

# Final Prospectus

## Shioc River Wetland Mitigation Bank Town of Bovina | Outagamie County, Wisconsin

Prepared for  
**J-PACC, INC.**  
OUTAGAMIE COUNTY, WISCONSIN

DECEMBER 14, 2023



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### I. INTRODUCTION & LOCATION

The Shioc River Wetland Mitigation Bank (Site) (224 acres) is in the Town of Bovina, Outagamie County, Wisconsin. The property is located in the Northwest Quarter (1/4) of Section Fifteen (15), Southern Half (1/2) of Section Ten (10) and Southwest Quarter (1/4) of Section Eleven (11), Township Twenty-Three (23) North, Range Seventeen (17) East. The Site has an access driveway off of Highway 54. The location of the Site is shown on Figure 1.

The Site is located in the Mink Creek – Shioc River Subwatershed (12-Digit HUC - 040302020807) - of the Shioc River Watershed (10-Digit HUC - 0403020208) which is part of the Wolf River Subbasin (8-Digit HUC - 04030202). The Site is within the Fox Bank Service Area (BSA) for wetland mitigation banking.

The Prospectus was completed in accordance with the guidelines contained in Appendix C of the "Guidelines for Wetland Compensatory Mitigation in Wisconsin, Version 1, August 2013" and the U.S. Army Corps of Engineers (USACE) checklist "Requirements for Submitting a Complete Mitigation Bank Prospectus to the USACE, St. Paul District."

### II. BANK SPONSOR & TEAM

McMahon Associates, Inc. (McMahon) has been retained to design and manage the wetland bank. Stuart Boerst is the Project Manager and Ecologist for the Site. Mr. Boerst has over 31 years of environmental consulting experience including designing and managing wetland banks, wetland restoration projects, prairies, prairie oak savannas, marshes, forests and other ecosystems. Mr. Boerst's resume is presented in Appendix A.

Nick Vande Hey is the lead Water Resources Engineer for the project. Mr. Vande Hey has 25 years of experience in the planning, design, and construction administration of stormwater management treatment facilities. He manages the Stormwater Group, which is responsible for all phases of stormwater management including planning cost effective analysis, detailed design, permitting, construction administration, and preparation of municipal stormwater management plans. Mr. Vande Hey's resume is presented in Appendix A.

J-PaCC, Inc. is the Bank Sponsor and property owner. Jim Vorland, part owner, will be the Sponsor Representative. The parcel ownership for the property and adjacent properties are shown on Figure 2. Mr. Vorland has decades of experience managing hundreds of acres of land used for forestry and agriculture. Jim Vorland's extensive land stewardship, philanthropy, and youth education is detailed on his resume presented in Appendix B. A list of adjacent property owners is provided in Appendix C. Parcel ownership is shown on Figure 2.

The contact information for the Sponsor and Consultant is provided below:

**PROJECT SPONSOR**

J-PACC, Inc.  
Attn: Jim Vorland  
N3255 Steeple Drive | Appleton, WI 54913  
Ph. 920.841.2460  
Email: [pvorland@mail.com](mailto:pvorland@mail.com)

**PROJECT CONSULTANT**

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### **III. PURPOSE, OBJECTIVES & NEED**

#### **A. Purpose**

The purpose of the Shioc River Wetland Mitigation Bank is to serve the public by supplying wetland compensatory mitigation credits within the Fox BSA within the Lake Michigan Basin. These credits are preferable over permittee-responsible wetland mitigation sites and the Wisconsin Department of Natural Resources (DNR) in lieu wetland mitigation credits, partly since there is not any temporal wetland loss.

#### **B. Objectives**

The Bank is proposed to be 223.39 acres, that will generate an estimated 144.86 wetland acre credits. The objectives are to transform 164.43 acres of agricultural fields back to historical pre-settlement or suitable wetland communities resulting in substantial wetland and ecological functional lift. A total of 11.2 acres of berm will be an upland buffer. A 5.34-acre mesic prairie and 6.46 acre mesic forest will be buffers. A total of 46.68 acres will be wetland buffer on the north side of the northern berm. The proposed wetland communities are listed below. The communities and boundaries will be refined in the future Compensation Site Plan (CSP) based on additional hydrological data.

There will be scattered uplands surrounded by wetland that will provide wildlife habitat for upland and wetland dependent species.

The uplands (approximately 23 acres) will complement the Bank Site with an array of ecological functional lifts in addition to protecting the wetlands and waterways from nutrient runoff, particularly Total Phosphorus (TP), sedimentation, Total Suspended Solids (TSS) in the waterways, pesticides, invasive plant species and other adverse effects.

The primary proposed plant communities that will be restored to pre-settlement historic or suitable wetland conditions are specified below.

- Restore a diverse fresh (wet) meadow (approximately 68 acres) in mineral soils.
- Restore a shallow emergent marsh and deep marsh (approximately 19 acres) in the lowest areas of mineral soil.
- Restore a hardwood/coniferous swamp (approximately 19 acres) in mineral soils.
- Restore shrub-carr (approximately 44 acres) in mineral soils.
- Restore a floodplain forest (approximately 2.5 acres) in mineral soils.
- Restore a mesic forest (approximately 6 acres) as an upland buffer.
- Restore a mesic prairie (approximately 5 acres) in mineral soils.
- Restore existing forested wetland buffer (approximately 47 acres) in mineral soils.

The following major activities will occur to accomplish restoring the six plant communities.

- Disabling the main ditches (8,940 feet) with ditch plugs located along the entire west and north sides of the Bank Site. Open water areas will provide habitat for aquatic flora and fauna.
- Excavate some areas of the shallow and deep marsh to improve the hydroperiod and restore deep marsh habitat.
- Install culverts through the northern berm in three areas to hydrologically reconnect the site to the Shioc River flood events.
- Grade some areas lower to increase connectivity during precipitation and Shioc River flooding events.
- Substantially reduce invasive species in the herbaceous layer, especially reed canary grass in the northeast corner of the site, floodplain forest enhancement area, and existing floodplain forest buffer area.
- Restoration of cradle-knoll microtopography, in the hardwood swamp and shrub-carr communities to retain surface water runoff and raise water table elevations to restore historic hydrology.

- Restoration of hummock and hollow microtopography in the fresh (wet) meadow community to retain surface water runoff and raise water table elevations to restore historic hydrology.
- Plant and seed species to restore the herbaceous, shrub and tree layers in the plant communities.
- Provide long-term vegetation management to remove Invasive Non-Native (INN) species and promote development of native species until performance standards are achieved and beyond for long-term sustainability.
- Promote long-term low-impact public use of the property with scientific and recreational opportunities to educate and inspire students. A pier will provide viewing and observations for students to learn.

Besides substantially increasing the environmental functional values of the area, Mr. Vorland will be educating youth, facilitating hunting and trapping educational courses and transporting the students to the Bank Site to learn and demonstrate skills and observe wildlife. The Bank will be a highlight to the classes to further inspire passion for the outdoors and restoration of various native plant communities.

The proposed wetland compensation acreage and credit allocation is provided on Table 1. This information is preliminary, and the wetland community boundaries may be refined in the CSP based on additional analysis of baseline groundwater and surface water monitoring, and consultation with the regulatory agencies.

### **C. Need**

The Bank Site is located directly adjacent to the Shioc River, which is classified by the Wisconsin DNR as an impaired river, with the principal pollutant being TP. The Shioc River extends for 28 miles through Outagamie and Shawano Counties. The Shioc River and its tributaries flow through agricultural land with little to no vegetation buffering. The Shioc watershed is 189 square miles of which 55.6% is agriculture. The Wisconsin DNR goals for the watershed are to restore wetlands. The Shioc River Wetland Mitigation Bank is consistent with reaching those goals and will provide substantial improvement by removing 166.43 acres of agricultural land from polluting the Shioc River with nutrients (especially phosphorus), suspended solids and herbicides. The Shioc River is an important fish spawning habitat where walleye and white bass use the river every spring for spawning. Information on the impaired conditions of the Shioc River are presented in Appendix D.

The Shioc River Bank will service the Fox Service Area which includes many large metropolitan areas. There are some wetland credits available from several wetland banks. However, the Fox Service Area has been developing rapidly for decades and is expected to continue long-term. The bank credits will be critical for continued support of development by the public and private sectors.

The proposed wetland compensation acreage and credit allocation is provided on Table 1. This information is preliminary and will likely be refined based on additional analysis of the soils and hydrology and consultation with the regulatory agencies.

The Site will service the Fox BSA area which includes many large metropolitan areas. There are some wetland credits available from several wetland banks. However, the Fox BSA has been developing rapidly for decades and is expected to continue long-term. The bank credits will be critical for continued support of development by the public and private sectors.

#### **IV. BASELINE CONDITIONS & ECOLOGICAL SUITABILITY**

The baseline conditions are based on field assessments in 2020, 2021, and 2022 desktop reviews of available information, and hydrology monitoring in 2021 and 2022.

##### **A. Site History, Existing Conditions & Utilities**

The Site was historically wetlands with a minor amount of uplands. A total of ten historical aerial photographs including 1938, 1957, 1964, 1970, 1980, 1992, 2000, 2005, 2010 and 2014 were reviewed and are presented in Appendix E. Prior to 1938, the vast majority of the site was cleared and converted to agricultural fields. Some unfarmed areas remained in the northeast section of the property but likely had historical logging in those areas. Between 1938 and 1957, the main ditch (8,940 feet) and berm were constructed on the north and west sides of the site. The 1957 photograph shows fallow land with some trees and shrubs on the eastern and small wet spots on the northern side of the site. The aerial photos from 1964 to 2005 show the entire site actively farmed. The 2010 aerial photograph shows a small 5-acre section of fallow land in the northeast corner. The 2014 aerial photograph is unclear. There are no utilities on the property.

##### **B. Topography**

The Site is very flat with approximately 4-feet (760 to 764 MSL) of elevation difference over 1.4-mile area. The area has gradual undulations across the landscape. Figure 3A shows the county contours for the property. Figure 3B shows the hydrologic features of the site. The topography was created from LIDAR collected from a drone flight completed in 2020. An oxbow exists in the center of the site that has some lower elevations than the rest of the surrounding area.

##### **C. Historic Vegetation**

The Finley's Pre-settlement Vegetation Cover Map (Figure 4) shows most of the site as a forest consisting of swamp conifers with approximately 40 acres of sugar maple, basswood, red oak, white oak and black oak. The 40-acre section of upland forest is not accurate based on the Land Survey Notes. The 1845 Original Land Survey Map (Figure 5)

shows the entire site as wetlands and the surrounding land to the east and south. The 1933-1945 Bordner Survey Map (Figure 6) shows the site with an alder, willow and dogwood swamp in the northern one-third and the remaining part is unlabeled.

The original 1843 land survey notes (Appendix F) show black ash and tamarack along the southern boundary of the main block of land (Section 10 and 15 line). Figure 7 shows the vegetation from the 1843 original land survey notes (Notes) and soil map units of the site and surrounding area. The eastern boundary (Section 10 and 11 line) was characterized as swamp with black ash, tamarack and willow. The western edge (Section 15 and 16 line) had a 10-inch black ash recorded and that section was characterized as swamp with black ash, elm, oak, alder and willow. A tamarack dominated swamp existed farther south on the same section line.

The section line between Sections 11 and 14, east of the site, was characterized as swamp with tamarack, cedar, elm and black ash. There were 7 and 14-inch tamaracks encountered on the line when surveying the path. The section line between Sections 14 and 15, southeast of the site, had black ash and tamarack trees that were encountered along the line.

Figure 8 shows the site within the central lake Michigan coastal ecological landscape.

Historical aerial photographs (Appendix E) from 1938, 1957, 1964, 1970, 1980, 1992, 2000, 2005, 2010 and 2014 were reviewed. The 1938 photograph does not show the current drainage ditches on the property. There appears to be several minor ditches in the southwest corner and south-central portion of the site. The former oxbows are more clearly shown in this photograph compared to more recent photographs since the dike was not constructed at this time. There is an oxbow in the southwest corner and three in the northern part of the site, including one large oxbow in the northeast section of the site. Some of the oxbows contain ground vegetation, shrubs and trees. The remaining part of the property appears to be active agricultural land except for the northeast corner which appears fallow with a couple trees or shrubs.

The 1957 photograph shows the three oxbows having vegetation and the eastern half appears to be a meadow, shrub-carr with some trees. The remaining portion of the site appears to be farmed. Drainage ditches are present along the north and western portion of the site.

The 1964 photograph appears to show the entire property as an active agricultural field except a vegetated part of the westernmost oxbow.

The 1970 photograph shows the entire site as an active agricultural field.

The 1980 to 2014 photographs show the entire site as an active agricultural field except for a small silver maple hardwoods area (2.5 acres) in the southwest corner of the property in an oxbow.

## **D. Existing Vegetation**

Figure 9 shows the existing plant communities on the Site. Site photographs are presented in Appendix G. The entire site is active agricultural land except for a small 2.5-acre patch of silver maple forest in the southwest corner and several acre fallow lands in the northeast corner dominated by reed canary grass. The exception being the 46.68-acre floodplain forest designated for wetland buffer. The floodplain forest buffer contains primarily a silver maple dominated canopy with some areas having green ash and swamp white oak dominated canopy. The primary herbaceous layer species is reed canary grass with some stringing nettle and Virginia wildrye.

Figure 10 shows the extent of Invasive Non-Native (INN) species on the property.

## **E. Historic Hydrology**

Historically, the entire property was directly connected to the Shioc River system, historically called “Menominee Shioc” River. Historic hydrology is shown on Figures 11. The property is located with the 100-year floodplain as shown on Figure 12.

The property surface water historically sheet flowed to drainageways, swales or oxbows that directly discharged surface water runoff to Shioc River. One large oxbow exists on the eastern portion of the property. Three small oxbows exist in the central and western portion of the site. Groundwater discharged to Shioc River contributing to base flow.

## **F. Existing Wetlands, Hydrology & Hydrology Infrastructure**

The floodplain and Wisconsin Wetland Inventory (WWI) wetlands are shown on Figure 12. The entire Site is located within the 100-year floodplain. A relatively small amount of wetlands are shown on the WWI.

Figure 13 shows the wetland delineation map for the property.

The current hydrology infrastructure is shown on Figure 14. A Wetland Delineation was completed on the property in 2020 by a Wisconsin DNR-Assured Wetland Delineator. Of the 175-acre review area, 96.92 is currently wetlands. A large area (58.73 acres) of uplands contains hydric soil or hydric soil indicators that is restorable.

The current drainage ditch system located around most of the perimeter of the property was constructed between 1938 and 1957, based on historical aerial photographs. The drainage ditches on the north and west sides are much wider and deeper with widths ranging from 13 to 30 feet. The main ditch on the north and west sides of the Site is approximately 8,940 feet long. The shallow ditch on the east side of the Site is approximately 1,715 feet long. The medium depth ditch existing along east to west on the central portion of the site is approximately 4,120 feet long. The ditches on the south side

and the east side are much narrower and shallower. The widths are typically 5 to 10 feet. Some of the natural drainage features were graded lower in elevation to expediate surface water drainage. There were approximately 13 shallow linear swales created in the fields to direct water to the drainage ditches. This is especially the case in the main large block of land-oriented east-west.

All the ditches lead to the southwest corner of the site, where an off-site water control structure including a pump, discharges the water to the Shioc River via 620-foot-long channel. The Bovina-Black Creek District (drainage district) owns and operates the pumps. The Outagamie County Drainage District regulates the local drainage districts within the county. The Shioc River confluence with the Wolf River is 1.4 linear miles to the southwest. Shioc River water does not enter the Site unless there is a breach in the dike. No tile exists on the Site.

It is not possible to restore the wetland communities to the exact pre-settlement conditions since the hydrology has substantially changed in the last 170 years due to development of the Shioc River watershed. The primary influence of hydrology on the Site will be the Shioc River due to being adjacent to the river. According to the Wisconsin DNR, the Shioc River watershed is 55% developed into agricultural use.

Historically, the agricultural land was primarily forested. The forests had duff layers that absorbed precipitation leading to retainage of the water by infiltration, which slowly recharged the groundwater with relatively stable discharge to waterways. The forests transferred a substantial amount of water back to the atmosphere by evapotranspiration. Agricultural lands lost the microtopography and most contain ditches and/or tiles that quickly direct surface water and shallow groundwater to streams. Consequently, the Shioc River currently receives substantially more water with greater water level fluctuations than pre-settlement. The Wisconsin DNR characterizes the river as having extreme water levels fluctuations with low water and isolated pools during the summer months.

### Baseline Groundwater Monitoring

On April 20 - 22, 2021, McMahon installed 15 groundwater monitoring wells (MW-01 to MW-15) and three surface water wells (SW-01 to SW-03). The surface water wells were installed in May 2021. Two surface water wells (SW-01 and SW-02) are located in the Shioc River and one surface water well (SW-03) is located in the main drainage ditch on the north side of the Site. The monitoring well locations are shown on Figures 16 and 19. The monitoring wells were installed 30 to 48-inches below grade but mainly 30-inches below grade. The soil types included sand loamy, loamy sand, sandy clay, and clay loam.

Hydrology was monitored in 2021, 2022 and 2023. The monitoring well water level summaries, hydrographs, and antecedent graph for 2021 and 2022 are presented in Appendix H. Also, hydrographs comparing the Shioc River surface elevation to the Wolf River elevation in Shiocton is presented in Appendix H. 2023 data will be included in the

Draft Compensation Site Plan (CSP). Surface water well SW-01 was destroyed by the river current resulting in no data. Water levels were recorded four times/day using In-Situ Ruggedtroll 100 data loggers with one Baratroll.

The monitoring wells were constructed of 1.5-inch I.D. PVC with 0.010-inch slots in the screened portions. The screens ended 5-inches below grade. Filter pack sand was backfilled from the bottom of the soil borings to 4-inches below grade. Bentonite chips (3/8-inch) were placed from 4-inches below grade to above grade to create a mound. Native soil was placed over the bentonite to prevent erosion and drying out of the bentonite.

### 2021 Hydrology Monitoring

Based on soil temperature data from the general area and emerging vegetation, the latest the growing season began is April 8, 2021. Therefore, we are using that date as a starting point. The 30-day rolling precipitation average showed most of April being within the normal precipitation range. From the last week in April until mid-June, the 30-day rolling precipitation average was below normal. July, August, and early September were mostly above the 30-day rolling precipitation average. Mid-September to the end of the growing season (November 12<sup>th</sup>) was below the 30-day rolling prescription average.

Based on this data, monitoring well MW-12 located in a map wetland area in the large oxbow, met hydrology performance standards. Monitoring wells MW-01, MW-04, MW-07, MW-11, MW-14 and MW-15 located in mapped wetland areas, did not meet hydrology performance standards. Monitoring wells MW-03, MW-06, MW-08, MW-09, MW-10 and MW-13, located in restorable wetland areas, did not meet wetland hydrology performance standards. Monitoring wells MW-02 and MW-05 are located in upland areas.

### 2022 Hydrology Monitoring

Based on soil temperature data from the general area and emerging vegetation, the growing season began on April 20, 2022. The end of the growing season was November 12, 2022. Based on the antecedent precipitation graph, precipitation was below normal from early May to early June, normal to below normal precipitation from early June to early October, below normal from early October to late October and above normal through the remainder of the growing season.

Based on the data, monitoring well MW-12 located in a map wetland area in the large oxbow, met hydrology performance standards. Monitoring wells MW-01, MW-04, MW-07, MW-11, MW-14 and MW-15 located in mapped wetland areas, did not meet hydrology performance standards. However, monitoring wells MW-01, MW-04, MW-07, MW-09, MW-11 and MW-15 met basic wetland hydrology standards.

Monitoring wells MW-03, MW-06, MW-08, MW-09, MW-10 and MW-13, located in restorable wetland areas, did not meet wetland hydrology performance standards but

MW-09 met basic wetland hydrology standards. Monitoring wells MW-02 and MW-05 are located in upland areas.

#### Inundation Projections Based on Shioc River Levels

The inundation depths were mapped twice a month from June 1, 2021 to November 1, 2021 and from April 15 through June 15, 2022 using the recorded surface water elevation of the Shioc River in comparison to the LIDAR surface of the Site. The figures represent just the inundation represented by water supplied by the Shioc River. The figures do not include inundation levels that may exist from precipitation. The figures are snapshot in time for just river surface water levels but provide critical information on the supply of river water to the Site. The data has assisted in informing potential hydrology at the site that has been used in designing plant community types. River water levels are highly dynamic and will vary substantially in the short and long term. The figures are presented in Appendix I.

### **G. Soils**

Based on the NRCS Outagamie County Survey, there are four soil units on the 223.4-acre Site. The soil units, parent material, minor components, component percentage, landform, drainage class, hydric status, pond/flooding, and percent area of main soil unit are summarized on Table 2. The hydric soil rating is shown on Figure 15. The soil was formed on the Central Lake Michigan Coastal Landscape.

The loamy and fine sandy loam soils were formed on glaciofluvial deposits. The silt loam soil was formed on sandy and loamy lacustrine deposits. The fluvaquents soil was formed on alluvium.

Based on the soil survey, very poorly drained soils exist on approximately 7% of the Site. Poorly drained soils exist on approximately 42% of the Site. Somewhat poorly drained soil exists on 51% of the Site.

Figure 16 shows the estimated extent of re-established wetlands once all the ditches are plugged, culverts are installed connecting the Site to the Shioc River system, and establishment of microtopography. These areas are based on hydric soil indicators, topography and landscape position. The estimated area fitting these criteria is 58.73 acres. In 2021, the extent of soil exhibiting reduced soil or redoximorphic features was defined in the field and is shown on Figure 16.

## **V. MITIGATION BANK ESTABLISHMENT & ECOLOGICAL SUITABILITY**

The final details for the establishment of the eight plant communities including boundaries and alterations of the hydrology will be specified in the CSP following final approval of the Prospectus.

The vegetation in the wetland communities will be designed using the following resources.

- Species inventoried from local reference quality wetlands for each community type within several miles of the Site.
- Specific Site species inventory lists from the closest reference quality wetlands inventoried by the Wisconsin DNR as part of their 2014-2018 floristic quality survey (over 1,000 wetlands) of non-restored wetlands.
- Draft Species List for Reference Quality Wetland Communities Grouped by Related Community Types and Omernik Level 3 Ecoregion, February 18, 2020.
- Chapter 7 – Natural Communities, Aquatic Features, and Selected Habitats of Wisconsin in: The Ecological Landscapes of Wisconsin: An Assessment of Ecological Resources and a Guide to Planning Sustainable Management. WDNR. 2017.
- Flora of Wisconsin Consortium of Wisconsin Herbaria.
- 1843 Original Land Survey Notes.

The vegetation in the upland buffer communities will be designed using the following resources.

- Local reference quality upland mesic forest within several miles of the Site.
- Chapter 7 – Natural Communities, Aquatic Features, and Selected Habitats of Wisconsin in: The Ecological Landscapes of Wisconsin: An Assessment of Ecological Resources and a Guide to Planning Sustainable Management. WDNR. 2017.
- Flora of Wisconsin Consortium of Wisconsin Herbaria.
- 1843 Original Land Survey Notes.

## **A. Proposed Plant Communities**

The proposed eight plant communities are listed below and shown in Figure 17. Figure 18 shows the wetland plant communities by restoration type. The forested communities will include some “northern-type” tree species since the site is located in the northern portion of the tension zone. The justification and description of the eight plant communities are presented below.

### 1. Fresh (Wet) Meadow

Restore a fresh (wet) meadow (approximately 68 acres) in mineral soils that will occupy an area of the current actively farmed area in mineral soils. The species richness will be over 50.

### 2. Shrub-carr

Restore a shrub-carr (approximately 44 acres) in mineral soils that will occupy an area actively farmed in mineral soils. Furthermore, the proposed restoration of shrub-carr is supported by the presence of willow noted in the 1843 Original Land

Survey Notes (see Appendix F) along the western and eastern sides of the Site. Trees will be a minor component of the community occupying 10 to 25% cover.

3. Hardwood/Coniferous Swamp

Restore a hardwood/coniferous swamp (approximately 19 acres) in mineral soils. The hardwood/coniferous swamp will be dominated by deciduous and/or conifer tree species with shrubs. The hardwood/coniferous swamp will be positioned higher in landscape position between the shrub-carr and upland mesic forest buffer. The dominant species will likely be red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), and tamarack (*Larix laricina*). Swamp white oak will have a higher percent cover compared to historically, to be a replacement of the green ash (*Fraxinus pennsylvanica*) and black ash (*Fraxinus nigra*) cover loss that is presently occurring in the local area due to Emerald Ash Borer (EAB). Associates will include bur oak (*Quercus macrocarpa*), shagbark hickory (*Carya ovata*), silver maple (*Acer saccharinum*), bitternut hickory (*Carya cordiformis*), basswood (*Tilia americana*), white cedar (*Thuja occidentalis*), red oak (*Quercus rubra*) and other species.

4. Shallow Marsh

Shallow marsh (approximately 19 acres) with deep marsh will be in areas that are generally 3 to 6-inches lower in elevation than the surrounding landscape.

5. Deep Marsh

The marsh (approximately 19 acres with shallow marsh) will be in areas that are generally 6-inches to 3-feet lower in elevation than the surrounding landscape. The oxbow will be the center piece of the deep marsh area.

6. Mesic Forest Buffer

Restore a mesic forest (approximately 6 acres) as an upland buffer. The re-establishment in the general area of mesic upland buffer is supported by the presence of such communities. A greater emphasis will be placed on white oak since white oak has diminished on the landscape compared to red oak. White oak flourishes in communities with an active fire regime. White oak is commonly listed on the 1843 original Land Survey Notes in nearby upland areas. Fire suppression since the early 1900's has favored red oak since white oak is much more fire tolerant than red oak. Also, oak species in general have reduced in abundance on the landscape being replaced with more shade tolerant and fire sensitive tree species. The dominant species will be white oak (*Quercus alba*), red oak (*Quercus rubra*), and shagbark hickory (*Carya ovata*). Associates will include white pine (*Pinus strobus*), sugar maple (*Acer saccharum*), basswood (*Tilia americana*), bitternut hickory (*Carya cordiformis*) and other species.

7. Floodplain Forest

Enhance a floodplain forest (approximately 2.5 acres) in mineral soils. The floodplain forest has reed canary grass (*Phalaris arundinacea*) present, which is an INN species. The canopy composition is 95% silver maple (*Acer saccharinum*) and 5% cottonwood (*Populus deltoides*). The herbaceous layer contains 5 to 90% reed canary grass. Reed canary grass would be reduced to less than 5% coverage from the floodplain forest by spot herbiciding.

8. Mesic Prairie

Restore a mesic prairie (approximately 5 acres) on mineral soil. The species richness will be over 70. Long term the mesic prairie would be allowed to follow the path of natural succession once final performance standards are met.

9. Existing Forested Wetland Buffer

An existing forested wetland buffer (approximately 46 acres) would be enhanced by reducing the INN species. The primary INN species is reed canary grass (*Phalaris arundinacea*), which is present 15 to 90% coverage. Reed canary grass would be reduced to less than 5% absolute coverage from the floodplain forest by herbiciding.

Furthermore, hydrology would be enhanced by plugging (see Figures 9, 17 and 18) a channel that was created (1938-1957) when constructing the berm. The channel substantially reduces the hydrology of approximately 3,120 feet of the Shioc River by diverting approximately 50% of the river water through the channel. Restoring all the river water to 3,120 feet of Shioc River will increase hydrology to the surrounding riparian wetlands and substantially reduce reed canary grass coverage.

10. Berm Buffer

The berms (11.2 acres) will be uplands that separate the Site from adjacent INN species. The berms are dominantly by upland INN species that do not represent an appreciable threat to the wetland communities. Three culverts will connect the Site directly to the Shioc River. The river may supply some INN species seeds during flooding events.

## **B. Hydrology Restoration Activities**

The following activities will occur to restore the hydrology to both the wetlands and uplands.

- Disabling the main ditch (8,940 feet) with ditch plugs located along the entire west and north sides of the Bank Site. Open water areas will provide habitat for aquatic flora and fauna.
- Disabling the central (4,120 feet) and east ditch (1,715 feet) with ditch plugs.
- Excavate some areas of the shallow and deep marsh to improve the hydroperiod and restore deep marsh habitat.
- Install culverts through the northern berm to hydrologically reconnect the site to the Shioc River water.
- Grade some areas lower to increase connectivity during precipitation and Shioc River flooding.
- Substantially reduce invasive species in the herbaceous layer, especially reed canary grass in the northeast corner of the site, floodplain forest enhancement area, and existing forested wetland buffer.
- Restoration of cradle-knoll microtopography, in the hardwood swamp and shrub-carr communities to retain surface water runoff and raise water table elevations to restore historic hydrology.
- Restoration of hummock and hollow microtopography in the fresh (wet) meadow community to retain surface water runoff and raise water table elevations to restore historic hydrology.
- Plant and seed species to restore the herbaceous, shrub and tree layers in the plant communities.
- Provide long-term vegetation management to remove invasive species and promote development of native species until performance standards are achieved and beyond for long-term sustainability.
- Promote long-term low-impact public use of the property with scientific and recreational opportunities to educate and inspire students. A pier will provide viewing and observations for students to learn.

## **C. Water Supply**

There is more than sufficient supply of water (surface/groundwater) and drainage rights to sustain the proposed water regimes on the Site in the short and long term. The Shioc River will be a major supply of water to the Site. Modifications to the ditch, drainageways and reconnecting the site to the Shioc River floodplain will affect only the Sites hydrology. Refer to Figure 14 for hydrologic features. The anticipated water levels following construction activities are shown on Figure 19.

#### **D. Effects of Hydrology on Neighboring Properties**

Based on the design there will not be any appreciable effects to the hydrology on neighboring properties.

The Sponsor owns the land to the south and will have a berm created to protect the existing hydrology on that property. A Wisconsin Department of Transportation (WisDOT) wetland bank exists to the east that has separate ditches and water control infrastructure. The properties to the west and north are directly connected to the Shioc River system.

#### **E. Invasive Species Control**

The active farm fields are already prepared for vegetation plantings and seeding. The active farm fields will be continuously farmed until plantings and seeding occurs to prevent invasive species from establishing and seeding.

The fallow land (5 acres) in the northeast corner is dominated primarily by reed canary grass. These areas have already been herbicided several times using glyphosate. Also, the existing floodplain forest herbaceous layer is dominated by reed canary grass. These areas will be herbicided two to three times/year for at least one more additional year to eradicate reed canary grass. Reed canary grass will be controlled in the existing wetland forest buffer area. Spot herbiciding will occur several times a year after vegetation planting and seeding until performance standards are met.

Other invasive species will be controlled using herbicides and/or mowing depending on the species.

#### **F. Climate Change Adaptability & Mitigation Strategies**

McMahon reviewed the document titled "Climate Adaptation Strategies and Approaches for Conservation and Management of Non-Forested Wetlands".

The plan for the Site will incorporate the following climate change adaptability strategies at the site.

- Strategy 1 – Enhance Hydrologic Processes and Water Quantity
  - ▶ Enhance infiltration and water storage within wetlands, adjacent uplands and groundwater recharge.
    - ◆ Microtopography will be established in the wetlands to facilitate infiltration and water storage. Upland row crop areas will be converted to fresh (wet) meadow, shrub-carr, floodplain forest, shallow marsh, deep marsh, and mesic upland forest which will substantially slow surface water flows and increase infiltration.

- ▶ Restore a Natural Hydrologic Regime
  - ◆ Ditches will be plugged in the wetlands and uplands to restore the natural hydrologic regime by increasing residence times.
- Strategy 2 – Enhance Water Quality of Wetland Habitats
  - ▶ Moderate Surface Water Temperature Increases
    - ◆ Restoration of all the diverse plant communities will create shaded environments which will reduce water temperatures throughout the site. This combined with increased water residence time will restore water temperatures.
  - ▶ Reduce Soil Erosion and Sediment Deposition
    - ◆ Upland row crop areas will be converted to all the diverse plant communities which will substantially reduce soil erosion and downgradient sediment deposition.
  - ▶ Reduce Loading and Export of Nutrients and Other Pollutants
    - ◆ Restoration activities at the site will reduce phosphorous, nitrogen, other nutrients, herbicides from entering the wetlands.
- Strategy 3 – Restore Wetland Vegetation
  - ▶ Restore Wetland Structure
    - ◆ The restoration plan for the site will restore historical wetland community types.
  - ▶ Enhance Diversity of Plant Species
    - ◆ The restoration plan will seed and plant stock that will substantially restore a high quality and diverse species to various community types.
    - ◆ Species will include a full spectrum from shade to sun preferred environments and wetland rankings to allow transitioning if needed from climate change.
  - ▶ Invasive Species Control
    - ◆ INN species will be substantially reduced in the fallow land areas and long-term.
- Strategy 4 – Facilitate Transformation of Wetland Communities by Adjusting Species Composition
  - ▶ The diversity of wetland community types and species will facilitate transformation of wetland communities.

## VI. DETERMINATION OF WETLAND CREDITS

Figure 17 shows the various wetland and upland plant communities planned for the Site. Figure 18 shows the wetland communities by restoration type. These include fresh (wet) meadow, shrub-carr, hardwood/coniferous swamp, shallow marsh, deep marsh, floodplain forest enhancement and existing forested wetland buffer. Uplands will be mesic prairie and mesic forest. The wetland credit rationale is provided below by plant community type.

### A. Fresh (Wet) Meadow Re-establishment

The proposed fresh (wet) meadow is located in mineral soils in actively farmed areas. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via re-establishment activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The area is an active farm field. The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. Native Non-Invasive (NNI) species will be re-established by a series of introduction including seeding to achieve performance standards. There is not any significant anticipated source of NNI in the seedbank due to the long crop history.

A proposed credit ratio for this community is 1:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful re-establishment results in an increase in wetland acreage by establishing historic hydrology, land contours and plant communities. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

### B. Fresh (Wet) Meadow Rehabilitation

The proposed fresh (wet) meadow is located in mineral soils that are actively farmed. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features

have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding to achieve performance standards. There is not any anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.75:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

### **C. Shrub-carr Re-establishment**

The proposed shrub-carr is located in mineral soils in actively farmed areas. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via re-establishment activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The area is an active farm field. The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be

reestablished by a series of introduction including seeding, shrub and tree planting. There is not any significant anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 1:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful re-establishment results in an increase in wetland acreage by establishing historic hydrology, land contours and plant communities. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

#### **D. Shrub-carr Rehabilitation**

The proposed shrub-carr is located in mineral soils in actively farmed areas. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding, shrub and tree planting. There is not any significant anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.75:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

## **E. Hardwood/Coniferous Swamp Re-establishment**

The proposed hardwood/coniferous swamp is located in mineral soils in actively farmed areas in the northeast corner of the site dominated by reed canary grass with over 99% coverage. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via re-establishment activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The area is an active farm field. The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding, shrub and tree planting. There is not any significant anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 1:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful re-establishment results in an increase in wetland acreage by establishing historic hydrology, land contours and plant communities. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

## **F. Hardwood/Coniferous Swamp Rehabilitation**

The proposed hardwood/coniferous swamp is located in mineral soils in actively farmed areas with a small area in the northeast corner of the site dominated by reed canary grass. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding, shrub and tree planting. There is not any significant anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.75:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

#### **G. Shallow Marsh Rehabilitation**

The proposed shallow marsh area is located in mineral soils in actively farmed areas. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding, and herb planting to achieve performance standards. There is not any significant anticipated source of NNI in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.75:1. The Guidelines document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in eradication of INN species, and improve functional lifts in water quality, groundwater recharge, floristic integrity, wildlife habitat and human use values compared to the pre-wetland violation conditions in 2008.

## **H. Deep Marsh Rehabilitation**

The proposed deep marsh area is located in mineral soils in actively farmed areas. The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding, and herb planting to achieve performance standards. There is not any significant anticipated source of NNI in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.75:1. The Guidelines document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in eradication of INN species, and improve functional lifts in water quality, groundwater recharge, floristic integrity, wildlife habitat and human use values compared to the pre-wetland violation conditions in 2008.

## **I. Existing Floodplain Forest Rehabilitation**

The existing floodplain forest is located in mineral soil with 5 to 90% coverage of reed canary grass (INN species). The area has lost wetland hydrology due to ditching, flattening of the land surface (lost microtopography), and disconnection to the Shioc River. All these manmade features have facilitated the rapid runoff of precipitation and snow melt

instead of retaining water on the landscape to allow recharge of the groundwater. Consequently, water tables have been lowered by these manmade landscape alterations.

The proposed restoration via rehabilitation activities are designed to restore the conditions similar to pre-settlement conditions, substantially lifting the hydrology function of the Site. Ditches will be plugged. Microtopography will be re-established to slow the velocity of runoff allowing for greater surface water retention times, which will increase infiltration. The Shioc River will be reconnected to the Site. The substantial increase in infiltration and flood water is anticipated to raise the groundwater table, re-establishing the hydrology of the former wetland areas.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all performance standards are met. NNI species will be re-established by a series of introduction including seeding to achieve performance standards. There is not any anticipated source of NNI species in the seedbank due to the long crop history.

A proposed credit ratio for this community is 0.5:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in hydrology, eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

## **J. Existing Forested Wetland Buffer Rehabilitation**

The existing floodplain forested wetland is degraded by INN species and altered hydrology of the Shioc River by a diversion channel.

The proposed restoration via rehabilitation activities are natural stream flow and associated riparian wetlands. The diversion channel will be plugged allowing all the river water to be restored back to original river channel instead of approximately 50% of the water being diverted from approximately 3, 120 feet of the Shioc River. This will slow the water flow rate and increase surface water elevation in the segment of river and to some degree upgradient and downgradient of that river segment.

The INN species will be treated by a combination of herbicide and tillage prior to introduction of native species and spot herbiciding and mowing long-term until all INN performance standards are met. NNI species will be allowed to be re-established from the native seedbank. NNI species will not be seeded in this buffer area.

A proposed credit ratio for this buffer community is 0.25:1. The 2013 Guidelines for Wetland Compensatory Mitigation (Guidelines) document indicates that successful rehabilitation results in an increase of two or more wetland functions. The plan for this community meets this requirement to improve the functional lift in hydrology,

eradication of INN species, and improve functional lifts in water quality, flood attenuation, groundwater recharge, floristic integrity, wildlife habitat and human use values.

