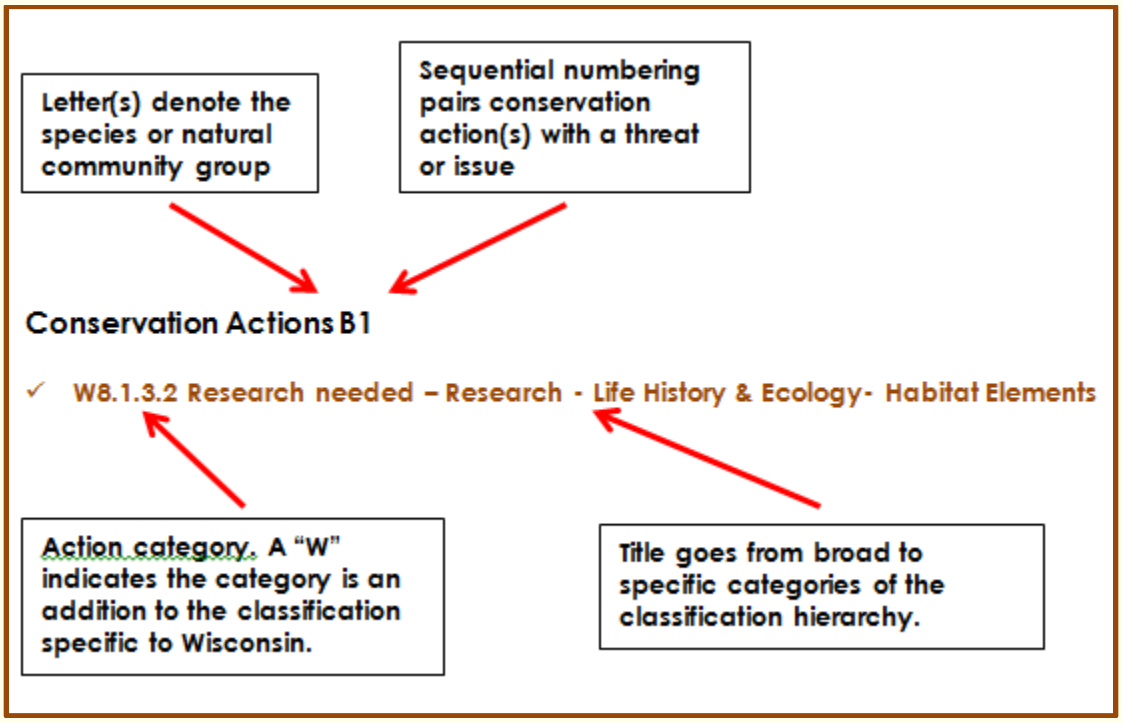
Threats/Issues and Conservation Actions for Invertebrate Species of Greatest Conservation Need

This is a summary of threats or issues affecting the conservation of invertebrate SGCN and actions that can be implemented at the source, or to address the effects of the source on the species or its habitat. Distinguishing the source of the impact from its effects on species and their habitats 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 species or habitat. Similar effects may be addressed collectively by a single action or suite of actions.

Conservation actions applicable to all or most invertebrate SGCN are organized according to categories in the Conservation Actions Classification based on the Open Standards threats and actions classification[1]. 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

[1] 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.

Effectiveness Monitoring page or in Sections 2 and 3.5 of the Wisconsin Wildlife Action Plan.

Threat/Issue Invert1

Lack of Information on population size and distribution, life history and ecology. Although we have sufficient information to estimate the SRank factors--rarity, trends and threats--as well as the other criteria used to classify invertebrate species as SGCN, lack of information remains a threat common to the conservation of SGCN invertebrate groups. There remains a lack of information about the biology and ecology of Aquatic Invertebrate SGCN to help us define conservation actions and threats.

Conservation Actions Invert1

✓W4.2.2 Education and awareness – Training – Inventory and monitoring training
✓W7.2.2 External capacity building – Alliance and partnership development – Inventory and monitoring
✓W8.1.2.1 Research needed – Research – Population size, distribution and past trends - Distribution and mapping
✓W8.1.2.2 Research needed – Research – Population size, distribution and past trends – Composition and quality
✓W8.1.3.1 Research needed – Research – Life history and ecology – Life history
✓W8.1.3.2 Research needed – Research – Life history and ecology – Habitat elements
✓W8.1.5 Research needed – Research – Threats
✓8.3.1 Research needed – Research – Monitoring – Population trends
✓W8.3.4.2 Research needed – Research – Monitoring – Composition, quality and function
Research Needed. Actions that can be taken to address the lack of information in these areas are listed below.

