Assessing Climate Vulnerability & Adaptive Capacity of Midwest Species of Greatest Conservation Need

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We collectively acknowledge that Michigan State University occupies the ancestral, traditional, and contemporary Lands of the Anishinaabeg – Three Fires Confederacy of Ojibwe, Odawa, and Potawatomi peoples. In particular, the University resides on Land ceded in the 1819 Treaty of Saginaw. We recognize, support, and advocate for the sovereignty of Michigan's twelve federally recognized Indian nations, for historic Indigenous communities in Michigan, for Indigenous individuals and communities who live here now, and for those who were forcibly removed from their Homelands. By offering this Land Acknowledgement, we affirm Indigenous sovereignty and will work to hold Michigan State University more accountable to the needs of American Indian and Indigenous peoples.

Cover: A juvenile spotted turtle (*Clemmys guttata*). Photo by Dan Earl.

EXECUTIVE SUMMARY

Adaptive capacity (AC) can be defined as a species' ability to tolerate or adapt to climate change, whether that be through shifting in space or persisting in place. Evaluating a species' AC may allow managers to develop and prioritize conservation actions that target specific climate vulnerabilities and strategically augment the AC of specific species. To facilitate this management and collaboration across states, the Michigan Department of Natural Resources (MDNR) and Michigan Natural Features Inventory (MNFI) worked with project partners across the Midwest region to assess the AC of several hundred species of greatest conservation need (SGCN) prior to upcoming revisions to many states' wildlife action plans (SWAPs).

To facilitate these evaluations, MNFI and MDNR staff worked with researchers at the United States Geological Survey (USGS) to create a tool that would allow for a rapid assessment of a species' AC based on previous assessment tools created by the USGS. This tool was designed to allow an in-depth analysis of a species' AC based on 37 different life history traits that could be scored by an evaluator based on available literature and research on a species.

MNFI staff completed AC assessments for 400 Midwest SGCN which included amphibians, birds, fish, invertebrates, mammals, and reptiles. MNFI staff summarized overall results as well as trends seen in taxonomic groups. In addition, MNFI staff led a one-day training to demonstrate use of the AC tool and the assessment project to partners in other states. Results from MNFI assessments will be shared with partners to inform upcoming SWAP revisions in partner states and allow for collaboration and more consistent management strategies to be implemented across a species' range.

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INTRODUCTION

While climate change is a pervasive global threat to biodiversity, the capacity of each species to adapt to a changing climate is highly variable (Bellard et al. 2012, LeDee 2021). Adaptive capacity (AC) is "the ability of species to cope with or adjust to climate change" (Thurman et al. 2020). Given the current rate and magnitude of climate change, many species are likely unable to adapt without conservation interventions. State Wildlife Action Plans (SWAPs) throughout the Midwest have identified climate change as a threat to Species of Greatest Conservation Need (SGCN) and their habitats. Identifying species that are vulnerable to climate change, assessing their AC, and prioritizing conservation actions to strategically augment the AC of rare species (i.e. SGCN) is urgently needed to inform upcoming SWAP revisions (Association of Fish and Wildlife Agencies 2022).

In preparation for the previous SWAP revisions in 2015, several states in the Midwest conducted vulnerability assessments to inform their SWAPs using NatureServe's Climate Change Vulnerability Index (CCVI) (Walk et al 2011, Hoving et al. 2013, Szcodronski et al. 2022). This tool provides a mechanism to estimate the relative risk that climate change poses for each SGCN at the state level. However, the capacity for species to adapt to climate change was poorly assessed with the CCVI tool prior to 2015, and relative vulnerability was difficult to link to conservation actions.

This project addresses these gaps by implementing a large-scale AC assessment of 538 species across six Midwest Association of Fish and Wildlife Agencies (MAFWA); the results of which can be used to identify best management practices for those species. This project used a tool developed by Thurman et al. (2020) that assesses the AC of species based on 37 life history, ecological, and evolutionary attributes. Adaptive capacity is only one component of a species' overall climate vulnerability (Glick et al. 2011); however it is the component that biologists and wildlife managers have the most ability to address. Results from this tool allow managers to craft conservation actions that target specific climate vulnerabilities of species, while also allowing for strategic prioritization of climate adaptation programs to benefit large numbers of SGCN in an efficient manner. Additionally, the AC tool assesses climate vulnerability across a species' entire range, which allows for greater sharing and collaboration among state SWAP programs.

The primary objectives of this project were three-fold: 1) develop a user-friendly interface for assessing AC using the framework and tools developed by Thurman et al. (2020, 2022); 2) assess the adaptive capacity of 400 SGCN in the Midwest, prioritizing SCGN in Michigan, Nebraska, Indiana, Minnesota, Missouri, and South Dakota; and 3) provide a one-day training for all of the MAFWA region states on how to use the adaptive capacity assessment tool so they can assess additional priority species for their states. This report provides an overview of accomplishments related to each objective, with a focus on the AC outputs. These outputs include key information regarding SGCN vulnerability to climate change and information that can be linked to conservation actions and used to inform upcoming SWAP revisions. Many species we assessed have been identified as Midwest Regional SGCN, which provides

opportunities to align SWAPs and standardize on-the-ground management across the MAFWA region. Ultimately, this project advances the Midwestern states' longstanding goal to increase the effectiveness of individual state programs by building a more regional and coordinated approach to rare species planning.

METHODS

Rapid Adaptive Capacity Assessment Tool

A user-friendly interface was developed using Microsoft Excel to conduct the adaptive capacity assessments for this project. Thurman et al. developed an interface in Microsoft Excel for assessing the adaptive capacity (AC) of animal species based on the adaptive capacity framework and tools developed previously (Thurman et al. 2020, 2022). This framework is flexible and can be used to document an in-depth, full literature review of the species using only primary literature and published species account. Alternatively, the framework can be used to facilitate a rapid assessment using secondary sources, expert knowledge of species' traits, and primary literature when necessary. For our purposes of this project, we chose the rapid assessment approach. To assist us in the goals of this project, and as a beta test of another tool that USGS was developing, USGS staff developed a user-friendly interface in Microsoft Excel to facilitate rapid AC assessments. USGS staff provided an initial iteration of the tool for us to use and provided training on the overall AC framework and use of the rapid assessment tool. After initial testing and feedback from Michigan Natural Features Inventory (MNFI) staff, an updated version of the rapid assessment tool was developed and used to complete species assessments.

The AC assessment tool/framework consists of 37 species- or population-level attributes organized into seven attribute groups: distribution, movement, evolutionary potential, ecological role, abiotic niche, life history, and demography (Table 1). Each species is assessed as low, moderately low, moderately high, or high for each attribute (some attributes only contain three levels – low, moderate, high) based on predefined evaluation criteria (Appendix A). For the evaluated attribute groups, the AC score indicates how that portion of a species' life cycle, ecology, or demography may be able to respond to and adapt to climate change, with a low scoring attribute or group being a limiting factor for the species' ability to adapt and continue to survive with climate change. For example, the distribution and movement attributes relate to a species' ability to potentially move through a landscape in response to climate change (shift in space), whereas the life history and demography attributes indicate a species' capacity to accommodate changing climates (persist in place) (Thurman et al. 2020). Attributes may also be scored as "NA" if it is not applicable for that species (e.g., migration attributes for a non-migratory species) or "unknown" if information is unavailable and there is no best estimate. For each attribute, the level of evidence available for assessment is classified as low, moderate, or high based on the amount of literature available relevant to the attribute. For attributes scored as "NA" or "unknown", evidence can be classified as "NA" or "None", respectively.

The assessment output includes an average AC level (low, moderately low, moderate, moderately high, or high), with an associated score ranging from 0 (lowest AC) to 1 (highest AC) for each of the seven attribute groups, and an overall AC level and score for the species. Each AC level corresponds to a specific score range, assigned according to the following scale: Low = 0.0 - 0.19, Moderately Low = 0.20 - 0.39, Moderate = 0.40 - 0.59, Moderately High = 0.60 - 0.79, and High = 0.80 - 1.0. The output also includes an average evidence level (NA, Low, Medium,

High, or Unknown) for each attribute group and an average evidence level for the assessment based on the number of primary references available. A lower AC score/level suggests a species may have reduced ability to adapt and may need targeted management or active intervention to persist with climate change. A species with a higher evaluated AC may be better able to cope with and adapt to climate change (i.e., by "persisting in place" or "shifting in space," Thurman et al. 2020).

Table 1. AC assessment groups and descriptions.

AC Attribute Group	Traits Assessed	Description
Distribution	Extent of Occupancy, Area of Occupancy, Habitat Specialization, Commensalism with Humans, Geographic Rarity	Where the species is found, how common the species is across the landscape.
Movement	Dispersal Syndrome, Dispersal Distance, Dispersal Phase, Site Fidelity, Migration Phenology, Migration Distance	How far and how often the species moves, how likely the species is to move and establish in new habitats.
Evolutionary Potential	Genetic Diversity, Population Size, Hybridization Potential	How genetically viable the species is, how likely is inbreeding to occur.
Ecological Role	Enemies, Diet Breadth, Diversity of Obligate Species	What the species eats, how dependent it is on other species, and other biotic interactions or relationships that impact the species.
Abiotic Niche	Seasonal Phenology, Climatic Niche Breadth, Physiological Tolerances, Behavioral Regulation of Physiology, Disturbance Tolerances	What range of climatic conditions the species can tolerate. How sensitive the species is to changes in natural disturbances.
Life History	Reproductive Phenology, Reproductive Mode, Mating System, Fecundity, Parity, Sex Ratio, Sex Determination, Parental Investment	How the species reproduces. How often, how many offspring, and how are offspring cared for.
Demography	Life Span, Generation Time, Age of Sexual Maturity, Age Structure, Recruitment	How populations of the species are composed. How old they can live and how likely juveniles are to survive to reproduce.

Species Selection

We worked with MDNR staff and partners in Nebraska, Indiana, Minnesota, Missouri, and South Dakota to select and finalize SGCN to be evaluated using the rapid AC assessment tool. The goal was to assess a total of 538 species, with our team assessing 400 species and Nebraska staff assessing 138 species. Nebraska's assessments are not included in this report. We were provided with a list of 339 species that had been identified as high priority SGCN in one or more of the six participating MAFWA states. To meet the project objective of assessing 400 species, we selected an additional 61 species from Michigan's SWAP (2023 proposed SGCN list for

Michigan's 2025 SWAP update). Of the 400 species selected for MNFI's AC assessments, 134 have been identified as Midwest Regional SGCN (Terwilliger and MLI 2022).

Completing Adaptive Capacity Assessments

All 400 species evaluated were assigned to MNFI science staff based on expertise. Our team followed the suggested timeline of completing each species assessment in approximately four hours, though actual completion times for assessments varied from 2.5 – 14 hours.

The primary sources used to complete rapid assessments were published species accounts completed by other agencies, including NatureServe status assessments, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) species assessments, Federal and state level Endangered Species Status Assessments, the International Union for Conservation of Nature (IUCN) Redlist, Forest Service Conservation Assessments, NatureServe Explorer, and Global Biodiversity Information Facility (GBIF). We also reviewed primary literature, field guides, and grey literature as necessary to ensure all AC traits were assessed.

In cases where there was little or no primary literature or status assessments for a species, we used information collected on a similar species, such as congeners in a similar climatic niche and with a similar life history to evaluate an AC trait. In these cases, we reduced evidence scores to account for greater uncertainty and placed comments into the species assessments. When there was not enough information to conduct an accurate assessment for a species or there was taxonomic uncertainty (i.e. two selected species had been combined into a species complex; or extremely geographically isolated subspecies), a different species in the same taxonomic group was substituted and a new assessment was completed.

Training for MAFWA Region States

We worked with the MDNR and partner states to schedule and plan two virtual training sessions for MAFWA region states. These trainings were intended to provide partner states with an overview of how to use the rapid AC assessment tool. All resources needed to complete the assessments were shared with partners to inform AC assessments completed within their state. An additional objective of the second virtual training was to provide additional clarity regarding how we completed the assessments by providing examples of the methods that were applied when assessing different taxa.

RESULTS

SGCN Assessments

We completed adaptive capacity (AC) assessments for 400 SGCN, 134 of which are classified as Midwest Regional SGCN (Table 2). We completed assessments for 155 insects, 66 birds, 50 freshwater mussels, 42 fishes, 36 reptiles/amphibians (also referred to as herptiles in this report), 23 gastropods, 19 mammals, and nine crayfish, with each species having a summary of its adaptive capacity output as a graph (Figure 1).

Table 2. The number of Species of Greatest Conservation Need (SCGN) by state and Midwest Regional SGCN that were assessed by MNFI staff.

	Michigan	Nebraska	Indiana	Minnesota	Missouri	South Dakota	RSGCN
Number of SGCN Assessed	232	48	50	49	50	41	134

Across all evaluated species, the majority were determined to possess moderate AC (Figure 2). Four species (1%) were evaluated as having low overall AC, 110 (28%) as moderately low, 226 (57%) as moderate, 57 (14%) as moderately high, and three (1%) as high. Among the major taxonomic groups assessed, insects (moderately low AC, score = 0.39) and mollusks (moderate AC, score = 0.44) had the lowest average overall scores (Table 3). In contrast, mammals (moderately high AC, score = 0.66) and herptiles (moderate AC, score = 0.59) had the highest average overall scores, and mammals were the only taxonomic group that contained multiple species with high overall AC. The AC of birds, fish, mollusks, and herptiles was most constrained by their abiotic niche, while insects and mammals were primarily constrained by their evolutionary potential. Crayfish were unique in that their AC was most limited by their distribution (Table 3). In the following sections, we provide detailed summaries of the AC assessment results for each taxonomic group.

Table 3. Average attribute group score and overall AC score for each taxonomic group assessed.

Taxonomic Group	Distribution	Movement	Evolutionary Potential	Ecological Role	Abiotic Niche	Life History	Demography	Overall Score
Bird	0.67	0.60	0.59	0.75	0.17	0.61	0.46	0.55
Fish	0.59	0.57	0.49	0.69	0.29	0.67	0.61	0.56
Insect	0.56	0.15	0.13	0.38	0.39	0.60	0.55	0.39
Mollusk	0.52	0.43	0.34	0.54	0.24	0.66	0.37	0.44
Crayfish	0.31	0.63	0.36	0.69	0.38	0.59	0.56	0.50
Mammal	0.73	0.72	0.43	0.78	0.67	0.72	0.60	0.66
Herptile	0.76	0.56	0.47	0.70	0.38	0.77	0.48	0.59

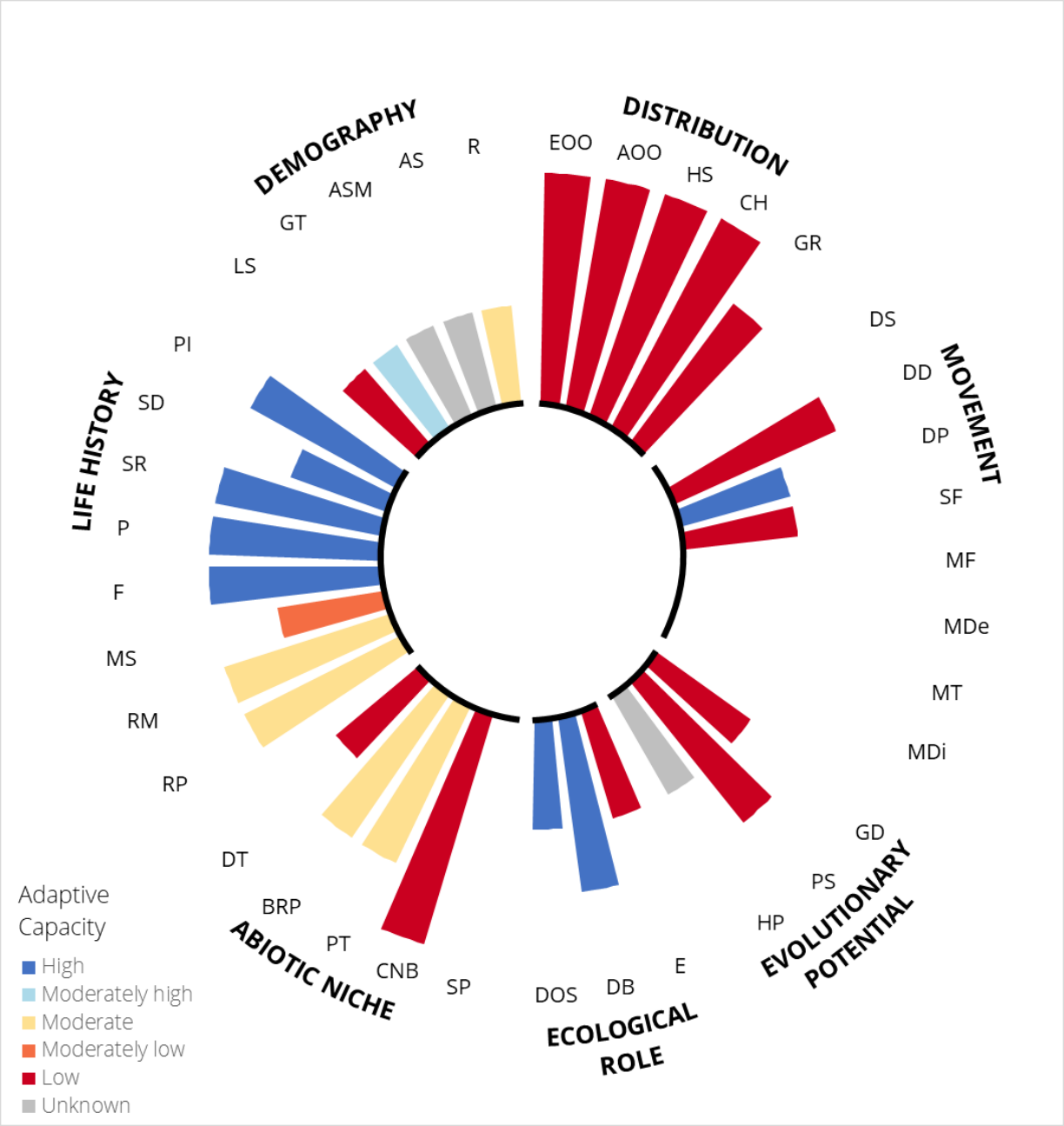

Figure 1. Example graph output from rapid adaptive capacity assessments for each species. The provided example is Caney Mountain Cave crayfish (*Orconects stygocaneyi*).

