfish in North Dakota waters. The small size of these stocked fish makes them extremely vulnerable to predation. Stocking rates in Lake Ashtabula are currently at or near maximum allowable levels due to predation from black and brown bullhead species. Lake Ashtabula has served as a source of northern pike eggs for both Garrison Dam National Fish Hatchery and Valley City National Fish Hatchery. Throughout the years, the pike population in Lake Ashtabula has contributed substantially to the state's pike production program.

Populations of other predator fish species (particularly northern pike and walleye) likely have an impact on the existing bullhead population, though to what degree is unknown due to lack of forage studies for the reservoir. In the absence of these large predators the bullhead population would likely increase. Very large (>8lb) walleye exist in this impoundment in relatively high numbers as compared to other area water bodies, and anglers are aware and utilize this resource accordingly. Walleye over 17 years of age have been aged in Ashtabula and tagging studies suggest that fish over 20 years old are present. Fish of this nature are a unique and valuable resource that cannot be replaced in a short time period.

2.4.4 Endangered and Threatened species

According to the US Fish and Wildlife Service, one federally listed endangered species and one candidate species are known to occur in Barnes and Griggs Counties, North Dakota. The Western Great Lakes population of gray wolf (*Canis lupus*) was recently delisted due to recovery; this population includes the eastern portion of North Dakota.

Whooping Crane (*Grus Americana*) – Listed as federally endangered. May occur in the area during spring and fall migration between breeding and wintering areas.

Sprague's Pipit (*Anthus spragueii*) – Listed as a candidate species. The Sprague's Pipit may nest in some large native and planted grasslands in the area.

2.4.5 Reptiles and Amphibians

Barnes County lies within the ranges of two turtles, three snakes, one skink, six frogs and toads, and one salamander. Many of these species complete a portion of their life cycle near or in water, and many feed in aquatic areas. However, many reptiles and amphibians hibernate in uplands, away from water, and would be unlikely to be impacted during winter drawdowns. The northern leopard frog, the common snapping turtle, and the western painted turtle are the only three amphibians or reptiles found in Barnes County that hibernate in shallow water. These species may be affected by winter drawdowns.

2.4.6 Birds and Mammals

Lake Ashtabula is located in the "prairie pothole" region and provides key nesting and brood rearing habitat for a wide variety of waterfowl. One unique seasonal visitor is the white pelican. Pelicans are seen throughout the summer months in large flocks on the lake. Other popular wildlife species that can be found at or near Lake Ashtabula include white tailed deer, sharptail grouse, wild turkey and gray partridge. As aquatic mammals, beaver and muskrat are most susceptible to changes in lake water levels. Wildlife species that use the riparian habitat include white-tailed deer, raccoon, skunk, squirrel, rabbit, and a variety of rodents. A number of resident and migratory bird species can be found in the project area, including hawks, killdeer, shorebirds, doves, swallows, meadowlarks, and sparrows.

2.4.7 Benthic Invertebrates

A 1972 survey of benthic invertebrates in Lake Ashtabula found that *Mollusca* comprised about 46% of the biomass collected, *Diptera* accounted for 34%, *Annelida* comprised 9%, *Ephemeroptera* 2%, and other about 2% (Peterka 1972). The number and kind of benthic invertebrates indicates that Lake Ashtabula is eutrophic with oxygen being a limiting factor below 10 m, due to high sediment oxygen demand. During the winter, stratification of the water column allows for oxygen depletion in the deeper portions of the lake. There are twelve species of native mussel known to occur in the Sheyenne River, but only four species have been sampled in Lake Ashtabula: the giant floater (*Pyganodon grandis*), fatmucket (*Lampsilis siliquoidea*), threeridge (*Amblema plicata*), and the white heelsplitter (*Lasmigona complanata*) (Jensen et al. 2001, Earth Tech, Inc. 2002).

2.4.8 Vegetation

Lake Ashtabula has beds of aquatic vegetation throughout the shallower portions of the reservoir. There are at least several hundred acres of aquatic vegetation beds, but they have not been surveyed in detail. Common species include sago pondweed, clasping leaf pondweed, northern

milfoil, and coontail. In the same 1972 study, *Potamogeton* (pondweed) species comprised the majority of the aquatic vegetation (Peterka 1972). Sago pondweed attracts waterfowl, which feed on the plant.

2.5 CULTURAL RESOURCES

Cultural resources in the Lake Ashtabula locality indicate continual human inhabitation for millennia. Although the archaeological record documents occupations extending back for approximately 3,000 years, it is likely that the area was utilized since the retreat of ice during the Wisconsin glaciation, approximately 11,500 years ago (e.g., Bluemle 2000; Fox 1984; SHSND 2008). Earlier occupations are likely to exist within the Lake Ashtabula locality although their identification is hampered by complex geomorphic processes, modern development and a lack of extensive archaeological surveys. Known cultural resources in and around Lake Ashtabula Corps lands include precontact and Euro-American archaeological sites and historic standing structures situated across a variety of landforms.

Limitations with many of the earlier surveys include a lack of systematic survey methods and subsurface testing. While some of the later investigations have focused on shoreline sites, many are located in upland settings and few deep-site testing programs have occurred. Broad shoreline surveys of Lake Ashtabula have not occurred since the 1970s. Further, opportunities to survey areas below the ordinary project pool water level of 1266.0 feet are severely limited as scheduled flood control drawdowns occur during the winter months when exposed ground surfaces are obscured by snow and ice. As a result, there is little contemporary information on sites existing below elevations of 1266.0 feet.

A total of 100 cultural resources have been identified in the Lake Ashtabula locality. These include 72 precontact sites, 21 Euro-American sites, five sites with both Euro-American and precontact components and two sites with an unknown affiliation (i.e., paleontological or faunal material). Precontact sites include: lithic scatters, cultural material scatters, village sites, burial mounds, burials, rock features and isolated find spots. Euro-American sites include: farmsteads, standing structures, bridges, a townsite, camps, dugouts, a river crossing and trash piles. Sites occur on the valley floor, terraces, alluvial fans and upland settings. Of the total known cultural resources, seven sites have been determined eligible for listing on the National Register of Historic Places (NRHP), five sites are potentially eligible for the NRHP, 34 sites have been determined to be not eligible for the NRHP and 54 sites remain to be evaluated.

CHAPTER 3. ALTERNATIVES

Alternatives were developed to evaluate various levels of increased drawdown in Lake Ashtabula to provide storage for flood damage reduction. The absolute maximum possible drawdown elevation is 1238.0 feet, which is the elevation of the low flow conduits. Drawdowns are usually conducted using the low flow culverts rather than the tainter gates, as this ensures a slow, steady rate of drop. Rapid water level drop increases stress on aquatic organisms and habitat. In addition, the low flow culverts are utilized for winter drawdowns because operating the tainter gates during the winter can freeze them in place, eliminating their operability and the ability to regulate water levels. Using only the low flow culverts, approximately one week is required for each desired foot of drawdown. Four alternative drawdown elevations were considered and compared to the No Action Alternative. The snow water equivalent (SWE) must reach three inches before any of the action alternatives can be initiated. Larger drawdowns would require greater SWE levels to ensure the reservoir would be refilled and available for water supply. The pool is drawn down at a constant rate and takes multiple weeks to reach the target elevation. The SWE must reach the minimum level with enough time to implement the drawdown. The larger the drawdown, the more time required to implement.

Additional drawdown times and the associated drawdown start dates are shown for each increment in Table 4-1. A sufficient snowpack must develop by the start date shown in the table to support any given drawdown target. As the targeted drawdown elevation becomes more extreme, the likelihood of a snowpack developing early enough in the winter decreases. Drawdown to elevation 1257.0 feet is already rarely attempted; each additional increment would be progressively less likely to achieve. Although the additional storage could provide flood risk reduction benefits, there may be adverse environmental impacts, particularly the possibility of a fish kill in the lake due to diminished dissolved oxygen.

3.1 NO ACTION (MAX DRAWDOWN TO ELEVATION 1257 FEET)

The No Action Alternative would retain the current operation of the dam. Drawdown of the pool begins on October 1st. The pool must be drawn down to elevation 1262.5 feet by March 1st. If conditions in the basin indicate there is more than 1.0 inches of SWE before March 1st, additional drawdown may be required, with a maximum drawdown level of 1257.0 feet. At least two inches of SWE are required to draw the pool down to elevation 1257.0 feet. When drawn down to the normal winter drawdown elevation of 1262.5 feet, the lake is 4,375 acres in size. When drawn down to the maximum allowable elevation of 1257.0 feet, the lake decreases to 3,227 acres, 59% the size of the pool at the conservation elevation of 1266.0 feet. This loss of aquatic habitat may cause stress to fish and wildlife. This alternative would not increase floodwater storage in Lake Ashtabula beyond what is already provided under current conditions. No additional flood reduction benefits would occur beyond those provided now. On the other hand, there would be no additional adverse impacts to aquatic habitat, aquatic resources, fish or wildlife.

3.2 ALTERNATIVE 1255 (DRAWDOWN ELEVATION RANGE 1257-1255 FEET)

Alternative 1255 would increase the maximum allowable winter drawdown elevation to 1255.0 feet. The pool drawdown would begin October 1st, as currently done. If conditions in the basin indicate there is between 3.0 and 4.0 inches of SWE before March 1st, additional drawdown to elevation 1255.0 feet could be implemented. If drawn down to elevation 1255.0 feet, the lake would decrease to 2,719 acres, which is 49% of the lake size at the conservation pool elevation and 84% of the lake size under the existing maximum drawdown. Compared to the No Action Alternative, the lake would lose 19% of its volume. These reductions in lake size and volume could result in impacts to aquatic habitat, fish, and wildlife. Alternative 1255 would provide an additional 5,900 acre-feet of flood storage as compared to no action. Drawing down the pool another two feet to elevation 1255.0 feet would require an additional two weeks of time. This additional storage would decrease the flow at Valley City by 200-400 cfs. Due to uncertainties in modeling flood stages, an increased drawdown to elevation 1255.0 feet may not consistently cause any reduction in flood peak outflow. At most, the peak flood stage in Valley City could be reduced by up to 0.2 feet. Depending on timing, flow from local streams, and model uncertainty, it is possible that during some flood events, the increased drawdown would not reduce the peak flood stage in Valley City at all.

3.3 ALTERNATIVE 1252 (DRAWDOWN ELEVATION RANGE 1255-1252 FEET)

Alternative 1252 would increase the maximum allowable winter drawdown elevation to 1252.0 feet. The pool drawdown would begin October 1st, as currently done. If conditions in the basin indicate there is over 4.0 inches of SWE before February 15th, additional drawdown to elevation 1252.0 feet could be implemented. If drawn down to elevation 1252.0 feet, the lake could decrease to 2,134 acres, which is 39% of the lake size at the conservation pool elevation and 66% of the lake size under the existing maximum drawdown. Compared to the No Action Alternative, the lake would lose 41% of its volume. These reductions in lake size and volume would result in impacts to aquatic habitat, fish, and wildlife. Alternative 1252 would provide an additional 12,800 acre-feet of flood storage as compared to no action. This additional storage would decrease the flow at Valley City by 500-800 cfs. Due to uncertainties in modeling flood stages, an increased drawdown to elevation 1252.0 feet may not consistently cause any reduction in peak outflow. At most, the peak flood stage in Valley City could be reduced by up to 0.5 feet. Depending on timing, flow from local streams, and model uncertainty, it is possible that during some flood events, the increased drawdown would not reduce the peak flood stage in Valley City.

3.4 ALTERNATIVE 1248 (DRAWDOWN ELEVATION RANGE 1252-1248 FEET)

Alternative 1248 would increase the maximum allowable winter drawdown elevation to 1248.0 feet. The pool drawdown would begin October 1st, as currently done. If conditions in the basin indicate there is over 5.0 inches of SWE before January 15th, additional drawdown to elevation 1248.0 could be implemented. If drawn down to elevation 1248.0 feet, the lake could decrease to about 1,600 acres, which is 29% of the lake size at the conservation pool elevation and 49% of the lake size under the existing maximum drawdown. Compared to the No Action Alternative, the lake would lose 66% of its volume. These reductions in lake size and volume could result in

significant impacts to aquatic habitat, fish, and wildlife. Alternative 1248 would provide an additional 20,500 acre-feet of flood storage as compared to no action. This additional storage would decrease the flow at Valley City for large historic flood events by 900-1,100 cfs. Due to uncertainties in modeling flood stages, an increased drawdown to elevation 1248.0 feet may not consistently cause any reduction in peak outflow. At most, the peak flood stage in Valley City could be reduced by up to 0.8 feet. Depending on timing, flow from local streams, and model uncertainty, it is possible that during some flood events, the increased drawdown would not reduce the peak flood stage in Valley City.

3.5 ALTERNATIVE 1240 (DRAWDOWN ELEVATION RANGE 1248-1240 FEET)

Alternative 1240 would increase the maximum allowable winter drawdown elevation to 1240.0 feet. The pool drawdown would begin October 1st, as currently done. If conditions in the basin indicate there is over 6.0 inches of SWE before November 30th, additional drawdown to elevation 1240.0 feet could be implemented. If drawn down to elevation 1240.0 feet, the lake would decrease to about 500 acres, which is 9% of the lake size at the conservation pool elevation and 16% of the lake size under the existing maximum drawdown. Compared to the No Action Alternative, the lake would lose 92% of its volume. These reductions in lake size and volume could result in significant impacts to aquatic habitat, fish, and wildlife. Alternative 1240 would provide an additional 28,500 acre-feet of flood storage as compared to no action. Due to uncertainties in modeling flood stages, an increased drawdown to elevation 1240.0 feet may not consistently cause any reduction in peak outflow. At most, the peak flood stage in Valley City could be reduced by up to 1.0 feet. Depending on timing, flow from local streams, and model uncertainty, it is possible that during some flood events, the increased drawdown would not reduce the peak flood stage in Valley City.

3.6 DISSOLVED OXYGEN MONITORING

Potential environmental impacts due to decreased dissolved oxygen levels would be mitigated through adaptive management. All alternatives would include DO monitoring when targeting a drawdown elevation below 1257.0 feet. DO would be measured at three locations twice a day for the duration of time that water level remains below elevation 1257.0 feet. During the drawdown of 2011, agency partners agreed on a minimum of 4.0 mg/L of dissolved oxygen within the upper two meters. That same criterion would be used in future drawdowns below elevation 1257.0 feet. The intensive daily monitoring would be used to ensure DO levels remain above the minimum threshold. If DO levels drop below 4.0 mg/L, discharge would be reduced to the required minimum, and the pool would begin to refill. The details of the monitoring plan are attached in Appendix D.

CHAPTER 4. ALTERNATIVES SCREENING

The alternatives described above were screened for acceptability and feasibility, and three alternatives were carried forward for more in-depth analysis. Two alternatives were determined to be unacceptable and infeasible—Alternatives 1248 and 1240. The two screening criteria were 1) acceptable impact to aquatic resources and habitat and 2) feasibility of implementation based on the ability to refill the reservoir to the conservation pool elevation and the ability to achieve an additional drawdown based on the timing of snowpack development. Table 4-1 summarizes the risk of fish kill and the feasibility of implementation for each alternative.

Table 4-1. Potential Drawdown Increments

Table 4-1
Potential Drawdown Increments

Drawdown Target (feet NGVD29)	Additional Drawdown Time/Start Date	Potential Flow Reduction at Valley City (cfs)	Likelihood of Achieving Drawdown	Fish Kill Risk
1257.0 (current plan)	0 weeks	0	Very High	Very Low
1255.0	2 weeks/March 1	200-500	High	Low
1252.0	5 weeks/Feb 15	500-800	Medium	Medium
1248.0	9 weeks/Jan 15	900-1,100	Low	High
1240.0	17 weeks/Nov 30	Not calculated	Very Low	Very High

Significant impacts to aquatic natural resources would be undesirable to the Corps, state and federal resource agencies, and other stakeholders. Potential environmental impacts include fish kills and exposure of the lake bottom. One particular concern is the USFWS fish hatchery intake, which draws water at elevation 1250.0 feet. Drawing down below elevation 1250.0 feet would cut off the water supply to the hatchery during the drawdown, which could impact to the agency's operation of the hatchery. A greater concern is that excessive levels of drawdown would pose a significant risk to the regionally-important fishery in Lake Ashtabula. Other natural resources in the lake such as aquatic vegetation, mammals, amphibians and benthic invertebrates could be adversely impacted. Table 4-2 shows the impacts that the five alternatives would have on the volume and area of Lake Ashtabula. Figure 4-1 depicts the size of Lake Ashtabula at varying levels of drawdown and what areas of the lake would be dewatered at various elevations. The loss of water volume, decrease in dissolved oxygen, and exposure of lake bottom could have many adverse impacts on fish, wildlife, and aquatic resources.

Table 4-2. Drawdown Impacts to Volume and Acres, Compared to Current Maximum Drawdown (1257).

Table 4-2
Drawdown Impacts to Volume and Acres
Compared to Current Maximum Drawdown (Elevation 1257.0 feet)

Pool Condition Alternative	Volume (acre-ft)	% Loss of Volume	Area (acres)	% Loss of Acres	Av. Depth (ft)	Max. Depth (ft)
No Action (1257)	31,000	0%	3,237	0%	21	40
Alternative 1255	25,100	19%	2,719	16%	19	38
Alternative 1252	18,200	41%	2134	34%	16	35
Alternative 1248	10,500	66%	~1600	51%	12	31
Alternative 1240	2,500	92%	~500	84%	4	23
Dead Storage (1238)	< 2,500	>92%	403	88%	2	19

Besides the impacts to natural resources, the feasibility of implementing each alternative was used as a screening criterion. Drawing water levels down farther than elevation 1257.0 feet would require additional time to reach an increased drawdown target. In a given year, the decision to target an increased drawdown would be made based on the amount of snowpack accumulated in the basin. Because the snowpack develops through winter and greater drawdown requires additional lead-time, each year there is a point in time where it will likely be too late to achieve a greater drawdown. In years when the snowpack develops early this is less of an issue, but in years when a deep snowpack develops at the end of the winter there may not be enough time to implement an increased drawdown. Recent weather patterns have been wetter than the long-term average, and some experts predict that this region will continue to experience wetter climate and more flooding in the future. At this time, these predictions and their impact on flooding severity are speculative; therefore this analysis has been based on historical conditions. However, it is important to recognize that wetter climate could potentially lead to higher SWE levels in the future, which could potentially allow more frequent implementation of these alternatives.

Finally, it should be reiterated that drawing down the reservoir must be based on a basin snowpack that can refill the reservoir to the summer conservation level. Drawing down below a level that can be refilled during the spring melt is unacceptable because the primary authorized purpose of the reservoir is water supply, not flood risk reduction. Table 4-3 shows the latest date that a drawdown must begin to achieve the target elevation. Each drawdown scenario would require progressively more SWE. Each additional drawdown increment becomes less implementable because it is rare to achieve high SWE early in the winter. There is insufficient SWE data to calculate the exact number of years each alternative could be implemented.

Figure 4-1: Lake Ashtabula Pool Sizes for Alternative Drawdown Levels.

