

Fish and Wildlife Habitat

Historical Fish and Wildlife Habitat

In the early 1630s, Frenchman Jean Nicolet first arrived in lower Green Bay when it was primarily inhabited by Native American tribes (Jean Nicolet: French Explorer by the Editors of Encyclopaedia Britannica: <https://www.britannica.com/biography/Jean-Nicolet>). Lower Green Bay consisted of large beds of wild rice (*Zizania* sp.) and wild celery (*Vallisneria americana*), extensive emergent marsh (*Schoenoplectus* sp., cattail), sedge meadows (*Calamagrostis canadensis*), shrub carr (e.g., *Cornus* spp., *Salix* spp.), swamps, and wet conifer forest (black spruce [*Picea mariana*], balsam fir [*Abies balsamea*]), particularly along the west shore, Duck Creek, and Point Sable (1843 and 1845 maps from La Baye website: <http://www.labaye.org/item/30/200>, Arthur C. Neville's Map of Historic Sites on Green Bay 1669-1689 [Green Bay Historical Bulletin, 1926, May-June Vol 1 and 2, page 3], personal communication with Thomas Erdman, WDNR Surface Water Data Viewer; Figures 2.52A and 2.53B, Appendix 8.1). Although coastal marshes and meadows dominated lower Green Bay and were subjected to dynamic water level changes, upland forests dominated by oaks (*Quercus* spp.) were common along the bay's and Fox River eastern shores, while sugar maple (*Acer saccharum*) and basswood (*Tilia americana*) forests were common along the western shores of the bay and Fox River (Dorney 1975, WDNR Surface Water Data Viewer; Figure 2.53A, Appendix 8.1). It is relatively well known that wild rice grew in the Duck Creek Delta; however, it is less well known that wild rice grew near the mouth of a small tributary off the Malchow/Olson Tract, which UW-Green Bay's Ellie Roark discovered when geotagging the 1840s PLSS surveyor notes in the LGB&FR AOC (Appendix 8.1).

Historically, there were three large barrier islands (called the Cat Island Chain) that provided critical fish and wildlife habitat for birds, fish, invertebrates, and mammals as well as refugia of native plants and extensive Great Lakes beach (1845 Map of Head of Green Bay, Brown County's online GIS portal's 1938 air photo; Figure 2.53). These islands also protected a massive emergent and submergent marsh complex in the Duck Creek Delta (>200 ha) and present-day Peters Marsh (Brown County 1938 air photo). The true size and extent of the marsh complex that the Cat Island Chain protected can best be appreciated by looking at 1938 and 1960 air photos (provided by Brown County's online GIS portal). According to the 1945 Bordner Surveys, alder, willow, and dogwood occurred along the west shore, Long Tail Point, mouth of Duck Creek, Point Sable, and present-day Bay Beach Wildlife Sanctuary (Figure 2.53). Inland areas along the west shore became croplands and pastures, and much of the east shore's former oak forests were also converted to agricultural lands (Figures 2.52-2.53). Housing development formed in downtown Green Bay (Figure 2.53). Stretches along the Fox River, particularly north of the present-day De Pere Dam, however, still contained emergent marshes, which were reported by the 1945 Bordner Survey and Brown County's 1938 air photos (Figure 2.53).

Due to extremely high water levels in the bay, massive storms, and recently hardened shorelines (e.g., development), the Cat Island Chain of barrier islands largely washed away during the spring of 1973 with the exception of a few small sandy islands, including Cat and Lone Tree Islands (Frieswyk and Zedler 2007). The huge emergent and submergent marshes of the Duck Creek Delta complex also vanished because the islands no longer provided protection and due to high sediment loads further upstream (Frieswyk and Zedler 2007). These significant changes can be viewed on Brown County's 1978 aerial imagery of lower Green Bay.

With some exceptions, information provided by Dorney (1975), Howlett (1974), 1840s PLSS records from the WDNR Surface Water Data Viewer and Roark's work geotagging surveyor

Excerpt from Howe et al. (2018)

notes (Appendix 8.1), historical paper maps from the 1840s, Brown County's 1938, 1960, and 1978 air photos, and other sources report relatively consistent historical plant community descriptions as summarized here. Additional historical vegetation descriptions are available for 14 priority areas within the LGB&FR AOC in Appendix 7.

