3.5 Invertebrate Species of Greatest Conservation Need

This is an overview of Wisconsin's invertebrate Species of Greatest Conservation Need (SGCN) and their associations with Natural Communities and Ecological Landscapes. This section also identifies invertebrate species that are not classified as SGCN, but are classified as BasicSINS (species with information needs), RankingSINS, or species that had sufficient information to assess them with confidence and did not meet the SGCN criteria (e.g., ranked S4 or S5, ranked S3G5 or S3S4G5, or did not meet the additional criteria considered after assessing S/G-Ranks). See Section 2.6 for more explanation on ranking and SINS.

The issues, challenges and conservation actions that will be important for most or all invertebrate SGCN over the next ten years are presented in the second half of this section along with those applicable to one or a few invertebrate species. The discussion of the issues and challenges facing invertebrate SGCN and their habitat, and the conservation actions that address them, follows nomenclature developed by the Open Standards for the Practice of Conservation.[1] The Open Standards classification for Conservation Actions, with some modification for circumstances particular to Wisconsin, is presented in Appendix 2.1 at the end of Section 2.

When dealing with invertebrates, it is often necessary to reconcile conflicts in the scientific nomenclature used by different researchers. Such conflicts result from advances in the description and documentation of previously undescribed invertebrate species and a changing understanding of evolutionary relationships. To ensure the most up-to-date taxonomic labels, scientific names from the Tree of Life Web Project (The University of Arizona 2004) were used. The Tree of Life is a collaborative effort of biologists from around the world. On more than 3,000 Internet web pages, the project provides information about the diversity of organisms on Earth, their evolutionary history, and characteristics. Each page contains information about a particular group of organisms. Tree of Life pages are linked to each other hierarchically, in the form of an evolutionary tree of life that illustrates the genetic connections between living things. Visitors to the Tree of Life web site can download the entire structure of the phylogenetic tree to examine relationships between organisms. These data are updated weekly to reflect current taxonomic understanding. This information can be accessed at http://tolweb.org/tree/phylogeny.html.

Standardized common names for invertebrate species included on the list of Species of Greatest Conservation Need were used as much as possible. Many invertebrates, however, do not have common names. NatureServe's database (NatureServe 2004) was used as a source of common names. Common names of some groups of species were updated using standard references (e.g., Stark 1998).

[1] http://cmp-openstandards.org/tools/threats-and-actions-taxonomies/ (Search Terms: open standards conservation threats actions)

3.5.1 Invertebrate SGCN

There are estimated to be over 25,000 native invertebrate species in Wisconsin. Of these only a small fraction (0.01) has been identified as Species of Greatest Conservation Need in Wisconsin. Forty-four are currently listed as Threatened or Endangered in Wisconsin. The invertebrate SGCN and SINS lists can be found respectively in tables 3.5.1 and 3.5.5, which are located at the end of the invertebrate report section. Tables 3.5.2 to 3.5.4 summarize the state of knowledge for invertebrates as the basis for assessing SGCN or SINS status.

Below is a summary table followed by descriptive paragraphs of the native invertebrate species reviewed and number of SGCNs and SINs by group. To facilitate consideration of invertebrates in planning for all SGCN and their habitats, we split aquatic and terrestrial species from the same orders into different report sections as indicated below.

Invertebrate Group and Report Section		SGCN	SINS	Total Species Reviewed
Aquatic and semi-aquatic Insects	3.5.1.1. Aquatic Beetles	51	28	220
	3.5.1.2 Aquatic (True) Bugs	5	8	35
	3.5.1.3 Aquatic Flies	1	3	5
	3.5.1.4. Caddisflies	7	25	40
	3.5.1.5. Dragonflies - Damselflies	28	11	162
	3.5.1.6. Mayflies	18	13	78
	3.5.1.7. Springtail*	0	3	3
	3.5.1.8. Stoneflies	4	7	20
Freshwater Mussels	3.5.1.9. Mussels - Clams	24	0	50
Terrestrial Insects	3.5.1.10. Bees - Wasps - Ants	11	95	118
	3.5.1.11. Butterflies - Moths	34	57	195
	3.5.1.12. Grasshoppers - Allies	29	11	51
	3.5.1.13. Terrestrial Beetles	27	20	80
	3.5.1.14. Terrestrial (Leafhopper) Bugs	25	5	48
Other Invertebrates	3.5.1.15. Crustacea	1	13	22
	3.5.1.16. Snails	21	24	122
	3.5.1.16. Spiders	0	9	9
Total Number		286	332	1258

3.5.1.1 Aquatic and Semi-Aquatic Beetles

Aquatic beetles are insects in the Order Coleoptera. Most species are good swimmers, with the exception of a few species such as the water penny beetle and riffle beetle, and live in a variety of habitats, ranging from ephemeral ponds to lakes. Most species live on the surface of the water in large schools as adults, such as the whirligig beetles, and carry a bubble of air for oxygen and flotation. The larvae are fierce predators. Some of the adults are predacious, while others eat plants and detritus. The larvae and adults are an important food source for fish and wildlife. The adults have wings and can fly, with some species remaining on top of the water and others transitioning to terrestrial habitat. Of the 220 native aquatic beetle species in Wisconsin that were reviewed, 51 are considered SGCNs.

3.5.1.2 Aquatic (True) Bugs

True Bugs are both aquatic and terrestrial species in the Order Hemiptera. Most of these 'Water Bugs' are predators with sucking mouth parts, but a few eat algae. Many are entirely aquatic during their larval and adult lives, but some are semi-aquatic because they spend most of their adult life on the surface of the water (such as waterstriders or water boatmen). They live in a variety of stream and lake habitats. Some prefer good water quality and others can tolerate poor water quality. They are eaten by birds and amphibians and are an especially important food for fish. Of the 35 native aquatic true bugs in Wisconsin that were reviewed, five are considered SGCNs.

3.5.1.3 Aquatic Flies

Aquatic flies are insects in the Order Diptera. In their larval stage, they can be found in many types of stream habitat. However, some Diptera species, such as midges, can be found in lake habitat. They are important in both aquatic and terrestrial food webs. Of the five native aquatic fly species in Wisconsin that were reviewed, one is considered an SGCN.

3.5.1.4 Caddisflies

Caddisflies are in the Order Trichoptera, and are the architects of the aquatic insect world. The larvae construct intricate nets or complex cases out of sticks, leaves, sand and gravel which are held together by 'silk' and are unique to the species. The larvae live approximately one year, then pupate and emerge as mothlike looking adults and live for only one to two weeks, although some species can last as long as two months. They are good indicators of water quality and an important food source for fish. Of the 40 native caddisfly species in Wisconsin that were reviewed, seven are considered SGCNs.

3.5.1.5 Dragonflies and Damselflies

Dragonflies and damselflies are aquatic insects in the Order Odonata. The adults are often noticed for their large compound eyes, their colorful body and wings, and amazing flying abilities of speed and hovering. The larvae or nymphs spend one to five years underwater in lakes, rivers, streams, and wetlands before emerging as a flying adult that lives for only a few days to a month. When they emerge as adults they crawl out of the water and leave their former exoskeleton behind. These 'exuvia' can be found around waterbodies and are an important component of Odonate surveys. Both the young and adults are fierce predators, and are eaten by fish and wildlife. Of the

162 native Odonate species in Wisconsin that were reviewed, 28 are considered SGCNs.

3.5.1.6 Mayflies

Mayflies are aquatic insects in the aptly named Order Ephemeroptera, since their 'ephemeral' lifespan can be couple of hours to only a week after becoming adults. The larvae or nymphs live in a variety of streams, and are good indicators of water quality. The young live one to several years, feeding on algae and detritus and are an important food item for fish. The adults have no mouthparts and are eaten by fish when they emerge or hatch in huge numbers over a very short period of time. The hatches can be large enough to be tracked by radar. This species is often mimicked by 'flies' tied by anglers. Of the 78 native mayfly species in Wisconsin that were reviewed, 18 are considered SGCNs.

3.5.1.7 Springtails

Springtails are terrestrial invertebrates of the Subclass Collembola. Even though they have six legs, they are wingless, have six abdominal sections, and are considered to have diverged very early in the evolution of modern insects. Springtails are associated with damp conditions and organic debris and are found outdoors in soil, leaf litter, lichen, under bark, decaying plant matter, rotting wood, and other areas of high moisture. They are found in many different habitats, feeding on fungi, pollen, algae, or decaying organic matter. They will jump away quickly when disturbed. Of the three native springtail species in Wisconsin that were reviewed, they tend to be found in large numbers on the water surface eating decaying plant matter. None of these are considered SGCNs.

3.5.1.8 Stoneflies

Stoneflies are aquatic insects of the Order Plecoptera that are primarily predators or shredders as larvae or nymphs. They are found in cool, running waters, and some have very specific habitat requirements. Stoneflies are good indicators of very clean water. The immature stages remain in the water from one to four years then emerge into flying adults that typically live only a few weeks. Winter stoneflies are one of the few aquatic species that emerge during cold months. Both young and adults are eaten by fish. Of the 20 native stonefly species in Wisconsin that were reviewed, four are considered SGCNs.

3.5.1.9 Mussels and Clams

Freshwater mussels and clams are aquatic organisms with two shells (valves) that are hinged together. It is the shells that are often noticed on the bottoms of lakes and rivers. They have no head or eyes and move around with a muscular foot, similar to their cousin the snail. They are filter feeders and help filter the water of our lakes, rivers and streams. The native clams are aptly named peaclams or fingernail clams and do not get much bigger than a dime. The native mussels (often called clams) start out small but can get quite large, varying from one-half inch as adults to the size of dinner plates, depending on the species. The shells are noted for the variety of shapes, colors, patterns, and features (such as bumps, ridges, groves) on the outside, and the mother of pearl on the inside, which can also be pink, orange, or purple. They are commonly eaten by wildlife, fish and birds. Of the 50 native mussel and clam species in Wisconsin

that were reviewed, 24 are considered SGCNs and all of them are mussels. Of these species, five are listed as federal and state endangered, six are listed as state endangered and eight are listed as state threatened.

3.5.1.10 Bees, Wasps and Ants

Wasps, ants and bees are terrestrial insects in the Order Hymenoptera, are found in a wide variety of habitats; most occur on flowers or vegetation, but some live on the ground or in debris and many nest in the ground. They exhibit some of the most complex behavior in the insect world by their ability to form social organizations. As adults, most wasps and ants are predators. Bees eat pollen and nectar and feed their young the same. Solitary wasps and bees construct nests of mud or resin attached to limbs and rocks, tunnel in soil or take over abandoned tunnels of wood-boring insects. Social hymenopterans establish their nests in a variety of ways. Social wasps construct nests of paper, made with chewed-up wood and saliva, in sheltered areas on trees and shrubs or human structures. Bumble bees nest in abandoned rodent burrows in the soil, inside rock crevices and other naturally occurring spaces. Some species are valued as controllers of insect pests, while others like bees are considered the most important pollinators of crops, garden and orchards or producers of honey, wax and other products. However, some are also considered house pests when they invade homes in search of food and water. In many hymenopterans the female determines the sex of her offspring by controlling which eggs are fertilized: fertilized eggs develop into females, unfertilized eggs into males. Of the 118 native Hymenoptera species in Wisconsin that were reviewed, 11 are considered SGCNs.

3.5.1.11 Butterflies and Moths

Butterflies and moths are terrestrial insects in the Order Lepidoptera. The larvae, or caterpillars, of most species are phytophagous. The larger caterpillars generally feed at the edge of the leaf and consume all but the large veins; the smaller caterpillars skeletonize the leaf or eat small holes in it. Many caterpillars are leaf miners, feeding inside the leaf and their mines can be linear, trumpet shaped or blotch-like. Butterflies and moths tend to have specific host plants, and many have subtle habitat requirements. For example, the phlox moth only feeds on downy phlox, which occurs in pine/oak barrens and scrub oak habitat as well as prairies and roadsides on sandy soils. Feeding adults are important pollinators of many plants, sometimes in very specialized relationships. In all their life stages, butterflies and moths are important food for wildlife. They are also hosts to specialized parasitoid wasps and flies. As plant parasites and predators caterpillars greatly influence forest health, bird reproduction and nutrient cycling in both terrestrial and aquatic systems. Some species overwinter beneath leaf litter or matted grasses and maybe sensitive to fire or other management practices. Of the 195 native Lepidoptera species in Wisconsin that were reviewed, 35 are considered SGCNs. Of these species, two are listed as federal endangered, one is listed as federal and state endangered, five are listed as state endangered and one is listed as state threatened.

3.5.1.12 Grasshoppers and Allies

Grasshoppers, crickets and katydids are terrestrial insects in the Order Orthoptera. They all have chewing mouth parts and most are herbivores and can be winged or wingless. They are generally associated with grasslands, but also occur in wetlands, marshes and

forests. Adults of most species can be found in late summer. Orthopterans, usually males, produce sound by stridulation rubbing the bases of the wings together or rubbing the hindlegs against the wing edges. These calls are of critical importance for locating mates and establishing territories. The volume and pitch are unique to each species. Grasshoppers and katydids tend to be very cryptic to avoid predators blending into their surroundings or resembling plants, leaves, sticks, stones, gravel or sand. However, some sport bold markings to warn predators of their distastefulness. Orthopterans develop by gradual metamorphosis and undergo six to ten molts before reaching maturity. They can be destructive to agriculture crops but are an important food source for wildlife. Of the 51 native Orthoptera species in Wisconsin that were reviewed, 29 are considered SGCNs. Of these species, one is listed as state endangered.

