Threats/Issues and Conservation Actions
Aquatic Community Group

This is a summary of threats/issues and conservation actions that are common to all or most of the community types[1] in the Aquatic Community group. As much as possible, the source of the threat is described as well as the stresses or effects that occur directly or indirectly as a result of the threat. Stresses are generally thought of as loss, conversion and/or degradation of the natural community. Distinguishing the **source** of the impact from the **effects** that occur to or in the community is important because the two typically need a different approach and set of conservation actions. Multiple sources of impact may have the same or similar effects on a community. Similar effects may be addressed collectively by a single action or suite of actions.

The Aquatic Group includes 23 natural community types. The former "Inland Lake" community type identified in the first WWAP has been expanded to comprise 15 new types reflective of their hydrology, depth, alkalinity, and landscape position as listed below. The Great Lakes, streams and river community descriptions can be found online.[2] Descriptions of the Inland Lake community types that were added to the WWAP can be found in Appendix 4.1at the end of Section 4.4.1 of the WWAP.

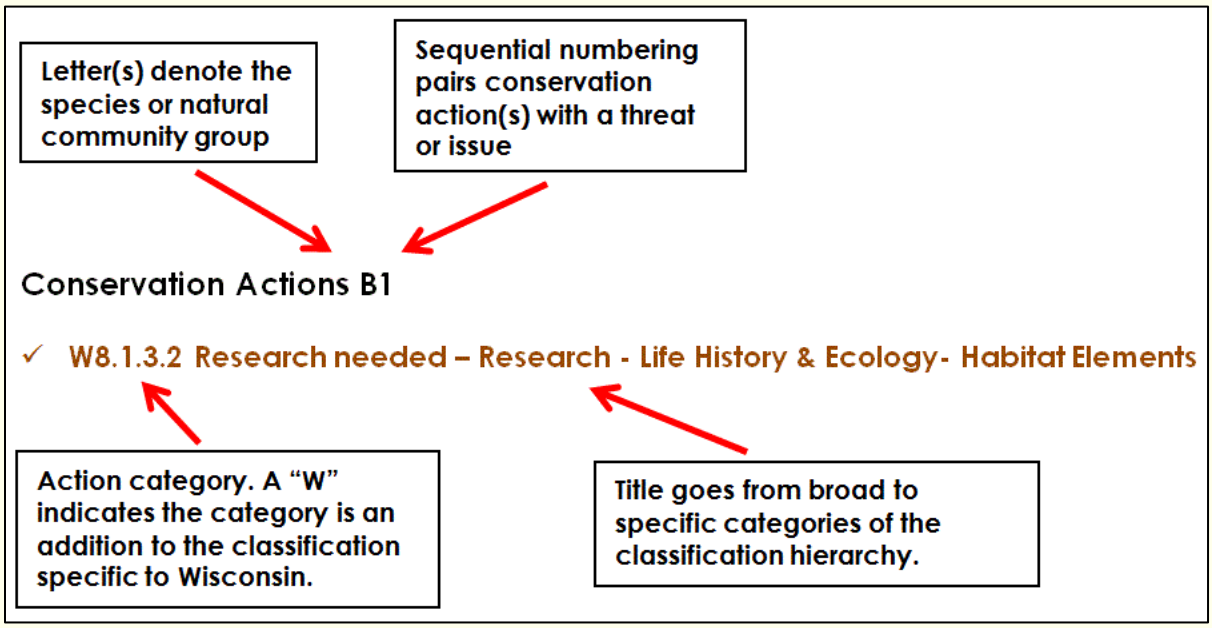
- Coldwater streams
- Coolwater streams
- Warmwater rivers
- Warmwater streams
- Lake Michigan
- Lake Superior
- Small Lake
    - Soft bog lake
    - Hard bog lake
    - Meromictic lake
    - Other
- Large Lake
    - Shallow seepage lake – soft
    - Shallow seepage lake – hard
    - Shallow drainage lake – soft
    - Shallow drainage lake – hard and very hard (marl)
    - Deep seepage lake – Soft and very soft
    - Deep seepage lake - Hard
    - Deep drainage lake – Soft
    - Deep drainage lake – Hard
- Other Lake Types
    - Riverine impoundment