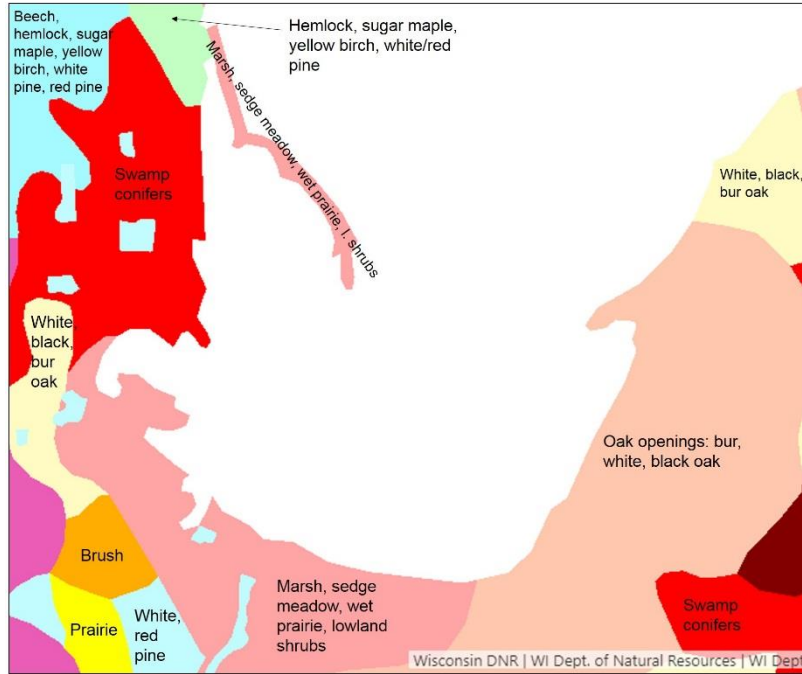


Figure 2.52A. Land cover map based on the original, historical vegetation from the Public Land Survey System based on the 1840s of lower Green Bay. Except for the text labels, this map was produced using the Wisconsin Department of Natural Resources' Surface Water Data Viewer on 29 December 2017: <https://dnrmaps.wi.gov/H5/?Viewer=SWDV>.

Excerpt from Howe et al. (2018)



Figure 2.52B. Land cover map based on the original, historical vegetation from the Public Land Survey System based on the 1840s of the lower Fox River. Except for the text labels, this map was produced using the Wisconsin Department of Natural Resources' Surface Water Data Viewer on 29 December 2017: <https://dnrmaps.wi.gov/H5/?Viewer=SWDV>.

Excerpt from Howe et al. (2018)