3.5.1.13 Terrestrial Beetles

Terrestrial beetles are insects found in almost every type of terrestrial habitat that is inhabited by insects; ranging from vegetation to dung to the carcasses of other animals. They feed on all sorts of plant and animal materials. Many are phytophagous, predaceous or faunivorous, some are scavengers and very few are parasitic. Many are considered serious pests of crops and managed forests, while many other species are considered beneficial. Some are used for biological control agents; like European leaf beetles used to control non-native Purple Loosestrife. Some have very specialized habitat requirements, for example *Cicindela hirticollis rhodensis* restricted to beach dunes of the Great Lakes. Some of the flower-visiting beetles can be important pollinators. Terrestrial beetles tend to be the most diverse in old growth forests, given the decaying log/fungal communities. The larvae and adults are an important food source for wildlife. The adults have wings and can fly. Of the 80 native terrestrial beetle species in Wisconsin that were reviewed, 27 are considered SGCNs. Of these species, two are listed as state endangered.

3.5.1.14 Terrestrial (Leafhopper) Bugs

Leafhoppers are terrestrial insects in the Order Hemiptera and are generally associated with grasslands but can be found in nearly every habitat with vascular plants. Some species are prairie-dependent and are more host specific than others, like the Prairie Leafhopper which only feeds on prairie dropseed in remnant high quality prairies. Leafhoppers are plant feeders, with a piercing mouthpart, feeding on the plant sap. Most adults are fully winged and strong fliers, while others are strong jumpers. Leafhoppers coat their bodies and wings with a light dusting of water-repellent waxy material (brochosomes), sometimes distributed unevenly as bilaterally asymmetric whitish streaks. In general, female inserts several eggs into living tissue of host plant; eggs either remain dormant for a period ranging from a month to over a year, or develop and hatch within a few weeks; nymphs undergo five molts, reaching adult stage in several weeks or months. Some species overwinter as adults beneath leaf litter or matted grasses and maybe sensitive to fire. Several species are serious crop pests; some transmit plant pathogens (viruses, mycoplasma-like organisms, etc.) Of the 48 native Hemiptera species in Wisconsin that were reviewed, 25 are considered SGCNs. Of these species, two are listed as state endangered and two are listed as state threatened.

3.5.1.15 Crustacea

Crayfish are invertebrates in the Order Decapoda and are found in diverse habitats. Crayfish typically burrow into the soil and can be found far from surface water. Of the 22 native crayfish species in Wisconsin that were reviewed, 1 is considered an SGCN.

3.5.1.16 Snails

Snails are invertebrates in the Class Gastropoda and are found in both aquatic and terrestrial habitats. Snails and slugs are closely related, but slugs lack a hard outer shell. Snails can adapt to a wide range of habitats and come in a wide variety of sizes and shapes. Of the 122 native snail species in Wisconsin that were reviewed, 21 are considered SGCNs and all are terrestrial species. Of these species, one is listed as state endangered and two are listed as state threatened.

3.5.1.17 Spiders

Spiders are terrestrial arthropods and are predaceous and feed mainly on insects or usually whatever prey they encounter. Some spiders, like the fishing spider may occasionally feed on small vertebrates. Others are specialists, attacking only certain kinds of arthropods or even other spiders. They are mostly found in terrestrial ecosystems and play a pivotal role in the regulation of insect populations. Spiders use silk for capturing prey and a variety of other purposes, including constructing shelters and protecting eggs. Some spiders do not capture their prey in webs; instead they wait and ambush using venom to subdue their prey. Spiders are also prey for other animals, particularly wasps. Some unique characters that define spiders include cheliceral venom glands, abdominal spinnerets and modification of the male pedipalps into sperm transfer organs. Of the 9 native spider species in Wisconsin that were reviewed, none are considered SGCNs.

3.5.2 SGCN–NC and SGCN–EL Association Scores

SGCN-NC and SGCN-EL scores were in many cases assigned to whole genera or families rather than species because of the limitations in associating species with microhabitat needs to larger scale natural communities or simply because so little is known about their habitat. For that reason, unlike the other SGCN groups, only the sums of moderate and high scores are provided instead of the species raw data tables.

The association between aquatic and invertebrate SGCN and each natural community type is summarized in Figures 3.6.1 to 3.6.4. These figures take all aquatic or invertebrate SGCNs with an association of moderate (score = 2) and high (score = 3) for a given community type and then sum all the "2's" and "3's". Each bar in the graph represents that sum for the stated natural community. If invertebrate SGCN have only a low or no association with a community type, the community is not listed. Higher scores indicate higher overall association of invertebrate SGCN with that community type. The definitions for each level of association are provided below.

Key to SGCN-NC Association Score

Level of Association	Description
High	This natural community (currently and/or historically) contains essential biological, physical and ecological habitat elements for the species, which must be present in quality and quantity to sustain the species; conservation actions implemented in this natural community may result in significant improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Moderate	This natural community (currently and/or historically) contains some, but not all biological, physical and ecological habitat elements that support or help to support this species; species may sustain itself with reduced quantity or quality of this natural community; conservation actions implemented in this natural community may result in moderate improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Low	Species is (and/or historically was) minimally associated with the biological, physical and ecological characteristics of this natural community; conservation actions implemented in this natural community may result in minimal improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
None	Species does not (and did not historically) or is highly unlikely to use this Natural Community.

The association between aquatic and terrestrial invertebrate SGCN and the sixteen ecological landscapes is provided in Figures 3.6.5 to 3.6.8. These figures take all aquatic or terrestrial SGCN with an association of moderate and high for a given ecological landscape and then sums all the 2's" and "3's". Each bar in the graph represents that sum for the stated landscape. If invertebrate SGCN have only a low or no association with a landscape, it is not listed. Higher scores indicate higher overall association of invertebrate SGCN with that ecological landscape.

One can see a marked contrast with the SGCN-EL scores versus the SGCN-NC scores in that many aquatic invertebrate SGCN demonstrate relatively wide association across landscapes. This is in part because the boundaries of the ecological landscapes tend more toward "terrestrial" characteristics and simply because warm and cold water habitats are well distributed throughout the state. While freshwater mussels are found in lake systems, all of the mussel SGCNs are associated strongest with warmwater rivers and streams. Many terrestrial snail SGCNs are highly associated with moist-wooded cliffs, which are more numerous in the Niagara Escarpment and the Western Coulee and Ridges Ecological Landscape. Many of the terrestrial insect SGCNs are highly associated with barrens and grasslands systems. The definitions for each level of association are provided below.

Key to SGCN-EL Association Scores

Level of Association	Description
High	Estimated as "majority", "critical", or likely to be ">50%" for current and historical characteristics that measure use or presence at a large scale: area of occupancy, state population size, and/or range extent of the species or its habitat; as a result, conservation actions implemented in this Ecological Landscape may result in significant improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Moderate	Estimated as "many", "important", or likely to be "≤50%" association with the EL for current and historical characteristics that measure use or presence at a large scale: area of occupancy, state population size, and/or range extent of the species or its habitat; as a result, conservation actions implemented in this Ecological Landscape may result in moderate improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
Low	Estimated as "minimal", "infrequent" or "occasional" association with the Ecological Landscape for current and historical characteristics that can be estimated at a large scale: area of occupancy and/or range extent of the species or its habitat; species is present; as a result, conservation actions implemented in this Ecological Landscape may result in some improvement in the factors used to identify SGCN (e.g., rarity, trend and threat factors used in S/G Ranks).
None	Species does not (and did not historically) or is highly unlikely to use or be present in this Ecological Landscape.

These associations are estimates based on expert and professional knowledge, and like the SGCN list itself, new information and changes in our environment are good reasons to reassess these scores periodically. Warm water habitats, and in particular those associated with major river systems are present throughout the state. However, they demonstrate considerable variation in habitat characteristics and therefore, conservation opportunity. The habitat needs of aquatic species in terms of vegetation, water flow, depth and quality vary on a scale that is not well-captured at the scale association scores are assigned. Nevertheless, they help us make decisions about matching conservation actions that are linked to invertebrate SGCN to the most appropriate species and natural community targets in an area. For aquatic species in particular, the scores are best considered together with the NC-EL opportunity scores presented in Section 4 and also in the context of surrounding land use that affects water quality.

3.5.3 Invertebrate SINS and Other Invertebrate Species that are not SGCN

As is evident from the state of our knowledge Tables 3.5.2 to 3.5.4, there are many groups for which we cannot even compile a Wisconsin species list much less describe which species are of conservation need. In addition, the lack of information has fostered extensive public misunderstanding regarding many invertebrate species. Wisconsin is not alone, most invertebrate groups have not been studied or catalogued and basic lists of species are lacking for most taxa for most states.

There are several taxa for which basic taxonomic and life history information remains lacking. These groups have two or three minus [-] signs in Tables 3.5.2 to 3.5.4 indicating little progress has been made in answering the three basic conservation questions. Biologists know a fair amount about the biology and distribution of some other groups (e.g., sponges, leeches), but current status and survey information remains inadequate for determining Species of Greatest Conservation Need. Some taxa include mostly exotic, accidental, or migrant species. For example, most terrestrial earthworms are known to be introduced exotic species. Relatively little, however, is known about the native earthworms and some of these may be of conservation concern. Sufficient information to assess the status of these organisms in Wisconsin is simply just not available, as more is known about the exotics than the native species. Similarly, while a fair number of parasitologists have worked on the Wisconsin fauna, most parasitic taxa (e.g., flatworms, horsehair worms) remain poorly understood. It is possible that conservation of vertebrate hosts will contribute to the conservation of their parasites. As a result of these uncertainties, invertebrate species within these groups were not evaluated to determine if any could be considered Species of Greatest Conservation Need.

(*) = The question can be answered completely or almost completely (e.g., for question 1, a checklist is available or could be compiled relatively easily to indicate what species occur in Wisconsin).
(+) = A partial, but by no means complete, answer is available (e.g., for question 2, scientists have a general sense of the species distributions in Wisconsin).
(-) = Little or no progress has been made in obtaining an answer to the question (e.g., relatively little attention has been paid to the Wisconsin fauna).

Invertebrate taxa not reviewed for SGCN status and classified as Species with Information Needs due to lack of information are identified in gray. Species for which only certain families or species groups were reviewed for SGCN status will have split symbols. For example, Wisconsin has a species list and key for terrestrial snails and there have been recent statewide survey efforts to determine distribution. There has not been a similar effort with aquatic snails, so the group has two symbols in the table, "*/-" to indicate that our knowledge is complete or almost complete for a portion of the group and little is known for the other portion. For mussels and clams the situation is similar. We have good information on species and distribution for mussels, but not for peaclams.

Our state of knowledge for many invertebrate groups is incomplete. For some groups, we cannot even make a species list for the state. For most others we lack distribution information. Species keys and citizen science efforts continue to fill these gaps.

3.5.4 Issues and Conservation Actions Common to Most Invertebrate Taxa

3.5.4.1 Information Needs Applicable to All Invertebrates

Issue. Lack of Information – 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 Action. Research Needed. Actions that can be taken to address the lack of information in these areas include:

- 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.

Issue. 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:

- 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.

3.5.4.2 Issues and Conservation Actions – Aquatic Invertebrates

This section summarizes threats and conservation actions that are generally common to all or most aquatic invertebrate taxonomic 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). 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 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:

The most commonly cited issues that affect many or most aquatic invertebrates are:

- 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:

The most commonly cited or important areas of conservation action are:

- 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.

- Local policies and regulations to consider aquatic invertebrate SGCN and their habitat in land use and development decisions in and around aquatic natural communities.

- Voluntary best management practices to protect microhabitats and water quality.

- Compliance with water quality laws and standards.

- 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.

- 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.

3.5.4.3 Issues and Conservation Actions Specific to One or a Few Aquatic Invertebrate Taxa

Mussels

Issue. 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 Actions. 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.

Issue. 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:

- 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*
Simpsonaias ambigua (Salamander Mussel)	*mudpuppy*

Issue. 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:

- 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.

Hines Emerald Dragonfly

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

Conservation action. 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.

3.5.4.4 Issues and Conservation Actions – Terrestrial Invertebrates

This section summarizes threats and conservation actions identified in the Actions Database that are generally 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.

Issue. 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:

- 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.

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

- 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.

Issues. Airborne pollutants in the form of herbicides and pesticides and problematic species that cause disease are potential threats to pollinator species. These threats are also compounded by agricultural and rural residential development that result in the loss of host and nectar plants and other forage plants for terrestrial insects.

Conservation Actions:

- 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).

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

- 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.

3.5.4.5 Issues and Conservation Actions Specific to One or a Few Terrestrial Invertebrate Taxa

Species-Specific Information that is Lacking

Issue. Even for terrestrial invertebrate SGCN, lack of information is one of the most frequently cited challenges. Many of these are specific to a particular species or location. Although the actions are presented in the form of surveys or monitoring, they are intended to provide information for subsequent habitat preservation, restoration and management actions.

Conservation 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.

Terrestrial Snails

Issue. Development of all types 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:

- 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.

