



Midwest Glacial Lakes Partnership Conservation Planner User Guide

Version 1.0, May 7, 2019

Contents

Overview.....	1
Map Panel.....	2
Data Panel.....	3
<i>Summary Tab</i>	3
<i>Watershed details</i>	6
<i>Shoreland details</i>	7
Example uses.....	7
<i>Identifying suitable habitat based on forecasted climate change</i>	7
<i>Identifying nonpoint source pollution lakes</i>	8
<i>Targeting shoreline protection</i>	8
<i>What should I do on “my” lake?</i>	9
Disclaimer.....	9
Attribution.....	9

Overview

The Conservation Planner is based upon the MGLP’s Phase II Assessment of Inland Lake Fish Habitats. This research is in preparation for peer-reviewed publication. When this paper is published, we will share a link to it on the website (<http://midwestglaciallakes.org/lakehabitatviewer/>); in the interim, please contact Joe Nohner with questions regarding the assessment or data availability.

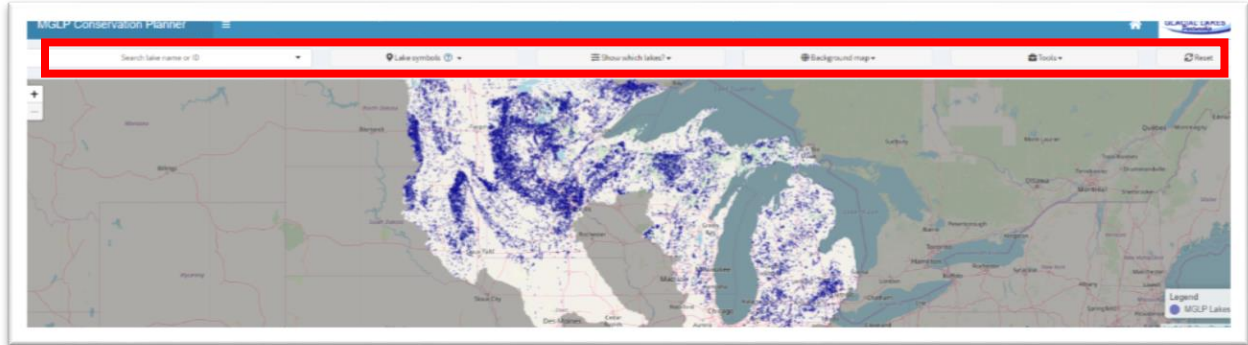
The Conservation Planner has two panels; the upper Map Panel is an interactive map capable of displaying information for a large number of lakes, while the lower Data Panel shows specific information about a single lake that the user selects.

📍 Click on this icon throughout the tool to learn more about each feature.

Map Panel

Toolbar

The toolbar contains the main functions for the Conservation Planner and allows you to change which



data are displayed, which lakes are shown, the background maps, and share your map view with others

Search bar

To find a specific lake, enter a portion of the lake name, all of the lake name, or the lake's MGLP unique ID. All of the lake names in the database that match your entry will appear in a dropdown, grouped by state. The county, state, and MGLP unique ID for that lake will also be displayed. Click on the desired lake, and the tool will identify that lake on the map.

Lake symbols

You can change the color of the lake symbols to correspond to disturbance or predicted fish suitability. To show disturbances values, select "disturbance" and then choose an indicator (climate vulnerability, watershed disturbance, or shoreland disturbance). To show predicted suitability for fishes, select "suitability" and then choose the fish of interest.

You can also show lakes that meet maximum and minimum surface area criteria. Please note that lake surface area is based upon the size of the lake as delineated by the National Hydrography Database; in some cases adjoined lakes are split or combined and so lake surface area may differ from other sources.

Show which lakes?

You can display a subset of lakes. To filter geographically, select one or more states, counties, or watersheds to show only lakes in those areas. In some cases, it may be easier to type in the county name, watershed name, or HUC8 ID. To filter by lake characteristics, click the watershed disturbance, shoreland disturbance, or climate vulnerability assessment categories that correspond with the lakes you'd like to see. The eye icon will be crossed out when those lakes are not displayed.