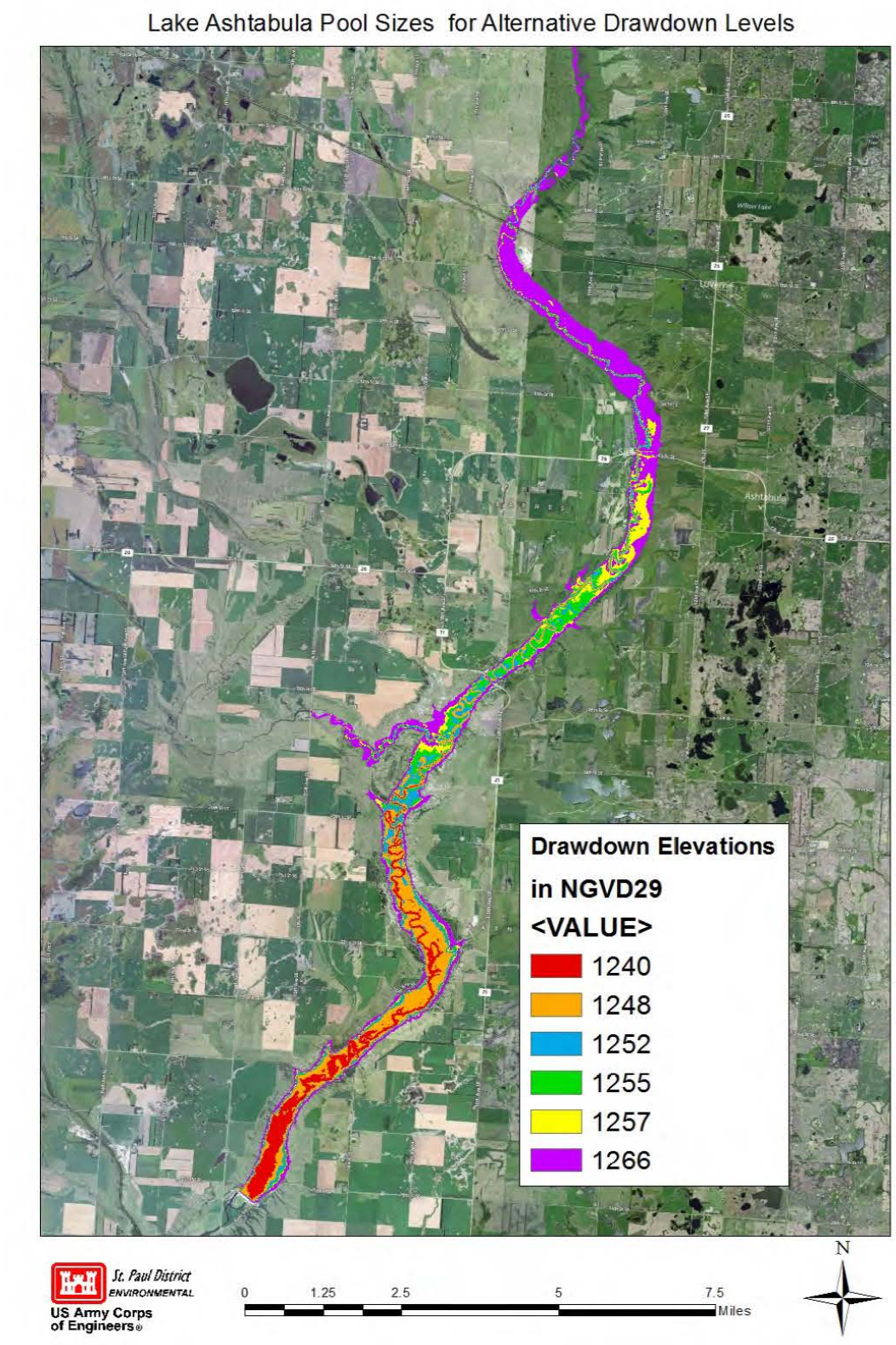


Table 4-3. Feasibility of Alternatives.

Table 4-3 Feasibility of Alternatives			
Pool Condition Alternative	**Elevation (feet)**	**Drawdown from elevation 1257.0 feet must start by:**	**Required Snow Water Equivalent to begin drawdown**
No Action	1257.0		2-3 inches
Alternative 1255	1255.0	March 1	3-4 inches
Alternative 1252	1252.0	February 15	4-5 inches
Alternative 1248	1248.0	January 15	5-6 inches
Alternative 1240	1240.0	November 30	Over 6 inches

4.1 NO ACTION ALTERNATIVE

A drawdown to 1257(the No Action Alternative) has been attempted six times in the past 30 years. Only three of those six attempts achieved the desired drawdown. Unless weather patterns change, we would expect to implement the No Action Alternative about the same number of times in next 30 years. In some years with large flood events, this alternative could not be attempted because Snow Water Equivalent was not attained early enough in the year. The No Action Alternative produces minor adverse environmental impacts. These include drops in DO, risk of fill kills, exposure and death of aquatic vegetation, hibernating amphibians and reptiles, and benthic invertebrates, and damage to cultural resources. Limited environmental and cultural assessments suggest that these impacts have been minor; no significant effects have been reported to date. The risk of a fish kill is very low.

4.2 ALTERANTIVE 1255

To implement Alternative 1255, there must be three to four inches of SWE by March 1st. There is insufficient SWE data to calculate the exact number of years each alternative could be implemented. However, we would reasonably expect to implement Alternative 1255 less than the No Action Alternative—probably less than 4 times in the next 30 years. Alternative 1255 would produce similar, though somewhat more significant environmental effects than the No Action Alternative. Compared to the No Action Alternative, Lake Ashtabula would lose 19% of its volume (5,900 acre-feet) and 16% of its area (518 acres). The risk of a fish kill would be low, though possible. Although the risk of a fish kill is undesirable, this alternative was carried forward for further review because the environmental effects may be acceptable and mitigatable, and the alternative could be implemented at least occasionally.

4.3 ALTERNATIVE 1252

To implement Alternative 1252, there must be four to five inches of SWE by February 15th. We would expect to implement Alternative 1252 less than Alternative 1255—probably less than 2 times in the next 30 years. Alternative 1252 would produce similar, though somewhat more significant environmental effects than Alternative 1255. Compared to the No Action Alternative, Lake Ashtabula would lose 41% of its volume (12,800 acre-feet) and 34% of its area (1,103 acres).The risk of a fish kill would be moderate. Although the risk of a fish kill is undesirable, this alternative was carried forward for further review since the environmental effects may be acceptable and mitigatable, and the alternative could be implemented at least occasionally.

4.4 ALTERNATIVE 1248

To implement Alternative 1248, there must be five to six inches of SWE by January 15th. It is very unlikely that these conditions would occur, perhaps one year out of fifty. Therefore, this alternative is nearly infeasible to implement. Alternative 1248 would produce significant environmental effects, and the risk of a fish kill would be high. Compared to the No Action Alternative, Lake Ashtabula would lose 66% of its volume (20,500 acre-feet) and 51% of its area (1,637 acres). Fish, wildlife, aquatic vegetation, and benthic organisms would experience stress, exposure, and death. Dissolved oxygen levels would likely drop, potentially causing fish kills. In addition, Alternative 1248 would draw the lake below the fish hatchery's intake pipe. Alternative 1248 fails to meet the feasibility screening criteria or the environmental effects criteria, therefore it was removed from further analysis.

4.5 ALTERNATIVE 1240

To implement Alternative 1240, there must be over six inches of SWE by the end of November. It is virtually impossible that these conditions would occur. Therefore, this alternative is infeasible to implement. Alternative 1240 would produce significant environmental effects, and the risk of a fish kill would be very high. Compared to the No Action Alternative, Lake Ashtabula would lose 92% of its volume (28,500 acre-feet) and 84% of its area (2,737 acres). Fish, wildlife, aquatic vegetation, and benthic organisms would experience stress, exposure, and death. Dissolved oxygen levels would likely drop, potentially causing fish kills. In addition, Alternative 1240 would draw the lake below the fish hatchery's intake pipe. Alternative 1240 fails to meet the feasibility screening criteria or the environmental effects criteria, therefore it was removed from further analysis.

CHAPTER 5. ALTERNATIVES EVALUATION AND ENVIRONMENTAL EFFECTS

An environmental analysis has been conducted for the alternatives, and a discussion of the impacts is presented in the following paragraphs. Because wetlands and other waters would not be filled as a part of the alternatives, a Clean Water Act Section 404(b)(1) evaluation was not prepared.

5.1 HYDROLOGIC EFFECTS AND WATER SUPPLY

Under the current water control plan, we expect to attempt to drawdown to elevation 1257.0 feet (No Action Alternative) around six times in the next 30 years. Alternative 1255 would be implemented fewer times, and Alternative 1252 even less. The infrequency of drawdowns minimizes their hydrologic effect. Greater drawdowns would increase flows on the Sheyenne River during the winter, which is typically a time of low flow conditions. Greater drawdowns would only occur during years of high snow water equivalent, and would only be implemented when moisture was sufficient to refill the pools. However, unexpected conditions could affect the ability to refill the pool. For example, SWE may have been over-estimated, soil moisture conditions may have been unexpectedly dry, or snowmelt may occur very gradually, minimizing runoff. The rules for implementing drawdowns have been developed with the goal to ensure adequate water supply to meet the purpose of the Baldhill Dam project. However, there is a small chance that the pool may not be adequately refilled, and water supply could be adversely impacted.

5.2 NATURAL RESOURCE EFFECTS

Environmental considerations associated with increased drawdowns include impacts to surface water quality, impacts to fish and wildlife, and impacts to habitat and biological productivity. The greatest two specific concerns are 1) reduced dissolved oxygen (DO) in the lake, which could lead to fish kills and impacts to other aquatic organisms, and 2) impacts to habitat from exposure of the lake bottom as the elevation of the lake is decreased. These environmental effects could adversely impact fish, benthic organisms, aquatic mammals such as beaver and muskrat, aquatic vegetation, reptiles, and amphibians. In addition, there is potential for adverse impacts to cultural resources that are usually submerged under the lake. Cultural and archeological sites could be damaged by erosion, sedimentation, or ice scour.

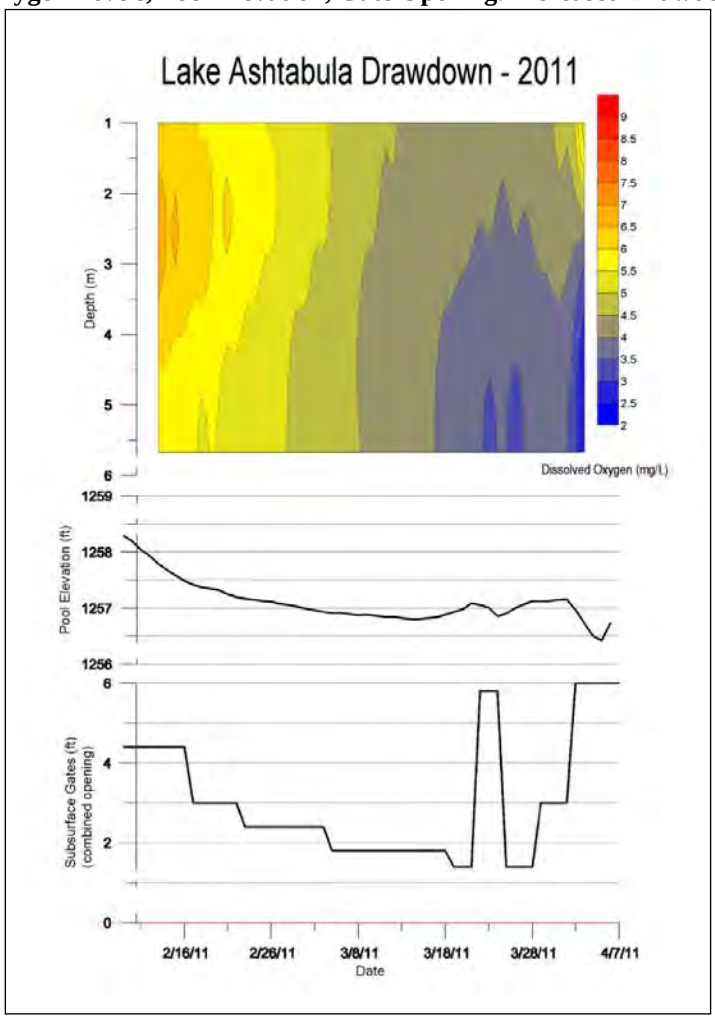
5.2.1 Water quality and fish

Under current conditions, DO levels drop throughout the winter as inflow decreases, volume decreases, and ice cover prevents reoxygenation through mixing. Levels of DO are lowest in the deeper portions of the water column, and tend to be higher in the upper one to three meters. For each additional increase in drawdown level, the volume of water in the lake is reduced, concentrating the oxygen demand and depleting the oxygen supply in the remaining water. Dissolved oxygen levels can be measured and monitored, but oxygen depletion is difficult to predict because it is dependent on numerous factors. Inflow volume seems to contribute substantially to winter DO levels. For example, in February of 1990, DO levels dropped below 4 mg/L just 2 meters below the surface even though the lake level was relatively high at 1263.35.

At this time, inflow was near zero. Conversely, in January of 1995, DO levels were above 5 mg/L even at 10 meters deep. The lake was at a slightly lower elevation of 1261.56, but inflow was approximately 100 cfs throughout the month. Snow cover can also impact DO levels.

During the drawdown to elevation 1255.0 feet in spring of 2011, oxygen levels dropped slightly below the predetermined minimum of 4 mg/L at a depth of two meters (see Figure 5-1). The drawdown was halted and the pool rose 0.3 feet overnight, and DO levels were measured at 7.32 mg/L at two meters depth the following day. Inflows increased at the same time, which may have contributed more to the DO recovery than closing the gates and ending the drawdown. Winter decrease of DO may be more a function of sediment oxygen demand and minimal inflow rather than the losses of DO through drawdown releases. Higher levels of inflow introduce new, highly oxygenated water. If this hypothesis is correct and inflow affects DO levels more than lake level, adaptive management may not reliably mitigate drops in DO. If DO levels drop below a predetermined level and the drawdown is halted, but there is no concurrent inflow, DO levels may remain low and continue dropping. If this occurs, the planned monitoring mitigation measure may fail to prevent a fish kill.

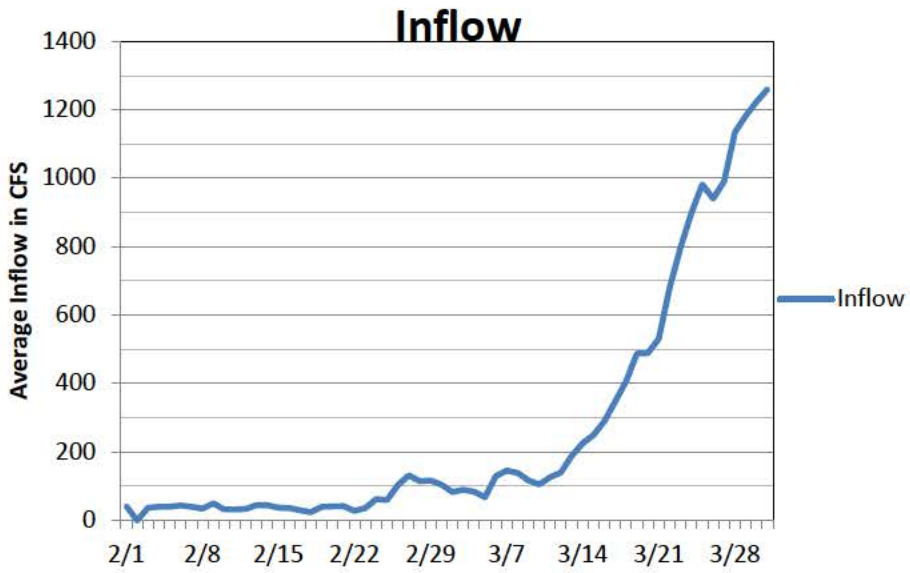
Figure 5-1. Dissolved Oxygen Levels, Pool Elevation, Gate Opening. Increased Drawdown, Spring 2011.



If higher drawdown levels were implemented, DO levels would likely be lower than if the No Action Alternative were accepted. A quantitative comparison between alternatives is not possible at this time because not enough data has been collected to fully understand the relationship between pool level and DO. Relatively speaking, the greater the drawdown, the earlier it must be implemented to achieve the desired pool level. This means that not only will pool water volume reach a lower level, but the pool will be at lower levels for additional weeks. Alternative 1255 must begin implementation by early March, and Alternative 1252 must begin implementation by mid February. These are the months that already have the lowest in DO levels. As compared to the No Action Alternative, Alternative 1255 only adds a few weeks of increased drawdown, while Alternative 1252 adds a month or more. Alternative 1252 would add an additional 3 weeks of increased drawdown as compared to Alternative 1255. Therefore, Alternative 1252 poses greater risk to aquatic organisms since DO levels are more likely to fall below acceptable levels during the additional weeks at low lake volume.

Impacts to the Lake Ashtabula fishery would be reduced and avoided through an adaptive management plan described in Section 3.6 and Appendix D. DO levels in the lake would be measured during drawdowns below elevation 1257.0 feet, and if levels drop below 4 mg/L, discharge would be reduced to the required minimum and the drawdown would be halted. Avoiding a fishing kill would depend on DO levels rebounding after the drawdown was halted. However, if inflows into the reservoir are very low, the DO levels may fail to rise or even continue to fall. The same processes that drive down DO throughout the winter would still be operating during a drawdown, and without inflow or surface mixing to reoxygenate the water, DO would likely continue to fall. On average, inflow during February is around 50 cfs, increasing to around 100 cfs in late February through mid March (see Figure 5-2). Spring meltwater flows typically increase to over 500 cfs in late March. Therefore, drawdowns initiated earlier in the winter are particularly likely to result in low DO until snowmelt increases flow in late March.

Figure 5-2. Average Inflow by Day (28 year average).



Alternative 1255 would begin on March 1st, holding the water levels low for two to four weeks before the average spring melt would replenish the DO. Alternative 1252 would begin on February 15th, which would add four to six weeks of risk. The date of spring melt varies by year, and in years with a late thaw, the risk of fish kills would be even greater as the time at low water level could be extended for additional weeks. For example, under Alternative 1255, if the spring melt water did not reach Lake Ashtabula until April 1, the lake would have been held at unusually low water level for six weeks with minimal input of DO. A review of spring melt events over the last twenty-eight years shows that in years with larger flood events, spring floodwater generally starts to rise by mid to late March. Flow generally remains low into April only in dry years, which would not correspond with an increased drawdown. Therefore the risk of a late snowmelt combined with an increased drawdown is very low.

At this time, we do not have enough information to predict or describe a potential fish kill in Lake Ashtabula. There have been no known fish kills resulting from previous drawdowns. The environmental risks associated with greater drawdowns are low probability, but high consequence. If a fish kill were to occur, mitigation would be considered to compensate for the damage to the fishery. Lake Ashtabula is the largest reservoir managed by the North Dakota Game and Fish department (NDGF) in the eastern half of the state and supports a popular fishery that has an estimated angling value of $2.6 million. The replacement value of the popular gamefish species is estimated at about $1.4 million. The Corps would coordinate the assessment and mitigation efforts with natural resources agencies.

While a fish kill of the entire gamefish population is unlikely, a major kill is possible under the right conditions. Even more concerning than a total fish kill is the possibility of a partial fish kill. In this case, the lake might experience the loss of gamefish species, which tend to be more susceptible to dissolved oxygen levels, than less desirable species such as bullheads. The lake has a strong population of bullheads, which compete directly with desirable gamefish species. After a partial fish kill, bullhead may become dominant in the lake and may make the recovery of a quality gamefish fishery nearly impossible, even with stocking.

5.2.2 Aquatic Habitat

Increased drawdowns would impact aquatic habitat by reducing the size and volume of Lake Ashtabula. Table 5.1 shows the decreases in volume and area for each alternative. The No Action Alternative—a 9 foot drawdown—dewaters 2,263 acres above Baldhill Creek, over half the length of the reservoir (except the channel and old oxbows). Compared to the No Action Alternative, Alternative 1255 would dewater an additional 518 acres, and Alternative 1252 would dewater an additional 1,103 acres. As described in the screening section, these additional acres represent a loss of 16% and 34% of the total lake acres as compared to the No Action Alternative. As compared to the normal conservation pool elevation of 1266.0 feet, the No Action Alternative dewaters 41% of lake acres, Alternative 1255 dewaters 51% of lake acres, and Alternative 1252 dewaters 61% of lake acres. Figure 5-3 shows the area of the lake for each alternative, showing the additional area exposed with each additional drawdown increment.

Reductions in lake volume are even larger than reductions in lake acres. As compared to the No Action Alternative, Alternative 1255 would reduce lake volume by 19%, and Alternative 1252

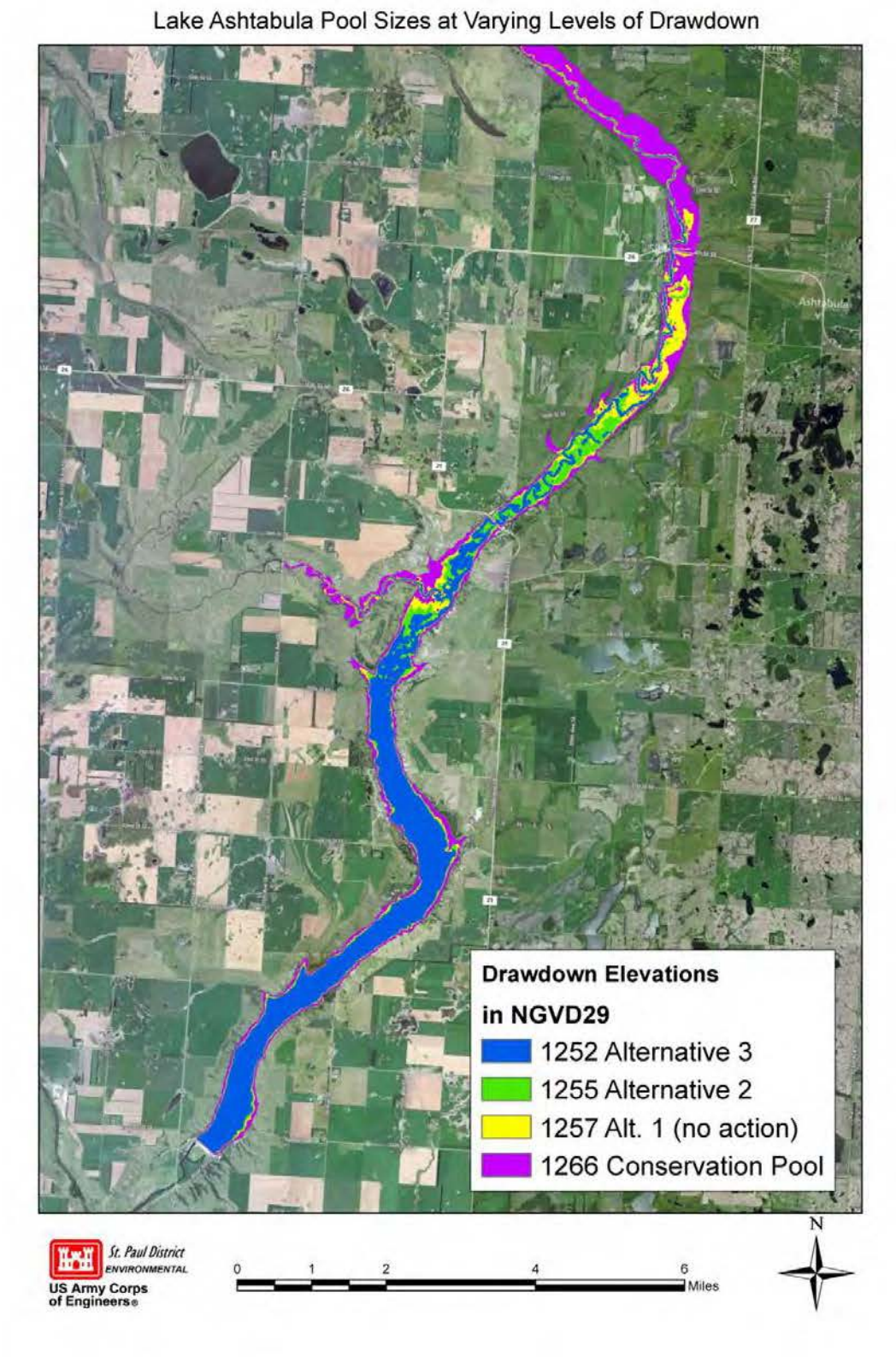
would reduce lake volume by 41%. As compared to the normal conservation pool elevation of 1266.0 feet, the No Action Alternative reduces lake volume by 56%, Alternative 1255 reduces lake volume by 64%, and Alternative 1252 reduces lake volume by 74%.