3.5.5.6 Aquatic and Terrestrial Invertebrate Data Sources and References

The following references were used in the evaluation and assessment of invertebrate species of greatest conservation need status as well as the specific issues, challenges and conservation actions presented in this section. It is impossible however, to document all the references used by the many people providing technical input to the WWAP revision. Conversely, there are many gaps in the published literature—funding or people to cover all important areas of research, inventory or monitoring is always limited. Some information about rare species locations is confidential[2] or comes to us through informal technical reports or memos. For these various reasons, we also relied on expert and professional observations and unpublished data.

The WWAP Invertebrate Species Team consulted the Natural Heritage Inventory Database (BIOTICS) as a primary source of information on invertebrates for which occurrence data has been collected and compiled previously. The Invertebrate Species Team also relied heavily on consultation with the experts who previously contributed information to BIOTICS and an extensive review of literature related to the various invertebrate taxa occurring in Wisconsin.

[2] Information related to the Natural Heritage Inventory database, which shows the name and/or specific location of rare species is confidential, but may be shared through agreements or permissions with the WDNR-NHI program. Information at a county level or higher is publicly available. http://dnr.wi.gov/topic/nhi/ (Search Terms: Wisconsin Natural Heritage Inventory)

Besides BIOTICS, other important sources used for this effort included the Wisconsin Invertebrate Database, a special database maintained by the Natural Heritage Inventory program. The Wisconsin Invertebrate Database includes the "Biomonitoring Database" maintained by Jeff Dimick, University of Wisconsin-Stevens Point under contract with WDNR for assessment of wadeable streams (Lillie et al. 2003). The Wisconsin Invertebrate Database uses the same general database structure, but also includes aquatic invertebrate species occurrence data from:

- biotic inventories conducted by Natural Heritage Inventory staff on WDNR's larger properties as part of property master planning efforts,
- mayfly and dragonfly status surveys, including those for Hine's emerald dragonfly, stream dragonflies, and mayflies under review for federal listing, and the U.S. Forest Service's "Sensitive Species" in Wisconsin,
- WDNR's ongoing Odonate Atlas Project,
- WDNR's ongoing Mussel Atlas Project,
- inventory work completed as part of the WDNR's Bureau of Endangered Resources' Peatlands Project,
- Environmental Review assessments and monitoring conducted for projects
- peer reviewed literature,
- reliable reports from unpublished "gray" literature,
- museum log data

Currently, the Wisconsin Invertebrate Database documents around 25,000 collection efforts in aquatic or wetland habitats with about 286,000 invertebrate species occurrence records representing approximately 4,000 different taxa. The Wisconsin Invertebrate Database serves as the main data-handling tool for all aquatic macroinvertebrate species and some terrestrial invertebrates addressed by the Natural Heritage Inventory. The Natural Heritage Inventory rare species database coverage of macroinvertebrates is largely derived by periodically querying the Wisconsin Invertebrate Database.

The grassland insect study lead by WDNR biologist Rich Henderson from 1992 to 2004 was consulted. The study documented well over 2,000 site visits on approximately 370 sites yielding about 1,900 taxa and nearly 30,000 specimens.

The Invertebrate Species Team also consulted several on-line databases maintained by the Milwaukee Public Museum. The Wisconsin Crustaceans Homepage (Milwaukee Public Museum 2015a) is based on Milwaukee Public Museum crustacean collections and research. The internet web site (http://www.mpm.edu/collect/invert/jass/Default.asp) primarily focuses on crayfish, with images and data from the book The Crayfishes and Shrimp of Wisconsin (Hobbs and Jass 1998), and includes data on fairy shrimp, amphipods, and isopods, as well as other crustaceans. Similarly, the Milwaukee Public Museum's Mathiak Collection of Freshwater Mussels of Wisconsin (Milwaukee Public Museum 2015b) contains significant holdings from Wisconsin. The Milwaukee Public Museum Mollusk Collection web site offers a searchable, composite database of this collection. It can be accessed at http://www.mpm.edu/collect/invert/mussels/default.asp. The Wisconsin Mussel Atlas

includes Mathiak's data as well as other survey data for mussels and provides species lists summarized by stream throughout the state(http://wiatri.net/inventory/mussels/). The Wisconsin Odonate Atlas includes data on the distribution of damselflies and dragonflies in Wisconsin (http://wiatri.net/inventory/Odonata/). Both the Mussel Monitoring and Odonate Monitoring Atlas projects are part of the Aquatic and Terrestrial Inventory maintained by the WDNR (http://wiatri.net/).

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Figure 3.5.1 Sum of All Aquatic Insect SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type

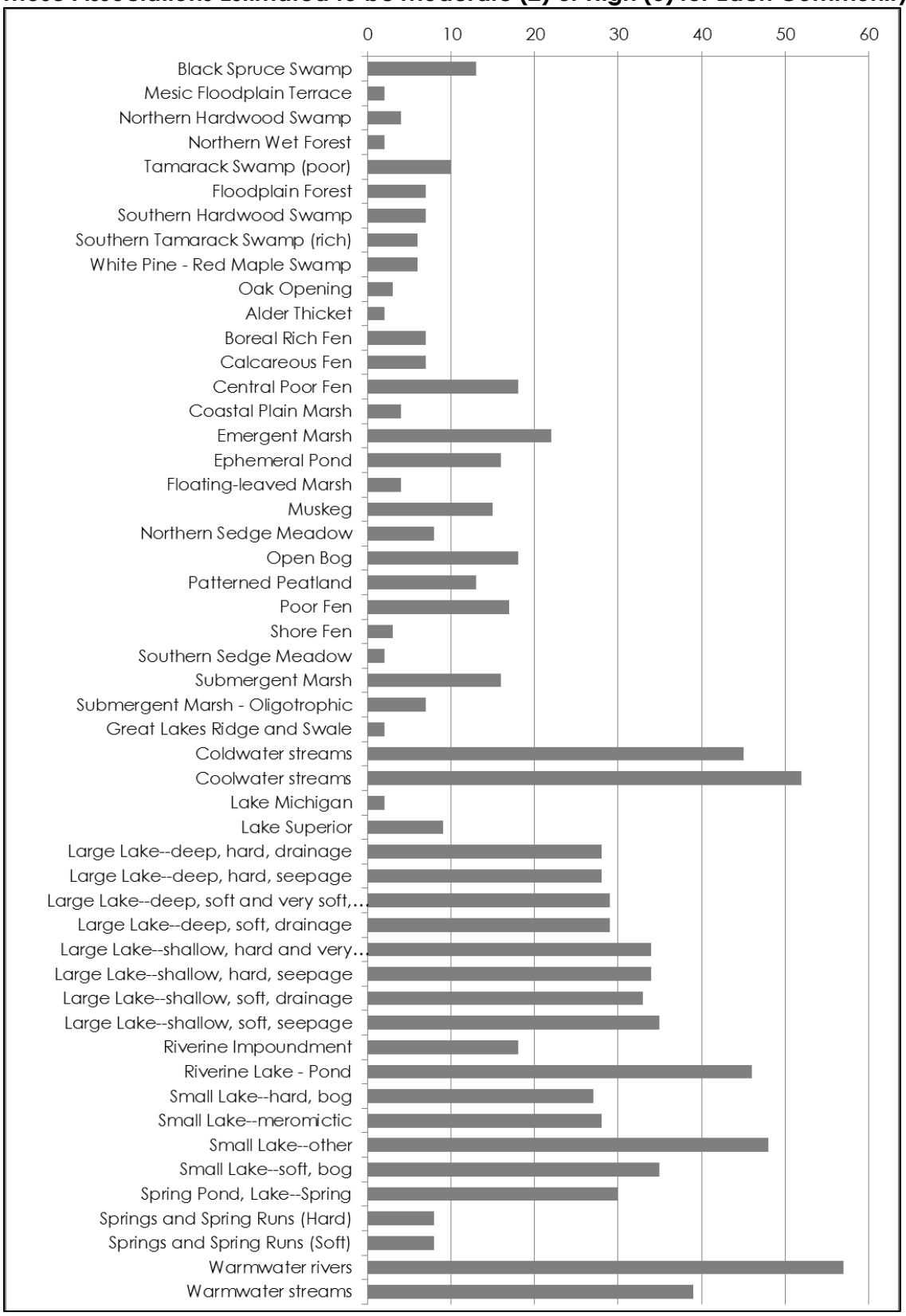

Figure 3.5.2 Sum of All Terrestrial Insect SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type

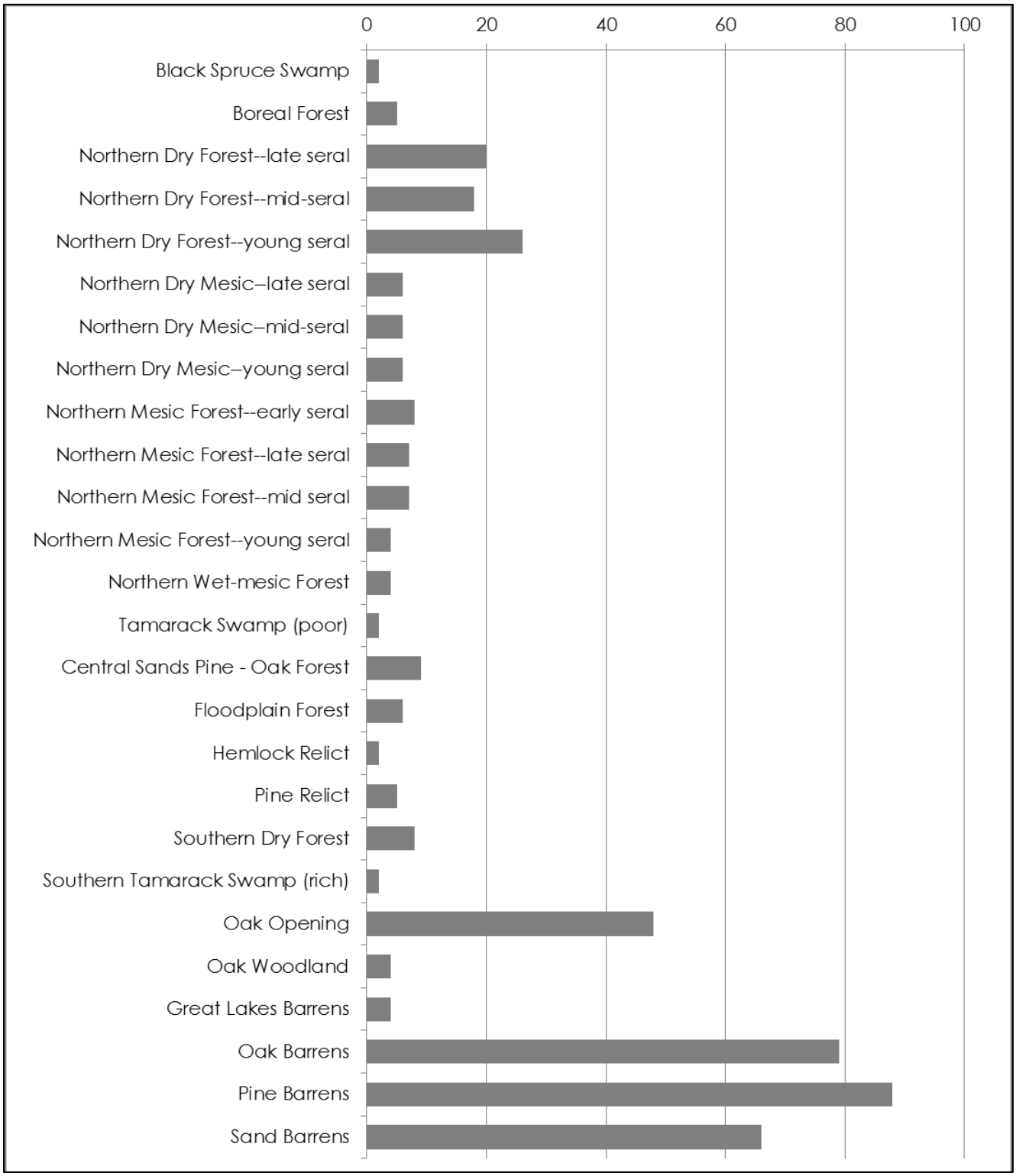

Figure 3.5.2 (continued) Sum of All Terrestrial Insect SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type

