HABITAT MANAGEMENT OF WILDLIFE FLOWAGES IN THE CHIPPEWA COUNTY FOREST

FINAL REPORT TO THE CHIPPEWA COUNTY LAND CONSERVATION AND FOREST MANAGEMENT DEPARTMENT

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INTRODUCTION

OVERVIEW

The Chippewa County Forest is home to 18 wildlife flowages, which were installed with the intent to provide increased recreation and sport opportunities within the forest. Little was known about the characteristics and habitat suitability of the flowages until now. In the past few decades, the flowages have been managed only to maintain dam safety and control flood events. It was determined that investigating the resource potential of the flowages could lead to the development of effective habitat management objectives and implementation plans. These plans would allow the flowages to be managed in a more effective manner to appeal to and increase use by a wide variety of waterfowl and shorebird species as well as other wildlife, fish, and invertebrates. They would also provide public benefit through increased sport and recreation opportunities.

The purpose of this study was to inventory the natural resources and characterize the habitat suitability of the flowages. By conducting this comprehensive inventory, the flowages can be more productive and beneficial for wildlife. It is especially important to preserve and make available critical habitat to endangered or threatened species. By understanding the natural resource potential of the flowages and creating management objectives, land resource managers will also have the ability to make informed decisions about the management of riparian zones, particularly in regards to silviculture in the forest.

HISTORY AND BACKGROUND

The flowages were built between 1960 and 1970 with funds raised by local hunting organizations as part of a game management waterfowl project. All of the flowage dams are constructed earthen embankments and are easily accessible to the public by forest road. Many of the flowages have a control structure at the principal spillway, permitting the dam owner-operator to adjust the water level as needed. The flowages collectively drain 11,300 acres and have a combined surface water area of about 400 acres.

Located within the North Central Forest and the Forest Transitional Zone ecological regions, the study area is considered a Legacy Place known as the Chippewa Glacial Lakes Region (Pohlman et. al., 2006). This region features high quality forests and many ephemeral wetlands, bogs, kettle lakes, and large seepage lakes. There is almost no development, with the primary land uses being forestry and recreation including hiking, wildlife viewing, paddling, hunting, and fishing. The Land Legacy Report indicates that the Chippewa Glacial Lakes Region is highly ranked for its recreation potential and that opportunities exist to increase its recreational value through conservation and resource management.

In addition to their land legacy value, many of the flowage watersheds are within High Conservation Value Forests as identified in the *Biotic Inventory and Analysis of the Chippewa County Forest* (Epstein et al., 2005). These areas possess unique qualities that make them excellent candidates for conservation efforts. Distinctive qualities include their ability to provide habitat for rare or special concern species

and they also provide exceptional opportunities for restoration and conservation, important ecological connections, and are home to high-quality natural communities.

It is believed that implementing a documented management regime based on the site-specific characteristics gained through this comprehensive on-site inventory, paired with long-term monitoring, will substantially increase the ecological, environmental, and cultural values provided by these impoundments. If appropriate safety features are installed and implementation of the management regime is relatively simple, local conservation organizations and school groups may be willing and able to make long-term commitments to management responsibilities. Ideally, these volunteer stakeholder groups will be empowered to sustain base-level management regardless of fluctuations in available public resources.

METHODS

This project encompassed a variety of methods to inventory the existing resources of the flowages. It was important to examine both terrestrial and aquatic characteristics of the flowages to be able to make the most informed decisions about their habitat suitability. Computer methods included geographic analysis of the flowage watersheds, gathering data about the history of the flowages, and reviewing historic aerial photographs of the land that was flooded to create the flowages. Field methods included a complete survey of the dam structure, bathymetric survey, vegetation and invertebrate surveys, and benthic sediment analysis.

GIS ANALYSIS

GIS analysis was conducted to document the characteristics of the flowages and their watersheds. The analysis was performed using ESRI ArcGIS 10.1 software. Maps and data resulting from the analysis included georeferencing 1951 aerial photographs (before dam construction), 1 ft contour maps and elevation data of the watersheds, compiling all current and historical aerial photography available for each flowage, glacial geology, soil texture and drainage class, land use, forest stand type, original vegetation, slope, and aspect. Soil data was collected from the United States Department of Agriculture Natural Resource Conservation Service Web Soil Survey online data server (Soil Survey Staff, 2014). Glacial geology was derived from the Wisconsin Geologic and Natural History Survey (Syverson, 2007). Original vegetation was from Finley, 1976, which was digitized by UW-Madison Students and made available online in GIS format by WDNR. Slope and aspect values were derived from the LiDAR data.

The Spatial Analyst extension within ArcGIS 10.1 was used to delineate the watershed for each of the 18 flowages and was based on Chippewa County's 2011 LiDAR derived digital elevation model (CCLIO, 2011). The outlet of each dam was chosen as the pour point of the watershed (the single point to which all water in a watershed drains). The LiDAR digital elevation model (DEM) was processed to remove any imperfections prior to watershed delineation. Because the DEM does not include any sub-surface conduits for water movement, road culverts affecting the hydrology of the water flow were also removed prior to watershed delineation.

SURVEYING THE DAMS

Each dam was surveyed to establish a baseline of dam morphology and for comparison in future inspections. These surveys were also important in mapping they bathymetry of the flowages as they provided a connection to tie the bathymetric data to the dam elevation. A temporary benchmark made of 2 foot long by ¾ inch diameter steel rebar was driven into a suitable location at each site. A GPS point was taken to map the location of the benchmark and its location was also described relative to the dam outlet in a field book. The benchmarks were topped with an orange plastic rebar cap and also marked nearby with lath and neon flagging.

A Sokkia Laser Level with prism rod and field book were used to take and record elevations. Survey points included the groins of the dam, dam crest, low point of crest, centerline of the outlet pipe at the center of the dam crest, cross-section of dam, profile of the emergency/auxiliary spillway if present, and features of the outlet including the sill, rim, stop log level, and outlet invert.

The dam surveys and benchmark descriptions can be found in the inspection reports completed for each dam in Spring 2013. These reports are located in the Chippewa County Department of Land Conservation and Forest Management. Permanent benchmarks should established in the future, particularly at the dams which are classified as large under WI state statutes.

Bathymetric Mapping

Collecting latitude, longitude, and depth values at multiple points in each flowage facilitated in the creation of bathymetric maps of the flowages. The data points were collected using a Humminbird 500ci HD depth finder. A 12 ft jon boat was fitted with a mount for the depth finder. A transducer was mounted to the rear of the boat and the distance from the water surface to the transducer after all equipment and people were loaded into the boat was measured and added to the depths determined by the depth finder. The depth finder collected depth in feet and latitude and longitude in WGS 1984 coordinates. Depth points in shallow areas were checked at random against the depth finder readings using a measuring rod and found to be accurate to within 6 inches.

In order to create high-resolution bathymetric maps, data points were collected in a semi-random manner: several laps were made around the perimeter of the flowage at increasing distance from the shoreline. This captured detail in the areas the most variation in surface and depth change. After the perimeter was mapped, transects were conducted in a grid-like fashion across the body of the flowage. Because the water level in the flowages can vary throughout the year and by manual manipulation of the dams, the bathymetric data was tied into the dam survey so that flowage depths are given relative to the dam crest.

After collecting the data points, the data was processed within ArcGIS and Microsoft Excel. Using the spatial analyst extension, a TIN was created for the data, and then a raster. These data layers were combined with contour lines generated from the raster to produce detailed bathymetric maps of each flowage surveyed and overlayed on a high resolution aerial photograph for cartographic purposes. Black and white maps were also produced using only the contour lines rather than the TIN and raster data layers.

Soil Exposure Maps and Vertical Profiles

A secondary use of the bathymetry data was to develop soil exposure maps and vertical profiles of each flowage. These maps show how much of the flowage bottom is exposed at various stages of drawdown. The maps and profiles were produced for each of the 17 flowages that were bathymetrically surveyed. The EZ Profiler 9.3 extension (Huang, 2009) was used within ArcGIS to create profile graphs along transects in each flowage. This tool allows the user to draw a line across any DEM, such as the bathymetry of the flowage, and produces a graph of the elevation profile along that line. These lines were then associated with the depths of the flowage at varying levels of water level drawdown. These maps and graphs provide insight valuable information about the quantity of area of moist soil exposed by drawing a flowage's water level down and were used in determining each flowage's best habitat management suitability. The vertical profiles and exposure maps are found in Appendix D.

Rapid Macrophyte Inventory

A rapid inventory and assessment of hydrophyte response to moist soil management was conducted in four flowages in 2013. The flowages were surveyed in in late June and again in late August and early September. The flowages surveyed were O'Neil Creek Flowage No. 2, Spring Creek Flowage No. 2, Hay Meadow Flowage No. 2, and Birch Creek Flowage No. 2. The materials used in the assessments were:

- Kayak
- Reference book for identification: Borman, S., R. Korth, J. Temte, 1997. Through the Looking Glass: a field guide to aquatic plants. Wisconsin Lakes Partnership.
- 10x hand lens
- Ruler
- Camera
- Clipboard, spreadsheet, pencil/pen

Approximately four hours were spent on each flowage. Using a kayak, macrophytes were observed around the perimeter and along transects through varying depths. Further observations on-foot in traversable areas was also carried out. The primary method of plant identification was to check each visually identified unique species against Borman *et al.*, 1999. Unclear species were confirmed by bagging the sample and cross checking the species using the online Herbarium from the University of Wisconsin – Green Bay (Fewless, 2013). This method yielded a reasonably thorough yet rapid observational inventory of macrophytes in the flowages. The survey was repeated in late summer to determine which species benefited and which suffered from the water level reduction over the summer months.

A second, more in-depth study of vegetation was conducted by the Beaver Creek Reserve Citizen Science Center in 2014. The flowages surveyed in that study were Birch Creek No. 1, Hay Meadow No. 2, Horseshoe, Spring Creek No. 2, and Willow Creek No. 3. This study used a more comprehensive point-intercept approach to sampling vegetation.

HYDROLOGY

The hydrology of the flowages was documented to gain a better understanding of the hydrologic interconnectedness of consecutive flowages, the contribution of ground water to flowage surface waters, and the effects of storm events to flowage discharge. Staff gages were installed in the center of the stream channel downstream of Birch Creek No. 1, Hay Meadow No. 1, Horseshoe, Mallard, O'Neil Creek No. 2, Spring Creek No. 1, Vista, and Willow Creek No. 1. Stream discharge was measured using a Swoffer Model 3000 Series Open Stream Current Velocity Meter. Measurements were taken downstream of the flowage outlet at a location where the stream channel was relatively straight and substrate or other debris did not obstruct flow. Velocity was collected at stations along a transect following the six-tenths depth method described by USGS (Turnipseed and Sauer, 2010) as an averaged measurement taken over 45 seconds. Discharge (Q) was calculated using the standard formula $Q=v*d$, where v is the product of the width and depth of each transect station.

Each time a discharge measurement was taken, the gage height was also noted. A rating curve was developed for each gaged flowage based on these field-collected measurements. Discharge was also

measured at the flowages that were not gaged but were hydrologically connected to the gaged flowage. This made analysis of hydrologic interdependence the downstream flowages have on their upstream counterparts. Measurements taken both upstream and downstream of a flowage also provided insight into the role groundwater plays in the hydrology of the flowages.

Benthic Sediment

Thirteen flowages were sampled and 5 to 10 samples were taken at each flowage. Sample distribution was chosen based on the size of the flowage, vegetation communities, water depth, and accessibility. A data sheet was used to record field observations at each sample site. The flowages were navigated using a 16' jon boat. Supplies used to perform the surveys included a Humminbird 597 HCi depth finder with GPS (depth finder), 25 lb bottom dredge, 4 ft tile probe with 4 ft extension, bucket auger, metal pan, and Field Book for Sampling and Describing Soils (Schoeneberger, et al., 2012).

A new datasheet was used at each flowage. At the top of the sheet the flowage name, date, time, field crew, field conditions, sampling method, GPS unit, and datum were recorded. Within the flowage, each sample site was given a unique ID number assigned by the depth finder when a waypoint was collected to mark the sample location. The waypoint and depth were recorded on the datasheet, and the latitude and longitude (in WGS 1984 coordinates) were added to the table after downloading the data from the depth finder. The bottom type for each sample was recorded using the method for subaqueous soil descriptions (pp. 2-97) described in the Field Book for Describing and Sampling Soils (Schoeneberger et al., 2012).

A 3 inch diameter regular bucket auger was used to collect samples at sites with less than 4 ft of water. At these sites the auger was inserted into the sediment and twisted to collect the sample. The sample was then removed from the auger and placed into a metal tray for in-field texture analysis. If needed, the auger was inserted a second or third time to collect sediment at greater depths. The depth of each horizon was estimated to highest degree possible while still accounting for sample compaction inside the auger.

For samples at depths of greater than 4 ft, an AMS 25 lb bottom dredge was used to collect surface benthic sediment. This Ponar-style bottom dredge is useful in a wide variety of substrate (US EPA, 1999). The dredge was set with a pin and lowered into the water using a nylon rope. After the dredge was fully submerged, the rope was released and the dredge allowed to free-fall. The pin is released upon impact with the flowage bottom. Pulling up on the rope after the dredge has hit the bottom closes the dredge's jaws. The sample was then pulled up and slowly drained of excess water before released into a metal pan for texture analysis.

A 3/8" diameter steel tile probe was used to identify textural changes at depths greater than could be sampled with either the bucket auger or the dredge. The probe was marked with one-tenth foot intervals. It was then inserted into the benthic sediment until a change in soil texture was identified. The change from organic sediment to mineral soil, or change from fine to coarse or coarse to fine mineral soil, can easily be felt and heard using the probe. The depth to that change was determined using the marked intervals along the probe and noted on the data sheet.

For both the bucket auger and dredge sampling methods, samples were analyzed for texture, coarse fragment content, and depth of each horizon, along with other observational notes such as color and local vegetation. Vegetation was recorded using the Natural Resources Conservation Service PLANTS Database (NRCS, 2014) Texture analysis was performed in accordance with the methods and notation described in Schoeneberger, et al. (2012).

Results

GIS Analysis

GIS analysis of the flowages provided valuable insight into characteristics that have an effect on habitat suitability for the flowages. The tables summarizing the GIS analysis for the flowages are found in Appendix B.

Bathymetric Mapping

Highly detailed bathymetric maps were completed for 17 of the 18 flowages in the Chippewa County Forest using the field-collected data. A minimum of 23 points per acre was collected, with an average of 85 points per acre. Using this data, two bathymetric maps were created for each flowage: one in color, the other in black and white. This was done so that the public can download and print the maps from Chippewa County's website for a variety of uses. The depth values given on the maps are relative to the dam crest and were tied into the survey of the dam itself. The dams are considered to be nearing flood stage when water levels are within one foot of the dam crest, thus it is unlikely that under normal conditions the depths given on the bathymetric maps will be present.

Appendix C contains all bathymetric maps created for the flowages.

Soil Exposure Maps and Vertical Profiles

Exposure maps were developed for 13 flowages. These maps depicted how much moist soil area would be exposed at various stages of water level drawdown. The bathymetric and dam survey data were used to create the maps. Each map shows the flowage at 3 different levels of water level: maximum flood level, about halfway drawn down, and drawn down as much as possible. Eleven of the mapped flowages have water control structures and could actually be drawn down to the elevations indicated on the maps. The remaining three flowages do not have a water control structure, thus, the maps model what elevation of drawdown might be achieved if a water control structure were installed.

The soil exposure maps and vertical profiles can be found in Appendix D.

Rapid Macrophyte Assessment

Four flowages, Birch Creek Flowage No. 2 (BC2), Hay Meadow No. 2 (HM2), O'Neil Creek No. 2 (OC2), and Spring Creek No. 2 (SC2), were surveyed in a rapid, qualitative manner to assess species presence, identify any invasive species, and determine if moist soil prosperous species were present. The surveys were repeated in the fall to determine if summer drawdown and moist soil exposure caused a change in species diversity.

No invasive species were found in the surveyed flowages. HM2 and BC2 showed the most change in macrophyte activity in response to moist soil management. On HM2, a moist soil perimeter of 1-3 ft in width was exposed along most of the navigable flowage due to an apparently recent water level reduction. This perimeter exhibited lush new growth of sedges, rushes, cattails, arrowhead, and bidens. These species are all beneficial to waterfowl and other wildlife for both food and habitat. As water levels

receded at BC2, which does not have a water control structure at its principal spillway, new cattail and fern growth was most common. Visually, the diversity of species in the exposed mud flats at BC2 was not as great as at HM2.

O'Neil Creek No. 2 was also drastically different between the midsummer and late summer surveys, but not in terms of new plant growth. Rather, the wild rice previously documented in this flowage had grown to maturity and showed evidence of being recently harvested. Very little other plant growth was evident in areas with wild rice growth (at a depth of 2-3 ft around entire perimeter of flowage) and the shoreline macrophyte and submerged macrophyte communities were relatively unchanged. Although the water level was reduced, significant mud flats areas for new/increased macrophyte growth were not exposed. Wild rice would not be as successful if water levels fluctuated too drastically (Borman et al., 1999).

Spring Creek 2 was the least changed flowage. The late summer water level was down only slightly from midsummer, however the extent of water level reduction was not significant enough to expose large areas of flowage bottom to new or increased macrophyte growth. Data and details o the rapid assessment can be found in Appendix E.

A quantitative survey of macrophytes was conducted at five flowages during summer 2014 by Beaver Creek Reserve Citizen Science Center. This study confirmed the results of the rapid assessment and found additional species. No aquatic invasive species or species of concern were identified in any of the flowages. The results of those surveys and the accompanying report can be found in Appendix H. Invertebrate counts were also conducted where accessible on the same flowages and confirmed that current invertebrate populations would support foraging by a variety of bird species and other wildlife.