Background map

You can show different basemaps in the background to suit your needs. Available maps include:

- Mapnik (OpenStreetMap, default): Streets, cities, and other points of interest
- Gray canvas (Esri): A greyscale map for simple, uncluttered display
- Protected areas database (USGS): Identifies areas protected for biodiversity and multiple natural resource use.

- Land cover (USGS 2011): Satellite-derived land use and land cover based upon a simplified classification of the 2011 National Land Cover Database
- Watershed (USGS): HUC8 watersheds in the National Hydrography Database Plus
- Ecoregions level II (EPA): EPA ecoregions
- World imagery (Esri): Satellite imagery
- Topographic (Esri): Topographic maps
- OpenTopoMap (OpenStreetMap): Digitized topographic maps
- Ceded territories: Ceded territory boundaries provided by the Great Lakes Indian Fish & Wildlife Commission

Tools

Lake point opacity: Make symbols for lakes more transparent (value = 0) or more opaque (value = 1).

Shareable link: Share a specific view with colleagues or save it for yourself by copying and pasting the link. The view will include the specific zoom, lake symbols, base maps, and the lake you have may have selected.

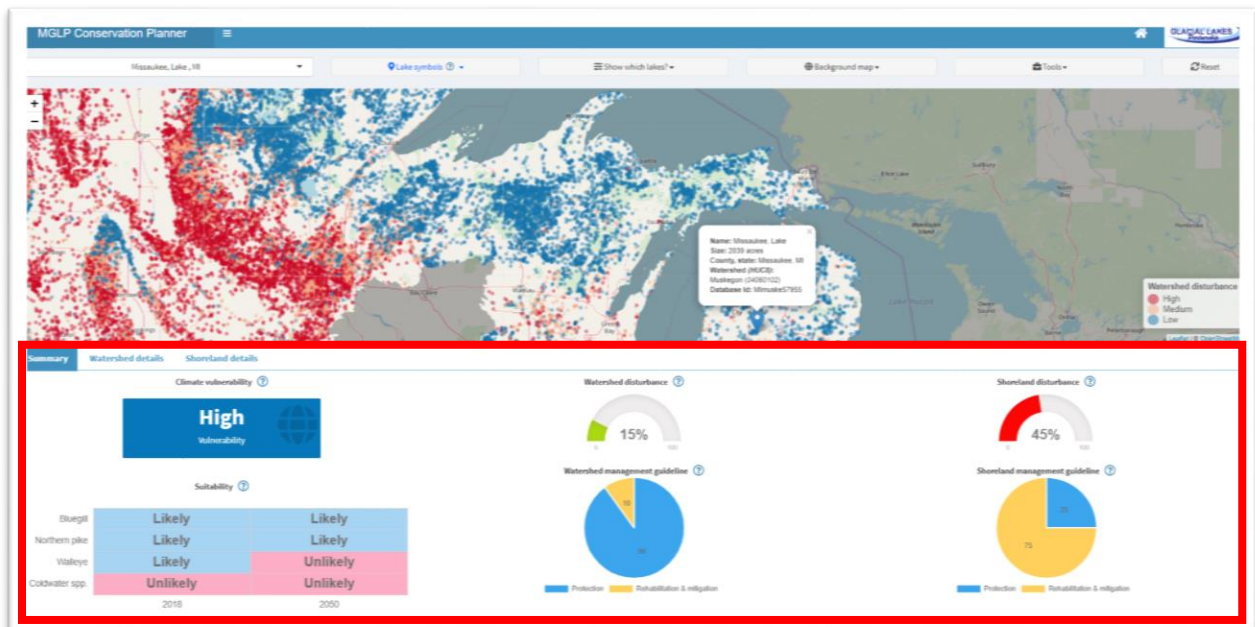
Reset

This function resets all user specifications on map symbols, basemaps, and lake selections.

Lake pop-up

Click on the point representing a lake to open a pop-up box with basic information about that lake such as its name, surface area, county, etc.