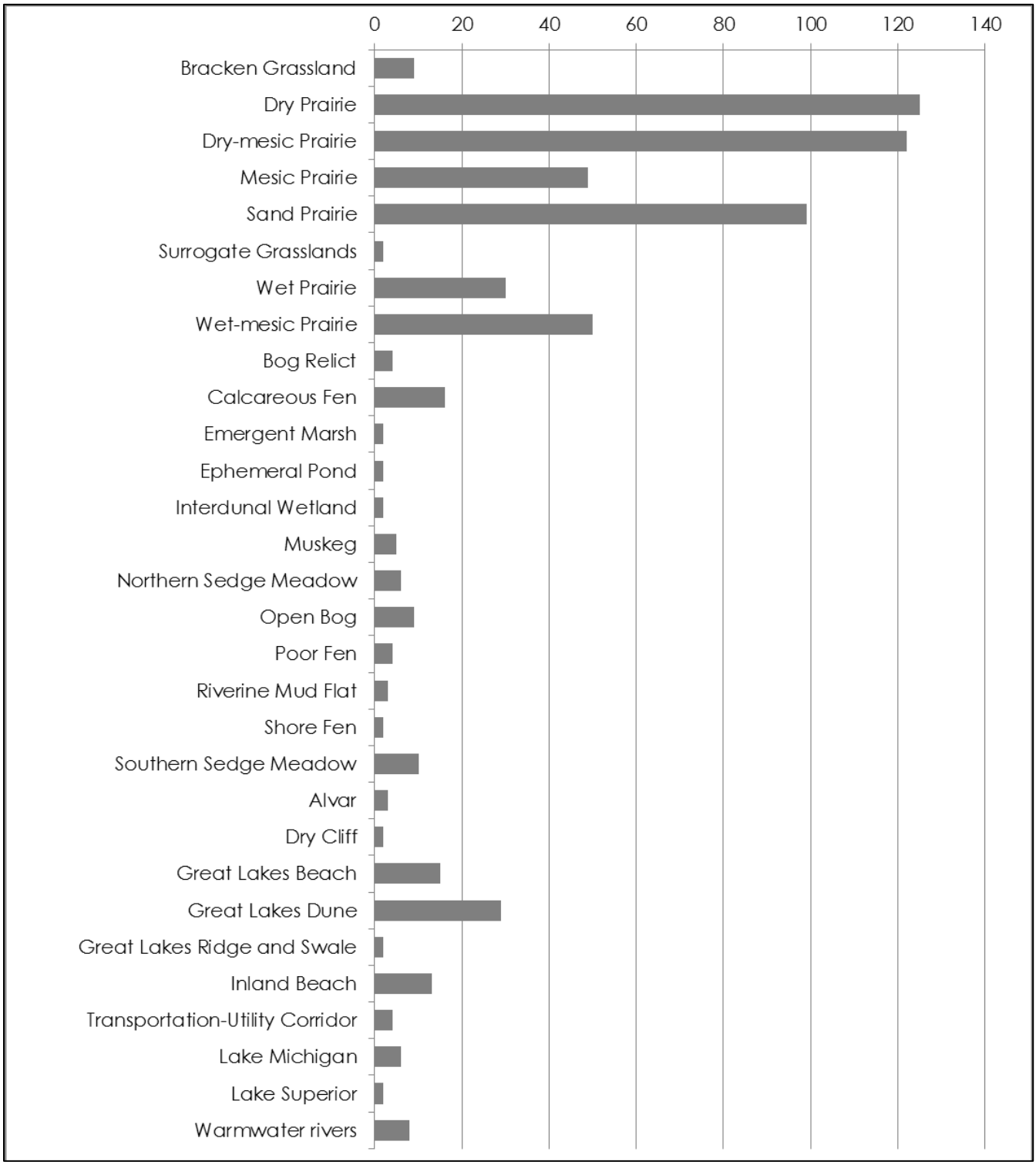

Figure 3.5.3 Sum of All Mussel SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type

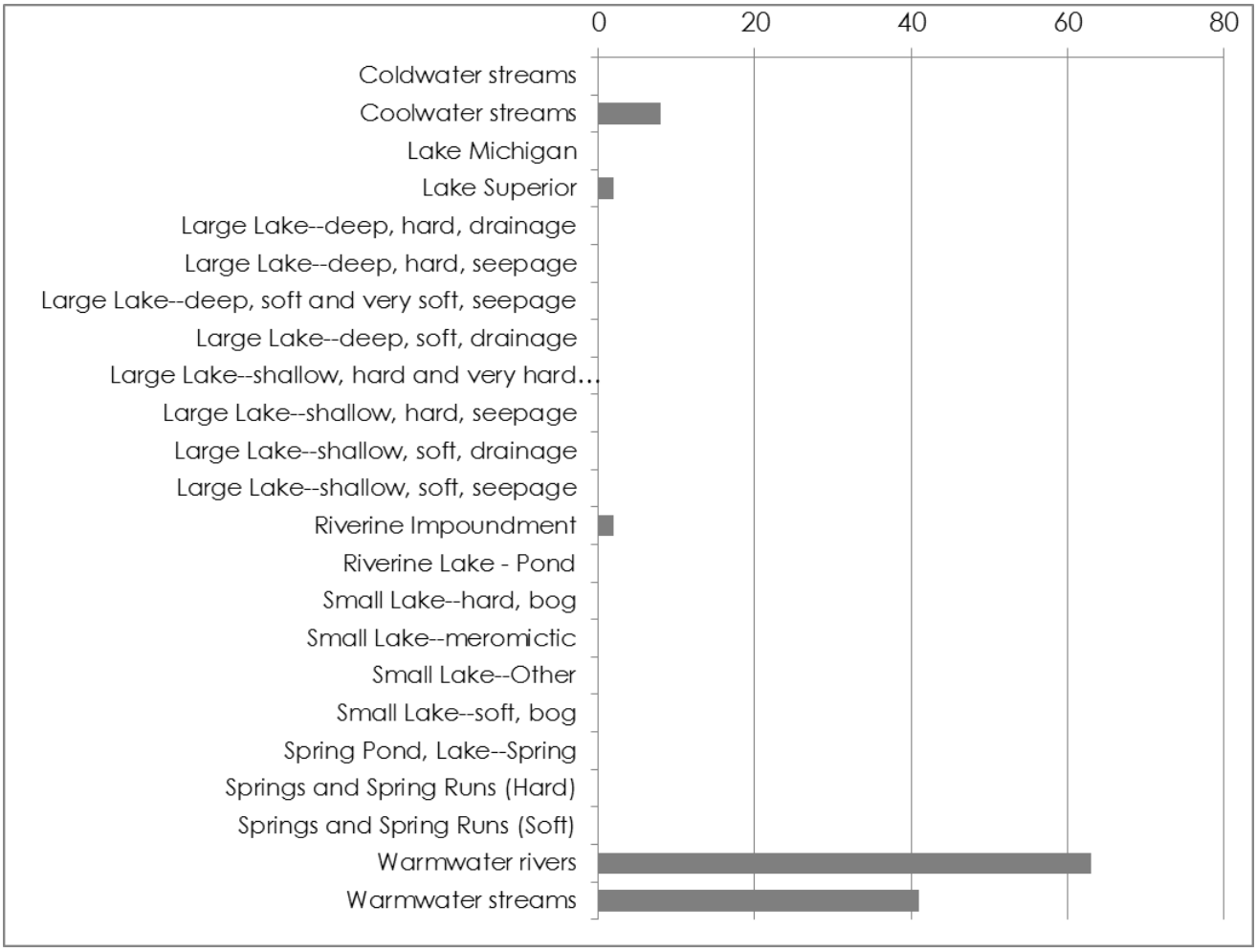

Figure 3.5.4 Sum of All Terrestrial Snail SGCN-Natural Community Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Community Type

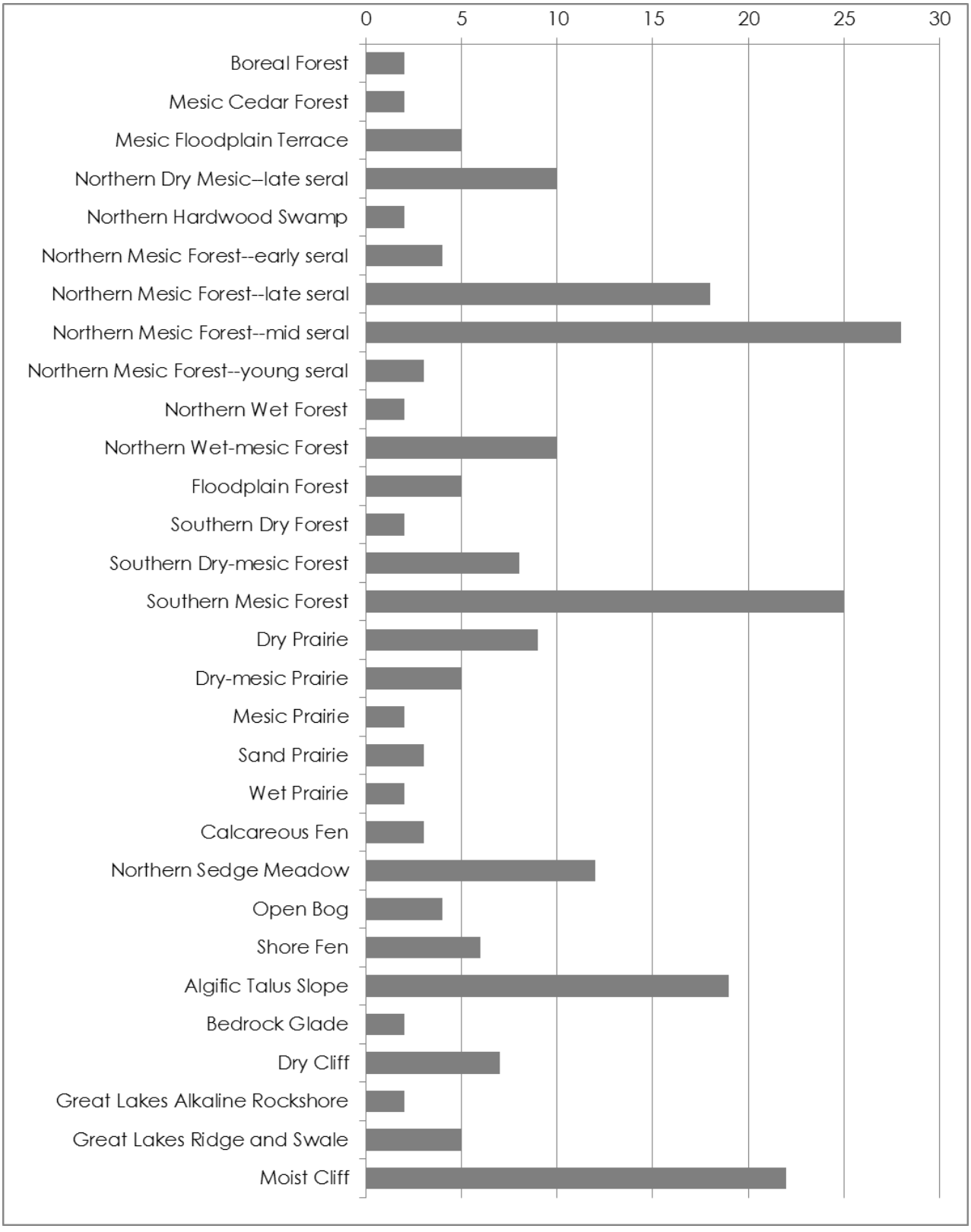

Figure 3.5.5 Sum of All Aquatic Insect SGCN-Ecological Landscape Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Ecological Landscape

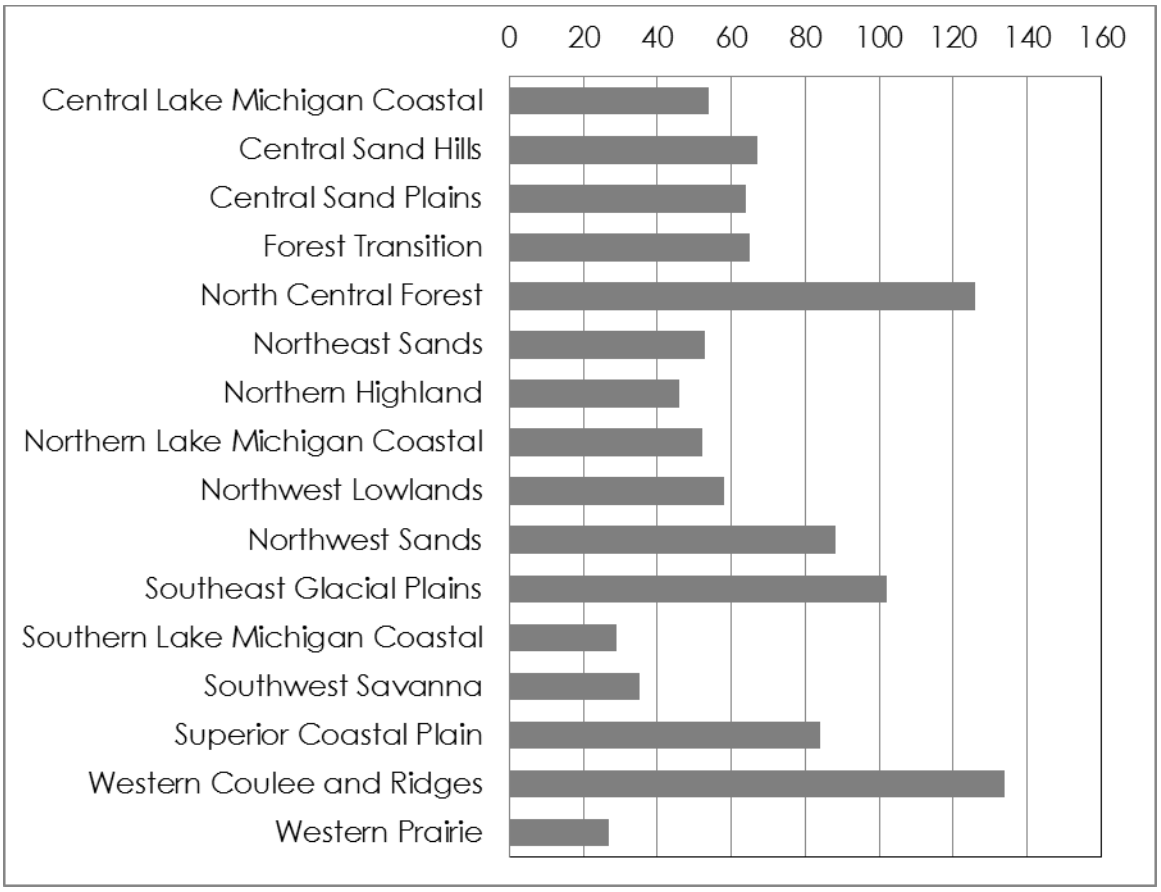

Figure 3.5.6 Sum of All Terrestrial Insect SGCN-Ecological Landscape Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Ecological Landscape