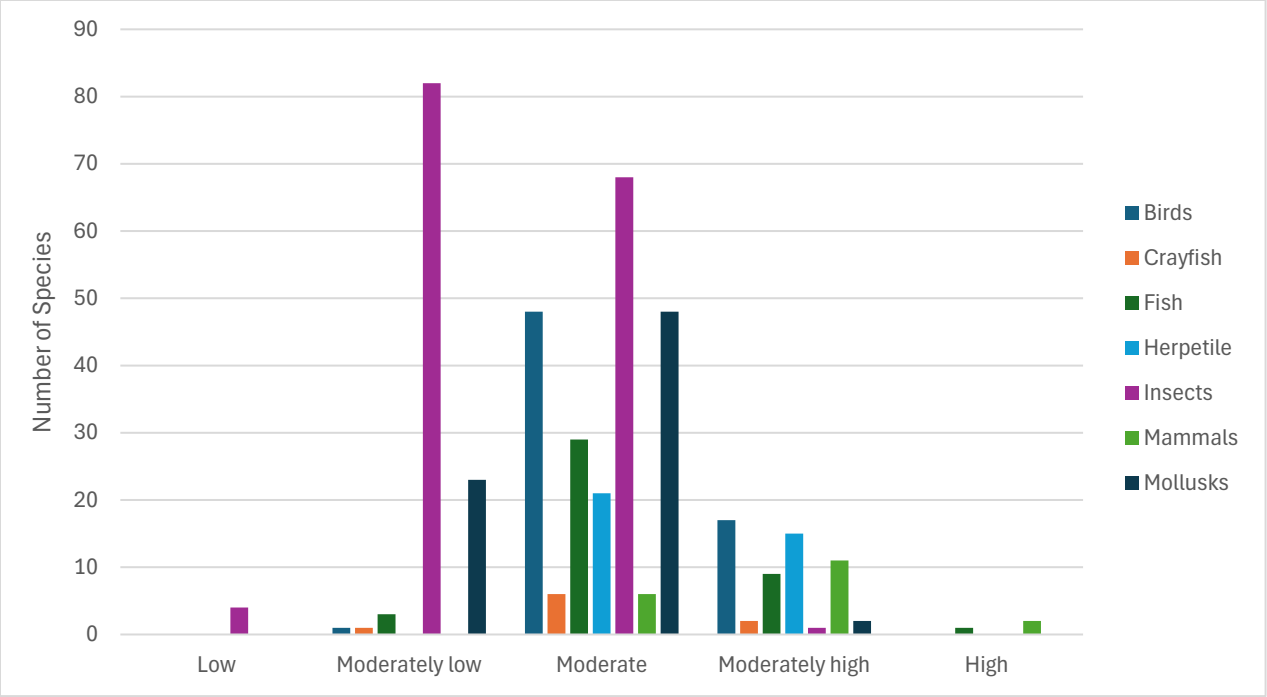

Figure 2. Bar graph of species evaluated, and overall adaptive capacity (AC) rank sorted by taxonomic groupings.

Insects

Overall, insects were found to have low to moderate AC. Of the 155 insect species evaluated, 4 (2.6%) species were evaluated as having low overall adaptive capacity, 83 (53.2%) were evaluated as having moderately low adaptive capacity, 67 (42.9%) were evaluated to have moderate adaptive capacity, and 1 (0.6%) was evaluated to have moderately high adaptive capacity (Table 4). The highest scoring attribute groups for insects evaluated were life history (moderate, score = 0.60) and distribution (moderate, score = 0.56). The lowest scoring attribute groups were evolutionary potential (low, score = 0.13) and movement (low, score = 0.17) (Figure 4). All insects we evaluated scored low for the AC attributes of parity and dispersal phase (n = 155 species for each), and many insects we evaluated scored high on the metrics for extent of occurrence (n = 141) and parental investment (n = 144). In addition, dispersal syndrome was either low (n = 109) or unknown/NA for all insects evaluated. The only insect evaluated to have moderately high adaptive capacity was the Great Plains tiger beetle (*Amblychelia cylindriformis*; AC score = 0.61), and the insect evaluated to have the lowest overall adaptive capacity was the Eastern carder bee (*Anthidiellum notatum*; AC score = 0.11). Of the ten insects with the highest evaluated adaptive capacity there were two tiger beetles, three grasshoppers, and one each of a dragonfly, butterfly, bumble bee, katydid, and spittlebug. Comparing this to the ten insect species with the lowest evaluated overall AC which contained two butterflies, two moths, two caddisflies, a longhorn beetle, a solitary bee, a tree cricket, and a locust. The two lowest scoring insects scored similarly to the highest scoring

insects in the life history and demography AC groups but differed the most in the distribution and movement AC groups where they scored significantly lower.

When divided into smaller taxonomic groups within insects (e.g., bumble bees, lepidopterans) few trends could be identified. Leafhoppers and planthoppers were the insect group with the lowest scoring overall AC (n = 7, average AC moderately low, score = 0.29), with the lowest scores in the movement and ecologic role AC metric groups. Bumble bees (n = 7) were all evaluated to have moderate overall AC (score range from 0.58 - 0.44) with the lowest scoring bumble bee species being the federally listed rusty-patched bumble bee (*Bombus affins*). The rusty-patched bumble bee appears to be limited in its AC by factors including geographic rarity, population size, and physiological tolerances. Aquatic insects (e.g., caddisflies, stoneflies, and mayflies) experienced a unique trend with little primary literature available on these groups; and as such many were evaluated on genus level information with area of occupancy and diet breadth as the few traits that differed between species. Within lepidopterans, the major factors that differed between the species with the highest and lowest AC scores were in the evolutionary potential and distribution attribute groups; many of the lepidopterans with lower overall AC scored unknown for many individual attributes in these groups.

Figure 3. Rusty-patched bumble bee (*Bombus affinis*) had the lowest AC of bumble bee species evaluated. Photo credit: Dave Cuthrell.

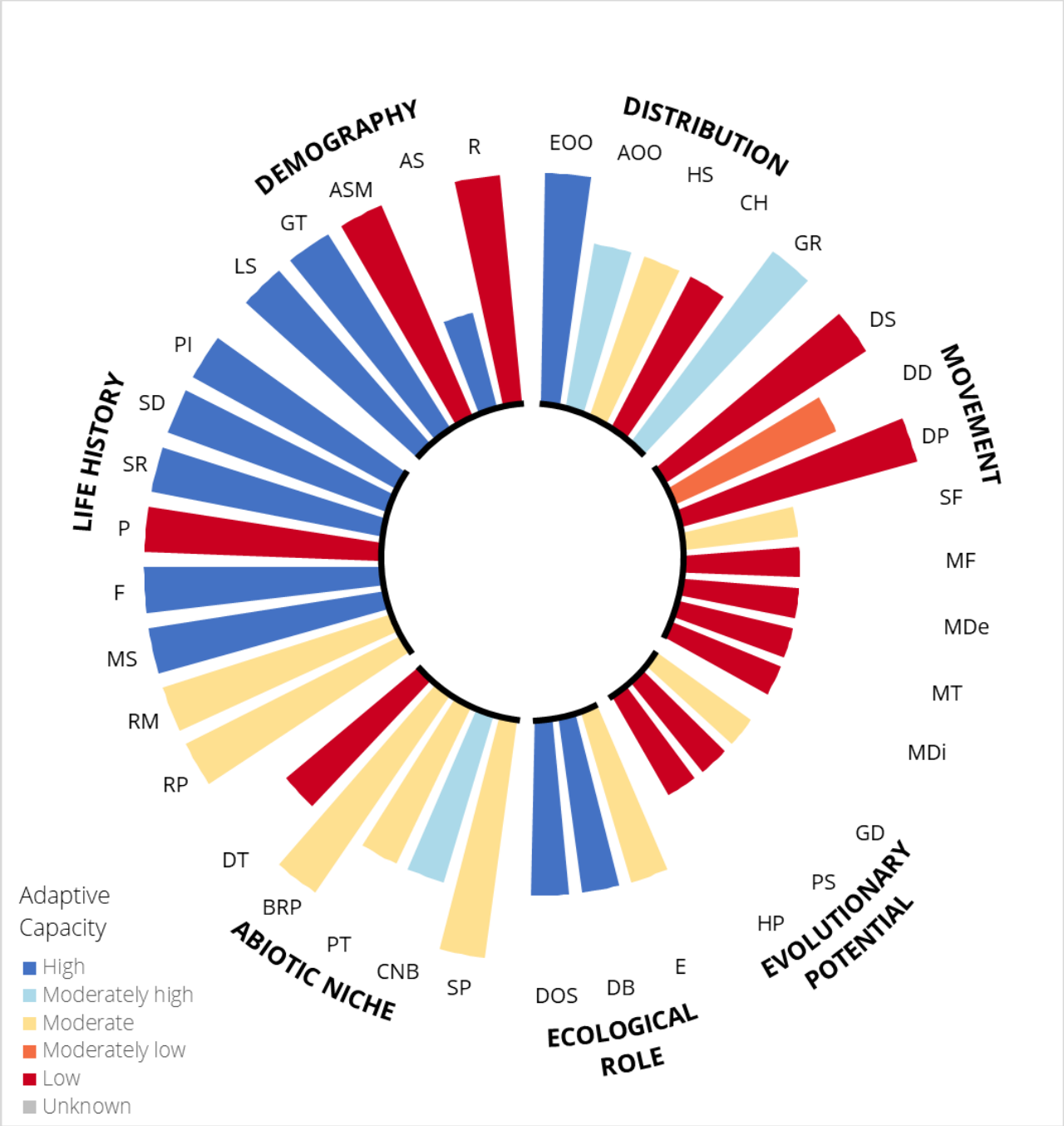

Figure 4. Summary of AC scores for insects evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Table 4. AC level and score for the 155 insect species assessed.

Scientific Name	Common Name	AC Level	AC Score
Aquatic Insects (Caddisflies, Stoneflies, Mayflies)			
Acroneuria ozarkensis	Ozark stone	Moderately low	0.35
Agapetus artesus	Artesian Agapetus caddisfly	Moderately low	0.21
Agnetina annulipes	Southern stone	Moderate	0.46

Anabolia ozburni	Ozburn's Northern caddisfly	Moderately low	0.31
Analetris eximia	Extraordinary bow-legged minnow mayfly	Moderately low	0.3
Attaneuria ruralis	Giant stone	Moderate	0.41
Baetisca obesa	Fork-headed armored mayfly	Moderately low	0.38
Glyphopsyche missouri	Missouri glyphopsyche caddisfly	Moderately low	0.22
Goera stylata	Stalked weighted-case caddisfly	Moderately low	0.35
Helopicus nalatus	Ozark springfly	Moderately low	0.38
Holocentropus milaca	A Polycentropodid caddisfly	Moderately low	0.34
Homoeoneuria ammophila	Sand-loving brush-legged mayfly	Moderately low	0.34
Homoplectra doringa	A hydropsychid caddisfly	Moderately low	0.39
Hydroptila waskesia	Waskesiu microcaddisfly	Moderately low	0.31
Isogenoides varians	Rock island springfly	Moderately low	0.39
Limnephilus janus	Two-faced Northern caddisfly	Moderately low	0.31
Maccaffertium bednariki	A flat-headed mayfly	Moderately low	0.29
Ochrotrichia contorta	Contorted ochrotrichian micro caddisfly	Moderately low	0.27
Perlesta dakota	Dakota Stone	Moderately low	0.39
Protoptila erotica	Erotic saddle-case caddisfly	Moderately low	0.38
Serratella frisoni	Frison's serratellan mayfly	Moderately low	0.36
Siphloplecton interlineatum	Flapless cleft-footed minnow mayfly	Moderately low	0.36
Sparbarus lacustris	Lacustrine small square-gilled mayfly	Moderately low	0.37
Triaenodes flavescens	Bronze long-horned caddisfly	Moderately low	0.36
Coleoptera (Beetles)			
Amblycheila cylindriformis	Great Plains tiger beetle	Moderately high	0.61
Brychius hungerfordi	Hungerford's crawling water beetle	Moderately low	0.34
Cicindela marginipennis	Cobblestone tiger beetle	Moderate	0.54
Dryobius sexnotatus	Six-banded longhorn beetle	Low	0.18
Ellipsoptera lepida	Ghost tiger beetle	Moderate	0.58
Ellipsoptera nevadica makosika	Indian Creek tiger beetle	Moderate	0.40
Liodessus cantralli	Cantrall's bog beetle	Moderate	0.52
Nicrophorus americanus	American burying beetle	Moderate	0.49
Hymenoptera (Bumble bees, solitary bees)			
Andrena rubi	An andrenid bee	Moderately low	0.25
Anthidiellum notatum	Eastern carder bee	Low	0.11
Bombus affinis	Rusty patched bumble bee	Moderate	0.44
Bombus bohemicus	Ashton cuckoo bumble bee	Moderate	0.46
Bombus borealis	Northern amber bumble bee	Moderate	0.56
Bombus fervidus	Yellow bumble bee	Moderate	0.54
Bombus pennsylvanicus	American bumble bee	Moderate	0.55
Bombus sandersoni	Sanderson's bumble bee	Moderate	0.56
Bombus terricola	Yellow banded bumble bee	Moderate	0.56
Bombus vagans	Half-black bumble bee	Moderate	0.58