#### **K. Mesic Prairie & Mesic Forest Upland Buffer**

The upland buffers will be revegetated with native species. The proposed credit ratio is 0.25:1.

Mesic prairie and forested upland buffers will cover relatively small areas of the Site.

The mesic prairie and forested upland buffers will substantially contribute to the ecological functions of the Site. Generally, edge effects provide ecological for 300 feet and beyond from the edge of a different community type. Forested upland buffers will filter sediments from rainwater, snowmelt and flood water, remove nutrients, provide habitat for species (e.g., amphibians) that require both upland and wetlands to survive and benefits wildlife species that prefer both uplands and wetlands in close proximity. The Site has meandering uplands bordering the wetlands creating high value wildlife edge effect.

### **VII. BANK SERVICE AREA**

The Shioc River Wetland Mitigation Bank is planned to be used for a commercial bank for the entire Fox BSA within the Lake Michigan Basin. The BSA and Site location are shown on Figure 20.

### **VIII. WETLAND FUNCTIONS & SERVICES**

The wetland restoration of this site will substantially increase the functional values of the property, Shioc River and Wolf River corridors and eventually Lake Winnebago system lakes. The property is directly adjacent to the Shioc River, which is heavily meandered along the northern and western side of the property. There are many places where the meanders are directly against the dike separating the field from the river. The Shioc River is classified by the Wisconsin DNR as an impaired river (see Figure 21) by total phosphorus. The Wisconsin DNR's goal for the Shioc River watershed is wetland restoration.

The project will prevent approximately 164 acres of agricultural land from polluting the Shioc River with phosphorus, nitrogen and other nutrients, suspended solids and herbicides. This will assist in improving the water quality of the Shioc River and Wolf River, both are of which are important walleye and white bass fisheries.

Furthermore, the bank property will provide a service by facilitating youth outdoor education. The bank site will be a component of local hunting and trapping education classes and general ecological education. The dikes will be used for transportation for outdoor education classes and as an upland buffer planted with native prairie species to protect the site from invasive species.

The restoration of the site will substantially improve floral diversity, hydrology, reduce soil erosion, improve water quality, improve aesthetics, increase wildlife habitat, substantially reduce non-native invasive species and increase stormwater storage.

## **IX. TECHNICAL FEASIBILITY**

The wetlands, former wetlands and uplands at the site are highly degraded. The hydrology and vegetation will be restored to reflect historical conditions or suitable wetland communities, especially plant communities that were historically hardwood/coniferous swamps, shrub-carr, shallow marsh and deep marsh, and shrub-carr.

Disabling the extensive drainage ditch systems, re-establishing microtopography, and reconnection of surface water with the Shioc River system will supply the hydrology needed to restore wetland communities. Hydrology alterations on the site will not appreciably affect neighboring properties.

Wetland restoration of this site is also feasible based on an existing 425-acre wetland bank owned by the State of Wisconsin that is bordering the east side of the site. The Shioc River Wetland Mitigation Bank will complement this area by continuing wetland restoration along the Shioc River to improve the water quality and other functions and services of this impaired river.

A CSP will be developed that will provide a detailed plan to transform the site from the current conditions to a diverse high functional value wetland mitigation bank. McMahon has experience with creating the same type wetland communities at various locations in northeast Wisconsin.

## **X. OWNERSHIP & LONG-TERM MANAGEMENT**

The site will be owned long-term by J-PaCC, Inc. The long-term management will follow the requirements of the conservation easement that would be placed on the property as part of establishing bank. The long-term management strategy will involve invasive species control consisting of spot herbiciding and mowing.

## **XI. FUTURE ASSESSMENTS**

The following activities will occur in 2023 to assist in designing a compensation Site plan.

- Incorporate all groundwater data in the CSP.

## **XII. SITE SELECTION CRITERIA CHECKLIST**

A site selection criteria checklist was completed for the Prospectus. The completed checklist is presented in Appendix J.

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Table 1

**PROPOSED WETLAND COMPENSATION ACREAGE,  
CREDIT RATIO & CREDIT RELEASE SCHEDULE**  
SHIOC RIVER WETLAND MITIGATION BANK  
Town of Bovina | Outagamie County, Wisconsin

Type of Compensation Credit Ratio	Type of Wetland Credit	Acres	Final Projected Credits	MBI, FA, CE & Title Insurance Executed 10%	As-Built Completion 10%	Hydrology PS Met 30%	Interim 1 Vegetation PS Met 10%	Interim 2 Vegetation PS Met 10%	Final Vegetation PS Met & Delineation 30%
Restoration via Re-Establishment (1:1)	Fresh (Wet) Meadow	36.83	36.83	3.68	3.68	11.05	3.68	3.68	11.05
	Shrub-carr	10.78	10.78	1.08	1.08	3.23	1.08	1.08	3.23
	Hardwood/Coniferous Swamp	10.84	10.84	1.08	1.08	3.25	1.08	1.08	3.25
Restoration via Rehabilitation (0.75:1)	Fresh (Wet) Meadow	31.72	23.79	2.38	2.38	7.14	2.38	2.38	7.14
	Shrub-carr	33.05	24.79	2.48	2.48	7.44	2.48	2.48	7.44
	Hardwood/Coniferous Swamp	8.50	6.38	0.64	0.64	1.91	0.64	0.64	1.91
	Shallow/Deep Marsh	19.24	14.43	1.44	1.44	4.33	1.44	1.44	4.33
Restoration via Enhancement (0.5:1)	Floodplain Forest	2.53	1.27	0.13	0.13	0.38	0.13	0.13	0.38
Buffer (0.25:1)	Forested Upland	6.46	1.62	0.16	0.16	0.49	0.16	0.16	0.49
	Prairie	5.34	1.34	0.13	0.13	5.55	0.13	0.13	0.40
Existing Forest Wetland Buffer (0.25:1)		46.68	11.67	1.17	1.17	3.50	1.17	1.17	3.50
Berm (0.1:1)		11.22	1.12	0.11	0.11	0.34	0.11	0.11	0.34
No Credit Areas		0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>TOTALS</b>		<b>223.39</b>	<b>144.86</b>	<b>14.49</b>	<b>14.49</b>	<b>48.61</b>	<b>14.49</b>	<b>14.49</b>	<b>43.46</b>

NOTES

1. As-built releases will only be granted after seeding/planting activities have occurred.
2. Interim vegetation credit releases will only be granted after demonstration that hydrology performance standards are met.

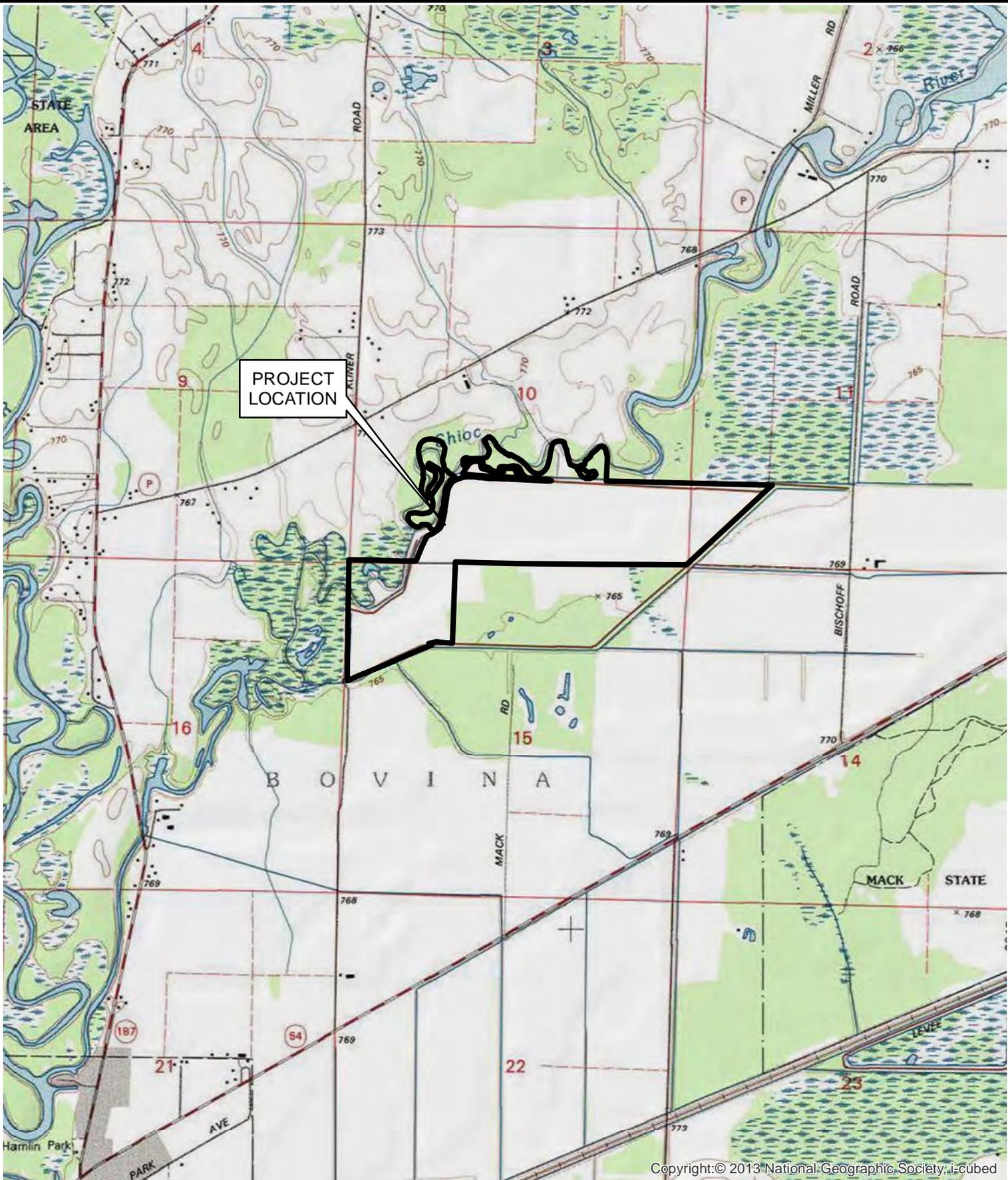
Table 2

**SOILS**

SHIOC RIVER WETLAND MITIGATION BANK

Town of Bovina | Outagamie County, Wisconsin

Map Unit Name	Parent Material	Soil Unit Minor Component	Component Percent	Landform	Drainage Class	Hydric Status	Flooding/ Ponding	Percent Area of Main Soil Unit
Deford Loamy Fine Sand (De)		Deford	95	Drainageways	Poorly Drained	Predominantly Hydric	Frequent Ponding	31.5
		Markey	2	Depressions				
		Wainola	3	Drainageways				
Keowns Silt Loam, 0 to 2% Slopes (Ke)		Keowns	85	Depressions	Poorly Drained	Hydric	Frequent Ponding & Flooding	7.2
		Palms, muck	15	Depressions				
Wainola Loamy Fine Sand, 0 to 3% Slopes (WaA)		Wainola	90	Drainageways	Somewhat Poorly Drained	Predominantly Nonhydric	Occasional Ponding	50.7
		Deford	4	Depressions				
		Shiocton	3	Drainageways				
		Rousseau	3	Rises				
Fluvaquents		Fluvaquents	95	Floodplains/ Drainageways	Poorly Drained	Predominantly Hydric	Frequent Ponding & Flooding	10.5
		Udifluents	5	Floodplains				



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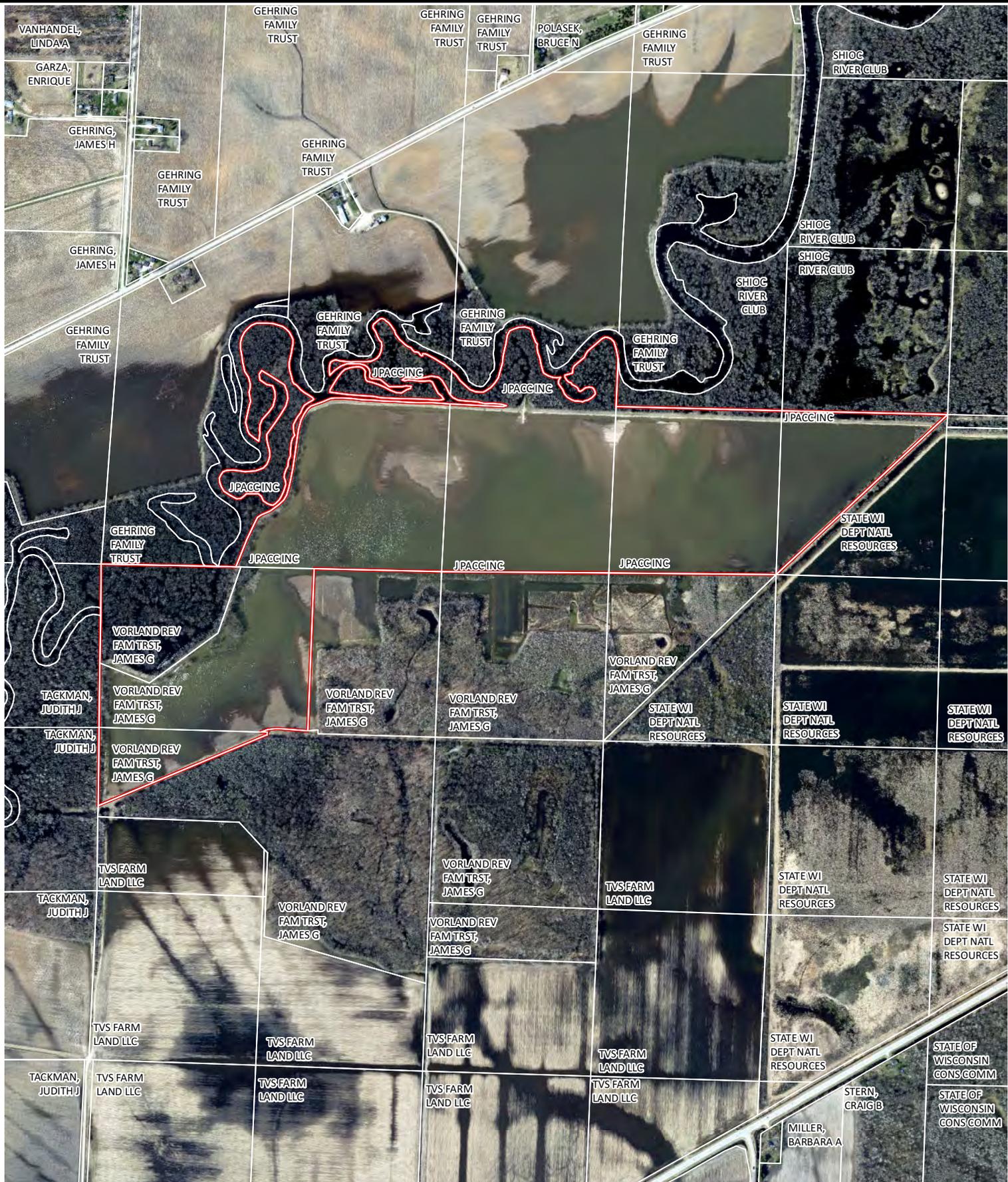
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1 inch = 2,000 feet

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**FIGURE 1**  
**SITE LOCATION & TOPOGRAPHIC MAP**  
**SHIOC RIVER WETLAND MITIGATION BANK**  
**TOWN OF BOVINA**  
**OUTAGAMIE COUNTY, WISCONSIN**



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**Mapped Features**

- OWNER Parcel Boundary
- Project Area

Data Source: Outagamie County, April 2023 (Parcels)  
 Imagery: Outagamie County, 2023

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**FIGURE 2**  
**PARCEL OWNERSHIP**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN



**Mapped Features**

- Project Area - 223.4 acres

**Contours**

- Intermediate
- Index
- Depression

Source: 2018 Contours (Outagamie County)  
 Imagery: Outagamie County (2010)

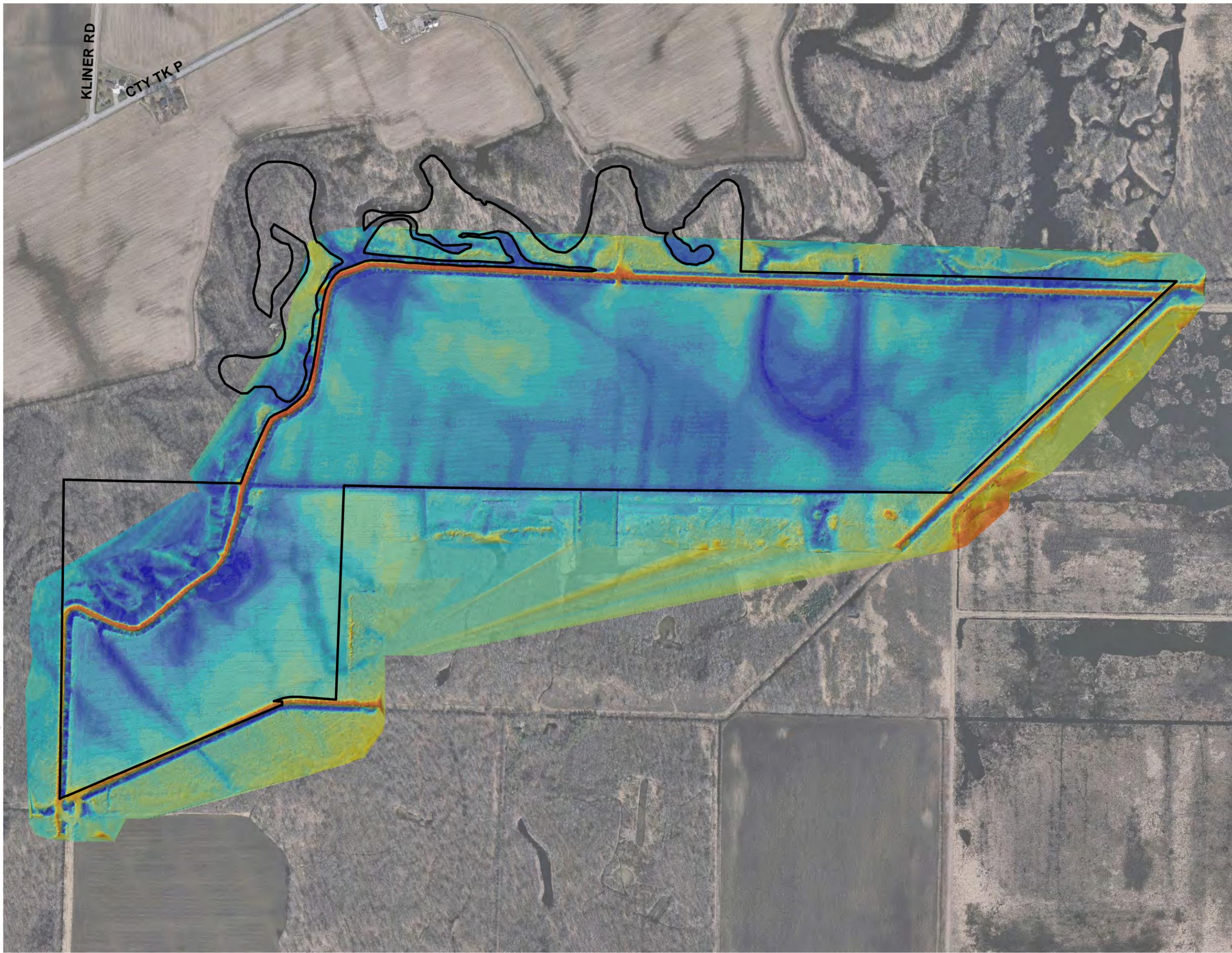


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**FIGURE 3A**  
**TOPOGRAPHIC MAP**  
**SHIOC RIVER WETLAND MITIGATION BANK**  
**TOWN OF BOVINA**  
**OUTAGAMIE COUNTY, WISCONSIN**

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**Mapped Features**

— Project Area (223.4 acres)

**Elevation**

772 - 780	764 - 764.5
770 - 772	763.5 - 764
768 - 770	763 - 763.5
767.5 - 768	762.5 - 763
767 - 767.5	762 - 762.5
766.5 - 767	761.5 - 762
766 - 766.5	761 - 761.5
765.5 - 766	760.5 - 761
765 - 765.5	760 - 760.5
764.5 - 765	759.03 - 760

Source: McMAHON Site Obtained LiDAR, 2021  
Imagery: Outagamie County, 2010



**FIGURE 3B**  
**COLOR TOPOGRAPHIC MAP**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

PROJECT  
LOCATION



**ORIGINAL VEGETATION COVER**

- Beech, hemlock, sugar maple, yellow birch, white pine, red pine
- Hemlock, sugar maple, yellow birch, white pine, red pine
- Beech, sugar maple, basswood, red oak, white oak, black oak
- Sugar maple, basswood, red oak, white oak, black oak
- Swamp Conifers
- Lowland Hardwoods
- Water

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1 inch = 1 miles



WI Dept. of Natural Resources

**FIGURE 4**  
**FINLEY'S PRESETTLEMENT**  
**VEGETATION COVER MAP**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

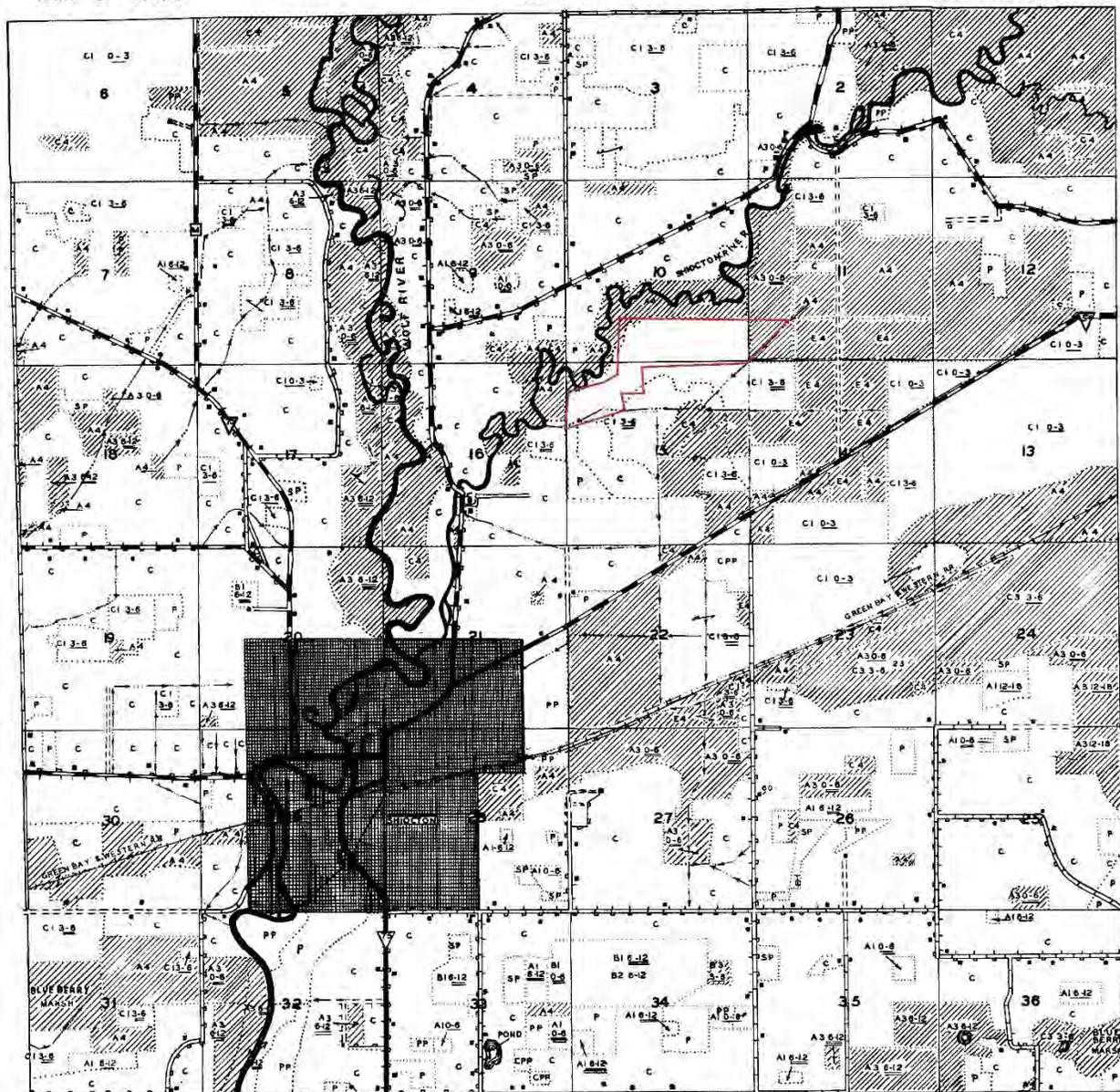


LAND COVER MAP

TOWN OF BOVINA

T23 N R16 E

OUTAGAMIE COUNTY



LEGEND

UPLAND FOREST NUMERALS 1-2	LOWLAND FOREST ALL NUMERALS 3	NON-TILLABLE A-PP-CPP-SP-D-4A-C4-E4-A	INFERIOR FOREST POORLY STOCKED WOODLAND BI-CI-D5-D5	OPEN SWAMP ALL NUMERALS 4	TILLABLE LAND C-C5-P	ALL SWAMP LAND NUMERALS 3-4
-------------------------------	----------------------------------	--	---	------------------------------	-------------------------	--------------------------------

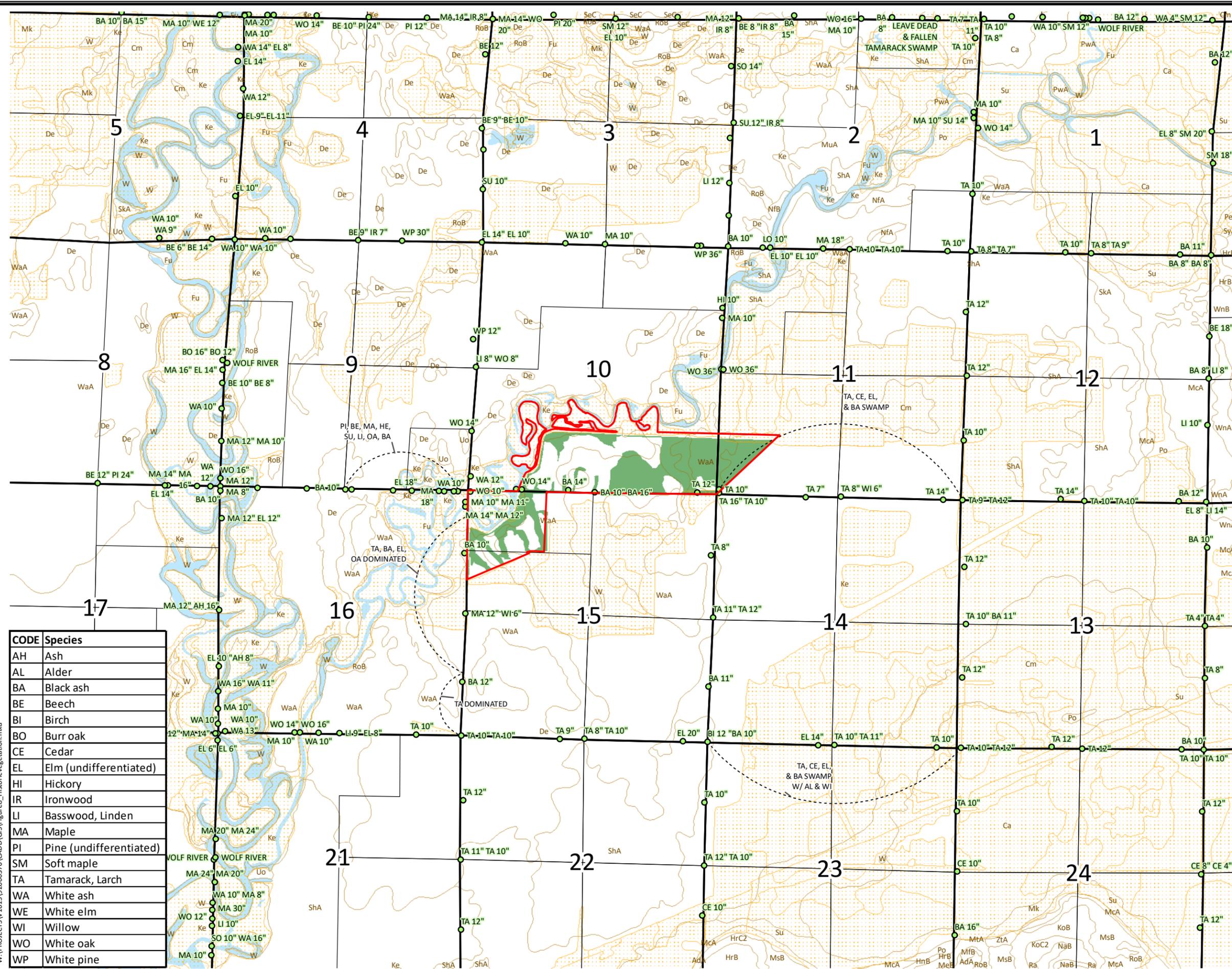
FOREST PLANTING RECOMMENDED

LAND COVER		ROADS		IMPROVEMENTS	
<ul style="list-style-type: none"> <li>--- COVER BOUNDARY</li> <li>A ABANDONED</li> <li>A1 UPLAND HARDWOODS</li> <li>A2 HEMLOCK WITH HARDWOOD</li> <li>A3 SWAMP HARDWOODS</li> <li>A4 TAGALDER, WILLOW, DOGWOOD</li> <li>B BIRCH</li> <li>B1 HARDWOOD WITH CONIFERS</li> <li>B1 INFERIOR B1</li> <li>B2 WHITE PINE</li> <li>B3 WHITE CEDAR</li> <li>B4 CAT TAIL MARSH</li> <li>C CLEARED CROP LAND</li> <li>C1 POPPLE WITH WHITE BIRCH</li> <li>C2 INFERIOR C1</li> <li>C2 NORWAY PINE</li> <li>C3 TAMARACK</li> <li>C4 GRASS MARSH</li> <li>CF SEDGE MARSH</li> <li>CS CULTIVATED STUMP LAND</li> <li>D OPEN</li> <li>D SCRUB OAK</li> <li>D1 OAK-HICKORY</li> <li>D2 JACK PINE</li> <li>D3 BLACK SPRUCE</li> <li>D5 BALSAM</li> <li>D5 LEATHER LEAF</li> <li>D5 RECENT BURN</li> <li>D5 DEAD TIMBER</li> <li>E1 PIN CHERRY</li> <li>E4 WEEDY PEAT</li> <li>FA CRANBERRY MARSH</li> <li>FF FOREST PLANTATION</li> <li>P PASTURE</li> <li>PP PERMANENT PASTURE</li> <li>RC RED CEDAR</li> <li>SP STUMP PASTURE</li> <li>TG TRUCK GARDEN</li> <li>RA RELATIVELY ABUNDANT PLANT GROWTH</li> <li>M.A. MODERATELY</li> <li>V.A. VERY</li> <li>S.C. PLANT GROWTH SCARCE</li> <li>A. PLANT GROWTH ABSENT</li> <li>Q.D. WATER LILLY BED</li> <li>W.C. AQUATIC PLANT BED</li> <li>WC. WILD CELERY</li> <li>SH. SHALLOW</li> <li>BK. BASS WEED</li> </ul>	<ul style="list-style-type: none"> <li>M. MEDIUM HARD WATER</li> <li>VH. VERY</li> <li>V. VERY</li> <li>H. HARD WATER</li> <li>A.A. ALGAE ABUNDANT</li> </ul>	<ul style="list-style-type: none"> <li>GC. GOLF COURSE</li> <li>BD. BEAVER DAM</li> <li>PD. PUBLIC DUMP</li> <li>T. ORCHARD</li> <li>C. CIVIL TOWN BOUNDARY</li> </ul>	<ul style="list-style-type: none"> <li>1. FEDERAL HIGHWAY</li> <li>2. STATE HIGHWAY</li> <li>3. COUNTY HIGHWAY</li> <li>4. HARD SURFACED ROAD</li> <li>5. IMPROVED GRAVEL ROAD</li> <li>6. UNIMPROVED GRAVEL ROAD</li> <li>7. IMPROVED DIRT ROAD</li> <li>8. UNIMPROVED DIRT ROAD</li> <li>9. TRAIL</li> <li>10. DRIVABLE FIRE LANE</li> <li>11. NON-DRIVABLE FIRE LANE</li> <li>12. TELEPHONE LINE</li> <li>13. POWER LINE</li> <li>14. RAILROAD</li> <li>15. ABANDONED RAILROAD</li> </ul>	<ul style="list-style-type: none"> <li>16. OCCUPIED HOUSE</li> <li>17. VACANT HOUSE</li> <li>18. SUMMER HOME</li> <li>19. OCCUPIED SCHOOL</li> <li>20. VACANT SCHOOL</li> <li>21. CHURCH</li> <li>22. TOWN HALL</li> <li>23. CHEESE FACTORY</li> <li>24. CREAMERY</li> <li>25. FILLING STATION OR GARAGE</li> <li>26. STORE</li> <li>27. TAVERN</li> <li>28. HOTEL</li> <li>29. SAW MILL</li> <li>30. GRIST MILL</li> <li>31. CARN. BLDG. LESS THAN 100 FT.</li> </ul>	

MISCELLANEOUS SYMBOLS		LAKE SYMBOLS		WOODED AREAS	
<ul style="list-style-type: none"> <li>Q. QUARRY</li> <li>SP. GRAVEL PIT</li> <li>SR. SPRING</li> <li>FF. FUR FARM</li> <li>DD. DRAINAGE DITCH</li> <li>CH. CEMETERY</li> <li>NU. NURSERY</li> <li>ER. ERECTION</li> <li>FT. FIRE TOWER</li> <li>IS. INTERMITTENT STREAM</li> </ul>	<ul style="list-style-type: none"> <li>RA. RELATIVELY ABUNDANT PLANT GROWTH</li> <li>M.A. MODERATELY</li> <li>V.A. VERY</li> <li>S.C. PLANT GROWTH SCARCE</li> </ul>	<ul style="list-style-type: none"> <li>GC. GOLF COURSE</li> <li>BD. BEAVER DAM</li> <li>PD. PUBLIC DUMP</li> <li>T. ORCHARD</li> <li>C. CIVIL TOWN BOUNDARY</li> </ul>	<ul style="list-style-type: none"> <li>A. PLANT GROWTH ABSENT</li> <li>Q.D. WATER LILLY BED</li> <li>W.C. AQUATIC PLANT BED</li> <li>WC. WILD CELERY</li> <li>SH. SHALLOW</li> <li>BK. BASS WEED</li> </ul>	<ul style="list-style-type: none"> <li>16. OCCUPIED HOUSE</li> <li>17. VACANT HOUSE</li> <li>18. SUMMER HOME</li> <li>19. OCCUPIED SCHOOL</li> <li>20. VACANT SCHOOL</li> <li>21. CHURCH</li> <li>22. TOWN HALL</li> <li>23. CHEESE FACTORY</li> <li>24. CREAMERY</li> <li>25. FILLING STATION OR GARAGE</li> <li>26. STORE</li> <li>27. TAVERN</li> <li>28. HOTEL</li> <li>29. SAW MILL</li> <li>30. GRIST MILL</li> <li>31. CARN. BLDG. LESS THAN 100 FT.</li> </ul>	<p style="text-align: center;">DENSITY OF STAND</p> <p>IS INDICATED BY THE LINE OR LINES BELOW THE DIAMETER</p> <ul style="list-style-type: none"> <li>DI 1-12 ONE LINE = GOOD STAND</li> <li>DI 2-12 TWO LINES = MEDIUM STAND</li> <li>DI 3-12 THREE LINES = POOR STAND</li> <li>DI 4-12 FOUR LINES = SCATTERED</li> </ul>

FOR ADDITIONAL COPIES OF THIS MAP WRITE WISCONSIN LAND ECONOMIC INVENTORY

**FIGURE 6**  
**WISCONSIN LAND ECONOMIC SURVEY**  
**(BORDNER SURVEY) ca. 1933-ca. 1945**  
**SHIOC RIVER WETLAND MITIGATION BANK**  
**TOWN OF BOVINA**  
**OUTAGAMIE COUNTY, WISCONSIN**



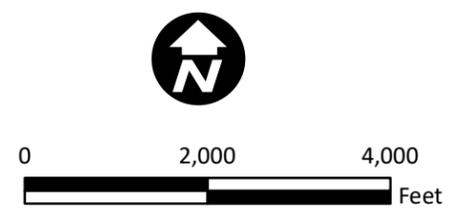
**Mapped Features**

- Project Area (223.4 acres)
- Bearing Trees & Other Notes - Pre-European Settlement Vegetation
- Wetland Area (2020 Delineation)
- Wisconsin Wetland Inventory
- NRCS Soils
- Large Waterbodies
- Section Line
- Quarter-Section Line

Vegetation data sourced from the US General Land Office's Public Lands Survey

Source: USDA (Soils)  
WDNR (Wetlands, Waterbodies, Pre-European Settlement Vegetation)