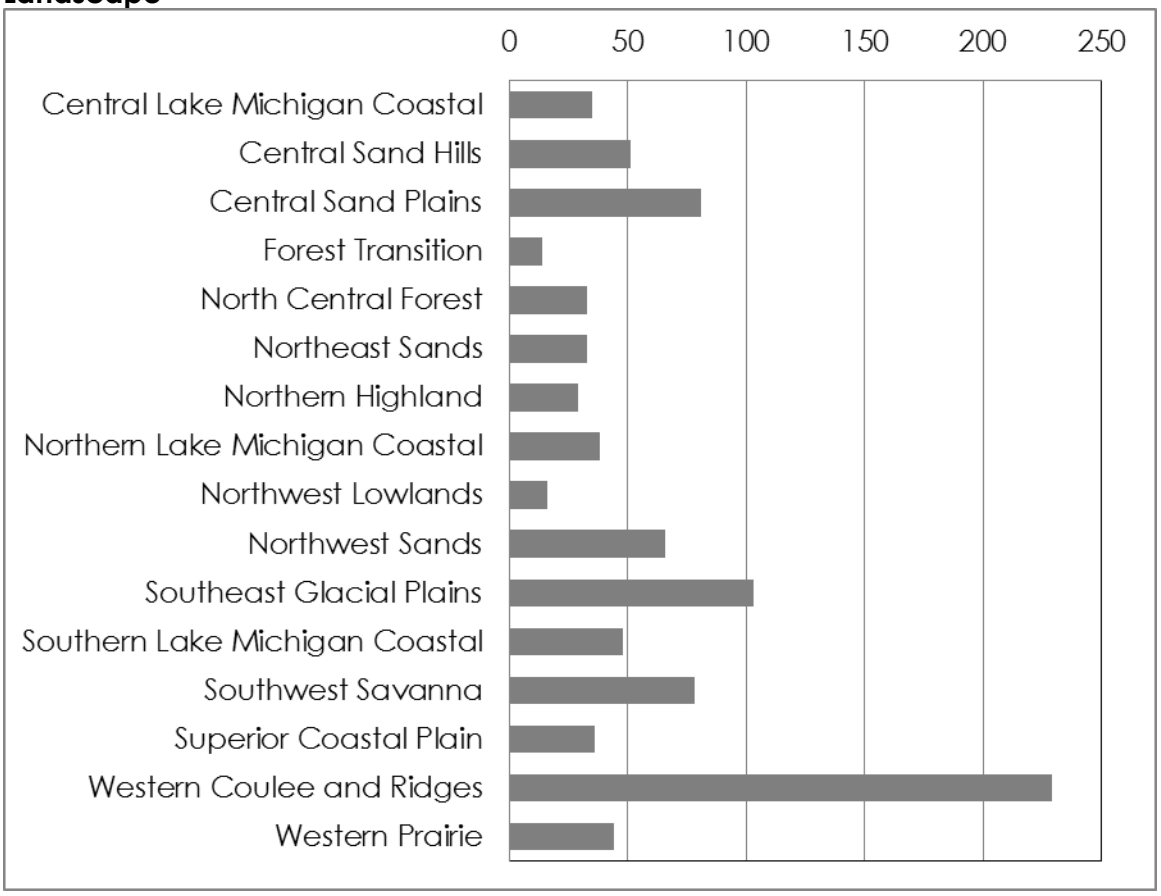

Figure 3.5.7 Sum of All Mussel SGCN-Ecological Landscape Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Ecological Landscape

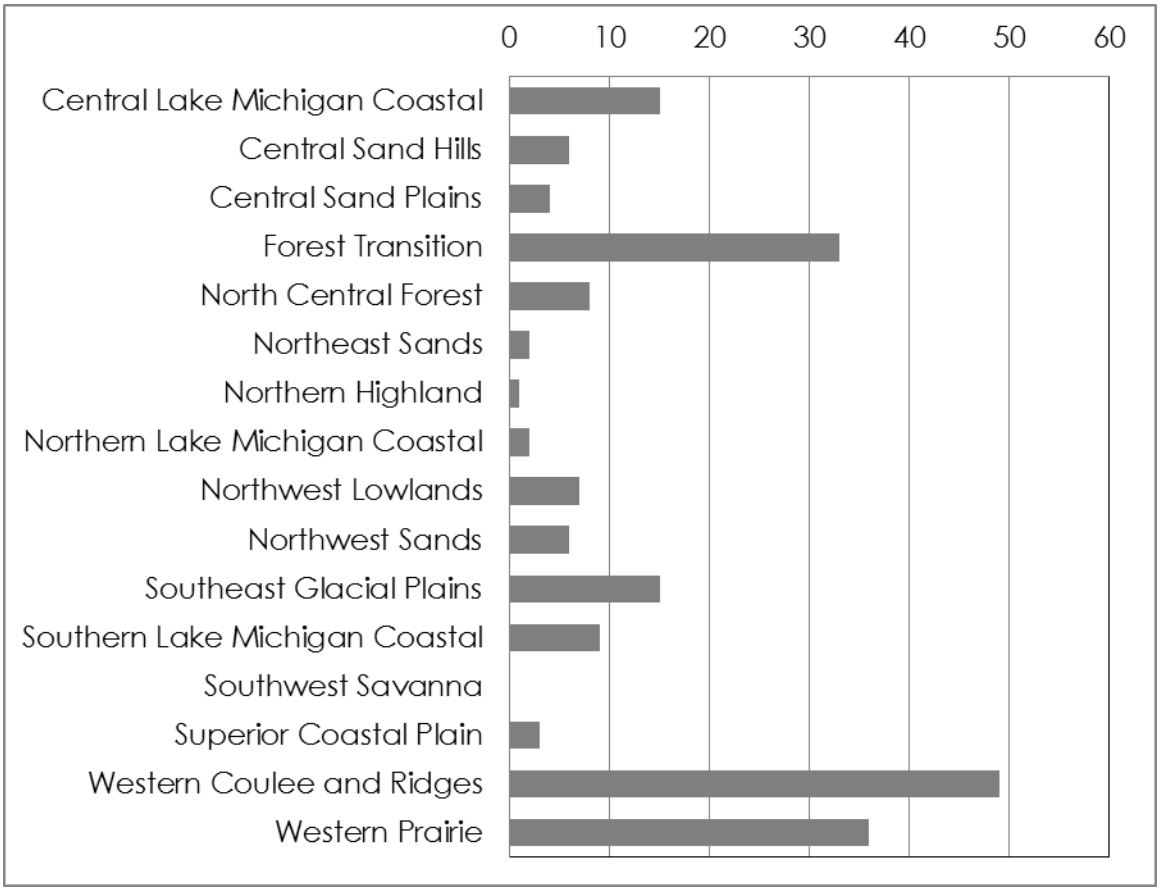

Figure 3.5.8 Sum of All Snail SGCN-Ecological Landscape Association Scores for Those Associations Estimated to be Moderate (2) or High (3) for Each Ecological Landscape