Data Panel



The Data Panel provides data about user-selected lakes within the MGLP database. To select a lake, simply click on the lake in the map panel. The gauges in the Data Panel will populate with information about the selected lake. There are three tabs in the Data Panel; these tabs provide a summary of data for the lake as well as detailed information on the shoreland and watershed for that lake.

Summary Tab

Climate vulnerability

This figure shows vulnerability of the lake to climate change (high or medium) based on whether it is likely to become unsuitable for cool- or cold-water fishes.

Water temperature is an important variable determining how suitable a lake is for different fish species. Because water temperatures are expected to increase with future climate change, we expect an increase in the number of lakes that are suitable for warmwater species (e.g., Bluegill and Largemouth Bass) and a reduction in the number lakes that are suitable coolwater (e.g., Northern Pike and Walleye) and coldwater species (e.g., Cisco, Burbot, and Lake Trout).

We used projected climate scenarios to predict future water temperatures for each lake. We then re-ran our suitability models (described under Suitability information) with future water temperatures and estimated whether representative warm-, cool-, and cold-water fishes are likely to be present in 2050. If cool- or cold-water fishes are expected to be present now, but be extirpated by 2050, we classified the lake as having high vulnerability.

Watershed disturbance

This figure shows the proportion of a lake's watershed with disturbed (urban and agricultural) land cover.

A lake's watershed is defined as all of the land surrounding a lake that contributes rainfall and snowmelt to the lake. As water moves across and through the landscape, it transports sediment and nutrients from the watershed to the lake. Consequently, the condition of the watershed is an important factor determining lake ecosystem health.

We delineated lake watersheds and assessed disturbances in the watershed using information from the 2006 National Land Cover Database. In general, urban and agricultural land cover increase sediment and nutrient inputs to lakes, as a result of runoff, sewage, leaking septic systems, and other sources. We report watershed disturbance as the proportion of the watershed area with urban or agricultural land cover. We classified watershed disturbance as low (0 – 25%), medium (25%-60%), and high (60% - 100%) based on a review of scientific studies.

It is important to note that the specific context of each watershed influences the way disturbed land cover contributes to nutrients in a lake. This context includes lake morphology and hydrology, geology, existence of and compliance with best management practices for nutrient mitigation, and other factors.

Shoreland disturbance

This figure shows the proportion of a lake's shoreland with disturbed (urban and agricultural) land cover.

A lake's shoreland is defined as the land along the lake shore. Shorelands provide habitat for fish and wildlife species, influence the movement of nutrients and woody debris, and affect soil erosion along the lake shore. Human development within shorelands often results in decreased aquatic vegetation

and large woody habitat, hardening of the shoreline, reduction in water quality, and declines in fish and wildlife populations. Consequently, condition of the shoreland is an important factor determining lake ecosystem health.

We delineated shorelands as the area within 100m of each lake and assessed disturbances to the shoreland using information from the 2006 National Land Cover Database. We report shoreland disturbance as the proportion of the shoreland area with urban or agricultural land cover. We classified shoreland disturbance as low (0 – 10 %), medium (10%-30%), and high (30% - 100%) based on a review of scientific studies.

It is important to note that the specific context of each shoreland influences the way disturbed land cover affects fish habitat in lakes. This context includes lake morphology and hydrology, existence of and compliance with best management practices for shoreland habitats, presence of invasive species, aquatic plant management, and other factors.

Predicted suitability

This figure shows the likelihood that a lake is currently suitable for warmwater, coolwater or coldwater fishes.

Lakes differ in their ability to support different fish species. We developed species distribution models that predict the presence or absence of a species using a suite of variables describing lake temperature, morphology, hydrology, and connectivity. These models were used to estimate whether each lake was likely to support representative warmwater (Bluegill), coolwater (Northern Pike and Walleye), and coldwater (any coldwater species including Cisco, Lake Whitefish, Lake Trout, and Burbot) fishes.

Watershed management guidelines

This figure provides a suggested allocation of watershed conservation effort based upon the amount of disturbed land cover in the watershed.