Coelioxys hunteri	A leafcutter bee	Moderately low	0.3
Lasioglossum fedorense	A sweat bee	Moderately low	0.36
Lasioglossum oenotherae	Evening primrose sweat bee	Moderately low	0.4
Lasioglossum heterognathus	Wide-mouthed sweat bee	Moderately low	0.35
Osmia subfasciata	A mason bee	Moderate	0.47
Lepidoptera (Butterflies, skippers, and moths)			
Acronicta dolli	Doll's dagger moth	Moderate	0.49
Acronicta falcula	Corylus dagger moth	Moderately low	0.25
Acronicta funeralis	Funerary dagger moth	Moderate	0.5
Amblyscirtes belli	Bell's roadside skipper	Moderately low	0.31
Amblyscirtes linda	Linda's roadside skipper	Moderately low	0.24
Argynnis atlantis pahasapa	Pahasapa fritillary	Moderately low	0.37
Argynnis idalia	Regal fritillary	Moderate	0.48
Atrytone arogos	Arogos skipper	Moderately low	0.31
Atrytonopsis hianna	Dusted skipper	Moderately low	0.36
Battus philenor	Pipevine swallowtail	Moderate	0.53
Boloria chariclea	Arctic fritillary	Moderate	0.48
Boloria freija	Freija fritillary	Moderate	0.46
Boloria frigga	Frigga fritillary	Moderate	0.52
Brachionycha borealis	Boreal brachionycha	Moderately low	0.27
Calephelis muticum	Swamp metalmark	Moderately low	0.31
Callophrys irus	Frosted elfin	Moderately low	0.3
Catocala abbreviatella	Abbreviated underwing	Moderately low	0.36
Catocala amestris	Three-staff underwing	Moderate	0.41
Catocala dulicola	Quiet underwing	Moderate	0.46
Catocala illecta	Magdalen underwing	Moderate	0.53
Catocala whitneyi	Whitney's underwing	Moderately low	0.3
Copablepharon michiganensis	Michigan dune dart moth	Low	0.17
Cycnia collaris	Unexpected milkweed moth	Moderate	0.52
Danaus plexippus	Monarch	Moderate	0.54
Dargida rubripennis	Pink streak	Moderately low	0.39
Dichagyris reliqua	Relict dart moth	Moderately low	0.23
Eacles imperialis pini	Imperial pine moth	Moderate	0.43
Erebia discoidalis	Red-disked alpine	Moderate	0.53
Erebia mancinus	Taiga alpine	Moderate	0.52
Erora laeta	Early hairstreak	Moderate	0.4
Erynnis martialis	Mottled duskywing	Moderately low	0.29
Erynnis persius persius	Persius duskywing	Moderately low	0.27
Euchloe ausonides	Large marble	Moderate	0.47
Eucosma bipunctella	Two-spotted eucosma	Moderately low	0.33
Eucosma giganteana	Giant eucosma moth	Moderately low	0.39
Euphyes dukesi	Dukes' skipper	Moderately low	0.32
Euxoa aurulenta	Dune cutworm	Moderately low	0.35

Hemaris gracilis	Slender clearwing	Moderate	0.44
Hesperia dacotae	Dakota skipper	Moderately low	0.38
Hesperia metea	Cobweb skipper	Moderate	0.49
Hesperia ottoe	Ottoe skipper	Moderately low	0.35
Hesperia sassacus	Indian skipper	Moderate	0.59
Lasionycta secedens	A noctuid moth	Moderately low	0.36
Lasionycta taigata	A noctuid moth	Moderately low	0.35
Meropleon ambifusca	Newman's brocade	Moderately low	0.33
Neonympha mitchellii mitchellii	Mitchell's satyr	Moderately low	0.29
Oarisma poweshiek	Poweshiek skipperling	Moderately low	0.23
Oeneis macounii	Macoun's arctic	Moderate	0.41
Papaipema astuta	Yellow stoneroot borer	Moderately low	0.28
Papaipema aweme	Aweme borer moth	Moderately low	0.26
Papaipema beeriana	Blazing star stem borer	Moderately low	0.25
Papaipema cerina	Golden borer moth	Moderately low	0.29
Papaipema maritima	Maritime sunflower borer moth	Moderately low	0.28
Papaipema sciata	Culver’s root borer	Moderately low	0.28
Papaipema silphii	Silphium borer moth	Moderately low	0.28
Papaipema speciosissima	Osmunda borer moth	Moderately low	0.28
Papilio joanae	Ozark swallowtail	Moderately low	0.33
Photedes includens	Included cordgrass borer moth	Moderately low	0.23
Photedes inops	Spartina moth	Moderately low	0.23
Phyciodes batesii	Tawny crescent	Moderate	0.48
Pieris oleracea	Eastern veined white	Moderate	0.52
Plebejus idas nabokovi	Nabokov's blue	Moderately low	0.25
Plebejus samuelis	Karner blue	Moderately low	0.33
Poanes massasoit	Mulberrywing skipper	Moderately low	0.36
Poanes viator	Broad-winged skipper	Moderate	0.51
Polygonia gracilis	Hoary comma	Moderate	0.54
Polygonia progne	Gray comma	Moderate	0.54
Proserpinus flavofasciata	Yellow-banded day sphinx moth	Moderately low	0.31
Proserpinus juanita	Juanita sphinx moth	Moderate	0.55
Pyrgus centaureae wyandot	Grizzled skipper	Moderately low	0.2
Satyrium favonius ontario	Northern oak hairstreak	Moderate	0.41
Schinia hulstia	Hulst's flower moth	Moderately low	0.29
Schinia indiana	Phlox moth	Moderately low	0.36
Schinia lucens	Leadplant flower moth	Moderately low	0.29
Xestia mixta	Mixta xestia moth	Moderately low	0.34
Odonata (Dragonflies and Damselflies)			
Aeshna sitchensis	Zigzag darner	Moderate	0.51
Aeshna subarctica	Subarctic darner	Moderate	0.51
Epitheca petechialis	Dot-winged baskettail	Moderate	0.57
Gomphurus ventricosus	Skillet clubtail	Moderate	0.46

Nannothemis bella	Elfin skimmer	Moderate	0.43
Ophiogomphus anomalus	Extra-striped clubtail	Moderate	0.43
Ophiogomphus howei	Pygmy snaketail	Moderate	0.45
Somatochlora hineana	Hine's emerald dragonfly	Moderate	0.50
Somatochlora incurvata	Incurvate emerald	Moderate	0.51
Stylurus amnicola	Riverine clubtail	Moderate	0.49
Tachopterix thoreyi	Grey petaltail	Moderate	0.53
Williamsonia fletcheri	Ebony boghaunter	Moderate	0.46
Orthoptera (Grasshoppers, crickets, katydids)			
Appalachia arcana	Michigan bog grasshopper	Moderately low	0.22
Melanoplus flavidus	Green desert grasshopper	Moderate	0.57
Melanoplus viridipes	Green-legged grasshopper	Moderate	0.54
Melanoplus walshii	Walsh's short-winged grasshopper	Moderate	0.52
Neoconocephalus lyristes	Bog conehead	Moderate	0.51
Oecanthus laricis	Tamarack tree cricket	Low	0.19
Orchelimum concinnum	Red-faced meadow katydid	Moderate	0.55
Orphulella delicatum	Delicate meadow katydid	Moderate	0.58
Orphulella pelidna	Green desert grasshopper	Moderate	0.59
Paroxya hoosier	Hoosier grasshopper	Moderately low	0.39
Psinidia fenestralis	Atlantic-coast locust	Moderate	0.59
Trimerotropis huroniana	Lake Huron locust	Moderately low	0.34
Miscellaneous Insects			
Auridius sandaraca	Sanders' golden leafhopper	Moderately low	0.31
Dorydiella kansana	Kansan spikerush leafhopper	Moderately low	0.32
Fitchiella robertsonii	Robertson's flightless planthopper	Moderately low	0.25
Flexamia huroni	Lake Huron leafhopper	Moderately low	0.28
Flexamia reflexa	Reflexed bluestem leafhopper	Moderate	0.43
Lepyronia angulifera	Angular spittlebug	Moderate	0.43
Lepyronia gibbosa	Great Plains spittle bug	Moderate	0.56
Limotettix elegans	Elegant spikerush leafhopper	Moderately low	0.31
Polyamia herbida	Prairie panic grass leafhopper	Moderately low	0.30

Birds

Of the 66 bird species we evaluated, none had high or low levels of AC. The majority of species (73%, n = 48) had moderate AC, while 17 species (26%) had moderately high AC and only one (1.5%) species had moderately low AC (Table 5). The highest scoring attribute groups were ecological role (moderately high, score = 0.75) and distribution (moderately high, score = 0.67), while the lowest scoring groups were abiotic niche (low, score = 0.17) and demography (moderate, score = 0.46) (Figure 6). Of the attributes that exhibited some interspecific variation, the greatest number of species scored low for migration timing (n = 57) and parental investment (n = 45), while the greatest number of species scored high for extent of occurrence (n = 65) and migration frequency (n = 64). Among major groups of birds, shorebirds (n = 7),

seabirds (n = 5), and marsh birds (n = 8) had the lowest average scores, while raptors (n = 10), woodpeckers (n = 2), and upland game birds (n = 3) had the highest average scores. Species primarily associated with wetland (n = 17) and river/stream (n = 2) habitats had the lowest average scores, while species associated with open landscapes (n = 7) and grassland (n = 8) habitats had the highest average scores.

Relative to average scores for all bird species, the ten lowest-scoring species were characterized by below average scores in the movement, distribution, and abiotic niche attribute groups, while the ten highest-scoring species were characterized by above average scores in the abiotic niche, distribution, and ecological role attribute groups. When directly comparing the ten highest- and lowest scoring species, the largest differences in average score were present in the abiotic niche, movement, and distribution attribute groups. Conversely, the smallest differences were present in the life history and demography attribute groups. Within the abiotic niche group, lower scoring species were more restricted to a particular climatic or

Figure 5. Prothonotary warblers (*Protonotaria citrea*) were assessed as having moderate AC, with attributes related to their abiotic niche being the most limiting. Photo credit: Aaron Kortenhoven.

hydrological condition considered vulnerable to climate change. For movement attributes, lower scoring species exhibited a higher degree of site fidelity and were more likely to be complete, long-distance migrants. When considering distribution attributes, low scoring species exhibited a higher degree of habitat specialization and were less tolerant of human interactions and infrastructure. Additionally, lower scoring species were more likely to be negatively

affected by native or non-native species because of climate change, were less tolerant of disturbance events, and exhibited a reduced capacity to adjust the timing of breeding events in response to environmental conditions.

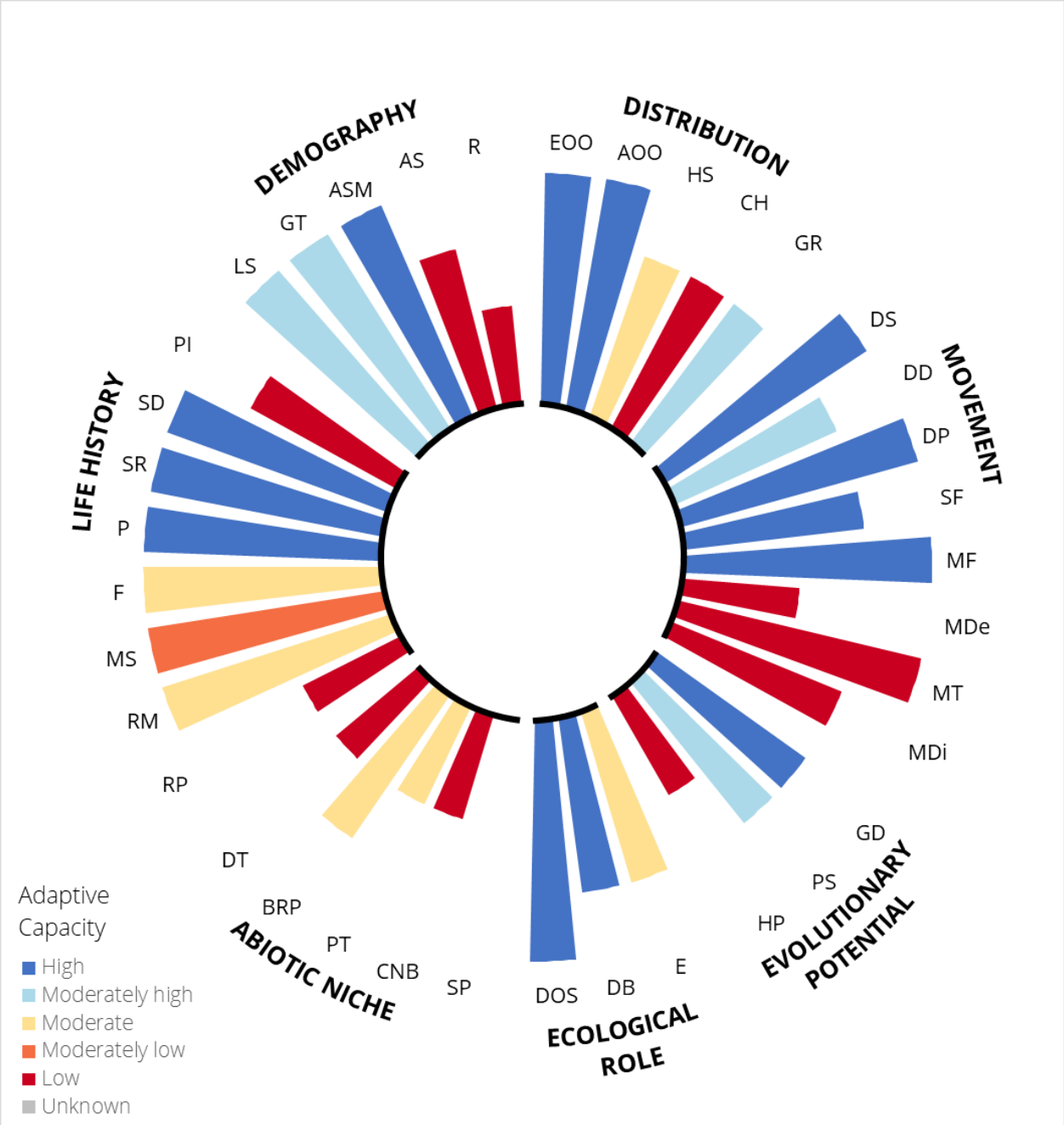

Figure 6. Summary of AC scores for birds evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Table 5. AC level and score for the 66 bird species assessed.

Scientific Name	Common Name	AC Level	AC score
Aquatic birds			
Anas rubripes	American black duck	Moderately high	0.63
Gavia immer	Common loon	Moderate	0.52
Podiceps grisegena	Red-necked grebe	Moderate	0.51
Marsh birds			
Botaurus lentiginosus	American bittern	Moderate	0.4
Butorides virescens	Green heron	Moderate	0.57
Coturnicops noveboracensis	Yellow rail	Moderate	0.42
Gallinula galeata	Common gallinule	Moderately high	0.61
Ixobrychus exilis	Least bittern	Moderate	0.46
Nycticorax nycticorax	Black-crowned night-heron	Moderately high	0.6
Rallus elegans	King rail	Moderate	0.49
Rallus limicola	Virginia rail	Moderate	0.59
Nightjars			
Antrostomus vociferus	Eastern whip-poor-will	Moderate	0.52
Caprimulgus carolinensis	Chuck-will's-widow	Moderate	0.54
Chordeiles minor	Common nighthawk	Moderate	0.52
Passerines			
Ammodramus savannarum	Grasshopper sparrow	Moderately high	0.67
Ammospiza leconteii	LeConte's sparrow	Moderate	0.54
Ammospiza nelsoni	Nelson's Sparrow	Moderate	0.48
Centronyx henslowii	Henslow's sparrow	Moderate	0.56
Cinclus mexicanus	American dipper	Moderate	0.53
Cistothorus palustris	Marsh wren	Moderate	0.58
Cistothorus stellaris	Sedge wren	Moderate	0.52
Coccothraustes vespertinus	Evening grosbeak	Moderate	0.48
Cyanocitta cristata	Blue jay	Moderately high	0.73
Helmitheros vermivorum	Worm-eating warbler	Moderate	0.48
Hylocichla mustelina	Wood thrush	Moderate	0.52
Lanius ludovicianus migrans	Migrant loggerhead shrike	Moderate	0.48
Oporornis agilis	Connecticut warbler	Moderate	0.44
Parkesia motacilla	Louisiana waterthrush	Moderate	0.5
Poecile hudsonicus	Boreal chickadee	Moderate	0.54
Protonotaria citrea	Prothonotary warbler	Moderate	0.51
Setophaga caerulescens	Black-throated blue warbler	Moderate	0.58
Setophaga cerulea	Cerulean warbler	Moderate	0.55
Setophaga citrina	Hooded warbler	Moderate	0.58
Setophaga kirtlandii	Kirtland's warbler	Moderate	0.41
Spiza americana	Dickcissel	Moderately high	0.63
Sturnella magna	Eastern meadowlark	Moderate	0.6
Tyrannus tyrannus	Eastern kingbird	Moderately high	0.65