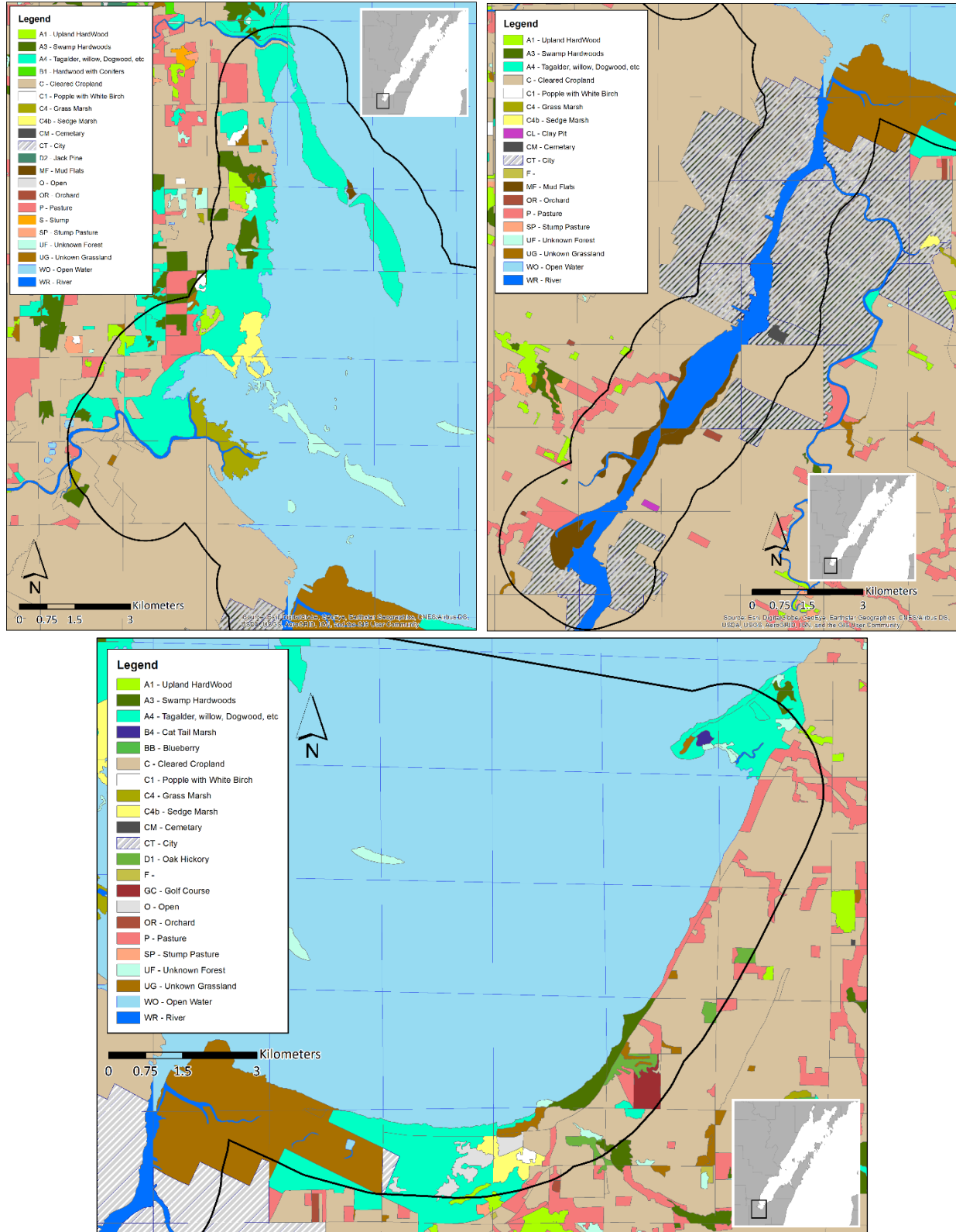


Figure 2.53. Land cover maps based on the 1945 Bordner Survey in Brown County along the west shore (upper left), Fox River (upper right), and east shore (bottom) within 1 km of the Lower Green Bay and Fox River Area of Concern (black line). Bordner land cover geospatial data were produced by the Coastal Bordner Project (Mladenoff et al. 2017). Maps were made using ArcGIS 10.5 software (Environmental Systems Research Institute 2016).

Excerpt from Howe et al. (2018)

SELECTED REFERENCES

- Dorney, J.R. 1975. The vegetative pattern around Green Bay in the 1840s as related to geology, soils and land use by Indians with a detailed look at the townships of Scott, Green Bay, and Suamico. Senior Distinction Project. University of Wisconsin-Green Bay, Green Bay, Wisconsin.
- Environmental Systems Research Institute. 2016. ArcGIS Desktop: Release 10.5. Environmental Systems Research Institute, Redlands, California, USA.
- Frieswyk, C.B. and J.B. Zedler. 2007. Vegetation change in Great Lakes coastal wetlands: deviation from the historical cycle. *Journal of Great Lakes Research* 33:366-380.
- Howlett Jr., G.R. 1974. The rooted vegetation of west Green Bay with reference to environmental change. Master's Thesis. University of Wisconsin-Green Bay, Green Bay, Wisconsin.
- Mladenoff, D.J., H. Veregin, and M. Noone. 2017. Coastal Bordner Project. Website available: <https://maps.sco.wisc.edu/BordnerCoastal/about/#About> (accessed on 31 December 2017).