HYDROLOGY

The eight gaged flowages were measured a minimum of four times and during varying hydrologic events over the spring, summer, and fall of 2014, which was an above average year for precipitation. This allowed us to capture a variety of flow conditions and create a stage-discharge rating curve for each gaged flowage. The rating curves give us an understanding of the influence one flowage has over the next downstream flowage. The most predictable of the hydrologically connected flowages were the Willow Creek Flowages, as shown in the figure below. Flowages No. 1 and 2 are particularly "in sync", while No. 3 is still very predictable. Comparatively, Hay Meadow Flowage Nos. 1 and 2 are closely related, while measurements at Hay Meadow 3 and 4 would not provide a reliable prediction of hydrologic activity at 1 and 2.

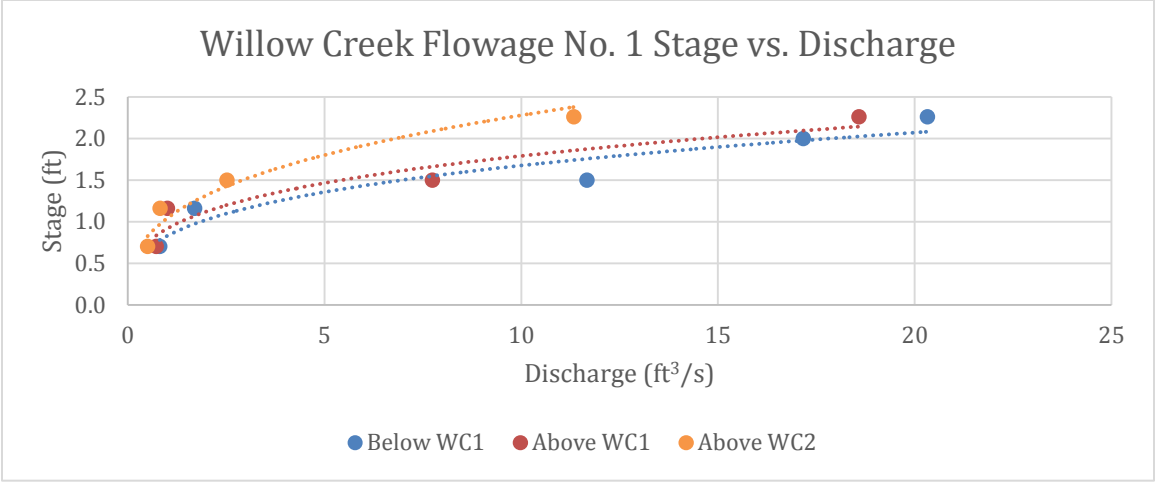

Figure 1. Willow Creek Flowages 1-3 stage versus discharge graph.

Additional measurements would fine-tune the rating curves, identify any anomalies, and provide more precise equations for predicting stream flow based on stage. The stage-discharge relationships for all flowages measured are given in Appendix F.

Benthic Sediment

There were 76 samples taken among 13 flowages sampled. Sampling was performed between July 28 and August 8, 2014 under moderate to severely dry conditions of 30 – 70 percent of the 1981-2010 average for the period of July 27-August 9 (NCDC, 2014). All flowages were sampled from a johnboat at sites throughout each flowage that exemplified different vegetation, water depths, and location relative to the dam outlet and stream inlet. Spring Creek Flowage Number 1 could not be sampled adequately due to very low water levels, which prohibited the use of the johnboat. The flowage bottom was extremely soft and not traversable by foot. This flowage was instead sampled from the shore at several locations. It exhibited similar characteristics in substrate as Spring Creek Flowage Number 2, which lies just upstream and flows directly into No. 1.

When it could be determined, the average depth to mineral soil among all flowages sampled was 0.7 ft. The maximum depth was 4 ft. A few sites had little to no organic matter overlying the mineral soil. The depth to mineral soil could not be determined at several sites because the distance was greater than the length of the probe, the water was too deep, or the change in texture was too subtle and could not be detected using the probe method.

A layer of organic material was present at most sample sites. For this reason the dredge, which can sample sediment to only 4-6 in (US EPA ,1999), usually returned only organic material. There were a few exceptions, such as near the dam outlet and emergency spillways, where greater flow rates probably reduced the depth of organic material. At sample sites with up to 6 ft of water depth the tile probe was used to determine depth to mineral soil; however, the mineral soil generally could not be sampled at these depths. In some cases a small amount of residue returned with the probe and an inference could

be made about the mineral soil texture. These were generally clayey soils with the ability to “stick” to the probe tip and return through the water to the boat.

Horseshoe Flowage exhibited the most divergent results when compared to the other flowages sampled. Unlike other sites, where the mineral soils were clay or sandy with a gleyed matrix color, in Horseshoe Flowage they were composed of fine, black, smeary, silty soils. Redoximorphic features at Horseshoe in the form of manganese (Mn) and iron (Fe) concentrations were present in half of the samples in the first mineral horizon. The depth to mineral soil ranged from 0.1 to 0.2 ft, with an average of 0.15 ft. The organic benthic layer was similar to other flowages, composed of moderate to highly decomposed plant material of a medium to dark brown color.

No relationship exists between water depth and the thickness of the organic layer. Figure 1 shows a comparison of these metrics. A slight positive correlation is visible in the graph, however the correlation factor (Pearson’s r) is just 0.132 and the r^2 value is only 1.8%.

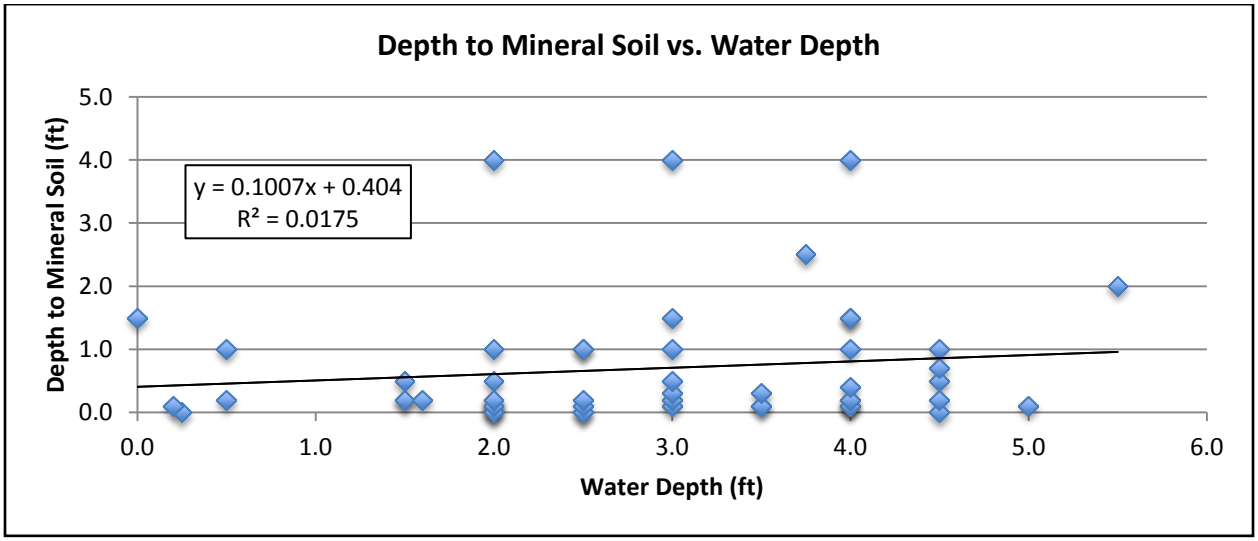

Figure 2. Depth to mineral soil compared with water depth.

The complete results of the benthic sediment analysis are available in Appendix G.

RECOMMENDATIONS

Management objectives for each of the 18 flowages were determined based on the results of the natural resource inventory described above. This data was used to determine existing habitat and identify opportunities to maximize habitat potential. The results of the resource inventory indicate that many of the flowages of the Chippewa County Forest can be successfully managed for wildlife by implementing moist soil management techniques. Several flowages are better suited for fishery management due to their bathymetry and known fish population. A third management option for one or more flowages, which provides both recreational opportunities and wildlife benefit, is to manage for wild rice production.

SUMMARY OF MANAGEMENT OBJECTIVES

Three management objectives were identified for the Chippewa County flowages. These are to i) manage for moist soil, ii) manage for fishery, or iii) manage for wild rice. As a result of the comprehensive inventory of the characteristics of the flowages, 13 flowages were identified as best suited for moist soil management. Four will be managed as a fishery, and one will be managed for wild rice. Several of the flowages may also be suitable for alternative management strategies such as dam removal and stream restoration for trout habitat. Additional research and analysis is needed to evaluate the success potential of these alternatives.

Moist soil management is a technique for managing impoundments to produce areas of mud flats to be used by shorebirds, waterfowl, and other wildlife for forage and breeding habitat. Implemented properly, moist soil management increases desired vegetation growth, reduces undesirable vegetation, and provides habitat variability needed by a wide range of wildlife (Frederickson and Taylor, 1982). Various techniques can be used, and rotational management is a very successful option because it allows invertebrate communities to recover between periods of intense foraging (Helmers, 1992). Rotating moist soil management between several flowages within the Chippewa County Forest flowage complex ensures a continuous array of habitat and forage conditions throughout the year that appeal to a variety of waterfowl, shorebirds, and other wildlife.

The following flowages do not have a water control structure but do have bathymetry and hydrology conducive to moist soil habitat. They will be passively managed for moist soil and monitored for safety.

- Beaver Dam Flowage
- Birch Creek Flowage No. 2
- Hay Meadow Flowage No. 3
- Willow Bay Flowage

Water control structures at flowages allow the water level to be manipulated at any time. This gives control to habitat managers to raise and lower water level based on hydrologic conditions, season, migration patterns, and to work in coordination with other flowages to provide an array of habitat conditions at any given time. The following flowages are best suited for active moist soil management:

- Birch Creek Flowage No. 1

- Hay Meadow Flowage No. 2
- Horseshoe Flowage
- Mallard Flowage
- O'Neil Creek Flowage No. 1
- Spring Creek Flowage No. 1
- Spring Creek Flowage No. 2
- Willow Creek Flowage No. 2
- Willow Creek Flowage No. 3

Fisheries in the flowages are limited to smaller game species such as pan fish, northern pike, and bass species. Management for fisheries is limited to maintaining water levels for maximum pool elevation, while keeping a balance to reduce the possibility of flooding or dam over-topping. The following flowages will be managed as a fishery. These flowages have suitable bathymetry, water depths, in flow and out flow of water, and established fish populations.

- Hay Meadow Flowage No. 1
- Hay Meadow Flowage No. 4
- Vista Flowage
- Willow Creek Flowage No. 1

In addition, Willow Creek Flowage Nos. 2 and 3 would also be suitable for management as fisheries, however their bathymetry makes them better suited to provide moist soil habitat through water level manipulation.

O'Neil Creek Flowage No. 2 has an established wild rice community and will be actively managed for wild rice. Hay Meadow Flowage No. 2 has many physical characteristics that are similar to O'Neil Creek Flowage No. 2 including substrate, bathymetry, and hydrology and could likely also be managed for wild rice if it were seeded and established.

Habitat management plans (Appendix A) were written for each flowage based on the above identified habitat management objectives. These plans are included in the Inspection, Operation, and Maintenance Plans that were written for each flowage under an earlier phase of this project. The plans will be executed by volunteers and monitored for success in future years.

Future Studies and Success Markers

The success of these management objectives and plans will be dependent upon implementation by volunteer organizations and future monitoring. Marketing efforts to promote the project and rally volunteer groups will be critical to the project's success. Training measures will be necessary to ensure successful implementation of the management plans as well as safety. The management plans have been written in a way that they can be easily implemented with minimal training and supervision. The plans can be updated at any time as necessary. The success of these management efforts should be tracked through periodic surveys to assess the flowages for bird and other wildlife use. These could be

volunteer led surveys. The surveys will be a measure of success of the management plans and help flowage managers determine if changes are needed to the management regime.

Additional studies in plant species distribution could fine-tune management objectives. A GIS analysis using the Beaver Creek Reserve vegetation data could reveal patterns in hydrophyte growth relative to flowage depth and location that would help in determining the effects of moist soil management on nutrient and habitat availability. This would allow flowage managers to identify management activities that could help improve habitat for a particular species of concern.

Effective management of fisheries in the flowages is dependent upon a thorough understanding of current fish trends, sustainability, water quality, and fish habitat quality of the fishery flowages. This information is currently unknown and would provide valuable insight into ideal management of the flowages to improve fish productivity.

Another consideration for future study is that of cold-water trout stream restoration. Currently, cold-water trout streams are underrepresented in this landscape. It is possible that the installation of some of these flowages changed the trout landscape within the County Forest. An historic inventory of surface waters in Chippewa County (Sather and Threinen, 1963) indicated that Spring Creek was historically a known trout water. It would be worth investigating the Spring Creek Flowages and the stream above and below them to determine if they could be successfully restored to trout habitat. If a restoration is determined a viable option and is successful, this could pave the way for similar projects in the county to work towards rebalancing trout habitat in the area.

Greater knowledge of the habitat potential of these flowages also provides an opportunity for evidenced based riparian management. Riparian management zones (RMZs) are the landscape along the perimeter of each flowage. Land management within these zones should take habitat objectives into consideration to further the success of the habitat management objective. Considerations for RMZs can include even or uneven cutting of timber, leaving large logs for shade and woody habitat along the shoreline, and many other silviculture/habitat considerations.

It will be important for permanent benchmarks to be established at the flowages. Not only are these required by state statutes to be installed at all large dams, but they also provide a common measurement point for which to tie future surveys into. This will allow managers to monitor the integrity and safety of the dams and track changes over time. Trends in water levels can also be tracked relative to the benchmark.

Chippewa County possesses a much greater understanding of the habitat flowages of the Chippewa County Forest than two years ago. Management objectives have been laid out and the next step is to implement the plans. The plans are meant to be living documents, to be updated as conditions change and activities are found to be successful or unnecessary. It is the hope of the Chippewa County Land Conservation and Forest Management Department that the implementation of the management plans will lead to increased waterfowl and shorebird presence in the County Forest and provide critical habitat that is so rapidly disappearing from our region.

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APPENDIX A: HABITAT MANAGEMENT OBJECTIVES

On the following pages are the habitat management objectives and management procedures identified for each flowage in the Chippewa County Forest. These objectives were selected based on the inventory data collected,

Beaver Dam

Overview

Beaver Dam Flowage is an 8 acre impoundment is set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. The flowage is home to shorebirds as well as turtles, amphibians, and other wildlife. It drains directly into O'Neil Creek Flowage No. 1, at the headwaters of O'Neil Creek. There is no boat landing at the flowage.

Management Objective

Beaver Dam Flowage does not have a water control structure and is passively managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 8 acre impoundment
- 25 acre watershed
- Maximum depth of 8 ft
- Substrate is muck
- Access via O'Neil Creek No. 1 Trail
- No boat landing
- Located in the Town of Cleveland at 45.2011, -91.3611

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The flowage does not have a water control structure with which to manipulate the water level. Natural water level fluctuations during dryer and wetter months provide varying habitat and production levels.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Spring: March – May

During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is no emergency spillway at this flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September

Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

Birch Creek Flowage No. 1

Overview

Birch Creek Flowage No. 1 is a 5 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. The flowage is located immediately downstream of Birch Creek Flowage No 2. The Birch Creek Flowages are home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. The flowage is accessible via Birch Creek Trail from County Highway M.

Management Objective

Birch Creek Flowage No. 1 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

The flowage has been seeded to wild rice previously but it has not flourished on this flowage. During dryer months there is little to no water movement, which is not ideal for wild rice growth. This indicates that managing for wild rice would not be the most effective management option.

Flowage General Characteristics

- 5 acre impoundment
- 148 acre watershed
- Maximum depth of 8 ft
- Substrate is mostly muck
- Accessible via Birch Creek Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2421, -91.2238

Summary of Habitat Management Activities

Year	Spring	Fall
1	Maintained flooding, no change	Maintained flooding, no change
2	Partial early drawdown: April – May	Early flooding: August – September
3	Partial late drawdown: May – June	Early drawdown: August – September
4	Late Drawdown: May – June	Late flooding: September – October
5	Early drawdown: April – May	Late flooding: September – October

Habitat Management Procedure
The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation
The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Add stop logs to ensure a total of eight 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and

report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one log per week until no stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Early drawdown, late flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

Birch Creek Flowage No. 2

Overview

Birch Creek Flowage No. 2 is a 4 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It drains into Birch Creek Flowage No. 1 and is accessible via Birch Creek Trail from County Hwy M. The Birch Creek flowages are home to shorebirds as well as turtles, amphibians, and other wildlife.

Management Objective

Birch Creek Flowage No 2 does not have a water control structure and is passively managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 4 acre impoundment
- 113 acre watershed
- Maximum depth of 7ft
- Substrate is muck
- Access via Birch Creek Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2415, -91.2273

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The flowage does not have a water control structure with which to manipulate the water level. Natural water level fluctuations during dryer and wetter months provide varying habitat and production levels.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Spring: March – May

During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is no emergency spillway at this flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September

Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

HAY MEADOW FLOWAGE NO. 1

Overview

Hay Meadow Flowage No. 1 is a 33 acre impoundment of the North Fork of Bob Creek that drains into Bob Lake approximately 0.75 mi downstream of the flowage outlet. The flowage impounds water around a kettle lake, which has a maximum depth of 38 ft. Outside of the kettle lake, the water depth of the flowage ranges from 3-6 ft. There is a concrete boat landing available, accessible by taking Hay Meadow Flowage No. 1 Trail east from Hay Meadow Flowage Trail. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and fish. A boat landing and turnaround area located at the end of Hay Meadow Flowage Trail off of the main Hay Meadow Trail. Historically the flowage has contained fish species that included northern pike, largemouth bass, and pan fish.