We recommend tailoring watershed management strategies to existing land use and land cover. We distinguish between two strategies for watershed conservation. The most efficient strategy is protecting land. Examples of protection include acquisition, easement, zoning, and monitoring. In some cases, critical habitats or land have been degraded; rehabilitating and mitigating this degradation is often more expensive and does not provide all of the ecosystem functions that an undisturbed ecosystem would provide. Examples of rehabilitation include reforestation, creation of vegetated buffer strips, and building engineered wetlands or stormwater retention ponds. Examples of mitigation include using best practices for fish passage on road-stream crossings, erosion control measures, and minimizing sewage and runoff.

Watershed conservation should be implemented based on an inventory of existing and potential stressors to the lake and target the highest-value opportunities. In general, protection is more efficient and effective than mitigation and restoration, but there will almost always be a need for both. For lakes with low watershed disturbance, we recommend that about 90% of watershed conservation efforts in the watershed focus on protection and that 10% focus on rehabilitating critical sites that have been degraded, and mitigating the effects of the small amount of development that does exist in the watershed. In lakes with medium watershed disturbance, we recommend 75% protection: 25% rehabilitation and mitigation. In lakes with high watershed disturbance, we recommend 25%

protection:75% rehabilitation and mitigation. In these high-disturbance systems it is critical to mitigate the effects of existing stressors and opportunistically protect intact sites.

Shoreland management guidelines

This figure provides a suggested allocation of shoreland conservation effort based upon the amount of disturbed land cover on the lake’s shoreland.

We recommend tailoring shoreland management strategies to existing land use and land cover around the lake. We distinguish between two strategies for shoreland conservation. The most efficient strategy is protecting land and in-lake habitats. Examples of protection include acquisition, easement, zoning, invasive species prevention, and monitoring. In some cases, critical habitats or land have been degraded; rehabilitating and mitigating this degradation is often more expensive and does not provide all of the ecosystem functions that an undisturbed ecosystem would provide. Examples of rehabilitation include bioengineered shorelands, large woody habitat, and aquatic vegetation plantings. Examples of mitigation include no-mow zones, sewage management, and erosion control.

Shoreland conservation should be implemented based on an inventory of existing and potential stressors to the lake and target the highest-value opportunities. In general, protection is more efficient and effective than mitigation and restoration, but there will almost always be a need for both. For lakes with low shoreland disturbance, we recommend that about 90% of shoreland conservation efforts focus on protection and that 10% focus on rehabilitating critical sites that have been degraded, and mitigating the effects of the small amount of development that does exist. In lakes with medium shoreland disturbance, we recommend 75% protection: 25% rehabilitation and mitigation. In lakes with high shoreland disturbance, we recommend 25% protection:75% rehabilitation and mitigation. In these high-disturbance systems it is critical to mitigate the effects of existing stressors and opportunistically protect intact sites.

Watershed details



Click on the watershed detail tab, and you will see a figure and a table. These provide similar land cover and land protection data in a graph and table.

The watershed land cover graph displays the proportion of the watershed in each 2006 National Land Cover Database land cover class (e.g. forest) on the inner ring. The outer ring shows the proportion of that land cover class in each Protected Areas Database of the United States (PADUS) protection class (e.g., forest with no protection).

This same information is displayed in the table on the right side of the panel. The blue cells in the table are protected, natural land cover types that should be monitored to ensure they continue to provide ecological benefits to the watershed. The yellow cells are natural land cover types that are not protected; these areas should be identified for land use protection through easement, acquisition, and other means. The green cells represent the sum of all natural land cover types in the watershed, and contribute to the health of the watershed. The orange cells represent the proportion of land cover in agricultural and urban categories. These areas represent *potential* contributors to nonpoint source pollution (e.g., sediments and nutrients), and in general are correlated with nonpoint source pollution. These areas represent opportunities to work with private landowners to reduce runoff through riparian buffer zones, no-till farming, native landcover restoration, and other mechanisms.

Shoreland details



Click on the shoreland detail tab, and you will see a figure and a table. These provide similar land cover and land protection data in a graph and table.