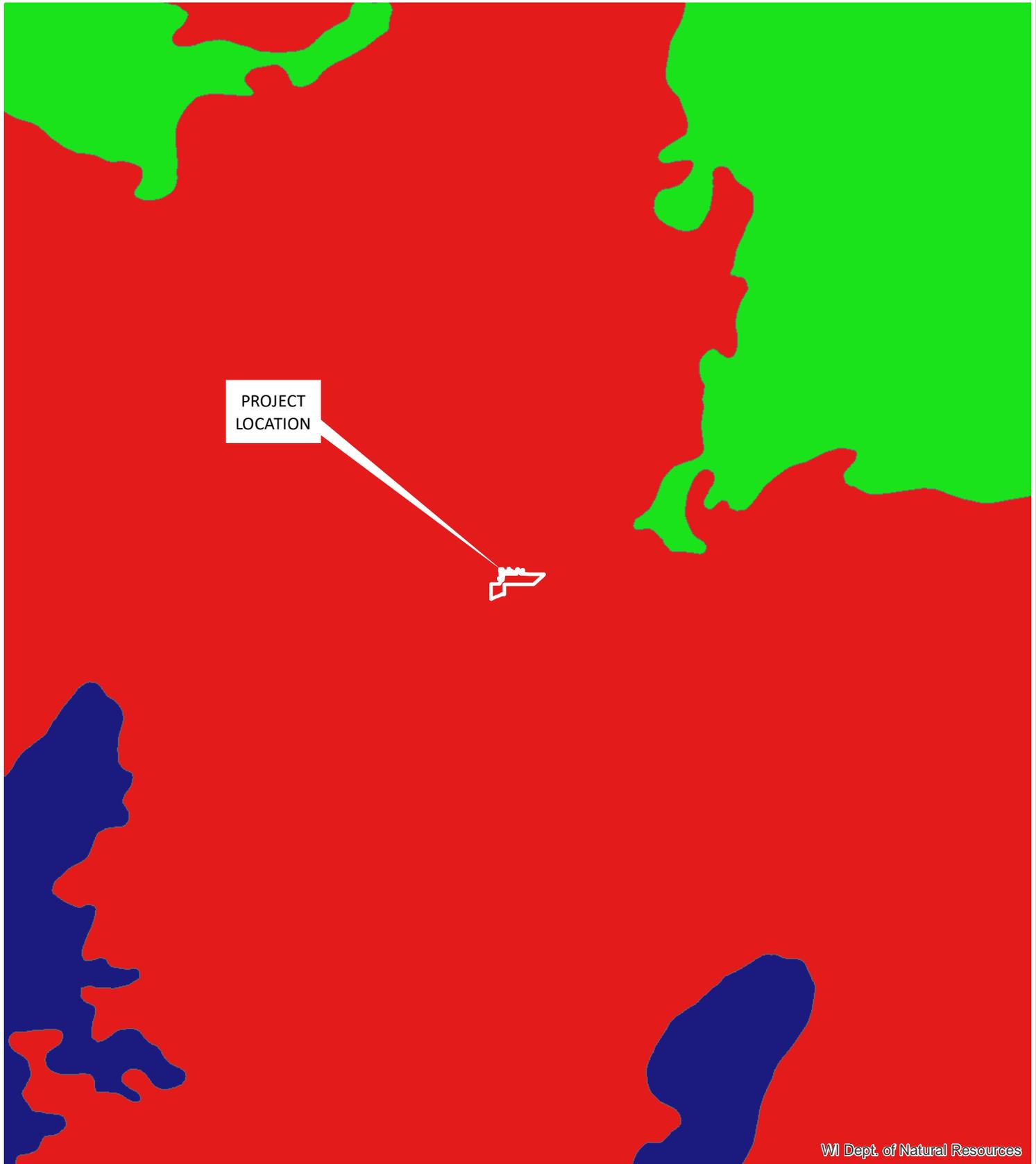
CODE	Species
AH	Ash
AL	Alder
BA	Black ash
BE	Beech
BI	Birch
BO	Burr oak
CE	Cedar
EL	Elm (undifferentiated)
HI	Hickory
IR	Ironwood
LI	Basswood, Linden
MA	Maple
PI	Pine (undifferentiated)
SM	Soft maple
TA	Tamarack, Larch
WA	White ash
WE	White elm
WI	Willow
WO	White oak
WP	White pine



**FIGURE 7**  
**1848 HISTORIC VEGETATION MAP**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

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WI Dept. of Natural Resources

**Ecological Landscapes**

-  Central Lake Michigan Coastal
-  Northern Lake Michigan Coastal
-  Southeast Glacial Plains

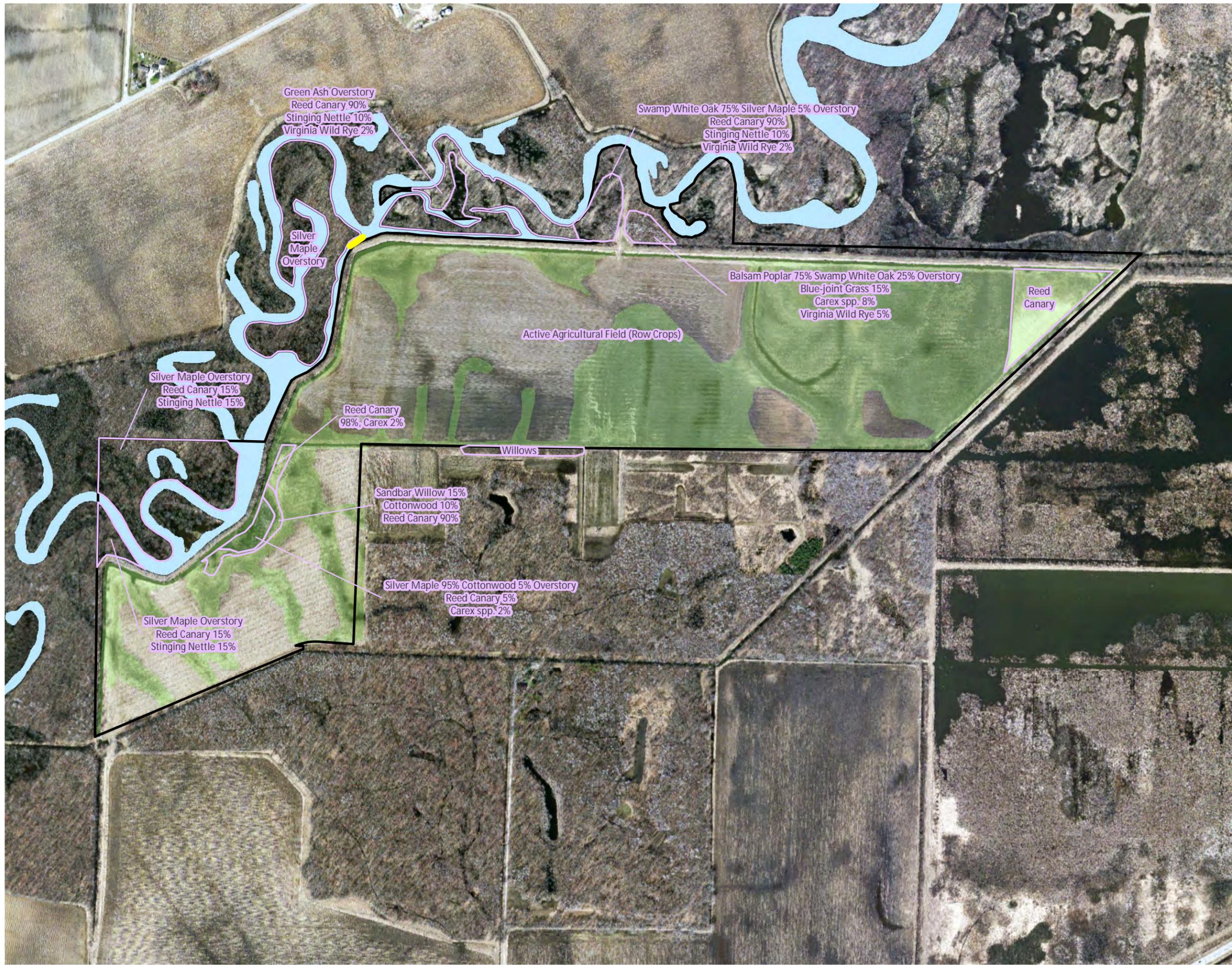
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1 inch = 3 miles



**FIGURE 8**  
**ECOLOGICAL LANDSCAPES**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN



**Mapped Features**

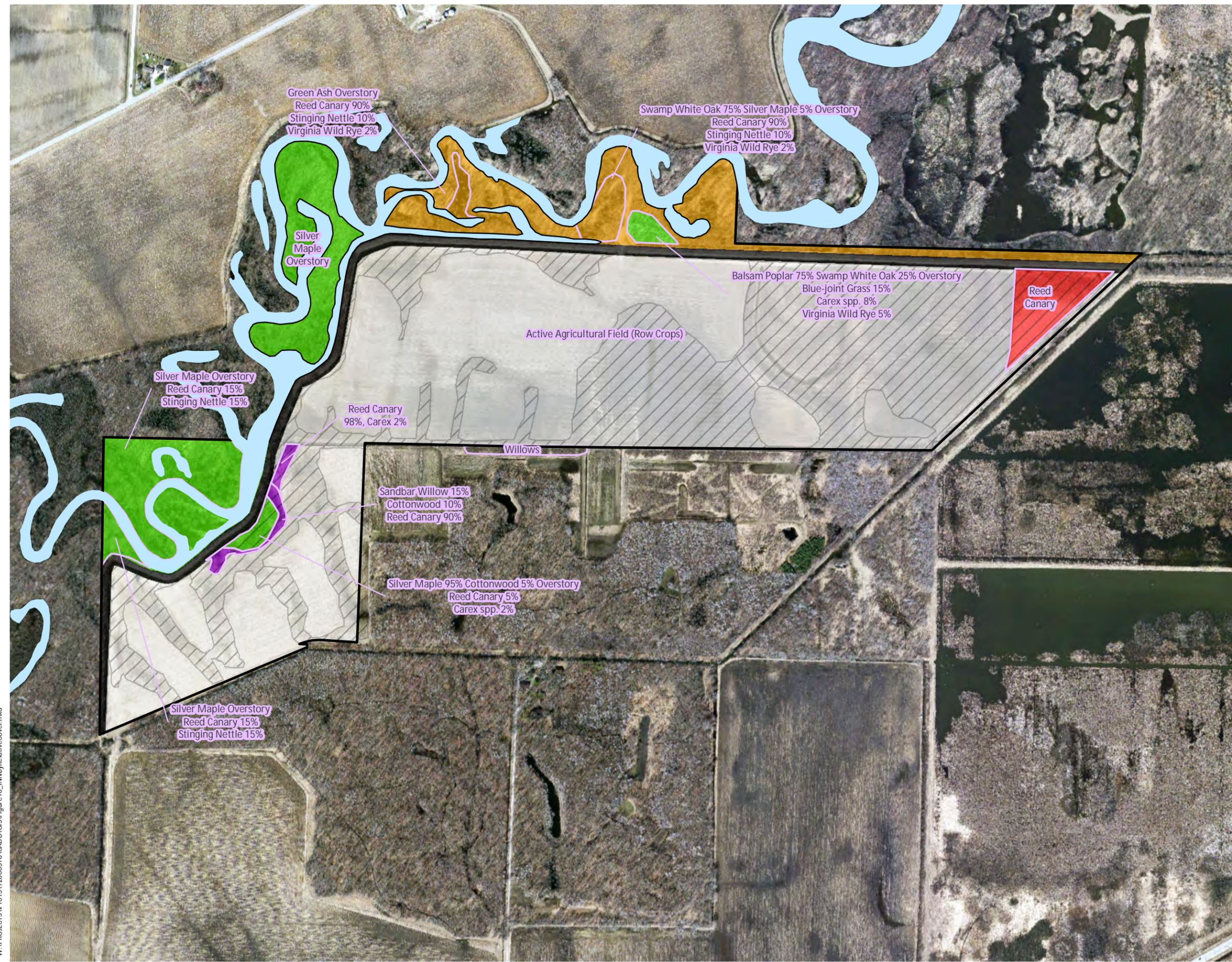
- Review Area (223.39 acres)
- Plant Community Extent
- Wetland Area
- Shioc River
- Proposed Channel Plug

Imagery: Outagamie County, 2021



**FIGURE 9**  
**EXISTING PLANT COMMUNITIES**  
**SHIOC RIVER WETLAND MITIGATION BANK**  
**TOWN OF BOVINA**  
**OUTAGAMIE COUNTY, WISCONSIN**

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**Mapped Features**

- Review Area (223.4 acres)
- Plant Community Extent
- Wetland Area
- Shioc River

**INN Species by Percent Relative Cover**

- <10% INN Species
- 10-25% INN Species
- 25-50% INN Species
- 50-75% INN Species
- 75-99% INN Species
- >99% INN Species
- Active Agricultural Land
- Berm/Open Water Ditch

Average Relative Cover INN Species: 19%  
(Excludes Active Agricultural Land, Berm, & Open Water Ditch)

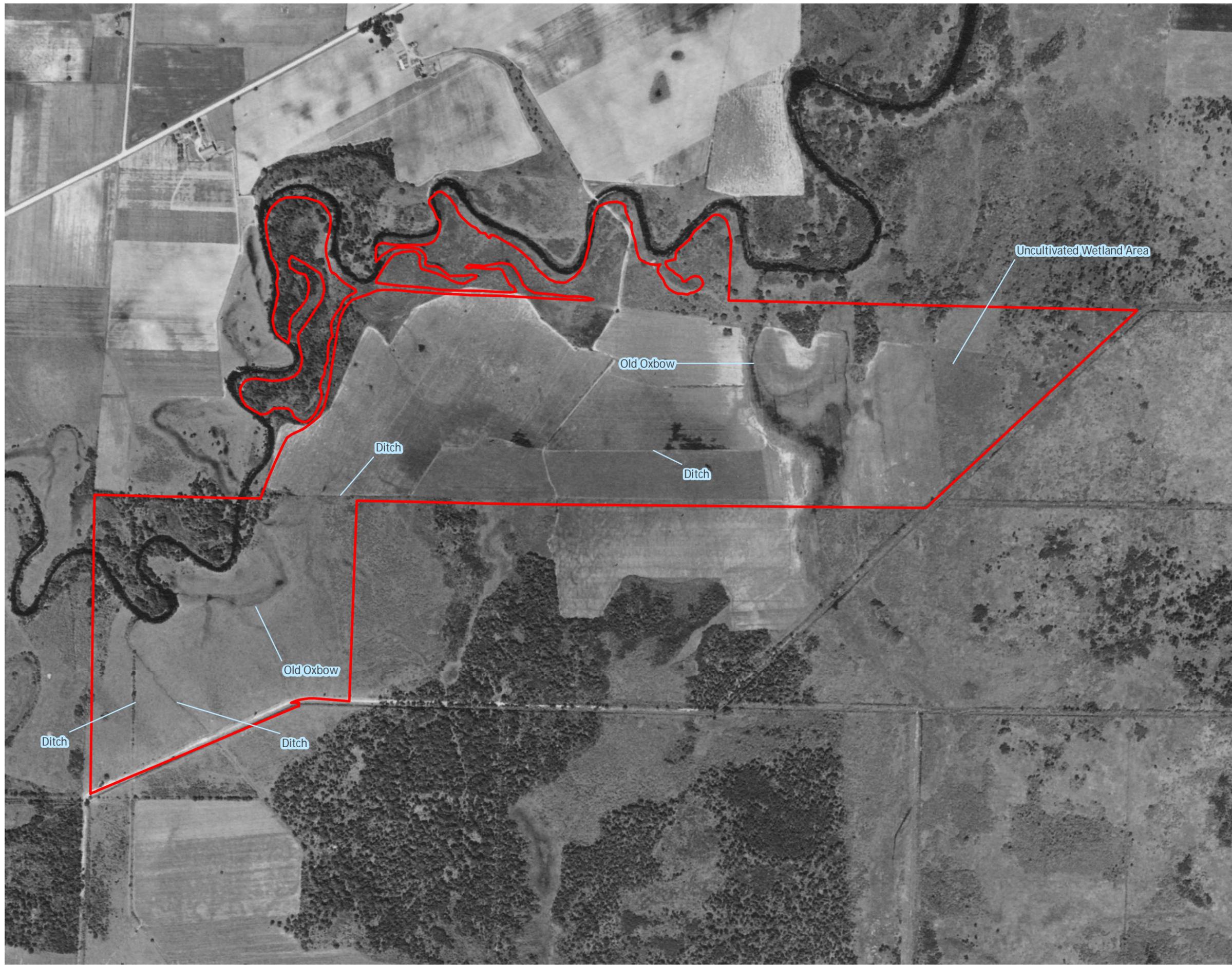
Imagery: Outagamie County, 2021

0 600 1,200 Feet

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**FIGURE 10**  
INVASIVE NON-NATIVE (INN) SPECIES  
BY PERCENT RELATIVE COVER  
SHIOC RIVER WETLAND MITIGATION BANK  
TOWN OF BOVINA  
OUTAGAMIE COUNTY, WISCONSIN

\\PROJECTS\1015\92000376\CADD\GIS\Figure10\_INNbyRelativeCover.mxd



Mapped Features

- Project Area (223.4 acres)

Imagery: Outagamie County, 1938



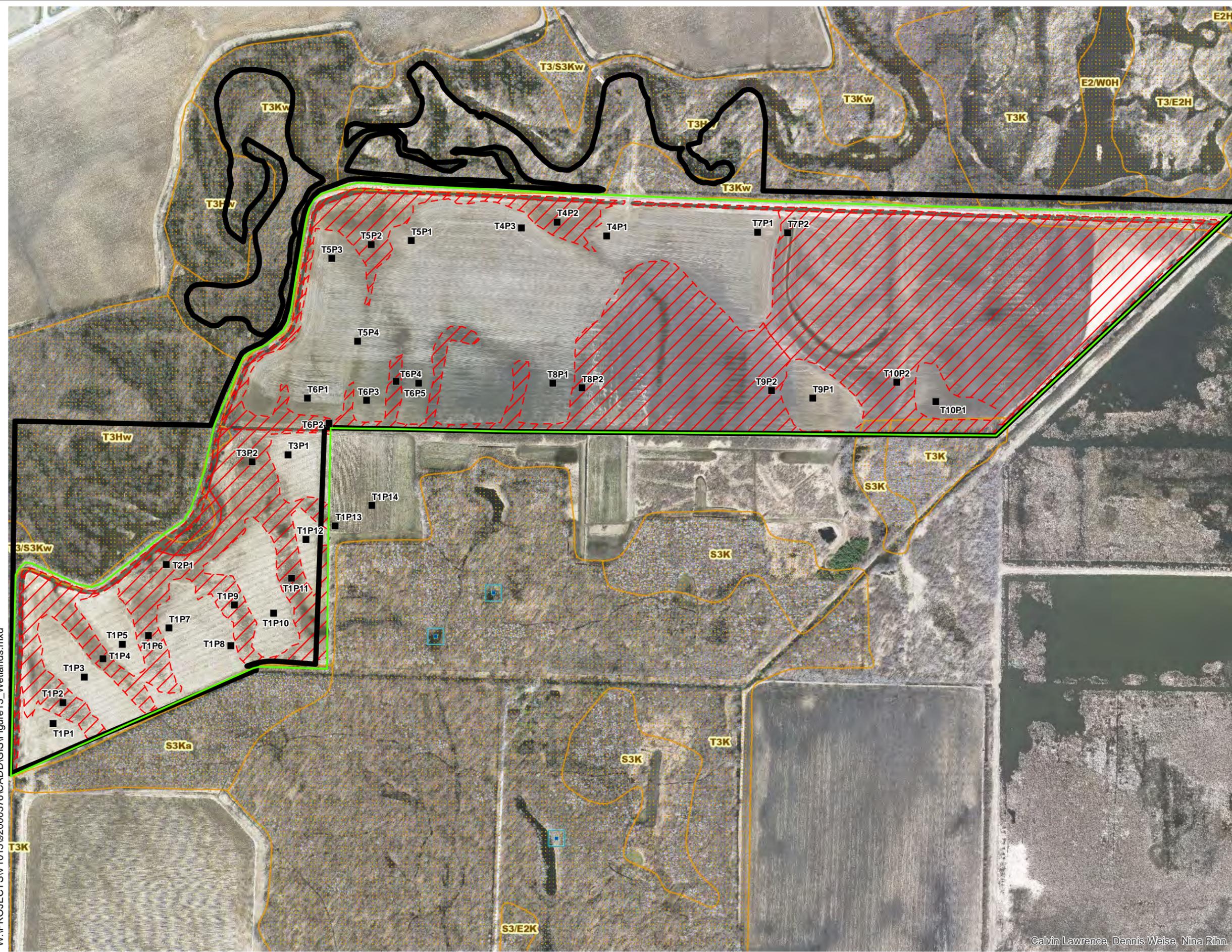
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 ENGINEERS ARCHITECTS  
 McMAHON ASSOCIATES, INC.

FIGURE 11  
 HISTORIC HYDROLOGY  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

W:\PROJECTS\101519\2000376\CADD\GIS\Figure9\_ExistingPlantCommunities.mxd



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**Mapped Features**

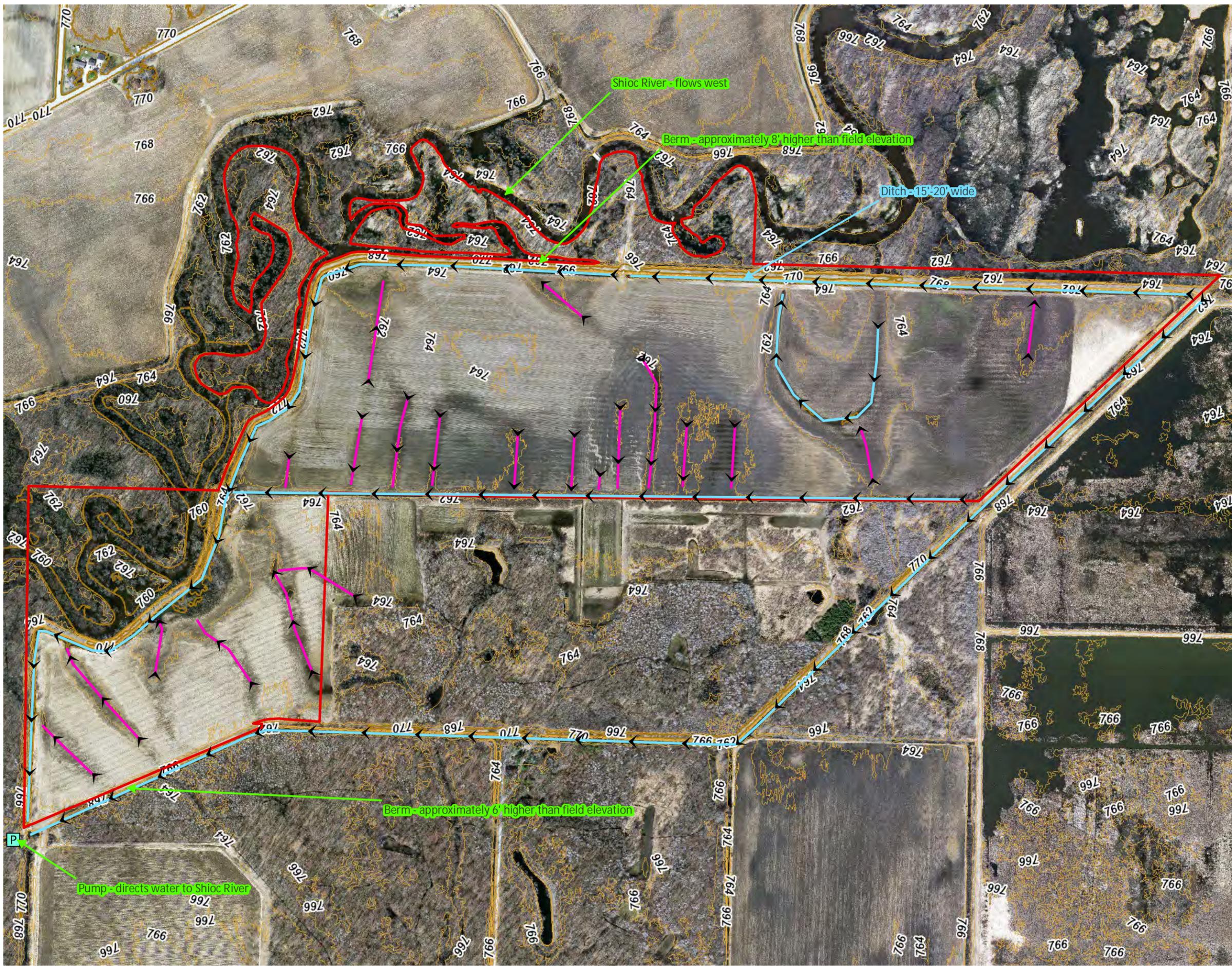
- Project Area (223.4 acres)
- Delineation Review Area (175 acres)
- Wetland Area - 96.92 acres  
McMahon 2020 Delineation
- WDNR Wetland Inventory
- T1P1  
Transect Line Number & Sample Point Number

Source: Outagamie County (2021 Imagery)



**FIGURE 13**  
**WETLAND DELINEATION MAP**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

Calvin Lawrence, Dennis Weise, Nina Rihn



**Mapped Features**

- Project Area (223.4 acres)

**Contours**

- Intermediate
- Index
- Depression

**Hydrology Features**

- Ditch
- Flow Path

Source: Outagamie County (2018 Contours)  
 Imagery: Outagamie County, 2021

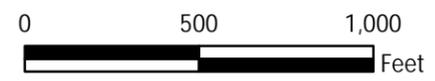
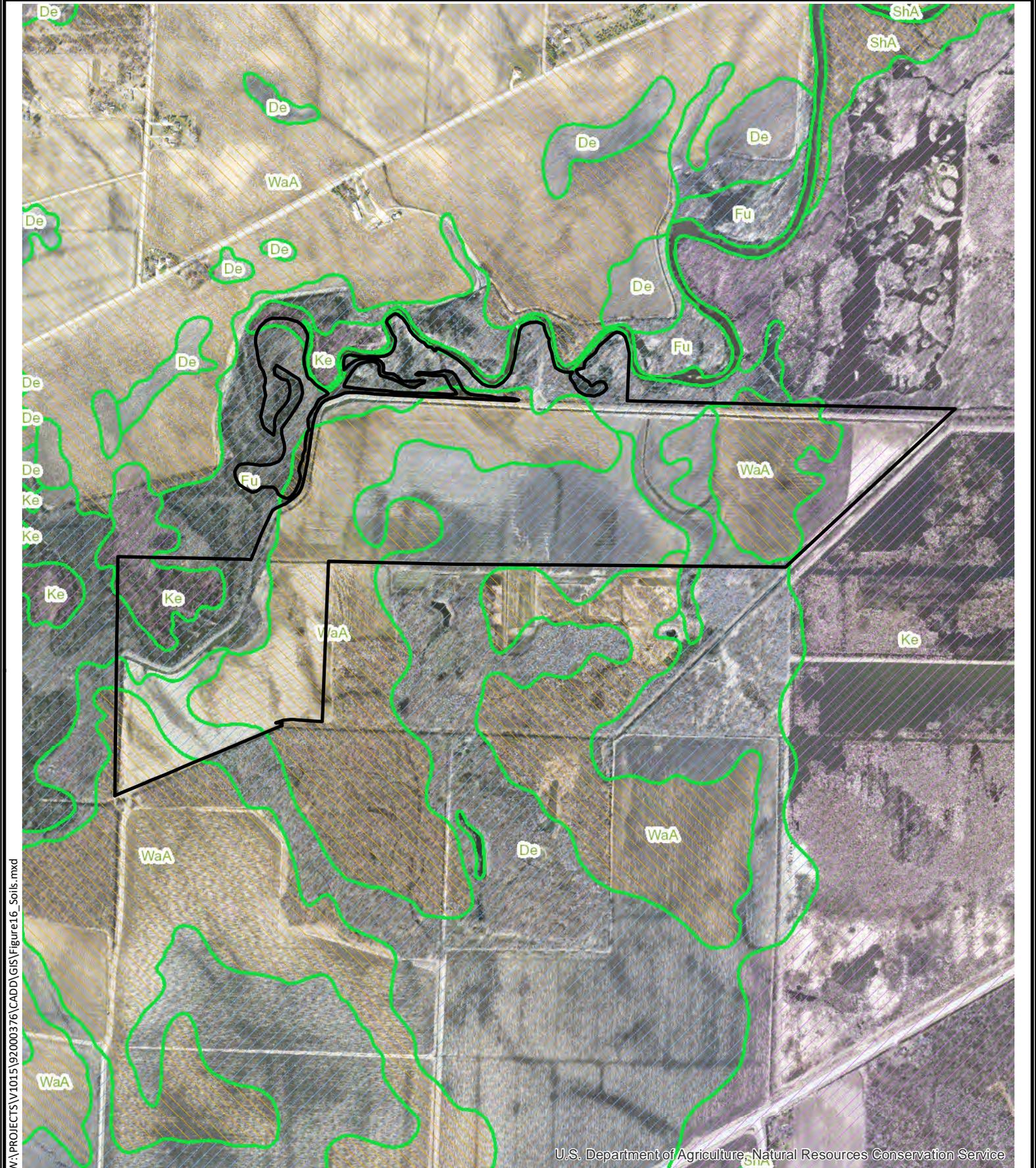


FIGURE 14  
 CURRENT HYDROLOGY INFRASTRUCTURE  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

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U.S. Department of Agriculture, Natural Resources Conservation Service

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**NRCS Soil Hydric Rating**

	Hydic
	Predominantly Hydic
	Partially Hydic
	Predominantly Non-Hydic

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1 inch = 1,000 feet



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**FIGURE 15**  
**HYDIC SOIL RATING**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

W:\PROJECTS\1015192000376\CADD\GIS\Figure16\_EstimatedFutureWetlands.mxd



**Mapped Features**

- Project Area (223.4 acres)
- Wetland Area - 97.26 acres  
McMahon 2020 Delineation
- Estimated Future Wetland Area based on Soil Indicators - 58.73 acres
- Wisconsin Wetland Inventory

**T1P1** ■ Transect Line Number & Sample Point Number

**USDA Soil Unit Boundary**

**Soil Notes**

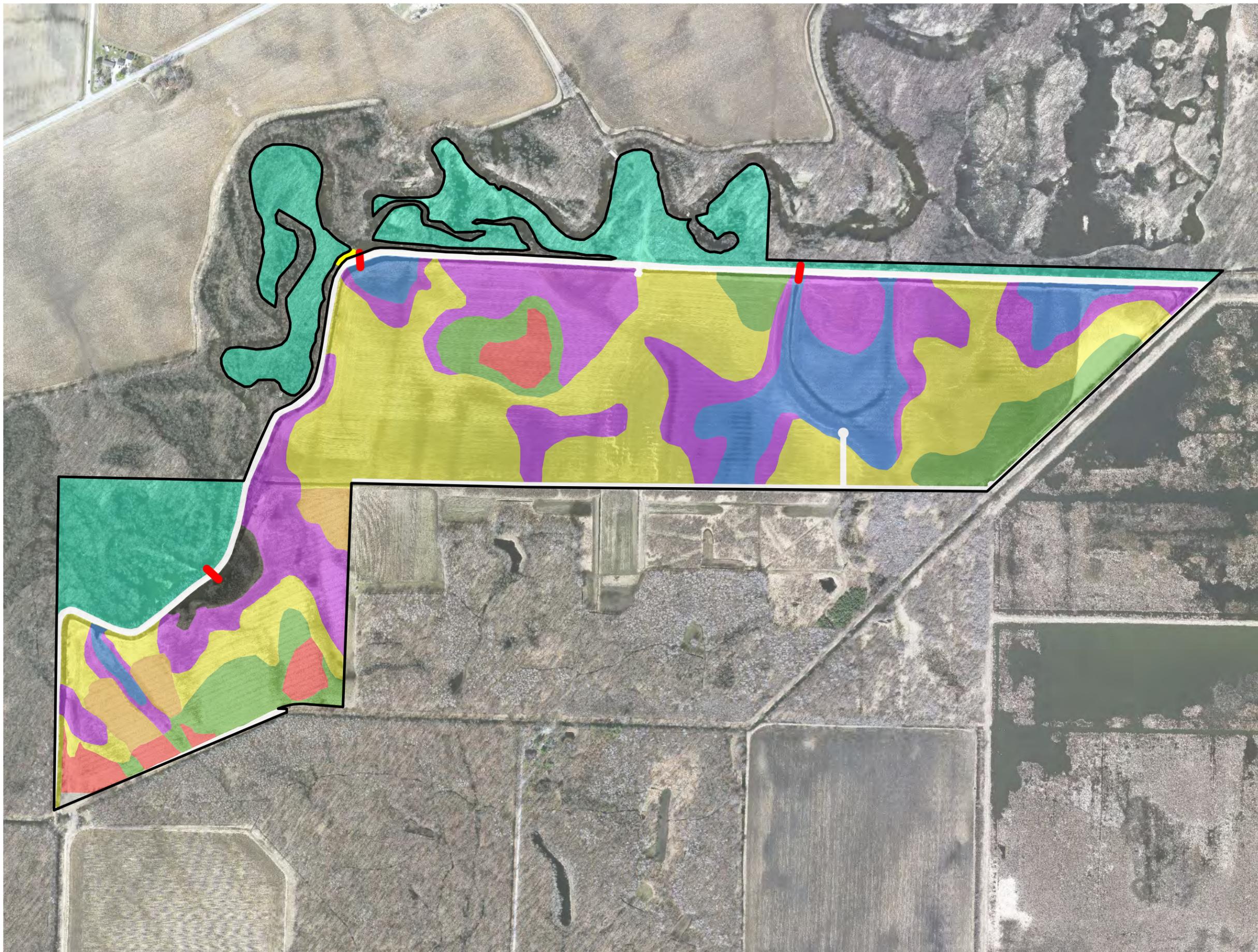
- Meets Hydric Soil Field Indicator
- Does Not Meet Hydric Soil Indicator - Reduced Soil or Redoximorphic Features Observed
- Does Not Meet Hydric Soil Indicator

Source: Outagamie County (2021 Imagery) USDA (Soils) Wisconsin Wetland Inventory (WDNR)



**FIGURE 16**  
**ESTIMATED FUTURE WETLAND AREAS**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

Calvin Lawrence, Dennis Weise, Nina Rihn



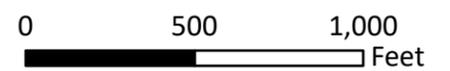
**Mapped Features**

- Project Area (223.39 acres)
- Proposed Culvert
- Proposed Channel Plug

**Proposed Community Type**

- Wet Meadow (68.55 acres)
- Shrub Carr (43.83 acres)
- Hardwood/Coniferous Swamp (19.34 acres)
- Shallow/Deep Marsh (19.24 acres)
- Upland Hardwood (6.46 acres)
- Mesic Prairie (5.34 acres)
- Floodplain Forest Enhancement (2.53 acres)
- Existing Forested Wetland Buffer (46.68 acres)
- Berm Buffer (11.22 acres)
- No Credit Area (0.20 acres)

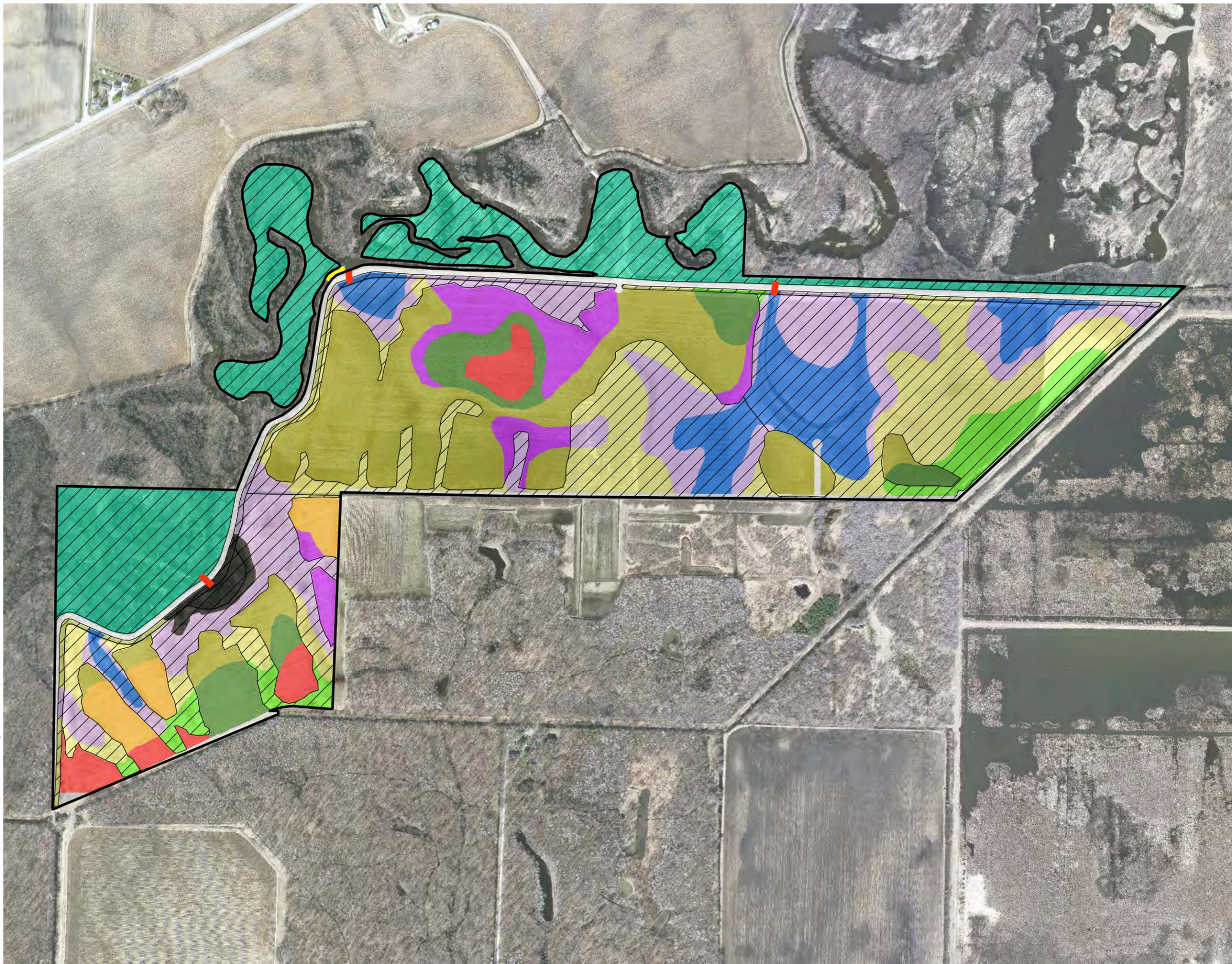
Source: Outagamie County (2021 Imagery)