Management Objective

Hay Meadow Flowage No. 1 is managed as a fishery.

Flowage General Characteristics

- 33 acre impoundment
- 2,231 acre watershed
- Maximum depth of 38ft
- Substrate is muck
- Access via Hay Meadow Trail
- Boat landing available
- Located in the Town of Cleveland at 45.1727, -91.3258

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Flowage is kept well flooded for fish habitat
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage maximizes water depth for fish habitat.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize fish habitat.

Spring: March – May

During spring the flowage should be monitored weekly for safety. Remove stop logs as necessary to promote drainage of excess water during snowmelt and thawing of the watershed. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is an emergency spillway to facilitate flood alleviation. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September

Replace stop logs at a rate of one log per week until a total of seven 5.5 inch logs are in the riser. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will enable safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

HAY MEADOW FLOWAGE NO. 2

Overview

Hay Meadow Flowage No. 2 is a 43 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. The flowage is part of a series of four hydrologically connected flowages draining the North Fork of Bob Creek. The Hay Meadow Horse Trail runs along the dam crest. Hay Meadow No. 2 is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. The flowage is accessible via an unimproved boat landing off at the east end of the dam. The horse trail and dam are gated to exclude vehicular traffic.

Management Objective

Hay Meadow Flowage No. 2 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

The bathymetry, substrate, and hydrologic conditions of this flowage indicate that it may also be suitable for wild rice production if it were seeded and managed for that purpose.

Flowage General Characteristics

- 43 acre impoundment
- 2,091 acre watershed
- Maximum depth of 10 ft
- Substrate is muck
- Access via Hay Meadow Trail
- Walk in access to unimproved boat landing
- Located in the Town of Cleveland at 45.1785, -91.3237

Summary of Habitat Management Activities

Year	Spring	Fall
1	Maintained flooding, no change	Maintained flooding, no change
2	Partial early drawdown: April – May	Early flooding: August – September
3	Partial late drawdown: May – June	Early drawdown: August – September
4	Late Drawdown: May – June	Late flooding: September – October
5	Early drawdown: April – May	Late flooding: September – October

Habitat Management Procedure
The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation
The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Add stop logs to ensure a total of seven 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and

report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Early drawdown, late flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

HAY MEADOW FLOWAGE NO. 3

Overview

Hay Meadow Flowage No. 3 is a 13 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is part of a series of four flowages draining the North Fork of Bob Creek. The Hay Meadow flowages are home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. The flowage is accessible via the Hay Meadow Horse Trail from Hay Meadow Trail.

Management Objective

Hay Meadow Flowage No. 3 does not have a water control structure and is passively managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 13 acre impoundment
- 174 acre watershed
- Maximum depth of 7ft
- Substrate is muck
- Access via Hay Meadow Horse Trail
- Walk-in access along low-sloped banks, no boat landing
- Located in the Town of Cleveland at 45.1827, -91.3203

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The flowage

does not have a water control structure with which to manipulate the water level. Natural water level fluctuations during dryer and wetter months provide varying habitat and production levels.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Spring: March – May

During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is a small, secondary outlet under the horse parking area but no emergency spillway at this flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September

Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

HAY MEADOW FLOWAGE NO. 4

Overview

Hay Meadow Flowage No. 4 is a 13 acre impoundment on a tributary to the North Fork of Bob Creek, which drains into Bob Lake. It is located among the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. The flowage impounds water around a kettle lake that has a maximum depth of 27 ft. Outside of the kettle lake area of the flowage, the average depth is 3-4 ft. Emergent vegetation such as cattails, blue flag iris, sedges and reeds is common around the perimeter and northern parts of the flowage where the water is up to 2 ft deep. Deerfly Trail runs across the dam crest. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, beaver, and fish.

Management Objective

Hay Meadow Flowage No. 4 does not have a water control structure and is passively managed as a fishery with the added benefit of seasonal moist soil production for waterfowl and shorebird habitat.

Flowage General Characteristics

- 13 acre impoundment
- 133 acre watershed
- Maximum depth of 27ft
- Substrate is muck
- Built in 1961
- Access via Deerfly Trail
- No boat landing
- Located in the Town of Cleveland at 45.1861, -91.3218

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage emphasizes depth for fishery production as well as provides an array of moist soil conditions along the perimeter and upstream areas of the flowage. Moist soil provides forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize fish habitat.

Spring: March – May

During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately. There is no emergency spillway at this flowage.

Summer: June – September

Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

HORSESHOE FLOWAGE

Overview

Horseshoe Flowage is a 14 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. Horseshoe Trail runs across the top of the dam and is accessible by vehicle. Draining Cranberry Creek, the flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. There is no boat landing; however, low banking provides easy access for canoes and other small watercraft.

Management Objective

Horseshoe Flowage is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 14 acre impoundment
- 288 acre watershed
- Maximum depth of 9 ft
- Substrate is muck
- Access via Horseshoe Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2166, -91.2223

Summary of Habitat Management Activities

Year	Spring	Fall
1	Early drawdown: April – May	Late flooding: September – October
2	Maintained flooding, no change	Maintained flooding, no change
3	Partial early drawdown: April – May	Early flooding: August – September
4	Partial late drawdown: May – June	Early drawdown: August – September
5	Late Drawdown: May – June	Late flooding: September – October

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and

extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Early drawdown, late flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of six stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Maintained Flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.

Add stop logs to ensure a total of six 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for

flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of six logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.

Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of six stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one 5.5 inch stop log per week until no stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of six stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

MALLARD FLOWAGE

Overview

Mallard Flowage is a 42 acre impoundment set amidst a landscape of mixed hardwoods, undulating glacial moraine, and forested and emergent wetlands. A secondary forest road from Buckhorn Trail leads to and runs across the top of the dam, but is gated at the dam to prevent vehicular traffic. The waters impounded by Mallard Flowage drain into the Fisher River about 2 mi downstream of the outlet, and ultimately into the Chippewa River. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. There is no boat landing; however, low banking provides easy access for canoes and other small watercraft.

Management Objective

Mallard Flowage is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- Built in 1968
- 42 acre impoundment
- 1,234 acre watershed
- Maximum depth of 6 ft
- Substrate is muck
- Access from secondary road off of Buckhorn Trail
- No boat landing
- Located in the Town of Ruby at 45.2133, -91.0318

Summary of Habitat Management Activities

Year	Spring	Fall
1	Early drawdown: April – May	Late flooding: September – October
2	Maintained flooding, no change	Maintained flooding, no change
3	Partial early drawdown: April – May	Early flooding: August – September
4	Partial late drawdown: May – June	Early drawdown: August – September
5	Late Drawdown: May – June	Late flooding: September – October

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Early drawdown, late flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until no 5.5 inch stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Maintained Flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.

Add stop logs to ensure a total of eight 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until no 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

O'Neil Creek Flowage No. 1

Overview

O'Neil Creek Flowage No. 1 is set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. Located at the headwaters of O'Neil Creek and just upstream of O'Neil Creek Flowage No. 2, this 48 acre flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. Canoes and other small watercraft can access the flowage via carry-in; there is no boat landing. The dam crest is gated to exclude vehicular traffic.

Management Objective

O'Neil Creek Flowage No. 1 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- Built in 1965
- 48 acre impoundment
- 623 acre watershed
- Maximum depth of 10 ft
- Substrate is muck
- Walk in access via O'Neil Creek No. 1 Trail
- No boat landing
- Located in the Town of Cleveland at 45.2004, -91.3550

Summary of Habitat Management Activities

Year	Spring	Fall
1	Late Drawdown: May – June	Late flooding: September – October
2	Early drawdown: April – May	Late flooding: September – October
3	Maintained flooding, no change	Maintained flooding, no change
4	Partial early drawdown: April – May	Early flooding: August – September
5	Partial late drawdown: May – June	Early drawdown: August – September

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The rate and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Late drawdown, late flooding

January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Remove stop logs at a rate of one log per week until two 5 ½ inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Early drawdown, late flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until two 5 ½ inch stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Add stop logs to ensure a total of seven 5 ½ inch stop logs are in place. Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until four 5 ½ inch stop logs remain in the riser. This will expose an area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until four 5 ½ inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one log per week until two 5 ½ inch stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of seven stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

O'Neil Creek Flowage No. 2

Overview

O'Neil Creek Flowage No. 2 is set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. Located at the headwaters of O'Neil Creek, the flowage is abundant with wild rice, which can be harvested following the rules and regulations set forth by the State. It is the responsibility of gatherers to review and follow these regulations when engaging in any harvesting activities on any water body. The flowage features an unimproved boat landing for canoe access. Waterfowl and many shorebirds are seen commonly in spring and fall and the flowage is also home to muskrat, beaver, and other wildlife.

Management Objective

O'Neil Creek Flowage No. 2 is managed for wild rice production for recreational harvesting by the public and consumption by wildlife.

Flowage General Characteristics

- Built in 1965
- 33 acre impoundment
- 2,159 acre watershed
- Maximum depth of 9 ft
- Substrate is muck
- Access via O'Neil Creek Trail
- Unimproved boat landing available
- Located in the Town of Cleveland at 45.1920, -91.3596

Summary of Habitat Management Activities

Time	Activity
Late March/Early April	Flowage is monitored for safety and flooding during spring thaw
Mid April	Water level is gradually drawn down to promote wild rice production
Mid April – Mid July	Flowage water level is maintained through summer as rice transitions from floating-leaf to emergent stage of growth
August	Wild rice beings to ripen for harvest; water level is maintained
September	Flowage is re-flooded to create stopover habitat for migrating birds

Oct-March	Flowage is monitored for safety over winter

Habitat Management Procedure
Wild rice requires a particular set of growing conditions to be successful. These include:

- Water depths of 1 to 3 ft
- Organic soil depth of 6 in or greater with calcareous material (such as shells) intermixed
- Gentle but continuous water flow
- Minimal water level fluctuation during floating leaf stage (June & July)
- pH of 6.8 to 8.8; sulfate ion concentration of < 10 ppm, total alkalinity of 40-200 ppm
- 0.4 dissolved oxygen during seed germination.

Implementation
The following schedule is to be implemented only by designed persons and is intended to optimize wild rice production for recreation and wildlife benefit.

Late March/Early April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. O'Neil Creek Flowage No. 2 has no emergency spillway to facilitate high water alleviation.

Mid April: Water level is gradually drawn down to promote wild rice production.
Replace stop logs at a rate of one log per week until a total of four 5 ½ inch stop logs are in the riser. This will cause a majority of the flowage to be shallowly flooded, ideal for wild rice production. This water level should be maintained until re-flooding of the flowage in the fall.

Mid April – Mid July: Flowage water level is maintained through summer.
Steady water level is a critical management risk during the current floating leaf stage of wild rice. Monitor flowage regularly and especially after precipitation events to ensure that the flowage maintains a stable water level with less than 6 inches of variation. Remove stop logs as necessary to facilitate drainage during and immediately after storm events, but be sure to replace them as hydrologic conditions stabilize to prevent excessive drawdown.

August: Wild rice beings to ripen for harvest; water level is maintained.
Maintain current water levels until September. Wild rice ripens for harvest over 10-14 days between the 3rd week of August and 2nd week of September. The flowage is open to public harvesting; all harvesters are responsible for researching and following state harvesting rules.

September: Flowage is re-flooded to create stopover habitat for migrating birds.
After the first week of September, begin adding one stop log per week to the water control structure to facilitate flooding of the flowage coinciding with fall waterfowl migrations. A total of eight 5 ½ inch stop

logs should be in the riser at the end of the re-flooding period. Raising the water level helps to dislodge remaining wild rice from the stalk, making the nutritious grain readily available for consumption by waterfowl. Re-flooding of the flowage also creates ideal stopover habitat for migrating birds.

Oct-March: Flowage is monitored for safety over winter.
Monitor flowage periodically for safety. Remove any obstructions to the outlet prior to freezing and just after thawing to reduce flood risks in the spring.

Sources

Great Lakes Indian Fish and Wildlife Commission brochure. Wild rice: ecology; harvest; management.

United States Department of Agriculture Natural Resource Conservation Service, 2001. Wild rice establishment. Michigan NRCS conservation sheet 644b.

United States Department of Agriculture Natural Resource Conservation Service, 1995. Wild rice seeding guidelines. Wisconsin biology technical note 4.

Wisconsin Department of Natural Resources, 2014. Harvesting wild rice in Wisconsin, http://dnr.wi.gov/topic/outdoorrecreation/ activities/rice.html.

SPRING CREEK FLOWAGE NO. 1

Overview

Spring Creek Flowage No. 1 is a 10 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is located just downstream of Spring Creek Flowage No. 2. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. The flowage is accessibly via 250th Ave, which runs across the dam's crest. There is no boat landing at this flowage.

Management Objective

Spring Creek Flowage No. 1 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 10 acre impoundment
- 1,481 acre watershed
- Maximum depth of 8 ft
- Substrate is muck
- Access via 250th Avenue
- No boat landing
- Located in the Town of Birch Creek at 45.2092, -91.2475

Summary of Habitat Management Activities

Year	Spring	Fall
1	Late Drawdown: May – June	Late flooding: September – October
2	Early drawdown: April – May	Late flooding: September – October
3	Maintained flooding, no change	Maintained flooding, no change
4	Partial early drawdown: April – May	Early flooding: August – September
5	Partial late drawdown: May – June	Early drawdown: August – September

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The rate and

extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Late drawdown, late flooding

January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Remove stop logs at a rate of one log per week until no 5 ½ inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Early drawdown, late flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until no 5 ½ inch stop logs remain in the riser. This will expose the most area of moist soil, which encourages the

growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5 ½ inch stop logs remain in the riser. This will expose an area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of eight stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage does not have an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until three 5 ½ inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one log per week until no 5 ½ inch stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.

Begin re-flooding the flowage at a rate of one 5 ½ inch stop log per week until a total of eight stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

SPRING CREEK FLOWAGE NO. 2

Overview

Spring Creek Flowage No. 2 is a 25 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is located at the end of Spring Creek Trail. The flowage drains 920 acres of Spring Creek's watershed and it drains into Spring Creek Flowage No. 1, which is located immediately downstream. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife. There is no boat landing; however, low banking provides easy access for canoes and other small watercraft.

Management Objective

Spring Creek Flowage No. 2 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 25 acre impoundment
- 920 acre watershed
- Maximum depth of 10 ft
- Substrate is muck
- Access via Spring Creek Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2108, -91.2496

Summary of Habitat Management Activities

Year	Spring	Fall
1	Partial late drawdown: May – June	Early drawdown: August – September
2	Late Drawdown: May – June	Late flooding: September – October
3	Early drawdown: April – May	Late flooding: September – October
4	Maintained flooding, no change	Maintained flooding, no change
5	Partial early drawdown: April – May	Early flooding: August – September

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and

extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Partial late drawdown, early drawdown

January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.

Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.

Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Late drawdown, late flooding

January – April: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.

Remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for

shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Early drawdown, late flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one 5.5 inch log per week until no stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Maintained Flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.

Add stop logs to ensure a total of seven 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Partial early drawdown, early flooding

January – March: Flowage is monitored for flooding during spring thaw.

Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.

Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.

Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.

Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of seven logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.

Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

VISTA FLOWAGE

Overview

Vista Flowage, also known as Conley Flowage, is a 19 acre impoundment on Mud Brook. The flowage is located amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. A blue heron rookery is located adjacent to the flowage along the nearby Ice Age Trail. Deerfly Trail runs across the dam crest. The flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and fish. There is no boat landing, although small boats can be put in along the flowages low banks along Deerfly Trail.

Management Objective

Vista Flowage does not have a water control structure and is passively managed as a fishery with the added benefit of seasonal moist soil production for waterfowl and shorebirds.

Flowage General Characteristics

- 19 acre impoundment
- 1,672 acre watershed
- Maximum depth of 8ft
- Substrate is muck
- Built in 1970
- Access via Deerfly Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2168, -91.3079

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage emphasizes depth for fishery production as well as provides an array of moist soil conditions along the perimeter and shallow upstream areas of the flowage. Moist soil

provides forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize fish habitat.

Spring: March – May

During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately. There is no emergency spillway at this flowage.

Summer: June – September

Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November

Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March

Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

WILLOW BAY FLOWAGE

Overview

Willow Bay Flowage is set amidst a landscape of mixed hardwoods, undulating glacial moraine, and forested and emergent wetlands. Buckhorn Trail runs across the top of the dam. Willow Bay Flowage is home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, and other wildlife.

Management Objective

Willow Bay Flowage does not have a water control structure and is passively managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

Flowage General Characteristics

- 17 acre impoundment
- 208 acre watershed
- Maximum depth of 9ft
- Substrate is muck
- Access via Buckhorn Trail
- No boat landing
- Located in the Town of Ruby at 45.2085, -91.0172

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Water level naturally fluctuates with hydrologic conditions
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The flowage does not have a water control structure with which to manipulate the water level. Natural water level fluctuations during dryer and wetter months provide varying habitat and production levels.

Implementation
The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Spring: March – May
During the spring months the flowage should be monitored weekly for safety. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is no emergency spillway at this flowage. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September
Following spring snowmelt and soil thawing, the flowage will have a moderate water level. The level will likely go down over the summer months and with dryer weather, while storm events will cause the level to rise. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November
Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March
Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

Willow Creek Flowage No. 1

Overview

Willow Creek Flowage No. 1 is set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is the most downstream flowage in a series of three flowages along Willow Creek. The flowage has a surface area of 19 acres and a maximum depth of 9 ft. It is home to many varieties of waterfowl and shorebirds as well as turtles, beaver, and fish including perch, bluegill, and pumpkin seed. There is no boat landing, although small boats can be put in along the flowage's low banks.

Management Objective

Willow Creek Flowage No. 1 is managed as a fishery.