- Undertake systematic and focused inventories of invertebrates independently or incidental to other studies/efforts.
- Collect data to comply with professional collection standards and protocols.
- Produce up-to-date keys to identify Wisconsin invertebrates and source materials to provide accurate, easy-to-use reference works. Readily accessible online library of existing taxonomic and related references for Wisconsin invertebrate groups.
- Citizen-based monitoring and citizen science programs that include hands-on and online support for identification by non-experts can be improved.
- Monitor micro and macro habitat changes in natural communities that support diverse aquatic invertebrate assemblages as a response to large-scale changes in water temperature, dissolved oxygen and other water quality variables.

- Be as specific as possible about the information needed to identify issues/threats and conservation actions by taxa, habitat or invertebrate species assemblages (e.g., aspects of life history, habitat requirements, etc.).

- Reduce or eliminate barriers to data sharing between and among public and private organizations and individuals.

Threat/Issue Invert2

Lack of Information to inform conservation planning. Conservation planning is associated with development from all sources, including commercial, industrial, residential, agricultural and establishment and operation of Transportation and Service Corridors. We often do not adequately consider invertebrates in conservation planning, management and decisions related to all types of development. This is a large-scale issue, although the type of development that needs to be considered in conservation planning for invertebrates will vary depending on where one is in the state.

Conservation Actions Invert2

✓W4.3.1 Education and awareness – Awareness and communications – General ecology, biology, habitat related to conservation needs
✓5.2.3.1 Law and policy – Policy and regulations – Local - County
✓W5.2.3.2 Law and policy – Policy and regulations – Local - Municipal
✓5.3 Law and policy – Private sector standards and codes
✓8.1.6 Research needed – Research – Actions
✓8.2.2 Research needed – Conservation planning – Area-based management plan

Research Needed. Actions that can be taken to address the lack of information in these areas are listed below.

- Outreach, education and training efforts to foster awareness of the important roles invertebrates play in natural systems. Create opportunities for natural resources professionals, citizens, local governments, and other public entities to be involved in invertebrate protection and conservation efforts.

- Voluntary management guidelines and best management practices can be applied to development projects and activities on public and private lands that occur in or adjacent to natural communities in conservation opportunity areas and ecological landscapes with habitats that are moderately or highly associated with invertebrate Species of Greatest Conservation Need.

- Develop basic guidelines for considering assemblages of invertebrate species in local development and conservation planning.

- Integrate invertebrate into site planning and land management activities on protected or preserved lands.

- Develop and implement area plans linked to aquatic conservation opportunity areas that support or may support assemblages of invertebrate SGCN.

Aquatic Invertebrates

These Issues/Threats are common to all or most aquatic invertebrate groups. All of these issues and the conservation actions to address them are the same as those described for fish SGCN (See Section 3.3), the Aquatic Community Group (Section 4.4.1) and some shoreline communities in the Miscellaneous Group (Section 4.4.8). This illustrates that conservation efforts to help invertebrate SGCN are not exclusive of benefits to other aquatic species and their habitats and vice versa. It is particularly important for invertebrate conservation actions to specify their scale and location. This also leads one back to the question of having enough information to know what habitat elements to target and where to implement conservation actions.

Issues/Threats Invert3

Following are the most commonly cited issues/threats that affect many or most aquatic invertebrates.

- Residential development along riparian zones, shorelines and floodplains.

- Recreational activities where the intensity and timing of use diminishes habitat quality and exceeds the tolerance of aquatic invertebrates.

- Dams that change hydrology and water level manipulation that reduces surface water in habitat areas

- Polluted effluents from all sources.

- Climate change and severe weather will interact with and exacerbate other threats (e.g., dissolved oxygen levels, suspended sediment levels from intense rain events).

Conservation Actions Invert3

Following are the most commonly cited or important areas of conservation action to address these Issues/Threats.