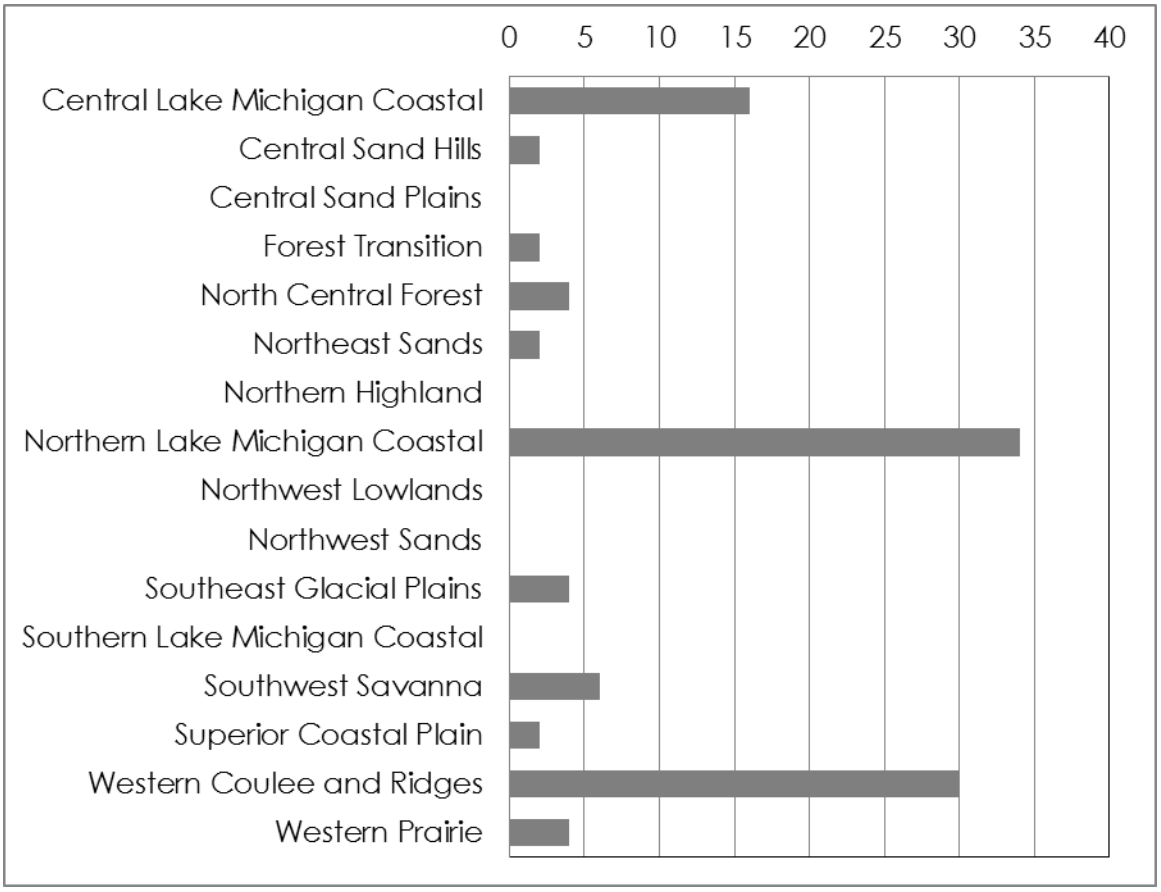

Table 3.5.1 Invertebrate Species of Greatest Conservation Need

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Aquatic Beetles						
Agabetes acuductus	A Water Scavenger Beetle			GNR	S3	
Agabus aeruginosus	A Predaceous Diving Beetle			GNR	S1S2	
Agabus discolor	A Predaceous Diving Beetle			GNR	S3	
Agabus immaturus	A Predaceous Diving Beetle			GNR	S1S2	
Agabus leptapsis	A Predaceous Diving Beetle			GNR	S2S3	
Colymbetes exaratus	A Predaceous Diving Beetle				S3	Y
Copelatus chevrolati	A Predaceous Diving Beetle			GNR	S1S2	
Cybister fimbriolatus	A Predaceous Diving Beetle				S3	Y
Cymbiodyta toddi	A Water Scavenger Beetle			GNR	S2S3	
Dubiraphia robusta	Robust Dubiraphian Riffle Beetle			G1G3	S2S3	
Dytiscus alaskanus	A Predaceous Diving Beetle			GNR	S1S2	
Haliplus apostolicus	A Crawling Water Beetle			GNR	S2S3	
Helophorus latipenis	A Water Scavenger Beetle			GNR	S1S2	
Helophorus orchymonti	A Water Scavenger Beetle			GNR	S2S3	
Heterosternuta pulchra	A Hydroporus Diving Beetle			GNR	S2S3	
Heterosternuta wickhami	A Hydroporus Diving Beetle			GNR	S2S3	
Hydraena angulicollis	A Minute Moss Beetle			GNR	S2S3	
Hydrocanthus iricolor	A Burrowing Water Beetle			GNR	S1	
Hydrochara leechi	A Water Scavenger Beetle			GNR	S1	
Hydrocolus persimilis	A Predaceous Diving Beetle			GNR	S2	
Hydrocolus rubyae	A Predaceous Diving Beetle			GNR	S2	
Hydroporus morio	A Predaceous Diving Beetle			GNR	S2	
Hygrotus compar	A Predaceous Diving Beetle			GNR	S3	
Hygrotus falli	A Predaceous Diving Beetle			GNR	S1S2	
Hygrotus farctus	A Predaceous Diving Beetle			GNR	S2S3	
Hygrotus marklini	A Predaceous Diving Beetle			GNR	S2	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Hygrotus sylvanus	Sylvan Hygrotus Diving Beetle			GU	S1S2	
Ilybius angustior	A Predaceous Diving Beetle			GNR	S2S3	
Ilybius confusus	A Predaceous Diving Beetle				S2S3	
Ilybius gagates	A Predaceous Diving Beetle			GNR	S1S2	
Ilybius opacus	A Predaceous Diving Beetle				S1S2	Y
Ilybius subaeneus	A Predaceous Diving Beetle			GNR	S1S2	
Laccophilus undatus	A Predaceous Diving Beetle			GNR	S2	
Laccornis deltoides	A Predaceous Diving Beetle			GNR	S2	
Liodessus cantralli	Cantrall's Bog Beetle			GNR	S2S3	
Liodessus obscurellus	A Predaceous Diving Beetle				S2	Y
Lioporeus triangularis	A Predaceous Diving Beetle			GNR	S1S2	
Matus ovatus	A Predaceous Diving Beetle			GNR	S1S2	
Neoporus hybridus	A Predaceous Diving Beetle			GNR	S1S2	
Ochthebius lineatus	A Minute Moss Beetle			GNR	S2S3	
Oreodytes scitulus	A Predaceous Diving Beetle			GNR	S1S2	
Platambus confusus	A Predaceous Diving Beetle			GNR	S1S2	
Rhantus sericans	A Predaceous Diving Beetle			GNR	S1S2	
Stenelmis antennalis	A Riffle Beetle			GNR	S2S3	
Stenelmis douglasensis	Douglas Stenelmis Riffle Beetle			G1G3	S1S2	
Stenelmis fuscata	A Riffle Beetle			GNR	S2S3	
Stenelmis knobeli	Knobel's Riffle Beetle	END		G1G3	S1S2	
Stenelmis musgravei	A Riffle Beetle			GNR	S2S3	
Stenelmis quadrimaculata	A Riffle Beetle			GNR	S2	
Stenelmis sexlineata	A Riffle Beetle			GNR	S1	
Thermonectus basilaris	A Predaceous Diving Beetle			GNR	S2S3	
Aquatic Bugs						
Dasycorixa hybrida	A Water Boatman			GNR	S2	
Microvelia albonotata	A Broad-shouldered Water Strider			GNR	S2	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Neogerris hesione	A Water Strider			GNR	S1S2	
Notonecta borealis	A Backswimmer			GNR	S2S3	
Ramphocorixa acuminata	Acuminate Water Boatman			G4	S1S2	
Aquatic Flies						
Pseudodiamesa pertinax	A Non-biting Midge			GNR	S2	
Caddisflies						
Banksiola dossuaria	A Giant Casemaker Caddisfly			G5	S2S3	
Beothukus complicatus	A Phryganeid Caddisfly			G4	S1S2	
Brachycentrus lateralis	A Humpless Casemaker Caddisfly			G5	S1S2	
Lepidostoma vernale	A Lepidostomatid Caddisfly			G5	S1S2	
Psilotreta indecisa	A Caddisfly			G5	S1S2	
Wormaldia moesta	A Fingernet Caddisfly			G5	S2S3	
Wormaldia shawnee	A Fingernet Caddisfly			G4G5	S1S3	Y
Dragonflies and Damselflies						
Aeshna clepsydra	Mottled Darner			G4	S2S3	
Aeshna sitchensis	Zigzag Darner			G5	S1	
Aeshna subarctica	Subarctic Darner			G5	S1S2	
Argia plana	Springwater Dancer			G5	S2S3	
Arigomphus villosipes	Unicorn Clubtail			G5	S2S3	
Cordulegaster diastatops	Delta-spotted Spiketail			G5	S1	
Enallagma basidens	Double-striped Bluet			G5	S2S3	Y
Enallagma clausum	Alkali Bluet			G5	S1	
Epiaeschna heros	Swamp Darner			G5	S2S3	
Gomphus graslinellus	Pronghorn Clubtail			G5	S2S3	Y
Hetaerina titia	Smoky Rubyspot			G5	S1S2	
Ischnura kellicotti	Lilypad Forktail			G5	S1S2	
Libellula cyanea	Spangled Skimmer			G5	S2	
Libellula incesta	Slaty Skimmer			G5	S2S3	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Libellula semifasciata	Painted Skimmer			G5	S1S2	
Macromia taeniolata	Royal River Cruiser			G5	S2S3	
Nehalennia gracilis	Sphagnum Sprite			G5	S2S3	
Ophiogomphus anomalus	Extra-striped Snaketail	END		G4	S2S3	
Ophiogomphus smithi	Sioux (Sand) Snaketail			G2G3	S2	
Ophiogomphus susbehcha	St. Croix Snaketail	END		G2	S2	
Rhionaeschna mutata	Spatterdock Darner	THR		G4	S1	
Somatochlora cingulata	Lake Emerald			G5	S2S3	
Somatochlora ensigera	Plains Emerald			G4	S2S3	
Somatochlora forcipata	Forcipate Emerald			G5	S2S3	
Somatochlora hineana	Hine's Emerald	END	LE	G2G3	S1	
Somatochlora incurvata	Incurvate Emerald	END		G4	S2S3	
Somatochlora tenebrosa	Clamp-tipped Emerald			G5	S1S2	
Williamsonia lintneri	Ringed Boghaunter			G3	S3	
Mayflies						
Acanthametropus pecatonica	Pecatonica River Mayfly	END		G2G4	S1	
Ameletus lineatus	A Mayfly			G5	S2S3	
Cercobrachys fox	Fox Small Square-gilled Mayfly			G3G4	S2S3	
Cercobrachys lilliei	Wisconsin Small Square-gilled Mayfly			G2	S1S2	
Cercobrachys winnebago	Winnebago Small Square-gilled Mayfly			G3G4	S1S2	
Dolania americana	American Sand Burrowing Mayfly			G4	S1S2	
Drunella cornuta	A Spiny Crawler Mayfly			G5	S2S3	
Eurylophella aestiva	A Spiny Crawler Mayfly			G5	S2S3	
Homoeoneuria ammophila	A Brush-legged Mayfly			G4	S2	
Maccaffertium pulchellum	A Flat-headed Mayfly			G5	S2S4	Y
Macdunnoa persimplex	A Flat-headed Mayfly			G4	S1S2	
Metretopus borealis	A Cleft-footed Minnow Mayfly			G5	S1S2	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Neoephemera bicolor	A Large Square-gilled Mayfly			G1G2	S1S2	
Paracloeodes minutus	A Small Minnow Mayfly			G5	S1S2	
Pentagenia vittigera	A Common Burrower Mayfly			G5	S2S3	
Plauditus cestus	A Small Minnow Mayfly			G5	S2S3	
Rhithrogena undulata	A Flat-headed Mayfly			G4Q	S2S3	
Spinadis simplex	A Flat-headed Mayfly	END		G2G4	S1	
Stoneflies						
Attaneuria ruralis	A Common Stonefly			G4	S2S3	
Isogenoides frontalis	A Perlodid Stonefly			G5	S1S2	Y
Isogenoides olivaceus	A Perlodid Stonefly			G3	S2S3	
Zealeuctra narfi	A Rolled-winged Winter Stonefly			G4	S1	
Mussels and Clams						
Alasmidonta marginata	Elktoe			G4	S3	Y
Alasmidonta viridis	Slippershell Mussel	THR		G4G5	S2	
Anodonta suborbiculata	Flat Floater			G5	S2S3	
Arcidens confragosus	Rock Pocketbook	THR		G4	S1S2	
Cumberlandia monodonta	Spectaclecase	END	LE	G3	S1	
Cyclonaias tuberculata	Purple Wartyback	END		G5	S2	
Ellipsaria lineolata	Butterfly	END		G4G5	S2	
Elliptio complanata	Eastern Elliptio			G5	S2S3	Y
Elliptio crassidens	Elephant Ear	END		G5	S1	
Epioblasma triquetra	Snuffbox	END	LE	G3	S1	
Fusconaia ebena	Ebonyshell	END		G4G5	S1	
Lampsilis higginsii	Higgins Eye	END	LE	G1G2	S1	
Lampsilis teres	Yellow & Slough Sandshells	END		G5	S1	
Megalonaias nervosa	Washboard			G5	S3	Y
Plethobasus cyphyus	Sheepnose	END	LE	G3	S1	
Quadrula fragosa	Winged Mapleleaf	END	LE	G1	S1	
Quadrula metanevra	Monkeyface	THR		G4	S2	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Quadrula nodulata	Wartyback	THR		G4	S1S2	
Quadrula quadrula	Mapleleaf			G5	S3	
Simpsonaias ambigua	Salamander Mussel	THR		G3	S2	
Tritogonia verrucosa	Buckhorn	THR		G4G5	S2	
Truncilla donaciformis	Fawnsfoot	THR		G5	S1S2	
Venustaconcha ellipsiformis	Ellipse	THR		G4	S3	
Villosa iris	Rainbow Shell	END		G5Q	S1	
Bees and Wasps						
Antistrophus silphii	Silphium Terminal Gall Wasp				S2S3	Y
Bombus (Psithyrus) insularis	Rusty-patched Bumble Bee			G4G5	S1S2	Y
Bombus (Pyrobombus) perplexus	Confusing Bumble Bee			G5	S1	Y
Bombus (Pyrobombus) sandersoni	Sanderson's Bumble Bee			G4G5	S1S3	Y
Bombus (Thoracobombus) fervidus	Yellow Bumble Bee			G4?	S2	Y
Bombus affinis	Rusty-patched Bumble Bee			G1	S1	Y
Bombus frigidus	Frigid Bumble Bee			G4?	S1S2	Y
Bombus pensylvanicus	American Bumble Bee			G3G4	S1	Y
Bombus terricola	Yellowbanded Bumble Bee			G2G4	S1	Y
Epeolus ainsliei	A Cuckoo Bee				S1	Y
Neolarra vigilans	An Anthophorid Bee				S1	Y
Butterflies and Moths						
Acronicta dolli	Doll's Merolonche			G3G4	S3?	Y
Atrytonopsis hianna	Dusted Skipper			G4G5	S3	Y
Bagisara gulnare	A Noctuid Moth			GU	S1S2	Y
Boloria chariclea	Arctic Fritillary			G5	S3	
Calephelis muticum	Swamp Metalmark	END		G3	S1	
Callophrys irus	Frosted Elfin	THR		G3	S1	
Catocala abbreviatella	Abbreviated Underwing Moth			G4	S3	Y

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Catocala semirelicta	Semirelict Underwing Moth			G5	S2S3	
Catocala whitneyi	Whitney's Underwing Moth			G3G4	S3	
Cerma cora	Owl-eyed Bird Dropping Moth			G3G4	S3	Y
Chlosyne gorgone	Gorgone Checker Spot			G5	S3	Y
Danaus plexippus	Monarch			G5	S1S3	Y
Dichagyris reliqua	A Noctuid Moth			G2G3	S2	Y
Erynnis lucilius	Columbine Dusky Wing			G4	S2S3	
Erynnis martialis	Mottled Dusky Wing			G3	S2	
Erynnis persius	Persius Dusky Wing			G5	S3	
Grammia phyllira	Phyllira Tiger Moth			G4	S2	
Hemileuca nevadensis ssp. 3	Midwestern Fen Buckmoth			G5T3T4	S3	
Hesperia metea	Cobweb Skipper			G4	S2	
Hesperia ottoe	Ottoe Skipper	END		G3G4	S1	
Lycaeides idas	Northern Blue	END		G5	S1	
Lycaeides melissa samuelis	Karner Blue		LE	G5T2	S3	
Lycaena dione	Gray Copper			G5	S2	
Oarisma poweshiek	Poweshiek Skipperling	END		G1	S1	
Oeneis chryxus	Chryxus Arctic			G5	S3	
Papaipema beeriana	Liatris Borer Moth			G2G3	S2S3	
Papaipema silphii	Silphium Borer Moth	END		G3G4	S2S3	
Pieris virginiensis	West Virginia White			G3?	S3	
Polites origenes	Cross Line Skipper			G4G5	S3	Y
Problema byssus	Byssus Skipper			G3G4	S2S3	
Pygarctia spraguei	Sprague's Pygarctica			G5	S2	
Schinia bina	Bina Flower Moth			G4	S2S3	
Schinia indiana	Phlox Moth	END		G2G4	S2S3	
Schinia lucens	Leadplant Flower Moth			G4	S3	Y
Speyeria idalia	Regal Fritillary	END		G3	S1	
Grasshoppers and Allies						