Flowage General Characteristics

- 19 acre impoundment
- 1,866 acre watershed
- Maximum depth of 9ft
- Substrate is muck
- Built in 1966
- Access via Willow Creek Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2539, -91.2902

Summary of Habitat Management Activities

Time	Activity
Spring	Flowage is monitored for safety and flooding during spring thaw
Summer	Flowage is kept well flooded for fish habitat
Fall	Flowage is monitored for safety and cleared of any obstructions to drainage prior to freezing
Winter	Flowage is monitored periodically for safety

Habitat Management Procedure

The management of this flowage maximizes water depth for fish habitat.

Implementation

The following schedule is to be implemented only by designated persons and is intended to optimize fish habitat.

Spring: March – May
During spring the flowage should be monitored weekly for safety. Remove stop logs as necessary to promote drainage of excess water during snowmelt and thawing of the watershed. Safely remove any obstructions to the outlet that would prevent draining of the flowage. There is an emergency spillway to facilitate flood alleviation. If flooding is imminent, notify the Chippewa County Land Conservation and Forest Management Department immediately.

Summer: June – September
Replace stop logs until a total of six 5.5 inch logs are in the riser. Monitor the flowage periodically to ensure there are no obstructions to the outlet. The flowage should also be monitored during and after storm events for flooding and potential damage to the dam itself. Any change in the dam structure or outlet should be reported to the Chippewa County Land Conservation and Forest Management Department.

Fall: October – November
Ensure that the outlet is clear and free from obstruction prior to freeze-over of the flowage in the winter months. This will promote safe drainage of the flowage in the spring.

Winter: December – March
Monitor the flowage periodically for obstructions to the outlet or changes in the dam structure. Report any significant changes to the Chippewa County Land Conservation and Forest Management Department.

WILLOW CREEK FLOWAGE NO. 2

Overview

Willow Creek Flowage No. 2 is a 20 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is second in a series of three impoundments on Willow Creek in the town of Birch Creek. The Willow Creek Flowages are home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, other wildlife, and fish including perch, bluegill, and pumpkin seed. There is no boat landing; however, low banking provides easy access for canoes and other small watercraft.

Management Objective

Willow Creek Flowage No. 2 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

The bathymetry, hydrology, and know fish population of the flowage indicate that it would also be suitable for management as a fishery.

Flowage General Characteristics

- Built in 1966
- 20 acre impoundment
- 1,406 acre watershed
- Maximum depth of 9 ft
- Substrate is muck
- Access via Willow Creek Trail
- Unimproved boat landing
- Located in the Town of Birch Creek at 45.2512, -91.2763

Summary of Habitat Management Activities

Year	Spring	Fall
1	Partial late drawdown: May – June	Early drawdown: August – September
2	Late Drawdown: May – June	Late flooding: September – October
3	Early drawdown: April – May	Late flooding: September – October
4	Maintained flooding, no change	Maintained flooding, no change
5	Partial early drawdown: April – May	Early flooding: August – September

Habitat Management Procedure
The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation
The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until five 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one log per week until three stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Early drawdown, late flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until three 5.5 inch stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Add stop logs to ensure a total of ten 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until five 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

WILLOW CREEK FLOWAGE NO. 3

Overview

Willow Creek Flowage No. 3 is a 27 acre impoundment set amidst the rolling landscape of Chippewa County's glacial outwash plains and surrounded by forests of mixed hardwoods. It is the most upstream in a series of three impoundments on Willow Creek in the town of Birch Creek. The Willow Creek Flowages are home to many varieties of waterfowl and shorebirds as well as turtles, muskrat, beaver, other wildlife, and fish including perch, bluegill, and pumpkin seed. There is no boat landing; however, low banking provides easy access for canoes and other small watercraft.

Management Objective

Willow Creek Flowage No. 3 is managed for moist soil habitat to produce optimal forage and nesting habitat to migratory and resident shorebird populations.

The bathymetry, hydrology, and know fish population of the flowage indicate that it would also be suitable for management as a fishery.

Flowage General Characteristics

- Built in 1966
- 27 acre impoundment
- 1,342 acre watershed
- Maximum depth of 9 ft
- Substrate is muck
- Access via Willow Creek Trail
- No boat landing
- Located in the Town of Birch Creek at 45.2480, -91.2711

Summary of Habitat Management Activities

Year	Spring	Fall
1	Partial early drawdown: April – May	Early flooding: August – September
2	Partial late drawdown: May – June	Early drawdown: August – September
3	Late Drawdown: May – June	Late flooding: September – October
4	Early drawdown: April – May	Late flooding: September – October
5	Maintained flooding, no change	Maintained flooding, no change

Habitat Management Procedure
The management of this flowage provides an array of moist soil conditions that provide forage and breeding habitat to a wide variety of resident and migratory waterfowl and shorebirds. The timing and extent of water level fluctuations are varied from year to year to promote preferred vegetation growth and to allow for invertebrate population recovery.

Implementation
The following schedule is to be implemented only by designated persons and is intended to optimize moist soil habitat for wildlife benefit.

Year 1: Partial early drawdown, early flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until five 5.5 inch stop logs remain in the riser. This will expose an area of moist soil around the perimeter of the flowage while keeping in the interior flooded. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – September: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

October – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 2: Partial late drawdown, early drawdown
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to partially expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one log per week until five 5.5 inch stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – July: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

August – October: Flowage is drawn down further prior to fall migrations.
Remove stop logs at a rate of one 5.5 inch stop log per week until two stop logs remain in the riser. This exposes mudflats and creates forage habitat ideal for migrating shorebirds.

November – December: Re-flood the flowage prior to winter freeze over.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. Maintain that water level through the winter season. Follow schedule of implementation for the next year in the spring.

Year 3: Late drawdown, late flooding
January – April: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

May – June: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Remove stop logs at a rate of one 5.5 inch log per week until two stop logs remain in the riser. This will expose mud flats that positively impact the growth of hydrophytes and provide critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

July –August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 4: Early drawdown, late flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation.

April – May: Water level is gradually drawn down to expose mud flats and facilitate hydrophyte growth.
Assuming the flowage is ice-free, begin to remove stop logs at a rate of one log per week until two 5.5 inch stop logs remain in the riser. This will expose the most area of moist soil, which encourages the growth of hydrophytes and provides critical habitat for shorebirds and waterfowl. This water level should be maintained until re-flooding of the flowage in the fall.

June – August: Flowage water level is maintained.
Maintain current water level. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

September – October: Flowage is re-flooded for fall waterfowl and shorebird migrations.
Begin re-flooding the flowage at a rate of one 5.5 inch stop log per week until a total of ten stop logs are in place. This creates the shallowly flooded stopover habitat ideal for migrating birds and helps to dislodge nutritious seed from the stalk, making it readily available for consumption by wildlife.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

Year 5: Maintained Flooding
January – March: Flowage is monitored for flooding during spring thaw.
Monitor flowage closely during snowmelt and thawing of watershed. Remove stop logs as necessary to facilitate drainage and reduce possibility of flooding or dam over-topping. The flowage has an emergency spillway to facilitate high water alleviation. Replace any removed stop logs after threat of flooding is diminished.

April –October: Flowage water level is maintained.
Add stop logs to ensure a total of ten 5.5 inch stop logs are in place. Monitor flowage regularly for obstructions that could cause the water level to rise and remove them as necessary. Monitor for flooding following severe storm events and report any critical information to the Chippewa County Land Conservation and Forest Management Department.

November – December: Maintain flowage water level and monitor for safety.
Maintain water level of flowage through winter season. Follow schedule of implementation for the next year in the spring.

After completing the habitat management activities for Year 5, the five-year sequence begins again at Year 1.

APPENDIX B: RESULTS OF GIS ANALYSIS

Name	Slope (total acres in slope range)						
	0-2%	**2-5%**	**5-10%**	**10-20%**	**20-50%**	**>50%**	***Total***
BEAVER DAM	10	3	5	5	1	0	*25*
BIRCH CREEK NO. 1	50	25	34	30	8	0	*148*
BIRCH CREEK NO. 2	40	19	25	22	6	0	*113*
HAY MEADOW NO. 1	713	456	533	432	97	0	*2,231*
HAY MEADOW NO. 2	666	430	502	402	91	0	*2,091*
HAY MEADOW NO. 3	63	23	34	42	13	0	*174*
HAY MEADOW NO. 4	43	17	28	34	11	0	*133*
HORSESHOE	68	76	76	55	13	0	*288*
MALLARD	704	442	81	7	0	0	*1,234*
O'NEIL CREEK NO. 1	215	83	132	155	37	0	*623*
O'NEIL CREEK NO. 2	777	337	440	474	132	0	*2,159*
SPRING CREEK NO. 1	408	279	354	345	96	0	*1,481*
SPRING CREEK NO. 2	273	186	213	198	50	0	*920*
VISTA	470	255	349	440	157	0	*1,672*
WILLOW BAY	110	77	19	2	0	0	*208*
WILLOW CREEK NO. 1	491	437	478	393	88	0	*1,886*
WILLOW CREEK NO. 2	334	299	374	326	73	0	*1,406*
WILLOW CREEK NO. 3	307	289	361	314	71	0	*1,342*

Name	Slope (% of watershed area in slope range)						
	0-2%	**2-5%**	**5-10%**	**10-20%**	**20-50%**	**>50%**	***Total***
BEAVER DAM	39	14	22	22	4	0	*100*
BIRCH CREEK NO. 1	34	17	23	21	5	0	*100*
BIRCH CREEK NO. 2	36	17	22	20	5	0	*100*
HAY MEADOW NO. 1	32	20	24	19	4	0	*100*
HAY MEADOW NO. 2	32	21	24	19	4	0	*100*
HAY MEADOW NO. 3	36	13	20	24	7	0	*100*
HAY MEADOW NO. 4	32	12	21	26	8	0	*100*
HORSESHOE	23	26	26	19	5	0	*100*
MALLARD	57	36	7	1	0	0	*100*
O'NEIL CREEK NO. 1	35	13	21	25	6	0	*100*
O'NEIL CREEK NO. 2	36	16	20	22	6	0	*100*
SPRING CREEK NO. 1	28	19	24	23	6	0	*100*
SPRING CREEK NO. 2	30	20	23	22	5	0	*100*
VISTA	28	15	21	26	9	0	*100*
WILLOW BAY	53	37	9	1	0	0	*100*
WILLOW CREEK NO. 1	26	23	25	21	5	0	*100*
WILLOW CREEK NO. 2	24	21	27	23	5	0	*100*
WILLOW CREEK NO. 3	23	22	27	23	5	0	*100*

Name	Aspect (total acres in aspect range)										
	Flat (-1)	North (0-22.5)	Northeast (22.5-67.5)	East (67.5-112.5)	Southeast (112.5-157.5)	South (157.5-202.5)	Southwest (202.5-247.5)	West (247.5-292.5)	Northwest (292.5-337.5)	North (337.5-360)	*Total*
BEAVER DAM	8	1	2	2	3	2	1	3	3	1	*25*
BIRCH CREEK NO. 1	26	9	16	16	16	14	12	14	17	8	*148*
BIRCH CREEK NO. 2	19	6	12	11	12	11	10	11	14	7	*113*
HAY MEADOW NO. 1	335	102	202	230	250	248	268	265	229	102	*2,231*
HAY MEADOW NO. 2	310	95	190	216	234	233	253	249	214	96	*2,091*
HAY MEADOW NO. 3	42	8	15	16	19	18	18	21	12	6	*174*
HAY MEADOW NO. 4	31	6	12	13	15	11	13	18	9	5	*133*
HORSESHOE	18	13	37	43	43	42	34	26	22	10	*288*
MALLARD	93	74	152	161	141	119	125	141	156	72	*1,234*
O'NEIL CREEK NO. 1	162	23	46	52	64	72	69	57	54	24	*623*
O'NEIL CREEK NO. 2	556	95	166	161	189	206	220	225	238	104	*2,159*
SPRING CREEK NO. 1	178	71	156	188	194	185	161	142	137	69	*1,481*
SPRING CREEK NO. 2	108	44	95	116	121	110	99	92	92	44	*920*
VISTA	258	84	154	143	158	177	179	199	225	96	*1,672*
WILLOW BAY	16	11	23	23	23	22	26	28	25	11	*208*
WILLOW CREEK NO. 1	192	122	212	170	166	181	219	236	261	128	*1,886*
WILLOW CREEK NO. 2	144	92	160	129	123	131	160	174	197	97	*1,406*
WILLOW CREEK NO. 3	122	89	154	125	119	124	153	169	191	95	*1,342*

Name	Aspect (% of watershed area in aspect range)										
	Flat (-1)	North (0-22.5)	Northeast (22.5-67.5)	East (67.5-112.5)	Southeast (112.5-157.5)	South (157.5-202.5)	Southwest (202.5-247.5)	West (247.5-292.5)	Northwest (292.5-337.5)	North (337.5-360)	*Total*
BEAVER DAM	32	3	7	9	12	8	5	10	11	3	*100*
BIRCH CREEK NO. 1	18	6	11	11	11	9	8	9	12	6	*100*
BIRCH CREEK NO. 2	17	6	10	10	11	10	9	10	12	6	*100*
HAY MEADOW NO. 1	15	5	9	10	11	11	12	12	10	5	*100*
HAY MEADOW NO. 2	15	5	9	10	11	11	12	12	10	5	*100*

HAY MEADOW NO. 3	24	4	8	9	11	10	10	12	7	4	*100*
HAY MEADOW NO. 4	23	5	9	10	11	9	10	13	7	4	*100*
HORSESHOE	6	5	13	15	15	15	12	9	8	4	*100*
MALLARD	8	6	12	13	11	10	10	11	13	6	*100*
O'NEIL CREEK NO. 1	26	4	7	8	10	12	11	9	9	4	*100*
O'NEIL CREEK NO. 2	26	4	8	7	9	10	10	10	11	5	*100*
SPRING CREEK NO. 1	12	5	11	13	13	12	11	10	9	5	*100*
SPRING CREEK NO. 2	12	5	10	13	13	12	11	10	10	5	*100*
VISTA	15	5	9	9	9	11	11	12	13	6	*100*
WILLOW BAY	8	5	11	11	11	10	13	13	12	5	*100*
WILLOW CREEK NO. 1	10	6	11	9	9	10	12	13	14	7	*100*
WILLOW CREEK NO. 2	10	7	11	9	9	9	11	12	14	7	*100*
WILLOW CREEK NO. 3	9	7	12	9	9	9	11	13	14	7	*100*

Key to Glacial Geology of Chippewa County Forest flowage watersheds

Wisconsin Geological and Natural History Survey, Bulletin 103 (2007). "Pleistocene Geology of Chippewa County, Wisconsin. Kent M. Severson

gc Glacial sediment of the Copper Falls Formation. Unit gc: reddishbrown to brown, gravelly sandy loam till, poorly sorted; low- to moderate-relief, rolling to streamlined surfaces deposited subglacially by the Chippewa Lobe.

gc h Glacial sediment of the Copper Falls Formation. Unit gch: reddishbrown to brown, gravelly sandy loam gravity-flow sediment and meltout till, silt loam lake sediment, and sandy gravel meltwater-stream sediment; chaotic bedding; low- to high-relief hummocky surfaces; sediment deposited at the surface of the melting Chippewa Lobe, and sediment later collapsed and flowed as underlying ice melted.

lci Lake sediment of the Copper Falls Formation. Unit lci: brown, yellowish-brown, to dark gray, laminated silt and silt loam offshore sediment, sandier and more gravelly nearer to former shoreline; flat to broad, convex surfaces are commonly high areas in the moraine landscape; deposited in ice-walled lakes. Rim ridges contain poorly to well sorted sandy gravel, sand, and gravelly sandy loam deposited in nearshore environment.

p Post-glacial sediment. Sediment of low, wet areas. Peat or slope sediment covering the stream, lake, or glacial sediment indicated by adjacent map units; flat to low-relief surfaces.

sc h Meltwater-stream sediment of the Copper Falls Formation. Unit sch: brown sandy gravel, gravelly sand, and reddish-brown gravelly sandy loam, poorly sorted; chaotic bedding; moderate- to high-relief hummocky surfaces; deposited on surface of Chippewa Lobe by streams and gravity flows; as buried ice melted, original depositional surface was destroyed.

w Open water

Glacial Geology of the Chippewa County Flowage Watersheds														
Flowage	**Unit (acres in watershed)**							**Unit (percent of watershed)**						
	gc	**gch**	**lci**	**p**	**sch**	**w**	***Total***	**gc**	**gch**	**lci**	**p**	**sch**	**w**	***Total***
BEAVER DAM	0	17	3	5	0	0	*25*	0	66	13	21	0	0	*100*
BIRCH CREEK NO. 1	0	125	0	22	0	0	*148*	0	85	0	15	0	0	*100*
BIRCH CREEK NO. 2	0	90	0	22	0	0	*113*	0	80	0	20	0	0	*100*
HAY MEADOW NO. 1	0	1,555	173	382	0	121	*2,231*	0	70	8	17	0	5	*100*
HAY MEADOW NO. 2	0	1,455	173	359	0	103	*2,091*	0	70	8	17	0	5	*100*
HAY MEADOW NO. 3	0	85	47	31	0	11	*174*	0	49	27	18	0	7	*100*
HAY MEADOW NO. 4	0	69	39	13	0	11	*133*	0	52	30	10	0	8	*100*
HORSESHOE	0	197	76	8	0	7	*288*	0	68	26	3	0	3	*100*
MALLARD	892	55	0	275	0	12	*1,234*	72	4	0	22	0	1	*100*
O'NEIL CREEK NO. 1	0	431	62	48	0	82	*623*	0	69	10	8	0	13	*100*
O'NEIL CREEK NO. 2	0	1,373	377	167	0	243	*2,159*	0	64	17	8	0	11	*100*
SPRING CREEK NO. 1	0	819	364	216	0	82	*1,481*	0	55	25	15	0	6	*100*
SPRING CREEK NO. 2	0	486	221	149	0	63	*920*	0	53	24	16	0	7	*100*
VISTA	0	923	462	186	0	101	*1,672*	0	55	28	11	0	6	*100*
WILLOW BAY	48	59	0	101	0	0	*208*	23	28	0	49	0	0	*100*
WILLOW CREEK NO. 1	0	1,223	411	159	10	83	*1,886*	0	65	22	8	1	4	*100*
WILLOW CREEK NO. 2	0	921	294	120	0	71	*1,406*	0	65	21	9	0	5	*100*
WILLOW CREEK NO. 3	0	880	287	120	0	55	*1,342*	0	66	21	9	0	4	*100*