Table 5-1. Reductions in Volume and Acres.

Table 5-1 Reductions in Volume and Acres				
Alternative	**Compared to No Action Drawdown (1257.0 feet)**		**Compared to Conservation Pool (1266.0 feet)**	
	Loss Acres	**Loss Volume (acre-feet)**	**Loss Acres**	**Loss Volume (acre-feet)**
No Action	0	0	2,263 / 41%	39,600 / 56%
Alternative 1255	518 / 16%	5,900 / 19%	2,781 / 51%	45,500 / 64%
Alternative 1252	1,103 / 34%	12,800 / 41%	3,366 / 61%	52,400 / 74%

Such substantial reductions in lake volume and size would stress aquatic organisms in several ways. Fish and other aquatic organisms must migrate to follow the retreating water and may become crowded in the remaining lake area. Dissolved oxygen can become depleted, as discussed in the previous section. Some individuals could become entrapped in small pools or become stranded. Bathymetric analysis of the drawdown indicates that there are small pockets where entrapment may occur. Email coordination with the North Dakota Game and Fish Department indicated that by slowly lowering the lake elevation, more fish may be encouraged to move towards the deeper water in the channel of the reservoir and avoid being crushed by ice (Attachment B). A variety of plant and animal species live in the lake year round and others may use the lake and its substrate as refuge during the winter months. Non-mobile aquatic organisms like mussels and vegetation would likely suffer significant mortality if exposed to ice and winter temperatures. In addition, increasing flows in the Sheyenne River downstream of Baldhill Dam during winter can have adverse effects on aquatic organisms accustomed to lower winter flows.

Figure 5-3. Alternatives Comparison—Acres Dewatered.



5.2.3 Threatened and Endangered Species

One species on the federal threatened and endangered species list is known to occur in Barnes and Griggs Counties, ND: the endangered whooping crane (*Grus 28mericana*). The Western Great Lakes population of gray wolf (*Canis lupus*) was recently delisted due to recovery; this population includes the eastern portion of North Dakota. Sprague's Pipit (*Anthus spragueii*) is listed as a candidate species. Sprague's Pipit may nest in some large native and planted grasslands in the area. The proposed project would not impact upland grassland, therefore the project would have no effect on this candidate species.

While the whooping crane species may be found in Barnes and Griggs Counties, no critical habitat is known to exist for this species in the immediate project area. Because of the timing of drawdowns, it is unlikely that whooping cranes would be located on the project site during drawdown implementation. Crane migration normally begins after March 25th, by which time, generally, the spring floodwater would have started to rise and the pool would likely be refilling with flood water. Therefore, the St. Paul District has determined that all alternatives would have no effect on threatened and endangered species.

5.2.4 Reptiles and Amphibians

Most North Dakota reptiles and amphibians hibernate in terrestrial areas by burying themselves in organic matter or by occupying abandoned burrows of other animals. The northern leopard frog *(Rana pipiens),* the painted turtle (*Chrysemys picta*), and the common snapping turtle (*Chelydra serpentine*), however, hibernate in the shallows of lakes and ponds (Wheeler 1947, Hoberg and Guase 1992). They often bury themselves in shallow pits in areas with fine substrates. Reptiles and amphibians hibernating in areas of the reservoir that are exposed during a drawdown would experience mortality.

The No Action Alternative exposes 2,263 acres of lake bottom between October and March as the lake falls from the conservation pool elevation of 1266.0 feet to the maximum drawdown elevation of 1257.0 feet (9 foot drawdown). Reptiles and amphibians hibernating in this area would not survive. Alternative 1255 (11 foot drawdown) would expose an additional 518 acres of lake bottom, and Alternative 1252 (14 foot drawdown) would expose an additional 1,103 acres of lake bottom. The northern leopard frog hibernates at an average water depth of nine feet (EPA Region 1). Therefore the No Action Alternative would likely kill half or more of the frogs in the lake, while Alternative 1255 may kill 80% or more of the lake's leopard frog population. Alternative 1252 would not likely kill a great number of additional frogs, as they are not typically found at that great a depth.

In a study on the Mississippi River, snapping turtles were found hibernating at water depths of 0.3 to 5.9 ft, with an average of 1.3 ft (Paisley et. al. 2009). Forty-one percent of wintering snapping turtles were within 3.3 ft of a shoreline. In a study in southern Ontario, painted turtles overwintered in areas with water depths from 0.7 to 1.6 ft (Taylor and Nol 1988). The No Action Alternative would kill the majority of both snapping turtles and painted turtles hibernating in Lake Ashtabula as it would draw the lake below the range of their hibernation depth. Alternatives 1255 and 1252 would not cause additional impacts.

5.2.5 Benthic invertebrates

Large fluctuations in water levels can kill benthic organisms through stranding, desiccation, or freezing. Macroinvertebrate biomass often recovers quickly after drawdowns, but community composition can be significantly altered (Palomäki and Koskenniemi 1993). Frequently, macroinvertebrate species diversity is decreased and their seasonal availability as food sources for higher organisms is adversely impacted. As the base of the food chain, losses of benthic invertebrates can impact biological productivity at higher levels. Greater losses of lake bottom and lake volume would lead to greater impacts to benthic invertebrates. While information regarding specific impacts is lacking, impacts to benthic organisms would likely be greater in the shallow portions of the lake. Table 5-2 shows the relative portion of organisms occupying various depths of the lake. While there are more individuals in the 10-26 feet depth, the greatest biomass is in the shallowest portion of the lake (Peterka 1972). A large portion of this biomass is mussels. For the Order *Diptera* (fly species), the next most common invertebrate group after mussels, biomass was about three times greater in the 10-26 ft depth zone as compared to the 0-10 ft depth zone and about two times higher than in the 26-39 ft zone.

Considering that the No Action Alternative dewaters 41% of the lake compared to the conservation pool, the additional impacts of Alternative 1255 (51%) and Alternative 1252 (61%), are relatively small increments of additional impact. In addition, these added increments impact deeper portions of the lake bottom (greater than 10 ft), which support fewer benthic organisms. Specifically, the No Action Alternative dewaters the area that contains the greatest biomass of benthic invertebrates, particularly mussels. Therefore the greatest overall impact to benthic invertebrates results from the No Action Alternative drawdown, with substantially fewer additional impacts resulting from Alternative 1255 and even fewer additional impacts from Alternative 1252.

Table 5-2: Benthic Invertebrates in Lake Ashtabula

Table 5-2
Benthic Invertebrates in Lake Ashtabula

Depth	Percentage Organisms by Number	Percentage Organisms by Weight
0-10 feet	28%	53%
10-26 feet	56%	37%
26-39 feet	16%	9%

Winter drawdowns are particularly harmful to unionid mussels which have limited ability to move and succumb to freezing or desiccation. There are twelve species of native mussel known to occur in the Sheyenne River, but only four species have been sampled in Lake Ashtabula: the giant floater (*Pyganodon grandis*), fatmucket (*Lampsilis siliquoidea*), threeridge (*Amblema plicata*), and the white heelsplitter (*Lasmigona complanata*) (Jensen et al. 2001, Earth Tech, Inc. 2002). These species are common and not of special concern. Mussels in lacustrine

environments tend to occupy the littoral zone where the substrate is better consolidated and where dissolved oxygen levels remain higher. Peterka found that the majority of mussels were found in the 0-10 ft depth zone (1972). However, mussels may be found at any depth. Mussels exposed during winter drawdown would die, however the area would likely be repopulated the following year. The No Action Alternative impacts a large portion of the best mussel habitat—the shallower portion along the shoreline. Greater drawdowns would impact mussels found at greater depths, however we would expect these additional incremental impacts to be relatively small compared to the impacts resulting from drawing down to elevation 1257.0 feet.

5.2.6 Vegetation

Ice scour and freezing substrate can be responsible for drastic declines in aquatic vegetation following winter drawdown conditions. Lack of community diversity, lack of sexual reproduction, and damage to propagules at the lake bottom have all been attributed to winter drawdowns (Beard 1973). The resulting lack of plant diversity and biomass may lead to reduced habitat quality for invertebrates, reduced invertebrate food sources for wildlife, reduced winter food supply for herbivorous animals, as well as reduced feeding and juvenile habitat for some fish species. Natural resources managers have noted that drawdowns to elevation 1257.0 feet have impacted vegetation beds in the northern portion of the reservoir, which experiences greater dewatering. In summers following these low drawdowns, the sago pondweed beds are smaller, especially near the Karnak Wildlife Management Area. The sago pondweed attracts waterfowl, and decreases in the vegetation may have an impact on waterfowl feeding.

Aquatic vegetation tends to grow better in shallower water, especially in areas with turbid water, since the light only reaches the shallower portions. In Lake Ashtabula, we would expect to see the largest beds of aquatic vegetation in water 7 feet or shallower. Peterka found that the majority of aquatic plants grew in a band 33-66 ft wide around the reservoir in water 2.0-8.2 ft deep. The No Action Alternative dewaters three meters, thus impacting the majority of aquatic vegetation. Therefore, the greatest impacts to aquatic vegetation would be caused by the loss of lake area during the drawdown to elevation 1257.0 feet. An additional drawdown to elevation 1255.0 feet or 1252.0 feet would not have greater impacts to aquatic vegetation as there would be little vegetation growing at these depths.

5.2.7 Mammals and Birds

Beavers and muskrats are the mammals most likely to be affected by the drawdown activities on Lake Ashtabula. Drawdowns restrict beaver access to stored food caches and increase the frequency of overland searches for food (Smith and Peterson 1988). Susceptibility to predation increases as more time is spent above the ice. Muskrats have been shown to have decreased productivity (Bellrose and Brown 1941), higher incidence of disease (Friend et al. 1964), and lower population success from fluctuations in water levels (Bellrose and Low 1943). A study based in Northern Minnesota recommended that impacts from reservoir drawdown could be minimized by keeping annual water fluctuations at less than 5 ft and winter drawdowns at less than 2.3 ft (Smith and Peterson). The No Action Alternative produces a winter drawdown far greater than these recommendations. Alternative 1255 and 1252 may have greater negative effects that the No Action Alternative if more food caches are exposed and the mammals must

travel greater distances over ice rather than below. However, the greatest impacts likely result from the first 7 feet of drawdown, which occur in the No Action Alternative. The additional incremental impacts from additional drawdown depth are probably minor.

5.3 SOCIAL AND ECONOMIC EFFECTS

5.3.1 Uncertainty in Hydrologic Predictions

There are many variables in the calculation of flood volumes, flood stages, and flood frequencies. The exact impacts of increased drawdowns at Lake Ashtabula depend on many factors, many of which exhibit large ranges of variability. For example, two different years could result in the same volume of runoff, but the timing of flows could produce very different peak flood discharges. Likewise, a given flow could produce two different stages in different years, depending on the channel conditions at the time (amount of vegetation, presence of ice, etc.). In addition to this natural variability, there are also many unknowns. For instance, the hydrologic period of record for this study is not sufficiently long to tell exactly what the 1% (100 year) flood discharge is. The elevation model used to develop the hydraulic data may have a precision of one or two feet. The natural variability of these inputs, combined with the unknowns associated with each variable produce a good deal of uncertainty in the final estimates of flood elevations.

Given these uncertainties, the downstream impacts of the drawdowns have a large range of possibilities. The reductions in flows and flood stage at Valley City are estimates only. The flow ranges used to calculate flood damage benefits contained many assumptions. In an actual flood, the benefit in Valley City of a greater pool drawdown may be zero. There are risks presented by accepting the modeled flood reduction benefits. If the flood stage and flood damage benefits are less than anticipated, the action may not have been justified, considering the environmental risks.

5.3.2 Flooding Effects

Increased drawdowns would allow for more flood storage, which may reduce peak flood stage in downstream communities. In particular, Valley City could benefit from the additional flood water storage. Adding two or five feet to the Lake Ashtabula drawdown maximum could provide an added increment of flood damage reduction during some flood events. Alternative 1255 could decrease peak flood stage in Valley City by up to 0.2 feet and Alternative 1252 could decrease peak flood stage in Valley City by up to 0.5 feet. Figures 5-4 and 5-5 depict rough approximations of the area of Valley City that may experience reduced risk from flooding due to greater drawdowns. The benefited area could include residential neighborhoods, part of the Mercy Hospital campus, a few blocks of downtown, and some athletic facilities at Valley City State University.

The pool drawdown would only be implemented when snow pack conditions and expected spring runoff are predicted to result in significant flooding at Valley City. The city was successful in its flood fight efforts during the record flood events of 2009 and 2011; however, any additional increment of storage available at Lake Ashtabula could help reduce the pressure on emergency levees, reduce the need to raise emergency levees, and assist in-town flood fight efforts. More than 20,000 feet of emergency levee were required during these recent floods, and

in 2009 the sanitary sewer system failed resulting in a voluntary city-wide evacuation. While a pool drawdown to elevation 1255.0 feet or 1252.0 feet would not eliminate the need for flood fight efforts during severe flood events, the additional storage could reduce peak flows in Valley City and reduce the pressure on emergency levees in town. Additional pool drawdown during a severe flood is another tool in the toolbox and one piece of a comprehensive flood fight.

The Valley City Feasibility Study included an analysis of the economic benefit of increased drawdowns at Lake Ashtabula. The Equivalent Expected Annual Benefits (EEAB) for each alternative was calculated. EEAB basically means the average annual benefits of a project over time, averaging out different flood events and their probabilities. The equivalent expected annual benefits for increased drawdown to elevation 1255.0 feet was $130,000. This value was calculated assuming the flow reductions would fall within a range of 300 to 500 cfs. The equivalent expected annual benefits for increased drawdown to elevation 1252.0 feet was $240,000. This value was calculated assuming the flow reductions would fall within a range of 500 to 800 cfs. The actual reduction in flood flows depends on many variables, leaving a high degree of uncertainty regarding actual flooding benefits. Under some conditions, drawing the pool down additional feet may not provide any reduction in flood stage. In addition, the economic benefit numbers were calculated assuming that the pool could be drawn down each year. As described above, the pool can only be drawn down in years with adequate snow cover early enough in the year. Therefore, the economic benefit values are based on a best case scenario and significantly overstate the actual achievable flood benefits.

Increased drawdown would lower flood risk in Valley City by a minor increment. The City relies heavily on emergency levees for flood management. While the benefit is small, even a small increment can help reduce the flood fighting efforts, the risk of levee or sewer failure, or the need for evacuation. Increased drawdowns would not generate new or increased flows or increase water surface elevations, nor would they encourage increased development of the floodplain. Greater drawdown elevations would not transfer risk from one area or population to another.

The term “residual risk” as applied to levee systems refers to the level of risk that remains after flood risk management measures have been implemented. As with any flood risk management measure, Valley City would experience residual risk of flooding. Increased drawdowns may produce a minor reduction of flood risk, but the majority of flood risk would remain unchanged. These risks include failure of emergency levees, overtopping, or seepage. It is recommended that the city communicate the residual risk to residents and minimize these risks through flood fight planning and evacuation planning. Public education on the residual risks associated with living behind a levee would help residents make informed decisions regarding whether to purchase flood insurance, whether to build or develop in the floodplain, and how to protect their health and safety.

Figure 5-4. Flooding Effects for 50 Year Flood Event.