The shoreland land cover graph displays the proportion of the shoreland (within 100m of the lake) in each 2006 National Land Cover Database land cover class (e.g. forest) on the inner ring. The outer ring shows the proportion of that land cover class in each Protected Areas Database of the United States (PADUS) protection class (e.g., forest with no protection).

This same information is displayed in the table on the right side of the panel. The blue cells in the table are protected, natural land cover types that should be monitored to ensure they continue to provide ecological benefits to the lake. The yellow cells are natural land cover types that are not protected; these areas should be identified for land use protection through easement, acquisition, and other means. The green cells represent the sum of all natural land cover types in the watershed, and contribute to the health of the watershed. The orange cells represent the proportion of land cover in agricultural and urban categories. These areas represent *potential* contributors to nonpoint source pollution (e.g., sediments and nutrients), degradation of nearshore habitat such as large woody debris, and prevalence of structures like docks and seawalls. These areas represent opportunities to work with private landowners to reduce runoff through riparian buffer zones, increase woody habitat, minimize aquatic vegetation treatments, and minimize human-caused effects through other mechanisms.

Example uses

Identifying suitable habitat based on forecasted climate change

Imagine you work for the Minnesota DNR, and you want to know how climate change will affect Walleye in your state. Specifically, you would like to show Walleye anglers in the state which lakes over 100 acres are currently predicted to be suitable for Walleye and which lakes are predicted to be suitable in 2050.

How would you do this?

1. Click “Lake symbols”, then “predicted suitability”, “Walleye” and “2018”.
2. Click “Show which lakes?” and enter “Minnesota”. On the same dropdown, use the slider to set the minimum lake size at 100 acres.
3. Take a screen capture of the map.
4. Click “Lake symbols”, then change the date to “2050”.
5. Take a screen capture of the map.
6. Put the two side by side for visual comparison to show the expected decline and shift in Walleye lakes due to climate change from 2018 to 2050.

Identifying nonpoint source pollution lakes

Imagine you work for a watershed organization in Iowa, and are interested in identifying large lakes (> 500 acres) with relatively healthy watersheds so that you can fund nonpoint source pollution projects to mitigate the few sources of nutrients in the watershed. What instructions would you give applicants to determine whether they qualify? How would you create a map showing all lakes that would qualify?

Instructions to an applicant:

1. Zoom in to your lake
2. Click on your lake
3. See whether the “watershed disturbance” indicator color is red, yellow, or green and report the proportion of the watershed that is disturbed. For more detail, applicants could click the “Watershed detail” tab and report the proportion of the watershed that is in natural land cover but not protected.
4. Cite the unique ID of your lake in the MGLP database and the watershed disturbance score in your application so reviewers can verify your submission.

Instructions to create a statewide map:

1. Click “Lake symbols”, then “Disturbance”, and “Watershed disturbance”.
2. Click “Show which lakes?” and enter “Iowa”. On the same dropdown, use the slider to set the minimum lake size at 500 acres.
3. Lakes with orange or blue coloration are eligible for the program, while red programs are not (for example).
4. Alternately, in the “Show which lakes?” tab you could click the watershed disturbance icon to filter out lakes with “High” watershed disturbance and show only lakes with “Low” and “Medium” watershed disturbances.

Targeting shoreline protection

Imagine you operate a lake shoreline protection program in Michigan. You would like to identify small lakes (< 100 acres) in the northwestern part of the lower peninsula that have low shoreline development. Of those lakes, you’d like to pick a lake or two and look closer to figure out where the wetlands are, so that you can compare existing wetlands to your other databases of easements to see if there are additional locations you should protect.

How would you do this?

1. Click “Show which lakes”, then deselect “Medium” and “High” shoreland disturbances.
2. In the same dropdown, enter/select Charlevoix, Antrim, and Emmet counties.
3. In the same dropdown, use the slider to set the maximum lake size at 100 acres.
4. Click on a lake, and then click on the “Watershed detail” tab in the Data Panel.
5. Inspect the “no protection” row of the “wetland” column of the land cover table to see whether unprotected shoreline wetlands exist on the lake.
6. If unprotected wetlands do exist, click on the “Background map” button in the Map Panel, and select “Land Cover (USGS 2011)” or “Protected areas database (USGS)”.
7. Identify locations with the land cover corresponding to wetlands and no protection as potential locations for site visits and potential protection.