Soil Texture of Flowage Watersheds																			
Flowage	**Texture (acres in watershed)**									**Texture (% of watershed)**									
	fsl	**l**	**ls**	**MK**	**PT**	**sl**	**sil**	**N/A**	***Total***	**fsl**	**l**	**ls**	**MK**	**PT**	**sl**	**sil**	**N/A**	***Total***
BEAVER DAM					7	18	0		*25*	0	0	0	0	27	72	1	0	*100*
BIRCH CREEK NO. 1					20	112		15	*148*	0	0	0	0	14	76	0	10	*100*
BIRCH CREEK NO. 2					20	84		8	*113*	0	0	0	0	18	75	0	7	*100*
HAY MEADOW NO. 1	12		0	291	195	1,520	42	171	*2,231*	1	0	0	13	9	68	2	8	*100*
HAY MEADOW NO. 2	12		0	274	183	1,427	42	152	*2,091*	1	0	0	13	9	68	2	7	*100*
HAY MEADOW NO. 3	1			24	7	111	3	29	*174*	1	0	0	14	4	64	2	16	*100*
HAY MEADOW NO. 4	1			17	7	91	3	13	*133*	1	0	0	13	5	69	2	10	*100*
HORSESHOE	31		3	11	0	217	21	6	*288*	11	0	1	4	0	75	7	2	*100*
MALLARD	6	0		257		3	958	11	*1,234*	0	0	0	21	0	0	78	1	*100*
O'NEIL CREEK NO. 1			13	65	27	417	32	68	*623*	0	0	2	10	4	67	5	11	*100*
O'NEIL CREEK NO. 2	43		50	244	66	1,446	84	225	*2,159*	2	0	2	11	3	67	4	10	*100*
SPRING CREEK NO. 1	7	4	13	173	62	999	117	105	*1,481*	0	0	1	12	4	67	8	7	*100*
SPRING CREEK NO. 2	3	4	13	110	46	603	71	70	*920*	0	0	1	12	5	66	8	8	*100*
VISTA	1			231	67	1,074	157	142	*1,672*	0	0	0	14	4	64	9	9	*100*
WILLOW BAY				92		10	106		*208*	0	0	0	44	0	5	51	0	*100*
WILLOW CREEK NO. 1	8		54	127	87	1,269	228	114	*1,886*	0	0	3	7	5	67	12	6	*100*
WILLOW CREEK NO. 2	8		0	107	49	1,005	141	96	*1,406*	1	0	0	8	3	71	10	7	*100*
WILLOW CREEK NO. 3	8		0	107	49	960	141	76	*1,342*	1	0	0	8	4	72	11	6	*100*

Flowage	Soil Drainage Class (acres in watershed)								
	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained	N/A	*Total*
BEAVER DAM			19				7		*25*
BIRCH CREEK NO. 1			112				20	15	*148*
BIRCH CREEK NO. 2			84				20	8	*113*
HAY MEADOW NO. 1	0	24	1,512	34	4		486	171	*2,231*
HAY MEADOW NO. 2	0	24	1,420	34	4		457	152	*2,091*
HAY MEADOW NO. 3		15	99	1			31	29	*174*
HAY MEADOW NO. 4		12	82	1			24	13	*133*
HORSESHOE	3		217	51		0	11	6	*288*
MALLARD			3	178	548	181	313	11	*1,234*
O'NEIL CREEK NO. 1	13	24	425				93	68	*623*
O'NEIL CREEK NO. 2	50	66	1,435	56	13	3	311	225	*2,159*
SPRING CREEK NO. 1	13	26	1,041	50			245	105	*1,481*
SPRING CREEK NO. 2	13	26	624	21			166	70	*920*
VISTA		10	1,113	104	1	4	298	142	*1,672*
WILLOW BAY			16	38	35		118		*208*
WILLOW CREEK NO. 1	54	31	1,349	38	66	3	232	114	*1,886*
WILLOW CREEK NO. 2	0	30	1,086	25	9	3	156	96	*1,406*
WILLOW CREEK NO. 3	0	30	1,041	25	9	3	156	76	*1,342*

Flowage	Soil Drainage Class (% of watershed)								
	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained	N/A	*Total*
BEAVER DAM	0	0	73	0	0	0	27	0	100
BIRCH CREEK NO. 1	0	0	76	0	0	0	14	10	100
BIRCH CREEK NO. 2	0	0	75	0	0	0	18	7	100
HAY MEADOW NO. 1	0	1	68	2	0	0	22	8	100
HAY MEADOW NO. 2	0	1	68	2	0	0	22	7	100
HAY MEADOW NO. 3	0	9	57	1	0	0	18	16	100
HAY MEADOW NO. 4	0	9	62	1	0	0	18	10	100
HORSESHOE	1	0	75	18	0	0	4	2	100
MALLARD	0	0	0	14	44	15	25	1	100
O'NEIL CREEK NO. 1	2	4	68	0	0	0	15	11	100
O'NEIL CREEK NO. 2	2	3	66	3	1	0	14	10	100
SPRING CREEK NO. 1	1	2	70	3	0	0	17	7	100
SPRING CREEK NO. 2	1	3	68	2	0	0	18	8	100
VISTA	0	1	67	6	0	0	18	9	100
WILLOW BAY	0	0	8	18	17	0	57	0	100
WILLOW CREEK NO. 1	3	2	72	2	3	0	12	6	100
WILLOW CREEK NO. 2	0	2	77	2	1	0	11	7	100
WILLOW CREEK NO. 3	0	2	78	2	1	0	12	6	100

Key to original vegetation codes
"Original Vegetation Cover of Wisconsin" map by Robert W. Finley, 1976

0	Water
3	Hemlock, sugar maple, yellow birch, white pine, red pine
4	Sugar maple, yellow birch, white pine, red pine
5	White pine, red pine
9	Sugar maple, basswood, red oak, white oak, black oak
10	Oak -- white oak, black oak, bur oak
14	Swamp conifers -- white cedar, black spruce, tamarack, hemlock

Flowage	Original Vegetation Cover (acres)								Original Vegetation Cover (% of watershed)							
	0	**3**	**4**	**5**	**9**	**10**	**14**	***Total***	**0**	**3**	**4**	**5**	**9**	**10**	**14**	***Total***
BEAVER DAM	0	0	0	0	0	25	0	*25*	0	0	0	0	0	100	0	*100*
BIRCH CREEK NO. 1	0	106	41	0	0	0	0	*148*	0	72	28	0	0	0	0	*100*
BIRCH CREEK NO. 2	0	71	41	0	0	0	0	*113*	0	63	37	0	0	0	0	*100*
HAY MEADOW NO. 1	29	0	140	635	509	0	918	*2,231*	1	0	6	28	23	0	41	*100*
HAY MEADOW NO. 2	29	0	27	635	509	0	891	*2,091*	1	0	1	30	24	0	43	*100*
HAY MEADOW NO. 3	0	0	0	0	171	0	4	*174*	0	0	0	0	98	0	2	*100*
HAY MEADOW NO. 4	0	0	0	0	133	0	0	*133*	0	0	0	0	100	0	0	*100*
HORSESHOE	0	278	10	0	0	0	0	*288*	0	97	3	0	0	0	0	*100*
MALLARD	0	1,187	0	0	0	0	48	*1,234*	0	96	0	0	0	0	4	*100*
O'NEIL CREEK NO. 1	0	0	0	0	0	623	0	*623*	0	0	0	0	0	100	0	*100*
O'NEIL CREEK NO. 2	30	0	0	0	672	1,363	94	*2,159*	1	0	0	0	31	63	4	*100*
SPRING CREEK NO. 1	30	815	338	299	0	0	0	*1,481*	2	55	23	20	0	0	0	*100*
SPRING CREEK NO. 2	30	569	316	5	0	0	0	*920*	3	62	34	1	0	0	0	*100*
VISTA	46	0	453	497	2	0	673	*1,672*	3	0	27	30	0	0	40	*100*
WILLOW BAY	0	116	0	0	0	0	91	*208*	0	56	0	0	0	0	44	*100*
WILLOW CREEK NO. 1	45	1,418	411	6	0	0	6	*1,886*	2	75	22	0	0	0	0	*100*
WILLOW CREEK NO. 2	45	950	411	0	0	0	0	*1,406*	3	68	29	0	0	0	0	*100*
WILLOW CREEK NO. 3	31	900	411	0	0	0	0	*1,342*	2	67	31	0	0	0	0	*100*

Forest Stand Distribution in Watersheds of the Chippewa County Forest Flowages

Flowage	Tree Stand Type	Area (acres)	Percent
BEAVER DAM	Aspen	6	23
BEAVER DAM	Minor Lake	8	30
BEAVER DAM	No. Hardwoods	10	40
BEAVER DAM	Oak	1	4
BEAVER DAM		1	3
BEAVER DAM	Private Land or Not Forested	0	0
BIRCH CREEK NO. 1	Aspen	18	12
BIRCH CREEK NO. 1	Keg	11	7
BIRCH CREEK NO. 1	Minor Lake	9	6
BIRCH CREEK NO. 1	No. Hardwoods	19	13
BIRCH CREEK NO. 1	Oak	9	6
BIRCH CREEK NO. 1	Red Pine	22	15
BIRCH CREEK NO. 1	Swamp Hardwoods	10	7
BIRCH CREEK NO. 1	White Birch	14	9
BIRCH CREEK NO. 1		34	23
BIRCH CREEK NO. 1	Private Land or Not Forested	2	2
BIRCH CREEK NO. 2	Aspen	18	16
BIRCH CREEK NO. 2	Keg	11	9
BIRCH CREEK NO. 2	Minor Lake	4	3
BIRCH CREEK NO. 2	No. Hardwoods	7	7
BIRCH CREEK NO. 2	Oak	9	8
BIRCH CREEK NO. 2	Red Pine	22	19
BIRCH CREEK NO. 2	Swamp Hardwoods	10	9
BIRCH CREEK NO. 2	White Birch	13	12
BIRCH CREEK NO. 2		17	15
BIRCH CREEK NO. 2	Private Land or Not Forested	3	2
HAY MEADOW NO. 1	Aspen	404	18
HAY MEADOW NO. 1	Black Spruce	6	0
HAY MEADOW NO. 1	Keg	126	6
HAY MEADOW NO. 1	Keg Grass	22	1
HAY MEADOW NO. 1	Lowland Brush	38	2
HAY MEADOW NO. 1	Minor Lake	86	4
HAY MEADOW NO. 1	No. Hardwoods	159	7
HAY MEADOW NO. 1	Non-comm S,T, or C	6	0
HAY MEADOW NO. 1	Oak	255	11
HAY MEADOW NO. 1	Pine	0	0
HAY MEADOW NO. 1	Red Pine	15	1
HAY MEADOW NO. 1	Swamp Hardwoods	30	1
HAY MEADOW NO. 1	Tamarack	28	1
HAY MEADOW NO. 1	White Birch	4	0
HAY MEADOW NO. 1		141	6
HAY MEADOW NO. 1	Private Land or Not Forested	910	41
HAY MEADOW NO. 2	Aspen	374	18

HAY MEADOW NO. 2	Black Spruce	6	0
HAY MEADOW NO. 2	Keg	126	6
HAY MEADOW NO. 2	Keg Grass	18	1
HAY MEADOW NO. 2	Lowland Brush	32	2
HAY MEADOW NO. 2	Minor Lake	49	2
HAY MEADOW NO. 2	No. Hardwoods	137	7
HAY MEADOW NO. 2	Non-comm S,T, or C	6	0
HAY MEADOW NO. 2	Oak	230	11
HAY MEADOW NO. 2	Red Pine	15	1
HAY MEADOW NO. 2	Swamp Hardwoods	30	1
HAY MEADOW NO. 2	Tamarack	24	1
HAY MEADOW NO. 2		136	7
HAY MEADOW NO. 2	Private Land or Not Forested	907	43
HAY MEADOW NO. 3	Aspen	25	14
HAY MEADOW NO. 3	Keg	46	27
HAY MEADOW NO. 3	Lowland Brush	29	17
HAY MEADOW NO. 3	Minor Lake	0	0
HAY MEADOW NO. 3	No. Hardwoods	17	10
HAY MEADOW NO. 3	Oak	34	19
HAY MEADOW NO. 3	Tamarack	16	9
HAY MEADOW NO. 3		8	4
HAY MEADOW NO. 3	Private Land or Not Forested	0	0
HAY MEADOW NO. 4	Aspen	40	30
HAY MEADOW NO. 4	Keg	18	14
HAY MEADOW NO. 4	Minor Lake	12	9
HAY MEADOW NO. 4	No. Hardwoods	33	25
HAY MEADOW NO. 4	Oak	16	12
HAY MEADOW NO. 4	Tamarack	5	4
HAY MEADOW NO. 4		8	6
HAY MEADOW NO. 4	Private Land or Not Forested	0	0
HORSESHOE	Aspen	95	33
HORSESHOE	Lowland Brush	0	0
HORSESHOE	Minor Lake	18	6
HORSESHOE	No. Hardwoods	69	24
HORSESHOE	Red Pine	0	0
HORSESHOE	Swamp Hardwoods	8	3
HORSESHOE	Tamarack	1	0
HORSESHOE	White Birch	3	1
HORSESHOE	White Pine	5	2
HORSESHOE		37	13
HORSESHOE	Private Land or Not Forested	53	18
MALLARD	Aspen	100	8
MALLARD	Bog	25	2
MALLARD	Fir-Spruce	8	1
MALLARD	Keg	126	10
MALLARD	Keg Grass	40	3

MALLARD	Lowland Brush	77	6
MALLARD	Minor Lake	45	4
MALLARD	No. Hardwoods	170	14
MALLARD	Swamp Hardwoods	5	0
MALLARD	Tamarack	40	3
MALLARD	White Spruce	2	0
MALLARD		35	3
MALLARD	Private Land or Not Forested	562	46
O'NEIL CREEK NO. 1	Aspen	60	10
O'NEIL CREEK NO. 1	Fir-Spruce	13	2
O'NEIL CREEK NO. 1	Keg	4	1
O'NEIL CREEK NO. 1	Keg Grass	21	3
O'NEIL CREEK NO. 1	Lowland Brush	2	0
O'NEIL CREEK NO. 1	Minor Lake	67	11
O'NEIL CREEK NO. 1	No. Hardwoods	44	7
O'NEIL CREEK NO. 1	Non-comm S,T, or C	3	0
O'NEIL CREEK NO. 1	Oak	213	34
O'NEIL CREEK NO. 1	Red Pine	20	3
O'NEIL CREEK NO. 1	Swamp Hardwoods	20	3
O'NEIL CREEK NO. 1	Tamarack	5	1
O'NEIL CREEK NO. 1	White Pine	2	0
O'NEIL CREEK NO. 1		22	4
O'NEIL CREEK NO. 1	Private Land or Not Forested	127	20
O'NEIL CREEK NO. 2	Aspen	209	10
O'NEIL CREEK NO. 2	Bog	6	0
O'NEIL CREEK NO. 2	Fir-Spruce	17	1
O'NEIL CREEK NO. 2	Keg	7	0
O'NEIL CREEK NO. 2	Keg Grass	89	4
O'NEIL CREEK NO. 2	Lowland Brush	16	1
O'NEIL CREEK NO. 2	Minor Lake	253	12
O'NEIL CREEK NO. 2	No. Hardwoods	244	11
O'NEIL CREEK NO. 2	Non-comm S,T, or C	3	0
O'NEIL CREEK NO. 2	Oak	607	28
O'NEIL CREEK NO. 2	Red Pine	20	1
O'NEIL CREEK NO. 2	Swamp Hardwoods	42	2
O'NEIL CREEK NO. 2	Tamarack	13	1
O'NEIL CREEK NO. 2	White Birch	86	4
O'NEIL CREEK NO. 2	White Pine	7	0
O'NEIL CREEK NO. 2		147	7
O'NEIL CREEK NO. 2	Private Land or Not Forested	395	18
SPRING CREEK NO. 1	Aspen	158	11
SPRING CREEK NO. 1	Fir-Spruce	2	0
SPRING CREEK NO. 1	Keg	2	0
SPRING CREEK NO. 1	Keg Grass	8	1
SPRING CREEK NO. 1	Minor Lake	55	4
SPRING CREEK NO. 1	No. Hardwoods	61	4