✓W2.4 Land/water management – Comprehensive management
Comprehensive management of a range of small to large rivers with clean, fast-flowing cool to warmwater streams and rivers with a range of bed topography and cobble-gravel- sand substrates. This implies all activities of restoration, preservation and maintenance will be needed.

✓5.2.3.1 Law and policy – Policy and regulations – Local - County
✓W5.2.3.2 Law and policy – Policy and regulations – Local - Municipal
Local policies and regulations to consider aquatic invertebrate SGCN and their habitat in land use and development decisions in and around aquatic natural communities.

✓5.3 Law and policy – Private sector standards and codes
Voluntary best management practices to protect microhabitats and water quality.

✓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)
Compliance with water quality laws and standards.

✓8.2.2 Research needed – Conservation planning – Area-based management plan
Identify conservation opportunity areas with aquatic and wetland natural communities or where multiple SGCNs are likely to occur are among the most important places to implement this action.

✓W8.3.4.1 Research – Research needed – Monitoring – Habitat trends – Distribution and mapping
✓W8.3.4.2 Research – Research needed – Monitoring – Habitat trends – Composition, quality and function
Monitor community level vegetation changes within coastal wetland communities along Lake Superior and Lake Michigan in light of climate change to detect responses to things such as lake level changes, water temperature changes, and other environmental changes. This is especially relevant to coastal wetlands not connected to the Great Lakes via surface flow; surficially connected coastal wetlands are already part of an extensive monitoring network through the Great Lakes Coastal Wetlands Consortium monitoring plan.

Threat/Issue Invert4, MUSSELS

Alteration of Ecological Processes – Dams. Artificial hydrological conditions are created by dam and other control structures that few riverine mussel species are able to tolerate by:

- slowing or stopping the flow of water that mussels need to bring food to them and carry their wastes away,
- restricting fish movements and migrations, thus limiting access to hosts during a critical stage in the mussels' life cycles,
- causing changes in water temperatures and dissolved oxygen concentrations in impoundments and tail waters,
- causing fluctuating water levels that can leave mussels stranded above the water surface,
- creating hydrologic instability (e.g., currents that move or cover mussel beds and sweep mussels onto shifting sandbars where they are smothered), and
- causing increased sediment containment behind the dam which buries mussel beds.

Conservation Action Invert4, MUSSELS

✓W2.3.1 Land/water management – Habitat and natural process restoration – Aquatic
✓W5.2.2.1 Law and policy – Policies and regulations – State and tribal - State
✓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)
Restore natural hydrologic regimes and fish migration patterns by removing dams, modifying dam operations, preventing and mitigating nonpoint source pollution, providing for fish passage, or addressing watershed land use practices.

Threat/Issue Invert5, MUSSELS

Biological Resource Use - Over-harvesting of mussels and host species. Impacts of mussel harvesting include:

- reduction of breeding stock to levels exceeding their maximum sustainable harvest rate (e.g., where reproduction does not offset mortality),
- wasteful death of individuals—especially juveniles—below useful or legal size limits,
- abortion of glochidia by gravid females when disturbed,
- death of adults that are unable to rebury themselves after being uprooted, and
- disruption and destruction of stream and river beds.

Loss of larval host species appears to have eliminated some mussel species from some river systems.

Conservation Actions Invert5, MUSSELS

✓1.2 Land/water protection – Resource and habitat protection
✓W2.4 Land/water management – Comprehensive management
✓W4.3.2 Education and awareness – Awareness and communications – Harvest, roadkill or other sources of illegal, incidental mortality and nonlethal threats

- Continue legal protection and monitor harvest.
- Consider larval host fish species in fish community management efforts.

Many threatened mussel species continue to produce large numbers of viable glochidia (larvae). Therefore, it is logical to suspect that the availability of host species and the survival of the early juvenile stages may be critical issues for the continued survival of some species. Several freshwater mussels considered Species of Greatest Conservation Need have known or suspected vertebrate hosts that are also considered Species of Greatest Conservation Need. Addressing the conservation needs of these larval host species will be an important part of any conservation strategies for the mussels of conservation need.