Vermivora chrysoptera	Golden-winged warbler	Moderate	0.51
Xanthocephalus xanthocephalus	Yellow-headed blackbird	Moderate	0.52
Raptors			
Accipiter atricapillus	American goshawk	Moderate	0.58
Aquila chrysaetos	Golden eagle	Moderately high	0.62
Asio flammeus	Short-eared owl	Moderately high	0.62
Asio otus	Long-eared owl	Moderate	0.58
Athene cunicularia	Burrowing owl	Moderate	0.59
Circus hudsonius	Northern harrier	Moderately high	0.63
Falco peregrinus	Peregrine falcon	Moderately high	0.68
Falco sparverius	American kestrel	Moderately high	0.71
Haliaeetus leucocephalus	Bald eagle	Moderately high	0.65
Tyto alba	Barn owl	Moderately high	0.67
Seabirds			
Chlidonias niger	Black tern	Moderate	0.53
Hydroprogne caspia	Caspian tern	Moderate	0.5
Pelecanus erythrorhynchos	American white pelican	Moderate	0.49
Sterna hirundo	Common tern	Moderately high	0.61
Sterna forsteri	Forster's tern	Moderate	0.47
Shorebirds			
Bartramia longicauda	Upland sandpiper	Moderate	0.53
Charadrius melodus	Piping plover	Moderate	0.47
Numenius americanus	Long-billed curlew	Moderate	0.47
Phalarous tricolor	Wilson's phalarope	Moderate	0.5
Pluvialis dominica	American golden-Plover	Moderate	0.51
Scolopax minor	American woodcock	Moderate	0.59
Tringa solitaria	Solitary sandpiper	Moderately low	0.38
Upland game birds			
Canachites canadensis	Spruce grouse	Moderate	0.52
Colinus virginianus	Northern bobwhite	Moderately high	0.61
Tympanuchus phasianellus	Sharp-tailed grouse	Moderate	0.59
Woodpeckers			
Melanerpes erythrocephalus	Red-headed woodpecker	Moderately high	0.63
Picoides arcticus	Black-backed woodpecker	Moderate	0.5

Mammals

Mammals had the highest average AC score of the taxonomic groups that were assessed, and no species scored lower than moderate. Of the 19 species, 11 (58%) were scored at moderately high AC, while six species (32%) had moderate AC, and two species (10%) had high AC (Table 6). The highest scoring attribute groups were ecological role (moderately high, score = 0.78) and distribution (moderately high, score = 0.73), while the lowest scoring groups were evolutionary potential (moderate, score =0.43) and demography (moderately high, score = 0.60) (Figure 8). Of individual attributes that exhibited some interspecific variation, the greatest number of

species scored low for parental investment (n =18), fecundity, and site fidelity (n = 7 for both), while the greatest number of species scored high for area of occupancy (n = 18) and dispersal phase (n = 17). Relative to average scores for all mammals, the three lowest scoring species (Indiana bat (*Myotis sodalis*), northern bog lemming (*Synaptomys borealis*), and evening bat (*Nycticeius humeralis*)) were characterized by much lower abiotic niche and evolutionary potential scores, while the three highest scoring species (northern flying squirrel (*Glaucomys sabrinus*), long-tailed weasel (*Neogale frenata*), and gray wolf (*Canis lupus*)) were well above average for both.

Bats (n = 6) had lower average AC (moderate, score = 0.57) than other mammal species (moderately high, score = 0.71), with lower average scores for all attribute groups except ecological role. Relative to average values for all bat species, the two species with moderately high AC (hoary bat (*Lasiurus cinereus*) and little brown bat (*Myotis lucifugus*)) had much higher evolutionary potential and abiotic niche scores. In contrast, the lowest scoring species (Indiana bat) had well below average distribution, abiotic niche, and demography scores. Relative to hoary and little brown bats, Indiana bats were found to occupy less overall area, be more geographically restricted, be less tolerant of human interactions and infrastructure, have lower genetic diversity, and have a lower tolerance for disturbance events. Among the remaining mammals (n = 13), species with high AC (n = 2) had considerably higher abiotic niche and ecological role scores than species with moderate AC (n = 2). Both moderate AC species (i.e., northern bog lemming, Eastern heather vole (*Phenacomys ungava*)) were more restricted to a particular climatic condition considered vulnerable to climate change, and Northern bog lemming additionally had reduced diet flexibility. In contrast to these attribute groups, life history and demography attributes varied little between these species.

Figure 7. A cluster of little brown bats (*Myotis lucifugus)* hibernating in an abandoned mine in Michigan's Upper Peninsula. Photo Credit: Nicolette Sexton.

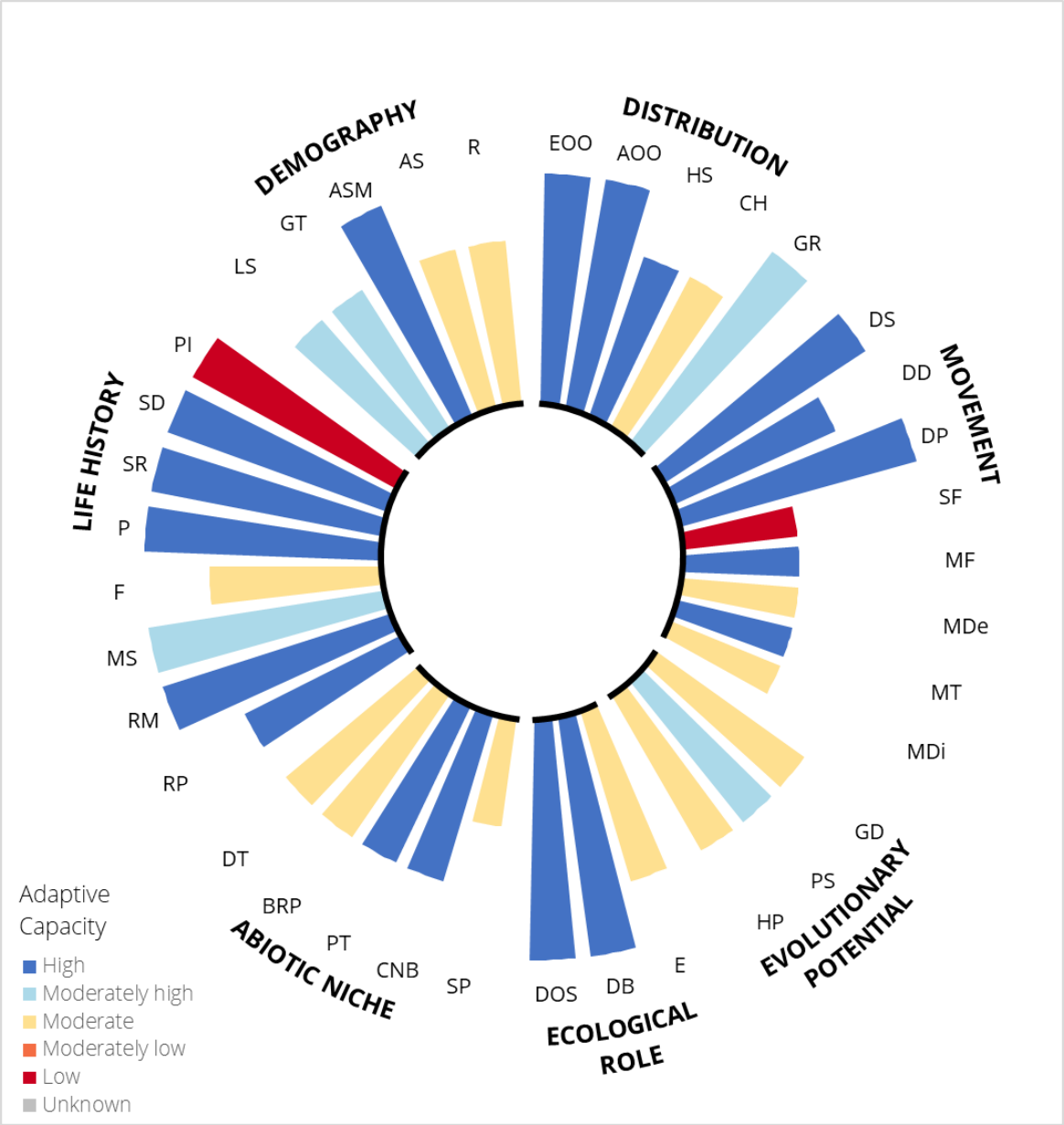

Figure 8. Summary of AC scores for mammals evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Table 6. AC level and score for the 19 mammal species assessed.

Scientific Name	Common Name	AC Level	AC Score
Alces americanus	Moose	Moderately high	0.68
Canis lupus	Gray wolf	High	0.86
Cryptotis parva	Least shrew	Moderately high	0.67
Felis concolor	Cougar	Moderately high	0.77
Glaucomys sabrinus	Northern flying squirrel	Moderately high	0.79
Lasiurus cinereus	Hoary bat	Moderately high	0.66
Lynx canadensis	Canada lynx	Moderately high	0.72

Microtus ochrogaster	Prairie vole	Moderately high	0.71
Microtus pinetorum	Woodland vole	Moderately high	0.68
Myotis lucifugus	Little brown bat	Moderately high	0.67
Myotis septentrionalis	Northern long-eared bat	Moderate	0.56
Myotis sodalis	Indiana bat	Moderate	0.46
Neogale frenata	Long-tailed weasel	High	0.83
Nycticeius humeralis	Evening bat	Moderate	0.51
Perimyotis subflavus	Tricolored bat	Moderate	0.57
Phenacomys ungava	Eastern heather vole	Moderate	0.58
Sylvilagus aquaticus	Swamp rabbit	Moderately high	0.69
Synaptomys borealis	Northern bog lemming	Moderate	0.47
Vulpes velox	Swift fox	Moderately high	0.77

Fish

Fish had a relatively moderate AC score. Of the 42 fish species we evaluated, one (2.3%) had high overall AC, three (7.1%) were evaluated as having moderately low AC, 29 (69%) were evaluated as moderate AC, and nine (21.4%) were evaluated as moderately high AC (Table 7). Fish scored the highest in the ecological role attribute group (moderately high, score = 0.69) and lowest in the abiotic niche attribute group (moderately low, score = 0.29). Every fish species scored high on the sex determination, dispersal syndrome and fecundity attributes, though evidence for these metrics could vary greatly between species. Most fish species evaluated also scored high in the age structure (n = 41) and diversity of obligate species (n = 40) attributes. Fish also tended to score low on the attributes of recruitment (n = 39), reproductive mode (n = 41) and disturbance tolerances (n = 38) (Figure 9).

When evaluating the AC of fish, extremes of high and low evaluated traits could be seen. Even in the three fish that were evaluated as having moderately low overall AC; high scores in the life history and demography attribute groups may have inflated the overall score of these species. Many of the lowest scoring fish also tended to be small bodied, slow-moving species, including two Ozark minnows (Niangua darter (*Etheostoma nianguae*) and Ozark shiner (*Notropis ozarcanus*)) and the Hoosier cavefish (*Amblyopsis hoosieri*) which had the lowest overall AC scores for fish (moderately low, score = 0.4). In contrast, the three fish species with the highest overall AC are the blue catfish (*Ictalurus furcatus*), river darter (*Percina shumardi*), and sauger (*Sander canadensis*), which all scored higher than average in the areas of occupancy, dispersal distance, and population size attributes. Finally, fish tended to score low for commensalism with humans, with all 42 fish evaluated as having low commensalism, with structures such as dams posing a threat to most fish species.

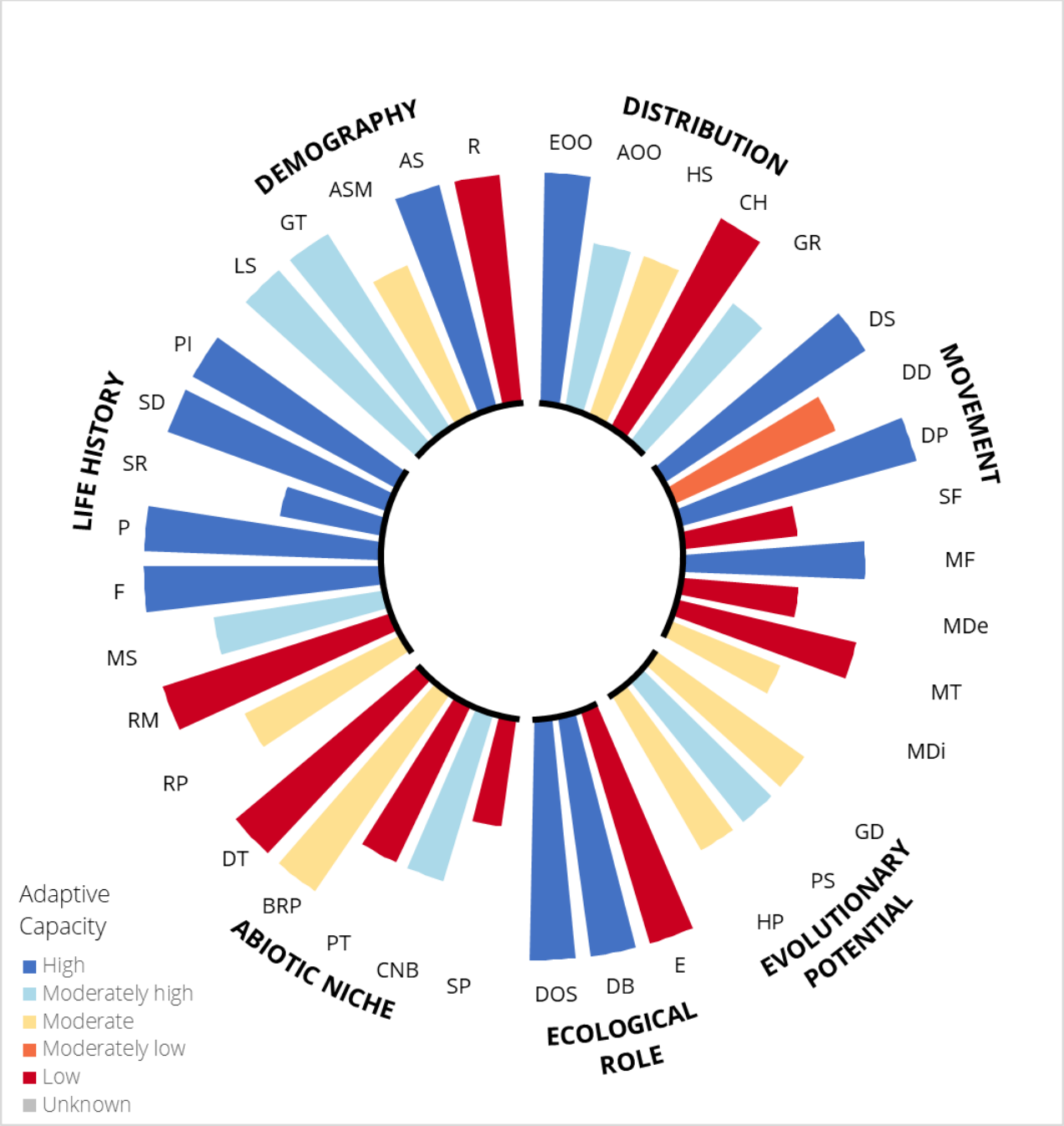

Figure 9. Summary of AC scores for fish evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Figure 10. Channel darter (*Percina copelandi*) from the Au Sable River watershed, Michigan. Photo credit: Peter Badra.

Table 7. AC level and score for the 42 fish species assessed.