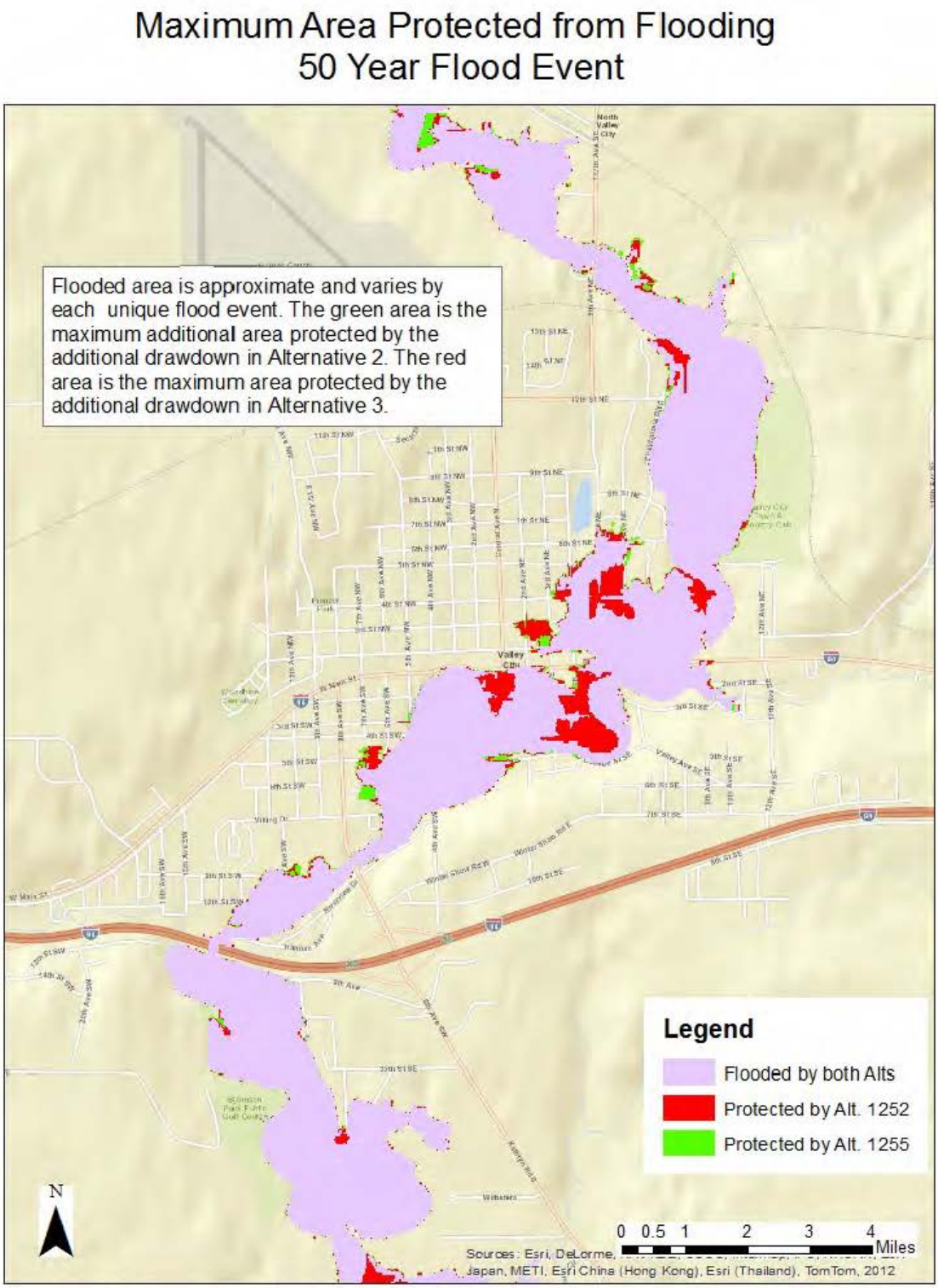
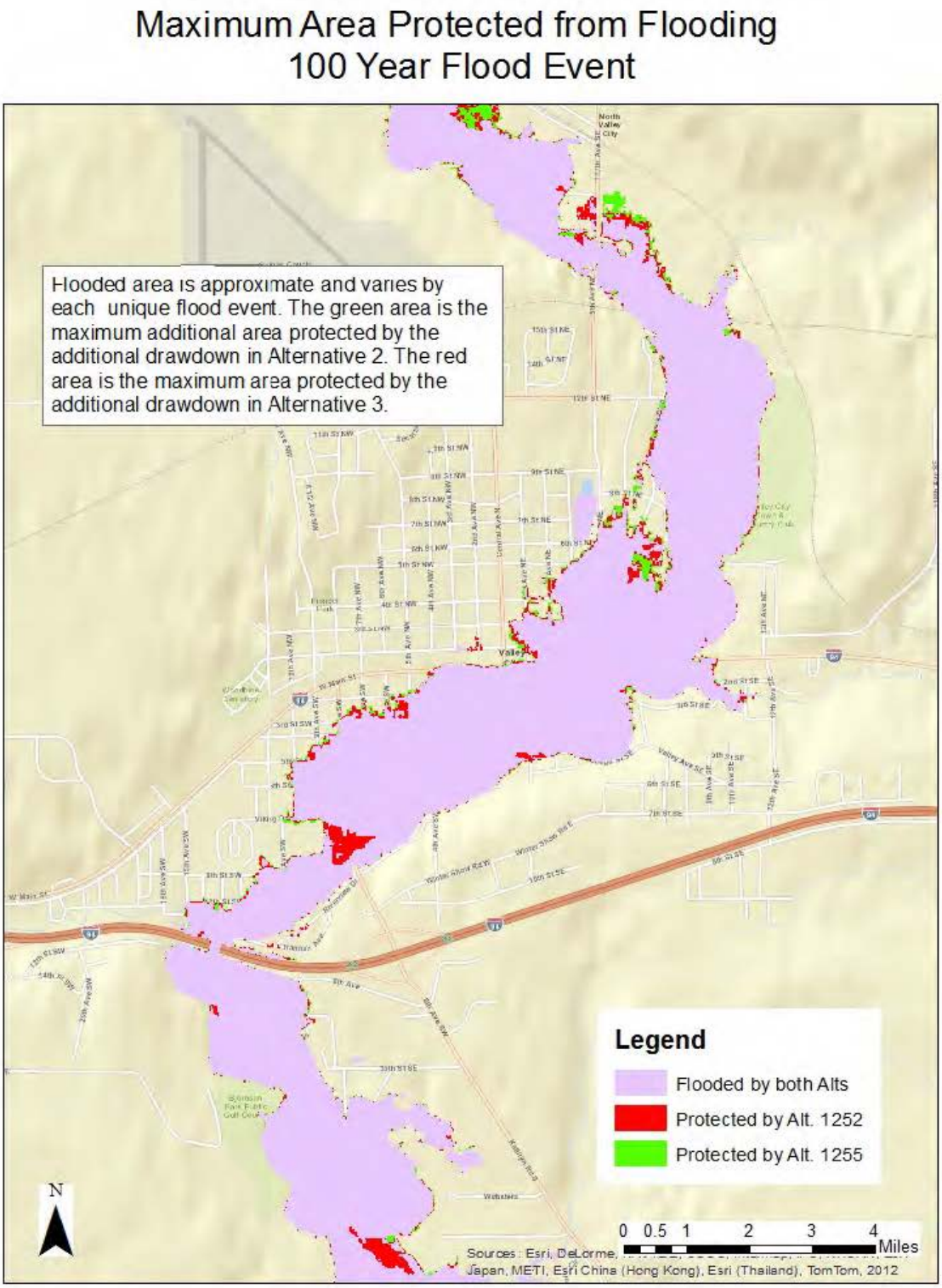


Figure 5-5. Flooding Effects for 100 Year Flood Event.



5.3.3 Controversy

If no actions were taken to increase the drawdown of Lake Ashtabula, the local community might experience an increase in the level of controversy. While the flood benefits of a drawdown beyond 1257 may be small, there is a perception that all measures, even minor ones, should be tried. If the No Action Alternative were selected, the local community may feel that the federal government is not exhausting all possible options to reduce flood damages. Conversely, even if little benefit were provided by a greater drawdown, there would be a sense that at least all options had been attempted. The evaluation conducted under this assessment should, however, minimize the level of controversy because of the increased public understanding of the benefits and potential adverse effects of increased drawdowns.

5.3.4 Recreation Effects

It is unlikely that increased drawdowns would have any effect on recreational opportunities. However, in the unlikely event that a drawdown causes low levels of dissolved oxygen leading to a fish kill, the recreational opportunities at Lake Ashtabula could be severely adversely impacted. If bullheads prevent re-establishment of gamefish, recreational opportunities would be seriously degraded permanently. Although the consequences of a fish kill are very high, the probability is low because the Corps has a water quality monitoring plan to prevent DO levels from dropping below acceptable levels (see Section 3.6 and Appendix D). Nonetheless, the consequences of a fish kill would be severe and significantly detrimental to recreation on Lake Ashtabula.

5.4 CULTURAL RESOURCES EFFECTS

A variety of factors related to drawdowns have the potential to directly and indirectly affect cultural resources, including: erosion and sedimentation from fluctuating water levels and discharge flows in impounded and tailwater areas, erosion from rainfall, wave action from wind and boat traffic, ice-wedging, alternate saturation/drying, down-cutting of tributary streams, biochemical activity, recreation, changes to the view shed, vandalism and looting. Although each of these factors may be detrimental to archaeological sites, especially erosion, the extent to which they may affect cultural resources is difficult to predict. Lake Ashtabula drawdowns have the potential to negatively impact cultural sites located at and below its normal pool elevation of 1266.0 feet.

The various factors that may have potential impacts to cultural resources may be further qualified by segregating areas within and around the pool into four impact zones: the conservation pool, the fluctuation zone, the backshore zone and the tailwater zone. The conservation pool includes the portion of the pool below the average annual drawdown. Here, the effects to cultural resources are largely biochemical, although submerged resources may be impacted by mechanical actions or exposed with lower water levels. The fluctuation or drawdown zone includes the area exposed to periodic, usually annual, shoreline fluctuation. In this zone, sites situated along the shoreline may be subjected to erosion. Erosion can cause severe impacts to shoreline cultural resource sites, such as bank destabilization, undermining foundations, loss of artifact provenience, destruction of artifacts and features from wave action and washing away a

site. In addition, increased access to sites may occur during a drawdown. This may result in inadvertent disturbance, vandalism and artifact looting with greater surface areas of a site exposed from a drawdown. The backshore zone includes the area above the level of the maximum flood pool, extending upslope and includes portions of the pool watershed. Typically, there are no direct mechanical or biochemical impacts to cultural resources within this zone. However, a lower water level may cause down-cutting of tributaries that may increase erosion to sites situated along these streams. The tailwater zone includes waterbodies immediately downstream of dams. Here, erosion and associated sedimentation along the shoreline may accelerate with increased discharges during a drawdown.

None of the previous cultural resources investigations for the Lake Ashtabula locality have specifically focused on the effects of drawdowns to cultural resources. However, based on research conducted at Corps operated reservoirs along the Upper Mississippi River (UMR) and in the southern and eastern portions of the United States, it is clear that a variety of direct (e.g., erosion) and indirect (e.g., looting) factors of water level management can adversely affect cultural resources (e.g., Dunn 1996; Ware 1989). One measure of potential effects to cultural resources relates to the proposed level of a drawdown. While normal pool operations frequently result in minor fluctuating water levels, drawdowns greater than one foot appear to have increased potential to negatively impact cultural resources. For example, almost half of the shoreline sites monitored during drawdowns in UMR pools 5 and 8 suffered negative impacts from erosion or looting (Kolb and Jalbert 2004, 2007; Perkl 2007). Under the current operating plan, Lake Ashtabula is typically drawn down in the winter months to elevations around 1262.5 feet and occasionally to 1257.0 feet. Thus, typical minor fluctuations and flood reduction drawdowns between 3.5 and 9.0 feet may have already had negative impacts to shoreline and inundated cultural resources. However, a lack of recent cultural resources information prevents a clear assessment of these effects.

At minimum, the APE for each alternative would include the entire area of exposed acres (i.e., the conservation and fluctuation zones), select backshore zone areas where down-cutting may occur and select areas in the tailwater zone dependent on discharge rates. Other than the projected areas of exposed acres, the APE for backshore and tailwater areas may best be determined by surveys or monitoring.

Of the 100 known cultural resource sites in the Lake Ashtabula locality, ten sites are entirely or partially inundated and 52 sites are situated along shorelines. Of the sites located along shorelines, 21 are protected with rip-rap and 31 are situated on non rip-rapped shorelines. Of the non rip-rapped sites, ten sites have been determined not eligible for the NRHP, leaving 21 shoreline sites that are eligible, potentially eligible or remain to be evaluated for the NRHP that may be vulnerable to negative impacts from a drawdown. Four other sites are located in backshore and tailwater zones and may also be affected by a drawdown. In total, 42 cultural resource sites in the Lake Ashtabula locality have the potential to be impacted by a drawdown. General information for the cultural resource sites that may be potentially impacted by each alternative is presented in Table 5.3.

Table 5-3: Summary of Lake Ashtabula Locality Recorded Non-Rip-Rapped Cultural Resource Sites and Potential Impacts by Alternative.

Site	Type	Affiliation	NRHP Eligibility	Impact Zone	Alternative		
					No Action/9 ft	1255/ 11 ft	1257/ 14 ft
32BA2	Artifact Scatter	Precontact	Unknown	Conservation	Yes	Yes	Yes
32BA5	Artifact Scatter	Precontact	Potentially Eligible	Conservation	Yes	Yes	Yes
32BA6	Artifact Scatter	Precontact	Potentially Eligible	Conservation	Yes	Yes	Yes
32GG2	Artifact Scatter	Precontact	Potentially Eligible	Conservation	Yes	Yes	Yes
32BA7	Artifact Scatter	Precontact	Eligible	Fluctuation	Yes	Yes	Yes
32BAx271	Artifact Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32BA414	Artifact Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32BAx113	Isolated Find	Precontact	Unknown	Fluctuation	Yes	Yes	Yes
32BA417	Artifact Scatter	Precontact	Unknown	Fluctuation	Yes	Yes	Yes
32BA426	Artifact Scatter	Historic	Not Eligible	Fluctuation	No	No	No
32BA14	Lithic Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32BAx269	Artifact Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32GG3	Artifact Scatter	Precontact	Eligible	Fluctuation	Yes	Yes	Yes
32xGG111	Lithic Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32GGx112	Lithic Scatter	Precontact	Unknown	Fluctuation	Yes	Yes	Yes
32GG9	Artifact Scatter	Precontact	Potentially Eligible	Fluctuation	No	Yes	Yes
32GG11	Artifact Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32GG13	Lithic Scatter	Precontact	Not Eligible	Fluctuation	No	No	No
32GG14	Artifact Scatter	Precontact/ Historic	Not Eligible	Fluctuation	No	No	No
32ST2	Farmstead	Historic	Unknown	Fluctuation	No	Yes	Yes
32GGx66	Isolated Find	Precontact	Unknown	Fluctuation	No	Yes	Yes
32GGx65	Artifact Scatter	Precontact	Unknown	Fluctuation	No	Yes	Yes
32GG161	Artifact Scatter/Farmstead	Precontact/ Historic	Unknown	Fluctuation	No	Yes	Yes
32GG162	Artifact Scatter/Farmstead	Precontact/ Historic	Unknown	Fluctuation	No	Yes	Yes
32GG17	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GGx115	Faunal	Precontact	Not Eligible	Backshore	No	No	No
32GG221	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG223	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG15	Lithic Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG7	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG227	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG18	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG233	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG12	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32GG232	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32BAx263	Faunal	Precontact	Not Eligible	Backshore	No	No	No
32BA131	Camp	Historic	Unknown	Backshore	No	No	Yes
32BAx274	Artifact Scatter	Precontact	Unknown	Backshore	No	Yes	Yes
32BA428	Artifact Scatter	Precontact	Not Eligible	Backshore	No	No	No
32GG10	Artifact Scatter	Precontact/ Historic	Not Eligible	Backshore	No	No	No
32GG222	Artifact Scatter	Precontact	Unknown	Backshore	No	No	Yes
32BA3**	Artifact Scatter	Precontact	Eligible	Tailwater	No	No	No

*NA=No Action

**below Baldhill Dam and USFWS fish hatchery

Assessment of Potential Effects

The scale of the drawdown (3.5 to 9.0-foot [No Action], 11-foot [Alternative 1255] or 14-foot [Alternative 1252]), would have various effects on cultural resources. Because of the nature of Lake Ashtabula, the duration of an additional drawdown (e.g., ca. two weeks), low drawdown discharge flows and a drawdown occurring during the winter months, many of the factors with potential effects to cultural resources would be inconsequential or absent. Factors judged to have inconsequential effects for Alternatives 1255 and Alternative 1252 include: wind and boat induced wave action; ice-wedging; alternate saturation/drying; biochemical activity; recreation; vandalism and looting. A factor judged to be absent for both alternatives include changes to the view shed. Potential tributary down-cutting would be reduced due to low winter flows in tributaries and short durations of increased drawdowns. With Alternative 1255, if down-cutting would occur, it would likely be restricted to deposits formed in recent sediments bereft of significant cultural phenomena. However, potential down-cutting may be greater under Alternative 1252 in the backshore zone, particularly along the Sheyenne River at the head of the lake. Potential erosion and sedimentation in tailwater zones is unlikely as discharge flows would not increase significantly from normal rates.

Of the 42 cultural resource sites at risk for impacts by a drawdown, 13 sites may be ruled out for effects by virtue of not being eligible for the NRHP. Table 5.4 presents the total number of recorded cultural resource sites by impact zone that may be potentially impacted for each alternative.

Table 5-4: Number of Recorded Cultural Resource Sites within Each Impact Zone at Lake Ashtabula that May be Potentially Impacted by Alternative.

Alternative/Foot Drawdown	Impact Zone				Total (Cumulative)	Total (Incremental)
	Conservation	Fluctuation**	Backshore	Tailwater		
NA*/9.0 ft	4	5	-	1	9	9
1255/11.0	4	11	1	1	16	7
1252/14.0	4	11	13	1	28	19

*NA=No Action
**non rip-rapped sites

No Action Alternative

Seasonal drawdowns between 3.5 and 9.0 feet may already be affecting cultural resources at Lake Ashtabula. It is difficult to attain a clear understanding of potential effects with the available cultural resources information along shorelines and ancillary areas. As a result, a total of nine known sites have the potential to be impacted by the No Action Alternative.

Alternative 1255

As above, a lack of current information on the effects of seasonal drawdowns at Lake Ashtabula hampers the determinations of potential effects to cultural resources of a drawdown to elevation 1255.0 feet. This alternative would allow a drawdown two feet lower than the current maximum

seasonal drawdown. The drawdown under this alternative has the potential to impact a total of 16 known sites, which is seven more than may be impacted under the No Action Alternative.

Alternative 1252

This alternative contemplates a drawdown four feet lower that the seasonal drawdown, or 14-feet below the normal pool level. Under this scenario, a total of 28 known sites may be impacted, which is 19 more than those potentially impacted under the No Action Alternative.

Recommendations

While the above discussion offers possible parameters for framing an APE based on each alternative, the effects of a Lake Ashtabula drawdown on cultural resources remain unknown. Assessing potential impacts to cultural resources sites from a drawdown at Lake Ashtabula is complicated by a lack of current condition information on the lake's shoreline sites below normal pool levels and because drawdowns would occur during the winter months. Currently, the Corps is not aware of negative impacts occurring to cultural resources at the Lake Ashtabula locality. However, the Corps would complete the following actions:

- If winter field conditions are suitable for cultural resources surveys during a drawdown, a systematic survey of impact zones would be completed.

- As funding allows, a comprehensive cultural resources survey of shoreline and ancillary impact zones will be completed at normal pool water levels to obtain current site conditions.

- Patrols would be increased to deter artifact looting during a drawdown.

Results of a comprehensive shoreline and ancillary impact zone survey based on the selected alternative will inform future cultural resources management schemes, such as evaluative testing, placement of shoreline protection and other measures.

5.5 CUMULATIVE IMPACTS

Cumulative effects are defined by CEQ as, "[T]he impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The proposed drawdown increase is not expected to result in impacts beyond the effects described above. There is no evidence that there would be similar activities that would result in cumulative impacts. There are no additional actions that would increase impacts to environmental resources. The greatest risk is low dissolved oxygen resulting in fish kills, and there is no evidence for recent or future actions that would cumulatively lower DO levels in the lake.

The State of North Dakota has constructed outlets on the west and east sides of Devils Lake to actively lower the lake and reduce the potential for flood damages there. These outlets are capable of pumping a combined 600 cubic feet per second of Devils Lake water into the Sheyenne River and Lake Ashtabula. However, their operation is limited to April through November, outside the timing of Lake Ashtabula drawdown and refilling. Therefore, the proposed drawdown increase is not expected to have a cumulative effect with the operation of the Devils Lake outlets. The water pumped from Devil's Lake has higher concentrations of sulfate than the Sheyenne River. Higher sulfate levels could adversely impact fish reproduction through decreased spawning success; however Lake Ashtabula fish recruitment levels are currently low for gamefish species, likely due to bullhead predation. Much of the gamefish recruitment results from stocking. Because of this, sulfate impacts on fish recruitment would likely not have a significant cumulative effect in combination with an increased drawdown.

CHAPTER 6. ALTERNATIVES COMPARISON AND PROPOSED ALTERNATIVE

Table 6.1 provides a summary of the effects of the no-action and the proposed alternatives, and Table 6.3 provides additional detail. The current maximum drawdown elevation has adverse environmental effects, and the no-action alternative continues but does not increase these effects. Alternative 1255 would increase the adverse environmental effects. The No Action Alternative would forego some potential beneficial effects to flooding, while Alternatives 1255 and 1252 would have beneficial impacts to flooding.

Table 6-1. Comparison of Major Effects

	No Action Alternative	Alternative 1255: Drawdown to 1255 feet	Alternative 1252: Drawdown to 1252 feet
Fish Kill Potential	Very Low	Low	Moderate
Additional Acres Dewatered	No Additional	518 / 16%	1,103 / 34%
Volume Lost	No Additional	5,900 acre-feet / 19%	12,800 acre-feet / 41%
Additional Flood Stage Reduction	No Additional	0.2 feet at most	0.5 feet at most
Potential Flood Benefits (EEAB)	No Additional	$130,000/year at most and likely much less	$240,000/year at most and likely much less
Last Date to Begin Drawdown from Elevation 1257.0 feet	N/A	March 1	February 15
Likelihood of Achieving Drawdown	Very High	High	Medium

Table 6-2 shows the risks associated with drawing the pool below elevation 1257.0 feet. Responses to accept, mitigate, or avoid these risks are also indicated.

Table 6-2: Project Risk Matrix

Risk Description	Likelihood	Consequences	Risk Rating	Action	Comments
Fish Kill	Low	High	Medium	Mitigate	Monitor DO; if a fish kill occurs, assess and potentially restore and compensate
Impacts to Aquatic Habitat	High	Low	Medium	Accept	Impacts would be minor and short-term
Impacts to Cultural Resources	High	Low	Medium	Mitigate and Accept	Survey cultural resources to determine impacts, avoid looting through increased patrols
Water Supply (Failure to Refill)	Very Low	Medium	Low	Mitigate and Accept	Monitor SWE, accept small risk that miscalculations lead to refill failure

After considering the effects to flooding conditions, natural resources, cultural resources, hydrology, and water supply, the Corps of Engineers is recommending Alternative 1255 as the proposed alternative. This alternative would provide flood reduction benefits to Valley City, would have less adverse impacts to natural and cultural resources than Alternative 1252, and would have a moderate probability of being implemented. Alternative 1252 would provide greater potential flood reduction benefits than Alternative 1255. However, the impacts to natural resources—the moderate risk of a fish kill, in particular—make this alternative less acceptable. In addition, Alternative 1252 would have a low probability of being implemented because there are few years with high enough snow levels by mid-February. In summary, Alternative 1255 would balance flood risk reduction benefits with increased risk to natural and cultural resources. The risks to fish and other aquatic organisms due to low DO levels would be mitigated through an adaptive management plan. If implemented, the Alternative 1255 drawdown elevation would be incorporated into the Baldhill Dam operation manual and would be implemented when basin conditions allow for increased drawdown.