[1] Community or natural community is used in the WWAP as a proxy for habitat.
[2] http://dnr.wi.gov/topic/EndangeredResources/Communities.asp?mode=group&Type=Aquatic (Search Terms: Aquatic Communities of Wisconsin DNR)

Riverine Lake/Pond
Spring pond/lake

- Spring and Spring Run (Hard)
- Spring and Spring Run (Soft)

Conservation actions for most or all aquatic community types are organized according to categories in the Conservation Actions Classification based on the Open Standards threats and actions classification[3]. If the threat/issue and its associated conservation action(s) apply to one or a few species they are identified as such. Conservation actions overlapping in content or scope may be grouped under a single code. Coding and identification for each action category are explained further below.



More about how threats and issues or conservation actions were developed, opportunities to provide input on this topic, and how this information can be used to make conservation decisions can be found on the Conservation Actions and Effectiveness Monitoring page or in Sections 2 and 4.4.1 of the Wisconsin Wildlife Action Plan.

[3] See the following website for the classifications. http://cmp-openstandards.org/tools/threats-and-actions-taxonomies/ (Search Terms: open standards conservation threats actions). The conservation actions classification is provided in Appendix 2.1.

Threat/Issue AQ1

Nonpoint source (NPS) pollution, also known as polluted runoff, is a leading cause of water quality problems in Wisconsin. Polluted runoff is caused by rainfall or snowmelt moving over and through the ground picking up natural and human–made pollutants, depositing them into rivers, lakes, wetlands and groundwater. Pollutants include fertilizers, nutrients, oil, grease, sediment and bacteria from agricultural, urban and residential areas. Runoff may be exacerbated by climate change-related events, including more frequent and intense storms, and winter precipitation falling in the form of rain on frozen ground.

Conservation Actions AQ1

✓5.4.2 Law and policy - Compliance and enforcement – National level (federal)
Improve habitat and water quality conditions in river basins, such as the Milwaukee River basin, by controlling non-point pollution through compliance with existing runoff and water quality laws.

✓W5.2.1 Law and policy – Policies and regulations – National (federal)
✓W5.2.2.1 Law and policy – Policies and regulations – State and Tribal – State
✓5.3 Law and policy – Private sector standards and codes
✓5.4.2 Law and policy - Compliance and enforcement – National level (federal)
Work with NRCS Conservationist or follow NRCS guidelines (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/fotg/) to develop a 'cropland conservation management system' for water quality and water quantity that holistically considers the effects of planting design, crop selection, discontinuous vegetative cover, tillage practices, nutrient management, pest management, and irrigation. Of particular concern is water degradation due to inputs of sediment (soil runoff), nutrients (fertilizers), and pesticides, as well as lowered water tables. Make specific reference to USDA NRCS National Agronomy Manual (2011). On WDNR lands leased for agricultural purposes, follow department policy as noted in the WDNR Wildlife Management Handbook.

✓W5.2.3.1 Law and policy – Policies and regulations – Local – County
✓W5.2.3.2 Law and policy – Policies and regulations – Local - Municipal
Work with local municipalities to reduce runoff from impervious surfaces and enhance infiltration through ordinances and development planning.

✓W5.2.3.1 Law and policy – Policies and regulations – Local - County
✓W5.2.3.2 Law and policy – Policies and regulations – Local – Municipal
Work with DNR, county, and municipal forests and other partners to refine and implement the strategy to "Slow the Flow" of runoff and sedimentation in the Superior Coastal Plain (in part by increasing the percentage of mature forests and conifer component in those forests and by decreasing the percentage of open land and very young forest in a given watershed). For recommendations, see WDNR publication entitled "Managing Woodlands on Lake Superior's Red Clay Plain: Slowing the Flow of Runoff".