Scientific Name	Common Name	AC Level	AC score
Acipenser fulvescens	Lake sturgeon	Moderate	0.53
Amblyopsis hoosieri	Hoosier cavefish	Moderately low	0.4
Ammocrypta clara	Western sand darter	Moderate	0.54
Ammocrypta pellucida	Eastern sand darter	Moderate	0.55
Chrosomus erythrogaster	Southern redbelly Dace	Moderate	0.56
Clinostomus elongatus	Redside dace	Moderate	0.57
Coregonus artedi	Cisco	Moderately high	0.62
Coregonus kiyi	Kiyi - Upper Great Lakes	Moderate	0.53
Coregonus Nipigon	Nipigon cisco	Moderate	0.57
Coregonus zenithicus	Shortjaw cisco	Moderate	0.58
Cottus ricei	Spoonhead sculpin	Moderate	0.6
Couesius plembeus	Lake chub	Moderately high	0.61
Crystallaria asprella	Crystal darter	Moderate	0.49

Elassoma zonatum	Banded pygmy sunfish	Moderate	0.51
Erimyzon claviformis	Western creek chubsucker	Moderately high	0.61
Etheostoma microperca	Least darter	Moderate	0.55
Etheostoma nianguae	Niangua darter	Moderately low	0.39
Etheostoma spectabile	Orangethroat darter	Moderate	0.6
Fundulus dispar	Starhead topminnow	Moderate	0.58
Hiodon tergisus	Mooneye	Moderately high	0.62
Ichtyomyzon fossor	Northern brook lamprey	Moderate	0.48
Ictalurus furcatus	Blue catfish	High	0.83
Lepisosteus oculatus	Spotted gar	Moderate	0.6
Lota lota	Burbot	Moderate	0.6
Moxostoma carinatum	River redhorse	Moderate	0.53
Notropis anogenus	Pugnose shiner	Moderate	0.51
Notropis dorsalis	Bigmouth shiner	Moderately high	0.61
Notropis ozarcanus	Ozark shiner	Moderately low	0.36
Notropis photogenis	Silver shiner	Moderate	0.6
Noturus miurus	Brindled madtom	Moderate	0.47
Noturus stigmosus	Northern madtom	Moderate	0.54
Opsopoeodus emiliae	Pugnose minnow	Moderate	0.5
Percina copelandi	Channel darter	Moderate	0.57
Percina cymatotaenia	Bluestripe darter	Moderate	0.43
Percina evides	Gilt darter	Moderate	0.57
Percina shumardi	River darter	Moderately high	0.65
Percopsis omiscomaycus	Trout perch	Moderate	0.58
Polyodon spathula	Paddlefish	Moderate	0.54
Rhinichthys cataractae	Longnose dace	Moderately high	0.61
Salvelinus fontinalis	Brook trout	Moderately high	0.64
Sander canadensis	Sauger	Moderately high	0.67
Thymallus articus	Arctic grayling	Moderate	0.57

Crayfish

In total, we evaluated nine crayfish species. Of these, six (67%) were evaluated to have moderate AC, two (22%) were evaluated to have moderately high AC, and one (11%) was evaluated to have moderately low overall AC (Table 8). Evaluated crayfish were largely similar across AC metrics. The largest identifiable trend in crayfish is that all species except the big water crayfish (*Cambarus robustus*) were evaluated as having a low score for the enemies metric, showing a vulnerability to more climate adapted invasive species (Figure 11). In addition, for many Ozark crayfish species, species range was a limiting factor with lower areas of occupancy compared to other crayfish. The lowest scoring crayfish, the Caney Mountain Cave crayfish (*Orconectes stygocaneyi*), is only known from a single cave complex and was the only cave crayfish evaluated. This species scored low or moderately low across 14 evaluated

metrics, apart from traits in the life history and ecological role attribute groups that were moderate to moderately high, similar to the scores for all crayfish that were evaluated.

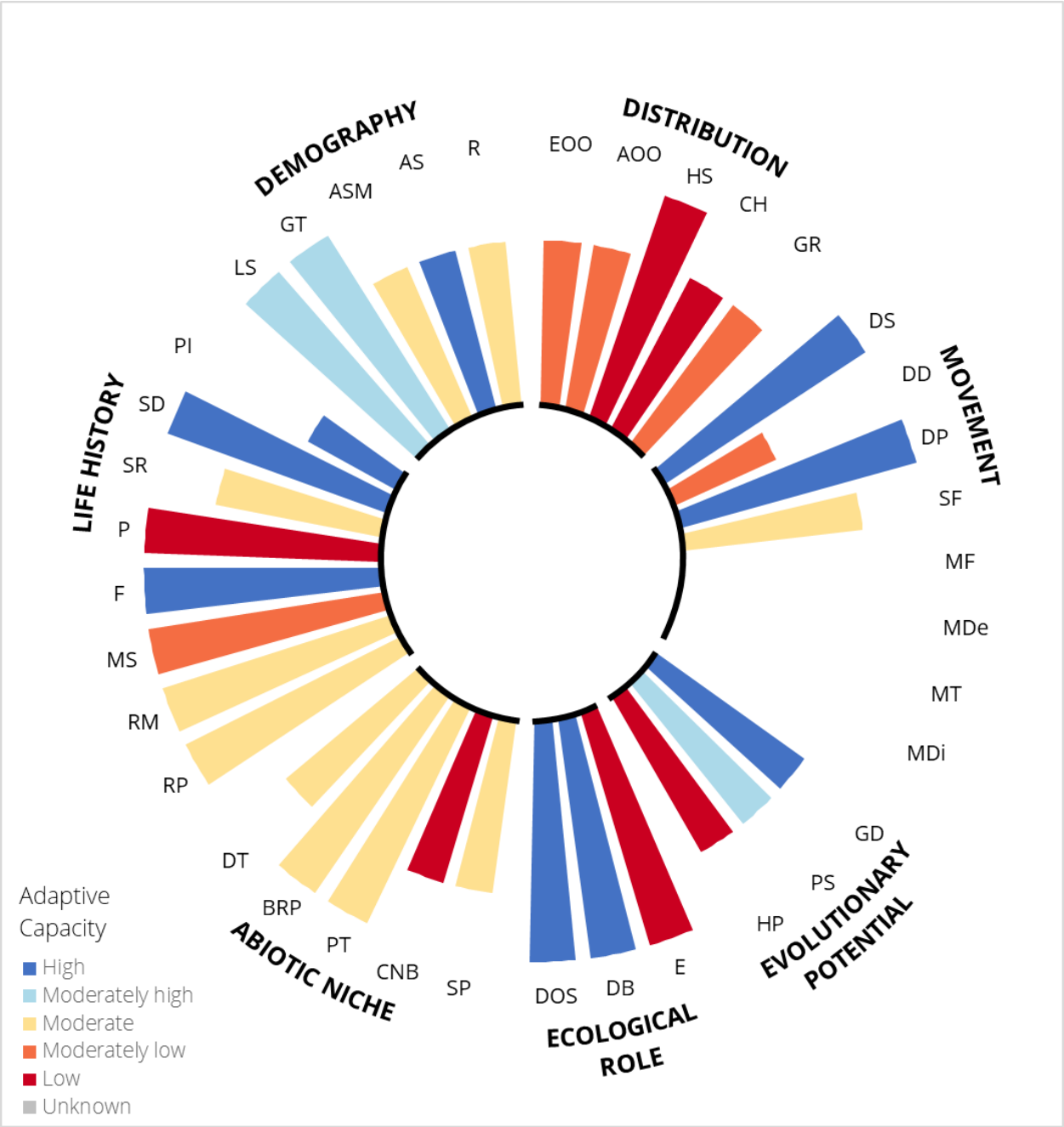

Figure 11. Summary of AC scores for crayfish evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Figure 12. Calico crayfish (*Faxonius immunis*). Of crayfish evaluated calico crayfish scored a moderately high AC, but still scored low in the enemies AC metric. Photo credit: Dan Earl.

Table 8. AC level and score for the nine crayfish species assessed.

Scientific Name	Common Name	AC Level	AC Score
Cambarus maculatus	Freckled crayfish	Moderate	0.47
Cambarus robustus	Big Water crayfish	Moderately high	0.63
Faxonius eupunctus	Coldwater crayfish	Moderate	0.52
Faxonius immunis	Calico crayfish	Moderately high	0.65
Faxonius marchandi	Mammoth Springs crayfish	Moderate	0.52
Faxonius peruncus	Big Creek crayfish	Moderate	0.48
Faxonius quadruncus	St. Francis River crayfish	Moderate	0.49
Faxonius roberti	Spring River crayfish	Moderate	0.45
Orconectes stygocaneyi	Caney Mountain Cave crayfish	Moderately low	0.3

Mollusks

The AC scores for all 73 mollusk species that we evaluated ranged from moderately low to moderately high. Of the 73 mollusk species that we evaluated, 48 species (66%) were determined to possess moderate AC, while 23 species (31%) had moderately low AC and only two species (3%) had moderately high AC (Table 9). The highest scoring attribute groups were life history (moderately high, score = 0.66) and ecological role (moderate, score = 0.54), while

the lowest scoring groups were abiotic niche (moderately low, score = 0.24) and evolutionary potential (moderately low, score = 0.34). For individual attributes, the greatest number of species scored low for recruitment (n = 69) and physiological tolerances (n = 64), while the greatest number of species scored high for diet breadth (n = 72), extent of occurrence, and parity (n = 69 for both) (Figure 13). Gastropods (n = 23) had slightly lower average AC than mussels (n = 50), although the difference was minor (difference in AC score = - 0.04), and terrestrial species (n = 20) scored slightly lower than aquatic species (n = 53), but this difference was also minimal (difference in AC score = - 0.07). Relative to averages for all mollusks, species with moderately low AC were characterized by below average evolutionary potential and distribution scores, while species with moderately high AC had above average distribution, evolutionary potential, and ecological role scores.

In general, the AC of mussel species appears to be limited primarily by abiotic niche and demography attributes. However, these attributes appear to be relatively consistent across species, contributing little to the variation in overall AC scores. Trends within mussels closely resembled those observed across all mollusks, as lower scoring species (moderately low AC) were associated with below average distribution and evolutionary potential scores, while the single species with moderately high AC had above average scores in both these categories and ecological role. A direct comparison between moderately high and moderately low species indicates that the largest differences were present in the distribution and evolutionary potential attributes, while life history, demography, and movement attributes varied little. Within the distribution group, lower scoring species were found to occupy less area, be more geographically restricted, exhibit a higher degree of habitat specialization, and have a lower tolerance for human influences and human-dominated landscapes. For evolutionary potential attributes, lower scoring species were associated with reduced genetic diversity and smaller population sizes.

The AC of gastropods (i.e., snails and slugs) appeared to be primarily limited by evolutionary potential and abiotic niche attributes, while evolutionary potential and ecological role appeared to contribute much of the variation in overall AC scores. Species with moderately low AC were slightly below average in nearly all attribute groups, with no groups contributing disproportionately to lower overall scores. Conversely, the single species with moderately high AC was associated with well above average ecological role and evolutionary potential scores, and the largest differences between this species and lower scoring species were present in these attribute groups. A direct comparison of the attributes within these groups indicates that lower scoring species were more likely to be negatively affected by a native or non-native species because of climate change and had smaller population sizes.

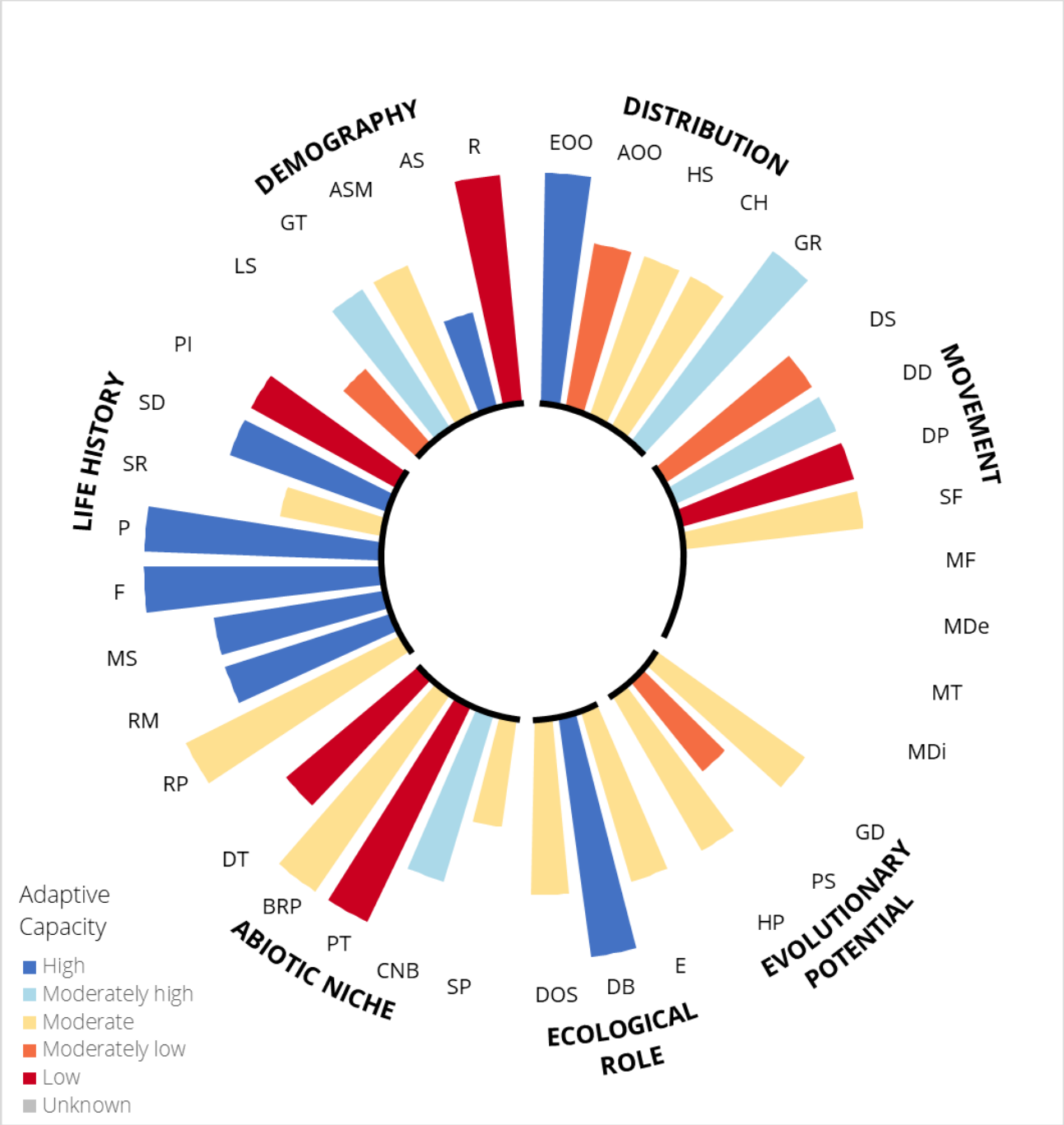

Figure 13. Summary of AC scores for mollusk species evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Figure 14. The median striate (*Striatura meridionalis*). This species scored moderate AC but may still be limited by population sizes and its abiotic niche. Photo credit: Ashley Cole-Wick.

Table 9. AC level and score for the 73 mollusk species assessed.