Table 6-3. Environmental Assessment Matrix

No Action Alternative Effects of No Action as Compared to Existing Conditions **(Effects of Nature)**								**Proposed Alternative** Effects of Project as Compared to No-Action Effects **(Effects of Project)**						
BENEFICIAL				ADVERSE				BENEFICIAL				ADVERSE		
SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
							A. Social Effects							
			X				1. Noise Levels				X			
			X				2. Aesthetic Values				X			
			X				3. Recreational Opportunities				X*			
			X				4. Transportation				X			
			X				5. Public Health and Safety			X				
			X				6. Community Cohesion (Sense of Unity)				X			
			X				7. Community Growth and Development				X			
			X				8. Business and Home Relocations				X			
			X				9. Existing/Potential Land Use				X			
				X			10. Controversy			X				
							B. Economic Effects							
			X				1. Property Values				X			
			X				2. Tax Revenue				X			
			X				3. Public Facilities and Services				X			
			X				4. Regional Growth				X			
			X				5. Employment				X			
			X				6. Business Activity				X			
			X				7. Farmland/Food Supply				X			
			X				8. Commercial Navigation				X			
			X				9. Flooding Effects			X				
			X				10. Energy Needs and Resources				X			
							C. Natural Resource Effects							
			X				1. Air Quality				X			
			X				2. Terrestrial Habitat				X			
			X				3. Wetlands				X			
			X				4. Aquatic Habitat					X		
			X				5. Habitat Diversity and Interspersion				X			
			X				6. Biological Productivity					X		
			X				7. Surface Water Quality					X		
			X				8. Water Supply					X**		
			X				9. Groundwater				X			
			X				10. Soils				X			
			X				11. Threatened or Endangered Species				X			
							D. Cultural Resource Effects							
			X				1. Historic Architectural Values				X			
			X				2. Prehistoric & Historic Archeological Values					X		

*If a fish kill were to occur, recreational opportunities would be severely adversely impacted. However, water quality monitoring would likely prevent any fish kill.

**Drawdowns would only occur when there is sufficient snow cover to refill the pool. However, there is a small chance that there would be insufficient water to refill the pool for water supply.

CHAPTER 7. ENVIRONMENTAL COMPLIANCE AND REVIEW

7.1 APPLICABLE ENVIRONMENTAL LAWS AND EXECUTIVE ORDERS

The proposed action would comply with Federal environmental laws, Executive Orders and policies, and applicable State and local laws including but not limited to the Clean Air Act, as amended; the Clean Water Act, as amended; the Endangered Species Act of 1973, as amended; the Fish and Wildlife Coordination Act of 1958, as amended; the Land and Water Conservation Fund Act of 1965, as amended; the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969, as amended; Executive Order 11990 - Protection of Wetlands; Executive Order 12898 - Environmental Justice; the Farmland Protection Policy Act of 1981 (the proposed action would not result in the conversion of farmland, as defined by the Farmland Policy Act, to non agricultural uses); and Executive Order 11988 - Floodplain Management (having the option to draw Lake Ashtabula down two feet lower than the current maximum winter drawdown of 1257.0 feet would not encourage additional development in the floodplain).

Knowledge of the past and the preservation or minimization of the degradation of archaeological resources is one of the responsibilities of the Corps and other Federal agencies under several Federal laws, principally Sections 106 and 110 of the National Historic Preservation Act of 1966 (Public Law 89-665), as amended, various North Dakota State laws (e.g., Protection of Human Burial Sites, Human Remains and Burial Goods [North Dakota Century Code 23-06-27]) and applicable Corps of Engineers Regulations (e.g., Project Construction and Operation-Historic Preservation Program [ER-1130-2-438]).

7.2 REQUIRED COORDINATION

Planning for the overall project has been coordinated with the public, State and Federal agencies, and other interested parties (Appendix B). The views expressed by the public and agencies have been considered throughout project planning. This Environmental Assessment was made available for additional input and coordination during the public comment period.

7.2.1 Fish and Wildlife Coordination Act, Endangered Species Act

Preparation of this Environmental Assessment included coordination with the U.S. Fish and the North Dakota Game and Fish. At the closing of the public comment period, no major concerns had been raised by resource agencies.

The St. Paul District has determined that the project would have no effect on threatened and endangered species.

7.2.2 Cultural Resources and Tribal Coordination

The Corps of Engineers coordinated with the North Dakota State Historic Preservation Office (SHPO) regarding potential impacts to cultural resources. The Corps invited the Assiniboine and Sioux Tribes of the Ft. Peck Reservation, the Cheyenne River Sioux Tribe, the Chippewa-Cree

Tribe of Rocky Boys Reservation, the Lower Sioux Indian Community, the Prairie Island Indian Community, the Red Lake Band of Chippewa, the Spirit Lake Tribe, the Standing Rock Sioux Tribe, the Three Affiliated Tribes and the Turtle Mountain Band of Chippewa to participate in consultation. The Standing Rock Sioux Tribe sent a letter requesting further consultation on May 1, 2013 (see Appendix B). The Corps responded to the letter, inviting r consultation. The Standing Rock Sioux Tribe responded, as described in a letter dated July 19, 2013 (see Appendix B).The Corps has had preliminary discussions with the Standing Rock Tribal Historic Preservation Office and will continue consultation.

7.2.3 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The Executive Order makes clear that its provisions apply fully to programs involving Native Americans.

The proposed project would not have a disproportionately high adverse effect on minority or low income populations and is in compliance with EO 12898. The project would generally have beneficial social and economic effects and would generally affect all persons equally.

7.2.4 Migratory Bird Treaty Act

Potential effects to migratory birds have been considered during the planning of this project. Because implementation of the drawdown would occur in late winter and the lake would refill by the time migratory birds return to the area, it would not have an effect on migratory birds.

7.3 DISTRIBUTION OF ENVIRONMENTAL ASSESSMENT

Federal

Environmental Protection Agency
U.S. Fish and Wildlife Service

State of North Dakota

State Water Commission
Department of Health
Department of Game and Fish

Others

City of Valley City
Barnes and Griggs Counties
Valley City Public Library

7.4 COMMENTS ON THE ENVIRONMENTAL ASSESSMENT

Written comments on this environmental assessment were requested between April 5, 2013 and May 12, 2013. Two responses from individuals were received during the public comment period. One letter from the Standing Rock Sioux Tribe was received. The letter expressed concern that sites of significance to the tribe could be impacted during drawdowns. The letter requested that tribal representatives assist in surveying the area for cultural resources. Agency responses had been received prior to the public comment period, and no additional agency comments were received. All comments are included in Appendix B: Correspondence.

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APPENDIX A

FONSI

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

Regional Planning and Environment Division North

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, the St. Paul District, Corps of Engineers, has assessed the environmental impacts for the following proposed project:

LAKE ASHTABULA WINTER DRAWDOWN
BARNES COUNTY, NORTH DAKOTA

The purpose of the proposed action is to amend the Water Control Manual for Baldhill Dam to allow a maximum winter drawdown to elevation 1255.0 feet (Datum NGVD 1929). The current maximum drawdown elevation is 1257.0 feet. The additional drawdown will be used to provide additional flood storage in Lake Ashtabula to reduce the effects of spring flooding. The lake would only be drawn down to the lower elevation when snow cover in the basin ensures that the lake can be refilled to the normal summer pool elevation. The July 2013 Environmental Assessment describes the proposed action and includes an evaluation of the associated impacts.

This Finding of No Significant Impact is based on the following factors as discussed in the Environmental Assessment: the increased drawdown would produce minor positive effects on flooding and public health and safety in Valley City; the increased drawdown would have minor negative effects on aquatic habitat, biological productivity, surface water quality, and cultural resources; the increased drawdown would have no effect on endangered and threatened species. The increased drawdown moderately heightens the risk of a fish kill in Lake Ashtabula. The Corps of Engineers will mitigate the increased risk by monitoring the lake during drawdowns to ensure water quality remains sufficient to support fish. If water quality levels drop below a predetermined threshold, the drawdown will be halted.

For the reasons above, the proposed action does not constitute a major Federal action significantly affecting the quality of the environment. Therefore, an environmental impact statement will not be prepared.

Date_____

Daniel C. Koprowski
Colonel, Corps of Engineers
District Engineer

APPENDIX B

CORRESPONDENCE

From:	Clark, Steven J MVP
To:	Terry_Ellsworth@fws.gov; Jeffrey_Towner@fws.gov; Mike Sauer (msauer@nd.gov); "Engelhardt, Bruce W."; Steve Dyke (sdyke@nd.gov); ValleyCity@fws.gov; gvaneeckhout@nd.gov
Cc:	Bertschi, Tim S MVP; Nelsen, Elizabeth A MVP; Devendorf, Randall D MVP; Schueneman, Richard J MVP
Subject:	RE: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)
Date:	Friday, January 06, 2012 2:07:00 PM

Classification: UNCLASSIFIED
Caveats: NONE

Just to clarify, I meant 1257 not 1457 for our normal drawdown target (too much time working on Devils Lake lately).

-----Original Message-----
From: Clark, Steven J MVP
Sent: Friday, January 06, 2012 1:43 PM
To: Terry_Ellsworth@fws.gov; Jeffrey_Towner@fws.gov; Mike Sauer (msauer@nd.gov); 'Engelhardt, Bruce W.'; Steve Dyke (sdyke@nd.gov); 'ValleyCity@fws.gov'; 'gvaneeckhout@nd.gov'
Cc: Bertschi, Tim S MVP; Nelsen, Elizabeth A MVP; Devendorf, Randall D MVP; Schueneman, Richard J MVP
Subject: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

I am sending this message to let you all know that the Corps is starting an evaluation of our existing drawdown rules for Lake Ashtabula/Baldhill Dam. As you probably know, last year we attempted a more aggressive drawdown in anticipation of the flooding we were expecting. Even though it appears that this year we are pretty dry thus far, we anticipate that there will be a need, or at the very least requests from the public for more aggressive drawdowns more frequently in the future. In light of that, we have decided to evaluate our rules and consider implementing a revised drawdown rule now, so that we are prepared in advance for future drawdowns.

We intend to present this evaluation and the selection of any new rules (IF we select new rules) to the public in an Environmental Assessment. We would like to have a draft assessment out to the public for review near the end of January or early February. The original intent was to have a FONSI signed around the first of March so that we could implement a greater drawdown using this plan, if needed. However, some of that urgency may be reduced now with the dry conditions (but of course that could change). Nevertheless, we are going to try to finish this as soon as we can.

At this time, we are beginning to work on evaluating various drawdown targets, and the conditions that would trigger the selection of those targets in any given year. I expect that for "normal" winters, we will not be changing our target drawdown rules (drawing down to 1457). For wetter winters, we will consider lower elevations. Under the evaluation we need to consider our ability (the physical constraints) to achieve greater drawdowns, what are the benefits of doing so, and what are the risks. Under the risks of course, we need to consider natural resources. We also intend to include a dissolved oxygen monitoring plan that would be implemented if/when we decide to attempt a greater drawdown, similar to what we did last year.

At this time, my plan is to complete a preliminary draft plan with some alternatives and then to share that will all of you for comment. After we are fairly comfortable with a proposed alternative, a draft EA will be completed and released for public review and comment. Because of our timeline, I would like to have a draft plan out to you in a couple weeks.

In the meantime, if anyone has some information that would help with an evaluation the effects of various drawdown levels below 1457, please give me a call. Of course DO is our primary concern, along with the area dewatered, but DO levels can be hard to predict. On that note, last year we suspended the drawdown when DO fell below 4 ppm in the upper part of the water column. This seems like a

reasonable trigger, but I have heard from some that it may be a bit too conservative (we could have allowed DO to go lower). So, any thoughts on DO monitoring and criteria would be helpful now and later as we go.

Again, the intent of this message is to initiate coordination and get you thinking about this. I don't expect much in the way of comments until we provide more information to you, but any assistance or comment you would like to give now is certainly helpful.

If I have missed anyone that you feel should be included, please forward this on to them and copy me.

If you have any questions, please let me know. Thanks.

Steve

Steven J. Clark
Fisheries Biologist
U.S. Army Corps of Engineers
180 5th Street East, Suite 700
St. Paul, MN 55101-1678
Phone: (651) 290-5278
Fax: (651) 290-5258
steven.j.clark@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

From:	Jeffrey Towner
To:	Clark, Steven J MVP
Cc:	Kari Thorsteinson; Terry Ellsworth
Subject:	RE: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)
Date:	Friday, February 15, 2013 3:57:01 PM

Steven:

Terry Ellsworth will be assigned to this review.

Thanks,
Jeff

Jeffrey K. Towner, Field Supervisor
Ecological Services
U.S. Fish & Wildlife Service
3425 Miriam Avenue
Bismarck ND 58501
Telephone: 701-250-4481 ext. 508
Fax: 701-355-8513

"In the long history of humankind (and animal kind, too), those who learned to collaborate and improvise most effectively have prevailed."
Charles Darwin

-----Original Message-----
From: Clark, Steven J MVP [mailto:Steven.J.Clark@usace.army.mil]
Sent: Thursday, February 14, 2013 8:33 AM
To: Jeffrey_Towner@fws.gov
Cc: McGuire, Megan K MVP
Subject: FW: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Jeff,

About a year ago I sent the email below regarding our plans for considering modifying our operating plan at Ashtabula to include an additional 2 feet of drawdown in very wet winters. The project was put on the back burner last winter because of the dry conditions and because we were also going to study measures for flood risk reduction at Valley City. The study at Valley City did not lead to a feasibly project (no Federal interest anyway), and we have been working again on a plan to allow additional drawdown.

In a nutshell what we are proposing is an additional 2 feet of drawdown in wet years. We expect that we would attempt the additional drawdown roughly 4 times over the next 30 years. Water levels would be lower than the current maximum drawdown for a couple weeks to about a month. We don't expect the risk of fish kill to be high.

We are coming to a point where we expect to have a preliminary EA ready for an internal and agency partner review. I would like to know who in your office you would like to have assist us in this review, and also if you would like us to develop a scope of work for the effort for funding

your work under the FWCA? We don't have a need for a full FWCA report, and I would expect the effort on your end would entail a day or two of review and comment.

If you have any questions or would like to talk about what we are proposing, feel free to call. Thanks.

Steve

Steven J. Clark
Chief, Environmental Compliance Section
U.S. Army Corps of Engineers
180 5th Street East, Suite 700
St. Paul, MN 55101-1678
Phone: (651) 290-5278
Fax: (651) 290-5258
steven.j.clark@usace.army.mil

-----Original Message-----
From: Clark, Steven J MVP
Sent: Friday, January 06, 2012 2:07 PM
To: Terry_Ellsworth@fws.gov; Jeffrey_Towner@fws.gov; Mike Sauer (msauer@nd.gov); 'Engelhardt, Bruce W.'; Steve Dyke (sdyke@nd.gov); 'ValleyCity@fws.gov'; 'gvaneeckhout@nd.gov'
Cc: Bertschi, Tim S MVP; Nelsen, Elizabeth A MVP; Devendorf, Randall D MVP; Schueneman, Richard J MVP
Subject: RE: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Just to clarify, I meant 1257 not 1457 for our normal drawdown target (too much time working on Devils Lake lately).

-----Original Message-----
From: Clark, Steven J MVP
Sent: Friday, January 06, 2012 1:43 PM
To: Terry_Ellsworth@fws.gov; Jeffrey_Towner@fws.gov; Mike Sauer (msauer@nd.gov); 'Engelhardt, Bruce W.'; Steve Dyke (sdyke@nd.gov); 'ValleyCity@fws.gov'; 'gvaneeckhout@nd.gov'
Cc: Bertschi, Tim S MVP; Nelsen, Elizabeth A MVP; Devendorf, Randall D MVP; Schueneman, Richard J MVP
Subject: Lake Ashtabula/Baldhill Dam Drawdown Evaluation (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

I am sending this message to let you all know that the Corps is starting an evaluation of our existing drawdown rules for Lake Ashtabula/Baldhill Dam. As you probably know, last year we attempted a more aggressive drawdown in anticipation of the flooding we were expecting. Even though it appears that this year we are pretty dry thus far, we anticipate that there will be a need, or at the very least requests from the public for more aggressive drawdowns more frequently in the future. In light of that, we have decided to evaluate our rules and consider implementing a revised drawdown rule now, so that we are prepared in advance for future

drawdowns.

We intend to present this evaluation and the selection of any new rules (IF we select new rules) to the public in an Environmental Assessment. We would like to have a draft assessment out to the public for review near the end of January or early February. The original intent was to have a FONSI signed around the first of March so that we could implement a greater drawdown using this plan, if needed. However, some of that urgency may be reduced now with the dry conditions (but of course that could change). Nevertheless, we are going to try to finish this as soon as we can.

At this time, we are beginning to work on evaluating various drawdown targets, and the conditions that would trigger the selection of those targets in any given year. I expect that for "normal" winters, we will not be changing our target drawdown rules (drawing down to 1457). For wetter winters, we will consider lower elevations. Under the evaluation we need to consider our ability (the physical constraints) to achieve greater drawdowns, what are the benefits of doing so, and what are the risks. Under the risks of course, we need to consider natural resources. We also intend to include a dissolved oxygen monitoring plan that would be implemented if/when we decide to attempt a greater drawdown, similar to what we did last year.

At this time, my plan is to complete a preliminary draft plan with some alternatives and then to share that will all of you for comment. After we are fairly comfortable with a proposed alternative, a draft EA will be completed and released for public review and comment. Because of our timeline, I would like to have a draft plan out to you in a couple weeks.

In the meantime, if anyone has some information that would help with an evaluation the effects of various drawdown levels below 1457, please give me a call. Of course DO is our primary concern, along with the area dewatered, but DO levels can be hard to predict. On that note, last year we suspended the drawdown when DO fell below 4 ppm in the upper part of the water column. This seems like a reasonable trigger, but I have heard from some that it may be a bit too conservative (we could have allowed DO to go lower). So, any thoughts on DO monitoring and criteria would be helpful now and later as we go.

Again, the intent of this message is to initiate coordination and get you thinking about this. I don't expect much in the way of comments until we provide more information to you, but any assistance or comment you would like to give now is certainly helpful.

If I have missed anyone that you feel should be included, please forward this on to them and copy me.

If you have any questions, please let me know. Thanks.

Steve

Steven J. Clark
Fisheries Biologist
U.S. Army Corps of Engineers
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St. Paul, MN 55101-1678
Phone: (651) 290-5278
Fax: (651) 290-5258

steven.j.clark@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

From:	McGuire, Megan K MVP
To:	"Van Eeckhout, Gene R."; "Jeffrey_Towner@fws.gov"; "Pete Wax (pwax@nd.gov)"; "svoboda.larry@epa.gov"; "Terry_Ellsworth@fws.gov"; "Engelhardt, Bruce W."; "Steve Dyke (sdyke@nd.gov)"; "ValleyCity@fws.gov"
Cc:	Clark, Steven J MVP
Subject:	Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)
Date:	Friday, March 01, 2013 12:06:00 PM
Attachments:	Ashtabula Drawdown Draft EA.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Agency Partners,

We have completed a preliminary draft of an Environmental Assessment to allow increased drawdown at Lake Ashtabula. I am sending this version to you for comment prior to public release. We will accept your comments until March 15, as we would like to release this for public review no later than March 29, hopefully earlier.

This version of the EA has undergone a brief in-house review. Because of that, we fully expect some revisions to this EA prior to public release, as it will be undergoing a complete review in-house next week as well. We will thoroughly review the document again before release to the public, therefore we are most interested in your thoughts on the content and substance rather than minor edits.

Again, this version is NOT FOR PUBLIC RELEASE.

If you have any questions, please contact me at 651-290-5990.

Thanks in advance for your time.

Megan McGuire
Biologist
Corps of Engineers, St. Paul District
180 East Fifth Street
Suite 700
Saint Paul, MN 55101
651-290-5990
Megan.K.McGuire@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

REPLY TO
ATTENTION OF

MAR 1 8 2013

Regional Planning and Environment Division North

SUBJECT: Contingency Drawdowns for Increased Floodwater Storage Capacity at Lake Ashtabula in Barnes, Griggs and Steele Counties, North Dakota

Mr. Roger Yankton
Chairperson
Spirit Lake Sioux Tribe
P.O. Box 359
Fort Totten, North Dakota 58335

Dear Mr. Yankton:

The St. Paul District, U.S. Army Corps of Engineers (Corps) is conducting drawdown contingency planning for increased floodwater storage capacity at Lake Ashtabula in Barnes, Griggs and Steele Counties, North Dakota (Figure1). Various drawdown alternatives are being considered to accommodate increased floodwater storage capacity in anticipation of severe flood events that could result from extraordinary wet conditions in eastern North Dakota.

Lake Ashtabula's normal pool elevation is 1266 feet relative to the National Geodetic Vertical Datum. The lake is typically drawn down gradually in the winter months (October to March) to provide flood storage for spring runoff. Target drawdown elevations are based on snow-water-equivalent (SWE) measurements from basin snow surveys. Since the Corps began operating Baldhill Dam in 1950, most of the drawdowns extended to elevations around 1262.5 to 1262.0 feet (with SWE of up to 1.0 inch). Occasionally lower elevations occur with an elevation at or near 1257 feet (SWE 2.0 to 3.0 inches) reached six times. The scheduled seasonal drawdown of 3.5 to 9.0 feet (1262.5 to 1257 feet) is the No Action Alternative. The second Alternative proposes a drawdown of two feet beyond the maximum seasonal drawdown to an elevation of 1255 feet. The third Alternative proposes a drawdown of four feet below the maximum seasonal drawdown, or to an elevation of 1252 feet (Figure 2). The anticipated frequency for exercising Alternative 1255 is approximately four times and Alternative 1252 is approximately two times over the next 30 years.