**FIGURE 17**  
**PROPOSED PLANT COMMUNITIES**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

Path: W:\PROJECTS\1015\92000376\CADD\GIS\VorlandSurfaceWater\VorlandSurfaceWater.aprx

W:\PROJECTS\1015192000376\CADD\GIS\Figure18\_ProposedPlantCommunities\_establishmentype.mxd 12.13.23



**Mapped Features**

- Project Area - 223.39 acres
- Existing Wetlands
- Proposed Culvert
- Proposed Channel Plug

**Proposed Community Type**

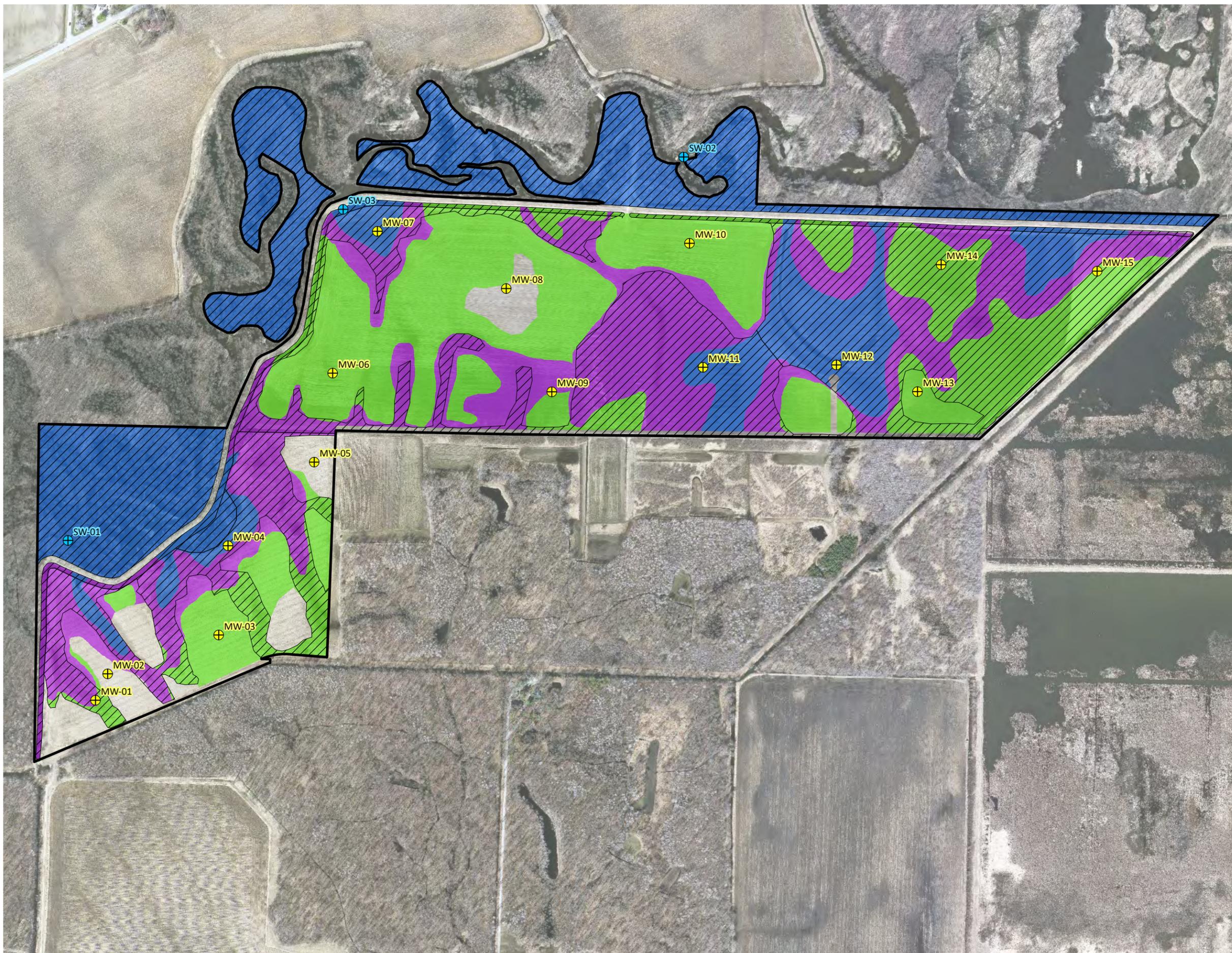
- Re-establishment - Wet Meadow (36.83 acres)
- Rehabilitation - Wet Meadow (31.72 acres)
- Re-establishment - Shrub Carr (10.78 acres)
- Rehabilitation - Shrub Carr (33.05 acres)
- Re-establishment - Hardwood/Coniferous Swamp (10.84 acres)
- Rehabilitation - Hardwood/Coniferous Swamp (8.50 acres)
- Rehabilitation - Shallow/Deep Marsh (19.24 acres)
- Upland Hardwoods (6.46 acres)
- Mesic Prairie (5.34 acres)
- Floodplain Forest Enhancement (2.53 acres)
- Existing Forested Wetland Buffer (46.68 acres)
- Berm (11.22 acres)
- No Credit Area (0.20 acres)

Imagery: Outagamie County, 2021



**FIGURE 18**  
**PROPOSED PLANT COMMUNITIES**  
**BY RESTORATION TYPE**  
**SHIOC RIVER WETLAND MITIGATION BANK**  
**TOWN OF BOVINA**  
**OUTAGAMIE COUNTY, WISCONSIN**

Path: W:\PROJECTS\1015\92000376\CADD\GIS\VorlandSurfaceWater\VorlandSurfaceWater.aprx



**Mapped Features**

— Project Area (223.4 acres)

Existing Wetlands

**Anticipated Water Levels**

Saturated

0-6 Inches Below Grade

6-12 Inches Below Grade

Monitoring Well

Surface Water

Monitoring Point

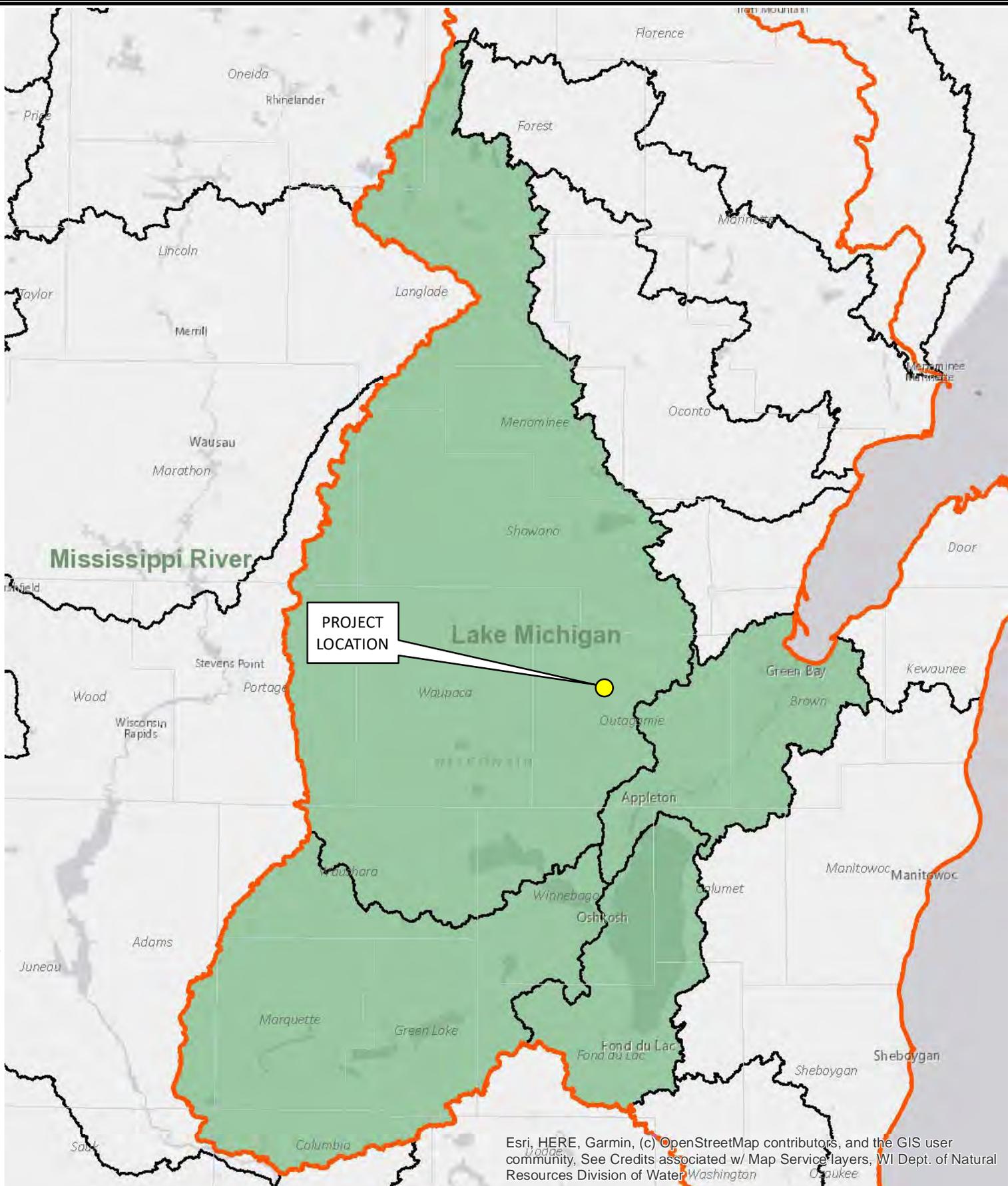
Source: Outagamie County (2021 Imagery)



0 500 1,000 Feet

**McMAHON**  
ENGINEERS ARCHITECTS  
McMAHON ASSOCIATES, INC.

**FIGURE 19**  
**ANTICIPATED WATER LEVELS**  
SHIOC RIVER WETLAND MITIGATION BANK  
TOWN OF BOVINA  
OUTAGAMIE COUNTY, WISCONSIN



PROJECT LOCATION

Lake Michigan

W:\PROJECTS\VI\015192000376\CADD\GIS\Figure20\_ServiceArea.mxd

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-  Major Basins
-  Fox Bank Service Area
-  HUC-8 Boundaries
-  County Boundary

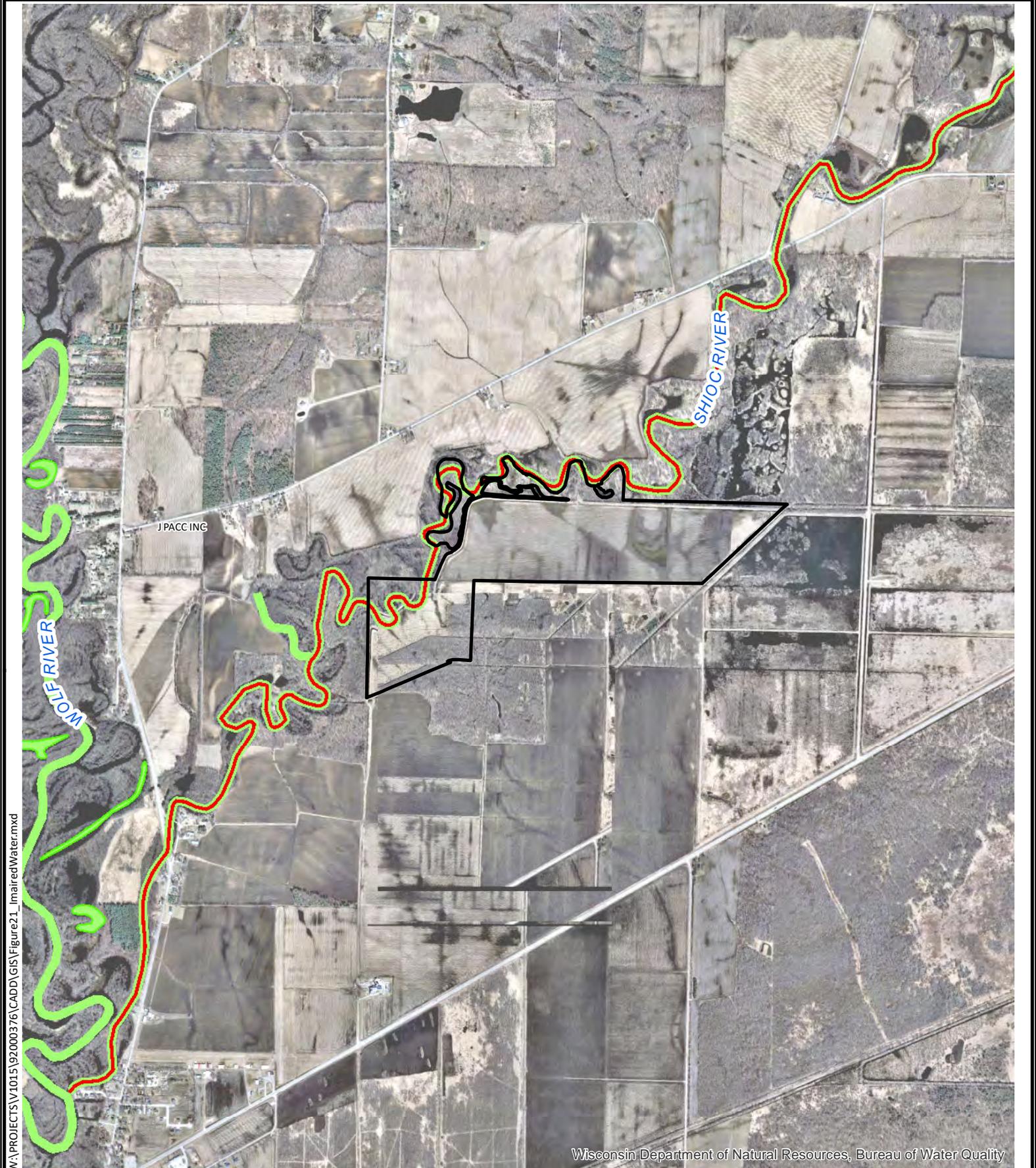
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1 inch = 17 miles



**FIGURE 20**  
**BANK SERVICE AREA**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN



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Wisconsin Department of Natural Resources, Bureau of Water Quality

**Mapped Features**

-  Impaired Rivers & Streams
-  Project Area
-  WADRS Assessment Unit Lines

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 1 inch = 2,000 feet  
**McMAHON**  
 ENGINEERS ARCHITECTS  
 McMAHON ASSOCIATES, INC.

**FIGURE 21**  
**IMPAIRED RIVERS**  
 SHIOC RIVER WETLAND MITIGATION BANK  
 TOWN OF BOVINA  
 OUTAGAMIE COUNTY, WISCONSIN

APPENDIX A

---

McMahon Associates, Inc. Resumes

# STUART A. BOERST, P.S.S., P.H.

Associate / Senior Ecologist

## NATIVE PRAIRIE/WETLAND DESIGNS & LONG TERM NATIVE VEGETATION MANAGEMENT:

Allouez, WI

Ariens Company, Brillion WI

Buchanan, WI

Garners Creek Storm Water Utility, WI

Green Bay, WI

Greenville, WI

Harrison, WI

Kaukauna, WI

Kimberly, WI

Lawrence, WI

Little Chute, WI

Manitowoc, WI

Neenah, WI

Oshkosh, WI

Sherwood, WI

Two Rivers, WI

Various Developers - Many Other Projects

## WETLAND COMPENSATORY MITIGATION PROJECTS:

Belgium, WI - Belgium Park

Garner's Creek Storm Water Utility, WI

Van's Road Detention Pond

Springfield Reforestation Project

Kaukauna, WI - Horseshoe Pond, Fish Spawning Area, and Stream Restoration

Little Chute, WI - Three Pond Systems

Rozelle Properties, Inc., Greenville, WI

Seymour, WI - Industrial Park

Shawano County Highway Department - 20 Acre Wetland Mitigation Bank

Various Developers - Other Projects

## WETLAND DELINEATION (MAPPING):

(OVER 140 PROPERTIES)

Brillion, WI - Brillion Business Park

Buchanan, WI - College Park Development

Greenville, WI - Green Ridge Bluff

Hillcrest Homes Development Property - De Pere, WI

Kaukauna, WI - Cedar Ridge Estates

Mackville, WI - Mackville Crossing Subdivision

Neenah, WI - Liberty Heights Subdivision

Seymour, WI - Seymour Industrial Park

Sheboygan Falls, WI - Covington Heights Subdivision

Vandenbroek, WI - Meadow Creek Subdivision

## INVASIVE/EXOTIC SPECIES CONTROL:

Develop Invasive / Exotic Species Control Management Plans for Prairies, Savannas, Woodlands & Wetlands

Manage Invasive / Exotic Species Control on Numerous Public & Private Sector Properties



## Specialized Competence:

Wetland Delineation & Mitigation  
Wetland Design & Management  
Wetland Water Quality Certification  
Prairie Design & Management  
Endangered Species Assessments  
Ecological Assessments/Plans  
Invasive/Exotic Species Control  
Native Landscape Plans  
Long Term Native Vegetation Management  
Stormwater Pond Maintenance,  
Monitoring, & Management  
Wetland Functional Value Assessments  
Brownfields Redevelopment  
Soil Evaluations For Stormwater  
Infiltration  
Phase I, II & III Environmental Assessments

## Academic Background:

B.S., UW-Stevens Point;  
Major: Resource Mgmt., Minor: Soil  
Science  
Additional Course Work:  
Graduate Course, Glacial Geology –  
UW-Green Bay  
Numerous Geology & Hydrogeology  
Courses - UW-Oshkosh

## Certifications & Training:

38-Hour Wetland Delineation Training;  
2003  
OSHA - 40-Hour Hazardous Waste  
Training;  
1990 & Annual Refresher Courses  
Wisconsin Certified Site Assessor (#42053)

## Professional Affiliations:

National Groundwater Association  
Wisconsin Wetland Association

## Professional Registrations:

Professional Soil Scientist  
Wisconsin (PSS-9)  
Professional Hydrologist  
Wisconsin (PH-28)

# STUART A. BOERST, P.S.S., P.H.

## PHASE I / PHASE II ENVIRONMENTAL SITE ASSESSMENTS:

(OVER 150 SITES)

Allouez, WI - Town Hall  
Brillion Cooperative Vocational School, Brillion, WI  
Foremost Farms, Abbotsford, WI  
High Cliff Golf Course, Sherwood, WI  
Keller Structures, Greenville, WI  
Kennecott Mining Corporation, MI - 22 Sites  
Palisades Properties - Menasha, WI  
Pierce Manufacturing, Inc., Appleton, WI  
Sherwood Sales & Service, Sherwood, WI  
Valley Fair Mall, Appleton, WI

## SITE INVESTIGATIONS & REMEDIATIONS (SOIL & GROUNDWATER):

(OVER 130 SITES)

Foremost Farms, Madison, WI  
Joe's Power Center - Kimberly, WI  
Kaukauna Utilities, Kaukauna, WI  
Tombstone Pizza, Medford, WI  
Associated Milk Producers, Inc. (AMPI), De Pere, WI - Natural Attenuation  
Bend Industries, Appleton, WI - Excavation, Biosite Treatment, Natural Attenuation  
Combined Locks, WI - Municipal Garage / Natural Attenuation  
Foremost Farms, Madison, WI - Excavation & Thermal Desorption  
Fox Valley Truck Service, Appleton, WI - Soil Excavation, Biosite Treatment  
Heart of the Valley Metropolitan Sewerage District, Kaukauna, WI - Excavation, Landspreading, Biosite Treatment, Natural Attenuation  
Kewaunee, WI - Soil Excavation & Landfill Disposal  
Kocken (Edward), De Pere, WI - Air Sparging, Soil Vapor Extraction & Groundwater Extraction  
Lomira, WI - Municipal Building / Soil Excavation & Landfill Disposal  
Menasha Utilities, Menasha, WI - Soil Excavation, Landspreading, Natural Attenuation  
Milwaukee Metropolitan Area - Several Properties  
Rondelle Foods, Merrill, WI - Soil Excavation & Landspreading

## OTHER PROFESSIONAL EXPERIENCE:

### Prairie Design & Management:

Completed many native prairie designs for both public and private sector clients on many different ecological landscapes. Provide long-term management of prairies for various clients to maximize the ecological and aesthetic quality.

### Wetland Design & Management:

Completed many native and wetland plant designs for public and private sector clients. Provide ecological consulting to maintain the high aesthetic and ecological values of the wetlands.

### Wetland Determinations & Delineations:

Completed over 100 wetland determinations and delineations in accordance with Wisconsin DNR Guidelines and the 1987 U.S. Army Corps of Engineers' Manual & Memorandum Updates.

### Invasive Species Control:

Developed invasive species control management plans for public and private sector properties. Managed implementation and quality control of invasive species control field activities.

# STUART A. BOERST, P.S.S., P.H.

## OTHER PROFESSIONAL EXPERIENCE:

### Endangered Species Assessments:

Conducted surveys on various properties to determine the presence of endangered plant species.

### Soil Site Evaluations for Stormwater Infiltration:

Completed soil evaluations for stormwater infiltration at over 80 properties in accordance with Chapter NR 151.12 and DNR Technical Standard 1002.

### Superfund Remediation System Operation & Maintenance - N.W. Mauthe Property, Appleton, WI

Project Manager for operation and maintenance of a hexavalent chromium groundwater remediation system at the N.W. Mauthe Superfund property, Appleton, WI.

### Recreational Trail Siting & Permitting:

Evaluated wetland and upland ecological conditions on the Ariens Company Property, Brillion, WI to determine the best location of a 1.5 mile Mike Ariens Recreational Trail. The trail was located in an area that represented the least amount of wetland impacts and maximized the trail users experience to the highest diversity of ecological landscapes. Designed wetland crossings and obtained the necessary Wisconsin DNR and U.S. Army Corps of Engineers permits. Plan to design native prairie vegetation along the trail to enhance wildlife, water quality and aesthetic components to the area.

### Industrial Property - Fond du Lac, WI

Project Manager for property that is entered into the Wisconsin DNR Voluntary Party Liability Exemption (VPLE) program. Performed historical land use and operations research and a soil and groundwater monitoring program. Successfully negotiated the end-point criteria with the Wisconsin DNR for case closure and obtaining a Certificate of Closure (COC).

### Industrial Property - Beaver Dam, WI

Conducted a soil investigation to determine the nature and extent of soil contamination within the sub-grade construction zone. Coordinated the proper management of arsenic and coal-tar contaminated soil.

Belgium, WI - Completed a sediment and soil assessment beneath a tributary to Belgium Creek to determine the magnitude of chromium contamination.

### Industrial Property - Brakebush Brothers, Inc., Montello, WI

Managed the installation of a groundwater quality monitoring well network to monitor the potential affects from a wastewater spray irrigation system.

### Hazardous Waste Investigation & Remediation - Appleton, WI

Defined the extent chlorinated solvents in the soil and groundwater. The solvents were classified as a listed hazardous waste. Remediation involved disposing of contaminated soil at the Peoria Disposal Company Landfill, Peoria, Illinois and long-term groundwater monitoring.

### Rondele Foods - Merrill, WI

Evaluated the groundwater data to determine if a lagoon system was the source of elevated chloride concentrations in the groundwater or if the cause was from other potential sources.

### Groundwater Quality Study - Two Rivers, WI

Assessed the groundwater quality on property adjacent to a landfill. The property was contaminated from potential releases from the landfill.

# NICHOLAS A. VANDE HEY, P.E., CPESC

Vice President / Senior Municipal & Water Resources Engineer

## STORMWATER PLANNING & EVALUATIONS:

Belgium (Village of), WI - Belgium-Holland, Sucker Creek, & Sauk Creek Watersheds  
Kaukauna (City of), WI - Apple Creek, Kankapot Creek & Fox River Watersheds  
Lawrence (Town of), WI - Apple, Ashwaubenon & Dutchmans Creek Watersheds  
Oshkosh (City of), WI - Glatz Creek Watershed  
Seymour (City of), WI - Black Creek & Little Henry Creek Watersheds  
Sturgeon Bay (City of), WI - Little Creek Watershed

## STORMWATER QUALITY FACILITIES:

Allouez (Village of), WI - Longview Wet Detention Pond  
Garners Creek Stormwater Utility, WI - State Park Court Wetland System  
Greenville (Town of), WI - Route 15 Biofiltration & Dry Detention System  
Green Bay (City of), WI - McKenzie Wet Detention Pond  
Manitowoc (City of), WI - South 30<sup>th</sup> Street Wet Detention Pond  
McLean, VA - Underground Sand Filter, McLean Square Shopping Center

## STORMWATER VOLUME:

Mole Lake, WI - Bioretention System, Casino & Tribal Office  
Shawano (City of), WI - Infiltration Basin & Bioretention, ThedaCare Hospital  
Sherwood (Village of), WI - Hydrologic Water Balance for Degraded Wetland System  
Sun Prairie (City of), WI - Underground Infiltration System & Bioretention, Copsps Store

## STREAM CORRIDOR RESTORATION:

Garners Creek Stormwater Utility, WI - Various Stream Corridor Projects  
Grand Chute (Town of), WI - Stream Enhancement Project  
Little Chute (Village of), WI - Various Stream Corridor Projects  
Sherwood (Village of), WI - Miller & Nuthatch Stream Corridor Restoration

## STORMWATER COLLECTION:

Belgium (Village of), WI - Hydrologic & Hydraulic Analysis for Interceptor System  
Cedar Grove (Village of), WI - STH '32' / North Main Street Storm Sewer Interceptor  
Kaukauna (City of), WI - Hydrologic & Hydraulic Analysis for Kankapot Storm Sewers  
Little Chute (Village of), WI - Florida Avenue & STH '96' Storm Sewer Reconstruction  
Seymour (City of), WI - Hydrologic & Hydraulic Analysis for Interceptor System  
Wrightstown (Village of), WI - CTH 'DD' / Broadway Street Storm Sewer Interceptor

## FLOOD CONTROL FACILITIES & 100-YEAR FLOODPLAINS:

Brillion (City of), WI - Spring Creek 100-Year Floodplain & Dam Structures  
Chilton (City of), WI - Irish Road Bridge, South Branch Manitowoc River  
Garners Creek Stormwater Utility, WI - Heartland Flood Control Facility  
Kimberly (Village of), WI - Sunset Park Pedestrian Bridge, Fox River Tributary  
Little Chute (Village of), WI - Industrial Flood Control Facility & Pump Station  
Menasha (Town of), WI - Cold Spring Road Bridge, Lake Winnebago Tributary

## Specialized Competence:

Stormwater Planning & Evaluation  
Design, Bidding & Construction  
Floodplain & Water Surface Profile Analysis  
(HEC-1, TR-55, HEC-2, HEC-RAS, TR-20, HEC HMS, SWMM)  
Hydraulic Analysis of Sewer Systems  
(Hydraflow, XP-Rat, StormCAD, SWMM)  
Stormwater Quality & BMP Facilities  
(SLAMM, P8, SWAT, Pondpack, SWMM)  
Erosion Control, Grading & Drainage

## Academic Background:

B.S. - Civil & Environmental Engineering -  
University of Wisconsin-Madison  
Sand Filter Design - Engineers & Surveyors  
Institute  
Adequate Stormwater Outfall - Engineers &  
Surveyors Institute  
HEC-1 Modeling Workshop  
Hydraulic Design of Culverts  
HEC-HMS Modeling Workshop  
Organizing & Financing Stormwater Utilities  
Creating & Using Wetlands for Wastewater  
& Stormwater Treatment & Water Quality  
Improvement  
Wisconsin Wetland Workshop  
SWMM Modeling Workshop  
Designing Bio/Infiltration BMP's for  
Stormwater Quality Improvement

## Professional Affiliations:

American Society of Civil Engineers  
Fox-Wolf Watershed Alliance  
Northeast Wisconsin Stormwater  
Consortium

## Professional Registration:

Professional Engineer:  
State of Wisconsin  
State of Illinois  
Certified Professional in Erosion and  
Sediment Control

APPENDIX B

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Jim Vorland Bank Sponsor Resume

My name is Jim Vorland, I am 69 years old, and live in Neenah, WI. I have a Bachelor of Science degree from UW Stevens Point, graduating in 1973.

My love affair with the outdoors started in my early teens, when I worked for the summer on a nearby farm. The farm had everything a young boy could want to explore: a river, woods, hills and valleys. On this farm, the owner cared for the land and all the animals and critters that called it home. This farm work instilled a passion in me to some day own my own land. It became an obsession.

It took years of work, but I have put together three different parcels that I manage for trees, water, crops and hunting.

Area 1 is 36 acres just outside Neenah, WI, managed since 1985 as crop land.

Area 2 is 200 acres outside Wallace, MI, managed since 2014 for red pine, food plots and hunting.

Area 3 is 414 acres outside Shiocton WI. This land has been in MFL since 1981. Six cuttings have taken place since the first purchase. Hunting and 18 food plots are managed there. Part of this land will be used for the Shioc River Mitigation Bank.

### Teaching

I was an educator in the Neenah Joint School District from 1973 to 1990. Teaching students is a passion of mine. I intend to use the newly constructed Mitigation Bank as an outdoor school. At our newly built Outdoor Education Center, kids will be taught hunter's education, trapping and animal recognition. Only so much can be learned in the classroom. I intend to bus students, along with mentors, to the mitigation site to learn and observe nature from two observation peninsulas in the heart of the project. Students will pay no fees to experience this unique classroom.

Additional benefits of the mitigation site will be to filter water from the Shioc River, to provide an area to aid water storage during spring run-off, and also assist various birds during nesting activities.

It is our intention to make this project a legacy for the Vorland family.

### Recent Philanthropy by the Vorland Family:

Building for the Colby Community Library - \$500,000  
Extend parking lot for Colby Community Library - \$ 50,000  
An endowment has been established for yearly maintenance.

Town of Mellen, MI Fire Department All-Terrain Vehicle - \$100,000

Shiocton Outdoor Education Center (Shadows On the Wolf) – Building - \$250,000  
- Parking Lot - \$25,000  
- Indoor Decor - \$10,000

Shiocton Public School Wrestling Program Weight Room and Mats - \$150,000

### Additional Information:

Jim Vorland holds a Bachelor of Science Degree from the University of Wisconsin-Stevens Point. Mr. Vorland is a retired educator of the Neenah Joint School District, he owned and operated Southside Storage from 1990 to 2002 and he retired as Vice-Chairman of the Board of Directors of CONE Credit Union in Neenah on which he served for twelve years. Mr. Vorland is currently President of J-PaCC Inc., a mitigation bank company. Mr. Vorland has been a director of the Thiele Kaolin Company since February 2014, was previously a director of the Company from 2001 to April 2011, and currently serves on the Board's Compensation Committee.

### Contact Information:

James Vorland  
495 County Road G  
Neenah, WI 54956

Home phone – 920-722-2309  
Cell phone - 920-841-2460

APPENDIX C

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Adjacent Property Owners & Addresses

Parcel ID	Owner Name	Mailing Address	Mailing Address 2	City State Zip
20021101	FIELDING, GENE & JANIC	W7417 COUNTY RD P		SHIOCTON, WI 54170
20022803	GEHRING FAMILY TRUST	C/O SHEILA OMHOLT	W7281 COUNTY RD P	SHIOCTON, WI 54170
20024300	MUNGER, GORDON D	N3722 COUNTY RD EE		APPLETON, WI 54913
20023201	SHIOC RIVER CLUB	%ROD BURR	2275 HENRY ST	NEENAH, WI 54956
20030200	STATE WI DEPT NATL RESOURCES	PO BOX 28080		GREEN BAY, WI 54324
20033700	TACKMAN, JUDITH J	N5357 PLUGER RD		SHIOCTON, WI 54170

Shioc River Impairment Information

**Impaired Water - Shioct River (Shioct River)**

[Return to Search](#)

**Location** Outagamie, Shawano County, Wisconsin

**Watersheds** WR13

**Waterbody ID Code** 316800 [View Water Details](#)

**Stream Miles** 0.00 - 27.96

**Lake Acres** 27.96

**Water Condition** Water is impaired due to one or more pollutants and associated quality impacts.

**Notes** This water was assessed during the 2012 listing cycle and results indicate that the fish and aquatic life use is not supported. This water was assessed during the 2014 listing cycle; total phosphorus sample data overwhelmingly exceed 2014 WisCALM listing thresholds for the Fish and Aquatic Life use, however, no biological data (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scores) were available to assess biological impairment.

This water was assessed during the 2016 listing cycle; total phosphorus sample data overwhelmingly exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category).

This water was assessed during the 2018 listing cycle; new total phosphorus sample data exceed 2018 WisCALM listing criteria for the Fish and Aquatic Life use, however, available chloride and biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category).

This water is covered by the Upper Fox & Wolf River Basins TMDL, approved by the US EPA on February 27, 2020

Listing Details

Pollutant	Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	2012-902	Listed For	Fish and Aquatic Life
<b>Impairments</b>						<b>Current Use</b>	WWSF - Warmwater Sport Fishery
<b>Listing Status</b>						<b>Attainable Use</b>	WWSF - Warmwater Sport Fishery
<b>Priority</b>						<b>Designated Use</b>	WWSF - Warmwater Sport Fishery
<b>303(d) ID</b>						<b>Listing Date</b>	4/1/2012

**Impaired Water Notes**

This water was assessed during the 2012 listing cycle, and total phosphorus sample data overwhelmingly exceed listing criteria (i.e. two times the applicable criterion) for the fish and aquatic life use.

**Date**

2/27/2013

**Impaired Water Notes**

This water was assessed during the 2014 listing cycle; total phosphorus sample data overwhelmingly exceed 2014 WisCALM listing thresholds for the Fish and Aquatic Life use, however, no biological data (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scores) were available to assess biological impairment).

**Date**

2/27/2014

**Impaired Water Notes**

This water was assessed during the 2016 listing cycle; total phosphorus sample data overwhelmingly exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category).

**Date**

9/23/2015

**Impaired Water Notes**

This water is covered by the Upper Fox & Wolf River Basins TMDL, approved by the US EPA on February 27, 2020

**Date**

3/3/2020

---

The Official Internet site for the Wisconsin Department of Natural Resources  
101 S. Webster Street . PO Box 7921 . Madison, Wisconsin 53707-7921 . 608.266.2621

**Shioc River, Shioc River Watershed (WR13)**

[Return to Search](#)  
[Go to Watershed](#)

**Shioc River (316800)**

**Size**  
 27.96 Miles  
**Segment**  
 0 - 27.96  
**Natural Community**  
 Warm Mainstem, COOL-Warm Mainstem  
**Year Last Monitored**  
 2019  
**General Condition**  
 Poor



This river is **impaired**  
**Impairments include**  
**Pollutants include**  
 High Phosphorus Levels  
 Total Phosphorus

Overview	Conditions	Goals	Monitoring & Projects	Ecosystem Challenges	Fish & Habitat	Photo Gallery	Map Gallery
<p><b>Overview</b></p> <p>Shioc River - The main stem is formed by the confluence of the West and East Branches Shioc River north of Navarino, and extends for 28 miles. The fishery of the main stem is derived from the Wolf River and is especially important during spring when walleye and bass use the river for spawning. A characteristic of the river is extreme water level fluctuations with low water and isolated pools during the summer months. The Shioc River and its tributaries flow through agricultural land with little or no buffering by vegetation. Both the Village of Bonduel and the Vlastic Foods Inc. discharge high concentrations of chlorides to the river (Masnado, 1995)</p> <p>The West and East Branches of the Shioc River exhibit the same general water quality and characteristics as the main stem Shioc River.</p> <p>From: Bougie, Cheryl A., Kosmond, Lisa D, and Watermolen, Drex J. 1996. Wolf River Basin Water Quality Management Plan. Wisconsin Department of Natural Resources, Madison, WI.</p>							
					<p><b>Counties</b>                      Outagamie,                      Shawano</p> <p><b>Trout Water</b>                      No</p> <p><b>Outstanding or Exceptional Impaired Water</b>                      No                      Yes</p> <p><b>Fish and Aquatic Life</b>                      Current Use WWSF                      Attainable Use WWSF                      Designated Use WWSF</p>		

**Date** 1996**Author** Cheryl Bougie**Historical Description**

Shioc River, T23N, R16E, Sec. 21(10), Area = 93.1 acres, Length = 19.2 miles, M.P.A. = 225 ppm. The Shioc River traverses the north central portion of Outagamie County, draining into the Wolf River just above Shiocton. The stream is characterized by extreme water level fluctuations, ranging from above an established gauge to below the gauge in less than a month. The stream is generally slow moving and turbid. Stream bottom materials consist mostly of silt with a few sand and gravel areas. Instream cover is present but not overly abundant. Caddisflies, shrimp, and crayfish are common. The Shioc River is fished heavily in the spring during the annual walleye and white bass runs. Road crossings are usually choked with fishermen at this time. The remainder of the fishery is largely derived from the Wolf River. Two State, two county, and three town roads provide public access.

From: Nelson, Linden M. and Ronald L. Fassbender. Surface Water Resources of Outagamie County: Lake and Stream Classification Project. Wisconsin Department of Natural Resources, Madison, WI.

**Date** 1972**Author** Surface Water Inventory Of Wisconsin

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**Shioc River, Shioc River Watershed (WR13)**

[Return to Search](#)  
[Go to Watershed](#)

**Shioc River (316800)**

**Size** 27.96 Miles  
**Segment** 0 - 27.96  
**Natural Community** Warm Mainstem, COOL-Warm Mainstem  
**Year Last Monitored** 2019  
**General Condition** Poor



This river is **impaired**  
**Impairments include** High Phosphorus Levels  
**Pollutants include** Total Phosphorus

Overview	Conditions	Goals	Monitoring & Projects	Ecosystem Challenges	Fish & Habitat	Photo Gallery	Map Gallery
----------	------------	-------	-----------------------	----------------------	----------------	---------------	-------------

**Impaired Waters**

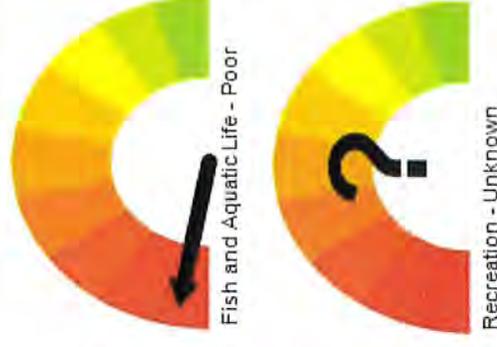
Shioc River (316800) was placed on the impaired waters list for total phosphorus in 2012. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data overwhelmingly exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category). Based on the most updated information, no change in existing impaired waters listing is needed.