SPRING CREEK NO. 1	Oak	125	8
SPRING CREEK NO. 1	Swamp Hardwoods	120	8
SPRING CREEK NO. 1	Tamarack	10	1
SPRING CREEK NO. 1	White Birch	68	5
SPRING CREEK NO. 1		76	5
SPRING CREEK NO. 1	Private Land or Not Forested	797	54
SPRING CREEK NO. 2	Aspen	102	11
SPRING CREEK NO. 2	Fir-Spruce	2	0
SPRING CREEK NO. 2	Keg Grass	8	1
SPRING CREEK NO. 2	Minor Lake	35	4
SPRING CREEK NO. 2	No. Hardwoods	61	7
SPRING CREEK NO. 2	Oak	53	6
SPRING CREEK NO. 2	Swamp Hardwoods	81	9
SPRING CREEK NO. 2	Tamarack	10	1
SPRING CREEK NO. 2	White Birch	53	6
SPRING CREEK NO. 2		43	5
SPRING CREEK NO. 2	Private Land or Not Forested	472	51
VISTA	Aspen	455	27
VISTA	Fir-Spruce	1	0
VISTA	Grass	0	0
VISTA	Keg	62	4
VISTA	Lowland Brush	24	1
VISTA	Minor Lake	86	5
VISTA	No. Hardwoods	84	5
VISTA	Non-comm S,T, or C	2	0
VISTA	Oak	128	8
VISTA	Swamp Hardwoods	116	7
VISTA	Tamarack	27	2
VISTA	White Birch	3	0
VISTA		27	2
VISTA	Private Land or Not Forested	656	39
WILLOW BAY	Aspen	27	13
WILLOW BAY	Bog	54	26
WILLOW BAY	Emergent Marsh	0	0
WILLOW BAY	Keg Grass	2	1
WILLOW BAY	Lowland Brush	30	15
WILLOW BAY	Minor Lake	16	8
WILLOW BAY	No. Hardwoods	79	38
WILLOW BAY		0	0
WILLOW BAY	Private Land or Not Forested	0	0
WILLOW CREEK NO. 1	Aspen	490	26
WILLOW CREEK NO. 1	Black Spruce	1	0
WILLOW CREEK NO. 1	Cedar	2	0
WILLOW CREEK NO. 1	Fir-Spruce	20	1
WILLOW CREEK NO. 1	Keg	2	0
WILLOW CREEK NO. 1	Keg Grass	5	0

WILLOW CREEK NO. 1	Lowland Brush	46	2
WILLOW CREEK NO. 1	Minor Lake	75	4
WILLOW CREEK NO. 1	No. Hardwoods	69	4
WILLOW CREEK NO. 1	Oak	73	4
WILLOW CREEK NO. 1	Red Oak	2	0
WILLOW CREEK NO. 1	Red Pine	26	1
WILLOW CREEK NO. 1	Swamp Conifer	52	3
WILLOW CREEK NO. 1	Swamp Hardwoods	143	8
WILLOW CREEK NO. 1	Tamarack	23	1
WILLOW CREEK NO. 1	White Birch	145	8
WILLOW CREEK NO. 1		115	6
WILLOW CREEK NO. 1	Private Land or Not Forested	595	32
WILLOW CREEK NO. 2	Aspen	272	19
WILLOW CREEK NO. 2	Aspen	47	3
WILLOW CREEK NO. 2	Black Spruce	1	0
WILLOW CREEK NO. 2	Fir-Spruce	5	0
WILLOW CREEK NO. 2	Keg	2	0
WILLOW CREEK NO. 2	Keg Grass	5	0
WILLOW CREEK NO. 2	Lowland Brush	29	2
WILLOW CREEK NO. 2	Minor Lake	61	4
WILLOW CREEK NO. 2	No. Hardwoods	40	3
WILLOW CREEK NO. 2	Oak	73	5
WILLOW CREEK NO. 2	Red Oak	2	0
WILLOW CREEK NO. 2	Red Pine	26	2
WILLOW CREEK NO. 2	Swamp Conifer	52	4
WILLOW CREEK NO. 2	Swamp Hardwoods	142	10
WILLOW CREEK NO. 2	Tamarack	18	1
WILLOW CREEK NO. 2	White Birch	112	8
WILLOW CREEK NO. 2	Private Land or Not Forested	518	37
WILLOW CREEK NO. 3	Black Spruce	231	17
WILLOW CREEK NO. 3	Fir-Spruce	1	0
WILLOW CREEK NO. 3	Keg	5	0
WILLOW CREEK NO. 3	Keg Grass	2	0
WILLOW CREEK NO. 3	Lowland Brush	1	0
WILLOW CREEK NO. 3	Minor Lake	29	2
WILLOW CREEK NO. 3	No. Hardwoods	52	4
WILLOW CREEK NO. 3	Oak	40	3
WILLOW CREEK NO. 3	Red Oak	73	5
WILLOW CREEK NO. 3	Red Pine	2	0
WILLOW CREEK NO. 3	Swamp Conifer	26	2
WILLOW CREEK NO. 3	Swamp Hardwoods	52	4
WILLOW CREEK NO. 3	Tamarack	142	11
WILLOW CREEK NO. 3	White Birch	18	1
WILLOW CREEK NO. 3		151	11
WILLOW CREEK NO. 3	Private Land or Not Forested	517	39

Key to National Land Cover Database (NLCD) Distribution in forest flowage watersheds

11	Open Water
21	Developed, Open Space
22	Developed, Low Intensity
41	Deciduous Forest
42	Evergreen Forest
43	Mixed Forest
52	Shrub/Scrub
71	Herbaceous
81	Hay/Pasture
82	Cultivated Crops
90	Woody Wetlands
95	Emergent Herbaceous Wetlands

Flowage	**National Land Cover Database Land-use Distribution (acres)**												
	11	**21**	**22**	**41**	**42**	**43**	**52**	**71**	**81**	**82**	**90**	**95**	***Total***
BEAVER DAM	0	1	0	16	0	0	0	0	0	0	8	1	*25*
BIRCH CREEK NO. 1	0	9	0	81	3	0	0	3	0	0	50	1	*148*
BIRCH CREEK NO. 2	0	5	0	50	3	0	0	3	0	0	50	1	*113*
HAY MEADOW NO. 1	136	59	0	1,495	18	12	1	30	7	108	313	53	*2,231*
HAY MEADOW NO. 2	117	57	0	1,398	18	12	1	30	7	108	294	49	*2,091*
HAY MEADOW NO. 3	20	10	0	114	0	0	0	0	0	15	12	3	*174*
HAY MEADOW NO. 4	8	4	0	96	0	0	0	0	0	15	7	3	*133*
HORSESHOE	6	8	0	227	1	1	0	7	14	5	20	1	*288*
MALLARD	5	12	0	714	0	1	6	24	4	150	141	177	*1,234*
O'NEIL CREEK NO. 1	64	9	0	459	14	4	0	3	0	5	54	10	*623*
O'NEIL CREEK NO. 2	174	38	0	1,609	14	6	0	15	20	32	172	77	*2,159*
SPRING CREEK NO. 1	71	59	1	900	1	10	0	12	15	126	254	33	*1,481*
SPRING CREEK NO. 2	58	36	1	510	1	8	0	7	15	77	184	23	*920*
VISTA	113	51	0	1,231	17	13	0	5	1	87	122	35	*1,672*
WILLOW BAY	7	8	0	112	0	0	4	1	0	0	50	25	*208*

WILLOW CREEK NO. 1	85	82	1	1,071	5	31	0	33	9	108	438	25	*1,886*
WILLOW CREEK NO. 2	67	74	1	775	5	20	0	33	9	102	307	14	*1,406*
WILLOW CREEK NO. 3	50	69	1	739	5	20	0	33	9	102	301	14	*1,342*

Flowage	**National Land Cover Database Land-use Distribution (% of watershed)**												
	11	**21**	**22**	**41**	**42**	**43**	**52**	**71**	**81**	**82**	**90**	**95**	***Total***
BEAVER DAM	0	3	0	62	0	0	0	0	0	0	30	5	*100*
BIRCH CREEK NO. 1	0	6	0	55	2	0	0	2	0	0	34	1	*100*
BIRCH CREEK NO. 2	0	5	0	44	3	0	0	2	0	0	45	1	*100*
HAY MEADOW NO. 1	6	3	0	67	1	1	0	1	0	5	14	2	*100*
HAY MEADOW NO. 2	6	3	0	67	1	1	0	1	0	5	14	2	*100*
HAY MEADOW NO. 3	11	6	0	65	0	0	0	0	0	9	7	2	*100*
HAY MEADOW NO. 4	6	3	0	72	0	0	0	0	0	11	5	2	*100*
HORSESHOE	2	3	0	79	0	0	0	2	5	2	7	0	*100*
MALLARD	0	1	0	58	0	0	0	2	0	12	11	14	*100*
O'NEIL CREEK NO. 1	10	1	0	74	2	1	0	0	0	1	9	2	*100*
O'NEIL CREEK NO. 2	8	2	0	75	1	0	0	1	1	1	8	4	*100*
SPRING CREEK NO. 1	5	4	0	61	0	1	0	1	1	8	17	2	*100*
SPRING CREEK NO. 2	6	4	0	55	0	1	0	1	2	8	20	2	*100*
VISTA	7	3	0	74	1	1	0	0	0	5	7	2	*100*
WILLOW BAY	3	4	0	54	0	0	2	1	0	0	24	12	*100*
WILLOW CREEK NO. 1	4	4	0	57	0	2	0	2	0	6	23	1	*100*
WILLOW CREEK NO. 2	5	5	0	55	0	1	0	2	1	7	22	1	*100*
WILLOW CREEK NO. 3	4	5	0	55	0	1	0	2	1	8	22	1	*100*

APPENDIX C: BATHYMETRIC MAPS

Black and white bathymetric maps for each of 17 flowages were created for the flowages identified below and are found on the following pages.

- Birch Creek Flowage No. 1
- Birch Creek Flowage No. 2
- Beaver Dam Flowage
- Horseshoe Flowage
- Hay Meadow Flowage No. 1
- Hay Meadow Flowage No. 2
- Hay Meadow Flowage No. 3
- Hay Meadow Flowage No. 4
- O'Neil Creek Flowage No. 1
- O'Neil Creek Flowage No. 2
- Spring Creek Flowage No. 1
- Spring Creek Flowage No. 2
- Vista Flowage
- Willow Bay Flowage
- Willow Creek Flowage No. 1
- Willow Creek Flowage No. 2
- Willow Creek Flowage No. 3

Birch Creek Flowage No. 1 Color

Birch Creek Flowage No. 1 B & W

Birch Creek Flowage No. 2 Color

Birch Creek Flowage No. 2 B & W

Beaver Dam Flowage Color

Beaver Dam Flowage B & W

Horseshoe Flowage Color

Horseshoe Flowage B & W

Hay Meadow Flowage No. 1 Color

Hay Meadow Flowage No. 1 B & W

Hay Meadow Flowage No. 2 Color

Hay Meadow Flowage No. 2 B & W

Hay Meadow Flowage No. 3 Color

Hay Meadow Flowage No. 3 B & W

Hay Meadow Flowage No. 4 Color

Hay Meadow Flowage No. 4 B & W

O’Neil Creek Flowage No. 1 Color

O’Neil Creek Flowage No. 1 B & W

O’Neil Creek Flowage No. 2 Color

O’Neil Creek Flowage No. 2 B & W

Spring Creek Flowage No. 1 Color

Spring Creek Flowage No. 1 B & W

Spring Creek Flowage No. 2 Color

Spring Creek Flowage No. 2 B & W

Vista Flowage Color

Vista Flowage B & W

Willow Bay Flowage Color

Willow Bay Flowage B & W

Willow Creek Flowage No. 1 Color

Willow Creek Flowage No. 1 B & W

Willow Creek Flowage No. 2 Color

Willow Creek Flowage No. 2 B & W

Willow Creek Flowage No. 3 Color

Willow Creek Flowage No. 3 B & W

APPENDIX D: VERTICAL PROFILE AND EXPOSURE MAPS

Exposure maps and vertical profiles of these flowages are found on the pages that follow.

- Birch Creek Flowage No. 1
- Horseshoe Flowage
- Hay Meadow Flowage No. 1
- Hay Meadow Flowage No. 2
- Hay Meadow Flowage No. 4
- O'Neil Creek Flowage No. 1
- O'Neil Creek Flowage No. 2
- Spring Creek Flowage No. 1
- Spring Creek Flowage No. 2
- Vista Flowage
- Willow Creek Flowage No. 1
- Willow Creek Flowage No. 2
- Willow Creek Flowage No. 3

Birch Creek Flowage No. 1

Horseshoe Flowage

Hay Meadow Flowage No. 1

Hay Meadow Flowage No. 2

Hay Meadow Flowage No. 4

O’Neil Creek Flowage No. 1

O’Neil Creek Flowage No. 2

Spring Creek Flowage No. 1

Spring Creek Flowage No. 2

Vista Flowage

Willow Creek Flowage No. 1

Willow Creek Flowage No. 2

Willow Creek Flowage No. 3

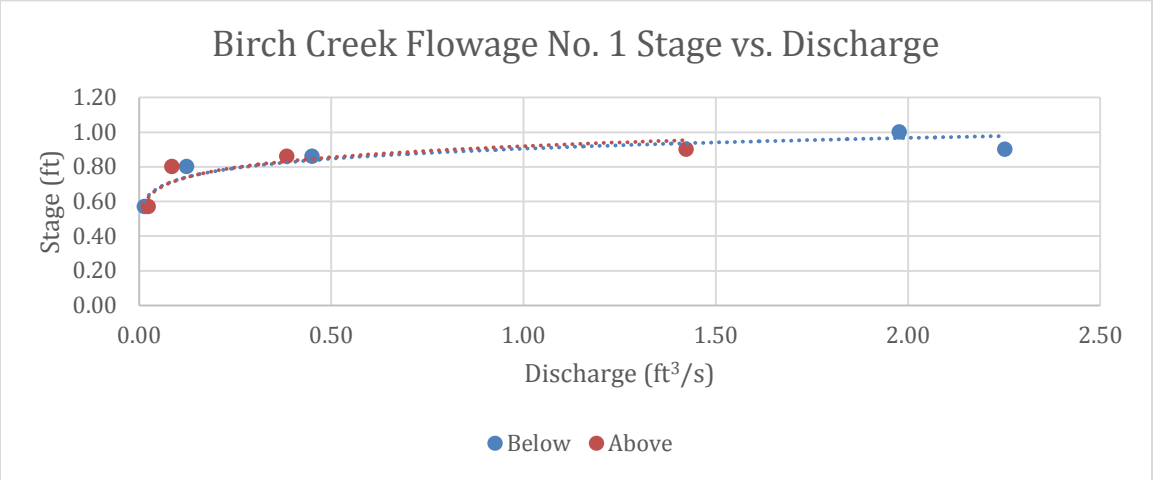
APPENDIX E: VEGETATION RAPID ASSESSMENT

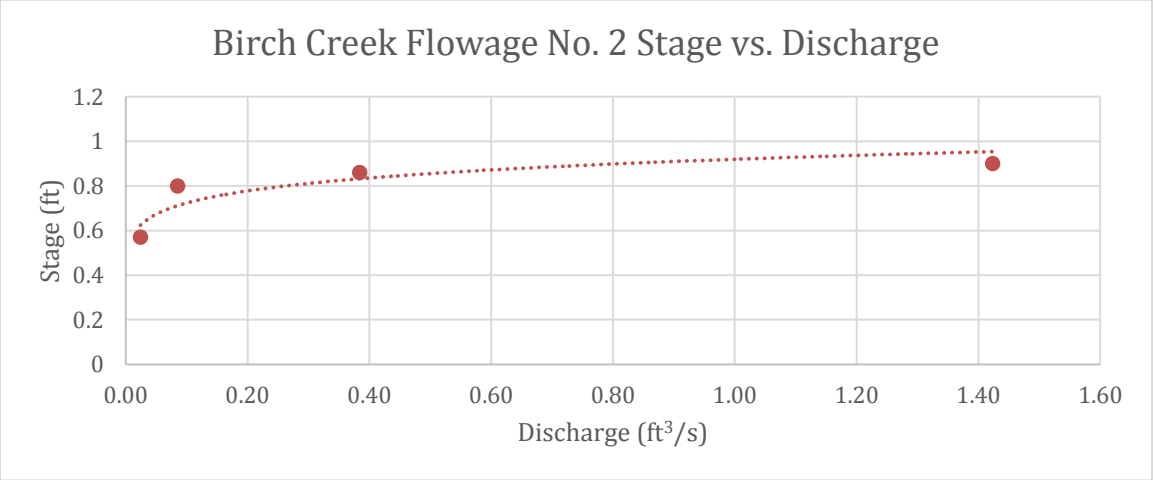
Results of Rapid Macrophyte Inventory and Assessment

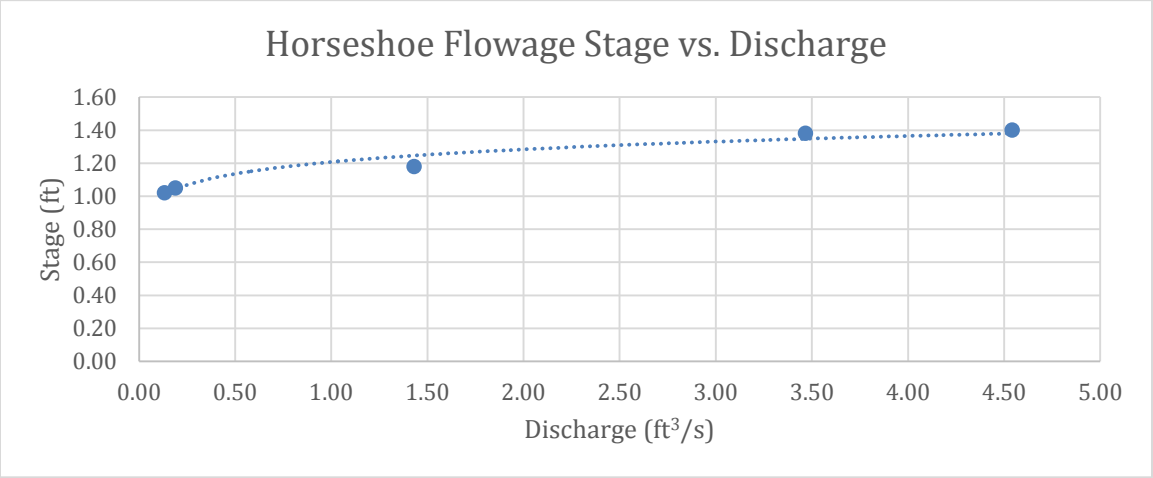
Species	O'Neil Creek No. 2	Spring Creek No. 2	Hay Meadow No. 2	Birch Creek No. 2
Bristly sedge (*Carex comosa*)	X	X	X	
Broad-leaf cattail (*Typha latifolia*)		X	X	X
Bulb-bearing hemlock (*Cicuta bulbifera*)		X		
Common arrowhead (*Sagittaria latifolia*)	X	X	X	X
Common bladderwort (*Utricularia vulgaris*)		X	X	X
Common bur-reed (*Sparganium eurycarpum*)	X		X	
Common watermeal *(Wolffia columbiana*)		X		
Coontail (*Ceratophyllum demersum*)			X	X
Creeping bladderwort (*Utricularia gibba*)			X	
Elodea (*Elodea Canadensis*)	X		X	
Flat-leafed bladderwort (*Utricularia intermedia*)			X	
Flat-stemmed pondweed (*Potamogeton zosteriformis*)	X	X		
Floating-leaf pondweed (*Potamogeton natans*)	X			
Great duckweed (*Spirodela polyrhiza*)	X	X	X	
Hard-stem bulrush (*Scirpus acutus*)	X	X	X	X
Large-leaf pondweed (*Potamogenton amplifolius*)				
Needle spikerush (*Eleocharis acicularis*)	X	X	X	X
Nodding bur-marigold (*Bidens cernuus* L.)	X	X	X	X
Northern blueflag (*Iris versicolor*)			X	
Reed carnary grass (*Phalaris arundinacea*)	X	X	X	X
Rice cut-grass (*Leersia oryzoides*)	X	X	X	X