5.4.2 Law and policy - Compliance and enforcement – National level (federal)
5.4.3 Law and policy – Compliance and enforcement – Sub-national level (state, tribal, local)
Work with state and local agencies to implement, comply with and enforce existing erosion control statues for construction, stormwater and runoff.

W5.2.2.1 Law and policy – Policies and regulations – State and Tribal - State
W5.2.3.1 Law and policy – Policies and regulations – Local – County
5.4.3 Law and policy – compliance and enforcement – Sub-national level (State, Tribal, Local)
Maintain or increase proportion of mature forests and other vegetation along riparian corridors and in upstream watersheds to help slow the flow of runoff during snowmelt and rain events.

W7.3.2 External capacity building - Conservation finance – Management and protection
Fund state and county staff levels and time to implement nonpoint source performance standards as described in Wisconsin's Nonpoint Source Program Management Plan and as required by state law (NR 151 [Runoff Management] and NR 216 [Storm Water Discharge Permits]).

W4.2.1 Education and awareness – Training – Management and conservation training
Work with municipal planners, developers, businesses, and local zoning boards to increase groundwater infiltration practices and decrease stormwater input and nutrient enrichment of water from impervious surfaces (parking lots, etc.) through techniques such as the installation of bioswales, etc.

W5.2.3.1 Law and policy – Policies and regulations – Local – County
W5.2.3.2 Law and policy – Policies and regulations – Local - Municipal
Develop lake and waterway plans that consider conservation, management and restoration of aquatic habitats as part of assuring sustainable use and enjoyment. Consider management measures, methods and tools that provide multiple benefits for mixed uses and goals that include SGCN and their habitat

W4.3.1 Education and awareness – Awareness and communications – general ecology, biology, habitats related to conservation needs
Educate, inform and guide property owners, organizations, lake and sanitary districts, businesses, interest groups and recreational users in aquatic habitat related issues

6.5 Livelihood, economic and other incentives – Non-monetary values
Encourage citizens, state and local decision-makers to take voluntary actions on behalf of maintaining and restoring water quality elements of aquatic habitats.

Threat/Issue AQ2

Eighty percent of the land bordering Wisconsin lakes and rivers is privately owned. Each year, thousands of shoreland parcels are developed. The cumulative effects of shoreline development projects of individual lakes and streams can harm water quality. Rain water and snow melt can become nutrient-laden as they run across lawns and gardens, picking up excess fertilizers that have been applied. These nutrients can cause excessive aquatic weed and algal growth that reduces the oxygen supply in lakes and rivers, incurring a cascade of aquatic ecosystem changes.

Conservation Actions AQ2

✓W4.2.1 Education and awareness – Training - Management and conservation training
✓W4.3.1 Education and awareness – Awareness and communications – General ecology, biology, habitat related to conservation needs
✓7.1 External capacity building – Institutional and civil society development
Learn about and restore shoreline habitat, assess the habitat on your shoreline property through technical assistance and information at: http://dnr.wi.gov/topic/shorelandzoning/.

Shoreline property owners become familiar with the WDNR publication series for shoreline protection and restoration. dnr.wi.gov; key words: "publications on shoreland management". Seek additional guidance from the Shoreland Coordinator in the WDNR Watershed Management Program, UW-Extension, Wisconsin Association of Lakes, and River Alliance.

Educate landowners on the uniqueness of the dune and shoreline plant community to minimize trails, erosion, beach grooming, etc.

✓5.1.3 Law and policy – Legislation – Sub-national level (state, tribal, local)
✓W5.2.3.1 Law and policy – Policies and regulations – Local - County
Work with DNR and local coastal zoning to develop stronger rules related to maintaining natural long-shore sand movement by minimizing new artificial shoreline structures (permanent piers, seawalls, rip-rap, jetties, etc.).

Comply with Ch. NR 115, describing minimum requirements for vegetated buffers around lakeshores to protect important traits of water chemistry, quality, and to prevent shoreline erosion.