The Area of Potential Effects (APE) will be dictated by which alternative is selected. In an attempt to qualify potential effects, areas within and around the lake may be segregated into four impact zones, each with a variety of factors that have the potential to directly and indirectly effect cultural resources. The impact zones and example factors include: the Conservation Zone (e.g., biochemical activity to inundated sites); the Fluctuation Zone (e.g., erosion/sedimentation of shoreline sites); the Backshore Zone (e.g., erosion to sites along tributaries with the potential for down-cutting); and, the Tail Water Zone (e.g., sites downstream of Baldhill Dam susceptible from erosion/sedimentation from increased tail-water flows). Because Lake Ashtabula has a minimal slope, the duration of an additional drawdown would be short, discharge flows would be low during a drawdown and a drawdown would occur during the winter months, many factors

are rendered inconsequential or are absent. Factors judged to have inconsequential effects for the 1255 and 1252 alternatives include: wind and boat induced wave action; ice-wedging; alternate saturation/drying; biochemical activity; recreation; vandalism and looting. A factor judged to be absent for both alternatives include changes to the view shed. Potential tributary down-cutting would be reduced due to a minimal slope of the lake. With Alternative 1255, if down-cutting would occur, it would likely be restricted to deposits formed in recent sediments without significant cultural phenomena. However, potential down-cutting may be greater under Alternative 1252 in the backshore zone, particularly along the Sheyenne River at the head of the lake. Potential erosion and sedimentation in tail-water zones is unlikely for discharge flows would not increase significantly from normal rates.

A total of 28 cultural resource sites identified within the Lake Ashtabula impact zones may potentially be impacted by a drawdown. Sites determined not eligible for listing on the National Register of Historic Places and that have been protected by rip-rap are omitted. The following table presents potentially at risk cultural resource sites by impact zone and alternative.

Number of Recorded Cultural Resource Sites within Each Impact Zone at Lake Ashtabula that May be Potentially Impacted by Alternative.

Alternative/ Foot Drawdown	Impact Zone				Total **(Cumulative)**	Total **(Incremental)**
	Conservation	Fluctuation**	Backshore	Tail Water		
NA*/9.0 ft	4	5	-	-	9	9
1255/11.0	4	11	1	-	16	7
1252/14.0	4	11	13	-	28	19

*NA=No Action

**non rip-rapped sites

Seasonal drawdowns between 3.5 and 9.0 feet (the No Action Alternative) have the potential to negatively affect nine known cultural resource sites at Lake Ashtabula. A cumulative assessment of potential effects results in Alternative 1255 potentially impacting 16 known sites and Alternative 1252 potentially impacting up to 28 known sites. Incrementally, Alternative 1255 indicates an increase in seven sites and Alternative 1252 an increase in 19 sites that may be potentially impacted.

While the above discussion offers possible parameters for framing an APE based on each alternative, the effects of a Lake Ashtabula drawdown on cultural resources remain obscure. Assessing potential impacts to cultural resources sites from a drawdown at Lake Ashtabula is hampered by a lack of current condition information on the lake's shoreline sites below normal pool levels and because drawdowns would occur during the winter months. Currently, the Corps is not aware of negative impacts occurring to cultural resources at the Lake Ashtabula locality. However, the Corps will complete the following actions:

- If winter field conditions are suitable for cultural resources surveys during a drawdown, a systematic survey of impact zones would be completed.

- As funding allows, a comprehensive cultural resources survey of shoreline and ancillary impact zones will be completed at normal pool water levels to obtain current site conditions.

- Patrols would be increased to deter artifact looting during a drawdown.

Results of a comprehensive shoreline and ancillary impact zone survey based on the selected alternative will inform future cultural resources management schemes, such as evaluative testing, placement of shoreline protection and other measures.

To summarize, the Corps is contemplating contingency drawdowns of Lake Ashtabula to accommodate increased flood water storage. Various factors will dictate if increased drawdowns are warranted, although it is unknown if and when increased drawdowns may occur. Potential effects to sites from increased drawdowns are unknown. Shoreline surveys during winter drawdowns are not practicable. Therefore, as funding allows, the Corps will complete cultural resources shoreline surveys during normal pool water levels to gather current site condition information and implement appropriate site management recommendations. With these provisions, the Corps has determined that a drawdown would have no adverse effect on cultural resources.

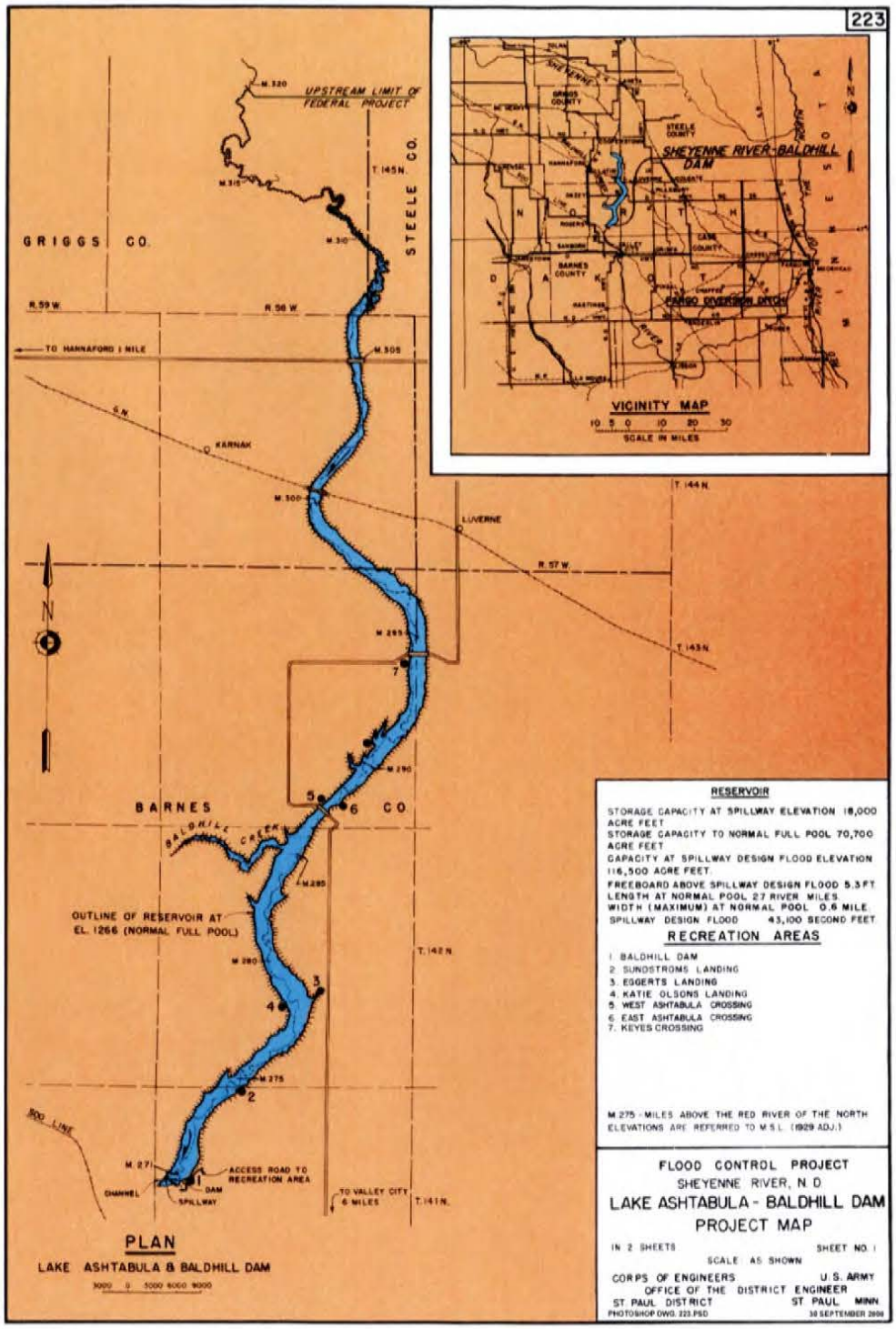
If your Band is interested in consulting on the contingency drawdowns for increased floodwater storage capacity at Lake Ashtabula, North Dakota, please provide the Corps with a letter to that effect and provide a point of contact for future consultation on the project. If you have any questions, please contact me at (651) 290-5300 or Dr. Bradley Perkl, Corps archaeologist, at (651) 290-5370.

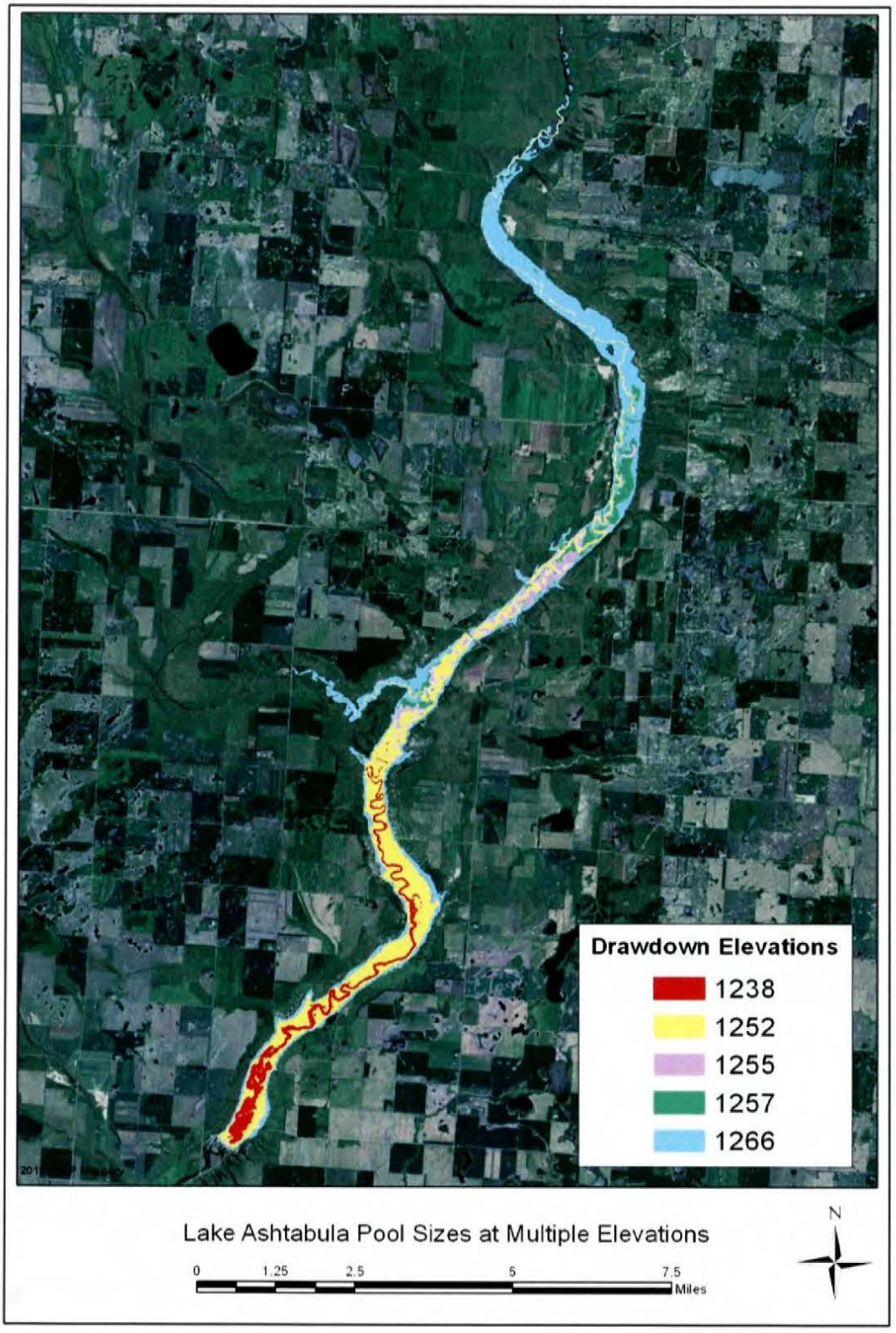
Sincerely,

Michael J. Price
Colonel, Corps of Engineers
District Engineer

Copy furnished w/enclosure
Darrell E. Smith, Cultural Advisor
Cultural Preservation Office
Spirit Lake Sioux Tribe
P.O. Box 475
Fort Totten, North Dakota 58335

CORPS OF ENGINEERS U. S. ARMY




Drawdown Elevations
1238
1252
1255
1257
1266
Lake Ashtabula Pool Sizes at Multiple Elevations
0
1.25
2.5
5
7.5
Miles
N

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

March 12, 2012

Mr. Terry J. Birkenstock, Deputy Chief
Regional Planning Environment Division North
Department of the Army
St. Paul District, Corps of Engineers
Army Corps of Engineers Center
180 Fifth Street East Suite 700
St. Paul, MN 55101-1678

NDSHPO REF.: 13-0680 COE Contingency Drawdowns for Increased Floodwater Storage at Lake Ashtabula, Griggs and Steele Counties, North Dakota

Dear Terry:

We have reviewed the project correspondence for: **13-0680 COE** "Contingency Drawdowns for Increased Floodwater Storage at Lake Ashtabula, Griggs and Steele counties, North Dakota."

We strongly support and encourage the shoreline cultural resources surveys to adequately assess and address impacts and implement management recommendations based on best practices as a result of the undertaking and actions at Lake Ashtabula.

Thank you for the opportunity to review the project, and we look forward to further consultation and on it. If you have questions please contact either Paul Picha at ppicha@nd.gov or (701) 328-3574 or Susan Quinnell at squinnell@nd.gov or (701) 328-3576.

Sincerely,

for Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota)
and
Director, State Historical Society of North Dakota

c: Bradley Perkl, COE-St. Paul District

From:	Wax, Peter N.
To:	McGuire, Megan K MVP
Subject:	RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)
Date:	Tuesday, March 12, 2013 11:09:28 AM

Dear Ms. McGuire:

Thank you for an opportunity to preview this document. First, as one that usually puts documents together instead of apart, I would like to congratulate you as this is excellent. Second, I am not really sure what my role is, but below are the questions and comments I put down as I went through it. Please use or ignore as you feel appropriate.

Questions:
1) What are the maximum lake depths with these alternatives? Could these be put them on Table 4-2 (page 19).
2) Why not have both Alternative 1255 and 1252 be preferred (or something just a hair less than 1252 like 1253.5). 1255 would kick in if 3 inches of SWE was present on March 1 and 1252 kicks in if 4 inches by February 1? "If 4 inches of SWE are there by February 1, residents along the Sheyenne might want to start looking for Noah."
3) In assessing the risk of not recovering the pool elevation, is the 600 cfs from the Devils Lake outlets taken into account? Or is the future of the outlet and operation to uncertain?
4) Page 8, Figure 2-2. Is it possible to put alternatives 1255 and 1252 on this graph or is there to much uncertainty?
5) Is it possible to list by year how often conditions for 1255 and 1252 would have occurred in the past and how much elevation would have been pulled off in actual the time available?

Water Quality Comments:
1) I like the monitoring and interactive response plan to Dissolved Oxygen concentrations. It would be interesting to see if the water elevations could be reached through pulses while protecting aquatic life.
2) 4 mg/L Dissolved Oxygen is a good number.
3) From a water quality perspective there are lots of issues at play when drawing down the reservoir and not all of them would be negative. A reduction in residence time might reduce trophic response. Exposing sediments could result in drying and consolidation reducing resuspension of nutrients after filling. Exposing sediments could encourage colonization by emergent macrophytes or terrestrial/hydrophytes resulting in less erosion and sediment resuspension of nutrients. Obviously there are negative possibilities as well.
4) The 600 cfs from Devils Lake (May 1 through November 30) has the potential to shorten Ashtabula's residence time and at least temporarily increase the concentrations of dissolved solids. A shortened residence time might reduce trophic response help fill the reservoir. "Are higher TDS concentrations good or bad? Are they likely to impair bullhead reproduction? Perch? Pike?"

General Comments:
5) Page 26. Might want to point out the wildlife loss 2.6 million + 1.4 million mitigation vs. 422,727,400 million in human suffering.
6) Page 32 last paragraph three lines up. I believe "keep" should be "keeping"
7) Page 41. I believe viewshed is one word.

Sincerely,

Peter Wax
Environmental Scientist
North Dakota Department of Health
Division of Water Quality, "Because Not Everyone Can Live Upstream"
701-328-5268
pwax@nd.gov

-----Original Message-----
From: McGuire, Megan K MVP [mailto:Megan.K.McGuire@usace.army.mil]
Sent: Friday, March 01, 2013 2:57 PM
To: Van Eeckhout, Gene R.; Jeffrey_Towner@fws.gov; Wax, Peter N.; 'Anderson.Carol@epamail.epa.gov'; Terry_Ellsworth@fws.gov; Engelhardt, Bruce W.; Dyke, Steve R.; ValleyCity@fws.gov
Cc: Clark, Steven J MVP
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Some of the formatting was incorrect in the document I just sent out. Here is a reformatted version. Sorry about that.

Thanks!

Megan

-----Original Message-----
From: McGuire, Megan K MVP
Sent: Friday, March 01, 2013 12:07 PM
To: 'Van Eeckhout, Gene R.'; 'Jeffrey_Towner@fws.gov'; 'Pete Wax (pwax@nd.gov)'; 'svoboda.larry@epa.gov'; 'Terry_Ellsworth@fws.gov'; 'Engelhardt, Bruce W.'; 'Steve Dyke (sdyke@nd.gov)'; 'ValleyCity@fws.gov'
Cc: Clark, Steven J MVP
Subject: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Agency Partners,

We have completed a preliminary draft of an Environmental Assessment to allow increased drawdown at Lake Ashtabula. I am sending this version to you for comment prior to public release. We will accept your comments until March 15, as we would like to release this for public review no later than March 29, hopefully earlier.

This version of the EA has undergone a brief in-house review. Because of that, we fully expect some revisions to this EA prior to public release, as it will be undergoing a complete review in-house next week as well. We will thoroughly review the document again before release to the public, therefore we are most interested in your thoughts on the content and substance rather than minor edits.

Again, this version is NOT FOR PUBLIC RELEASE.

If you have any questions, please contact me at 651-290-5990.

Thanks in advance for your time.

Megan McGuire
Biologist
Corps of Engineers, St. Paul District
180 East Fifth Street
Suite 700
Saint Paul, MN 55101
651-290-5990
Megan.K.McGuire@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

From:	Kreft, Bruce L.
To:	McGuire, Megan K MVP
Subject:	FW: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)
Date:	Wednesday, March 20, 2013 11:55:48 AM

Megan,
After corresponding with Gene, he concurs with your recommendation to implement Alternative 1255; therefore the Department will not be sending any additional comments or letters unless you need an official letter. Let me know if this is sufficient.
Bruce Kreft

-----Original Message-----
From: McGuire, Megan K MVP [mailto:Megan.K.McGuire@usace.army.mil]
Sent: Wednesday, March 20, 2013 8:22 AM
To: Dyke, Steve R.
Cc: Van Eeckhout, Gene R.
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Steve,

I received a brief email from Gene, indicating that your office would be sending additional comments on the Lake Ashtabula EA. Are you planning to send me something? If so, please send ASAP.

Thanks,
Megan

-----Original Message-----
From: Van Eeckhout, Gene R. [mailto:gvaneeckhout@nd.gov]
Sent: Tuesday, March 05, 2013 7:42 PM
To: McGuire, Megan K MVP
Cc: Clark, Steven J MVP
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Megan,

I provided some comments to Bruce Kreft (Steve Dyke's shop) in Bismarck. I suspect my agencies comments will come from that source.

Basically what I said was that after considering all the variables, I concur with your recommendation to implement Alternative 1255.

Regards,
GVE

-----Original Message-----
From: McGuire, Megan K MVP [mailto:Megan.K.McGuire@usace.army.mil]
Sent: Friday, March 1, 2013 2:57 PM
To: Van Eeckhout, Gene R.; Jeffrey_Towner@fws.gov; Wax, Peter N.; 'Anderson.Carol@epamail.epa.gov'; Terry_Ellsworth@fws.gov; Engelhardt, Bruce W.; Dyke, Steve R.; ValleyCity@fws.gov
Cc: Clark, Steven J MVP
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
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Megan

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From: McGuire, Megan K MVP
Sent: Friday, March 01, 2013 12:07 PM
To: 'Van Eeckhout, Gene R.'; 'Jeffrey_Towner@fws.gov'; 'Pete Wax (pwax@nd.gov)'; 'svoboda.larry@epa.gov'; 'Terry_Ellsworth@fws.gov'; 'Engelhardt, Bruce W.'; 'Steve Dyke (sdyke@nd.gov)'; 'ValleyCity@fws.gov'
Cc: Clark, Steven J MVP
Subject: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
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If you have any questions, please contact me at 651-290-5990.