What should I do on “my” lake?

Imagine you live on Partridge Lake in Waupaca Co., Wisconsin, and are active in your lake association. Your lake association has a small amount of funding, and would like to address the major threat to your lake. There isn’t a lot of data available for your lake from other sources. You feel that shoreline degradation from mowed lawns is likely the larger threat, while your neighbor feels that the funds would be better spent addressing problems in your lake’s watershed. In preparation for the next meeting, you do your homework on the MGLP Conservation Planner.

How would you gather that information?

1. Highlight your lake on the map by entering your lake name in the search bar, and then click on the lake to select it.
2. View the summary of disturbance scores in the Data Panel; Partridge lake has medium watershed disturbance (38%) and low shoreland disturbance (7%). Likely, threats from your watershed cause more degradation than threats from your shoreline.
3. BONUS EXAMPLE: You and your neighbor decide to identify likely sites to investigate further for the stream buffer strip program he recommended, so you click the “USGS 2011” background map and inspect the watershed for agriculture and urban land use near the streams that feed your lake.

Disclaimer

The following statements apply to all web pages that are part of the Midwest Glacial Lakes Partnership Conservation Planner.

This Conservation Planner was established to hold and communicate data from the Phase II Assessment of Inland Lake Habitats conducted by the Midwest Glacial Lakes Partnership (MGLP). It is strongly recommended that any additional data analyses use data received from the Midwest Glacial Lakes Partnership Coordinator as opposed to indirect sources, to ensure that the data are as up to date as possible. Data requests should be directed to the MGLP Coordinator, [Joe Nohner](#).

Although the data disseminated via the MGLP Conservation Planner have undergone data formatting and quality review prior to posting, errors or inaccuracies may still exist in the data. The MGLP, its members, and the individuals and organizations responsible for creating the Conservation Planner make no warranty, express or implied, nor assume any legal liability or responsibility for the accuracy,

completeness, or usefulness of any information, apparatus, product, or process disclosed, nor represent that its use would not infringe on privately owned rights. No warranty, expressed or implied, is made regarding the accuracy or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty. This disclaimer applies both to individual and aggregate uses of the data. The MGLP and its members shall not be held liable for improper or incorrect use of the data retrieved from the MGLP Conservation Planner.

Attribution

As a condition of use, those who refer to data and information found through the Conservation Planner in their publications and presentations must formally identify both the original authors of the MGLP Phase II Assessment of Inland lakes and the MGLP Conservation Planner through which data were accessed. Such citation may be in any format appropriate to the publication or presentation, or in any format required by the original creator or provider of the data/information. Identifying the source for citation is the responsibility of the user, and users should be prepared to provide a copy of the citing publication or presentation to the cited authors or data providers, upon their request. The MGLP Conservation Planner should be referred to in full as "The Midwest Glacial Lakes Partnership Conservation Planner at <http://ifrshiny.seas.umich.edu/mglp/>" and cited as "Midwest Glacial Lakes Partnership. 2019. Midwest Glacial Lakes Partnership Conservation Planner. Available from: midwestglaciallakes.org/conservationplanner.

Data disseminated through the MGLP Conservation Planner are the result of combined efforts by various federal, state, and provincial agencies and other researchers and managers. Publications based on these data should acknowledge all of their efforts. If a publication is based solely on the analysis of the data, we suggest that you involve the point of contact for the relevant datasets in the development and/or review of the manuscript. The point of contact might also appreciate receiving a reprint or photocopy of any such article at the time of its publication.

Base maps are provided by the following sources, which should be referenced accordingly. Mapnik (OpenStreetMap); Gray canvas (ESRI), Protected areas database (USGS); Land cover (USGS 2011); Watersheds (USGS latest); Ecoregion Level II (EPA latest); World imagery (ESRI); Topographic (ESRI); and Stamen watercolor.