✓W2.3.1 Land/water management – Habitat and natural process restoration - Aquatic
Restore wetland amphibian SGCN habitat adjacent to or within occupied areas. For example, riparian re-vegetation and groundwater flow areas, shoreline buffers and exclude cattle from streams/streambanks and adjacent amphibian breeding wetlands.

✓7.1 External capacity building – Institutional and civil society development
Continue to work with river and lake associations and other conservation organizations to promote shoreline protection and buffers for all aquatic SGCNs.

✓5.4.3 Law and policy – Compliance and enforcement – Sub-national level (state, tribal, local)
Continue regulatory efforts to implement and comply with laws related to fish kills, water pollution, and shoreline protection, which are key issues for preserving aquatic SGCNs.

✓W2.3.1 Land/water management – Habitat and natural process restoration - Aquatic
Restore and maintain natural banks where shoreline and riparian areas are eroded by using natural and/or biodegradable materials such as coarse woody material, native wetland vegetation, regrading to a more shallow slope, bio-engineered erosion control as opposed to hard armoring such as rip-rap or sea walls to restore SGCN habitat and to buffer variations in water levels and wave action.

Threat/Issue AQ3

Non-native aquatic invasives are successful because they originate in other regions or continents, thus lacking natural checks and balances. Early and abundant growth of invasive aquatic plants not only overwhelms native plants, it may disrupt aquatic predator-prey relationships by fencing out larger fish, and may limit important aquatic food plants for waterfowl. The die-off of plants such as curly-leaf pondweed in summer can cause oxygen depletion in waterbodies, and decaying plants can contribute to nutrient loading and algal blooms. Aquatic invasive animals similarly present overwhelming competition to their native counterparts (e.g., rusty crayfish versus native crayfish). The invasive common carp resuspends sediments and nutrients and destroys macrophyte beds, while non-native mussels feed on plants, animals and debris that are suspended in the water, leading to increased water clarity and light penetration (fostering overgrowth of rooted aquatic plants), and depleting the food supply for native aquatic organisms.

Aquatic invasive species spread to new waters by hitching a ride on watercraft and trailers, in the ballast water of Great Lakes ships, and on recreational equipment such as fishing gear. They can also be introduced via streams and rivers, and during flood events, which may be exacerbated with climate change-associated flooding. The milder winters and warmer temperatures projected with climate change may further enhance conditions for the proliferation and spread of invasives.

Conservation Actions AQ3

✓W2.2.1.1 Land/water management – Invasive/problematic species control – Prevention – Aquatic
✓W2.2.2.1 Land/water management – Invasive/problematic species control – Control - Aquatic
For any given waterbody, implement a multi-tiered approach to non-native invasive species: 1) careful planning; 2) prevention; 3) early detection and rapid response; 4) control; 5) slowing the spread; 6) monitoring; 7) restoration.

Prevent invasions of non-native plants by limiting human vectors (e.g., boat launch inspections), maintaining healthy and diverse natural communities and conducting periodic inspections of high-risk areas (e.g., boat ramps).
Implement an Early Detection-Rapid Response approach by finding new populations of non-native invasives as early as possible when eradication and control are still feasible and less costly.

Control non-native invasive species by manual, mechanical, and/or chemical means. In areas where eradication and control are not feasible, slow the spread of non-native invasives into adjoining areas by restricting activities during certain seasons, minimizing travel through areas, and inspecting watercraft.

At a landscape or statewide level, support and strengthen regulatory mechanisms and voluntary BMPs that address the introduction and spread of non-native invasives.

✓W2.3.1 Land/water management – Habitat and natural process restoration - Aquatic
Restore sites to confer resistance to infestation by non-native invasives. This may involve restoring system functions (e.g., hydrology), restoring natural community structure (E.g., native species)canopy, mid-story, shrub layer), and ameliorating invasive species.

✓W2.2.3 Land/water management – Invasive/problematic species control – Inventory and early detection
Develop a plan by conducting surveys for invasives and creating maps showing their locations and densities. Set reasonable management objectives based on this information.