Appendix 8: Mapping Historical Information for the LGB&FR AOC

Appendix 8.1: Mapping Information from the Public Land Survey System

Written by Erin Giese and Ellie Roark

Introduction

In the mid-1780s, the United States federal government wanted to increase the federal budget by selling off tracts of land located in American territories west of the 13 original colonies as well as encourage settlement (Board of Commissioners of Public Lands webpage - see below). Before they could sell the land, they first needed to methodically map these lands into a grid system and carefully describe the land, which started the Public Land Survey System (PLSS; USGS website last updated in Dec 2016). In the nineteenth century, the federal government hired teams of field surveyors to delineate the western territories into a grid system though eventually the entire U.S. was mapped into this grid (USGS webpage - see below).

Field surveyors mapped the state of Wisconsin between 1833 and 1866 (Board of Commissioners of Public Lands webpage). They delineated six-mile square “townships” and one-mile square “sections.” “Ranges” were vertical lines that ran north-south and separated each “township” every six miles. Aside from establishing this detailed grid system consisting of townships, ranges, and sections, they also took extremely detailed notes about the landscape and vegetation that they found at the time, which included identifying the dominant plant communities (e.g., swamp), streams, soil quality, dominant plants, etc. Although the primary purpose of these surveys was to demark boundaries, the detailed vegetation and landscape notes are invaluable to present day conservation and management efforts. However, many of the field notes were handwritten in cursive and sometimes in shorthand (i.e., shorthand format created for this specific project) on 180+ year old paper with fading ink, making it challenging to read and sometimes uninterpretable.

For more information on PLSS field methodology and how to interpret their notes, please visit:

- U.S. Geological Survey Article on the PLSS:
- https://nationalmap.gov/small_scale/a_plss.html
 - o Provides general overview of PLSS and methodologies.
- Board of Commissioners of Public Land:
<http://digicoll.library.wisc.edu/SurveyNotes/SurveyNotesHome.html>
 - o Provides detailed overview of the Wisconsin PLSS including scans of original surveyors’ field notes, field methodologies, and how to interpret the field notes.
- Wisconsin Department of Natural Resources’ Tutorial on the PLSS Descriptions and Grid System: <http://dnr.wi.gov/topic/forestmanagement/documents/plsstutorial.pdf>

Digitizing Methods

Under the guidance of Robert Howe and Michael Stiefvater, UW-Green Bay graduate student, Ellie Roark, converted the township, range, and section locations described in the original, handwritten PLSS surveyor notes into geospatial coordinates along transects for all available information recorded within the boundaries of the Lower Green Bay and Fox River Area of Concern (LGB&FR AOC) plus a 1 km buffer inland (Figure 1, Appendix 8.1). The final product of this effort was an ArcGIS shapefile containing these points. The transect points generally run

Excerpt from Howe et al. (2018)

north/south or east/west. However, it should be noted that these locations do not represent exact locations but rather estimated locations of where the surveyors stood. In other words, the recorded PLSS observations' proximity to the points is approximate. Only very rough, approximate measurements were done to match exact distances from the surveys to distances in the geodatabase.

Field notes were not available for all transects within the AOC, however. Where no observations are present (such as large stretches along the Fox River), no data or no relevant data were available. Many transects seemed to be incomplete when private lands overlapped a transect. Meanders along the Fox River frequently did not contain any vegetation information but only bearings for posts along the riverbank. This information was not included in the final database.

The data file name is "PLSS_SurveyData.shp".

Shapefile Attribute Fields:

FID - Auto-generated field by ArcGIS (e.g., 0, 1, 2, ...).

Shape * - Describes the type of shape used in the shapefile, namely "multipoint."

PLSS_TRS - Public Land Survey System Township Range and Section: this field lists the township, range and section of the map to which the point corresponds.

SurveyDate - Month/day/year of survey data collection. Typically, no day was available, only month for each survey. In these cases, Roark chose "1" as the default date. Example: 9/1/1834 (month/day/year) indicates that the survey took place in the month of September. Where a specific day was noted in the survey logs, it appears in this attribute field.