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Aeropedellus clavatus	Club-horned Grasshopper			G5	S2S3	
Arphia conspersa	Speckled Rangeland Grasshopper			G5	S2S4	
Arphia simplex	Plains Yellow-winged Grasshopper			G5	S1S2	
Camnula pellucida	Clear-winged Grasshopper			G5	S3	
Chloealtis abdominalis	Rocky Mountain Sprinkled Locust			G5	S2?	
Dichromorpha viridis	Short-winged Grasshopper			G5	S2S3	
Eritettix simplex	Velvet-striped Grasshopper			G5	S2S3	
Hesperotettix speciosus	Showy Grasshopper			G5	S1S2	
Hesperotettix viridis	Green-streak Grasshopper			G5	S2S3	
Melanoplus bruneri	Bruner's Spur-throat Grasshopper			G5	S1S2	
Melanoplus fasciatus	Huckleberry Spur-throat Grasshopper			G5	S2S3	
Melanoplus flavidus	Blue-legged Grasshopper			G4	S2S3	Y
Melanoplus foedus	A Spur-throat Grasshopper			G5	S2S3	
Melanoplus gladstoni	Gladston's Spur-throat Grasshopper			G5	S1S2	
Melanoplus islandicus	Forest Locust			G5	S2S3	Y
Melanoplus punctulatus	Grizzly Spur-throat Grasshopper			G4	S2S3	
Melanoplus scudderi	Scudder's Short-winged Grasshopper			G5	S1S2	
Melanoplus stonei	Stone's Locust			G4G5	S1S2	
Mermiria bivittata	Mermiria Grasshopper			G5	S2S3	
Neoconocephalus lyristes	Bog Conehead			GNR	S1S3	
Opeia obscura	Obscure Grasshopper			G5	S2S3	
Orchelimum delicatum	Delicate Meadow Katydid			GNR	S2?	
Orphulella pelidna	Spotted-winged Grasshopper			G5	S2S3	
Scudderia fasciata	Black-striped Katydid			GNR	S1S2	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Syrbula admirabilis	Handsome Grasshopper			G5	S1S2	
Trachyrhachys kiowa	Ash-brown Grasshopper			G5	S2	
Trimerotropis huroniana	Lake Huron Locust	END		G2G3	S1	
Trimerotropis maritima	Seaside Grasshopper			G5	S2S4	
Trimerotropis verruculata	Crackling Forest Grasshopper			G5	S2S3	
Terrestrial Beetles						
Altica litigata	A Leaf Beetle				S1S2	Y
Bassareus lituratus	A Leaf Beetle				S2S3	Y
Bassareus mammifer	A Leaf Beetle				S2S3	Y
Brachypnoea convexa	A Leaf Beetle				S1S2	Y
Cicindela hirticollis hirticollis	Hairy-necked Tiger Beetle			G5T4	S2S3	
Cicindela hirticollis rhodensis	Hairy-necked Tiger Beetle	END		G5T4	S1	
Cicindela patruela patruela	Northern Barrens Tiger Beetle			G3T3	S2	
Coelocephalapion decoloratum	A Pear-shaped Weevil				S1S2	Y
Colaspis suggona	A Colaspis Leaf Beetle			GNR	S3	
Cryptocephalus cuneatus	A Leaf Beetle			GNR	S1S2	Y
Cryptocephalus venustus	A Leaf Beetle				S2S3	Y
Distigmoptera impennata	A Leaf Beetle				S1S2	Y
Ellipsoptera lepida	Ghost Tiger Beetle			G3G4	S1	
Ellipsoptera macra	Sandy Stream Tiger Beetle			G5	S1S2	
Eutrichapion huron	A Straight-snouted Weevil				S1S2	Y
Fallapion bischoffi	A Pear-shaped Weevil				S1S2	Y
Fallapion impeditum	A Pear-shaped Weevil				S1S2	Y
Glyptina brunnea	A Leaf Beetle				S1S2	Y
Glyptina leptosoma	A Leaf Beetle				S1S2	Y
Pachybrachis atomarius	A Leaf Beetle				S2S3	Y
Pachybrachis luridus	A Leaf Beetle				S2S3	Y
Pachybrachis peccans	A Leaf Beetle				S2S3	Y

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Saxinis omogera	A Leaf Beetle			GNR	S2S3	
Sayapion segnipes	A Pear-shaped Weevil				S1S2	Y
Tetracha virginica	Virginia Big-headed Tiger Beetle			G5	S1S2	
Triachus vacuus	A Case-bearing Leaf Beetle				S1S2	Y
Trichapion perforicolle	A Pear-shaped Weevil				S1S2	Y
Terrestrial Bugs						
Aflexia rubranura	Red-tailed Prairie Leafhopper	END		G2	S2?	
Aphelonema simplex	Piglet Bug			GNR	S1S2	
Attenuipyga vanduzeei	A Leafhopper	END		GNR	S1	
Bruchomorpha extensa	An Issid Planthopper			GNR	S2S3	Y
Cuerna sayi	A Leafhopper			GNR	S2S3	
Destria crocea	A Leafhopper			GNR	S1S2	
Driotura robusta	A Leafhopper			GNR	S1S2	
Erythroneura carbonata	Yellow Loosestrife Leafhopper				S2S3	Y
Fitchiella robertsonii	An Issid Planthopper	THR		GNR	S1S2	
Flexamia prairiana	A Leafhopper			GNR	S1S2	
Kansendria kansiensis	A Leafhopper			GNR	S1S2	
Laevicephalus vannus	A Leafhopper			GNR	S1S2	
Limotettix elegans	A Leafhopper			GNR	S1?	
Limotettix pseudosphagneticus	A Leafhopper			GNR	S1?	
Memnonia panzeri	A Leafhopper			GNR	S2	
Myndus ovatus	A Planthopper			GNR	S1S2	Y
Paraphlepsius altus	A Leafhopper			GNR	S1S3	Y
Paraphlepsius maculosus	A Leafhopper			GNR	S1S3	
Paraphlepsius nebulosus	A Leafhopper				S1S2	Y
Polyamia dilata	Prairie Leafhopper	THR		GNR	S2	
Prairiana angustens	A Leafhopper			GNR	S1S3	
Prairiana cinerea	A Leafhopper			GNR	S2S3	
Prairiana kansana	A Leafhopper			GNR	S2?	

Scientific Name	Common Name	State THR/END	Federal LE/LT	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	New SGCN for WWAP2
Rhynchomitra microrhina	A Planthopper			GNR	S1S3	Y
Slaterobius quadristriata	A Seed Bug			GNR	S1S2	Y
Crustacea (Crayfish)						
Procambarus gracilis	Prairie Crayfish			G5	S2S3	
Snails						
Allogona profunda	Broad-banded Forestsnail			G5	S2S3	Y
Cochlicopa morseana	Appalachian Pillar			G5	S2	
Gastrocopta procera	Wing Snaggletooth	THR		G5	S3	
Glyphyalinia rhoadsi	Sculpted Glyph			G5	S2	
Glyphyalinia wheatleyi	Bright Glyph			G5	S1	
Guppya sterkii	Brilliant Granule			G5	S2S3	
Helicodiscus singleyanus	Smooth Coil			G5	S2?	Y
Hendersonia occulta	Cherrystone Drop	THR		G4	S2S3	
Paravitrea multidentata	Dentate Supercoil			G5	S2S3	
Planogyra asteriscus	Eastern Flat-whorl			G4	S1	
Striatura exigua	Ribbed Striate			G5	S2S3	Y
Striatura ferrea	Black Striate			G5	S2	
Strobilops aeneus	Bronze Pinecone			G5	S1	
Vallonia parvula	Trumpet Vallonia			G4	S2?	Y
Vertigo hubrichti	Hubricht's Vertigo	END		G3Q	S1	
Vertigo modesta	Cross Vertigo			G5	S1	Y
Vertigo morsei	Six-whorl Vertigo			G3	S1	
Vertigo nylanderi	Deep-throated Vertigo			G3G4	S1S2	
Vitrina angelicae	Transparent Vitrine Snail			G5	S1	
Zonitoides limatulus	Dull Gloss			G4G5	S1S2	
Zoogenetes harpa	Boreal Top			G5	S1	

Table 3.5.2 Nonarthropod Invertebrates - Assessment of Progress toward Answering Three Questions Key to Conservation Planning

Taxa	Key Questions		
	1. What species occur in Wisconsin?	2. How are the species distributed in space and time?	3. What factors cause the observed distributions in Wisconsin?
Porifera (sponges)	*	+	+
Cnidaria (hydra and "jellyfish")	-	-	-
Platyhelminthes: Turbellaria (flatworms)	-	-	-
Platyhelminthes: Trematoda (flukes)	+	-	-
Platyhelminthes: Cestoidea (tapeworms)	+	-	-
Nemertea (ribbon worms)	+	-	-
Nematoda (round worms)	+	+	-
Nematomorpha (horsehair worms)	*	-	-
Acanthocephala (spiny headed worms)	*	+	-
Gastrotricha (gastrotrichs)	-	-	-
Rotifera (rotifers)	+	+	-
Annelida: Oligochaeta (earthworms)	+	-	-
Annelida: Hirudinea (leeches)	*	+	+
Annelida: Branchiobdellida (crayfish worms)	+	-	-
Annelida: Aphanoneura (suction-feeding worms)	-	-	-
Annelida: Polychaeta (polychaete worms)	*	+	-
Entoprocta (*Urnatella*)	*	-	-
Ectoprocta (bryozoans)	+	-	-
Mollusca: Gastropoda (snails and slugs)	*/-	+/-	+/-
Mollusca: Pelecypoda (fingernail clams and freshwater mussels)	*/-	+/-	+/-

Table 3.5.3. Noninsect Arthropods - Assessment of Progress Toward Answering Three Questions Key to Conservation Planning

Taxa	Key Questions		
	1. What species occur in Wisconsin?	2. How are the species distributed in space and time?	3. What factors cause the observed distributions in Wisconsin?
Crustacea: Anostraca (fairy shrimp)	*	+	-
Crustacea: Notostraca (tadpole shrimp)	+	-	-
Crustacea: Laevicaudata and Spinicaudata (clam shrimp)	+	-	-
Crustacea: Cladocera (water fleas)	*	-	-
Crustacea: Ostracoda (seed shrimp)	+	+	-
Crustacea: Copepoda (copepods)	*/+	+	-
Crustacea: Branchiura (fish lice)	+	+/-	-
Crustacea: Mysidacea (opossum shrimp)	*	-	-
Crustacea: Isopoda (sow bugs)	*	+	-
Crustacea: Amphipoda (scuds)	*	+	-
Crustacea: Decapoda (crayfish, freshwater shrimp)	+/-	+/-	+/-
Diplopoda (millipedes)	+	-	-
Paurapoda (paurapods)	-	-	-
Chilopoda (centipedes)	+	-	-
Symphyla (symphylans)	-	-	-
Arachnida: Psuedoscorpiones (pseudoscorpions)	+	-	-
Arachnida: Opiliones (daddy-long legs)	*	-	-
Arachnida: Araneae (spiders)*	+	+	-
Arachnida: Acari (mites, ticks)*	+	-	-
Pentastomida (tongue worms)	-	-	-
Tardigrada (water bears)	-	-	-

*****Species in the Arachnida: Araneae and Arachnida: Acari groups are not known to occur in Wisconsin

Table 3.5.4. Insects and Related Hexapoda – Assessment of Progress Toward Answering Three Questions Key to Conservation Planning

Taxa	Key Questions		
	1. What species occur in Wisconsin?	2. How are the species distributed in space and time?	3. What factors cause the observed distributions in Wisconsin?
Hexapoda: Protura (proturans)	+	-	-
Hexapoda: Collembola (spring tails)	+	-	-
Hexapoda: Diplura (diplurans)	-	-	-
Insecta: Archaeognatha (bristletails)	-	-	-
Insecta: Thysanura (silverfish, fire brats)	*	-	-
Insecta: Ephemeroptera (mayflies)	*	+	+/-
Insecta: Odonata (dragonflies, damselflies)	*	+	+/-
Insecta: Plecoptera (stoneflies)	*	+	+/-
Insecta: Phasmida (stick and leaf insects)	+	-	-
Insecta: Orthoptera (grasshoppers, crickets, etc.)	+	+/-	-
Insecta: Dermaptera (earwigs)	*	+	-
Insecta: Dictyoptera (cockroaches, termites, mantids)	*	+	+/-
Insecta: Psocoptera (book lice, bark lice)			
Insecta: Phthiraptera (lice)	*	+	+/-
Insecta: Hemiptera (true bugs)	+	+/-	+/-
Insecta: Thysanoptera (thrips)	+	-	-
Insecta: Megaloptera (alderflies, dobsonflies, fishflies)	*	+	-
Insecta: Neuroptera (lacewings, ant lions, owlflies)	+	-	-
Insecta: Coleoptera (beetles)	+	+/-	+/-
Insecta: Strepsiptera (twisted-winged insects)	+	-	-
Insecta: Mecoptera (scorpionflies, hangingflies)	-	-	-
Insecta: Trichoptera (caddisflies)	*	+/-	+/-
Insecta: Lepidoptera (butterflies, moths)	+	+	+/-
Insecta: Diptera (flies)	+	+	+/-
Insecta: Siphonaptera (fleas)	+	+	-
Insecta: Hymenoptera (wasps, bees, ants, etc.)	*/+	+	+/

Table 3.5.5 Invertebrate SINS that were Assessed and are Considered Uncommon or Rare, but are not SGCN Because of Significant Information Needs

For common names go to: http://dnr.wi.gov/topic/endangeredresources/animals.asp; search terms: Wisconsin DNR rare animals.