Conduct regular monitoring of sites to detect new invasions and to evaluate the success of pest management plans and control measures.

Threat/Issue AQ4

Stream hydrology is altered with the installation of dams and other water control structures, or with channelization. Dams affect aquatic species and habitats by fragmenting them into disjunct segments, preventing the movements of some species between different stretches of the river. Water control structures and channelization may disrupt the natural hydrological fluctuations that are integral to aquatic ecosystems and associated riparian wetlands.

Long-term changes in the water levels of our waterbodies are projected to occur with climate change. Water levels may become lower due to the combined effect of summer heat, drought, diminished groundwater recharge due to less infiltration of precipitation in winter [if rain falls on frozen ground], and flashy spring/summer rains that run off rather than infiltrate. Or water levels may become higher due to overall increase in precipitation. Although the direction of change is hard to predict at a local level, some type of change is likely to occur, and with rapid onset.

Climate change-associated drought and extreme heat may lower groundwater resources, which may be further exacerbated by the necessity for increased agricultural irrigation. Even without climate change, humans may extract water for drinking/household usage or agriculture to the point where groundwater levels are severely lowered along with a commensurate lowering of associated streams and spring-fed lakes. Impervious surfaces also limit groundwater recharge by limiting infiltration of rainwater.

Conservation Actions AQ4

✓W8.1.8 Research needed – Research – Natural community threats and actions
Develop habitat management guidelines for Ephemeral Ponds to protect water quality, pond hydrology, and habitat for herptiles and invertebrates.

✓W8.2.2 Research needed – Conservation planning – Area-based management plan
Identify priority groundwater recharge areas that supply fens, sedge meadows, springs, streams, and other wetlands.

✓W8.3.4.2 Research needed – Monitoring – Habitat trends – Composition quality and function
Conduct groundwater quantity and/or quality monitoring, stream flow, and lake levels in areas where groundwater dependent species and communities are in close proximity to areas with high demand on groundwater resources.

✓4.2 Education and awareness – Training – Management and conservation training
Work with municipal planners, developers, businesses, and local zoning boards to increase groundwater infiltration practices and decrease stormwater input and nutrient enrichment of water from impervious surfaces (parking lots, etc.) through techniques such as the installation of bioswales, etc.

✓6.1 Livelihood, economic and other incentives – Linked enterprises and livelihood alternatives
Work with NRCS and UW-Extension to develop incentives for practices that promote groundwater infiltration in groundwater recharge areas, particularly in agricultural and developed landscapes.

✓4.3.1 Awareness and training – General ecology, biology, habitat related to conservation needs
Encourage Dams and Floodplain Programs to incorporate the data and conservation actions from the WWAP to help guide decision regarding the best locations for dam removal, constructing fish passages, and where to target floodplain zoning ordinance reviews and workshops.

Continue to review and provide input to FERC (dam) projects during re-licensing to ensure protection of aquatic SGCNs and their habitats.

Threat/Issue AQ5

Climate change is projected to significantly influence Wisconsin's aquatic communities. While the nature of this change and its impacts remain uncertain, scientists anticipate that the changes will occur rapidly, and may not allow sufficient time for natural adaptation. There are many other factors apart from climate change that can influence changes in aquatic communities, particularly land cover types, land use, soils, and hydrology within a given watershed, as well as shoreline development/alteration. Climate change may interact with these other factors to amplify their impacts, or synergistically create novel impacts. The major considerations relating to climate change and aquatic communities are summarized below.