East_pt - Observations near the northernmost point for latitudinal transects and ALL meanders, or near the easternmost point for all longitudinal transects. If a meander has the westernmost point as its northernmost point, the characteristics of that point are listed in this field, NOT in the West_pt field.

Center_pt - Observations near the central point on the transect. If no central point, no observations were listed in this field.

West_pt - Observations near the southernmost point for latitudinal transects and ALL meanders, or near the westernmost point for longitudinal transects.

DataSource - URL for data source from the Wisconsin historical society webpage

Additional Notes on the Creation of the Shapefile/Geodatabase:

- Illegible words were not noted in the creation of this database. If an entire entry was illegible, it was not entered into the database. Most entries were legible enough that even if a word was unclear, the gist of the observation was recorded. In hindsight, going through and marking which entries could be looked at by a closer eye would be helpful.
- Several things remain unclear to Roark in the vernacular of the PLSS data:
 - o Tree diameters are often noted with no units. Where this was the case, Roark entered exactly what was written, which was a diameter with no units.
 - o Land is characterized as 1st, 2nd or 3rd rate. Roark did not thoroughly explore what these designations mean.

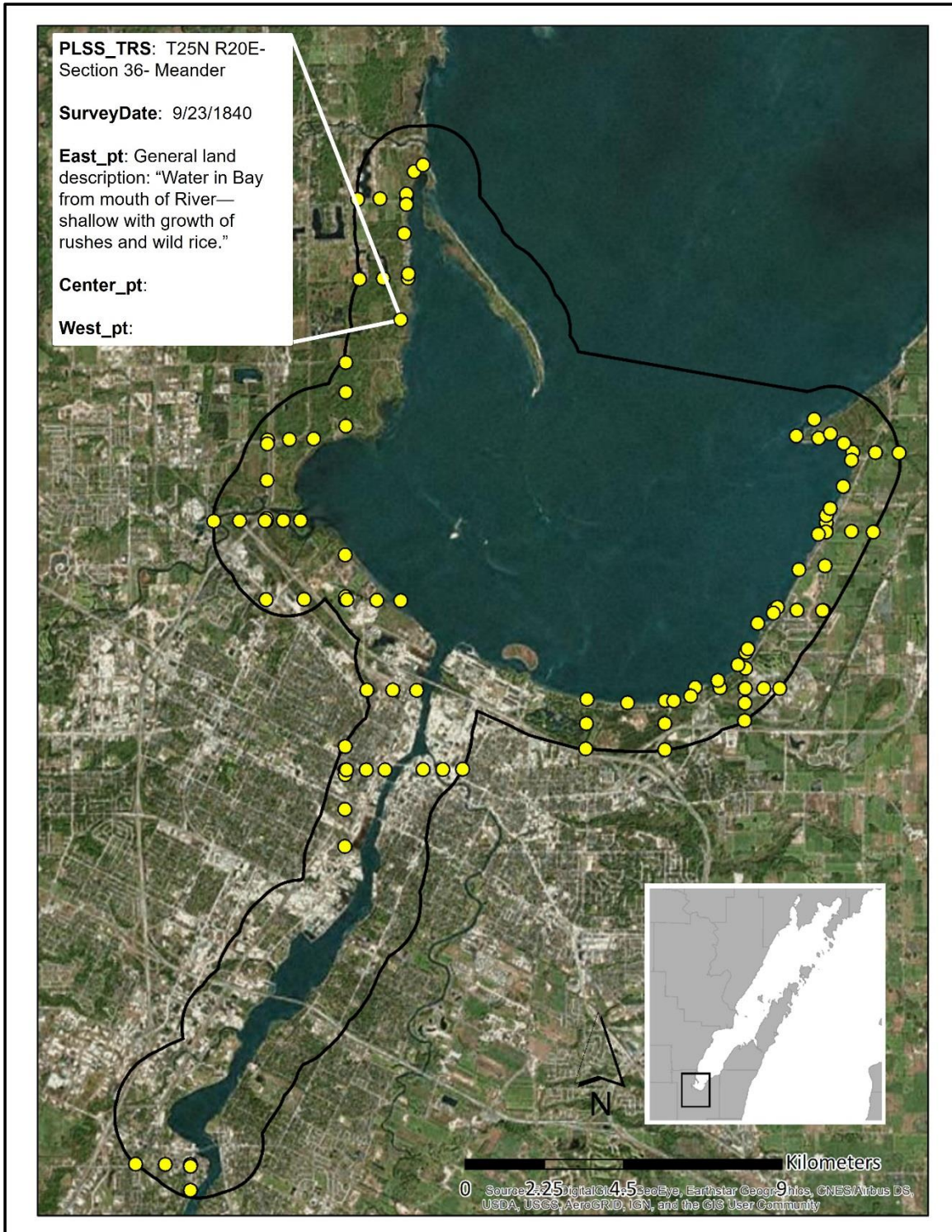


Figure 1. Map of estimated locations visited by the original Wisconsin land surveyors in the 1800s converted from township, range, and section. Note that these points represent rough, approximate locations of where the surveyors stood. Map was created using ArcGIS 10.5 software and displays World Imagery and World Boundaries and Places basemaps for reference (Environmental Systems Research Institute 2016). Wisconsin inset map sources include Esri, TomTom North America, Inc., U.S. Census Bureau, U.S. Department of Agriculture, and National Agricultural Statistics Service.

Excerpt from Howe et al. (2018)

Appendix 8.2: Wisconsin Land Economic Inventory Maps (“Bordner Surveys”)

Introduction