**Date** 2015

**Author** Aaron Larson

**Condition**

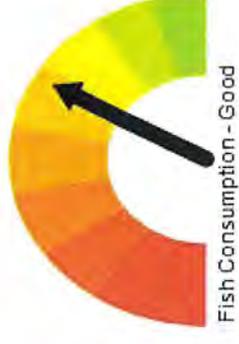
Wisconsin has over 84,000 miles of streams, 15,000 lakes and millions of acres of wetlands. Assessing the condition of this vast amount of water is challenging. The state's water monitoring program uses a media-based, cross-program approach to analyze water condition. An updated [monitoring strategy \(2015-2020\)](#) is now available. Compliance with Clean Water Act fishable,



swimmable standards are located in the [Executive Summary of Water Condition in 2018](#). See also the 'monitoring and projects' tab.

## Reports

[2020 Comprehensive WQ Assessments](#)  
[Comprehensive 2018 River/Stream Water Quality Assessments](#)  
[Comprehensive 2016 Rivers Stream Assessments](#)  
[Rivers TP Summary 2012](#)  
[ORDINANCE NO 141 - BOOK 2: An ordinance of the Village of Shiocton regulating boating and defining a slow-no-wake area upon the waters of the Wolf and the Shiocton Rivers and prescribing penalties for violation thereof \[Outagamie County\]](#)  
[ORDINANCE NO 141 - BOOK 2: An ordinance of the Village of Shiocton regulating boating and defining a slow-no-wake area upon the waters of the Wolf and the Shiocton Rivers and prescribing penalties for violation thereof \[Outagamie County\]](#)  
[Shiocton River Boom Shocking Survey \(1978\), Outagamie County](#)



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**Shiocton River, Shiocton River Watershed (WR13)**

[Return to Search](#)  
[Go to Watershed](#)

**Shiocton River (316800)**

**Size**  
 27.96 Miles  
**Segment**  
 0 - 27.96  
**Natural Community**  
 Warm Mainstem, COOL-Warm Mainstem  
**Year Last Monitored**  
 2019  
**General Condition**  
 Poor



This river is **impaired**  
**Impairments include**  
 High Phosphorus Levels  
**Pollutants include**  
 Total Phosphorus

Overview	Conditions	Goals	Monitoring & Projects	Ecosystem Challenges	Fish & Habitat	Photo Gallery	Map Gallery
----------	------------	-------	-----------------------	----------------------	----------------	---------------	-------------

**Recommendations**

Restore Wetlands  
 Restore Wetlands  
 Restore Wetlands  
 Restore Wetlands  
 Navigability Determination  
 ; Shiocton River; Extension of previous determination

**Management Goals**

Wisconsin's [Water Quality Standards](#) provide qualitative and quantitative goals for waters that are protective of Fishable, Swimmable conditions [[Learn more](#)]. Waters that do not meet water quality standards are considered [impaired](#) and [restoration actions](#) are planned and carried out until the water is once again fishable and swimmable  
 Management goals can include creation or implementation of a Total Maximum Daily Load analysis, a [Nine Key Element Plan](#), or other restoration work, education and outreach and more. If specific recommendations exist for this water, they will be displayed below online.

The Official Internet site for the Wisconsin Department of Natural Resources

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**Shioc River, Shioc River Watershed (WR13)**

**Shioc River (316800)**

- Size** 27.96 Miles
- Segment** 0 - 27.96
- Natural Community** Warm Mainstem, COOL-Warm Mainstem
- Year Last Monitored** 2019
- General Condition** Poor



This river is **impaired**  
**Impairments include** High Phosphorus Levels  
**Pollutants include** Total Phosphorus

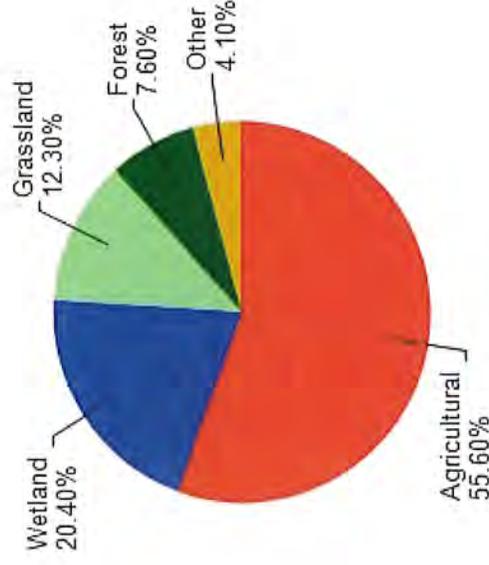
Overview	Conditions	Goals	Monitoring & Projects	Ecosystem Challenges	Fish & Habitat	Photo Gallery	Map Gallery
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**Watershed Characteristics**

Shioc River is located in the Shioc River watershed which is 189.76 mi<sup>2</sup>. Land use in the watershed is primarily agricultural (55.60%), wetland (20.40%) and a mix of grassland (12.30%) and other uses (11.70%). This watershed has 375.85 stream miles, 323.09 lake acres and 23,354.20 wetland acres.

**Nonpoint Source Characteristics**

This watershed is ranked High for runoff impacts on streams, Not Ranked for runoff impacts on lakes and High for runoff impacts on groundwater and therefore has an overall rank of High. This value can be used in ranking the watershed or individual waterbodies for grant funding under state and county programs. However, all waters are affected by diffuse pollutant sources regardless of initial water quality. Applications for specific runoff projects under state or county grant programs may



be pursued. For more information, go to [surface water program grants](#).

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**Shioct River, Shioct River Watershed (WR13)**

[Return to Search](#)  
[Go to Watershed](#)

**Shioct River (316800)**

**Size**  
 27.96 Miles  
**Segment**  
 0 - 27.96  
**Natural Community**  
 Warm Mainstem, COOL-Warm Mainstem  
**Year Last Monitored**  
 2019  
**General Condition**  
 Poor



This river is **impaired**  
**Impairments include**  
**Pollutants include**  
 High Phosphorus Levels  
 Total Phosphorus

Overview	Conditions	Goals	Monitoring & Projects	Ecosystem Challenges	Fish & Habitat	Photo Gallery	Map Gallery
----------	------------	-------	-----------------------	----------------------	----------------	---------------	-------------

Natural Community

**Shioct River** is considered a **Warm Mainstem, COOL-Warm Mainstem** under the state's Natural Community Determinations.

Natural communities (stream and lake natural communities) represent model results and DNR staff validation processes that confirm or update predicted conditions based on flow and temperature modeling from historic and current landscape features and related variables. Predicated flow and temperatures for waters are associated predicated fish assemblages (communities). Biologists evaluate the model results against current survey data to determine if the modeled results are correct and whether biological indicators show water quality degradation. This analysis is a core component of the state's resource management framework. [Wisconsin's Riverine Natural Communities](#).

Warm Mainstem waters are moderate-to-large but still Wadeable perennial streams with relatively warm summer temperatures. Coldwater fishes are absent, transitional fishes are common to uncommon, and warm water fishes are abundant to common. Headwater species are common to absent, mainstem species are abundant to common, and river species are common to absent.

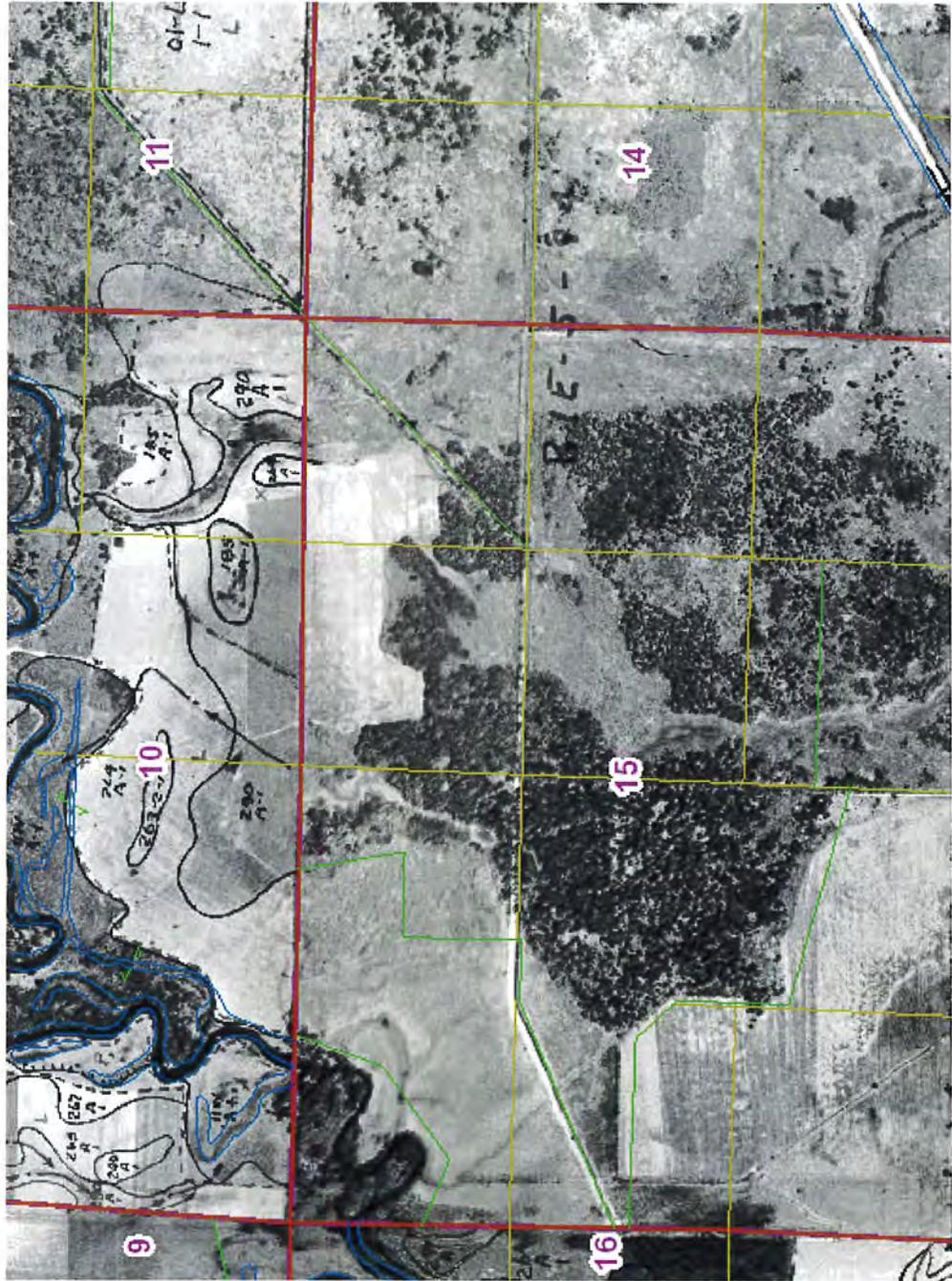
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APPENDIX E

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Historical Aerial Photographs

1938



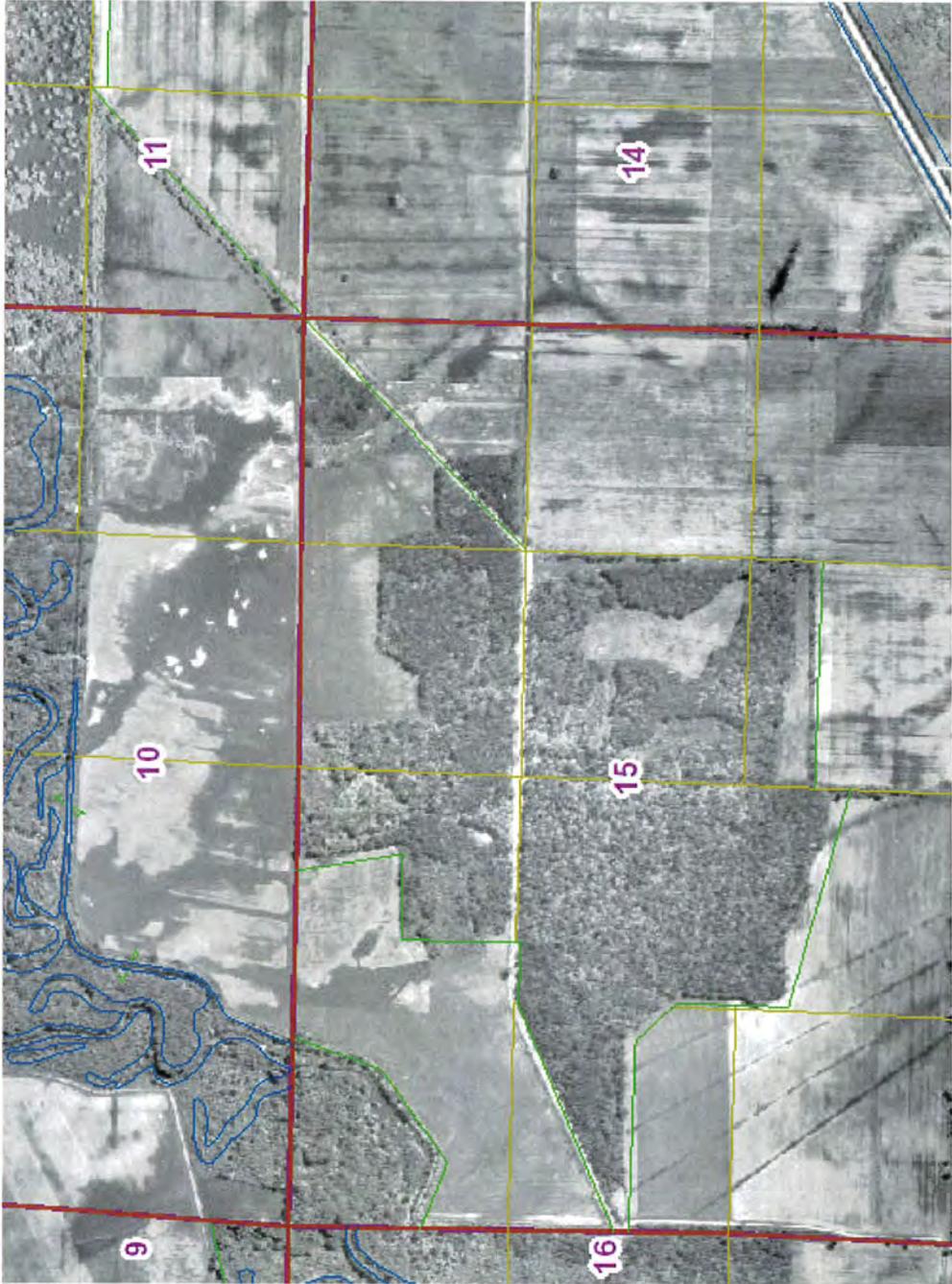
1957



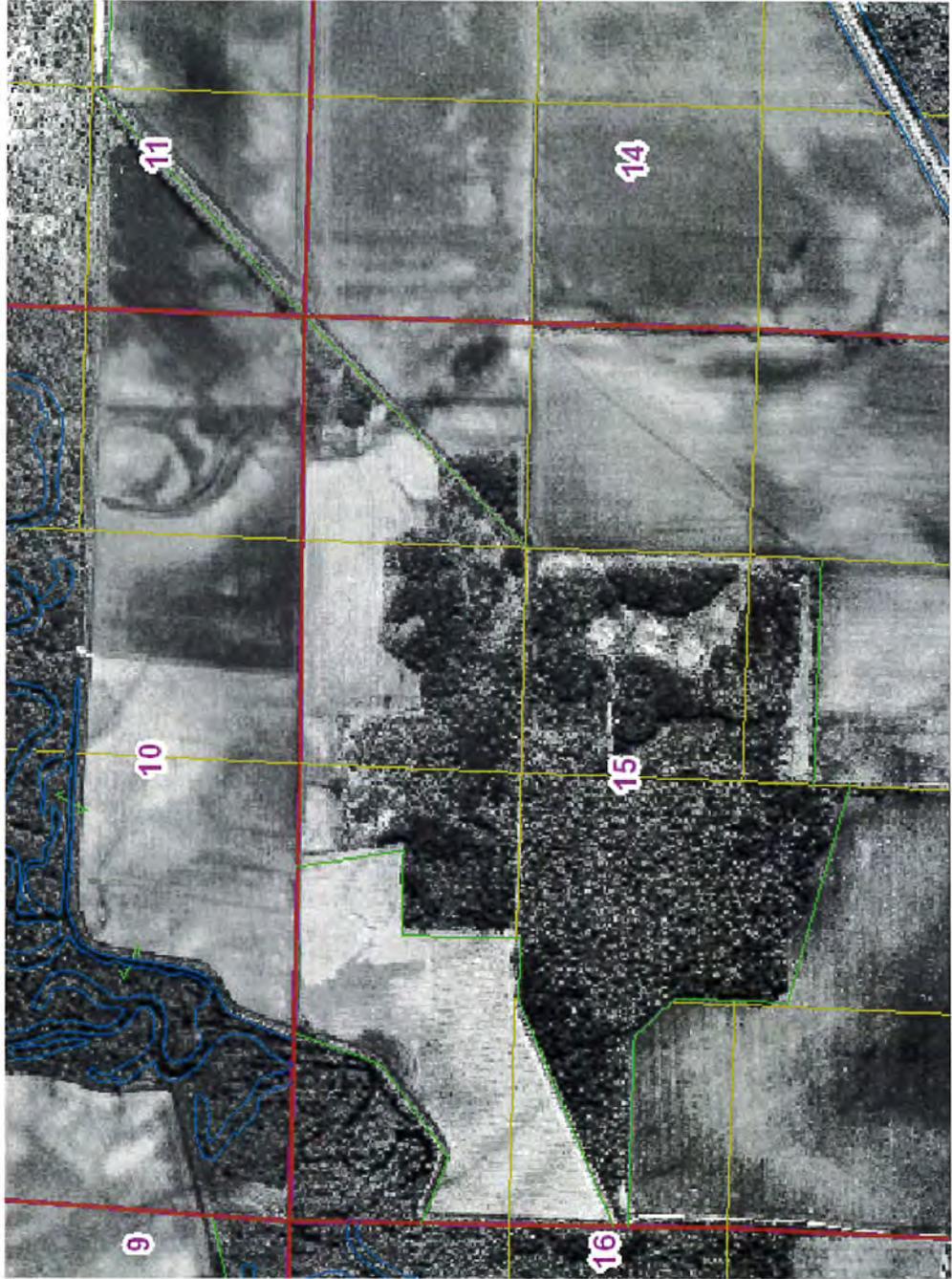
5964



1970

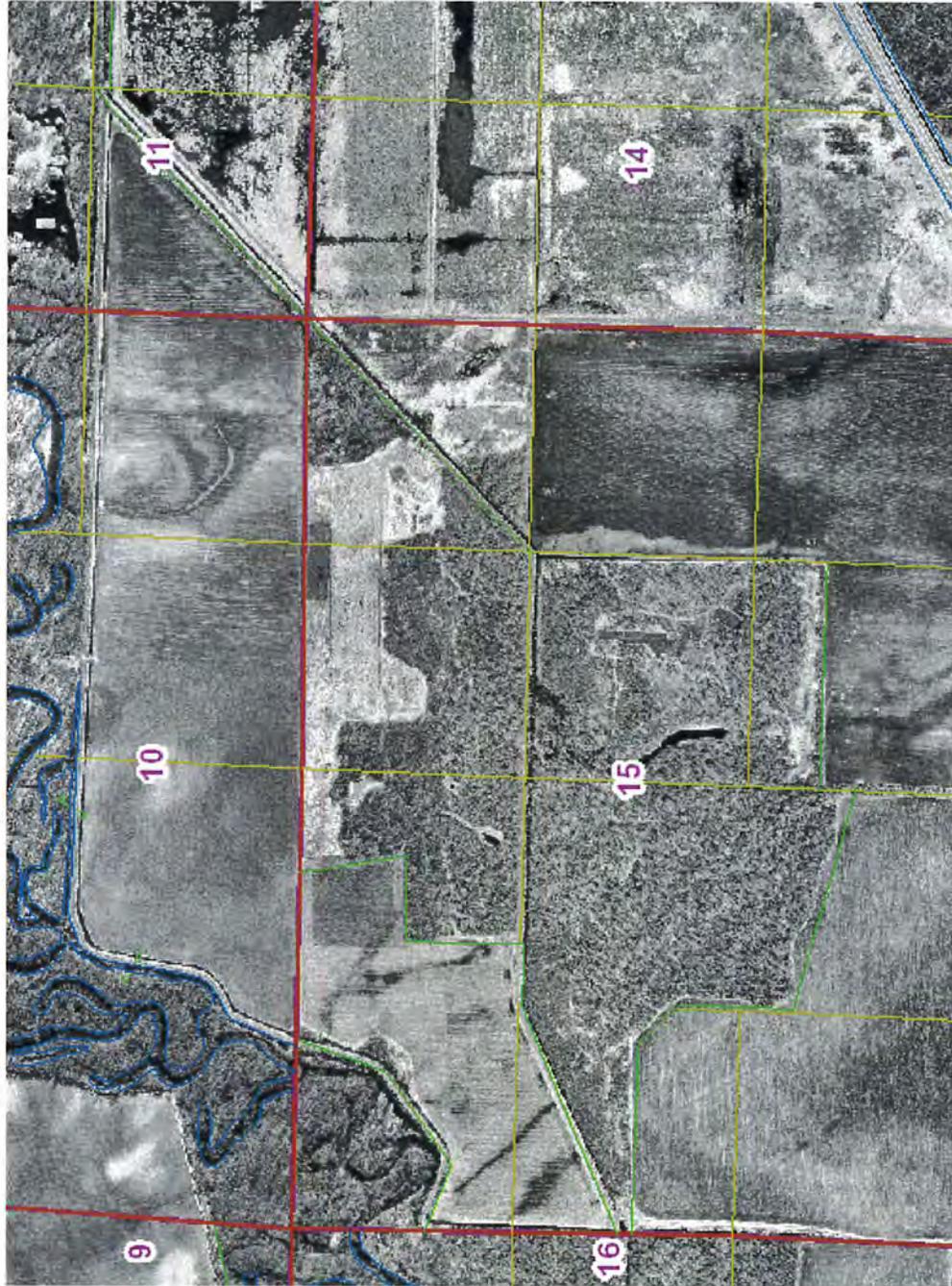


1980

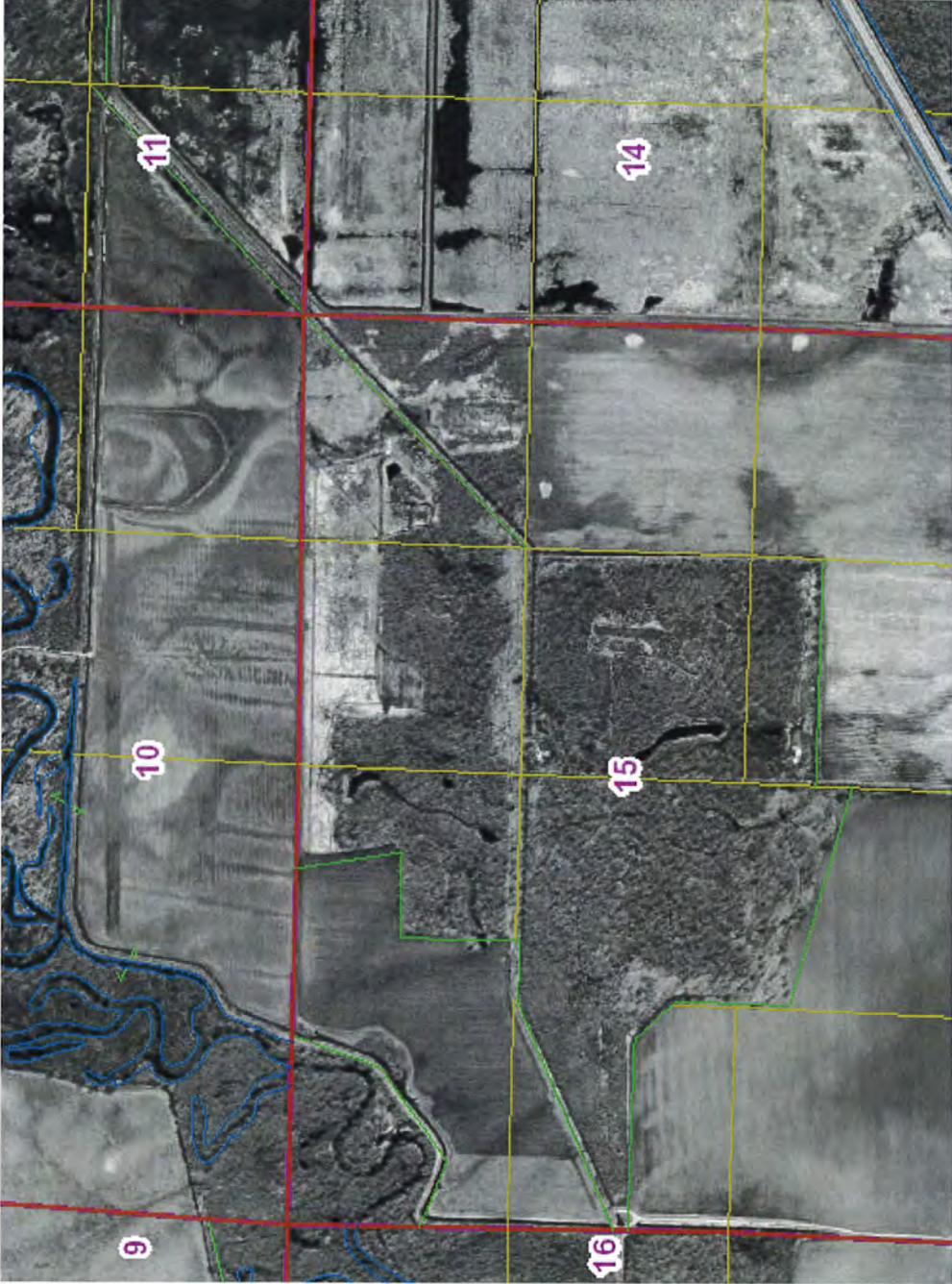




2000



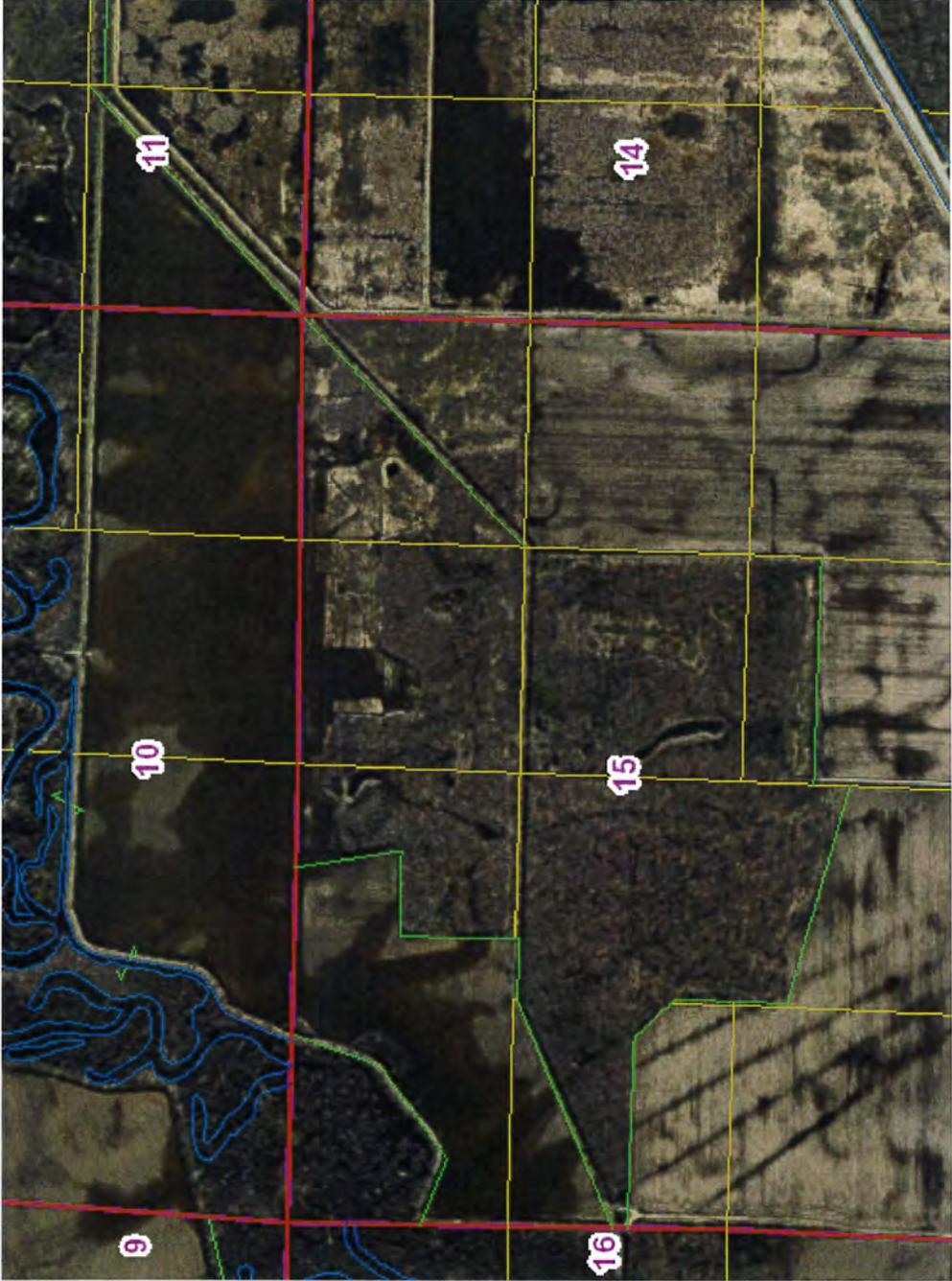
2005



2010



2014



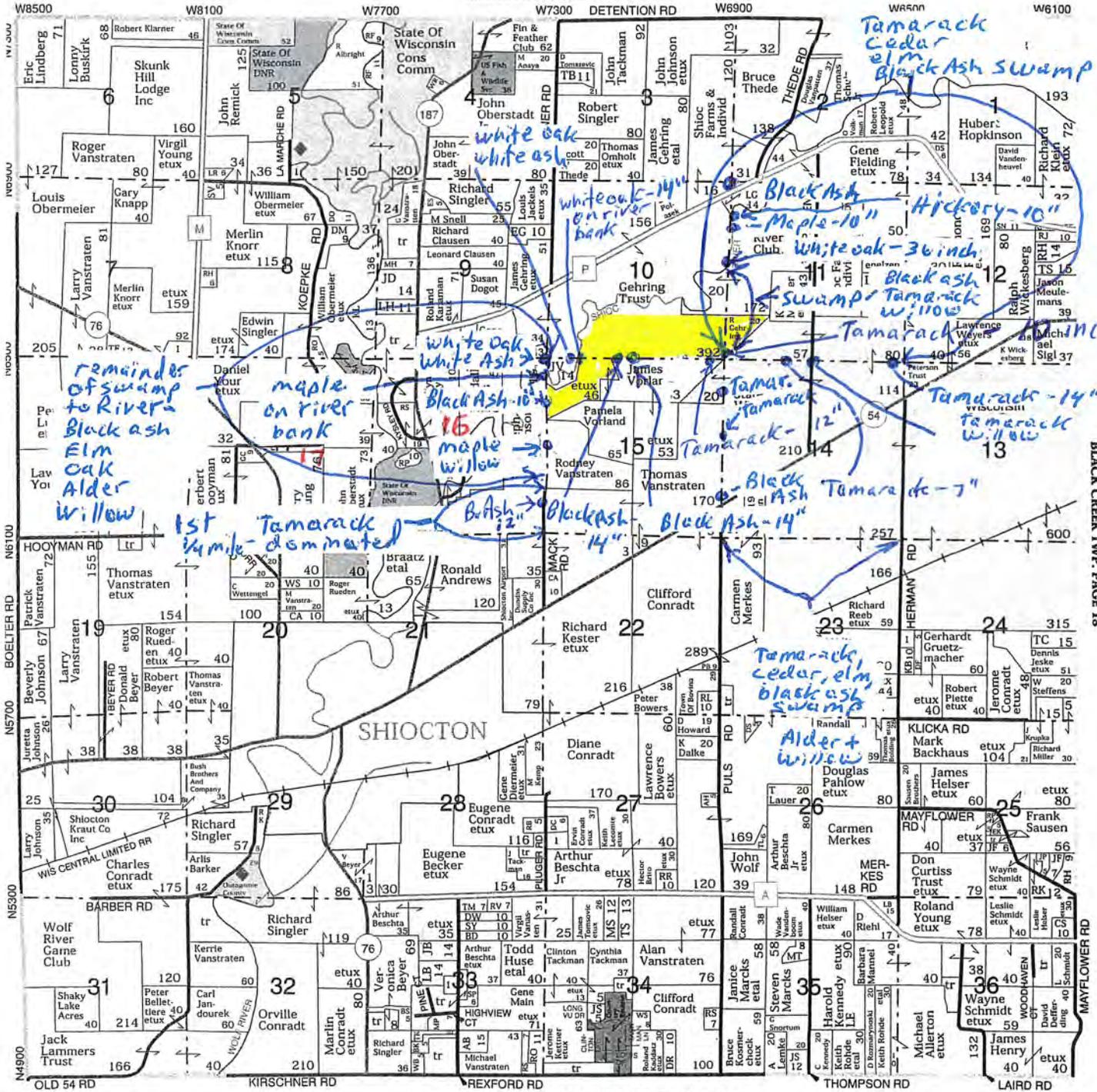
APPENDIX F

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1843 Original Land Survey Notes

Nov.-Dec. 1843  
Survey Notes

MAINE TWP. PAGE 22



ELLINGTON TWP. PAGE 12

BLACK CREEK TWP. PAGE 18

Help Preserve Our Nation's Most Valuable Liquid Asset.

Learn what you can do to help fight the  
pollution of America's waterways.

Nov. - Dec. - 1843

T 23 N R 16 E 4th Mer

## North between sections 15 &amp; 16

- 17.36 Black Ash 12 in diameter  
 40.00 At quarter section Post  
 Maple 12 084 NW 62  
 Willow 6 057 1/2 E 12  
 58.97 Black Ash 10 in diameter  
 74.00 Intersecter Left Bank of Menomonee  
 - one Shear & River W N W N E Post  
 and down stream 2.25 m  
 Maple 14 026 NW 57  
 do 12 019 1/2 E 53  
 75.50 Over River det Post on Right  
 Bank - Maple 10 N 36 N 24  
 do 11 N 66 E 21  
 80.00 At Post Corner Section 9, 10, 15, 16  
 White Ash 12 N 26 W 46  
 White Oak 10 N 15 E 56  
 Land mostly level - the  
 first 1/4 is somewhat the  
 near river Black Ash Elm and  
 Oak - Alder & Willow

T 23 N R 16 E 4th Mer

## East between sections 10 &amp; 15

- 14.50 Intersecter Menomonee Shear &  
 River C & N  
 14.52 Over River & Eastern Swamp  
 B A N  
 51.22 Intersecter 13 North of Post  
 Land & c. River  
 West Corner between sections 10 & 15  
 7.06 Damowuck 12 in diameter  
 40.11 At quarter section Post  
 Black Ash 10 N 79 W 14  
 do 16 S 13 E 20  
 48.91 Black Ash 14 in diameter  
 63.90 White Oak 14 in diameter  
 on Left Bank of Menomonee  
 Shear & River  
 65.72 Over River det Post on Right Bank  
 White Oak 14 S 8 1/2 W 29  
 White Oak & 0.85 1/2 W 2.5  
 80.22 Station Corner

Dec 16 E 4th Men

East Hudson between sections 11 & 14

50.00 Stream 10 E N.W.  
 80.42 Intersected 20 North of Pat  
 Land Level Swamp Dammed  
 Cedar & Elm Block ditch - use  
 but the middle of the Pin  
 and block is Willowland  
 Alder Swamp for 50.00

West Corvallis between sections 11 & 14

6.31 Damowack 14 in diameter  
 40.21 At quarter section Pat  
 Damowack 8 N 1/2 E 1, 2, 7  
 Willow 6.0 41 E 1, 1  
 50.79 Damowack 7 in diameter  
 80.42 section corner

Nov. - Dec. - 1843

Dec 16 E 4th Men

North between sections 10 & 11

6.18 Damowack 10 in diameter  
 39.50 Stream 18 E S.W. and same dam  
 E N. S. W.  
 40.00 Intersected Dept. Bank of Menomonee  
 Prairie River - E. N. S. W. and a White  
 block 36 in diameter and for  
 quarter section corner

54.60 New River ~~and~~ ~~at~~ ~~at~~ on right  
 bank - Maple 10 in diameter

59.78

80.00

Hickory 10 in diameter  
 Black Ash 10 in diameter  
 corner sections 2, 3, 10, 11  
 Land Level Except Swamp  
 Second knot - Sugar Bush  
 Maple Oak Ash and Pin-  
 Black Ash Rowlock & a The  
 East 6 tally on the first 1/2  
 with is Willow swamp

Nov. - Dec - 1843

14223

23.5 N 16 E 4th Mer

East corner between 8th & 10th Mer

79.84 W. corner 39 street of Post  
Lane level Samarack and  
E. corner Bluffs & Elm Street  
Alder & Willow

14223

West corner between sections 14, 15 & 23  
7.91 Samarack 10 in diameter  
39.92 det quarter section Post  
Samarack 10 N 13 W 28  
do 11 S 47 E 40  
46.28 Elm 14 in diameter  
79.84 Section corner

23.5 N 16 E 4th Mer

North between sections 14 & 15

77.86 Black Ash 11 in diameter  
40.00 det quarter section Post  
Samarack 11 S 67 W 36  
do 12 N 67 E 10  
do Samarack 8 in diameter  
80.00 det Post Corner sections 10, 11, 14, 15  
Samarack 16 N 43 E 75  
do 10 N 71 W 86  
Sand & c Samarack

APPENDIX G

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Site Photographs



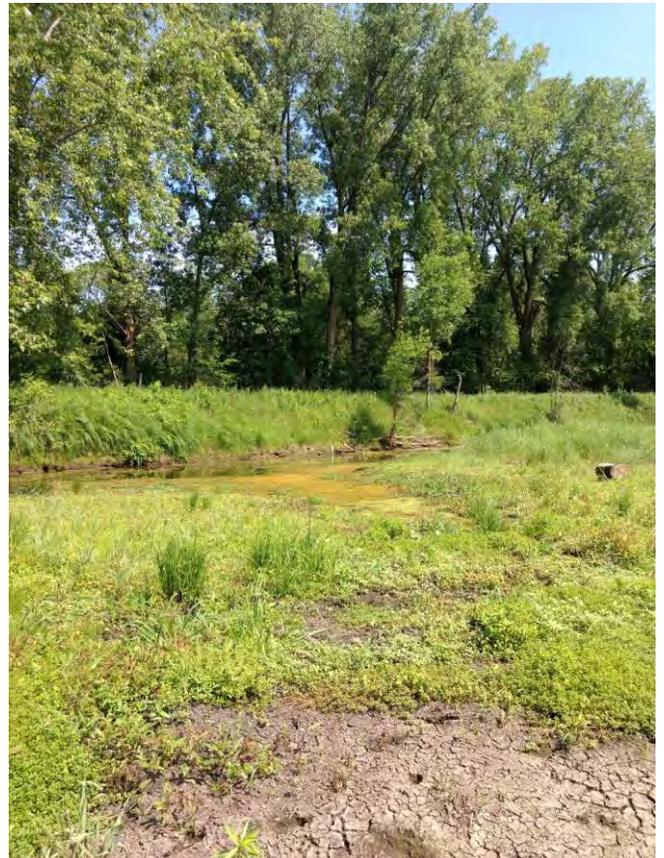
1. Viewing northwest at drowned out corn crop.