Mussel Species of Greatest Conservation Need	Larval Hosts (Species of Greatest Conservation Need in ***Italics***)
Arcidens confragosus (Rock Pocketbook)	*American eel*, drum, shad, rockbass, crappie
Cumberlandia monodonta (Spectacle Case)	*mudpuppy* (potentially)
Elliptio crassidens (Elephant-Ear)	*skipjack herring*
Fusconaia ebena (Ebonyshell)	crappie, bass, *skipjack herring*
Lampsilis teres (Yellow Sandshell)	gars, centrarchids, basses, *sturgeon*

Threat/Issue Invert6, MUSSELS

Invasive or problematic species

- The nonnative zebra mussel and Asiatic clam pose a significant threat to native mussel populations.
- Nonnative zebra mussels colonize the shells of native mussels.
- Zebra mussels compete with native mussels for food resources and may limit reproduction. Asiatic clam may also pose similar threats to native species.

Conservation Actions Invert6, MUSSELS

✓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
✓W4.3.2 Education and awareness – Awareness and communications - Harvest, roadkill or other sources or illegal incidental mortality, nonlethal threats
✓5.4.3 Law and policy – Compliance and enforcement – Sub-national level (State, Tribal, Local)

- Comply with and enforce aquatic prevention and control measures, voluntary and required best practices established and supported by the State's Invasive Species Law (NR40).
- Increase and sustain the awareness of those who use aquatic resources for recreational and commercial purposes.

Threat/Issue Invert7, HINE'S EMERALD DRAGONFLY

All forms of development can cause habitat fragmentation, loss or degradation.

Conservation Action Invert 7, HINE'S EMERALD DRAGONFLY

✓W2.4 Land/water management – Comprehensive management

Carry out the Federal Hine's Emerald Dragonfly Recovery Plan of which the overriding priority for this species is to protect and maintain the known populations and associated aquatic and terrestrial habitat, in part identified in Critical Habitat Areas.

Terrestrial Invertebrates

This section summarizes threats and conservation actions common to all or most terrestrial invertebrate taxonomic groups. All of these issues and the conservation actions to address them are similar to those described for the Barrens Community Group (Section 4.4.2), Grasslands Community Group (Section 4.4.3) and Savanna Community Group (Section 4.4.4). Refer to those sections for more explanation of the threats and conservation actions listed below. This illustrates that conservation efforts to help invertebrate SGCN are not exclusive of benefits to other species that inhabit these communities and vice versa. It is particularly important for invertebrate conservation actions to specify their scale and location. It also leads one back to the question of having enough information to know what habitat elements to target and where to implement conservation actions.

Threat/Issue Invert8

Natural systems are modified through changes in fire regimes. This issue is closely related to information lacking about the success and outcome of fire management on fire-dependent natural communities that support terrestrial invertebrate SGCN.

Conservation Actions Invert8

✓W2.3.3 Land/water management – Habitat and natural process restoration – Terrestrial
✓8.1.6 Research needed – Research – Actions
✓8.3.1 Research needed – Monitoring – Population trends
✓W8.3.5 Research needed – Monitoring – Effectiveness monitoring

- Quantify and monitor the impacts that prescribed burning and other management activities on remnant prairies may have on SCGNs invertebrates to inform future management decisions.

- When managing remnant prairie, do not apply the same management technique (burning, mowing, grazing) to the entire site too many years in a row to benefit remnant restricted inverts, reptiles and small mammals.

- When conducting burns on remnant prairie that contains SGCN insects, leave a portion of the site unburned ("refugia") to benefit fire sensitive remnant-restricted invertebrates.

- Research the efficacy of prairie refugia left during prescribed fires on the maintenance of prairie invertebrate diversity.

Threat/Issue Invert9

Airborne pollutants in the form of herbicides and pesticides

Problematic species that cause disease are potential threats to pollinator species.

Agricultural and rural residential development can result in the loss of host and nectar plants and other forage plants for terrestrial insects.

Conservation Actions Invert9

✓W2.3.3 Land/water management – Habitat and natural process restoration – Terrestrial
✓3.2 Species management - Species recovery
✓5.3 Law and policy – Private sector standards and codes

- Develop and implement Pollinator BMPs and Restoration Guidelines for enhancing habitat for native insect pollinators (bees, butterflies, moths, flies, etc.) related to state listed or SGCN species. Restorations should include local genotypes of a diversity of native species selected to provide habitat for pollinators throughout the growing season, especially early spring forbs. Strive for at least 3 plant species that bloom during spring, summer and fall. This can include trees and shrubs where appropriate. Leave bare ground and/or standing dead wood for nesting habitat, where appropriate.