Scientific Name	Common Name	AC Level	AC Score
Bivalves (Mussels)			
Actinonaias ligamentina	Mucket	Moderate	0.54
Alasmidonta viridis	Slippershell	Moderately low	0.36
Arcidens confragosus	Rock pocketbook	Moderate	0.51
Cambarunio iris	Rainbow	Moderate	0.47
Cyclonaias tuberculata	Purple wartyback	Moderate	0.51
Cyprogenia stegaria	Fanshell	Moderately low	0.49
Ellipsaria lineolata	Butterfly mussel	Moderate	0.48
Elliptio complanata	Eastern elliptio	Moderate	0.32
Elliptio crassidens	Elephantear	Moderate	0.52
Epioblasma curtisii	Curtis' pearly mussel	Moderately low	0.49
Epioblasma perobliqua	White catspaw	Moderately low	0.30
Epioblasma rangiana	Northern riffleshell	Moderately low	0.37
Epioblasma triquetra	Snuffbox	Moderately low	0.35
Lampsilis abrupta	Pink mucket	Moderately low	0.33
Lampsilis brittsi	Northern brokenray	Moderately low	0.40
Lampsilis fasciola	Wavy-rayed Lampmussel	Moderate	0.48
Lampsilis higginsii	Higgins eye	Moderate	0.45
Lampsilis ovata	Pocketbook	Moderate	0.54
Lasmigona compressa	Creek heelsplitter	Moderate	0.43
Lasmigona costata	Flutedshell	Moderate	0.39
Ligumia subrostrata	Pondmussel	Moderate	0.51
Margaritifera monodonta	Spectaclecase	Moderately low	0.38
Megalonaias nervosa	Washboard	Moderate	0.53
Obliquaria reflexa	Threehorn wartyback	Moderate	0.48
Obovaria olivaria	Hickorynut	Moderate	0.44

Obovaria subrotunda	Round hickorynut	Moderate	0.42
Paetulunio fabalis	Rayed bean	Moderate	0.41
Plethobasus cyphyus	Sheepnose	Moderate	0.44
Pleurobema cordatum	Ohio pigtoe	Moderate	0.47
Pleurobema plenum	Rough pigtoe	Moderately low	0.39
Pleurobema sintoxia	Round pigtoe	Moderate	0.43
Potamilus alatus	Pink heelsplitter	Moderate	0.48
Potamilus capax	Fat pocketbook	Moderate	0.40
Ptychobranchus fasciolaris	Kidneyshell	Moderately low	0.40
Quadrula fragosa	Winged mapleleaf	Moderate	0.41
Quadrula nodulata	Wartyback	Moderate	0.52
Quadrula pustulosa	Pimpleback	Moderate	0.55
Quadrula quadrula	Mapleleaf	Moderate	0.53
Reginaia ebenus	Ebonyshell	Moderate	0.47
Sagittunio nasutus	Eastern pondmussel	Moderate	0.57
Simpsonaias ambigua	Salamander mussel	Moderately low	0.32
Toxolasma lividus	Purple lilliput	Moderate	0.44
Toxolasma parvum	Lilliput	Moderate	0.46
Toxolasma texasiense	Texas lilliput	Moderate	0.47
Truncilla donaciformis	Fawnsfoot	Moderate	0.52
Truncilla truncata	Deertoe	Moderate	0.29
Utterbackia imbecillis	Paper pondshell	Moderately high	0.62
Venustaconcha ellipsiformis	Ellipse	Moderate	0.44
Villosa lienosa	Little spectaclecase	Moderate	0.51
Gastropods (Snails, slugs)			
Anguispira kochi	Banded tigersnail	Moderate	0.42
Campeloma decisum	Pointed campeloma	Moderately high	0.63
Carychium nannodes	File thorn	Moderately low	0.45
Discus patulus	Domed disc	Moderately low	0.3
Discus shimekii	Striate disc snail	Moderately low	0.35
Euconulus alderi	Marsh hive snail	Moderately low	0.35
Hendersonia occulta	Cherrystone drop	Moderately low	0.32
Lucilla singleyana	Smooth coil	Moderate	0.59
Lymnaea stagnalis	Swamp Lymnaea	Moderate	0.60
Mediappendix gelida	Frigid ambersnail	Moderately low	0.48
Mediappendix exilis	Pleistocene catinella	Moderately low	0.31
Mesomphix cupreus	Copper button snail	Moderate	0.34
Oreohelix strigosa cooperi	Cooper's Rocky Mountain snail	Moderately low	0.49
Patera pennsylvanica	Proud globelet	Moderate	0.44
Philomycus carolinianus	Carolina mantleslug	Moderate	0.5
Stagnicola woodruffi	Coldwater pondsnail	Moderate	0.34
Striatura meridionalis	Median striate	Moderate	0.44
Vallonia parvula	Trumpet vallonia	Moderate	0.4
Valvata perdepressa	Purplecap valvata	Moderate	0.45
Vertigo arthuri	Callused vertigo	Moderate	0.48
Vertigo bollesiana	Delicate vertigo	Moderately low	0.50
Vertigo meramecensis	Bluff vertigo	Moderately low	0.37
Vertigo tridentata	Honey vertigo	Moderate	0.44
Zonitoides limatulus	Dull gloss	Moderately low	0.37

Herptiles

Of the 36 herptiles species assessed, all either had moderate or moderately high adaptive capacity. Twenty-one species (58.3%) were evaluated to have moderate AC and 15 (41.7%) were evaluated to have moderately high AC (Table 10). The highest scoring attribute groups for herptiles assessed were the distribution (moderately high, AC score = 0.76), and life history (moderately high, AC score = 0.77), and the lowest scoring groups were the abiotic niche (moderately low, AC score = 0.38) and evolutionary potential (moderate, AC score = 0.47) groups. All herptiles assessed had high AC in the individual trait of extent of occupancy (n=36) and the majority had high AC in the traits of parity (n=35), dispersal syndrome (n=33), parental investment (n=32) and sex determination (n=31). Conversely, nearly all herptiles had low AC in the individual metrics of site fidelity (n=32) and disturbance tolerance (n=31) (Figure 16).

Within the evaluated herptiles, the Fowler's toad (*Anaxarus fowleri)* and gray rat snake (*Pantherophis spiloides*) had the highest overall AC scores (moderately high, AC score = 0.72 and 0.71, respectively), and the Kirtland's snake (*Clonophis kirtlandii*) and eastern hellbender (*Cryptobranchus alleganiensis*) had the lowest AC scores (moderate, AC score = 0.40 and 0.45, respectively). There did not appear to be any trends in differences of AC scores in reptiles assessed (n = 20) having higher/lower average scores than amphibians assessed (n = 16). The differences in the herptiles that had moderately high AC over moderate AC appears to be driven by a higher score in the habitat specialization, geographic rarity, and dispersal distance AC metrics.

For the amphibians that were assessed, the largest limiting factors were in the dispersal phase and site fidelity AC attributes. Other attributes which appear to be limiting factors for adaptive capacity for most amphibian species assessed include migration demography, migration timing, physiological tolerances, disturbance tolerances, and recruitment. The lowest scoring amphibians appear to have lower AC due to increased habitat specialization, lower tolerance to disturbance, and higher geographic rarity compared to other amphibians. The frogs/toads that were assessed tended to have higher AC than the average for herptiles, with many scoring higher than average in the evolutionary potential and demography AC groups.

Among the reptiles that were assessed, the attributes which appear to be the most prevalent limiting factors for adaptive capacity include site fidelity, migration demography, migration timing, behavioral regulation of physiology, and disturbances. Most turtles had lower than average overall AC compared to other herptiles. The limiting factors for turtle species' AC appear to be related to obligate migration timing, complete migration demography, long lifespans, and low recruitment. Snakes that were evaluated similarly had lower overall AC and appear to be limited in their adaptive capacity by a low hybridization potential and low tolerance to disturbance. Lizards tended to score above average AC for herptiles assessed but appear to still be limited by site fidelity and disturbance tolerance.

Figure 15. Blanding's turtle (*Emydoidea blandingii*) from southeast Michigan. Photo credit: Yu Man Lee.

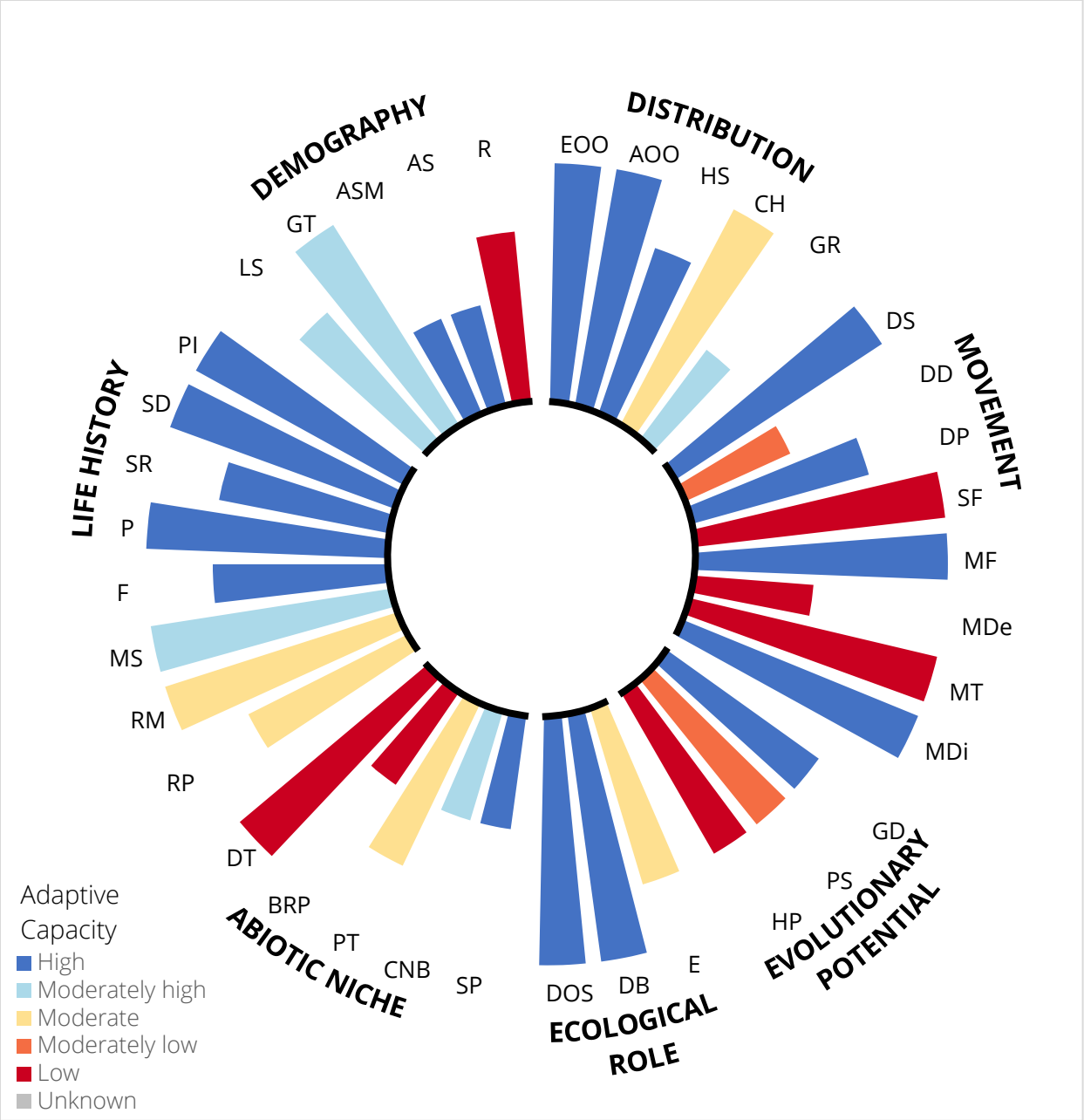

Figure 16. Summary of AC scores for herptiles species evaluated. Scores for AC metrics are averaged across taxa; bar length represents relative proportion of that taxa with that score.

Table 10. AC level and score for the 36 herptiles species assessed.

Scientific Name	Common Name	AC Level	AC Score
Frogs/Toads			
Acris blanchardi	Blanchard's cricket frog	Moderately high	0.67
Anaxyrus [Bufo] cognatus	Great Plains toad	Moderately high	0.63
Anaxyrus [Bufo] fowleri	Fowler's toad	Moderately high	0.72
Lithobates [Rana] areolatus	Northern crawfish frog	Moderate	0.57
Lithobates [Rana] blairi	Plains leopard frog	Moderately high	0.64
Lithobates [Rana] palustris	Pickerel frog	Moderately high	0.65
Lithobates [Rana] septentrionalis	Mink frog	Moderate	0.60
Pseudacris maculata	Boreal chorus frog	Moderately high	0.70
Lizards			
Aspidoscelis sexlineatus	Six-Lined racerunner	Moderately high	0.67
Holbrookia maculata	Common lesser earless lizard	Moderate	0.54
Plestiodon fasciatus	Five-lined skink	Moderate	0.57
Plestiodon multivirgatus	Many-lined skink	Moderate	0.59
Sceloporus grasiosus	Sagebrush lizard	Moderate	0.59
Salamanders			
Ambystoma opacum	Marbled salamander	Moderately high	0.67
Ambystoma texaunum	Small-mouthed salamander	Moderately high	0.67
Aneides aeneus	Green salamander	Moderate	0.53
Cryptobranchus alleganiensis	Eastern hellbender	Moderate	0.45
Hemidactylium scutatum	Four-toed salamander	Moderate	0.54
Necturus maculosus	Mudpuppy	Moderate	0.50
Notophthalmus viridescens	Eastern newt	Moderately high	0.67
Plethodon cinereus	Eastern red-backed salamander	Moderately high	0.65
Siren nettingi	Western lesser siren	Moderate	0.53
Snakes			
Clonophis kirtlandii	Kirtland's snake	Moderate	0.40
Nerodia erythrogaster neglecta	Copper-bellied water snake	Moderate	0.50
Opheodrys vernalis	Smooth green snake	Moderate	0.57
Pantherophis spiloides	Gray rat snake	Moderately high	0.71
Pantherophis vulpinus	Eastern fox snake	Moderate	0.54
Regina septemvittata	Queen snake	Moderate	0.58
Sistrurus catenatus	Eastern Massasauga	Moderate	0.56
Thamnophis butleri	Butler's garter snake	Moderately high	0.60
Turtles			
Clemmys guttata	Spotted turtle	Moderate	0.52
Emydoidea blandingii	Blanding's turtle	Moderate	0.50
Glyptemys insculpta	Wood turtle	Moderate	0.48
Graptemys pseudogeographica	False map turtle	Moderately high	0.60
Pseudemys concinna	River cooter	Moderately high	0.65
Terrapene carolina	Eastern box turtle	Moderate	0.58

Training for MAFWA Region States

In January 2024, we provided a virtual training on how to use the rapid adaptive capacity assessment tool to partners in Nebraska and shared all necessary resources, enabling them to begin conducting their own AC assessments. In March 2024, we provided a second virtual training for all partner states in the MAFWA region. In addition to providing an overview of the rapid assessment tool, we included examples of how to use the tool for the different taxa that were assessed. We prepared recorded examples for taxa that were not covered explicitly during the virtual training, and these recordings were shared with partner states after the training was completed. In addition to these recordings, we provided partner states with several supplemental resources, including the adaptive capacity framework and tools developed by Thurman et al. (2020, 2022), the Excel spreadsheet tool developed by USGS for conducting the rapid AC assessments, and examples of AC assessments completed by our staff and USGS staff. In January 2025, we will share results from all AC assessments with partners from all participating states in the Midwest.

DISCUSSION

The ability of a species to cope with or adapt to changing climatic conditions is a vital component of their overall climate vulnerability (Thurman et al. 2020), and the implementation of management actions that enhance adaptive capacity (AC) is greatly needed. Often, AC is difficult to evaluate and is inconsistently applied, which has limited its inclusion in conservation planning efforts (Thurman et al. 2020). This project addresses this issue by providing AC assessments for 400 SGCN using a standardized approach, the results of which can be used to identify species-specific conservation actions that directly or indirectly enhance AC.

Effective climate-adaptation strategies often require a regional approach. Therefore, states are increasingly discussing ways to share information and create more uniform content among State Wildlife Action Plans (SWAP). By assessing species relative to their range-wide distribution, this project facilitates collaboration among states in the Midwest region, where many of the evaluated species occur. This information can ultimately be used to inform SWAP revisions across the Midwest by linking assessment outputs to specific conservation actions. Specifically, the seven attribute groups can be linked directly to management strategies included in the wildlife adaptation menu (C. Hoving, Michigan Department of Natural Resources, unpublished data; Table 11). Such a process will help to ensure consistency across SWAPs and standardize on-the-ground management across the Midwest region.

When interpreting the results of these assessments, we caution against placing too much emphasis on the overall AC score. Many of the species assessed had moderate overall AC, but had specific attributes that may significantly constrain their ability to respond and adapt to climate change. For example, many species (insects, fish, bivalves) had high fecundity, which helped to raise their overall AC. However, many other traits, such as reduced area of occupancy, dependence on obligate species, and low commensalism with humans, were identified as key factors that may limit their AC. We recommend using the assessments to gain a deeper understanding of how specific factors contribute to a species overall AC profile (Thurman et al. 2020). When taking such an approach, it is important to understand that a species' ability to adapt will be most constrained by their lowest scoring traits, and those should be prioritized in conservation planning. It may also be meaningful to consider where species possess high AC, as management actions focused on maintaining or bolstering these attributes may help to sustain the species.

Table 11. A demonstration of how each of the seven attribute groups included in the rapid AC assessment tool can be linked to specific management strategies present in the wildlife adaptation menu. Adapted from C. Hoving (Michigan Department of Natural Resources, unpublished data).