2. Viewing north at drowned out corn crop.



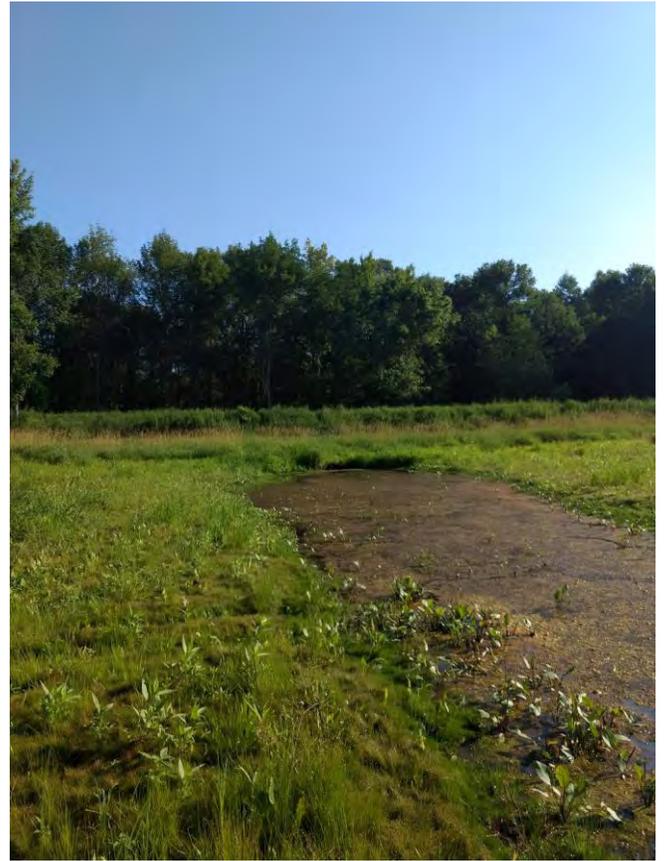
3. Viewing southwest at stressed corn crop and avoided area.



4. Viewing northwest at wetland area against dike.



5. Viewing southeast at drowned out corn field.



6. Viewing north at a former oxbow.



7. Viewing south at a former oxbow.



8. Viewing west at unplanted area of agricultural field.



9. Viewing northwest at unplanted area of agricultural field.



10. Viewing southwest from the south edge of a former oxbow.



11. Viewing southeast at unplanted area of agricultural field.



12. Viewing east at the north drainage ditch.



13. Viewing southeast at the agricultural field planted with beans.



14. Viewing south at the agricultural field planted with beans.



15. Viewing south at the agricultural field planted with beans.



16. Viewing southwest at the agricultural field planted with beans.



17. Viewing west at the north drainage ditch.

APPENDIX H

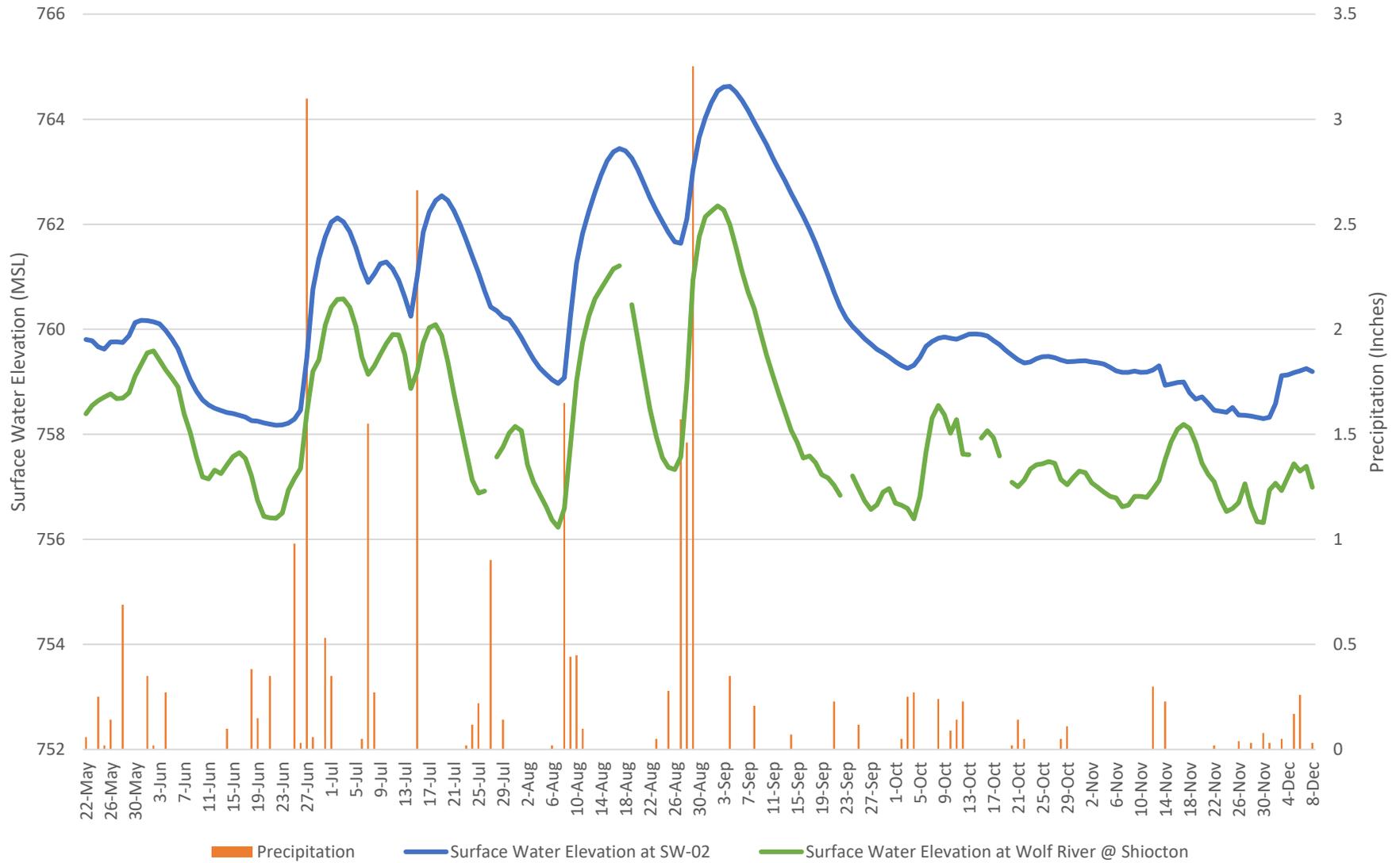
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Monitoring Well Hydrographs,  
Antecedent Precipitation & Hydrology Table

# 2021 Baseline Monitoring SW-02

## Surface Water Elevation of Shioc River

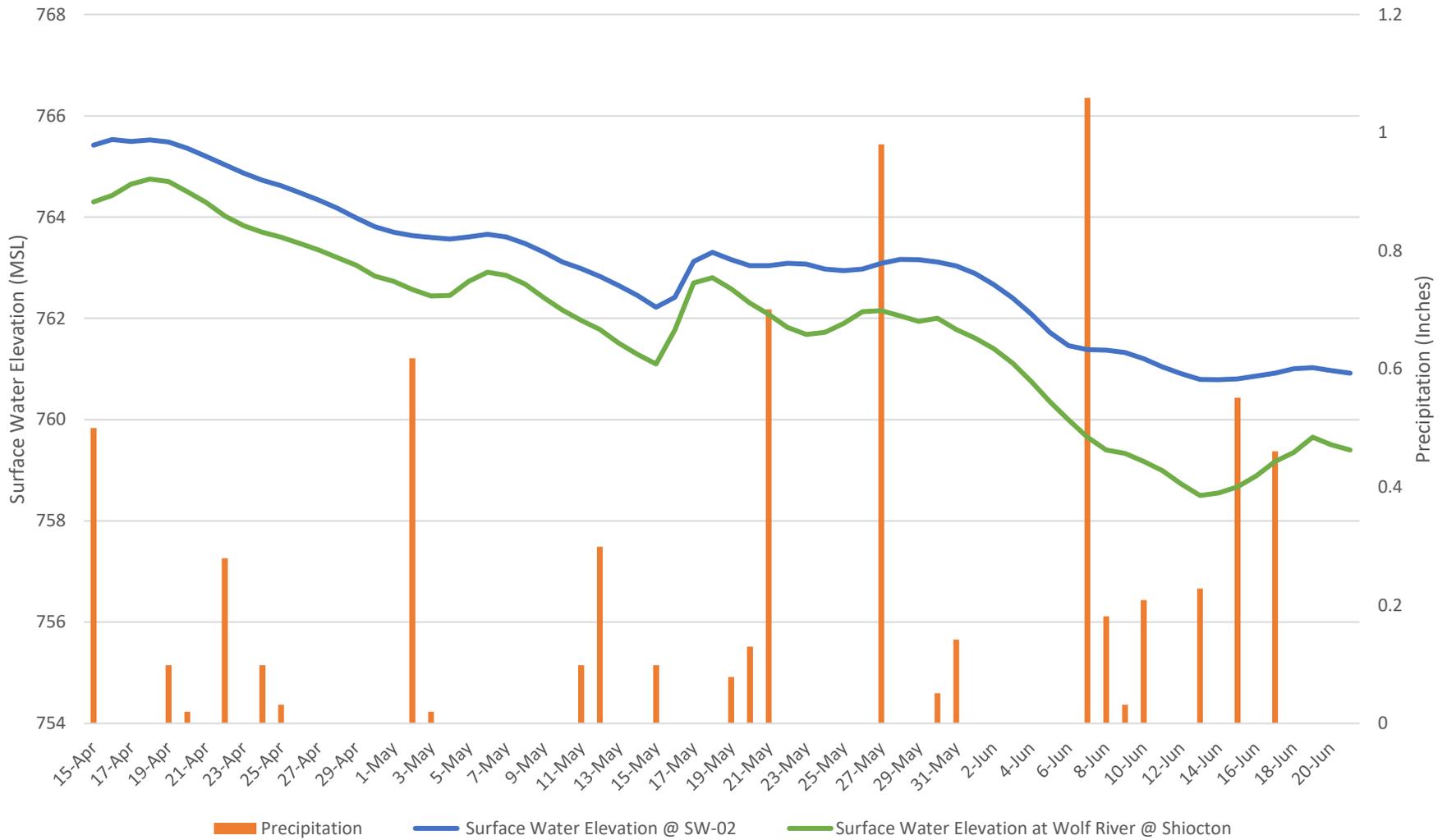
### Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



# 2022 Baseline Monitoring SW-02

## Surface Water Elevation of Shioc River

### Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



Average of Water Level from Ground Surface (ft)

Date	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	SW-03
4/24/2021	2.490	2.501	3.314	1.507	2.524	2.573	2.394	2.867	2.413	2.490	2.686	0.603	2.429	3.499	1.534	
4/25/2021	2.499	2.514	2.749	0.769	2.529	2.582	2.123	2.877	2.426	2.496	2.257	0.484	2.438	3.248	1.311	
4/26/2021	2.497	2.512	3.017	1.225	2.528	2.585	2.251	2.874	2.422	2.491	2.711	0.478	2.437	3.488	1.489	
4/27/2021	2.499	2.508	3.262	1.347	2.526	2.584	2.388	2.871	2.423	2.498	2.975	0.444	2.433	3.620	1.613	
4/28/2021	2.093	2.369	2.415	0.739	2.530	2.576	2.100	2.872	2.419	2.493	2.517	0.385	2.431	3.352	1.279	
4/29/2021	1.930	2.416	2.262	0.324	2.514	2.577	1.816	2.864	2.419	2.479	2.554	0.334	2.419	3.360	1.355	
4/30/2021	2.381	2.508	2.763	0.689	2.529	2.581	2.073	2.866	2.414	2.491	2.895	0.335	2.431	3.559	1.562	
5/1/2021	2.518	2.516	3.080	1.185	2.531	2.590	2.308	2.878	2.430	2.497	3.200	0.365	2.434	3.738	1.770	
5/2/2021	2.518	2.513	3.445	1.489	2.518	2.582	2.397	2.875	2.425	2.491	3.479	0.389	2.430	3.883	1.974	
5/3/2021	1.506	1.612	1.717	0.662	2.283	2.573	1.854	2.863	2.410	2.485	3.068	0.304	2.413	3.528	1.175	
5/4/2021	0.712	1.208	1.234	0.120	1.972	2.574	1.017	2.854	2.411	2.488	2.441	0.228	2.413	3.237	1.152	
5/5/2021	1.529	2.029	1.932	0.282	2.508	2.585	1.608	2.868	2.422	2.489	2.798	0.235	2.430	3.449	1.465	
5/6/2021	2.184	2.484	2.545	0.574	2.501	2.580	1.982	2.864	2.419	2.498	3.090	0.231	2.420	3.624	1.698	
5/7/2021	2.519	2.528	3.102	1.025	2.517	2.580	2.207	2.859	2.413	2.491	3.378	0.244	2.422	3.778	1.905	
5/8/2021	2.519	2.533	3.472	1.226	2.527	2.579	2.356	2.865	2.416	2.488	3.628	0.267	2.430	3.893	2.069	
5/9/2021	2.524	2.526	3.706	1.395	2.516	2.574	2.418	2.869	2.416	2.487	3.845	0.283	2.429	4.003	2.217	
5/10/2021	2.534	2.533	3.952	1.572	2.516	2.586	2.404	2.867	2.426	2.503	3.893	0.322	2.436	4.027	2.363	
5/11/2021	2.530	2.545	3.971	1.658	2.518	2.589	2.398	2.874	2.424	2.505	3.896	0.350	2.432	4.029	2.470	
5/12/2021	2.522	2.544	3.968	1.758	2.541	2.597	2.435	2.885	2.440	2.503	3.908	0.402	2.442	4.042	2.486	
5/13/2021	2.520	2.535	3.980	1.863	2.519	2.592	2.425	2.880	2.436	2.501	3.901	0.456	2.437	4.037	2.488	
5/14/2021	2.518	2.529	3.974	1.965	2.522	2.586	2.419	2.871	2.423	2.500	3.890	0.525	2.429	4.030	2.479	
5/15/2021	2.499	2.507	3.963	2.057	2.513	2.573	2.400	2.860	2.405	2.485	3.874	0.590	2.416	4.018	2.464	
5/16/2021	2.526	2.538	3.986	1.949	2.534	2.594	2.431	2.883	2.433	2.512	3.905	0.673	2.436	4.040	2.490	
5/17/2021	2.526	2.536	3.986	2.162	2.536	2.597	2.432	2.883	2.439	2.509	3.907	0.784	2.437	4.043	2.485	
5/18/2021	2.522	2.529	3.981	2.381	2.530	2.590	2.408	2.873	2.428	2.503	3.901	0.982	2.434	4.032	2.481	
5/19/2021	2.508	2.504	3.775	1.805	2.524	2.588	2.397	2.871	2.425	2.493	3.894	0.969	2.421	4.034	2.478	
5/20/2021	2.544	2.528	3.470	0.686	2.533	2.600	2.411	2.882	2.436	2.512	3.905	0.764	2.429	4.038	2.493	
5/21/2021	2.502	2.534	3.632	1.160	2.533	2.594	2.420	2.879	2.434	2.512	3.901	0.676	2.435	4.041	2.492	
5/22/2021	2.505	2.535	3.715	1.329	2.532	2.591	2.418	2.878	2.433	2.509	3.904	0.786	2.425	4.038	2.483	1.80775
5/23/2021	2.476	2.510	3.955	1.682	2.505	2.566	2.383	2.858	2.407	2.487	3.876	0.986	2.408	4.019	2.465	1.801
5/24/2021	2.497	2.520	3.898	1.771	2.523	2.586	2.403	2.877	2.426	2.505	3.891	1.072	2.436	4.036	2.486	1.75525
5/25/2021	2.500	2.516	3.975	1.676	2.531	2.591	2.411	2.881	2.430	2.513	3.898	1.176	2.437	4.042	2.489	1.70875
5/26/2021	2.488	2.509	3.972	1.891	2.516	2.577	2.400	2.870	2.415	2.492	3.887	1.337	2.424	4.028	2.472	1.686
5/27/2021	2.483	2.516	3.963	2.218	2.504	2.563	2.386	2.859	2.403	2.484	3.874	1.585	2.411	4.019	2.467	1.65675
5/28/2021	1.887	1.767	2.676	0.472	2.455	2.568	2.393	2.862	2.414	2.494	3.880	0.856	2.412	4.023	2.435	1.7155
5/29/2021	2.071	2.428	3.085	0.534	2.530	2.586	2.409	2.878	2.432	2.508	3.895	1.108	2.430	4.034	2.492	1.697
5/30/2021	2.531	2.544	3.662	1.185	2.533	2.582	2.417	2.876	2.429	2.502	3.896	1.449	2.433	4.034	2.472	1.662
5/31/2021	2.521	2.525	3.926	1.545	2.529	2.578	2.399	2.870	2.421	2.499	3.887	1.783	2.435	4.029	2.475	1.63725
6/1/2021	2.509	2.527	3.385	0.868	2.513	2.572	2.393	2.862	2.414	2.492	3.879	1.504	2.420	4.019	2.465	1.6495
6/2/2021	2.524	2.532	3.489	0.906	2.533	2.585	2.403	2.880	2.429	2.509	3.900	1.732	2.435	4.033	2.482	1.62075
6/3/2021	2.517	2.513	3.930	1.668	2.523	2.583	2.409	2.882	2.428	2.505	3.894	2.075	2.431	4.032	2.482	1.586
6/4/2021	2.523	2.507	3.978	2.034	2.520	2.584	2.400	2.877	2.425	2.489	3.893	2.330	2.422	4.033	2.474	1.54375
6/5/2021	2.523	2.513	3.972	2.468	2.523	2.581	2.406	2.879	2.419	2.500	3.893	2.531	2.426	4.029	2.477	1.47475
6/6/2021	2.509	2.520	3.985	2.491	2.533	2.582	2.407	2.878	2.427	2.499	3.897	2.564	2.430	4.042	2.488	1.38925
6/7/2021	2.503	2.522	3.981	2.490	2.532	2.582	2.405	2.877	2.424	2.510	3.896	2.563	2.432	4.041	2.486	1.29825
6/8/2021	2.503	2.513	3.977	2.483	2.523	2.577	2.402	2.881	2.420	2.503	3.896	2.557	2.426	4.040	2.485	1.2085
6/9/2021	2.486	2.513	3.975	2.477	2.522	2.581	2.398	2.872	2.416	2.489	3.891	2.551	2.417	4.030	2.480	1.1185
6/10/2021	2.493	2.514	3.982	2.483	2.517	2.577	2.395	2.876	2.423	2.501	3.892	2.553	2.422	4.034	2.480	1.01975
6/11/2021	2.486	2.515	3.977	2.476	2.517	2.570	2.393	2.869	2.421	2.504	3.889	2.547	2.421	4.035	2.479	0.9365
6/12/2021	2.508	2.513	3.980	2.471	2.517	2.573	2.395	2.866	2.412	2.500	3.892	2.547	2.424	4.034	2.477	0.85025
6/13/2021	2.514	2.508	3.963	2.470	2.520	2.571	2.393	2.866	2.415	2.499	3.885	2.546	2.416	4.035	2.479	0.76275
6/14/2021	2.499	2.502	3.969	2.468	2.516	2.566	2.392	2.861	2.411	2.497	3.886	2.540	2.414	4.025	2.471	0.69825
6/15/2021	2.514	2.499	3.968	2.476	2.521	2.566	2.390	2.863	2.416	2.490	3.886	2.547	2.415	4.030	2.476	0.62475
6/16/2021	2.519	2.498	3.964	2.471	2.511	2.573	2.393	2.866	2.417	2.492	3.887	2.547	2.422	4.026	2.479	0.547
6/17/2021	2.515	2.497	3.970	2.468	2.519	2.571	2.389	2.863	2.424	2.495	3.891	2.551	2.420	4.026	2.472	0.47975
6/18/2021	2.518	2.515	3.973	2.483	2.531	2.577	2.401	2.868	2.427	2.517	3.893	2.556	2.426	4.029	2.472	0.422
6/19/2021	2.520	2.514	3.969	2.478	2.525	2.571	2.394	2.864	2.424	2.499	3.888	2.556	2.422	4.023	2.478	0.3875
6/20/2021	2.498	2.490	3.952	2.457	2.501	2.557	2.379	2.849	2.397	2.492	3.874	2.537	2.400	4.010	2.460	0.36075
6/21/2021	2.497	2.495	3.945	2.462	2.507	2.552	2.379	2.849	2.401	2.491	3.874	2.530	2.406	4.015	2.461	0.35025
6/22/2021	2.494	2.500	3.959	2.468	2.507	2.570	2.381	2.861	2.412	2.502	3.889	2.544	2.416	4.024	2.470	0.3155
6/23/2021	2.505	2.502	3.963	2.476	2.515	2.572	2.391	2.864	2.420	2.501	3.891	2.548	2.416	4.025	2.469	0.2775
6/24/2021	2.506	2.512	3.974	2.474	2.518	2.577	2.390	2.867	2.418	2.508	3.888	2.550	2.417	4.026	2.465	0.27425
6/25/2021	2.509	2.504	3.967	2.476	2.522	2.571	2.385	2.869	2.418	2.503	3.883	2.551	2.421	4.020	2.475	0.3005
6/26/2021	2.009	2.077	3.939	2.071	2.493	2.562	2.354	2.858	2.402	2.420	3.875	2.000	2.420	4.016	2.459	0.3565
6/27/2021	0.381	0.542	2.412	0.392	0.528	0.626	0.174	2.885	0.955	0.418	1.378	0.161	0.761	0.808	0.597	1.7825
6/28/2021	0.326	0.790	1.129	0.270	1.131	0.674	0.314	2.862	0.912	0.712	1.288	0.041	1.076	1.633	0.629	2.1185
6/29/2021	0.430	1.097	1.436	0.242	1.887	0.961	0.373	2.871	1.112	1.206	1.391	0.028	1.777	2.335	0.685	2.13575
6/30/2021	0.307	0.711	0.593	0.147	1.202	0.596	0.220	2.851	0.576	0.865	0.897	-0.057	1.099	1.880	0.559	2.217

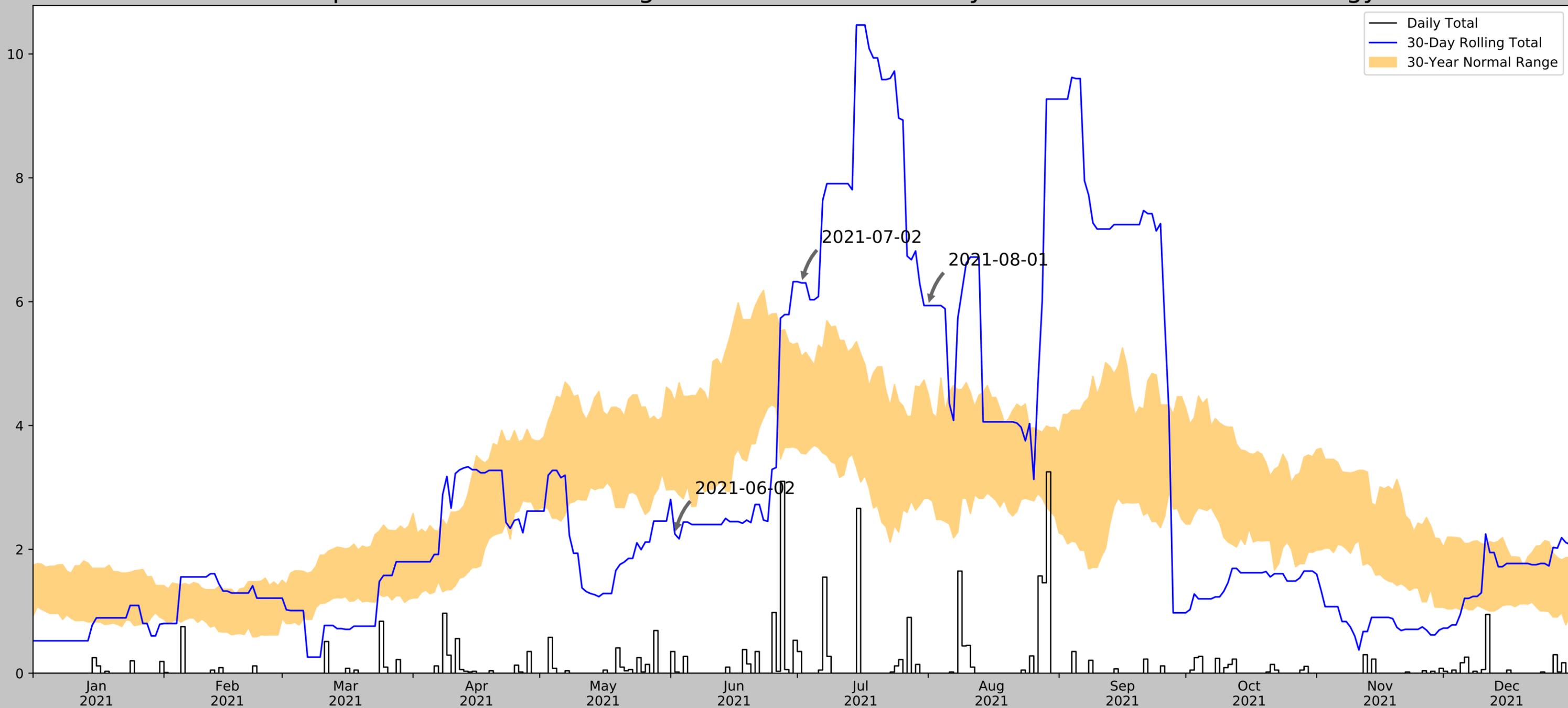
7/1/2021	0.513	1.382	1.283	0.247	2.174	1.391	0.581	2.861	1.608	1.788	1.561	0.212	2.262	2.604	0.689	1.74275
7/2/2021	1.109	2.392	2.416	0.856	2.505	2.465	1.186	2.856	2.329	2.379	2.212	0.255	2.403	3.007	0.830	1.267
7/3/2021	1.945	2.531	3.127	1.282	2.520	2.579	1.684	2.869	2.432	2.500	2.567	0.324	2.413	3.269	0.979	1.298
7/4/2021	2.507	2.508	3.672	1.680	2.521	2.581	2.081	2.875	2.419	2.503	2.866	0.414	2.422	3.480	1.110	1.34325
7/5/2021	2.510	2.510	3.976	2.092	2.518	2.590	2.339	2.873	2.423	2.501	3.101	0.590	2.419	3.651	1.263	1.359
7/6/2021	2.479	2.505	3.955	2.434	2.506	2.581	2.383	2.861	2.402	2.498	3.289	0.693	2.413	3.776	1.298	1.37025
7/7/2021	1.139	1.403	1.728	0.910	2.286	2.275	1.051	2.844	1.908	2.473	2.164	0.346	2.188	3.236	0.502	1.44075
7/8/2021	0.418	0.911	1.163	0.227	2.072	2.105	0.584	2.847	1.590	2.458	1.617	0.333	2.127	2.929	0.475	1.387
7/9/2021	0.771	1.608	2.042	0.378	2.500	2.557	0.976	2.855	2.211	2.483	2.102	0.391	2.410	3.177	0.553	1.425
7/10/2021	1.604	2.425	2.936	0.969	2.502	2.579	1.628	2.849	2.430	2.475	2.570	0.499	2.409	3.386	0.674	1.44575
7/11/2021	2.430	2.497	3.624	1.540	2.512	2.589	2.110	2.861	2.416	2.497	2.901	0.734	2.413	3.588	0.836	1.43775
7/12/2021	2.505	2.498	3.965	2.042	2.510	2.583	2.369	2.858	2.416	2.485	3.167	1.048	2.406	3.758	1.022	1.4125
7/13/2021	2.523	2.510	3.962	2.362	2.524	2.591	2.400	2.873	2.438	2.501	3.387	1.226	2.423	3.882	1.089	1.38025
7/14/2021	2.477	2.499	3.953	2.471	2.506	2.583	2.381	2.864	2.407	2.485	3.542	1.385	2.407	3.978	1.112	1.363
7/15/2021	0.878	0.680	0.941	0.240	0.664	0.581	-0.170	1.937	0.269	0.487	0.470	-0.599	0.634	0.603	0.414	2.84825
7/16/2021	0.416	1.247	0.943	-0.300	1.517	0.990	-0.108	2.478	1.068	1.106	0.790	-0.616	1.829	1.416	0.473	2.78975
7/17/2021	0.873	2.233	1.980	-0.195	2.421	1.996	-0.019	2.868	1.936	1.977	1.260	-0.536	2.419	2.319	0.582	2.70525
7/18/2021	1.728	2.537	2.893	-0.095	2.506	2.573	0.013	2.862	2.396	2.349	1.765	-0.513	2.419	2.760	0.757	2.67475
7/19/2021	2.422	2.523	3.400	0.113	2.505	2.577	0.234	2.860	2.428	2.495	2.190	-0.316	2.419	3.021	0.940	2.479
7/20/2021	2.519	2.526	3.778	0.346	2.506	2.571	0.789	2.863	2.414	2.491	2.583	-0.087	2.410	3.231	1.114	2.2555
7/21/2021	2.490	2.527	3.979	0.593	2.504	2.587	1.474	2.855	2.403	2.490	2.865	0.182	2.400	3.408	1.299	1.917
7/22/2021	2.490	2.512	3.947	1.204	2.497	2.580	1.969	2.854	2.401	2.481	3.078	0.280	2.400	3.554	1.453	1.7095
7/23/2021	2.523	2.540	3.978	1.647	2.520	2.601	2.252	2.877	2.425	2.502	3.236	0.369	2.424	3.697	1.568	1.71425
7/24/2021	2.503	2.509	3.964	1.768	2.520	2.575	2.287	2.873	2.422	2.497	3.310	0.420	2.420	3.777	1.270	1.7375
7/25/2021	2.519	2.505	3.959	1.385	2.516	2.591	2.275	2.870	2.419	2.500	3.355	0.448	2.409	3.851	1.196	1.75475
7/26/2021	2.514	2.509	3.967	2.008	2.508	2.594	2.411	2.870	2.422	2.497	3.566	0.607	2.415	3.995	1.453	1.72025
7/27/2021	2.412	2.510	3.831	2.040	2.496	2.599	1.783	2.873	2.414	2.499	3.536	0.521	2.419	3.932	0.779	1.744
7/28/2021	2.297	2.498	3.633	0.682	2.526	2.586	1.709	2.854	2.400	2.486	3.199	0.399	2.405	3.866	0.564	1.78075
7/29/2021	2.505	2.500	3.655	0.687	2.516	2.577	1.818	2.857	2.415	2.494	3.228	0.436	2.415	3.948	0.601	1.75875
7/30/2021	2.494	2.491	3.950	1.331	2.499	2.555	2.260	2.845	2.404	2.485	3.444	0.569	2.407	4.049	0.865	1.73225
7/31/2021	2.511	2.506	3.995	1.888	2.520	2.572	2.412	2.862	2.420	2.492	3.704	0.828	2.420	4.027	1.139	1.6785
8/1/2021	2.502	2.491	3.973	2.242	2.504	2.561	2.382	2.853	2.406	2.491	3.893	1.135	2.412	4.015	1.379	1.6385
8/2/2021	2.505	2.495	3.969	2.449	2.503	2.558	2.375	2.854	2.403	2.482	3.899	1.397	2.409	4.007	1.604	1.5925
8/3/2021	2.505	2.497	3.979	2.466	2.505	2.563	2.390	2.857	2.409	2.483	3.908	1.659	2.411	4.017	1.810	1.5335
8/4/2021	2.510	2.500	3.954	2.463	2.512	2.563	2.395	2.858	2.414	2.491	3.903	1.911	2.416	4.019	1.998	1.45975
8/5/2021	2.486	2.503	3.960	2.469	2.511	2.561	2.380	2.861	2.413	2.490	3.909	2.134	2.414	4.017	2.152	1.39075
8/6/2021	2.502	2.502	3.963	2.478	2.515	2.565	2.390	2.856	2.411	2.496	3.896	2.357	2.414	4.015	2.256	1.31725
8/7/2021	2.485	2.488	3.950	2.458	2.496	2.551	2.369	2.848	2.397	2.471	3.894	2.515	2.399	4.005	2.315	1.265
8/8/2021	1.813	1.671	3.777	1.575	1.669	2.527	1.411	2.859	2.394	2.485	3.599	0.804	2.409	3.656	0.548	1.51625
8/9/2021	0.303	0.540	0.825	0.196	0.571	0.937	0.184	2.873	0.382	0.702	0.811	0.141	2.139	2.162	0.414	1.896
8/10/2021	0.278	0.620	0.441	0.058	0.759	0.604	0.190	2.844	0.248	0.771	0.560	0.205	1.435	2.075	0.417	1.52975
8/11/2021	0.258	0.619	0.443	0.033	0.783	0.524	0.142	2.858	0.229	0.788	0.394	0.213	1.091	1.767	0.403	1.739
8/12/2021	0.397	1.033	0.749	0.130	1.546	0.854	0.286	2.854	0.489	1.426	0.581	0.224	1.884	2.247	0.422	1.5205
8/13/2021	0.680	1.779	1.587	0.307	2.313	1.740	0.697	2.860	1.385	2.204	1.088	0.263	2.440	2.700	0.524	1.598
8/14/2021	1.257	2.475	2.681	0.851	2.538	2.563	1.339	2.852	2.160	2.512	1.804	0.333	2.426	3.072	0.770	1.6735
8/15/2021	2.111	2.510	3.337	1.430	2.530	2.576	1.868	2.866	2.441	2.535	2.321	0.441	2.440	3.354	1.115	1.6515
8/16/2021	2.502	2.501	3.744	1.848	2.534	2.566	2.248	2.849	2.435	2.526	2.687	0.552	2.431	3.555	1.373	1.64975
8/17/2021	2.493	2.498	3.970	2.213	2.540	2.572	2.410	2.855	2.416	2.498	2.972	0.798	2.441	3.745	1.596	1.647
8/18/2021	2.515	2.517	3.995	2.479	2.552	2.597	2.425	2.872	2.412	2.512	3.233	1.126	2.448	3.927	1.800	1.64175
8/19/2021	2.516	2.520	3.983	2.521	2.539	2.576	2.431	2.872	2.421	2.506	3.471	1.428	2.452	4.054	1.972	1.63575
8/20/2021	2.506	2.506	3.970	2.493	2.532	2.561	2.414	2.854	2.408	2.494	3.701	1.695	2.421	4.040	2.091	1.66025
8/21/2021	2.507	2.505	3.965	2.482	2.519	2.561	2.413	2.859	2.404	2.503	3.907	1.975	2.429	4.024	2.228	1.6625
8/22/2021	2.507	2.501	3.961	2.495	2.544	2.560	2.416	2.859	2.400	2.524	3.903	2.250	2.429	4.018	2.367	1.68125
8/23/2021	2.495	2.498	3.951	2.495	2.536	2.558	2.415	2.853	2.400	2.516	3.897	2.457	2.434	4.013	2.458	1.58725
8/24/2021	2.467	2.483	3.939	2.482	2.520	2.546	2.396	2.841	2.401	2.492	3.885	2.540	2.427	4.004	2.317	1.6045
8/25/2021	2.494	2.502	3.965	2.501	2.539	2.568	2.414	2.855	2.409	2.525	3.916	2.553	2.441	4.022	2.067	1.57875
8/26/2021	2.480	2.509	3.972	2.498	2.530	2.556	2.404	2.853	2.404	2.520	3.908	2.535	2.437	4.017	2.286	1.46025
8/27/2021	1.671	1.966	3.890	1.341	2.096	2.547	1.737	2.853	2.393	2.509	3.889	1.309	2.421	4.021	0.911	1.4935
8/28/2021	0.304	0.520	1.448	0.024	0.609	1.164	-0.010	2.866	0.577	1.303	0.904	-0.356	2.212	1.130	0.386	2.50225
8/29/2021	0.217	0.560	0.450	-0.786	0.587	0.627	-0.643	1.696	0.244	0.719	0.140	-1.167	1.512	0.500	0.375	3.3725
8/30/2021	0.340	1.098	0.739	-0.946	1.436	1.138	-0.792	2.346	0.858	1.316	0.229	-1.324	2.431	1.079	0.466	3.51025
8/31/2021	0.534	1.761	1.409	-0.806	2.160	2.033	-0.686	2.849	1.692	2.049	0.340	-1.245	2.435	1.945	0.536	3.40175
9/1/2021	0.813	2.249	2.111	-0.540	2.513	2.578	-0.493	2.849	2.076	2.383	0.535	-1.074	2.438	2.423	0.664	3.21375
9/2/2021	1.184	2.484	2.674	-0.248	2.519	2.587	-0.265	2.841	2.350	2.506	0.828	-0.880	2.428	2.760	0.819	2.9865
9/3/2021	1.368	2.463	2.630	-0.074	2.515	2.578	-0.127	2.836	2.404	2.486	0.820	-0.708	2.418	2.860	0.779	2.838
9/4/2021	0.456	1.428	1.366	-0.303	2.128	2.583	-0.177	2.847	2.097	2.488	0.404	-0.732	2.429	2.456	0.524	2.8645
9/5/2021	0.583	1.645	1.688	-0.054	2.248	2.589	0.123	2.845	1.968	2.493	0.664	-0.500	2.438	2.505	0.671	2.51675
9/6/2021	1.147	2.315	2.527	0.363	2.535	2.595	0.423	2.851	2.371	2.510	1.319	-0.008	2.438	2.893	0.960	1.886
9/7/2021	1.505	2.471	2.765	0.530	2.532	2.593	0.648	2.847	2.412	2.51						