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Aquatic Beetles			
Agabus canadensis	GNR	SU	Y
Berosus infuscatus	GNR	SU	Y
Berosus pantherinus	GNR	SU	Y
Cymbiodyta blanchardi	GNR	SU	Y
Cymbiodyta semistriatus	GNR	SU	Y
Ectopria sp. 2	GNR	SU	Y
Enochrus diffusus	GNR	SU	Y
Enochrus perplexus	GNR	SU	Y
Gyrinus gehringi	GNR	SU	Y
Gyrinus impressicollis	GNR	SU	Y
Gyrinus parcus	GNR	SU	Y
Haliplus canadensis	GNR	SU	Y
Haliplus fasciatus	GNR	SU	Y
Haliplus leopardus	GNR	SU	Y
Haliplus nitens	GH	SH	Y
Haliplus tortilipenis	GNR	SU	Y
Helophorus oblongus	GNR	SU	Y
Hydrochus brevitarsis	GNR	SU	Y
Hydrochus granulatus	GNR	SU	Y
Hydrochus scabratus	GNR	SU	Y
Hydrochus setosus	GNR	SU	Y
Laccobius minutoides	GNR	SU	Y
Laccobius truncatipenis	GNR	SU	Y
Listronotus echinodori	GNR	SU	
Lixellus hubbardi	GNR	SU	
Lutrochus laticeps	GNR	SU	Y
Platypsyllus castoris	GNR	SU	
Suphisellus puncticollis	GNR	SU	Y

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Aquatic Bugs			
Cenocorixa dakotensis	GNR	SU	Y
Cenocorixa utahensis	GNR	SU	Y
Cymatia americana	GNR	SU	Y
Hebrus buenoi	G4	SU	Y
Hesperocorixa interrupta	GNR	SH	Y
Lethocerus grisea	GNR	SU	Y
Rheumatobates tenuipes	GNR	SU	
Trepobates knighti	GNR	SU	Y
Aquatic Flies			
Blepharicera tenuipes	GNR	SU	Y
Parochlus kiefferi	GNR	SU	Y
Phalacrocera neoxena	GNR	SU	Y
Caddisflies			
Agapetus hessi	G4G5	SU	Y
Agraylea costella	G3	SU	
Asynarchus rossi	G4G5	SU	Y
Brachycentrus incanus	G5	SU	Y
Fabria inornata	G4G5	SU	Y
Hagenella canadensis	G5	SU	Y
Hydroptila valhalla	G4	SU	Y
Hydroptila virgata	G5	SU	Y
Lepidostoma costale	G5	SU	Y
Lepidostoma griseum	G5	SU	Y
Lepidostoma libum	G3G4	SU	Y
Lepidostoma prominens	G5	SU	Y
Limnephilus janus	G5	SU	Y
Limnephilus parvulus	G5	SU	Y
Limnephilus perpusillus	G5	SU	Y
Limnephilus sericeus	G5	SU	Y
Neotrichia falca	G3G4	SU	
Ochrotrichia riesi	G3G4	SU	Y
Oecetis nocturna	G5	SU	Y
Oxyethira anabola	G4G5	SU	Y

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Oxyethira rossi	G3G4	SU	
Oxyethira serrata	G5	SU	Y
Polycentropus glacialis	G3G4	SU	Y
Polycentropus weedi	G5	SU	Y
Rhyacophila lobifera	G5	SU	Y
Dragonflies and Damselflies			
Anax longipes	G5	SU	Y
Archilestes grandis	G5	SU	
Coenagrion interrogatum	G5	SU	Y
Enallagma vernale	G4Q	SU	Y
Gomphaeschna furcillata	G5	SU	
Ischnura hastata	G5	SU	Y
Libellula vibrans	G5	SU	Y
Rhionaeschna multicolor	G5	SU	
Somatochlora linearis		SU	
Sympetrum ambiguum		SU	
Tramea carolina	G5	SU	Y
Mayflies			
Ameletus subnotatus		SU	
Caenis punctata	G5	SU	Y
Centroptilum semirufum		SU	
Fallceon quilleri		SU	
Leucrocuta maculipennis	G5	SU	Y
Nixe inconspicua	G5	SU	Y
Parameletus sp.?		SU	
Procloeon rivulare		SU	
Rhithrogena manifesta	G5	SU	
Sparbarus lacustris	G4	SU	Y
Sparbarus maculatus	G5	SU	Y
Sparbarus nasutus	G3G4	SU	Y
Susperatus prudens	G4	SU	
Springtail			
Arrhopalites clarus	G4	SU	
Onychiurus gelus	G2G3	SU	

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Onychiurus obesus	G3G4	SU	
Stoneflies			
Allocapnia frisoni	G4	SU	Y
Allocapnia illinoensis	G3	SU	
Haploperla brevis	G5	SU	
Leuctra ferruginea	G5	SU	Y
Paracapnia opis	G5	SU	Y
Perlinella ephyre	G5	SU	Y
Soyedina vallicularia	G5	SU	Y
Bees and Wasps			
Andrena arabis		SU	
Andrena barbara		SU	
Andrena carolina		SU	
Andrena clarkella		SU	
Andrena nigrihirta		SH	
Andrena peckhami		SU	
Andrena placata		SU	
Andrena wilmattae		SU	
Bombus (Psithyrus) fernaldae	GU	SH	
Bombus (Psithyrus) variabilis	GU	SH	
Bombus ashtoni	GH	SH	
Ceratina strenua		SU	
Coelioxys immaculata		SU	
Colletes aberrans		SU	
Colletes albescens		SU	
Colletes andrewsi		SU	
Colletes consors		SU	
Colletes impunctatus		SU	
Colletes nudus		SU	
Colletes susannae		SU	
Colletes wilmattae		SU	
Dianthidium simile		SU	
Dufourea marginata		SU	
Dufourea monardae		SU	

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Dufourea novaeangliae		SU	
Epeoloides pilosula	G1	SH	
Hoplitis albifrons		SU	
Hylaeus nelumbonis		SU	
Lasioglossum atlanticum		SU	
Lasioglossum bruneri		SU	
Lasioglossum coreopsis		SU	
Lasioglossum dreisbachi		SU	
Lasioglossum ellisiae		SU	
Lasioglossum forbesii		SU	
Lasioglossum hartii		SU	
Lasioglossum hemimelas		SU	
Lasioglossum illinoense		SU	
Lasioglossum lustrans		SU	
Lasioglossum nelumbonis		SU	
Lasioglossum nymphaearum		SU	
Lasioglossum obscurum		SU	
Lasioglossum paradmirandum		SU	
Lasioglossum perpunctatum		SU	
Lasioglossum sagax		SU	
Lasioglossum subviridatum		SU	
Lasioglossum succinipenne		SU	
Lasioglossum swenki		SU	
Lasioglossum texanum		SU	
Macropis (Macropis) ciliata	GNR	SH	
Megachile addenda		SU	
Megachile petulans		SU	
Megachile rugifrons		SU	
Nomada aquilarum		SU	
Nomada armatella		SU	
Nomada australis		SU	
Nomada fervida		SU	
Nomada graenicheri		SU	
Nomada hydrophylli		SU	

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Nomada illinoensis		SU	
Nomada imbricata		SU	
Nomada lehighensis		SU	
Nomada luteoloides		SU	
Nomada perplexa		SU	
Nomada rubicunda		SU	
Nomada xanthura		SU	
Osmia albiventris	G3G5	SU	
Osmia atriventris	G4G5	SU	
Osmia collinsiae	G4G5	SU	
Osmia conjuncta	G4	SU	
Osmia distincta	G4G5	SU	
Osmia georgica	G4G5	SU	
Osmia inermis	G5	SU	
Osmia inspergens	G3G5	SU	
Osmia proxima	G4G5	SU	
Osmia tersula	G5	SU	
Osmia virga	G3G5	SU	
Perdita albipennis		SU	
Perdita gerhardi		SU	
Perdita halictoides		SU	
Perdita maculigera		SU	
Perdita perpallida		SU	
Perdita swenki		SU	
Sphecodes antennariae		SU	
Sphecodes atlantis		SU	
Sphecodes banksii		SU	
Sphecodes johnsonii		SU	
Sphecodes levis		SU	
Sphecodes solonis		SU	
Sphecodes townesi		SU	
Stelis coarctatus		SU	
Stelis foederalis		SU	
Stelis labiata		SU	

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Stelis permaculata		SU	
Trachusa zebrata		SU	
Xylocopa virginica		SU	
Butterflies and Moths			
Acrocercops pnosmodiella	GNR	SU	
Aethes spartinana		SU	
Anacampsis wikeri		SU	
Anicla tenuescens		SU	
Cabera quadrifasciaria		SU	
Carmenta anthracipennis		SU	
Catocala amestris	G4	SU	
Chortodes defecta	G3G4	SU	
Copablepharon michiganensis	G1G2	SU	Y
Cycnia inopinatus	G4	SU	
Dargida rubripennis	G3G4	SU	Y
Dichagyris grotei	G4	SU	
Digrammia ordinata		SU	
Digrammia subminiata		SU	
Eoreuma crawfordi		SU	
Erora laeta	GU	SU	
Euchlaena milnei	G2G4	SU	Y
Eucosma bipunctella		SU	
Eucosma fulminana		SU	
Eucosma giganteana		SU	
Eucosma landana		SU	
Eucosma ridingsana		SU	
Eucosma simplex		SU	
Euxoa immixta		SU	
Euxoa medialis		SU	
Euxoa niveilinea		SU	
Filatima revisensis		SU	
Haimbachia albescens		SU	
Hystrichophora taleana		SU	
Hystrichophora vestaliana		SU	

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Lycaeides melissa melissa	G5T5	SU	
Mimoschinia rufofascialis		SU	
Neodactria murellus		SU	
Papaipema sciata	G3	SU	
Peoria gemmatella		SU	
Phaneta infimbriana		SU	
Photedes enervata	G4	SU	
Photedes inops	G3G4	SU	
Phytometra ernestinana	G4	SU	
Ponometia binocula		SU	
Ponometia tortricina		SU	
Protoschinia nuchalis		SU	
Psectraglaea carnosa	G3	SU	Y
Ptichodis bistrigata	G3	SU	Y
Resapamea stipata	G4	SU	
Schinia grandimedia		SU	
Schinia jaguarina		SU	
Schinia nundina		SU	
Schinia sanguinea		SU	
Schinia septentrionalis		SU	
Sciota rubescentella		SU	
Selicanis cinereola	GNR	SU	
Speranza amboflava		SU	
Sympistis perscripta		SU	
Tricholita notata	G5	SU	
Walshia amorphella		SU	
Zale largera	G4	SU	
Grasshoppers and Allies			
Hippiscus ocelote	G5	SH	
Melanoplus rusticus	G4G5	SH	Y
Metaleptea brevicornis	G5	SH	
Neoconocephalus robustus	GNR	SH	Y
Paratylotropidia brunneri	G4G5	SH	Y
Pardalophora haldemanii	G5	SH	Y

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Tetrix arenosa		SU	
Tetrix brunneri		SU	
Tetrix ornata		SU	
Tetrix subulata		SU	
Tettigidea lateralis		SU	
Terrestrial Beetles			
Altica heucherae		SU	
Brachypnoea tristis		SU	
Calligrapha incisa		SU	
Collops vicarius	GNR	SU	Y
Longitarsus spp.		SU	
Mordella spp.		SU	
Mordellina spp.		SU	
Mordellistena spp.		SU	
Oberea flavipes		SU	
Ophraella communa	GNR	SU	
Ophraella cribrata		SU	
Pachybrachis spumarius		SU	
Pachybrachis trinotatus	GNR	SU	
Pachyschelus confusus		SU	
Pachyschelus laevigatus		SU	
Phyllotreta liebecki		SU	
Thanasimus trifasciatus		SU	
Typocerus confluens		SU	
Typocerus octonotatus		SU	
Xyloryctes jamaicensis	GNR	SU	
Terrestrial Bugs			
Diceroprocta vitripennis		SU	
Dorycara platyrhynchus	GNR	SU	
Iowana frisoni		SU	
Okanagana balli		SU	
Paraphilaenus parallelus	GNR	S2S4	Y
Crustacea (aquatic and terrestrial)			
Aglaodiaptomus leptopus	GNR	SU	Y

Scientific Name	Natural Heritage Inventory Global Rank	Natural Heritage Inventory State Rank	SGCN in WWAP1 but not in WWAP 2
Aglaodiaptomus stagnalis	GNR	SU	Y
Crangonyx gracilis	G4	SU	
Crangonyx minor	G5	SU	Y
Cyzicus gynecia	G2Q	SU	
Eubranchipus ornatus	G3	SU	Y
Eubranchipus serratus	G5	SU	Y
Fallicambarus fodiens	G5	SU	Y
Limnocalanus macrurus	G5	SU	Y
Lirceus lineatus	G5	SU	Y
Lynceus brachyurus	G5	SU	Y
Onychodiaptomus birgei	GNR	SU	Y
Stygobromus putealis	G2G3	SU	
Snails (aquatic and terrestrial)			
Acella haldemani	G3	SU	
Aplexa elongata	G5	SU	
Bulimnaea megasoma	G4G5	SU	
Cochlicopa nitens	G4	SU	
Columella edentula	G5	SU	
Discus patulus	G5	SU	
Euconulus alderi	G4Q	SU	
Hoyia sheldoni	G1	SU	Y
Laevapex fuscus	G5	SU	
Lyogyrus walkeri	G3G4	SU	
Philomycus carolinianus	G5	SU	
Physella magnalacustris	G2Q	SU	Y
Physella parkeri	G2Q	SU	Y
Planorbella truncata	G3G4	SU	
Promenetus exacuous	G5	SU	
Promenetus umbilicatellus	G4	SU	
Pseudosuccinea columella	G5	SU	
Somatogyrus depressus	G2	SU	
Somatogyrus tryoni	G2G3	SU	
Stagnicola caperata	G5	SU	
Stagnicola woodruffi	G2G3	SU	

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Strobilops affinis	G4	S3	Y
Valvata perdepressa	G3	SU	
Valvata winnebagoensis	G2	SU	Y
Spiders			
Araneus groenlandicola	GNR	SU	
Bathyphantes weyeri	G4	SU	
Marpissa grata	GNR	SU	
Paradamoetas fontanus	GNR	SU	
Phidippus apacheanus	GNR	SU	
Phidippus pius	GNR	SU	
Sassacus papenhoei	GNR	SU	
Sphodros niger	G4G5	SU	
Zygiella nearctica	GNR	SU	