	Distribution	Movement	Evolutionary Potential	Demography	Life History	Ecological Role	Abiotic Niche
Maintain and enhance genetic diversity	X	X	X	-	-	-	-
Establish and maintain connectivity between populations	-	-	X	X	-	-	X
Facilitate shifts in the geographic range of the species in anticipation of future conditions	X	X	X	-	-	X	X
Manage interspecific and biotic interactions	-	-	X	X	X	X	-
Maintain a sustainable population size by managing reproduction, survival, and dispersal	X	X	X	X	X	-	-
Adjust harvest regulations to manipulate populations of harvested species	X	-	X	X	X	X	-
Plan for and reduce human disturbance and human-wildlife conflict	X	X	-	X	X	X	-
Restore, and maintain sources of food, water, and cover as components of habitat	X	X	-	-	-	X	X
Adjust management of food, water, and cover to align with expected future conditions	X	X	-	-	-	X	X
Establish and enhance protected areas or habitat reserves	X	X	-	-	-	-	X
Promote wildlife habitat conservation on lands outside of protected areas	X	X	-	-	-	-	X
Intentionally choose to take no action	X	X	X	X	X	X	X
Engage human communities in wildlife conservation	X	X	-	X	-	X	X

In general, it is important to note that all species that were assessed are SGCN, and these species are already known to be limited by factors beyond sensitivity to climate change that put them at greater risk of extinction. While these assessments should be used as another tool in conservation planning for these species, additional threats such as human development and invasive species must also be considered. AC is one component of a species' climate vulnerability; exposure and sensitivity must also be considered when determining how SGCN will respond to climate change.

While we believe that this tool will provide crucial assistance to future SWAP's, we also believe there are several modifications that may need to be considered in future iterations of this tool. For example, we often found that this tool generalized and may not show many specific differences between species within a taxonomic group beyond a given level (i.e. crayfish, bumble bees). Traits in the current iteration of the tool are also all given equal weight in defining a species' AC, and the disproportionate effect that certain traits (e.g., dependence on a single host plant or prey item) have on some species' AC may not be adequately captured by these assessments. We recommend that future versions of this tool explore a way to differentially weight traits to influence the overall score of a given species, and these weights may need to be evaluated based on taxonomic group or another given metric of a species AC (i.e., low genetic diversity may compound with low fecundity to combine to a lower overall AC score for each metric).

In addition, while the rapid assessment form allowed for relatively easy assessments of species across a wide range of taxonomic groups, the ranges for what determined a low/high score in some metrics may need to be adjusted based on taxonomic group. The clearest example of this could be seen in fecundity, in which over 10 offspring would give a score of "high" AC for that metric. Every fish, insect, and amphibian we evaluated would have at least this many offspring; though in comparison to other species within their taxonomic group, their fecundity may be significantly lower than average. Age of sexual maturity also could be re-examined since it is currently evaluated relative to lifespan. Some of the turtle species that were assessed take 14-20 years to reach sexual maturity which would normally be considered delayed sexual maturity. However, these species also are long-lived, with lifespans of 50-75+ years, they were scored as high AC with a rapid age of sexual maturity because the metric is scored relative to their lifespan. Additionally, providing more clarification (e.g., defining "broadly distributed" for geographic rarity, or short period/discrete phase vs. long period for dispersal phase given dispersal in some species may be focused on the juvenile stage but can last multiple years or an extended period of time compared to a species that can disperse throughout its life but the species may be very short-lived [1-2 years or less]), more options for AC scores (e.g., moderately low and moderately high compared to just moderate), and examples for some of the attributes (e.g., migration demography) would be helpful. Changes such as these could improve the consistency and interpretability of the assessments by facilitating better comparisons of scores between species both within and between taxonomic groups.

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APPENDIX A: ADAPTIVE CAPACITY RAPID ASSESSMENT TOOL

LL Thurman et al. (2020) Persist in place or shift in space? Evaluating the adaptive capacity of species to climate change. *Frontiers in Ecology & the Environment* 18: 520-528. https://doi.org/10.1002/fee.2253 WebTable 2.
Details on the 37 species- or population-level attributes (**2 new attributes**) used to assess adaptive capacity (AC), including all attribute definitions, relation to the persist-in-place (PiP)/shift-in-space (SiS) structure, relevant scales of assessment, and evaluation criteria (core attributes are in blue text).

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low	Moderately high	High
							Moderate		
DISTRIBUTION	Extent of Occurrence (EOO)	PiP and SiS	The area contained within the shortest continuous boundary that can be drawn to encompass all known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy (IUCN 2012); in the case of migratory species, EOO should be based on the minimum of breeding or non-breeding areas, but not both because the bulk of the population is found in only one of these areas at any given time	Species level		< 100 km^2	100–5000 km^2	5000–20,000 km^2	> 20,000 km^2
	Area of Occupancy (AOO)	PiP and SiS	The area within a species' EOO, excluding cases of vagrancy (IUCN 2012); AOO is a scaled metric that represents the area of suitable habitat currently occupied and is a measure of "insurance effect", wherein taxa that occur within many patches or large patches across a landscape are insured against risks from spatially explicit threats; AOO reflects the fact that a taxon will not usually occur throughout the area of its EOO, which may contain unsuitable or unoccupied habitats; in some cases, the AOO is the smallest area essential at any stage to the survival of existing populations of a taxon; the size of the AOO will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats, and available data	Species level		< 10 km^2	10–500 km^2	500–2000 km^2	> 2000 km^2

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
	Habitat Specialization (HS)	PiP and SiS	Also referred to as habitat specificity; evaluates the use of a relatively restricted subset of habitats, with narrow or well-defined physical or biotic characteristics, for the purposes of foraging, breeding, and other important life-cycle processes, including the reliance on particular habitats through which a species is capable of moving (adapted from NatureServe's CCVI; Young *et al.* [2016])	Population or species level; and/or specific life stage		Highly dependent on a particular habitat (more or less endemic to, or contains > 85% of occurrences)	Moderately dependent on a particular uncommon habitat; (1) an indicator of, but not an endemic to that habitat (contains 65–85% of occurrences); OR (2) more or less restricted to a habitat that is uncommon within the species' range, but is not one of the dominant types		Having a clear preference for a particular habitat (contains > 85% of occurrences), but the habitat is among the dominant types within the species' range; OR somewhat flexible in habitat utilization; OR described as a habitat generalist and/or occurrence has been documented on widely varied habitat types
	Commensalism with Humans (CH)	PiP and SiS	Degree of tolerance of human interactions and infrastructure	Population or species level		Intolerant of human influences and/or human-dominated landscapes	Moderately tolerant of human influences, utilization of semi-natural landscapes (eg, agricultural fields, suburban parks, etc)		Highly tolerant of human influences, wide utilization of human-dominated landscapes
	Geographic Rarity (GR)	PiP and SiS	*Sensu* Rabinowitz (1981), takes into consideration that some species may be broadly distributed in their spatial extent but simultaneously exhibit patchiness in their occurrence, or low local abundance	Species level		Geographically restricted with isolated populations	Geographically restricted with highly connected populations (eg, endemic species)	Broadly distributed with sparse or isolated populations	Broadly distributed with highly connected populations (ie, common)
MOVEMENT	**Dispersal Syndrome (DS)**	SiS	The degree of flexibility in either the timing or mechanism of dispersal; for mobile organisms, dispersal can either be obligate (dispersal events are fixed within a specific life stage) or facultative (individuals can "choose" if and when to disperse); for sessile organisms, dispersal syndrome refers to the morphological characteristics of seeds that are correlated with particular seed dispersal agents (adapted from NatureServe's CCVI; Young *et al.* [2016])	Population or species level	**Actively dispersing (mobile) organisms:**	Obligate (fixed timing, or dependence on a specific cue)			Facultative (flexible timing, or no cue dependence)
					Passively dispersing (sessile) organisms:	Dependence on invertebrate or vertebrate vector(s) with low mobility	Dependence on invertebrate or vertebrate vector(s) with high mobility	Localized (ie, gravity, or explosive dehiscence)	Wind or water currents

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low	Moderately high	High
							Moderate		
	Dispersal Distance (DD)	SiS	The distance an individual or propagule can move from an existing population's location, or a population's average location (adapted from NatureServe's CCVI; Young *et al.* [2016])	Individual, population or species level		Species is characterized by severely restricted dispersal or movement capability (< 10 m per dispersal event)	Species is characterized by highly restricted dispersal or movement capability; species rarely disperses through unsuitable habitat more than about 10–100 m per dispersal event; OR dispersal beyond a very limited distance (or outside a small isolated patch of suitable habitat) periodically or irregularly occurs, but is dependent on highly fortuitous or rare events; OR species has substantial movement capability but exhibits a very high degree of site fidelity	Species is characterized by limited (or moderate), but not highly or severely restricted, dispersal or movement capability; a large percentage (at least 50%) of propagules or individuals disperse approximately 100–1000 m per dispersal event (rarely farther); OR species has substantial movement capability, but exhibits a moderate to high degree of site fidelity and has very limited existing or potential habitat within the assessment area	Species is characterized by good to excellent dispersal or movement capability; species has propagules or dispersing individuals that commonly move more than 1 km from natal or source areas; OR species tends to occupy all or most areas of suitable habitat, or readily or predictably moves more than 1 km to colonize newly available habitat
	Dispersal Phase (DP)	SiS	The phase or life-stage in which individuals or propagules disperse	Population or species level		Short period or discrete phase (eg, life stage)			Long period or throughout life

	Site Fidelity (SF)	SiS	Natal site fidelity (the propensity to be a “stayer” within the population) allows for locally adapted life history traits that increase reproductive success and fitness; alternatively, “straying” during migratory or dispersal events promotes the colonization of new habitats, increases opportunities for genetic mixing among populations, and can buffer populations from variation in habitat quality	Population or species level	The propensity to be a “stayer” versus a “strayer”	High site fidelity (higher proportion of “stayers”)	Moderate site fidelity (roughly equal proportion of “stayers” and “strayers”)	Low site fidelity (higher proportion of “strayers”)

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
	Migration Phenology (encompassing MF, MDe, MT)	PiP and SiS	Behaviors related to the timing and demographics of migration within a species; reflects the degree of flexibility in migratory events and dependence on environmental cues (and degree of risk associated with the cues at departure being independent of conditions at destination); in this case, migration can be obligate (individuals must migrate given a specific cue), or facultative (individuals can "choose" to migrate or not) and a population can exhibit complete, partial (some individuals reside on the breeding site year-round, while others migrate), or differential migration (individuals from a population migrate different distances or to different locations)	Population or species level	**Migration Frequency (MF)**	Once during lifetime			Throughout lifetime (annually or seasonally)
					Migration Demography (MDe)	Complete (most or all individuals within a population migrate)	Partial (some individuals reside on breeding/natal grounds year-round, while others migrate)		Differential (individuals migrate different distances or to different locations)
					Migration Timing (MT)	Obligate (fixed timing or reliance on environmental cue or resource)			Facultative (flexible timing and independent of environmental cue or resource)
	Migration distance (MDi)	PiP and SiS	The total, geographic distance spanned during a migratory event; long-distance migrants have shown steeper population declines than their resident and short-distance migratory counterparts; ecological conditions at stopover sites, along with weather conditions, affect the survival, migratory schedules, and reproductive success of migrants; long-distance migrants are therefore at increased risk of exposure to spatially heterogeneous threats	Population or species level		Long-distance migration (eg, crosses geopolitical, large-landscape, or ecotypic boundaries)	Variation in distances or destinations within a population/species (differential migration)		Local migration

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
EVOLUTIONARY POTENTIAL	Genetic Diversity (GD)	PiP and SiS	The diversity of genotypes (or genetic variability) within a species; genetic diversity can be subdivided into adaptive vs neutral genetic diversity; neutral genetic diversity confers no direct effect on fitness, or the adaptive potential of a population, but it can inform processes such as genetic drift, gene flow, dispersal, and migration (ie, functional connectivity); adaptive genetic diversity is the genetic variation under natural selection; it informs a population's evolutionary adaptive potential and is assessed in quantitative genetic experiments (adapted from NatureServe's CCVI; Young *et al.* [2016])	Population or species level	Primarily focusing on adaptive genetic diversity	Low, within-population genetic variability; OR genetic variation reported as "very low" compared to findings using similar techniques on related taxa (ie, lack of genetic variation has been identified as a conservation issue for the species; OR evidence that total population was reduced to ≤ 250 mature individuals, one occurrence, and/or that occupied area was reduced by > 70% at some point in the past 500 years	Moderate, within-population genetic variability; OR genetic variation reported as "low" compared to findings using similar techniques on related taxa; OR evidence that total population was reduced to 251–1000 mature individuals, to less than ten occurrences, and/or that occupied area was reduced by 30–70% at some point in the past 500 years		High, within-population genetic variability; OR Genetic variation reported as "average" or "high" compared to findings using similar techniques on related taxa; OR No evidence that total population was reduced to ≤1000 mature individuals and/or that occupied area was reduced by > 30% at some point in the past 500 years
	Population Size (PS)	PiP	The number of individuals in a population, including those who contribute offspring to the next generation (ie, all breeding adults in that population) and non-breeding individuals (adapted from IUCN Red List thresholds, IUCN Standards and Petitions Subcommittee [2019])	Population level (but can be averaged for the species, or based on lowest known size)	The number of individuals in a population	< 250 mature individuals (low local abundance), or estimated population decline by ≥ 25% within 3 years or one generation, whichever is longer	< 2500 mature individuals, or estimated population decline by ≥ 20% within 5 years or two generations, whichever is longer	< 10,000 mature individuals, or estimated population decline by ≥ 10% within 10 years or three generations, whichever is longer	> 10,000 mature individuals (high local abundance), with high probability of long-term persistence
	Hybridization Potential (HP)	PiP and SiS	Existence of closely related species, subspecies, or allopatric populations for interbreeding, with much consideration of fitness consequences such as outbreeding depression	Population or species level		Hybridization does not occur OR hybridization occurs but offspring are not viable, or have lower fitness	Hybridization probably occurs (fitness consequences unknown)		Hybridization occurs; offspring are viable (minimal to no fitness consequences)

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderately high / Moderate		High
E C	***NEW*** Enemies (E) (*Formerly* Competitive Ability)	PiP and SiS	Considering biotic interactions is essential to accurately predicting species' responses to climate change and may favor some species but disadvantage others. Climate change can disrupt food webs by altering the distribution or abundance of species that act as key resources, competitors, or predators in the system, or by shifting phenologies and synchronies of interacting organisms (eg, host-pathogen dynamics), ultimately causing important changes in the nature of relationships among species. Climate change can also be a driver of species introductions, resulting in new and novel interactions.	Population or species level		Strongly affected by a native or non-native species that is likely to be favored by climate change; OR climate change is likely to substantially increase the prevalence of the natural enemy (or enemies); OR significant disruptions to trophic or non-trophic interactions, with consequences for species' fitness or access to critical resources (eg, through altered predator-prey interactions, competition, or disease dynamics)	Moderately affected by a native or non-native species that is likely to be favored by climate change; OR climate change is likely to only marginally increase the prevalence of the natural enemy (or enemies); OR disruptions to trophic or non-trophic interactions likely to have minimal consequences for species' fitness or access to critical resources (eg, through altered predator-prey interactions, competition, or disease dynamics)		Little or no response to a native or non-native species that is likely to be favored by climate change; OR climate change is likely to reduce or have no impact on the prevalence of the natural enemy (or enemies); OR no significant disruptions to trophic or non-trophic interactions, with no significant consequences for species' fitness or access to critical resources (eg, through altered predator-prey interactions, competition, or disease dynamics)
	Diet Breadth (DB)	PiP and SiS	Also referred to as diet versatility or flexibility; ability to utilize a range of food resources, or to be flexible in prey preference (adapted from NatureServe's CCVI; Young *et al.* [2016])	Population or species level		Completely or almost completely (> 90%) dependent on one food item (species) during any part of the year; equivalent alternatives to this single-species food resource are not readily available	Completely or almost completely (> 90%) dependent during any part of the year on either (1) a few species from a restricted taxonomic group, or (2) a narrow guild the members of which are thought to respond similarly to climate change		Diet flexible; during any season species readily switches among multiple food resources according to availability; OR not strongly dependent on one or a few species; OR omnivorous, with diet including numerous species of both plants and animals

	Diversity of Obligate Species (DOS)	PiP and SiS	Also referred to as interspecific dependencies; the number of obligate species interactions, including mutualists, pollinators, dispersers, etc, that a focal species relies on to complete some aspect of its life cycle not pertaining to food resources	Population or species level		Obligated to one or few species	Obligated to a restricted network (or pool) of species, indicating some functional redundancy in those species to which it is obligated	Diffuse interactions (no obligations)