9/12/2021	2.488	2.491	3.935	2.047	2.529	2.589	2.189	2.844	2.414	2.498	3.060	0.332	2.429	3.851	1.876	1.65875
9/13/2021	2.498	2.501	3.966	2.185	2.529	2.587	2.243	2.850	2.399	2.512	3.172	0.391	2.419	3.917	1.966	1.76975
9/14/2021	2.498	2.504	3.970	2.207	2.531	2.597	2.296	2.862	2.418	2.505	3.296	0.503	2.424	3.995	2.058	1.84075
9/15/2021	2.514	2.514	3.989	2.363	2.534	2.608	2.416	2.868	2.429	2.523	3.502	0.659	2.455	4.079	2.198	1.87
9/16/2021	2.512	2.510	3.963	2.478	2.534	2.600	2.419	2.860	2.433	2.519	3.675	0.936	2.441	4.015	2.326	1.8015
9/17/2021	2.512	2.514	3.969	2.506	2.549	2.611	2.428	2.867	2.435	2.523	3.856	1.253	2.453	4.030	2.444	1.47125
9/18/2021	2.494	2.507	3.960	2.499	2.533	2.595	2.415	2.858	2.422	2.511	3.878	1.543	2.444	4.014	2.451	1.59
9/19/2021	2.511	2.515	3.964	2.510	2.540	2.610	2.423	2.862	2.413	2.520	3.885	1.739	2.433	4.019	2.458	1.515
9/20/2021	2.509	2.517	3.973	2.511	2.519	2.602	2.428	2.865	2.412	2.498	3.885	1.898	2.423	4.018	2.458	1.4475
9/21/2021	2.473	2.490	3.952	2.488	2.517	2.584	2.399	2.842	2.409	2.472	3.860	1.840	2.423	3.996	2.125	1.5135
9/22/2021	2.470	2.491	3.954	2.490	2.528	2.592	2.400	2.848	2.410	2.480	3.866	2.038	2.439	4.001	2.302	1.3665
9/23/2021	2.476	2.502	3.961	2.501	2.523	2.596	2.409	2.853	2.401	2.489	3.867	2.243	2.446	4.013	2.468	0.95825
9/24/2021	2.491	2.515	3.969	2.511	2.529	2.611	2.429	2.865	2.423	2.500	3.877	2.416	2.453	4.019	2.461	0.85525
9/25/2021	2.480	2.491	3.949	2.495	2.534	2.592	2.422	2.847	2.415	2.506	3.864	2.513	2.441	4.002	2.449	0.84325
9/26/2021	2.487	2.508	3.963	2.516	2.541	2.606	2.413	2.866	2.415	2.521	3.879	2.566	2.454	4.020	2.464	0.796
9/27/2021	2.501	2.514	3.973	2.519	2.548	2.612	2.429	2.866	2.420	2.531	3.888	2.565	2.458	4.026	2.471	0.755
9/28/2021	2.482	2.502	3.954	2.519	2.539	2.589	2.422	2.850	2.407	2.518	3.870	2.561	2.452	4.010	2.454	0.73825
9/29/2021	2.492	2.513	3.972	2.519	2.545	2.605	2.417	2.861	2.419	2.517	3.882	2.566	2.451	4.022	2.459	0.705
9/30/2021	2.489	2.510	3.968	2.510	2.535	2.596	2.417	2.856	2.409	2.510	3.877	2.535	2.423	4.018	2.462	0.68175
10/1/2021	2.489	2.504	3.964	2.520	2.533	2.600	2.409	2.862	2.412	2.507	3.881	2.539	2.420	4.022	2.465	0.65275
10/2/2021	2.492	2.508	3.962	2.515	2.516	2.607	2.435	2.860	2.416	2.494	3.885	2.539	2.421	4.017	2.458	0.61975
10/3/2021	2.475	2.492	3.943	2.496	2.509	2.586	2.421	2.841	2.396	2.489	3.866	2.524	2.402	4.005	2.445	0.6485
10/4/2021	2.488	2.503	3.958	2.360	2.537	2.605	2.243	2.854	2.404	2.520	3.882	2.540	2.412	4.016	2.462	0.712
10/5/2021	2.481	2.498	3.954	2.463	2.542	2.600	1.784	2.849	2.407	2.505	3.875	2.537	2.413	4.016	2.197	0.7165
10/6/2021	2.485	2.509	3.964	2.479	2.546	2.597	1.933	2.862	2.410	2.505	3.878	2.539	2.424	4.016	2.365	0.7
10/7/2021	2.486	2.493	3.961	2.480	2.539	2.597	2.075	2.855	2.403	2.493	3.879	2.534	2.415	4.005	2.398	0.69175
10/8/2021	2.039	2.513	3.971	2.055	2.553	2.615	1.261	2.868	2.410	2.507	3.884	2.541	2.424	4.025	1.573	0.7395
10/9/2021	1.979	2.497	3.950	1.835	2.531	2.592	1.307	2.852	2.397	2.489	3.834	2.530	2.401	4.007	1.710	0.7535
10/10/2021	2.061	2.506	3.969	1.847	2.525	2.584	1.283	2.860	2.410	2.492	3.683	2.481	2.416	4.014	1.770	0.75375
10/11/2021	2.083	2.502	3.964	1.877	2.542	2.597	1.280	2.858	2.408	2.505	3.567	2.406	2.414	4.013	1.788	0.759
10/12/2021	1.247	2.253	3.841	1.050	2.539	2.604	0.737	2.859	2.400	2.504	3.420	2.321	2.412	4.010	1.543	0.78725
10/13/2021	1.560	2.321	3.747	1.201	2.542	2.608	0.972	2.860	2.412	2.512	3.272	2.245	2.417	4.011	1.749	0.76475
10/14/2021	1.948	2.493	3.750	1.521	2.533	2.602	1.242	2.855	2.403	2.503	3.196	2.207	2.412	4.013	1.964	0.73625
10/15/2021	2.420	2.500	3.869	1.961	2.521	2.604	1.615	2.853	2.406	2.519	3.225	2.287	2.420	4.010	2.216	0.68825
10/16/2021	2.506	2.502	3.972	2.242	2.534	2.602	1.867	2.859	2.414	2.509	3.302	2.379	2.425	4.012	2.382	0.6685
10/17/2021	2.510	2.506	3.998	2.447	2.535	2.600	2.112	2.869	2.416	2.499	3.394	2.478	2.424	4.019	2.488	0.64675
10/18/2021	2.509	2.511	3.998	2.485	2.548	2.607	2.201	2.871	2.420	2.498	3.455	2.541	2.425	4.020	2.489	0.62975
10/19/2021	2.516	2.509	4.001	2.488	2.556	2.605	2.334	2.869	2.422	2.502	3.554	2.554	2.423	4.024	2.496	0.61925
10/20/2021	2.501	2.505	3.979	2.477	2.537	2.587	2.422	2.857	2.412	2.491	3.640	2.537	2.414	4.011	2.488	0.6135
10/21/2021	2.489	2.499	3.981	2.473	2.529	2.573	2.272	2.853	2.405	2.483	3.675	2.530	2.410	4.008	2.408	0.62825
10/22/2021	2.498	2.517	3.995	2.470	2.557	2.611	2.102	2.873	2.418	2.501	3.683	2.550	2.432	4.029	2.453	0.63225
10/23/2021	2.488	2.509	3.999	2.427	2.548	2.609	2.193	2.864	2.420	2.496	3.660	2.541	2.425	4.019	2.456	0.64675
10/24/2021	2.507	2.521	4.014	2.526	2.571	2.625	2.363	2.885	2.433	2.515	3.738	2.556	2.444	4.040	2.478	0.623
10/25/2021	2.492	2.511	3.994	2.505	2.551	2.605	2.425	2.864	2.416	2.499	3.803	2.531	2.424	4.022	2.463	0.635
10/26/2021	2.516	2.534	4.009	2.537	2.569	2.630	2.455	2.888	2.442	2.517	3.920	2.559	2.450	4.044	2.496	0.584
10/27/2021	2.507	2.527	3.989	2.525	2.564	2.625	2.454	2.881	2.433	2.503	3.895	2.560	2.442	4.034	2.482	0.5765
10/28/2021	2.497	2.513	3.978	2.520	2.531	2.613	2.439	2.872	2.416	2.495	3.889	2.547	2.429	4.024	2.472	0.5745
10/29/2021	2.486	2.506	3.982	2.510	2.543	2.606	2.406	2.862	2.412	2.490	3.880	2.541	2.420	4.012	2.274	0.61575
10/30/2021	2.497	2.512	3.997	2.368	2.550	2.616	2.171	2.879	2.423	2.507	3.836	2.548	2.434	4.030	2.196	0.622
10/31/2021	2.497	2.513	3.987	2.360	2.550	2.611	2.237	2.873	2.421	2.502	3.807	2.546	2.430	4.024	2.362	0.61675
11/1/2021	2.498	2.519	3.983	2.520	2.560	2.624	2.424	2.880	2.426	2.506	3.903	2.552	2.440	4.034	2.492	0.5965
11/2/2021	2.508	2.525	3.978	2.528	2.572	2.622	2.456	2.885	2.433	2.515	3.901	2.557	2.439	4.035	2.484	0.60025
11/3/2021	2.519	2.534	3.997	2.536	2.570	2.639	2.465	2.897	2.449	2.528	3.910	2.570	2.448	4.048	2.495	0.58875
11/4/2021	2.516	2.534	3.995	2.538	2.568	2.633	2.462	2.892	2.442	2.516	3.909	2.567	2.446	4.043	2.490	0.5905
11/5/2021	2.509	2.523	3.998	2.535	2.563	2.631	2.455	2.885	2.440	2.510	3.900	2.556	2.440	4.035	2.484	0.58975
11/6/2021	2.496	2.508	3.986	2.518	2.528	2.623	2.442	2.866	2.424	2.502	3.882	2.545	2.426	4.024	2.471	0.60125
11/7/2021	2.489	2.511	3.978	2.507	2.546	2.618	2.436	2.865	2.421	2.493	3.878	2.541	2.422	4.022	2.469	0.5954
11/8/2021	2.494	2.509	3.979	2.512	2.553	2.615	2.442	2.873	2.417	2.499	3.885	2.547	2.425	4.028	2.470	0.5855
11/9/2021	2.509	2.529	4.003	2.530	2.554	2.632	2.455	2.890	2.441	2.513	3.898	2.560	2.436	4.044	2.488	0.563
11/10/2021	2.510	2.525	3.997	2.525	2.540	2.630	2.429	2.887	2.435	2.521	3.899	2.559	2.440	4.036	2.482	0.5525
11/11/2021	2.508	2.518	3.982	2.433	2.552	2.613	2.430	2.881	2.431	2.510	3.892	2.556	2.438	4.038	2.312	0.58575
11/12/2021	2.432	2.525	3.987	1.903	2.574	2.627	2.447	2.886	2.434	2.515	3.897	2.554	2.442	4.039	1.993	0.61225
11/13/2021	2.502	2.521	3.982	2.051	2.568	2.627	2.369	2.877	2.428	2.503	3.890	2.548	2.438	4.039	2.104	0.609
11/14/2021	2.141	2.530	3.981	1.862	2.581	2.637	2.118	2.888	2.438	2.516	3.906	2.563	2.441	4.043	1.948	0.618
11/15/2021	1.572	2.392	3.862	1.306	2.592	2.644	1.506	2.901	2.457	2.533	3.874	2.573	2.451	4.055	1.751	0.6085
11/16/2021	1.829	2.413	3.753	1.394	2.551	2.622	1.566	2.880	2.431	2.515	3.642	2.553	2.434	4.033	1.758	0.63775
11/17/2021	1.809	2.389	3.692	1.376	2.558	2.622	1.545	2.875	2.431	2.504	3.496	2.553	2.432	4.029	1.761	0.63
11/18/2021	2.275	2.539	3.811	1.746	2.572	2.639	1.941	2.896	2.449	2.528	3.500	2.569	2.451	4.052	2.127	0.59475
11/19/2021	2.541	2.531	3.953	2.034	2.555											

11/24/2021	2.541	2.529	4.024	2.513	2.553	2.629	2.451	2.888	2.440	2.515	3.850	2.563	2.434	4.038	2.494	0.5575
11/25/2021	2.569	2.562	4.052	2.409	2.575	2.659	2.488	2.919	2.462	2.547	3.931	2.592	2.461	4.070	2.300	0.54675
11/26/2021	2.558	2.566	4.040	2.453	2.582	2.661	2.492	2.924	2.472	2.554	3.939	2.602	2.470	4.076	2.543	0.5395
11/27/2021	2.549	2.548	4.028	2.542	2.570	2.647	2.470	2.904	2.449	2.528	3.924	2.581	2.445	4.058	2.512	0.5525
11/28/2021	2.557	2.546	4.020	2.554	2.565	2.647	2.473	2.906	2.458	2.534	3.922	2.586	2.445	4.059	2.507	0.5445
11/29/2021	2.554	2.552	4.021	2.549	2.564	2.646	2.476	2.907	2.451	2.539	3.926	2.587	2.448	4.059	2.507	0.528
11/30/2021	2.546	2.535	4.012	2.541	2.561	2.635	2.459	2.897	2.447	2.527	3.916	2.581	2.439	4.053	2.496	0.53325
12/1/2021	2.533	2.531	3.999	2.491	2.552	2.628	2.453	2.889	2.442	2.514	3.909	2.576	2.432	4.044	2.433	0.551
12/2/2021	2.536	2.528	4.001	2.161	2.542	2.625	2.452	2.885	2.433	2.516	3.899	2.582	2.428	4.041	1.958	0.5765
Total Days in Growing Season that Meet Wetland Hydrology:	23	10	9	50	7	11	31	0	11	8	16	93	2	3	39	

# Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network

Rainfall (Inches)



Coordinates	44.475943, -88.545062
Observation Date	2021-08-01
Elevation (ft)	761.61
Drought Index (PDSI)	Extreme wetness
WebWIMP H <sub>2</sub> O Balance	Dry Season

30 Days Ending	30 <sup>th</sup> %ile (in)	70 <sup>th</sup> %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-08-01	2.824803	4.511024	5.937008	Wet	3	3	9
2021-07-02	3.551181	5.117323	6.30315	Wet	3	2	6
2021-06-02	2.965748	4.385827	2.248032	Dry	1	1	1
Result							Wetter than Normal - 16



Figure and tables made by the  
**Antecedent Precipitation Tool**  
Version 1.0

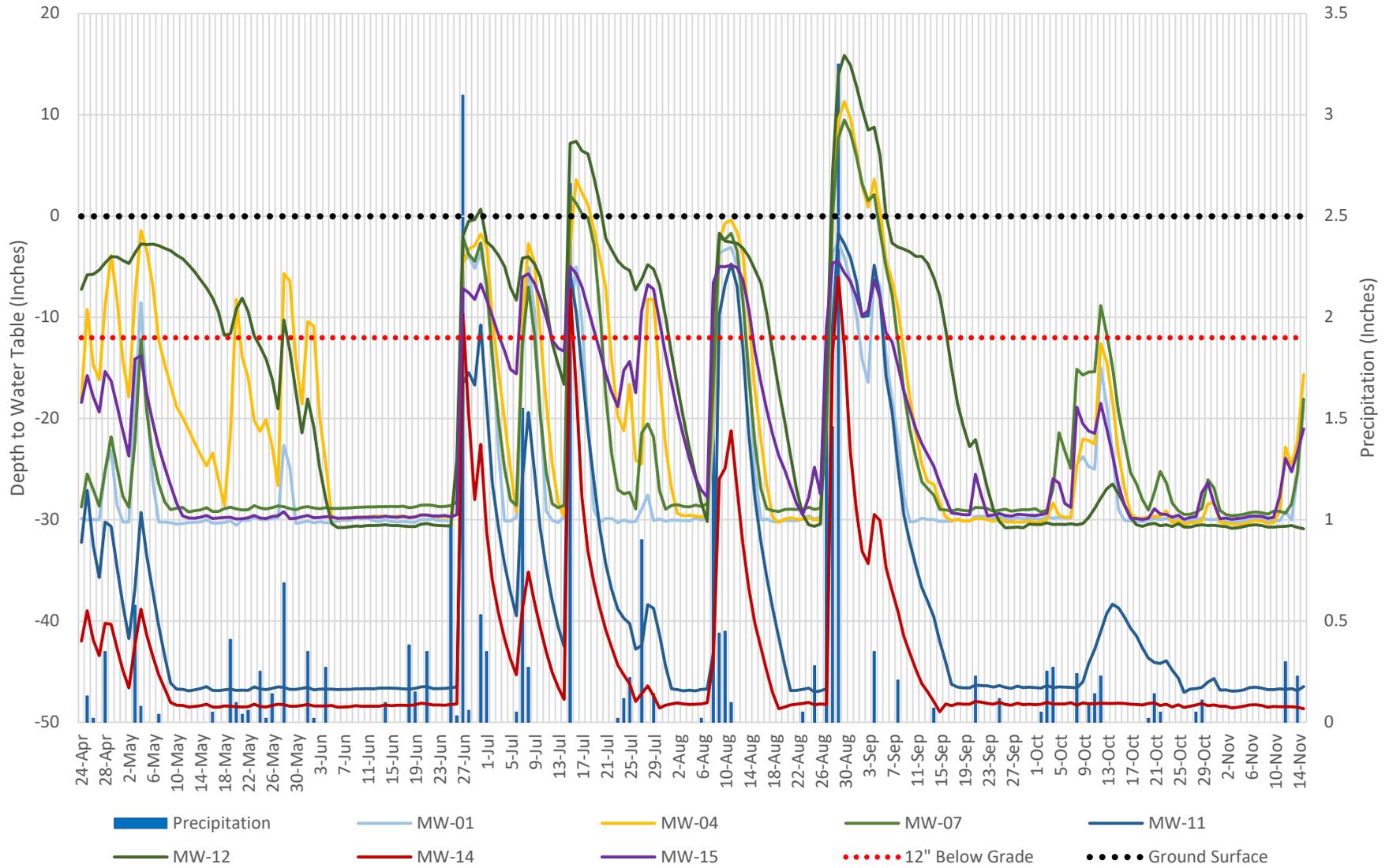
Written by Jason Deters  
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
SHIOCTON	44.4389, -88.5839	770.013	3.197	8.403	1.465	5783	90
NEW LONDON	44.3586, -88.7189	799.869	8.672	29.856	4.161	4632	0
SEYMOUR	44.5044, -88.3333	793.963	13.159	23.95	6.237	844	0
APPLETON	44.2769, -88.4378	791.995	13.318	21.982	6.286	94	0

# 2021 Baseline Monitoring Well Hydrographs

## Existing Wetland Areas

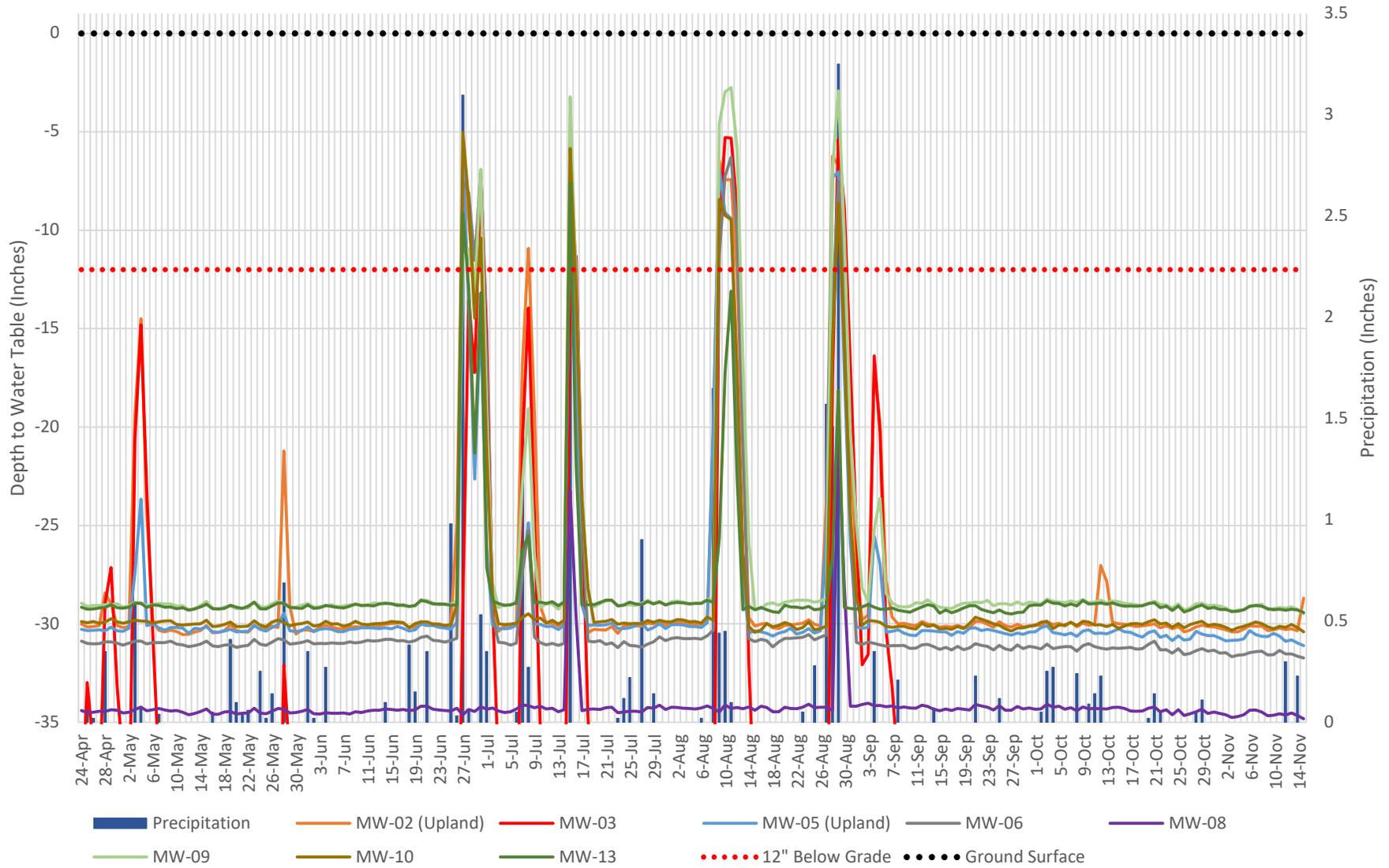
Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



# 2021 Baseline Monitoring Well Hydrographs

## Potentially Restorable Wetland Areas & Upland Areas

Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



Average of Water Level from Ground Surface (ft)

Water Table to Bottom of Data Logger (ft)

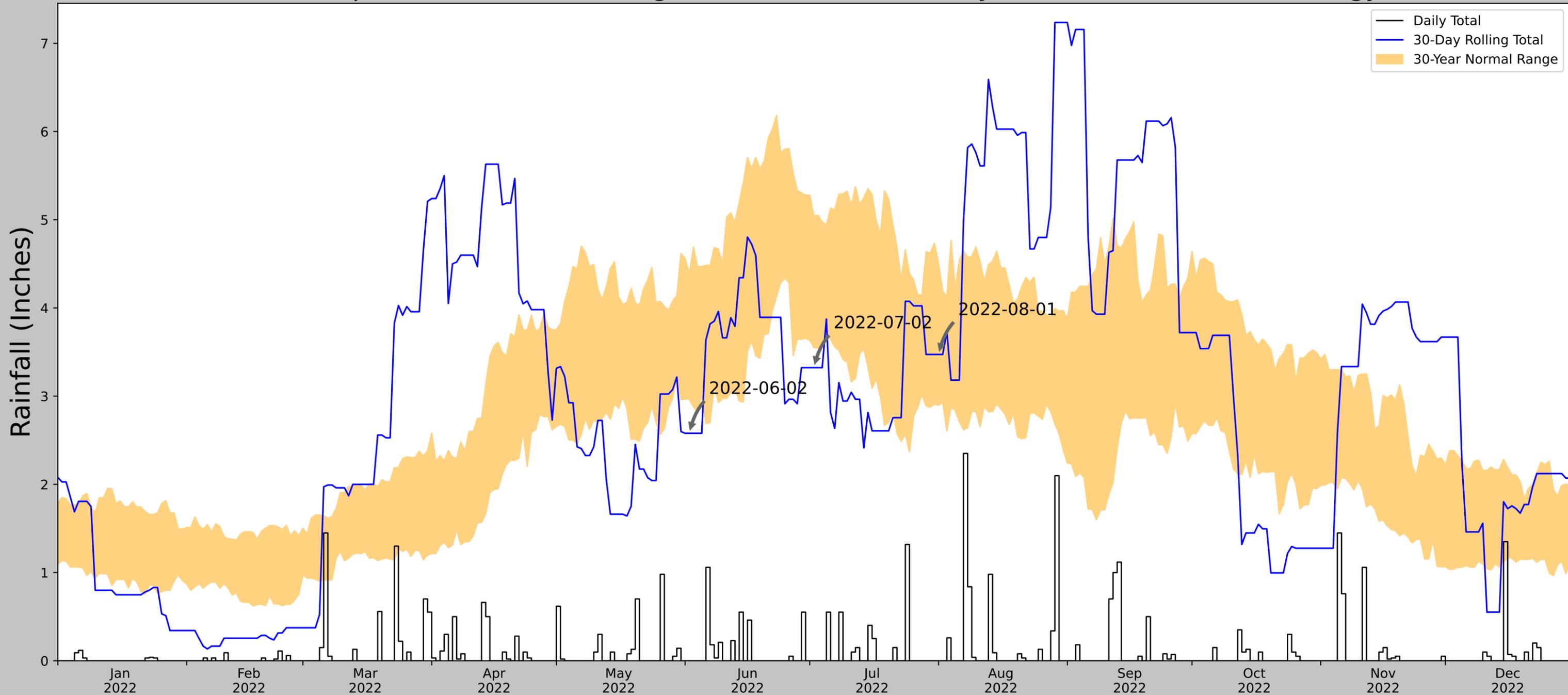
Date	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	SW-03
4/14/2022	2.491	0.054	0.178	-2.107	0.332		-1.872	2.889		0.205	-1.129	-2.498	0.008	0.441	-0.679	3.622
4/15/2022	-0.110	0.376	0.597	-1.790	1.090		-1.665	2.875		0.410	-0.769	-2.134	0.172	0.985	-0.496	3.48125
4/16/2022	-0.190	0.286	0.662	-1.862	1.300	0.387	-1.738	2.878	-0.285	0.376	-0.834	-2.193	0.116	1.205	-0.522	3.549
4/17/2022	-0.077	0.408	0.982	-1.760	1.534	0.436	-1.622	2.905	-0.233	0.515	-0.691	-2.029	0.274	1.373	-0.354	3.44625
4/18/2022	-0.073	0.413	0.772	-1.738	0.979	0.384	-1.617	2.648	-0.198	0.492	-0.685	-2.035	0.268	0.946	-0.360	3.427
4/19/2022	-0.063	0.415	0.781	-1.741	1.005	0.417	-1.606	2.670	-0.192	0.498	-0.685	-2.043	0.259	1.054	-0.361	3.43125
4/20/2022	-0.078	0.405	1.040	-1.762	1.322	0.415	-1.633	2.871	-0.201	0.499	-0.681	-2.032	0.277	1.318	-0.347	3.44975
4/21/2022	-0.064	0.419	0.600	-1.749	0.609	0.408	-1.608	1.763	-0.210	0.486	-0.696	-2.061	0.234	0.726	-0.402	3.4265
4/22/2022	-0.084	0.398	0.778	-1.776	1.147	0.421	-1.627	2.809	-0.206	0.510	-0.671	-2.018	0.278	1.158	-0.332	3.43825
4/23/2022	-0.069	0.404	0.612	-1.752	0.647	0.393	-1.619	2.074	-0.199	0.485	-0.662	-2.035	0.284	0.804	-0.338	3.42275
4/24/2022	-0.039	0.460	0.883	-1.735	1.303	0.408	-1.607	2.691	-0.188	0.492	-0.673	-2.046	0.278	1.434	-0.392	3.41825
4/25/2022	-0.016	0.582	1.815	-1.713	2.031	0.571	-1.577	2.859	-0.162	0.587	-0.644	-2.023	0.302	1.973	-0.357	3.38225
4/26/2022	0.014	0.607	2.190	-1.677	2.006	0.866	-1.538	2.874	-0.134	0.685	-0.612	-1.988	0.346	1.866	-0.308	3.346
4/27/2022	0.014	0.684	2.434	-1.680	2.100	1.220	-1.531	2.877	-0.114	0.846	-0.577	-1.945	0.439	1.952	-0.249	3.34725
4/28/2022	0.195	0.747	2.642	-1.490	2.143	1.578	-1.353	2.871	0.062	1.108	-0.411	-1.778	0.646	2.031	-0.095	3.15775
4/29/2022	0.356	1.040	2.783	-1.091	2.237	1.856	-0.957	2.863	0.244	1.452	-0.207	-1.414	1.075	2.157	0.233	2.762
4/30/2022	0.395	1.013	2.372	-0.317	2.018	1.571	-0.281	2.870	0.319	1.451	0.292	-0.749	1.123	1.969	0.333	1.9955
5/1/2022	0.304	0.472	0.585	0.179	0.518	0.404	0.105	2.811	0.218	0.531	0.302	0.177	0.370	0.620	0.308	0.88
5/2/2022	0.321	0.573	0.658	0.203	1.058	0.450	0.177	2.888	0.249	0.827	0.336	0.329	0.509	0.985	0.328	0.87625
5/3/2022	0.346	0.838	0.842	0.227	1.567	0.493	0.213	2.920	0.319	1.208	0.368	0.318	0.828	1.386	0.381	1.06375
5/4/2022	0.415	1.368	1.413	0.266	2.080	0.821	0.304	2.885	0.703	1.733	0.469	0.281	1.437	1.857	0.477	1.06675
5/5/2022	0.598	1.910	2.205	0.308	2.488	1.607	0.410	2.882	1.192	2.235	0.578	0.407	2.003	2.321	0.654	0.805
5/6/2022	0.965	2.290	2.784	0.443	2.529	2.287	0.557	2.877	1.648	2.497	0.742	0.425	2.342	2.604	0.827	0.8105
5/7/2022	1.655	2.531	3.360	0.746	2.525	2.585	0.885	2.878	2.063	2.528	1.031	0.466	2.417	2.878	1.048	0.8
5/8/2022	2.393	2.518	3.780	1.135	2.534	2.579	1.365	2.876	2.338	2.511	1.458	0.534	2.415	3.172	1.330	0.773
5/9/2022	2.508	2.516	3.936	1.359	2.537	2.582	1.863	2.887	2.510	2.518	1.799	0.626	2.416	3.347	1.544	0.7195
5/10/2022	2.416	2.513	3.689	1.263	2.535	2.587	2.094	2.876	2.435	2.514	1.829	0.626	2.415	3.304	1.556	0.74225
5/11/2022	0.488	1.284	1.454	0.414	1.756	1.703	0.709	2.878	1.172	1.897	0.517	0.446	1.519	1.909	0.704	0.79525
5/12/2022	0.404	1.206	0.969	0.390	1.773	1.624	0.476	2.887	0.950	1.915	0.555	0.449	1.342	1.867	0.653	0.75925
5/13/2022	0.870	2.374	2.266	0.874	2.536	2.594	1.224	2.885	1.981	2.519	1.096	0.526	2.403	2.750	1.095	0.742
5/14/2022	1.704	2.510	3.160	1.386	2.514	2.578	1.966	2.875	2.331	2.501	1.648	0.617	2.404	3.158	1.456	0.7765
5/15/2022	2.490	2.515	3.826	1.693	2.519	2.580	2.398	2.874	2.456	2.508	2.407	0.815	2.404	3.552	1.906	0.774
5/16/2022	2.474	2.499	3.973	1.907	2.509	2.573	2.394	2.874	2.410	2.500	2.834	1.071	2.399	3.836	2.257	0.7875
5/17/2022	2.482	2.499	3.964	2.134	2.512	2.574	2.394	2.891	2.414	2.497	3.275	1.330	2.408	4.019	2.510	0.8025
5/18/2022	2.479	2.503	3.964	2.290	2.516	2.574	2.395	2.864	2.414	2.496	3.390	1.384	2.399	4.016	2.540	0.84425
5/19/2022	2.492	2.502	3.962	2.309	2.521	2.579	2.403	2.865	2.413	2.503	3.413	1.356	2.412	4.024	2.449	0.88
5/20/2022	0.924	1.256	1.905	0.769	1.939	2.195	1.315	2.860	1.541	2.443	1.425	0.526	2.034	2.809	1.276	1.03925
5/21/2022	0.477	1.567	1.652	0.420	2.143	2.468	1.078	2.855	1.788	2.500	1.396	0.282	2.301	2.593	1.222	1.11025
5/22/2022	0.927	2.430	2.697	0.688	2.519	2.618	1.589	2.873	2.204	2.512	2.097	0.290	2.416	3.031	1.517	1.1025
5/23/2022	1.874	2.548	3.374	1.151	2.517	2.606	2.036	2.865	2.412	2.499	2.565	0.327	2.401	3.315	1.786	1.0435
5/24/2022	2.514	2.553	3.794	1.502	2.526	2.604	2.398	2.873	2.556	2.510	2.916	0.499	2.416	3.585	2.072	0.74025
5/25/2022	1.974	2.351	3.439	1.390	2.509	2.568	2.082	2.862	2.578	2.498	3.007	0.534	2.393	3.688	1.965	0.734
5/26/2022	0.403	0.612	0.700	0.425	0.934	1.208	0.303	2.898	0.583	1.706	0.595	0.429	0.924	1.541	0.710	0.68125
5/27/2022	0.428	1.115	0.881	0.408	1.739	1.844	0.471	2.876	1.123	2.004	0.895	0.441	1.488	2.139	0.882	0.6745
5/28/2022	0.643	1.937	1.704	0.416	2.498	2.530	0.729	2.864	1.877	2.472	1.462	0.446	2.255	2.649	1.102	0.71025
5/29/2022	0.782	1.979	1.993	0.505	2.513	2.529	0.917	2.877	1.966	2.504	1.584	0.474	2.338	2.770	1.159	0.67825
5/30/2022	0.892	1.997	2.207	0.583	2.536	2.596	1.113	2.884	2.039	2.519	1.805	0.501	2.355	2.879	1.245	0.67925
5/31/2022	2.118	2.533	3.275	1.297	2.521	2.582	2.109	2.865	2.384	2.499	2.655	0.623	2.406	3.368	1.700	0.573
6/1/2022	2.483	2.537	3.886	1.804	2.509	2.585	2.399	2.863	2.576	2.501	3.134	0.876	2.408	3.747	2.182	0.281
6/2/2022	2.484	2.537	4.003	2.118	2.518	2.576	2.399	2.867	2.656	2.510	3.483	1.197	2.407	4.009	2.502	0.2715
6/3/2022	2.487	2.540	3.960	2.370	2.523	2.581	2.400	2.865	2.737	2.502	3.723	1.665	2.404	4.044	2.490	0.3285
6/4/2022	2.484	2.508	3.956	2.484	2.520	2.578	2.401	2.862	2.843	2.500	3.931	2.099	2.401	4.024	2.450	0.31525
6/5/2022	2.480	2.541	3.961	2.476	2.524	2.574	2.407	2.862	2.835	2.497	3.807	2.136	2.402	4.025	2.457	0.30175
6/6/2022	1.048	1.683	2.709	0.991	2.167	2.391	1.595	2.870	2.252	2.508	2.303	0.877	1.832	2.866	1.305	0.333
6/7/2022	0.518	1.031	1.314	0.426	1.958	2.072	0.838	2.873	1.418	2.349	1.217	0.484	1.323	2.267	0.813	0.31975
6/8/2022	0.589	1.265	1.687	0.453	2.428	2.493	0.905	2.867	1.901	2.510	1.611	0.479	1.751	2.679	0.974	0.29775
6/9/2022	0.581	1.357	1.868	0.446	2.462	2.526	0.892	2.873	1.867	2.505	1.745	0.493	1.749	2.779	1.136	0.24375
6/10/2022	1.288	2.327	3.189	0.634	2.521	2.581	1.724	2.870	2.476	2.504	2.600	0.558	2.290	3.255	1.850	0.238
6/11/2022	2.202	2.521	3.759	1.346	2.512	2.561	2.263	2.860	2.630	2.499	2.964	0.613	2.400	3.536	2.245	0.42675
6/12/2022	0.997	2.044	2.968	0.420	2.518	2.573	1.326	2.866	2.556	2.502	2.243	0.479	1.903	2.983	1.317	0.5865
6/13/2022	1.735	2.269	3.345	0.560	2.517	2.577	1.669	2.871	2.655	2.505	2.385	0.523	2.046	3.196	1.689	0.599
6/14/2022	0.639	1.262	1.934	0.421	2.520	2.563	0.796	2.877	1.894	2.525	1.548	0.491	1.773	2.824	1.055	0.58475
6/15/2022	1.249	2.279	3.149	0.463	2.514	2.580	1.542	2.863	2.360	2.513	2.399	0.545	1.905	3.182	1.707	0.613
6/16/2022	0.796	1.490	2.459	0.405	2.517	2.585	1.061	2.863	2.210	2.498	1.880	0.493	1.606	2.939	1.311	0.731
6/17/2022	2.107	2.444	3.850	0.661	2.520	2.571	2.173	2.866	2.638	2.506	2.862	0.665	2.005	3.441	2.280	0.58175
6/18/2022	2.501	2.531	3.999	1.504	2.521	2.569	2.394	2.869	2.825	2.510	3.370	0.956	2.422	3.735	2.452	0.34525
6/19/2022	2.484	2.535	3.983	1.921	2.513	2.566	2.386	2.863	2.823	2.498	3.692	1.243	2.404	3.927	2.452	0.34425
6/20/2022	2.498	2.552	3.974													