Thanks in advance for your time.

Megan McGuire
Biologist
Corps of Engineers, St. Paul District
180 East Fifth Street
Suite 700
Saint Paul, MN 55101
651-290-5990
Megan.K.McGuire@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

From: McGuire, Megan K MVP
To: "Pete Wax (pwax@nd.gov)"
Subject: FW: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)
Date: Wednesday, March 27, 2013 9:15:00 AM

Classification: UNCLASSIFIED
Caveats: NONE

Dear Mr. Wax,

Thank you for your very insightful questions and comments. I have tried to answer them to the best of my ability (see responses below). We will be releasing our Draft EA to the public for comment this week. I invite you to submit additional questions or comments if you feel that these responses do not adequately answer for your questions.

Thanks,

Megan McGuire
Biologist
Corps of Engineers, St. Paul District

-----Original Message-----
From: Wax, Peter N. [mailto:pwax@nd.gov]
Sent: Tuesday, March 12, 2013 11:09 AM
To: McGuire, Megan K MVP
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Dear Ms. McGuire:

Thank you for an opportunity to preview this document. First, as one that usually puts documents together instead of apart, I would like to congratulate you as this is excellent. Second, I am not really sure what my role is, but below are the questions and comments I put down as I went through it. Please use or ignore as you feel appropriate.

Questions:
1) What are the maximum lake depths with these alternatives? Could these be put them on Table 4-2 (page 19).

Response:
Lake depths have been added to the report.

2) Why not have both Alternative 1255 and 1252 be preferred (or something just a hair less than 1252 like 1253.5). 1255 would kick in if 3 inches of SWE was present on March 1 and 1252 kicks in if 4 inches by February 1? "If 4 inches of SWE are there by February 1, residents along the Sheyenne might want to start looking for Noah."

Response:
We chose to proceed with Alternative 1255 as the only preferred alternative because the risk of a fish kill that would accompany Alternative 1252 is too high. A partial fish kill could be nearly impossible to mitigate, and therefore we strongly want to avoid a fish kill. In addition, the added flood reduction benefits from an intermediary drawdown are limited and the likelihood of achieving the extra drawdown is low.

3) In assessing the risk of not recovering the pool elevation, is the 600 cfs from the Devils Lake outlets taken into account? Or is the future of the outlet and operation to uncertain?

Response:
We did not include flow from Devils Lake in our risks analysis of recovering pool elevation. We do not want to depend on artificial flows to fill the pool, since these are not reliable enough. The refill will be determined by snow water equivalent. In addition, flow from Devils Lake will not address fish kill risks, since these risks will occur in late winter, long before flows from Devils Lake begin.

4) Page 8, Figure 2-2. Is it possible to put alternatives 1255 and 1252 on this graph or is there to much uncertainty?

Response:
Chapter 2 addresses existing conditions. The information you are seeking can be found in Tables 4-2 and 5-1, which show the same information as Figure 2-2 for Alternatives 1255 and 1252.

5) Is it possible to list by year how often conditions for 1255 and 1252 would have occurred in the past and how much elevation would have been pulled off in actual the time available?

Response:
We were hoping to complete this analysis. However, we do not have sufficient data on snow water equivalent to complete this analysis for more than a handful of years. The limited numbers of years with available data is not enough to form solid conclusions, therefore it would be confusing to include this data. In addition, there are other variables that factor into the decision for which we do not have good data (i.e., ambient soil moisture, flood predictions based on snow downstream of the dam, etc.). The variability of these factors and the need to make a "judgment call" explains why we don't always attempt a drawdown even when the SWE would allow us to. Therefore, we cannot accurately analyze how many years conditions were sufficient to conduct drawdowns to 1255 or 1252.

Water Quality Comments:
1) I like the monitoring and interactive response plan to Dissolved Oxygen concentrations. It would be interesting to see if the water elevations could be reached through pulses while protecting aquatic life.
2) 4 mg/L Dissolved Oxygen is a good number.
3) From a water quality perspective there are lots of issues at play when drawing down the reservoir and not all of them would be negative. A reduction in residence time might reduce trophic response. Exposing sediments could result in drying and consolidation reducing resuspension of nutrients after filling. Exposing sediments could encourage colonization by emergent macrophytes or terrestrial/hydrophytes resulting in less erosion and sediment resuspension of nutrients. Obviously there are negative possibilities as well.

Response:
We did consider whether there might be beneficial effects. It seems unlikely that the drawdown would have a measurable positive effect on vegetation given that the drawdown will occur during the dormant season. Positive vegetation response to drawdown would likely require a drawdown during the growing season lasting several months. It is possible that the drawdown could consolidate sediments, though we cannot be confident of this result. Therefore, we chose not to claim a potential benefit with high uncertainty.

4) The 600 cfs from Devils Lake (May 1 through November 30) has the potential to shorten Ashtabula's residence time and at least temporarily increase the concentrations of dissolved solids. A shortened residence time might reduce trophic response help fill the reservoir. "Are higher TDS concentrations good or bad? Are they likely to impair bullhead reproduction? Perch? Pike?"

Response:
In general high sulfate levels impact fish recruitment - potentially through hatching or rearing. We are not aware of good studies on this, but there may be some. Walleye do not successfully spawn in the eastern end of Devils Lake where sulfate is very high, but they do fine in the western end and the lake has a great walleye fishery. In Ashtabula we did see sulfate levels increase to the point of showing that the lake was effectively equal in sulfates to the pumped Devils Lake water last year. More importantly though is that while sulfate levels are interesting, they are not really affected by the drawdown.

General Comments:

5) Page 26. Might want to point out the wildlife loss 2.6 million + 1.4 million mitigation vs. 422,727,400 million in human suffering.

Response:
I'm not sure what you are referring to here. Does "422,727,400 million" refer to economic flood damages, population affected, or something else?

6) Page 32 last paragraph three lines up. I believe "keep" should be "keeping"
7) Page 41. I believe viewshed is one word.

Sincerely,

Peter Wax
Environmental Scientist
North Dakota Department of Health
Division of Water Quality, "Because Not Everyone Can Live Upstream"
701-328-5268
pwax@nd.gov

-----Original Message-----
From: McGuire, Megan K MVP [mailto:Megan.K.McGuire@usace.army.mil]
Sent: Friday, March 01, 2013 2:57 PM
To: Van Eeckhout, Gene R.; Jeffrey_Towner@fws.gov; Wax, Peter N.; 'Anderson.Carol@epamail.epa.gov'; Terry_Ellsworth@fws.gov; Engelhardt, Bruce W.; Dyke, Steve R.; ValleyCity@fws.gov
Cc: Clark, Steven J MVP
Subject: RE: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Some of the formatting was incorrect in the document I just sent out. Here is a reformatted version. Sorry about that.

Thanks!

Megan

-----Original Message-----
From: McGuire, Megan K MVP
Sent: Friday, March 01, 2013 12:07 PM
To: 'Van Eeckhout, Gene R.'; 'Jeffrey_Towner@fws.gov'; 'Pete Wax (pwax@nd.gov)'; 'svoboda.larry@epa.gov'; 'Terry_Ellsworth@fws.gov'; 'Engelhardt, Bruce W.'; 'Steve Dyke (sdyke@nd.gov)'; 'ValleyCity@fws.gov'
Cc: Clark, Steven J MVP
Subject: Request to Review EA for Increased Drawdowns at Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Agency Partners,

We have completed a preliminary draft of an Environmental Assessment to allow increased drawdown at Lake Ashtabula. I am sending this version to you for comment prior to public release. We will accept your comments until March 15, as we would like to release this for public review no later than March 29, hopefully earlier.

This version of the EA has undergone a brief in-house review. Because of that, we fully expect some

revisions to this EA prior to public release, as it will be undergoing a complete review in-house next week as well. We will thoroughly review the document again before release to the public, therefore we are most interested in your thoughts on the content and substance rather than minor edits.

Again, this version is NOT FOR PUBLIC RELEASE.

If you have any questions, please contact me at 651-290-5990.

Thanks in advance for your time.

Megan McGuire
Biologist
Corps of Engineers, St. Paul District
180 East Fifth Street
Suite 700
Saint Paul, MN 55101
651-290-5990
Megan.K.McGuire@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

REPLY TO
ATTENTION OF

March 29, 2013

Regional Planning and Environment Division North

Dear Interested Parties:

Enclosed for your information, review and comment is the Draft Environmental Assessment and Finding of No Significant Impact for a proposed change to the winter drawdown procedures for Lake Ashtabula in Barnes County, North Dakota. The change would consist of amending the Water Control Manual for Baldhill Dam to allow Lake Ashtabula to be drawn down to elevation 1255.0 feet during years with heavy snow cover. The current manual permits the lake to be drawn down to elevation 1257.0 feet. The change would allow an additional two feet of drawdown, but only in years with sufficient snow cover to refill the lake during sprint melt. The increased drawdown would provide additional flood storage in Lake Ashtabula, which could provide minor flood stage reduction benefits in Valley City. The additional drawdown may slightly increase the risk of a fish kill in the lake. Water quality would be monitored to reduce the risk of a fish kill.

We are distributing this environmental assessment to concerned agencies, interest groups and individuals for comment. The report can also be downloaded from the St. Paul District's website at: http://www.mvp.usace.army.mil/Missions/CivilWorks/Environment/EnvironmentalAssessments.aspx . If public review identifies any significant concerns or results in project modifications, a revised National Environmental Policy Act document may be prepared. If you have any comments on the environmental assessment, please provide them by May 12, 2013.

Questions concerning the change to the winter drawdown procedures should be directed to Megan McGuire, at (651) 290-5990 or Megan.K.McGuire@usace.army.mil. Please address all correspondence on this project to the District Engineer, St. Paul District, Corps of Engineers, Attention: Regional Planning and Environment Division North, 180 Fifth Street East, Suite 700 St. Paul, Minnesota 55101-1678.

Sincerely,

Terry J. Birkenstock
Deputy Chief, Regional Planning and
Environment Division North

Enclosure

From:	McGuire, Megan K MVP
To:	Van Eeckhout, Gene R.; Jeffrey_Towner@fws.gov; Pete Wax (pwax@nd.gov); "Anderson.Carol@epamail.epa.gov"; Terry_Ellsworth@fws.gov; "Engelhardt, Bruce W."; Steve Dyke (sdyke@nd.gov); ValleyCity@fws.gov; jfroelich@kwh.com; Dave Schelkoph; Matthew Pedersen; Ron.Halvorson@griggscountynd.gov
Cc:	Clark, Steven J MVP
Subject:	Draft EA for Increased Ashtabula Drawdown (UNCLASSIFIED)
Date:	Monday, April 01, 2013 9:18:45 AM
Attachments:	Ashtabula Drawdown Draft EA to post.reduced.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Dear Interested Parties:

Enclosed for your information, review and comment is the Draft Environmental Assessment and Finding of No Significant Impact for a proposed change to the winter drawdown procedures for Lake Ashtabula in Barnes County, North Dakota. The change would consist of amending the Water Control Manual for Baldhill Dam to allow Lake Ashtabula to be drawn down to elevation 1255.0 feet during years with heavy snow cover. The current manual permits the lake to be drawn down to elevation 1257.0 feet. The change would allow an additional two feet of drawdown, but only in years with sufficient snow cover to refill the lake during sprint melt. The increased drawdown would provide additional flood storage in Lake Ashtabula, which could provide minor flood stage reduction benefits in Valley City. The additional drawdown may slightly increase the risk of a fish kill in the lake. Water quality would be monitored to reduce the risk of a fish kill.

We are distributing this environmental assessment to concerned agencies, interest groups and individuals for comment. The document will also be posted on the St. Paul District website. If public review identifies any significant concerns or results in project modifications, a revised National Environmental Policy Act document may be prepared. If you have any comments on the environmental assessment, please provide them by May 12, 2013.

Questions concerning the change to the winter drawdown procedures should be directed to Megan McGuire, at (651) 290-5990 or Megan.K.McGuire@usace.army.mil. Please address all correspondence on this project to the District Engineer, St. Paul District, Corps of Engineers, Attention: Regional Planning and Environment Division North, 180 Fifth Street East, Suite 700 St. Paul, Minnesota 55101-1678.

Megan McGuire
Biologist
Corps of Engineers, St. Paul District
180 East Fifth Street
Suite 700
Saint Paul, MN 55101
651-290-5990
Megan.K.McGuire@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

From:	Terry Metzger
To:	McGuire, Megan K MVP
Subject:	Drawdown of Lake Ashtabula for Downstream Flood Prevention
Date:	Monday, May 06, 2013 8:23:33 AM

For Whom It May Concern:

This to voice my opinion that I am not in agreement with plans to lower Lake Ashtabula from 1257' to 1255' in the future. At 1255 we are in danger of losing the fish in the lake. This is a great fishing and recreation lake and I would have to assume that this could cost a great deal of revenue to the area if it is destroyed.

Also, I am hearing that lowering it two feet would do very little good for flood prevention, but will make the lake unable to sustain fish.

I am also very concerned that if this happens it will destroy property values as well. My wife and I purchased a year around place on the lake in 2012 and intend to retire here.

Please reconsider your plans on lowering the levels in the future!

Thanks for your time.

Sincerely,

Terry Metzger

147 Jewetts Beach

Valley City, ND 58072

From:	McGuire, Megan K MVP
To:	McGuire, Megan K MVP
Subject:	FW: St. Paul District Contact Form: public input of lake ashtabula maximum drawdown (UNCLASSIFIED)
Date:	Tuesday, June 04, 2013 8:50:05 AM

Classification: UNCLASSIFIED
Caveats: NONE

-----Original Message-----
From: cemvp-pa@usace.army.mil [mailto:cemvp-pa@usace.army.mil]
Sent: Friday, April 12, 2013 3:39 AM
To: CEMVP-PA MVP
Subject: St. Paul District Contact Form: public input of lake ashtabula maximum drawdown

This message was sent from the St. Paul District website.

Message From: adam larson
Email: adam.larson@vcsu.edu
Response requested: No

Message:

I would like to state my opposition to these changes due to the increased possibility of winter kill of the reservoir and the limited benefit in storage.
thank you for your consideration,
Adam

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

TRIBAL HISTORIC PRESERVATION OFFICE
STANDING ROCK SIOUX TRIBE
Administrative Service Center
North Standing Rock Avenue
Fort Yates, N.D. 58538
Tel: (701) 854-2120
Fax: (701) 854-2138

May 1, 2013

THPO file 13-99

Michael J. Price
Colonel, Corps of Engineers
District Engineer
St Paul District, Corps of Engineers
180 Fifth Street East, Suite 700
St Paul, MN 55101

RE: Lake Ashtabula Contingency Drawdowns for Increased Floodwater Storage

Dear Mr. Price,

The Standing Rock Sioux Tribe Tribal Historic Preservation Office (SRST-THPO) is in receipt of your letter dated March 18, 2013. The SRST-THPO would like to consult with your office on this proposed undertaking. In particular, we are a little concerned about the proposed no adverse effect determination and how that was achieved without any tribal input and with any plans to survey the current and drawdown lake pool levels and tributaries.

Should you require any additional information please contact Waste'Win Young (THPO officer), Terry Clouthier (Tribal Archaeologist) or Mary Wilson (Section 106 coordinator) at (701) 854-2120. We look forward to working with your office on this and future projects.

Sincerely,
STANDING ROCK SIOUX TRIBE

Terry Clouthier
Tribal Archaeologist

From:	McGuire, Megan K MVP
To:	McGuire, Megan K MVP
Subject:	FW: Lake Ashtabula (UNCLASSIFIED)
Date:	Tuesday, July 02, 2013 11:05:58 AM

Classification: UNCLASSIFIED
Caveats: NONE

-----Original Message-----
From: Perkl, Bradley E MVP
Sent: Friday, June 28, 2013 4:51 PM
To: 'mwilson@standingrock.org'
Cc: 'tclouthier@standingrock.org'; 'jmswhitted@yahoo.com'
Subject: Lake Ashtabula (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Mary:

It was a pleasure speaking with you yesterday about Lake Ashtabula.

The proposed drawdown EA is still a draft-internet link is here:

http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll7/id/268

Let me know if the link doesn't work...

I've placed PDF versions of the reports we have for cultural resources work at Lake Ashtabula on a CD-should be in the mail Monday.

Jim-I'll give you a call to discuss the proposed project at 605-698-3584 (please let me know if there's a better number).

Please contact me with questions. Talk with you soon. Thank you.

Bradley. E. Perkl, Ph.D.
District Archaeologist
Environmental Compliance
U.S. Army Corps of Engineers, St. Paul District
RPEDN-PD-C
180 Fifth Street East, Suite 700
St. Paul, MN 55101
651-290-5370
bradley.e.perkl@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

TRIBAL HISTORIC PRESERVATION OFFICE
STANDING ROCK SIOUX TRIBE
Administrative Service Center
North Standing Rock Avenue
Fort Yates, N.D. 58538
Tel: (701) 854-2120
Fax: (701) 854-2138

July 19, 2013

Bradley Perkl
District Archaeologist
Environmental Compliance
US Army Corps of Engineers, St. Paul District
180 Fifth Street East, Suite 700
St. Paul, MN 55101

Re: Lake Ashtabula Winter Drawdown THPO file 13-99

Dear Mr. Perkl:

Based on the project location, as well as other known sites in the area the Standing Rock Sioux Tribe, Tribal Historic Preservation requests continued consultation regarding cultural resources in the Lake Ashtabula area.

Given that broad shoreline cultural resource studies have not occurred since the 1970's, we would advise not only that the agency take steps to survey the project area but that Traditional Cultural Specialist be brought in to assist the agency with any identification efforts.

We know from past experience that archeologists and the methods they use in conducting archeological surveys are not appropriate for the identification of specific properties of significance to us. It is the policy of our office that a pedestrian survey of the APE conducted by tribal representatives is the only way to accomplish this.

This office is particularly concerned with the proposed project's potential impacts to resources in the backshore and fluctuation zones but support the recommendations outlined on page 38 (Section 5.4) of the March 2012 Draft Environmental Assessment with the added caveat that there be Tribal participation on any cultural resource survey's that are conducted.

Sincerely,

Mary S. Wilson
Section 106 Project Coordinator
Tribal Historic Preservation Office
701-854-8617

APPENDIX C

WATER QUALITY AND PAST DRAWDOWNS

INTRODUCTION

Baldhill Dam is located on the Sheyenne River in the Souris River-Red River of the North Basin, 12 miles upstream of Valley City, North Dakota, and 35 miles upstream of the mouth of the Sheyenne River near Fargo, North Dakota. The dam forms Lake Ashtabula, which stores 70,600 acre-feet of water at elevation 1266.0 feet (Datum NGVD 1929), and the lake is 27 miles long at normal pool level. Lake Ashtabula is an important regional resource.

The Baldhill Dam/Lake Ashtabula Project was authorized by the Flood Control Act approved 22 December 1944. The dam was constructed in 1950. The purpose of the project is two-fold: water supply (92%) and flood control (8%). The St. Paul District, Corps of Engineers (Corps) currently operates the project for water supply, flood damage reduction, recreation, and natural resources.