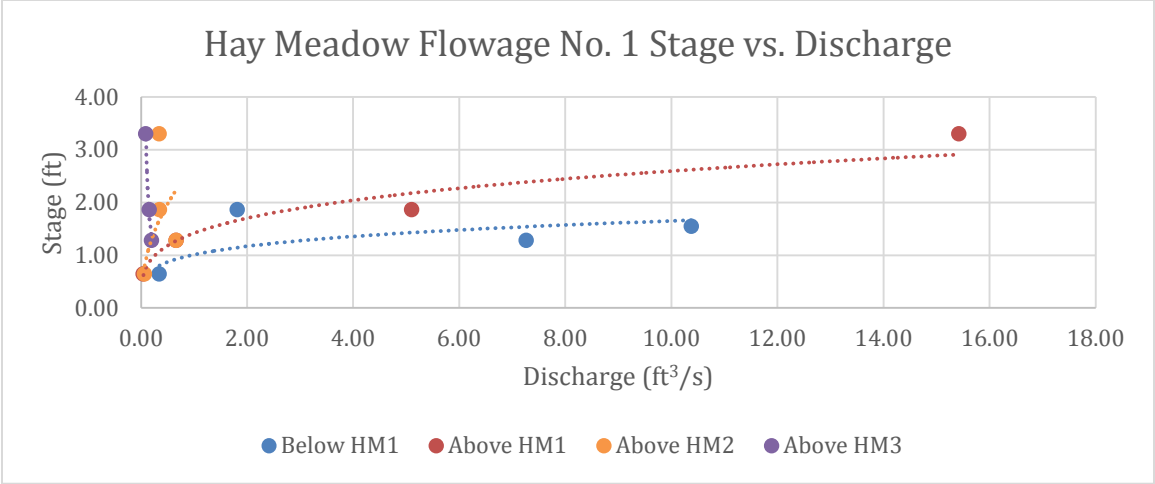
Species	O'Neil Creek No. 2	Spring Creek No. 2	Hay Meadow No. 2	Birch Creek No. 2
Sago pondweed (*Potamogeton pectinatus*)			X	X
Sedges (*Carex* spp.)	X	X	X	X
Short-stemmed bur-reed (*Sparganium chlorocarpum*)		X		X
Small duckweed *(Lemna minor*)	X	X	X	
Small pondweed (*Potamogeton pusillus*)		X	X	X
Soft rush, common rush, mat rush (*Juncus effusus*)	X	X	X	
Softstem bulrush (*Scirpus validus*)	X	X	X	
Spatterdock (*Nuphar variegata*)	X	X	X	X
Spineless hornwort (*Ceratophyllum echinatum*)	X	X	X	
Swamp loosestrife, water willow (*Decodon verticillatus*)	X		X	
Three-way sedge (*Dulichium arundinaceum*)	X		X	
Water smartweed (*Polygonum amphibium*)		X		
Watershield (*Brasenia schreberi*)	X	X	X	X
White water lily (*Nymphaea odorata*)	X	X	X	X
Wild calla (*Calla palustris*)				X
Northern wild rice (*Zizania palustris*)	X			

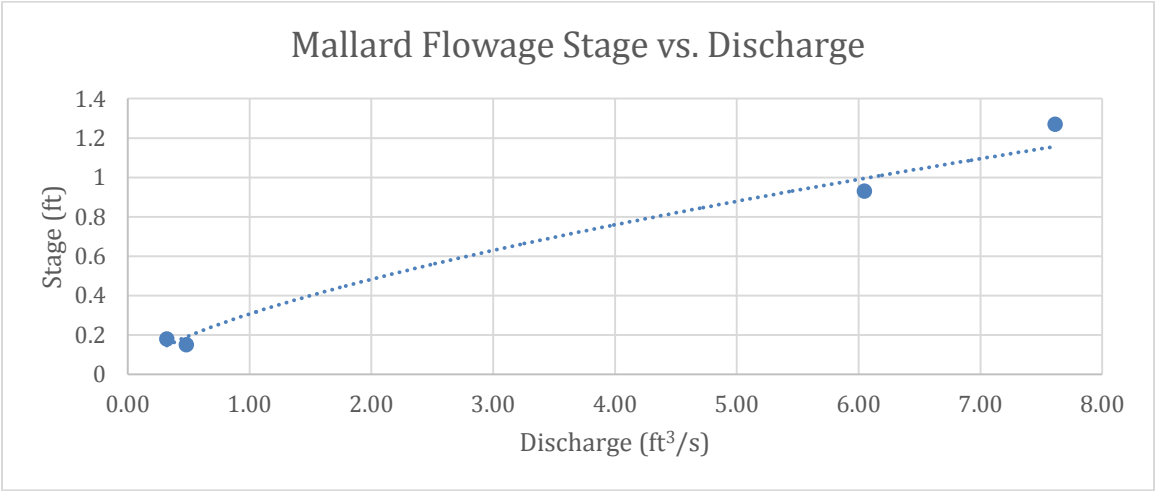
APPENDIX F: RESULTS OF HYDROLOGY MONITORING

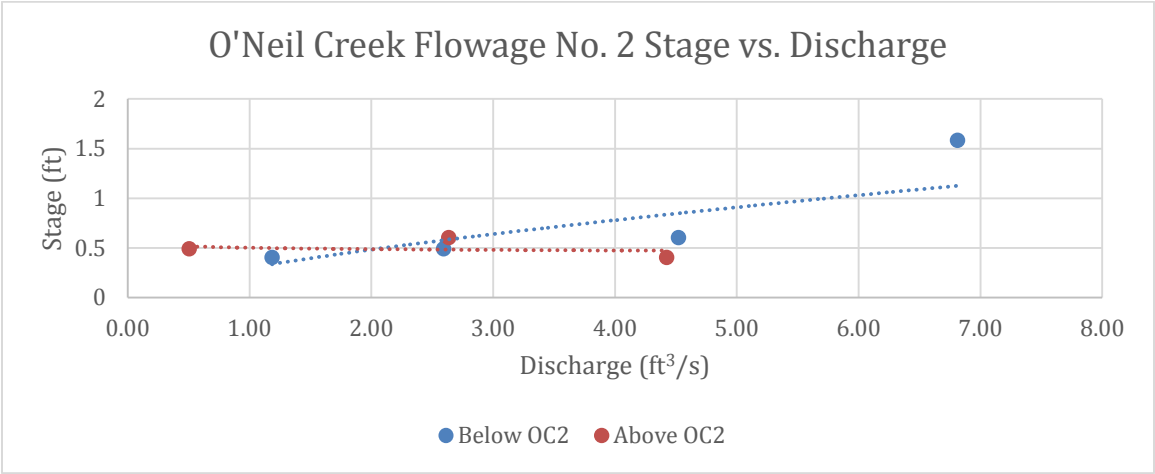


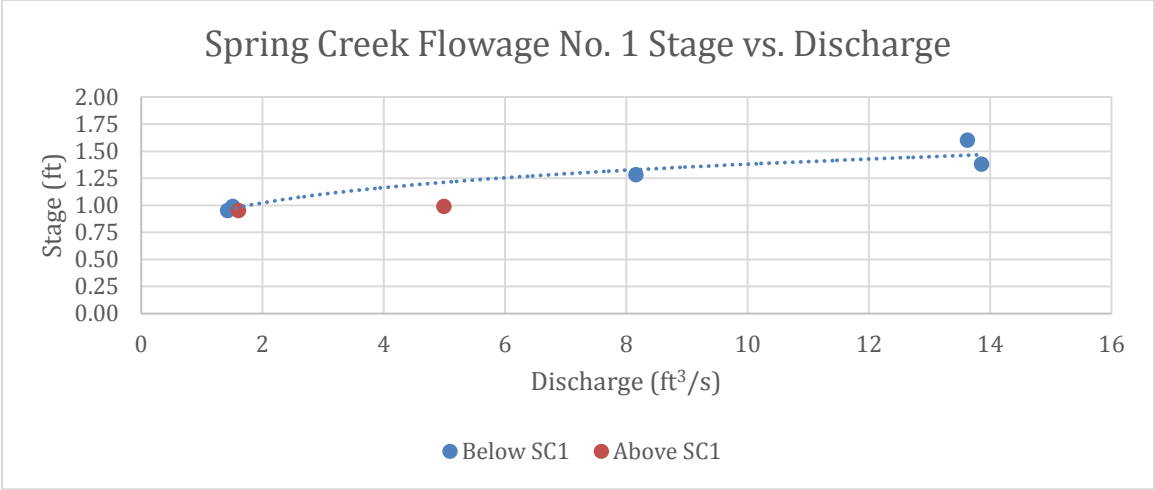


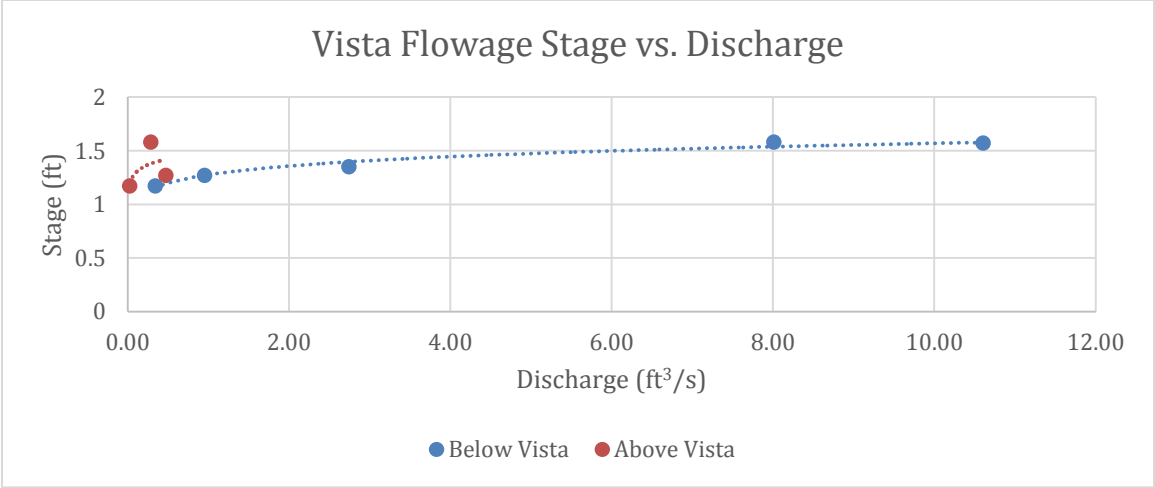


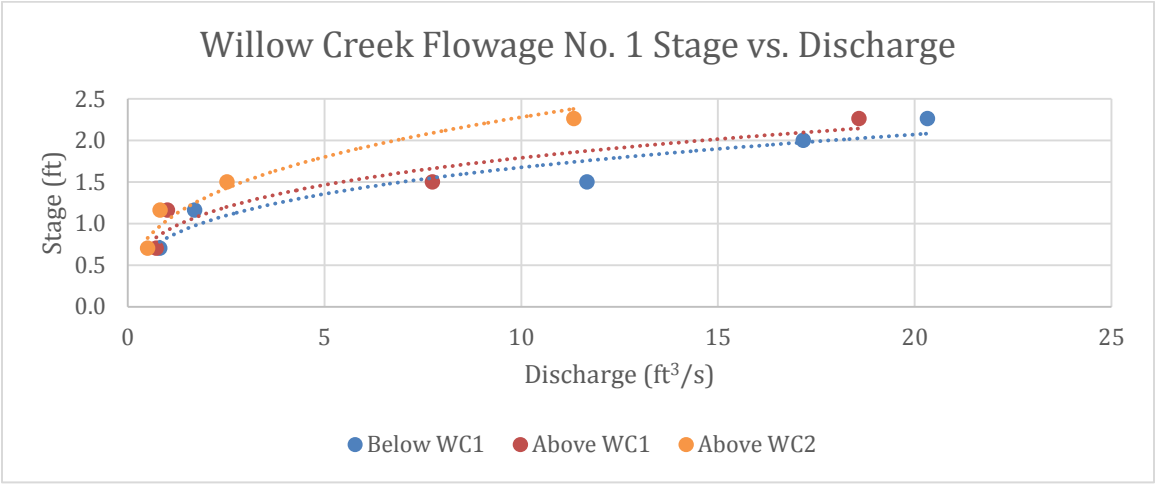

Hay Meadow Flowage No. 1 Stage vs. Discharge
Stage (ft)
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
Discharge (ft³/s)
Below HM1
Above HM1
Above HM2
Above HM3

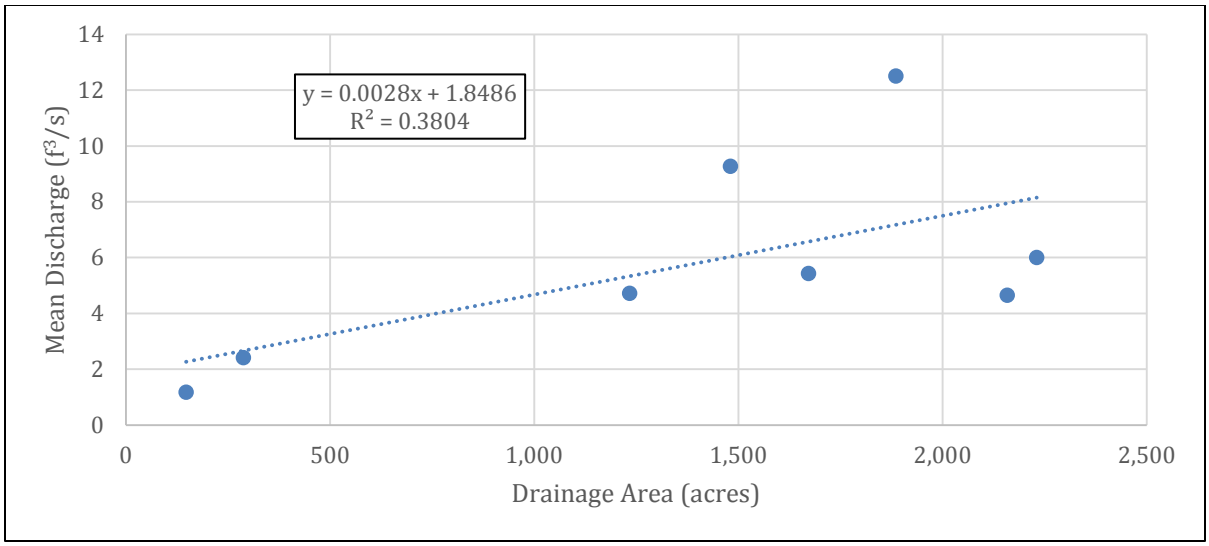

Mallard Flowage Stage vs. Discharge
Stage (ft)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Discharge (ft³/s)


O'Neil Creek Flowage No. 2 Stage vs. Discharge
Stage (ft)
2
1.5
1
0.5
0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
Discharge (ft³/s)
Below OC2
Above OC2


Spring Creek Flowage No. 1 Stage vs. Discharge
Stage (ft)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0
2
4
6
8
10
12
14
16
Discharge (ft³/s)
Below SC1
Above SC1


Vista Flowage Stage vs. Discharge
Stage (ft)
2
1.5
1
0.5
0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Discharge (ft³/s)
Below Vista
Above Vista


Willow Creek Flowage No. 1 Stage vs. Discharge
Stage (ft)
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
Discharge (ft³/s)
Below WC1
Above WC1
Above WC2


y = 0.0028x + 1.8486
R² = 0.3804
Mean Discharge (f³/s)
Drainage Area (acres)
0
2
4
6
8
10
12
14
0
500
1,000
1,500
2,000
2,500

APPENDIX G: BENTHIC SEDIMENT ANALYSIS

Table 1. Key to Table 2.