Starting in 1927, the state of Wisconsin launched a statewide effort called the Wisconsin Land Economic Inventory in order to map and record all current land uses (e.g., agriculture, developed, lowland deciduous forest; Steenbock Library webpage). The primary purpose of this mapping was to be able to identify land that could potentially be resettled, forested, or used for other purposes (Steenbock Library webpage - see below). Field surveyors visited every 40-acre quarter-quarter section in the state (based on the township, range, and section grid) and recorded neighboring land cover types on paper maps, which were used in conjunction with air photographs to produce these maps that came to be known as the “Bordner Surveys” (named after the director of this project, John Bordner; Steenbock Library webpage). In addition to mapping land cover types, surveyors also noted trails, logging camps, roads, railroad lines, fire towers, town halls, and many other noteworthy features. The mapping effort ended in 1947 and thus captured how much of the state looked throughout the 1930s and 1940s (Steenbock Library webpage).

For more information on the “Bordner Surveys,” please visit:

- University of Wisconsin-Madison’s Steenbock Library webpage on the Bordner Surveys: <https://www.library.wisc.edu/steenbock/wisconsin-land-economic-inventory-the-bordner-survey-land-cover-maps/>
- Original, scanned Bordner maps: <https://uwdc.library.wisc.edu/collections/econatres/wilandinv/>
- Key for land use/cover types: <https://maps.sco.wisc.edu/BordnerCoastal/about/#Legend>

Georeferencing Methods

Under the guidance of Robert Howe and Michael Stiefvater, UW-Green Bay graduate student, Ellie Roark, georeferenced the Brown County “Bordner Survey” paper map, which was surveyed in 1945 (estimated year), and save it as a raster data file. A preview of Roark’s georeferenced Bordner Survey map of the LGB&FR AOC study area is shown in Figure 2 (Appendix 8.2). The UW-Madison Dr. David Mladenoff Forest Ecosystem and Landscape Ecology Lab and the State Cartographer’s Office also produced a digital, geodatabase of the statewide, Bordner Survey land use/land cover map, which is now free and available for download online: <https://maps.sco.wisc.edu/BordnerCoastal/about/>. You can also browse this land cover data set on their team’s Coastal Bordner Project GIS portal: <https://maps.sco.wisc.edu/BordnerCoastal/?featureType=polygons&basemap=streets>.

The data file name is “BordnerSurvey_overlay.tif”.