6/21/2022	2.483	2.540	3.974	2.373	2.521	2.569	2.393	2.874	2.717	2.506	3.892	2.320	2.406	4.075	2.453	0.231
6/22/2022	2.489	2.514	3.970	2.493	2.516	2.571	2.399	2.876	2.432	2.503	3.890	2.538	2.420	4.021	2.462	-0.00625
6/23/2022	2.493	2.516	3.967	2.488	2.526	2.570	2.400	2.876	2.434	2.500	3.891	2.539	2.418	4.030	2.460	-0.01075
6/24/2022	2.486	2.510	3.963	2.490	2.519	2.572	2.395	2.869	2.427	2.509	3.893	2.546	2.421	4.031	2.460	-0.0105
6/25/2022		2.514	3.974	2.484	2.521	2.572	2.393	2.871	2.427	2.512	3.895	2.543	2.418	4.033	2.464	-0.01275
6/26/2022		2.504	3.972	2.482	2.517	2.571	2.387	2.870	2.422	2.515	3.891	2.539	2.414	4.024	2.455	-0.01125
6/27/2022		2.517	3.974	2.486	2.528	2.579	2.394	2.875	2.424	2.509	3.897	2.545	2.424	4.027	2.465	-0.01075
6/28/2022		2.512	3.971	2.484	2.523	2.576	2.397	2.877	2.426	2.503	3.893	2.550	2.428	4.035	2.459	-0.01575
6/29/2022		2.516	3.965	2.478	2.513	2.569	2.393	2.874	2.423	2.505	3.890	2.543	2.419	4.030	2.460	-0.00225
6/30/2022		2.513	3.973	2.485	2.517	2.567	2.387	2.874	2.426	2.504	3.891	2.538	2.417	4.029	2.460	-0.01225
7/1/2022		2.504	3.974	2.479	2.512	2.562	2.385	2.866	2.417	2.505	3.891	2.529	2.421	4.018	2.457	-0.00875
7/2/2022		2.513	3.964	2.486	2.512	2.574	2.387	2.870	2.417	2.498	3.888	2.534	2.409	4.018	2.459	-0.001
7/3/2022		2.508	3.971	2.490	2.518	2.573	2.389	2.872	2.424	2.514	3.886	2.535	2.421	4.026	2.459	-0.00125
7/4/2022		2.514	3.966	2.485	2.515	2.576	2.398	2.869	2.428	2.513	3.890	2.536	2.424	4.028	2.461	-0.01025
7/5/2022		2.517	3.969	2.483	2.518	2.578	2.394	2.874	2.427	2.502	3.897	2.541	2.416	4.026	2.464	-0.0145
7/6/2022		2.513	3.975	2.481	2.518	2.576	2.389	2.875	2.425	2.511	3.895	2.538	2.418	4.022	2.460	-0.0205
7/7/2022		2.512	3.972	2.487	2.510	2.575	2.394	2.873	2.425	2.509	3.896	2.538	2.421	4.028	2.458	-0.01575
7/8/2022		2.516	3.975	2.479	2.514	2.578	2.389	2.877	2.427	2.522	3.888	2.540	2.421	4.029	2.465	-0.022
7/9/2022		2.512	3.978	2.483	2.522	2.578	2.397	2.875	2.430	2.512	3.888	2.539	2.424	4.031	2.460	-0.01375
7/10/2022		2.526	3.982	2.495	2.530	2.582	2.406	2.882	2.431	2.527	3.904	2.555	2.437	4.036	2.473	-0.02925
7/11/2022		2.510	3.961	2.487	2.517	2.571	2.390	2.865	2.421	2.509	3.884	2.539	2.420	4.025	2.456	-0.0085
7/12/2022		2.528	3.976	2.497	2.528	2.586	2.400	2.884	2.440	2.518	3.901	2.548	2.429	4.034	2.465	-0.02575
7/13/2022		2.519	3.975	2.489	2.520	2.577	2.395	2.880	2.432	2.517	3.896	2.544	2.423	4.028	2.472	-0.024
7/14/2022		2.515	3.965	2.485	2.522	2.584	2.395	2.869	2.430	2.503	3.888	2.538	2.418	4.027	2.461	-0.018
7/15/2022		2.519	3.974	2.489	2.520	2.576	2.395	2.877	2.429	2.515	3.897	2.544	2.420	4.029	2.467	-0.0225
7/16/2022		2.512	3.970	2.484	2.521	2.580	2.391	2.874	2.428	2.510	3.891	2.539	2.429	4.029	2.458	-0.01275
7/17/2022		2.511	3.972	2.490	2.515	2.574	2.389	2.870	2.430	2.505	3.888	2.542	2.419	4.024	2.460	-0.0075
7/18/2022		2.511	3.959	2.482	2.511	2.572	2.387	2.860	2.423	2.506	3.890	2.534	2.412	4.023	2.464	-0.00975
7/19/2022		2.536	3.989	2.511	2.537	2.601	2.410	2.896	2.449	2.522	3.908	2.555	2.435	4.047	2.485	-0.04425
7/20/2022		2.519	3.979	2.501	2.529	2.580	2.406	2.881	2.435	2.505	3.889	2.543	2.431	4.036	2.467	-0.031
7/21/2022		2.525	3.974	2.497	2.535	2.584	2.406	2.885	2.439	2.510	3.897	2.554	2.435	4.034	2.472	-0.0465
7/22/2022		2.521	3.968	2.493	2.525	2.574	2.402	2.878	2.431	2.501	3.890	2.549	2.422	4.027	2.467	-0.03825
7/23/2022		2.510	3.967	2.490	2.523	2.579	2.395	2.864	2.427	2.502	3.881	2.538	2.415	4.026	2.459	-0.039
7/24/2022		2.516	3.970	2.491	2.519	2.573	2.392	2.872	2.435	2.506	3.889	2.539	2.299	4.020	2.457	-0.03375
7/25/2022		2.509	3.962	2.493	2.522	2.561	2.383	2.869	2.422	2.492	3.881	2.533	2.454	4.022	2.458	-0.01225
7/26/2022		2.511	3.958	2.486	2.515	2.581	2.389	2.870	2.432	2.499	3.880	2.536	2.446	4.021	2.454	-0.02075
7/27/2022		2.514	3.973	2.487	2.519	2.564	2.389	2.873	2.429	2.505	3.884	2.548	2.440	4.028	2.454	-0.023
7/28/2022		2.508	3.962	2.488	2.516	2.567	2.388	2.864	2.420	2.492	3.879	2.541	2.413	4.020	2.455	-0.01225
7/29/2022		2.506	3.964	2.483	2.513	2.569	2.385	2.864	2.411	2.497	3.877	2.537	2.417	4.022	2.451	-0.01225
7/30/2022		2.519	3.972	2.488	2.522	2.579	2.398	2.872	2.426	2.503	3.885	2.534	2.423	4.029	2.463	-0.03025
7/31/2022		2.517	3.979	2.499	2.531	2.574	2.397	2.879	2.435	2.511	3.889	2.547	2.428	4.038	2.461	-0.0225
8/1/2022		2.524	3.976	2.498	2.526	2.576	2.395	2.877	2.432	2.505	3.888	2.548	2.427	4.031	2.460	-0.0185
8/2/2022		2.519	3.980	2.490	2.523	2.578	2.394	2.874	2.436	2.508	3.886	2.549	2.428	4.030	2.463	-0.02275
8/3/2022		2.517	3.973	2.484	2.517	2.567	2.395	2.867	2.429	2.505	3.880	2.544	2.419	4.030	2.447	-0.01925
8/4/2022		2.523	3.981	2.493	2.529	2.575	2.399	2.881	2.440	2.513	3.897	2.546	2.430	4.040	2.464	-0.0285
8/5/2022		2.514	3.973	2.491	2.522	2.576	2.397	2.869	2.431	2.504	3.891	2.543	2.423	4.028	2.458	-0.03375
8/6/2022		2.521	3.979	2.498	2.528	2.582	2.397	2.884	2.438	2.508	3.891	2.548	2.426	4.033	2.461	-0.031
8/7/2022		1.316	3.609	0.861	2.417	1.432	0.683	2.898	0.654	1.331	1.470	0.716	1.081	3.266	1.656	0.01275
8/8/2022		0.621	3.999	1.176	2.156	0.545	0.306	2.636	0.330	0.916	0.429	0.165	0.927	3.579	0.831	-0.023
8/9/2022		0.974	3.967	1.427	2.393	0.788	0.460	2.666	0.418	1.482	0.501	0.248	1.121	3.828	1.180	-0.00775
8/10/2022		1.668	3.970	1.632	2.551	1.339	0.764	2.883	1.109	2.005	0.679	0.324	1.362	4.037	1.788	0.02275
8/11/2022		2.419	3.961	1.925	2.516	1.725	1.305	2.865	1.706	2.343	0.986	0.371	1.608	4.056	2.284	0.29575
8/12/2022		2.533	3.967	2.268	2.515	2.025	1.958	2.859	2.208	2.512	1.338	0.453	1.795	4.059	2.449	0.44075
8/13/2022		1.688	3.627	1.248	2.415	1.425	0.793	2.390	1.309	2.090	0.628	0.320	1.320	3.968	1.734	0.467
8/14/2022		0.846	2.559	0.466	2.301	0.730	0.362	2.009	0.333	1.518	0.428	0.261	1.017	3.533	1.128	0.4545
8/15/2022		1.278	2.870	0.646	2.425	1.157	0.522	2.526	0.729	1.875	0.530	0.300	1.167	3.627	1.550	0.44675
8/16/2022		2.017	3.346	1.101	2.541	1.650	0.946	2.872	1.398	2.180	0.744	0.343	1.319	3.900	2.064	0.49475
8/17/2022		2.533	3.695	1.584	2.548	1.914	1.567	2.875	1.933	2.407	1.067	0.401	1.470	4.068	2.418	0.554
8/18/2022		2.540	3.961	1.892	2.528	2.108	2.073	2.869	2.341	2.519	1.463	0.482	1.610	4.055	2.449	0.5835
8/19/2022		2.544	3.979	2.182	2.514	2.273	2.345	2.866	2.483	2.520	1.799	0.543	1.755	4.047	2.450	0.53275
8/20/2022		2.528	3.979	2.379	2.509	2.394	2.396	2.860	2.501	2.508	1.482	0.560	1.863	4.048	2.442	0.35525
8/21/2022		2.535	3.978	2.344	2.510	2.484	2.327	2.861	2.531	2.513	1.563	0.629	1.940	4.038	2.445	0.04625
8/22/2022		2.543	3.978	2.415	2.530	2.540	2.410	2.874	2.496	2.536	2.068	0.786	2.052	4.029	2.456	-0.02225
8/23/2022		2.544	3.966	2.500	2.521	2.585	2.402	2.875	2.428	2.520	2.497	1.011	2.138	4.025	2.453	-0.023
8/24/2022		2.541	3.967	2.484	2.520	2.600	2.397	2.866	2.423	2.500	2.771	1.389	2.209	4.024	2.449	-0.01375
8/25/2022		2.520	3.962	2.491	2.517	2.568	2.392	2.868	2.424	2.500	2.812	1.646	2.258	4.020	2.445	-0.00725
8/26/2022		2.512	3.973	2.483	2.516	2.569	2.389	2.868	2.425	2.503	2.973	1.995	2.304	4.022	2.447	-0.0135
8/27/2022		2.499	3.952	2.467	2.508	2.554	2.376	2.855	2.413	2.490	3.105	2.068	2.320	4.008	2.434	0.00425
8/28/2022		2.007	3.678	1.950	2.306	2.440	1.849	2.871	1.945	2.497	2.049	1.276	1.937	4.031	2.044	0.04
8/29/2022		0.905	2.439	0.569	1.932	0.742	0.458	1.961	0.449	1.213	0.485	0.207	0.952	2.501	0.900	0.1055
8/30/2022		1.542	2.323	0.833	2.211	1.029	0.850	2.504	1.101	1.883	0.625	0.281	1.16			

9/2/2022		2.506	3.763	1.929	2.544	2.153	2.277	2.871	2.384	2.505	1.359	0.497	1.547	4.069	2.455	-0.01275
9/3/2022		2.505	3.817	2.020	2.527	2.257	2.102	2.863	2.266	2.495	0.954	0.489	1.623	4.048	2.448	-0.007
9/4/2022		2.503	3.887	2.049	2.519	2.337	2.323	2.867	2.377	2.496	1.484	0.598	1.709	4.038	2.455	-0.00325
9/5/2022		2.511	3.975	2.233	2.511	2.388	2.412	2.866	2.489	2.498	1.977	0.734	1.789	4.061	2.452	-0.0075
9/6/2022		2.509	3.986	2.433	2.515	2.474	2.391	2.866	2.431	2.497	2.338	0.936	1.879	4.054	2.458	-0.008
9/7/2022		2.517	3.994	2.492	2.521	2.503	2.403	2.879	2.430	2.501	2.583	1.330	1.963	4.052	2.468	-0.0205
9/8/2022		2.506	3.976	2.498	2.524	2.524	2.399	2.880	2.429	2.500	2.761	1.747	2.040	4.055	2.465	-0.01875
9/9/2022		2.518	3.987	2.500	2.535	2.580	2.405	2.887	2.433	2.506	2.944	2.149	2.118	4.053	2.468	-0.01775
9/10/2022		2.501	3.960	2.489	2.515	2.592	2.397	2.869	2.429	2.499	3.106	2.447	2.175	4.060	2.449	-0.001
9/11/2022		2.494	3.955	2.479	2.505	2.585	2.387	2.865	2.413	2.491	1.286	1.029	2.223	4.040	2.441	-0.00425
9/12/2022		0.674	1.738	0.443	1.671	1.046	0.343	1.824	0.428	1.731	0.368	0.214	0.936	2.947	1.137	0.1685
9/13/2022		0.589	0.625	0.418	0.647	0.470	0.256	1.030	0.320	0.737	0.394	0.029	0.528	0.818	0.624	0.5375
9/14/2022		0.835	0.778	0.484	1.211	0.528	0.372	1.496	0.471	1.231	0.458	0.236	0.843	1.517	0.843	0.236
9/15/2022		1.179	1.001	0.654	1.761	0.725	0.522	1.848	0.799	1.727	0.530	0.305	1.148	2.175	1.240	0.49275
9/16/2022		1.456	1.273	0.748	2.029	1.012	0.682	2.131	1.030	2.057	0.582	0.335	1.276	2.608	1.540	0.619
9/17/2022		1.748	1.625	0.857	2.236	1.420	0.964	2.465	1.303	2.270	0.665	0.365	1.389	2.940	1.842	0.65975
9/18/2022		1.935	1.944	0.971	2.386	1.730	1.232	2.722	1.488	2.417	0.741	0.396	1.475	3.137	2.071	0.663
9/19/2022		2.100	2.309	1.076	2.513	1.931	1.483	2.864	1.701	2.522	0.858	0.440	1.547	3.290	2.258	0.63075
9/20/2022		1.558	1.883	0.834	2.532	1.601	1.162	2.443	1.329	2.542	0.692	0.427	1.587	3.279	2.051	0.659
9/21/2022		1.166	1.434	0.454	2.442	1.430	0.783	2.428	1.123	2.532	0.573	0.422	1.573	3.048	1.948	0.76075
9/22/2022		1.805	2.196	0.677	2.499	1.884	1.327	2.852	1.768	2.522	0.912	0.498	1.628	3.301	2.362	0.803
9/23/2022		2.301	2.691	0.911	2.527	2.173	1.700	2.881	2.127	2.536	1.200	0.589	1.715	3.481	2.461	0.8095
9/24/2022		2.150	2.687	0.881	2.530	2.285	1.531	2.874	2.006	2.514	1.066	0.576	1.774	3.499	2.457	0.812
9/25/2022		2.110	2.632	0.726	2.532	2.327	1.351	2.870	1.921	2.502	1.053	0.581	1.828	3.483	2.439	0.71775
9/26/2022		1.501	1.979	0.481	2.525	2.234	1.035	2.877	1.667	2.547	0.997	0.618	1.856	3.483	2.391	0.17325
9/27/2022		1.887	2.376	0.582	2.531	2.222	1.260	2.878	1.978	2.528	1.385	0.742	1.901	3.570	2.467	-0.00125
9/28/2022		2.412	2.873	0.795	2.535	2.336	1.692	2.874	2.354	2.558	1.793	0.912	1.964	3.699	2.467	0.002
9/29/2022		2.563	3.141	1.041	2.541	2.419	1.966	2.887	2.496	2.532	2.108	1.167	2.041	3.782	2.483	-0.00675
9/30/2022		2.556	3.280	1.251	2.546	2.485	2.129	2.890	2.504	2.541	2.300	1.423	2.122	3.848	2.479	-0.011
10/1/2022		2.553	3.390	1.448	2.540	2.539	2.277	2.881	2.450	2.544	2.461	1.661	2.187	3.904	2.474	0.0005
10/2/2022		2.536	3.498	1.622	2.531	2.580	2.385	2.869	2.426	2.525	2.599	1.894	2.251	3.970	2.465	0.00375
10/3/2022		2.560	3.622	1.761	2.534	2.605	2.443	2.888	2.438	2.529	2.713	2.080	2.333	4.023	2.477	-0.00475
10/4/2022		2.553	3.700	1.878	2.531	2.611	2.448	2.880	2.433	2.536	2.809	2.215	2.387	4.049	2.470	-0.00275
10/5/2022		2.562	3.787	2.008	2.549	2.626	2.425	2.890	2.449	2.545	2.919	2.340	2.453	4.078	2.480	-0.01125
10/6/2022		2.546	3.821	2.062	2.524	2.607	2.399	2.874	2.433	2.523	2.872	2.326	2.475	4.075	2.465	-0.00525
10/7/2022		2.557	3.843	1.999	2.533	2.621	2.417	2.885	2.442	2.533	2.895	2.362	2.446	4.060	2.477	-0.00775
10/8/2022		2.556	3.896	2.093	2.540	2.622	2.412	2.885	2.439	2.510	3.053	2.496	2.456	4.068	2.480	0.004
10/9/2022		2.536	3.941	2.241	2.538	2.619	2.408	2.880	2.438	2.520	3.178	2.575	2.458	4.065	2.478	0.00575
10/10/2022		2.529	4.005	2.413	2.536	2.628	2.410	2.885	2.444	2.537	3.287	2.598	2.434	4.076	2.482	0.00125
10/11/2022		2.525	4.019	2.492	2.548	2.629	2.409	2.887	2.440	2.529	3.365	2.600	2.432	4.076	2.480	-0.00575
10/12/2022		2.518	3.996	2.470	2.527	2.603	2.407	2.877	2.434	2.508	3.326	2.557	2.414	4.072	2.468	0.00175
10/13/2022		2.520	3.765	1.693	2.533	2.610	2.336	2.883	2.444	2.531	2.828	2.194	2.418	4.070	2.474	-0.0005
10/14/2022		2.525	3.452	1.217	2.536	2.618	1.981	2.888	2.439	2.541	2.606	1.985	2.419	3.961	2.473	-0.002
10/15/2022		2.518	3.181	0.983	2.535	2.620	1.639	2.881	2.488	2.529	2.372	1.788	2.420	3.780	2.248	0.012
10/16/2022		2.530	3.219	1.160	2.542	2.630	1.795	2.888	2.509	2.534	2.516	1.943	2.425	3.712	2.290	-0.00375
10/17/2022		2.510	3.127	0.867	2.540	2.619	1.447	2.886	2.465	2.536	2.268	1.679	2.428	3.637	2.142	-0.0055
10/18/2022		2.458	3.095	0.984	2.544	2.631	1.581	2.885	2.457	2.540	2.341	1.850	2.426	3.550	2.161	-0.0085
10/19/2022		2.510	3.184	1.243	2.537	2.634	1.961	2.880	2.443	2.522	2.651	2.095	2.424	3.559	2.338	0.01175
10/20/2022		2.550	3.375	1.447	2.543	2.630	2.148	2.884	2.446	2.510	2.837	2.189	2.426	3.615	2.440	0.0025
10/21/2022		2.553	3.574	1.671	2.536	2.631	2.277	2.878	2.446	2.502	2.996	2.274	2.419	3.692	2.486	-0.0075
10/22/2022		2.562	3.777	1.929	2.547	2.634	2.418	2.882	2.451	2.535	3.159	2.391	2.417	3.781	2.482	-0.0015
10/23/2022		2.566	3.923	2.155	2.549	2.619	2.412	2.882	2.447	2.529	3.292	2.442	2.423	3.818	2.481	-0.001
10/24/2022		2.559	3.967	1.696	2.530	2.624	2.325	2.875	2.447	2.521	3.273	1.980	2.409	3.796	2.339	-0.0065
10/25/2022		2.556	3.803	1.116	2.547	2.624	1.916	2.876	2.444	2.522	3.023	1.587	2.413	3.536	1.987	-0.01075
10/26/2022		2.525	3.695	1.380	2.520	2.609	2.005	2.868	2.429	2.519	3.003	1.765	2.404	3.502	2.273	0.00075
10/27/2022		2.534	3.867	1.833	2.549	2.636	2.357	2.899	2.456	2.540	3.246	2.052	2.429	3.646	2.474	-0.0135
10/28/2022		2.525	3.998	2.100	2.532	2.632	2.426	2.883	2.449	2.545	3.402	2.157	2.420	3.725	2.477	-0.0165
10/29/2022		2.530	4.020	2.290	2.544	2.635	2.426	2.890	2.445	2.542	3.511	2.238	2.422	3.794	2.487	-0.00325
10/30/2022		2.524	4.010	2.414	2.546	2.627	2.409	2.885	2.442	2.539	3.600	2.275	2.413	3.830	2.469	0.00025
10/31/2022		2.521	4.010	2.507	2.538	2.618	2.400	2.878	2.445	2.522	3.681	2.302	2.416	3.877	2.473	-0.005
11/1/2022		2.521	4.007	2.546	2.541	2.630	2.410	2.881	2.437	2.538	3.808	2.395	2.420	3.960	2.476	-0.00425
11/2/2022		2.525	4.004	2.541	2.543	2.620	2.416	2.884	2.447	2.540	3.922	2.475	2.421	4.029	2.481	-0.00625
11/3/2022		2.523	4.008	2.531	2.534	2.605	2.405	2.876	2.439	2.529	3.938	2.516	2.417	4.055	2.468	-0.00625
11/4/2022		2.517	3.995	2.512	2.523	2.588	2.404	2.868	2.433	2.509	3.928	2.379	2.405	4.064	2.468	0.0035
11/5/2022		0.923	1.620	0.394	1.546	1.682	0.459	2.162	0.965	1.735	1.134	0.404	0.952	1.734	1.164	0.031
11/6/2022		0.644	0.669	0.395	0.758	0.540	0.238	1.409	0.362	0.725	0.262	0.204	0.571	0.889	0.794	0.387
11/7/2022		1.007	0.975	0.489	1.391	0.693	0.349	2.067	0.626	1.197	0.295	0.287	0.936	1.366	0.969	0.78325
11/8/2022		1.118	1.073	0.495	1.746	0.729	0.330	2.239	0.728	1.385	0.292	0.251	1.094	1.578	1.044	1.0365
11/9/2022		1.185	1.171	0.441	1.935	0.839	0.328	2.375	0.807	1.504	0.305	0.017	1.153	1.780	1.096	1.25775
11/10/2022		1.110	1.137	0.241	1.768	0.919	0.254	2.105	0.750	1.520	0.293	-0.210	1.052	1.639	0.984	1.52225
11/11/2022		0.621	0.608	-0.310	0.655	0.504	-0.238	1.069	0.350	0.693	0.316	-0.754	0			

11/14/2022		1.416	1.347	<b>0.461</b>	2.012	1.012	<b>0.322</b>	2.418	1.004	1.505	<b>0.462</b>	<b>0.224</b>	1.232	1.472	<b>0.975</b>	0.37375
11/15/2022		1.318	1.267	<b>0.447</b>	2.222	<b>0.887</b>	<b>0.281</b>	2.243	<b>0.775</b>	1.620	<b>0.418</b>	<b>0.256</b>	1.260	1.485	<b>0.971</b>	0.3665
Total Days in Growing Season that Meet Wetland Hydrology:	39	30	22	81	9	31	62	0	41	21	61	111	29	10	41	

# Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	44.4757559, -88.545100
Observation Date	2022-08-01
Elevation (ft)	763.902
Drought Index (PDSI)	Moderate wetness
WebWIMP H <sub>2</sub> O Balance	Dry Season

30 Days Ending	30 <sup>th</sup> %ile (in)	70 <sup>th</sup> %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-08-01	2.89685	4.511024	3.472441	Normal	2	3	6
2022-07-02	3.551181	5.045669	3.322835	Dry	1	2	2
2022-06-02	2.965748	4.385827	2.57874	Dry	1	1	1
Result							Drier than Normal - 9



Figure and tables made by the  
**Antecedent Precipitation Tool**  
Version 1.0

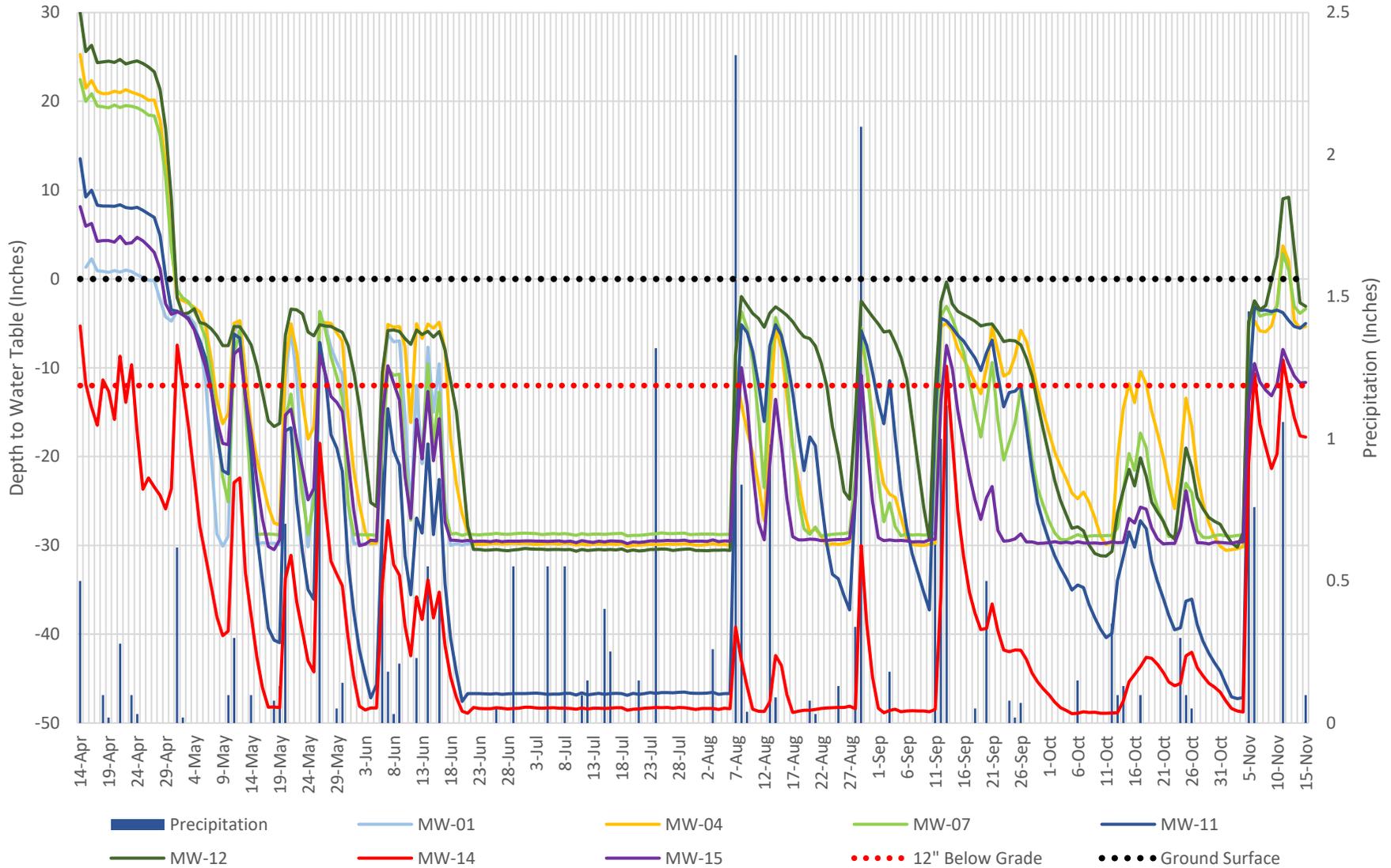
Written by Jason Deters  
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
SHIOCTON	44.4389, -88.5839	770.013	3.185	6.111	1.453	6148	90
NEW LONDON	44.3586, -88.7189	799.869	8.672	29.856	4.161	4375	0
SEYMOUR	44.5044, -88.3333	793.963	13.159	23.95	6.237	736	0
APPLETON	44.2769, -88.4378	791.995	13.318	21.982	6.286	94	0

# 2022 Baseline Monitoring Well Hydrographs

## Existing Wetland Areas

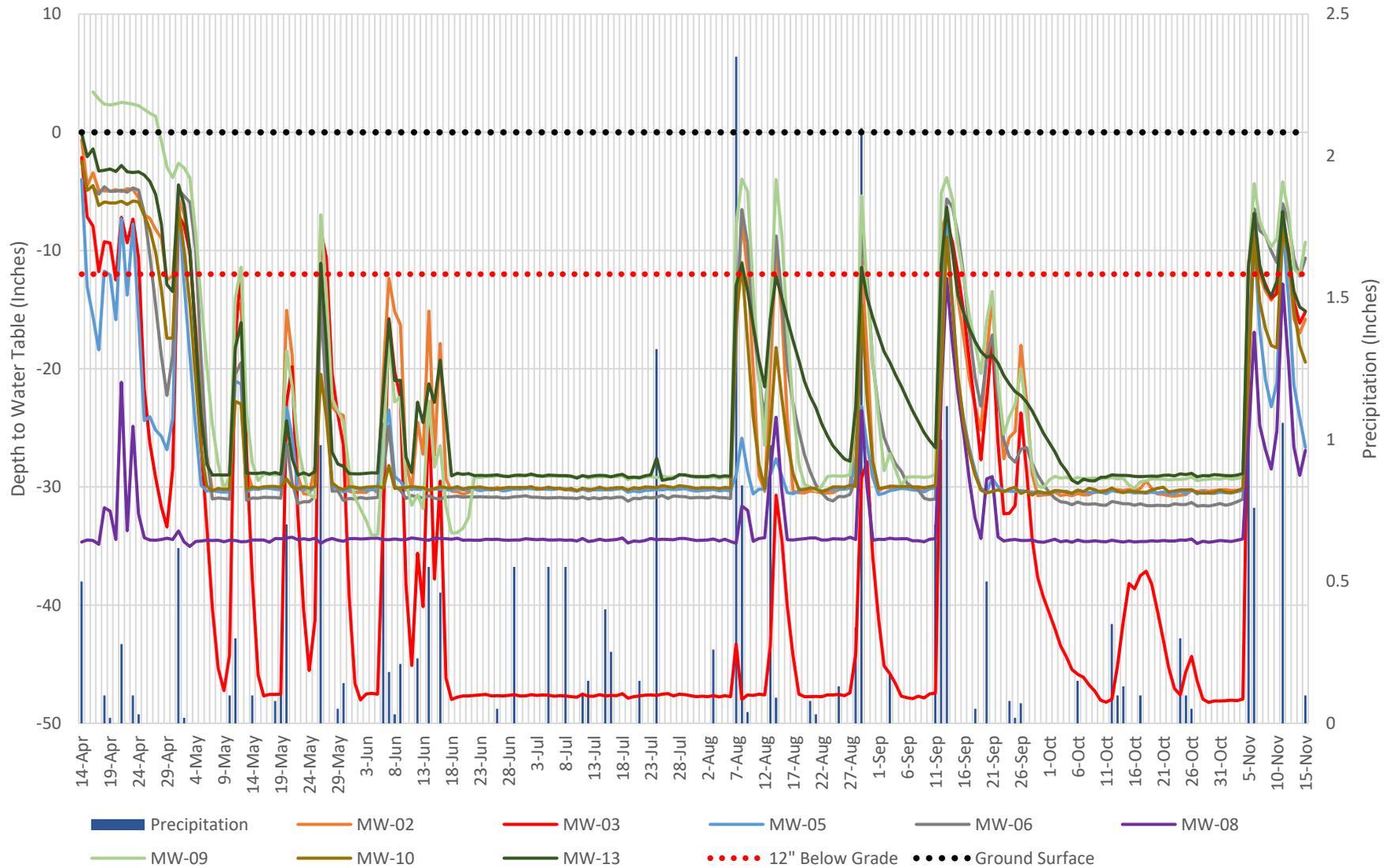
Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



# 2022 Baseline Monitoring Well Hydrographs

## Potentially Restorable Wetland Areas & Upland Areas

Shioc River Wetland Mitigation Bank | Town of Bovina, Outagamie County, WI



Projected Surface Water Depths

Site Selection Criteria Checklist



US Army Corps  
of Engineers®  
St. Paul District

## Requirements for Submitting a Complete Mitigation Bank Prospectus to the U.S. Army Corps of Engineers, St. Paul District

The Prospectus must provide a summary of the information regarding the proposed mitigation bank or in-lieu fee program site, at a level of detail sufficient to support informed comment by the public and IRT. A bank prospectus must contain the following information to be deemed complete by the St. Paul District.

- Owner and Agent.** Identify the bank sponsor and any consultants or experts to be involved in design of the compensation site.
- Objective(s).** Describe the specific objective(s) of the proposed mitigation bank or in-lieu fee program. For example, *bank will result in the re-establishment of X acres of sedge meadow wetland and x acres of upland buffer.*
- Operation.** How the mitigation bank or in-lieu fee program will be established and operated. Include a general description of anticipated design concept for wetland restoration, enhancement, or creation at the proposed compensation site. For example, *existing tile will be fully removed and excavated ditches will be filled completely to re-establish wetland hydrology and bank site will be managed to promote wet meadow, sedge meadow, and shrub carr plant communities;*
- Service Area.** Identify the proposed service area.
- Need.** Describe the general need for the proposed mitigation bank or in-lieu fee program. For example, *there are currently no banks located in this bank service area, or wetlands of the types proposed to be restored have been lost in large quantities in the watershed.*
- Technical Feasibility.** Describe the likelihood of successfully completing the project based on the expertise of the designers, proven methods, or other information available to the Sponsor. For example, *this kind of restoration has proven successful on XX sites in comparable landscape positions in this ecoregion.*
- Ownership and Long-term Management.** Proposed ownership arrangements and long-term management strategy for the mitigation bank or in-lieu fee project sites. For example, *DNR, who manages adjacent property, has indicated an interest in owning and managing the site long-term.*
- Qualifications.** The qualifications of the sponsor to successfully complete the type(s) of mitigation project(s) proposed, including information describing any past such activities by the sponsor.



**Ecological Suitability.** Describe suitability of the site to achieve the objectives of the proposed mitigation bank, including the physical, chemical, and biological characteristics of the bank site and how that site will support the planned types of aquatic resources and functions. Proposals involving preservation of aquatic resources must also include the information required under 33 CFR 332.3(h).



**Hydrology.** Provide assurance of sufficient water supply and drainage rights to sustain the proposed water regimes on the site in both the short- and long-term. Include documentation of any existing or anticipated right of the landowner or others to remove water, soil, minerals or biomass from within or adjacent to the site boundary. Also include documentation of any existing or anticipated right to drain water through, from, or onto the bank site or impound water on the bank site (e.g., tile outlets onto the property, ditches through the property, flooding easements, flowage easements, drainage easements, maintenance easements).

33CFR 325.3 requires that public comments on the Prospectus be solicited via a public notice. Because copies of the public notice must be sent to all adjacent property owners, the Prospectus submittal must also include the names and mailing addresses of all adjacent property owners.

Although not specifically required by the mitigation rule, a site location map and an air photograph of the site are essential for meaningful agency and public comment. The St. Paul District will not determine a Prospectus is incomplete if these items are not provided, but it will limit the ability of reviewers to critically evaluate the proposal. Maps accompanying a Prospectus should typically included the following:

- A plat or land ownership map
- Topographic or survey information
- Boundaries of the proposed compensatory mitigation site;
- National Wetland Inventory; State Wetland Inventory
- USDA soil survey map that shows soil map units (w/ legend, series descriptions)  
include a list of map units that are:
  - Predominantly hydric (list % hydric soil series in map unit),
  - Have some portion hydric (list % hydric soil series in map unit), and
  - Predominantly non-hydric (list % hydric soil series in map unit, if any);
- Adjacent county highway information; and
- Land-cover/land-use map

Sponsors also are strongly encouraged to consider including the following with their submittal.

- Existing wetland acreage;
- Existing land use;
- Proposed soil and hydrologic modifications;
- Proposed plant communities and anticipated dominant species, water regime, and approximate acreage;
- Proposed performance standards and monitoring methods for assessing how the objectives of the mitigation bank will be met