Common Name	Scientific Name	Code
White water lily	*Nymphaea odorata*	NYOD
Bulrush	*Scirpus spp.*	SCIRP
Common bladderwort	*Utricularia macrorhiza*	UTMA
Common duckweed	*Lemna minor*	LEMI3
Coontail	*Ceratophyllum demersum*	CEDE4
Elodea	*Elodea spp.*	ELODE
Flat-stem pondweed	*Potamogeton zosteriformis*	POGO
Northern wild rice	*Zizania palustris*	ZIPA3
Sago pondweed	*Stuckenia pectinata*	STPE15
Sedge	*Carex spp.*	CAREX
Spatterdock	*Nuphar variegata*	NULUV
Spineless Hornwort	*Ceratophyllum echinatum*	CEEC2
Water smartweed	*Polygonum amphibium*	POAMS
Watermeal	*Wolfia spp.*	WOLFF
Watershield	*Brasenia schreberi*	BRSC

Table 2. Wildlife flowages sediment samples.

Waypoint ID	Flowage	Date	Lat	Long	Soil Map Unit	Water Depth (ft)	Bottom Type	Horizon 1 Texture	Horizon 1 Depth (in)
WP063	BC1	8/8/2014	45.241617	-91.223917	AlD	1.5	mud	MPM	0-3
WP064	BC1	8/8/2014	45.241933	-91.224400	AlD	2.0	mud	MPM	0-3
WP065	BC1	8/8/2014	45.241983	-91.223833	W	3.0	mud	SPM	0-2
WP066	BC1	8/8/2014	45.242050	-91.224017	W	4.5	mud	MPM	0-5
WP067	H	8/8/2014	45.214983	-91.221167	AlD	4.0	mud	HPM	0-2
WP068	H	8/8/2014	45.215617	-91.221417	W	4.0	mud	MPM	0-3
WP069	H	8/8/2014	45.216433	-91.222383	W	1.5	sand	MPM	0-3
WP070	H	8/8/2014	45.216400	-91.222517	W	5.0	mud	MPM	0-2
WP071	H	8/8/2014	45.216067	-91.224483	W	1.6	mud	MPM	0-4
WP072	H	8/8/2014	45.215617	-91.224767	AlD	2.0	mud	MPM	0-4
WP073	H	8/8/2014	45.216117	-91.222700	AlD	2.5	mud	MPM	0-3
WP013	HM1	7/31/2014	45.172917	-91.325733	W	4.0	mud	MPM	0-18
WP014	HM1	7/31/2014	45.173950	-91.322783	W	27.0	mud	HPM	0-5
WP015	HM1	7/31/2014	45.174633	-91.321750	W	3.5	mud	SPM	0-5
WP016	HM1	7/31/2014	45.174317	-91.324367	W	2.0	mud	SPM	0-12
WP053	HM2	8/7/2014	45.180000	-91.320683	W	4.0	mud	MPM	0-60
WP054	HM2	8/7/2014	45.180050	-91.320133	W	3.5	mud	MPM	0-60
WP055	HM2	8/7/2014	45.179133	-91.321100	W	4.0	sand	GR MPM	0-4

Waypoint ID	Flowage	Date	Lat	Long	Soil Map Unit	Water Depth (ft)	Bottom Type	Horizon 1 Texture	Horizon 1 Depth (in)
WP056	HM2	8/7/2014	45.179150	-91.321550	W	2.0	mud	HPM	1-3
WP057	HM2	8/7/2014	45.179150	-91.323050	W	4.0	mud	MPM	0-12
WP058	HM2	8/7/2014	45.180083	-91.323600	W	3.0	mud	MPM	0-60
WP059	HM2	8/7/2014	45.180067	-91.323600	W	0.2	sand	scl	0-10
WP060	HM2	8/7/2014	45.179117	-91.324183	W	3.5	mud	c	0-10
WP061	HM2	8/7/2014	45.178900	-91.324083	W	4.5	mud	MPM	0-6
WP062	HM2	8/7/2014	45.178667	-91.324100	W	2.0	sand	ls	0-10
WP008	HM4	7/31/2014	45.187600	-91.321767	AlD	4.5	mud	MPM	0-12
WP009	HM4	7/31/2014	45.186750	-91.321933	W	6.0	mud	MPM	0-60
WP010	HM4	7/31/2014	45.186717	-91.322550	W	12.0	mud	HMP	0-60
WP011	HM4	7/31/2014	45.186733	-91.322500	W	20.0	mud	MPM	0-5
WP012	HM4	7/31/2014	45.186017	-91.323283	W	3.8	mud	SPM	0-30
WP038	OC1	8/7/2014	45.203067	-91.354300	Lp	2.5	mud	SPM	0-12
WP039	OC1	8/7/2014	45.203550	-91.355750	Lp	3.0	mud	MPM	0-60
WP040	OC1	8/7/2014	45.202683	-91.356367	W	4.0	mud	SPM	0-24
WP041	OC1	8/7/2014	45.201633	-91.355983	W	7.0	mud	MPM	0-5
WP043	OC1	8/7/2014	45.200750	-91.358433	W	5.0	mud	MPM	0-8
WP044	OC1	8/7/2014	45.199983	-91.356000	W	3.0	sand	s	0-8
WP045	OC1	8/7/2014	45.200017	-91.355750	W	4.0	sand	s	0-8
WP046	OC2	8/7/2014	45.192433	-91.359350	W	2.5	mud	SPM	0-3
WP047	OC2	8/7/2014	45.193383	-91.359367	W	4.0	mud	MPM	0-2
WP048	OC2	8/7/2014	45.193433	-91.359217	W	2.0	mud	SPM	0-6
WP049	OC2	8/7/2014	45.192800	-91.359633	W	3.0	mud	MPM	0-12
WP050	OC2	8/7/2014	45.192400	-91.360117	W	2.0	mud	MPM	0-12
WP051	OC2	8/7/2014	45.192150	-91.359917	Lp	4.5	mud	MPM	0-2
WP052	OC2	8/7/2014	45.192983	-91.358900	W	4.0	mud	HPM	0-5
1	SC1	8/8/2014	45.209671	-91.247431	AlD	0.5	mud	MPM	0-3
2	SC1	8/8/2014	45.209279	-91.247593	W	0.5	mud	MPM	0-12
3	SC1	8/8/2014	45.210565	-91.249258	AlD	0.3	sand	s	0-X
WP074	SC2	8/8/2014	45.211917	-91.248133	W	4.0	mud	MPM	0-12
WP075	SC2	8/8/2014	45.212733	-91.246950	Lp	2.0	mud	MPM	0-48
WP076	SC2	8/8/2014	45.211567	-91.249033	Lp	3.5	mud	MPM	0-48
WP077	SC2	8/8/2014	45.211250	-91.249550	W	3.0	mud	MPM	0-48
WP078	SC2	8/8/2014	45.210833	-91.249167	AlD	3.5	mud	MPM	0-4
WP003	V	7/31/2014	45.216717	-91.307683	AlD	2.0	mud	MK s	0-5
WP004	V	7/31/2014	45.216850	-91.306883	W	4.0	mud	MPM	0-6
WP005	V	7/31/2014	45.216117	-91.306467	W	7.0	mud	MK fs	0-5
WP006	V	7/31/2014	45.216350	-91.302800	W	6.0	mud	HPM	0-6

Waypoint ID	Flowage	Date	Lat	Long	Soil Map Unit	Water Depth (ft)	Bottom Type	Horizon 1 Texture	Horizon 1 Depth (in)
WP007	V	7/31/2014	45.215117	-91.306167	W	4.0	mud	MPM	
WP017	WC1	8/6/2014	45.251800	-91.290083	W	3.0	mud	MPM	0-18
WP018	WC1	8/6/2014	45.251883	-91.291133	W	3.0	mud	MPM	0-6
WP019	WC1	8/6/2014	45.251300	-91.290200	W	2.0	mud	sc	1-2
WP020	WC1	8/6/2014	45.252817	-91.288717	W	3.5	mud	SPM	0-2
WP022	WC1	8/6/2014	45.253950	-91.287767	W	4.5	mud	HPM	0-8
WP023	WC1	8/6/2014	45.254717	-91.289800	W	2.5	mud	CB sil	0-2
WP024	WC1	8/6/2014	45.254050	-91.290167	W	0.0	mud	SPM	0-18
WP026	WC2	8/6/2014	45.249400	-91.272183	W	2.0	mud	MK sil	0-12
WP027	WC2	8/6/2014	45.251117	-91.274133	W	3.5	mud	MPM	0-10
WP028	WC2	8/6/2014	45.251050	-91.274183	W	2.5	mud	MPM	0-12
WP029	WC2	8/6/2014	45.250033	-91.274200	W	5.5	mud	MPM	0-24
WP030	WC2	8/6/2014	45.249733	-91.276217	W	4.0	mud	MPM	0-18
WP031	WC2	8/6/2014	45.250967	-91.276233	W	2.5	sand	s	0-12
WP032	WC3	8/6/2014	45.244967	-91.270517	W	3.5	mud	SPM	0-48
WP033	WC3	8/6/2014	45.245900	-91.270517	W	1.5	sand	s	1-6
WP034	WC3	8/6/2014	45.247083	-91.268800	W	3.0	mud	SPM	0-48
WP035	WC3	8/6/2014	45.247183	-91.270217	W	4.5	mud	SPM	0-48
WP036	WC3	8/6/2014	45.247583	-91.271300	W	4.0	mud	MPM	0-48
WP037	WC3	8/6/2014	45.247817	-91.271000	W	3.0	mud	MPM	0-3

Waypoint ID	Flowage	Horizon 1 Coarse Frags (%)	Horizon 2 Texture	Horizon 2 Depth (in)	Horizon 2 Coarse Frags (%)	Horizon 3 Texture	Horizon 3 Depth (in)	Horizon 3 Coarse Frags (%)
WP063	BC1	0	sil	3-10	5		10-X	0
WP064	BC1	0	l	3-5	0	s	5-8	0
WP065	BC1	0	GR ls	2-7	20	sc	7-12	0
WP066	BC1	0	sil	5-10	0			0
WP067	H	0	si	2-12	0			0
WP068	H	0	si	3-12	0	U	12-X	0
WP069	H	0	ls	3-10	5			0
WP070	H	0	sc	2-10	0			0
WP071	H	0	sil	4-10	0			0
WP072	H	0	sil	4-12	0			0
WP073	H	0	scl	3-6	10	sc	6-12	10
WP013	HM1	0			0			0
WP014	HM1	0			0			0
WP015	HM1	0			0			0

Waypoint ID	Flowage	Horizon 1 Coarse Frags (%)	Horizon 2 Texture	Horizon 2 Depth (in)	Horizon 2 Coarse Frags (%)	Horizon 3 Texture	Horizon 3 Depth (in)	Horizon 3 Coarse Frags (%)
WP016	HM1	0	sc	12-15	0			0
WP053	HM2	0			0			0
WP054	HM2	0			0			0
WP055	HM2	30	ls	4-10	0	s	10-15	0
WP056	HM2	2	ls	3-24	0	U	24-X	0
WP057	HM2	0	sl	12-20	0			0
WP058	HM2	0			0			0
WP059	HM2	2			0			0
WP060	HM2	0			0			0
WP061	HM2	0	sl	6-18	0	U	18-X	0
WP062	HM2	0			0			0
WP008	HM4	0	sc	12-15	0			0
WP009	HM4	0			0			0
WP010	HM4	0			0			0
WP011	HM4	0			0			0
WP012	HM4	0			0			0
WP038	OC1	0	ls	12-16	0	s	16-22	0
WP039	OC1	0			0			0
WP040	OC1	0	U	24-26	0		26-48	0
WP041	OC1	0			0			0
WP043	OC1	0			0			0
WP044	OC1	30			0			0
WP045	OC1	5			0			0
WP046	OC2	0	sic	3-7	0	s	7-9	5
WP047	OC2	0	sic	2-8	30			0
WP048	OC2	0	sc	6-14	5	c	14-X	0
WP049	OC2	0	MKs	12-24	0	U	24-X	0
WP050	OC2	0			0			0
WP051	OC2	0	s	2-10	15			0
WP052	OC2	0	sil	5-10	0			0
1	SC1	0	cos	3-6	10	sl	6-10	0
2	SC1	0	U	12-X	0			0
3	SC1	15			0			0
WP074	SC2	0			0			0
WP075	SC2	0	U	48-X	0			0
WP076	SC2	0			0			0
WP077	SC2	0	U	48-X	0			0
WP078	SC2	5	sl	4-9	30	ls	9-12	2

Waypoint ID	Flowage	Horizon 1 Coarse Frags (%)	Horizon 2 Texture	Horizon 2 Depth (in)	Horizon 2 Coarse Frags (%)	Horizon 3 Texture	Horizon 3 Depth (in)	Horizon 3 Coarse Frags (%)
WP003	V	5			0			0
WP004	V	0			0			0
WP005	V	0			0			0
WP006	V	0			0			0
WP007	V	0			0			0
WP017	WC1	0	sc	18-X	0			0
WP018	WC1	0	silc	6-24	0	U	24-X	0
WP019	WC1	0	s	2-8	5	s	8-10	0
WP020	WC1	0	sc	2-10	0			0
WP022	WC1	0	s	8-12	0	sc	12-20	0
WP023	WC1	0	sc	2-8	0			0
WP024	WC1	0	s	18-X	0			0
WP026	WC2	0	s	12-X	0			0
WP027	WC2	0			0			0
WP028	WC2	0	MK sil	12-16	0			0
WP029	WC2	0	sil	24-X	0			0
WP030	WC2	0	c	18-22	0			0
WP031	WC2	50			0			0
WP032	WC3	0			0			0
WP033	WC3	0	sc	6-10	2			0
WP034	WC3	0			0			0
WP035	WC3	0			0			0
WP036	WC3	0			0			0
WP037	WC3	60	GR sc	3-10	40			0

Waypoint ID	Flowage	Sub. Aq. Veg	Depth to Mineral Soil (ft)
WP063	BC1	NYOD, CEDE4	0.2
WP064	BC1	NYOD, CEDE4, LEMI3, STPE15	0.2
WP065	BC1	NYOD, LEMI3, CEDE4	0.2
WP066	BC1	None	0
WP067	H	POAMS, BRSC, POGO	0.1
WP068	H	NULUV, BRSC	0.2
WP069	H	NYOD, CEDE4, BRSC	0.2
WP070	H	None	0.1
WP071	H	BRSC, CEDE4, LEMI3, NYOD	0.2
WP072	H	CEDE4, BRSC, LEMI3	0.2

Waypoint ID	Flowage	Sub. Aq. Veg	Depth to Mineral Soil (ft)
WP073	H	NYOD, BRSC	0.1
WP013	HM1	CEDE4	1.5
WP014	HM1	None	U
WP015	HM1		>4.0
WP016	HM1	LEMI3, UTMA, NYOD	1
WP053	HM2	UTMA, CEEC2	>5.0
WP054	HM2	NYOD, BRSC	>5.0
WP055	HM2	NYOD, CEEC2	0.2
WP056	HM2	BRSC, CEEC2, NYOD, CAREX	0.1
WP057	HM2		1
WP058	HM2	STPE15, CEEC2, NYOD	>5.0
WP059	HM2	NYOD	0.1
WP060	HM2	NYOD, CEEC2	0.1
WP061	HM2	CEEC2	0.5
WP062	HM2	CEEC2	0.1
WP008	HM4	CEDE4, NYOD	1
WP009	HM4		>5.0
WP010	HM4		>5.0
WP011	HM4		U
WP012	HM4	NYOD	2.5
WP038	OC1	NYOD, CEDE4, LEMI3, STPE15	1
WP039	OC1	POGO, CEDE4	>5.0
WP040	OC1	POGO, CEDE4, NYOD	4
WP041	OC1		U
WP043	OC1	NYOD, UTMA, POGO	>4.0
WP044	OC1	CEEC2, NULUV, POGO	0.1
WP045	OC1	CEEC2, NULUV, POGO	0.1
WP046	OC2	ELODE, NYOD	0.2
WP047	OC2	POGO, ZIPA3	0.1
WP048	OC2	ELODE, ZIPA3	0.5
WP049	OC2	ELODE, NYOD	1
WP050	OC2	ELODE, NYOD, POGO, ZIPA3	>6.0
WP051	OC2	ELODE	0.2
WP052	OC2	ELODE, POGO	0.4
1	SC1	LEMI3, POGO, ELODE, NYOD	0.2
2	SC1	NYOD, LEMI3, POGO	1
3	SC1		0
WP074	SC2	POGO	>4.0

Waypoint ID	Flowage	Sub. Aq. Veg	Depth to Mineral Soil (ft)
WP075	SC2	LEMI3, POGO, CEDE4, POAMS	4
WP076	SC2	POGO	>4.0
WP077	SC2	LEMI3, POGO, CEDE4, POAMS	4
WP078	SC2	UTMA, LEMI3	0.3
WP003	V	NYOD, CEDE4	0
WP004	V	NYOD, CEDE4	U
WP005	V	None	U
WP006	V	LEMI3, NYOD, CEDE4, POGO, NULUV	U
WP007	V		U
WP017	WC1	CEDE4, WOLFF, LEMI3	1.5
WP018	WC1	CEDE4, WOLFF, LEMI3	0.5
WP019	WC1	POAMS, WOLFF, LEMI3	0.1
WP020	WC1	CEDE4	0.1
WP022	WC1	CEDE4, LEMI3	0.7
WP023	WC1	POAMS, LEMI3, WOLFF	0
WP024	WC1	POAMS, LEMI3, WOLFF	1.5
WP026	WC2	CEDE4, POGO	0
WP027	WC2	CEDE4, POGO	>5.0
WP028	WC2	CEDE4, POGO	1
WP029	WC2	CEDE4	2
WP030	WC2	CEDE4, POGO	1.5
WP031	WC2	POGO	0
WP032	WC3	CEDE4, POGO	>4.0
WP033	WC3	NYOD	0.5
WP034	WC3	CEDE4, NYOD, BRSC	>4.0
WP035	WC3	CEDE4	>4.0
WP036	WC3	CEDE4	>4.0
WP037	WC3	CEDE4, POGO	0.3

APPENDIX H: BEAVER CREEK FLOWAGE INVENTORY REPORT

<<To be added after its completion at the end of March 2015>>