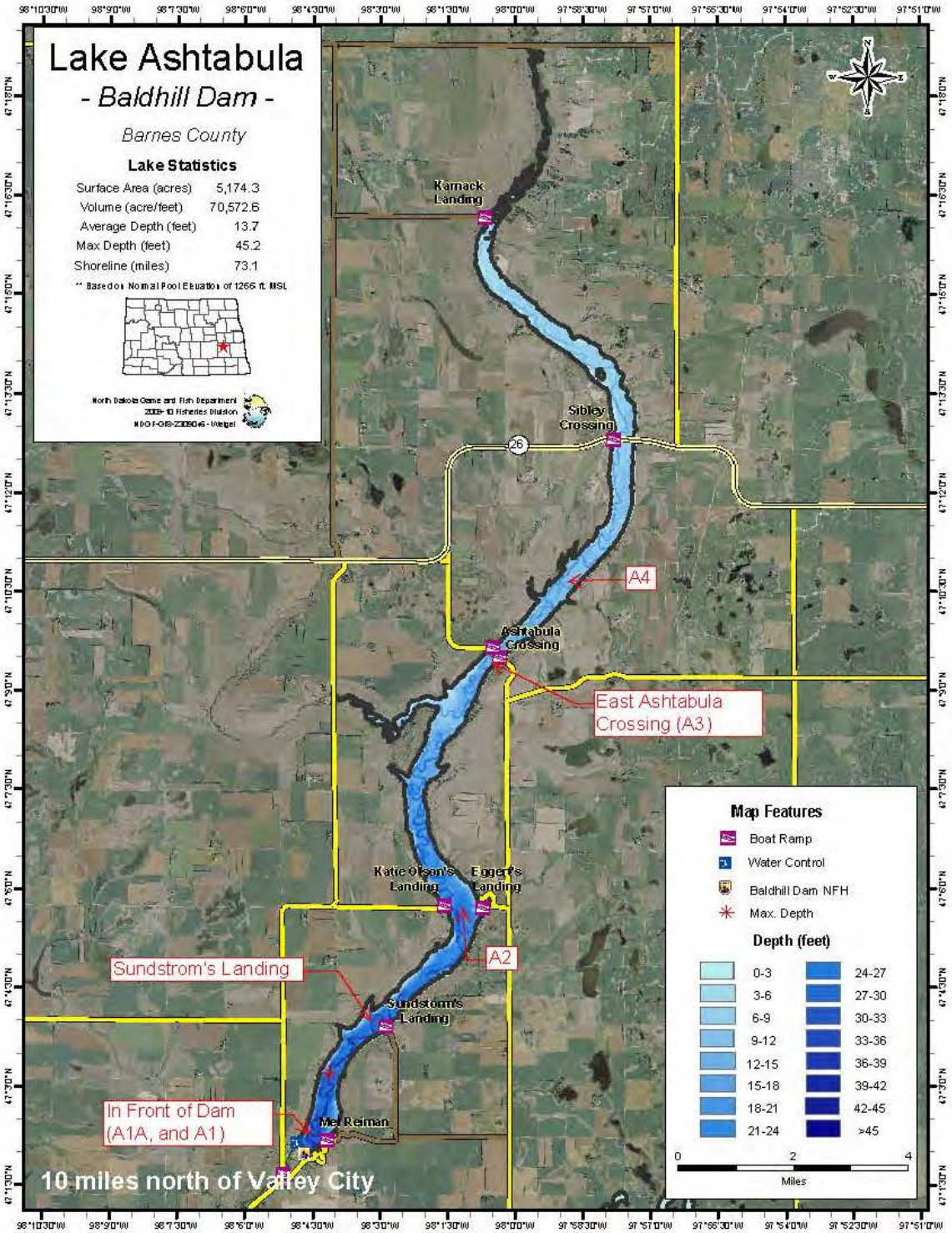
Baldhill Dam is operated in accordance with the 2006 Water Control Manual. The normal summer pool elevation is 1266.0 feet, and the elevation of the flood control pool is 1271.0 feet. The pool is drawn down to elevation 1257.0 feet prior to spring runoff during years with higher snow falls to provide storage for floodwaters.

During the winter of 2010-2011, unusually high snow depths led to concerns of flooding on the Sheyenne River and an attempt to draw the reservoir down lower than elevation 1257.0 feet by an additional two feet to elevation 1255..0 feet. Doing so would have provided some additional storage for floodwaters, potentially reducing anticipated flood damages. However, timing of the drawdown and the beginning of the runoff resulted in a drawdown of elevation 1256.42 feet.

While an increased drawdown would provide some benefit in creating additional flood storage, it increases the risk of low dissolved oxygen levels and induced stress on fish within the lake. Low dissolved oxygen levels is a common occurrence during winter in lakes, especially shallow ones such as Ashtabula. Decreasing lake water volume through increased drawdown can then further deplete total oxygen levels available to fish and other aquatic organisms.

Water quality data, including dissolved oxygen (DO), has been collected on Lake Ashtabula periodically during the winter months. Such data was collected intensively during the extended drawdown in March and April of 2011 to monitor DO and halt the drawdown when levels became too low. Such data was also collected in 1990, 1991, 1992, and 1995. These data are reviewed here to provide some insight into DO levels during the winter, and the potential relationship to extended drawdowns.

METHODS


Lake Ashtabula
- Baldhill Dam -
Barnes County
Lake Statistics
Surface Area (acres) 5,174.3
Volume (acre/feet) 70,572.6
Average Depth (feet) 13.7
Max Depth (feet) 45.2
Shoreline (miles) 73.1
** Based on Normal Pool Elevation of 1266 ft. MSL
North Dakota Game and Fish Department
2009-10 Fisheries Division
NDGF-GIS-20090045 - Weigel
Karnack Landing
Sibley Crossing
26
A4
Ashtabula Crossing
East Ashtabula Crossing (A3)
Katie Olsen's Landing
Eggert's Landing
A2
Sundstrom's Landing
Sundstrom's Landing
In Front of Dam (A1A, and A1)
Mel Reiman
Dam
10 miles north of Valley City
Map Features
Boat Ramp
Water Control
Baldhill Dam NFH
Max. Depth
Depth (feet)
0-3
3-6
6-9
9-12
12-15
15-18
18-21
21-24
24-27
27-30
30-33
33-36
36-39
39-42
42-45
>45
0
2
4
Miles

RESULTS

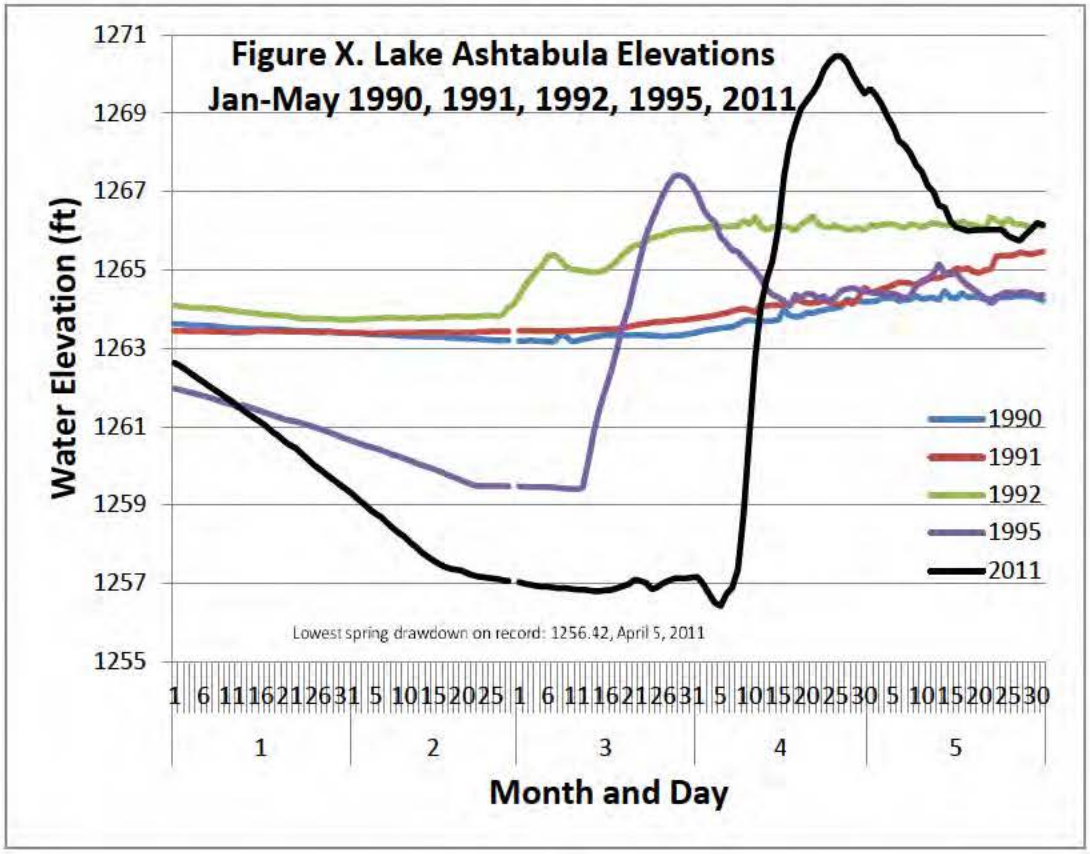


Figure X. Lake Ashtabula Elevations
Jan-May 1990, 1991, 1992, 1995, 2011
Water Elevation (ft)
1271
1269
1267
1265
1263
1261
1259
1257
1255
1990
1991
1992
1995
2011
Lowest spring drawdown on record: 1256.42, April 5, 2011
1 6 11 16 21 26 31 5 10 15 20 25 1 6 11 16 21 26 31 5 10 15 20 25 30 5 10 15 20 25 30
1
2
3
4
5
Month and Day

Table C-1. Dissolved Oxygen and Temperature at Station A1, 1990s

Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A1 Dissolved Oxygen (mg/l)						
1	6.25	6.26	8.82	5.9	6.05	9.84	10.42
2	6.72	3.44	8.05	5.6	2.87	8.39	8.4
3	5.88	0.2	7.4	3	1.03	7.49	8.02
4	3.75	0.21	7.75	0	1.02	6.92	7.04
5	1.16	0.27	7.58	0	0.75	6.88	7.86
6	0.82	0.34	1.5	0	0.04	7.8	9.04
7	0.13	0.34	4.6	0	0.56	8.18	9.39
8	0.13	0.76	2.7	0		8.31	9.48
9	0.13	1.24		0.1		8.33	9.64
10	0.2					8.45	9.75
11	0.2					8.56	9.74
12	0.27						
Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A1 Water Temperature (Deg C))						
1	3.17	4.64	0.82	3.9	3	1.08	1.27
2	3.22	4.5	2.7	3.7	4.05	2.09	2.57
3	3.27	4.27	3.1	3.7	4.28	2.78	3.06
4	3.47	4.24	3.55	3.8	4.41	2.84	3.51
5	3.67	4.47	3.86	3.8	4.55	2.98	3.22
6	3.64	4.36	4.35	3.8	4.72	3.01	3.05
7	3.79	4.42	4.5	3.8	4.84	2.99	2.95
8	3.76	4.31	4.8	3.6		2.95	2.94
9	3.76	4.43		3.6		2.98	2.89
10	3.76					2.99	2.87
11	3.75					3.03	2.92
12	3.75						

Table C-2. Dissolved Oxygen and Temperature at Station A1A, 1990s

Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A1A Dissolved Oxygen (mg/l)						
1	6.28	11.77		6.6		9.26	10.43
2	4.77	8.35		5.9		8.77	9.75
3	1.67	4.75		2.6		7.9	9.03
4	1.54	0.35		2.8		8.03	7.86
5	1.33	0.28		0		8.19	7.59
6	0.92	0.35		0		8.25	
7	1.31	0.49		0			
8				0			
9				0			
Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A1A Water Temperature (Deg C))						
1	3.05	4.64		3.8		1.53	1.49
2	3.74	4.58		3.7		1.89	1.88
3	3.95	4.26		3.8		2.23	2.34
4	4	4.18		3.8		2.84	3.16
5	4.1	4.13		3.9		2.9	3.35
6	4.18	4.14		4		2.94	
7	4.24	4.22		3.7			
8				3.5			
9				3.8			

Table C-3. Dissolved Oxygen and Temperature at Station A2, 1990s

Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A2 Dissolved Oxygen (mg/l)						
1	9.11	9.46		7.8		11.73	10.91
2	7.41	7.06		8.4		11.68	8.91
3	6.52	3.05		8.2		11.44	11.05
4	4.86	1.86		6.8		11.14	9.67
5	2.95	2.69		4.4		11.02	7.9
6	2.54	3.22		2.3		11.21	7.57
7	2.12	1.5		0		11.34	7.49
8	1.01	0.88		0		11.49	7.49
9	1.63	0.88		0		11.73	7.51
Date	2/6/1990	3/15/1990	1/28/1991	2/13/1991	1/30/1992	1/11/1995	2/2/1995
Time	1100	1610	1400	1500	1535	1130	1610
Depth (M)	Lake Ashtabula Monitoring Station A2 Water Temperature (Deg C))						
1	2.44	4.67		3.1		1.3	1.74
2	3.25	4.56		2.7		1.77	2.12
3	3.34	4.36		2.7		2.16	2.18
4	3.48	4.44		2.5		2.33	2.01
5	3.6	4.46		2.9		2.71	2.12
6	3.63	4.51		2.9		2.7	2.15
7	3.67	4.58		2.9		2.71	2.16
8	3.76	4.61		3		2.71	2.17
9	3.77	4.6		3		2.78	2.19

Table C-4. Dissolved Oxygen and Temperature at Station A3, 1990s

Date	1/24/1991	1/30/1992	1/11/1995	2/2/1995
Time	1530	1450	1230	1450
Depth (M)	Lake Ashtabula Monitoring Station A3 Dissolved Oxygen (mg/l)			
1	8.33		14.97	11.5
2	4.4	8.08	15.33	9.24
3	0.55	2.06	14.99	6.98
4		0.25	14.34	6.66
5		0.29	14.41	6.24
6		0.33	14.27	6.21
7		0.48	14.11	6.33
Date	1/24/1991	1/30/1992	1/11/1995	2/2/1995
Time	1530	1450	1230	1450
Depth (M)	Lake Ashtabula Monitoring Station A3 Temp (Deg C)			
1	1.42		1.04	1.27
2	2.7	2	1.26	0.99
3	3.12	3.77	1.5	1.2
4		4.21	1.96	1.62
5		4.11	2.03	2.06
6		4.11	2.12	2.22
7		4.14	2.17	2.3

Table C-5. Dissolved Oxygen and Temperature at Station A4, 1990s

Date	2/6/1990	3/15/1990	2/14/1991
Time	1300	1330	900
Depth (M)	Lake Ashtabula Monitoring Station A 4 - D. O. (mg/l)		
1	9.4	23.9	13.4
2	7.27	20.8	2.5
3	7.64	12.42	1
4	6.08	11.48	1
5	5.93	4.89	1
6		4.74	
Date	2/6/1990	3/15/1990	2/14/1991
Time	1300	1330	900
Depth (M)	Lake Ashtabula Monitoring Station A 4 - Temp (Deg C)		
1	3.74	5.25	4
2	4.12	5.21	3.5
3	3.38	4.73	2.9
4	3.35	4.11	2.8
5	3.39	4.01	2.9
6		4.04	

APPENDIX D

WATER QUALITY MONITORING PLAN

USACE - St. Paul District

2012-2017 Standard Operation Procedures for Winter Dissolved Oxygen Measurements at Lake Ashtabula

Background/Purpose

Baldhill Dam, located at Lake Ashtabula, ND, provides important flood control benefits along the Sheyenne River. As part of the project's flood control authorization, Lake Ashtabula is drawn down each year between November and March to provide storage for attenuating that spring's runoff hydrograph. However, by releasing water at Baldhill Dam during ice cover, the loss of dissolved oxygen (DO) from the system may cause the reservoir's DO concentrations to drop to levels detrimental to the lake's fish population.

The purpose of this monitoring plan is to collect winter DO measurements on Lake Ashtabula for the next five winters to better ascertain the effects of Lake Ashtabula's winter drawdown on the reservoir's DO concentrations.

Data Collection Procedure

Equipment –

Dissolved Oxygen Meter- Using the district's YSI ProODO meter or its YSI multiparameter sonde, a vertical profile of DO (mg/l) and water temperature (Deg C) will be measured and logged. If the multiparameter sonde is used, pH and specific conductivity (uS/cm) will also be recorded.

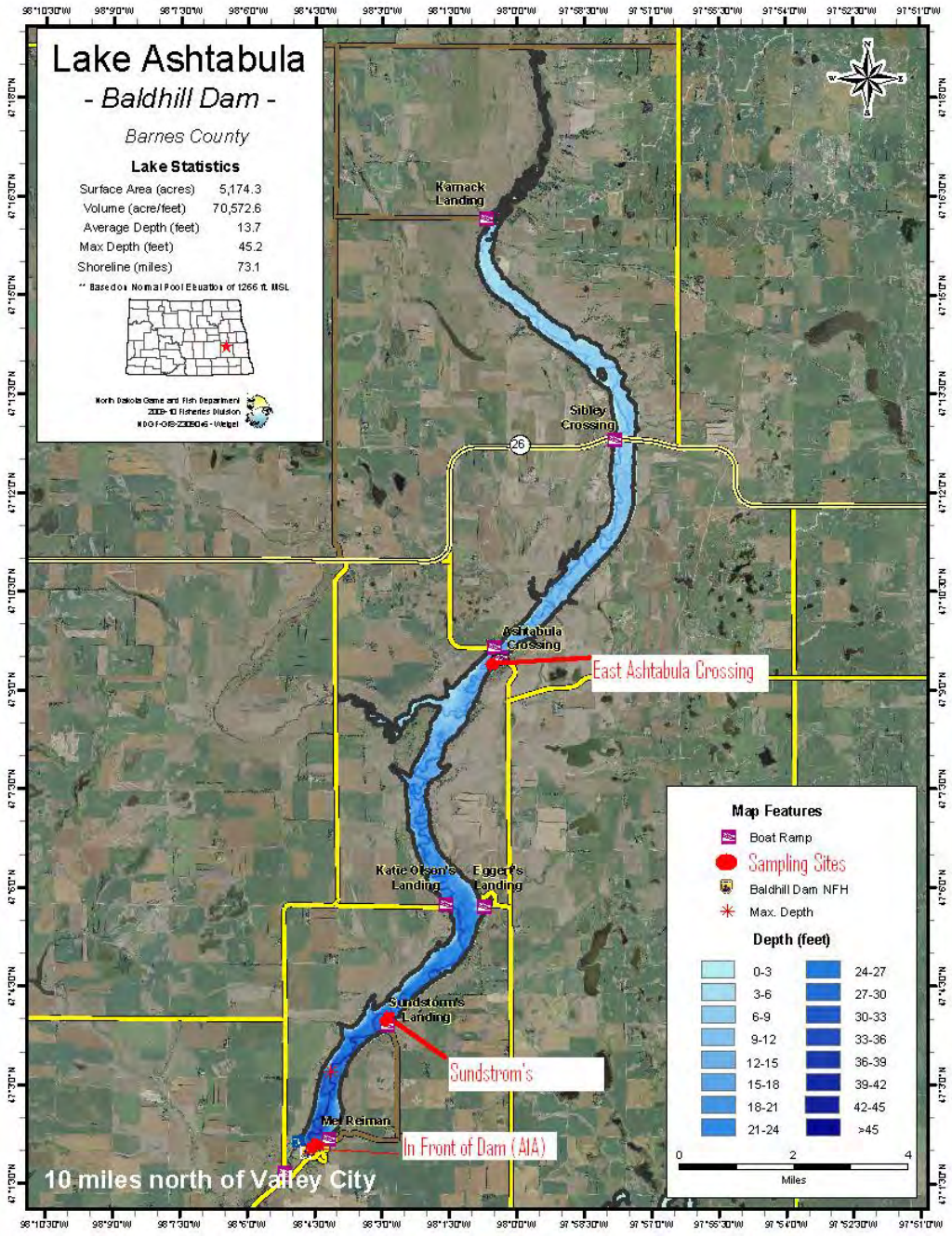
Measuring Stick- Both snow depth and ice depth will be measured in feet at each site.

Ice auger- Either a hand or motorized ice auger can be used for drilling through the ice.

Secchi Disk- To measure water transparency at each site.

Site Selection –

The three Lake Ashtabula sampling sites for this plan are in front of the dam (A1A), Sundstrom's Landing, and East Ashtabula crossing (see map below). At each site, it is important to be within the channel to capture the site's maximum depth. Once a suitable location for each site is identified, the site's coordinates will be recorded and it should be the primary site monitored to maintain sampling consistency and to enhance comparisons between monitoring sites.



Collection Schedule-

Sampling will occur two times a month at the three sites between November and April, 2012-2017, depending on safe ice conditions. During high snowmelt years, such as 2011, where there was a maximum drawdown, twice a day monitoring will begin once it is decided that it is needed. This continuous type of monitoring will be

done to insure that a predetermined criterion of minimum DO needed to preserve the fishery is maintained

Collection Time-

All three sites should be sampled during daylight hours on the same day when possible.

Methods –

For each sampling event the following steps are required.

Before sample round:

1. Calibrate water quality sensors indoors according to manufacturer's specifications prior to every sampling round.

At each site, drill hole at specified site location and:

2. Record weather conditions (air temperature, cloud conditions, wind, precipitation, etc.)
3. Measure snow depth.
4. Measure ice depth.
5. Measure Secchi Disk reading.
6. Assemble multiparamer sounde or Pro ODO sensor to cable and handheld display.
7. Turn on unit and lower sensor(s) to the bottom of the channel.
8. Wait 30-60 seconds for readings on handheld display to equilibrate.
9. Record parameter readings manually or digitally using the handheld display.
10. Raise sensor(s) 1 meter and repeat steps 6 and 7.
11. Repeat step 8 until sensor(s) reach the bottom of the ice.

Notes:

Make sure the sensor guard is used during sampling and that the sensors are kept moist using the calibration cup between sampling sites.

Cleaning –

Rinse equipment with tap water after use and keep sensors moist with tap water using the calibration cup. Store the equipment indoors and at room temperature between sampling rounds.

Reporting-

Within a few days after each sample round, email or fax vertical profile results, ice and snow measurements and weather conditions to:

Jim Noren
Hydrologist
US Army Corps of Engineers
St. Paul District
Email: James.b.noren@usace.army.mil
Phone: 651-290-5626
Fax: 651-290-5841