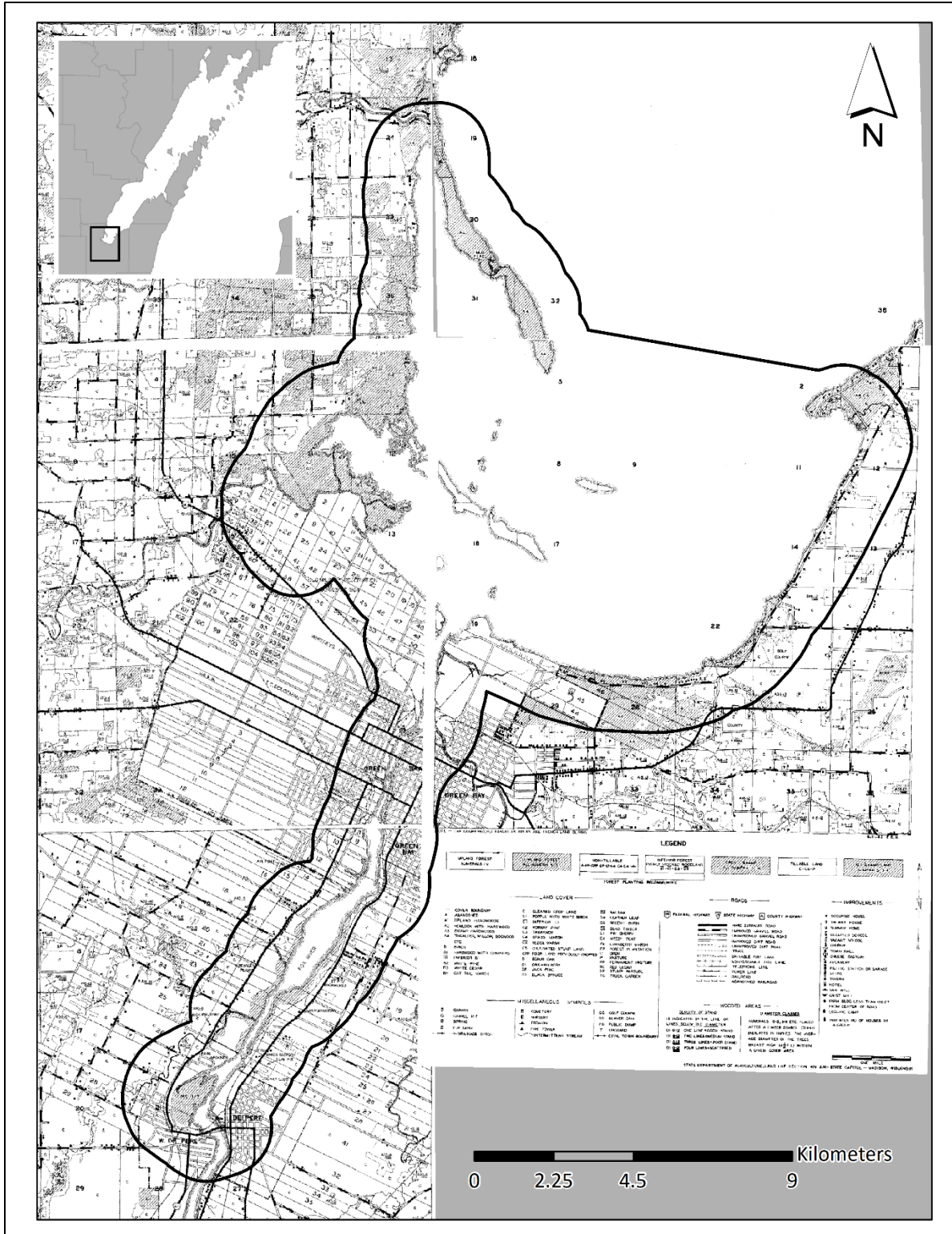


Figure 2. Georeferenced map of 1945 land uses/cover types based on the Bordner Survey of Brown County in the Lower Green Bay and Fox River Area of Concern project study area (1 km buffer shown in black outline). Paper map was georeferenced by Ellie Roark. Key for land cover types found here: <https://maps.sco.wisc.edu/BordnerCoastal/about/#Legend>. Map created using ArcGIS 10.5 (Environmental Systems Research Institute 2016).