- Restore barrens, pine-oak forest, and shrub-dominated habitats on sites such as old fields and pasture lands in the Central Sand Hills, with the goal of expanding and connecting existing stands. This action helps to address habitat fragmentation, genetic isolation, and favors SGCN by increasing habitat patch size and serving multiple life history needs, and by minimizing the negative effects of habitat edge. This approach promotes high species diversity and may also add resiliency to natural communities and species in the face of environmental change over time. Lastly, it may promote more cost-effective management by allowing for larger management units (e.g., for prescribed fire).

✓4.3.1 Education and awareness – Awareness and communications – General ecology, biology, habitat related to conservation needs

- Develop educational materials aimed at increasing awareness about SGCN plant-pollinator relationships, building on existing resources developed in other states when available.

✓W4.2.1 Education and awareness – Training – Management and conservation training
✓1.2 Land/water protection – Resource and habitat protection
✓W2.3.3 Land/water management – Habitat and natural process restoration – Terrestrial

- *Landowners can restore and preserve habitat for terrestrial invertebrates in areas* that currently or historically supported natural communities that have moderate or high associations with SGCN.

- Expand functional habitat areas of prairie remnant-associated invertebrates by working with partners to protect remnants in landscapes that already support remnants and/or can readily be converted to planted prairie.

Threat/Issue Invert10, BUTTERFLIES AND MOTHS

Even for terrestrial invertebrate SGCN, lack of information is one of the most frequently cited challenges. Many terrestrial invertebrates are specific to a particular hose or nectar species or location. Although the actions refer to needed surveys or monitoring, they are intended to provide information for subsequent habitat preservation, restoration and management actions.

Conservation Actions Invert10, BUTTERFLIES AND MOTHS

✓8.1.2 Research needed – Research – Population size, distribution and past trends
✓W8.1.3.2 Research needed – Research – Habitat elements
✓8.1.3.3 Research needed – Research – Species interactions and associations
✓8.1.6 Research needed – Research - Actions

- Conduct presence/absence surveys for Phlox moth on sandy dry to dry-mesic savannas (pine/oak barrens) to find new populations.

- Survey for Poweshiek skipperling using a standardized protocol to search recently and historically occupied sites that contain wet-mesic prairie with appropriate host plants.

- Conduct surveys of invertebrates in Coastal Plain Marshes to search for SGCN and understand their habitat use to inform management.

- Conduct presence/absence surveys for the Ottoe Skipper on remnant dry to dry-mesic prairie sites that have at least 2 acres of existing open prairie vegetation,

especially if the remnant is within ¼ mile of other remnant prairie(s) to find new populations of this extremely rare species

- Evaluate the status of swamp metalmark and assess potential reintroduction sites.
- Identify northern blue butterfly habitat restoration opportunities.

Threat/Issue Invert11, TERRESTRIAL SNAILS

All types of land development can result in habitat alteration, fragmentation or loss.

Land snails occupy a variety of habitats, but usually prefer sites with shelter, moisture, food, and an available source of lime. Forested river valleys and sites with limestone outcrops support the most diverse snail assemblages. Several land snail species are closely associated with algific (cold-producing) talus slopes in the Driftless Area of western Wisconsin. Others occupy similar sites along the Niagara Escarpment in eastern Wisconsin. These habitats are threatened by a variety of factors, including:

- overgrazing by livestock and erosion of fragile slopes,
- road building,
- quarrying,
- contamination from surface water runoff,
- trails sited along cliff bases (trampling can cause compaction of the litter layer where snails live, as well as crushing the animals themselves), and
- development along the bluff tops or in the valleys and removal of vegetation on the slopes.

Conservation Actions Invert11, TERRESTRIAL SNAILS

✓1.1 Land/water protection – Site/area protection
✓1.2 Land/water protection – Resource and habitat protections
✓2.3 Land/water management – Habitat and natural process restoration

- Preserve habitat and protect from human disturbance those unique sites currently occupied by snails. Maintain natural forest cover to protect surface areas that drain into fissures and minimize opportunities for pesticide infiltration and physical blockage of sinkholes.
- Maintain corridors connecting occupied sites to prevent isolating populations.
- Preserve habitat currently occupied by terrestrial snail SGCNs on the Niagara Escarpment.