More winter precipitation is projected to fall in the form of rain and freezing rain, especially at the tail ends of winter. If the ground is frozen, rain won't infiltrate, but instead will run off, limiting groundwater recharge. If, however, warmer winter temperatures prevent the ground from freezing, then groundwater recharge could increase; soil types, vegetation cover, and frost are all critical factors. Warmer summer temperatures, drought (and associated increase in irrigation demand), and a longer growing season can result in lower groundwater levels due to increasing evapotranspiration and plant uptake of water. This could all be offset, however, by increasing annual precipitation. A decrease in groundwater recharge can lead to lower lake levels, lower stream baseflow, and wetland loss or alteration. Slow-draining lakes and seepage lakes will be the most vulnerable to declining water levels (Walker et al., 2013). Lower lake levels may impact lake temperature, chemistry, and amount of available habitat for aquatic plants and animals. Cool- and cold-water streams may warm due to increasing temperatures and lower base flow, resulting in limited reproduction of species such as trout and aquatic invertebrates. Conversely, an increase in groundwater recharge can cause flooding and wetland loss/alteration.

If heavy rainfalls intensify, moderately deep lakes may no longer stratify, but instead mix continually, causing phosphorus loading and a change in trophic status ([WICCI] 2010). Lake ice depth and longevity may decrease as a result of milder winters. Prolonged warm weather and decreased ice depth/duration may lengthen the period of thermal stratification and promote more extensive oxygen depletion throughout bottom waters and eventual die-off of fish that need cooler water ([WICCI] 2010).

Flooding can connect formerly disjointed water bodies, allowing invasion of non-native invasive species (plants and animals). Nutrient and sediment runoff may increase with higher intensity and more frequent storms, especially if they occur in winter or spring when there is little to no vegetative cover to limit erosion and runoff. Increasing temperatures combined with increased runoff and sedimentation may thus further stimulate the growth of non-native invasive plants. Flooding may also overwhelm stormwater and sewage management systems, resulting in dispersion of pollutants and contaminants into aquatic communities. Decreased water quality can also be associated with lower groundwater levels, as there is less water to dilute pollutants. Phosphorus loading can boost algal growth, while sediment can limit photosynthesis of

submerged aquatic plants. Drainage lakes and impoundments may experience greater impacts than seepage lakes. Also, deeper, larger lakes may be more resistant to nutrient loading due to dilution.

Conservation Actions AQ5

✓W5.2.1 Law and policy – Policies and regulations – National (federal)
✓W5.2.2.1 Law and policy – Policies and regulations – State and Tribal – State
✓5.3 Law and policy – Private sector standards and codes
✓5.4.2 Law and policy - Compliance and enforcement – National level (federal)
Work with NRCS Conservationist or follow NRCS guidelines (http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/fotg/) to develop a 'cropland conservation management system' for water quality and water quantity that holistically considers the effects of planting design, crop selection, discontinuous vegetative cover, tillage practices, nutrient management, pest management, and irrigation. Of particular concern is water degradation due to inputs of sediment (soil runoff), nutrients (fertilizers), and pesticides, as well as lowered water tables. Make specific reference to USDA NRCS National Agronomy Manual (2011). On WDNR lands leased for agricultural purposes, follow department policy as noted in the WDNR Wildlife Management Handbook.

✓W5.2.3.1 Law and policy – Policies and regulations – Local – County
✓W5.2.3.2 Law and policy – Policies and regulations – Local - Municipal
Work with local municipalities to reduce runoff from impervious surfaces and enhance infiltration through ordinances and development planning.

✓W2.2.1.1 Land/water management – Invasive/problematic species control – Prevention – Aquatic
✓W2.2.2.1 Land/water management – Invasive/problematic species control – Control - Aquatic
At the site level, employ an eight-part approach to non-native invasive species: 1) careful planning; 2) prevention; 3) early detection and rapid response; 4) control; 5) slowing the spread; 6) reducing impacts; 7) monitoring; 8) restoration.

✓W8.2.2 Research needed – Conservation planning – Area-based management plan
Identify priority groundwater recharge areas that supply fens, sedge meadows, springs, streams, and other wetlands.

✓W8.3.4.2 Research needed – Monitoring – Habitat trends – Composition quality and function
Conduct groundwater quantity and/or quality monitoring, stream flow, and lake levels in areas where groundwater dependent species and communities are in close proximity to areas with high demand on groundwater resources.

NOTE: *Other conservation actions under the issue sections above can be adapted to consider the effects of changing climate.*