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderately high / Moderate		High
			(adapted from NatureServe's CCVI; Young *et al.* [2016])						
ABIOTIC NICHE	**Seasonal Phenology (SP)**	PiP and SiS	The timing of periodic life cycle events, not directly related to reproduction or movement, that are influenced by seasonal and interannual variations in climate; can include budburst, leaf abscission, timing of developmental cycles, hibernation, etc	Population or species level; and/or specific life stage		Dependence on environmental cue; species is incapable of adjusting the timing or duration of life-cycle events (ie, detectable change in cue, but no detectable change in the phenological variable measured); OR timing indirectly dependent and linked to non-environmental cue (eg, photoperiod), which may result in fitness consequences due to misalignment between life-cycle events and climate	Moderate dependence on environmental cue; species is capable of adjusting the timing or duration of life-cycle events (ie, detectable change in cue and species shows some associated change in the phenological variable measured, but change may be less than that of other species in similar habitats or taxonomic groups)		No dependence on environmental cue; Or dependence on environmental cue, but species is capable of adjusting the timing or duration of life-cycle events (ie, detectable change in cue and species shows an associated change in the phenological variable measured which is average compared to other species in similar habitats or taxonomic groups; OR timing indirectly dependent and linked to non-environmental cue (eg, photoperiod) that is not expected to result in fitness consequences due to misalignment between life-cycle events and climate (or misalignment is minimal)

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low	Moderately high	High
							Moderate		
	Climatic Niche Breadth (CNB)	PiP and SiS	A measure of niche specialization and reflective of the range of abiotic conditions to which a species is adapted, and their degree of flexibility in responding to changing conditions potentially outside of that range	Population or species level		Species is completely or almost completely (> 90% of occurrences or range) restricted to a particular climatic (or oceanic/ hydrological) condition that may be lost or reduced in the assessment area as a result of climate change	Species is moderately (50–90% of occurrences or range) restricted to a particular climatic (or oceanic/ hydrological) condition that may be lost or reduced in the assessment area as a result of climate change	Species is somewhat (10–50% of occurrences or range) restricted to a particular climatic (or oceanic/ hydrological) condition that may be lost or reduced in the assessment area as a result of climate change	Species distribution is not greatly affected by climatic (or oceanic/ hydrological) conditions in the assessment area; OR species occupies habitats that are thought to be not vulnerable to projected climate change; OR species shows a preference for environments at the warmer end of the spectrum (or the leading edge of changing conditions)
	Physiological Tolerances (PT)	PiP and SiS	Reflects the degree to which a species (or population) is restricted to a narrow range of abiotic conditions (eg, temperature, hydrology, or snow pack conditions) and often begins with the identification of the differences in sublethal and lethal effects of climate change on the organism; individuals exposed to climate stressors may reach a state that is beyond their capacity to maintain homeostasis and, consequently, may display changes in behaviors or performances such as growth rates and reproduction, to defend themselves against stressors; for most species, this requires an understanding of thermal limits (or reaction norms), or degree of tolerance of physiological stressors and whether or not the range of conditions causes lethal or sublethal effects (adapted from NatureServe's CCVI; Young *et al.* [2016])	Population or species level	With respect to the relevant climate-related stressor, or limiting abiotic factor	Range of novel conditions are known to cause lethal effects (intolerable); OR variation in historical conditions for limiting abiotic factor is highly restricted	Range of novel conditions unlikely to cause lethal effects (moderately tolerable), although sublethal effects have been observed; variation in historical conditions for limiting abiotic factor is moderate		Range of novel conditions are not likely to cause sub-lethal or lethal effects (tolerable); Variation in historical conditions for limiting abiotic factor is broad and/or extreme events have occurred with no subsequent declines in abundance or extent of occurrence

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
	Behavioral Regulation of Physiology (BRP)	PiP	The ability of individuals to change their behavior in effort to reduce exposure to climate stressors, such as the use of microhabitat features that moderate temperature and extreme conditions (eg, rock crevices, tree hollows, burrows, etc), or activity periods that limit their exposure to extreme temperatures	Population or species level		Minimal or no behavioral flexibility and reduction in exposure; species lacks cognitive capacity to enact a behavior, or behavior is canalized and not responsive to environmental influences, or species is restricted in expression of behavior by access to essential resources or other physiological limitations; OR behavior chronically restricts foraging or other essential activities and therefore reduces survivability or fitness	Moderate behavioral flexibility and reduction in exposure; behavior is infrequent, or is occasionally limited due to restricted access to resources; OR behavior temporarily restricts foraging or reproductive activities, but is not detrimental to survivability or fitness		High behavioral flexibility and reduction in exposure; behavior is not restricted by access to essential resources and does not substantially limit activities necessary for survival or reproduction

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderately high / Moderate		High
	NEW Disturbance Tolerances (DT)	PiP and SiS	Ecological disturbances are events or forces of abiotic or biotic origin that bring about mortality to organisms and changes in their spatial patterning and plays a significant role in shaping the structure and function of ecosystems. The ecological impact of a disturbance is dependent on its intensity, frequency, severity, and spatial extent. Disturbances can include minor events like localized droughts, floods, small wildland fires, and disease outbreaks in plant and animal populations; or major events like hurricanes and broad-scale wind events or forest fires. Though disturbances tend to negatively affect species, some species are disturbance-dependent (or disturbance-adapted) and others can capitalize on opportunities from disturbance events to move into, and gain footholds in, ecosystems that once excluded them.	Population or species level		Changes in the intensity, frequency, or severity of disturbance events due to climate change are likely to have significantly negative impacts on the species; OR changes in the disturbance regime will be beyond the species tolerance limits and likely to cause lethal effects; OR variation in historical patterns of disturbance is highly restricted	Changes in the intensity, frequency, or severity of disturbance events due to climate change are likely to have moderate impacts on the species; OR changes in the disturbance regime are marginal and not known to be detrimental to the species fitness or survival; OR variation in historical patterns of disturbance is moderate		Changes in the intensity, frequency, or severity of disturbance events due to climate change are unlikely to have impacts on the species; OR changes in the disturbance regime will be within the species tolerance limits and unlikely to affect species fitness; OR historical patterns of disturbance are highly variable

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderately high / Moderate		High
LIFE HISTORY	**Reproductive Phenology (RP)**	PiP	The timing of reproductive events within a species life cycle that are influenced by seasonal and interannual variations in climate	Population or species level; and/or specific life stage		Dependence on environmental cue; species is incapable of adjusting the timing or duration of reproductive events (ie, detectable change in cue, but no detectable change in the phenological variable measured); OR timing indirectly dependent and linked to non-environmental cue (eg, resource availability), which may result in fitness consequences due to misalignment between reproductive events and climate	Moderate dependence on environmental cue; species is capable of adjusting the timing or duration of reproductive events (ie, detectable change in cue and species shows some associated change in the phenological variable measured, but change may be less than that of other species in similar habitats or taxonomic groups)		No dependence on environmental cue; Or dependence on environmental cue, but species is capable of adjusting the timing or duration of reproductive events (ie, detectable change in cue and species shows an associated change in the phenological variable measured which is average compared to other species in similar habitats or taxonomic groups; OR timing indirectly dependent and linked to non-environmental cue (eg, resource availability) that is not expected to result in fitness consequences due to misalignment between reproductive events and climate (or misalignment is minimal)

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
	Reproductive Mode (RM)	PiP	In sexually reproducing organisms, there are multiple modes of reproduction, differentiated based on the relationship between zygote and parents; these include non-viviparous modes: *ovuliparity*, in which fertilization is external and eggs are released into the environment to be fertilized, and *oviparity*, in which fertilization is internal and the male inserts the sperm into the female intermittently or is picked up from the environment, and the female lays eggs; these modes are distinguished from *viviparity*, which covers all modes resulting in live birth; asexual reproductive modes are captured in "Mating system" below	Population or species level	As it relates to juvenile survivorship (as opposed to parental energetic costs, which are captured in "Parental investment" below)	Ovuliparity or broadcast spawning	Oviparity or direct development or colonial (as in Hymenopterans)		Viviparity or ovoviviparity (eggs are retained within the mother's body until they are ready to hatch)
	Mating System (MS)	PiP	Group structures within populations related to reproductive behaviors; in animals, this ranges from two-partner (monogamous) systems to promiscuous, multi-partner systems; similarly, in plants, reproductive systems reflect varying degrees of outcrossing, which can range from asexual or cloning systems to cross-fertilization among multiple individuals; these systems contribute to the gene frequency and genetic variability within a population	Population or species level	**Animals**	Asexual (eg, parthenogenesis)	Monogamy or mixed modes of reproduction (eg, facultative parthenogenesis, in which organisms can produce offspring either sexually or asexually)	Polygamy	Promiscuity
					Plants and other sessile organisms	Asexual (eg, apomixis); budding, sporulation, or fragmentation (as in some fungi)	Self-fertilization (eg, autogamy) or mixed modes of reproduction (eg, facultative parthenogenesis in which organisms can produce offspring either sexually or asexually)		Cross-fertilization (allogamy); sexual reproduction (eg, via hyphal fusion as in some fungi)
	Fecundity (F)	PiP	The number of offspring, seed sets, or asexual propagules produced on average by reproductive individuals of the species (or population)	Individual, population, or species level		One or two offspring or propagules	Few offspring or propagules (3–10)		Many offspring or propagules (> 10)

	Parity (P)	PiP	The number of times an organism reproduces within its lifetime (ie, reproductive rate); in animals, species are either semelparous and have a single reproductive event per lifetime,	Population or species level	**Animals**	Semelparous			Iteroparous

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate / Moderately high		High
			or iteroparous with multiple reproductive cycles; in plants, species are either monocarpic (single flowering cycle), plietesial (grow for a number of years then flower gregariously or synchronously once), or polycarpic (multiple flowering cycles)		**Plants and other sessile organisms**	Monocarpic; single reproductive event per lifetime	Plietesial		Polycarpic; multiple reproductive events per lifetime
	Sex Ratio (SR)	PiP	Spending equal amounts of resources to produce offspring of either sex is an evolutionarily stable strategy; for species where the cost of successfully raising one offspring is roughly the same regardless of its sex, this translates to an approximately equal sex ratio and is common in sexually reproducing species according to Fisher's principle, wherein parents will invest their resources equally between each sex of offspring because each sex supplies exactly half the genes of all future generations; however, many parthenogenic species and some colonial insect species can either permanently or periodically deviate from the 1:1 strategy and often exhibit female-biased sex ratios; reptile species that exhibit environmental sex determination also tend towards skewed sex ratios	Population level		Skewed (female- or male-biased; common in small populations of certain taxa) with known or expected consequences to local mate availability, male-to-male aggression, male-to-female harassment, or other disruptions to pairbond formation or reproductive output	Capable of facultative adjustments to mating systems to account for skewed adult sex ratios (as is the case in some species with female-biased populations); OR species is capable of hermaphroditism		Balanced (1:1)
	Sex Determination (SD)	PiP	In many species, sex determination is genetic, wherein males and females have different alleles (or genes) that specify their sexual morphology; in animals, this is often accompanied by chromosomal differences or haplodiploidy; in other cases, sex is determined by environmental variables (such as temperature) and populations may therefore be susceptible to skewed sex ratios (eg, if ambient temperature increases)	Species level		Temperature or environmentally dependent	Haplodiploidy		Chromosomal

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate	Moderately high / Moderate	High
	Parental Investment (PI)	PiP	Any parental expenditure (time, energy, etc) that benefits the offspring at a cost to parents' ability to invest in other components of fitness, and is therefore a form of reproductive success; represents one of many life-history optimization tradeoffs reflective of the cost of reproduction; individuals are limited in the degree to which they can devote time and resources to producing and raising their young, and such expenditure may be detrimental to their future condition, survival, and reproductive output; however, such expenditure is typically beneficial to the offspring, enhancing their condition, survival, and future reproductive success	Population or species level	As it relates to parental energetic costs (as opposed to offspring survivorship, which is captured in "Reproductive mode" below)	Altricial (young are hatched or born in an undeveloped state and require care and feeding by the parent[s])	Semi-precocial (dependent on parents for food) or semi-altricial; OR Altruistic care of young by non-reproducing individuals within the population (eg, sterile worker bees)		Precocial (young are relatively mature and mobile from the moment of birth or hatching and capable of feeding themselves)
DEMOGRAPHY	**Life Span (LS)**	PiP and SiS	Also referred to as longevity; the period between birth and death for the individual, or the average length of life or life expectancy for a population	Individual, population or species level		≥ 25 years	10–25 years	1–10 years	≤ 1 year
	Generation Time (GT)	PiP and SiS	Also referred to as generation interval; average time between two consecutive generations in the lineages of a population; can be measured as the mother–daughter distance (the average age of mothers at birth of their daughters); species with longer generation times typically have slower life histories and lower reproductive output	Population or species level		≥ 25 years	10–25 years	1–10 years	≤ 1 year

Attribute Complex	Attributes	Persist in Place or Shift in Space	Definition	Relevant taxonomic scale	Additional specifications	Level of AC			
						Low	Moderately low / Moderate / Moderately high		High
	Age of Sexual Maturity (ASM)	PiP and SiS	Also referred to as age at recruitment or age of first reproduction; time to reproductive maturation, relative to overall lifespan; age of sexual maturity is another life history optimization tradeoff; early reproduction lowers the chance of dying without offspring and increases the number of lifetime reproductive attempts (thereby increasing fitness), but breeding investment in early life can reduce survival probability and accelerate senescence later in life; therefore, age of sexual maturity, when evaluated in the context of fecundity, parity, and parental investment, is an indicator of reproductive fitness	Individual, population or species level	As it relates to the likelihood of an individual reproducing during its lifetime	Delayed (late relative to lifespan)	Intermediate (about halfway through lifetime)		Rapid (early relative to lifespan)
	Age Structure (AS)	PiP and SiS	A summary of the number of individuals of each age (or age class) in a population; age structure is useful in understanding and predicting population growth: if most individuals in a population are below the age of first reproduction, then the population is likely to grow, but if most individuals are beyond reproductive age, then the population would be expected to shrink	Population level		More old (higher proportion of population is beyond reproductive age)	Balanced (age classes are roughly equal)		More young (higher proportion of population is below first age of reproduction)

	Recruitment (R)	PiP an d SiS	Proportion of juveniles surviving to adulthood (maturity) in a population; recruitment can be an important factor in predicting future population growth potential; high recruitment may increase a species' current and future abundance within a system, whereas low recruitment can lead to reduced current and future abundance	Populatio n or species level		Small proportion or None	Approximately half	Large proportion or All juveniles

APPENDIX B: COMPLETE LIST OF ADAPATIVE CAPACITY SCORES FOR ASSESSED SPECIES. (ACCOMPANYING SPREADSHEET INCLUDING SCORES FOR INDIVIDUAL TRAITS AVAILBLE UPON REQUEST)

Scientific Name	Common name	Distribution Group AC Level	Distribution Group AC Score	Movement Group AC Level	Movement Group AC Score	Evolutionary Potential Group AC Level	Evolutionary Potential Group AC Score	Ecological Role Group AC Level	Ecological Role Group AC Score	Abiotic Niche Group AC Level	Abiotic Niche Group AC Score	Life History Group AC Level	Life History Group AC Score	Demography Group AC Level	Demography Group AC Score	Overall AC Level	Overall AC score
Accipiter atricapillus	*American goshawk*	Moderately high	0.65	High	0.84	Moderate	0.5	High	0.83	Low	-0.05	Moderately high	0.66	Moderate	0.6	Moderate	0.58
Acipenser fulvescens	*Lake Stugeon*	Moderately high	0.65	Moderately high	0.63	Moderate	0.42	Moderately high	0.67	Moderately low	0.31	Moderately high	0.75	Moderately low	0.3	Moderate	0.53
Acris blanchardi	*Blanchard's Cricket Frog*	High	0.90	Moderate	0.53	Moderate	0.58	High	0.83	Moderate	0.45	Moderately high	0.72	Moderately high	0.70	Moderately high	0.67
Acroneuria ozarkensis	*Ozark stone*	Moderate	0.5	Moderately low	0.31	Low	0	Moderate	0.42	Moderately low	0.25	Moderate	0.5	Moderate	0.5	Moderately low	0.35
Acronicta dolli	*Doll's dagger moth*	Moderately high	0.75	Low	-0.13	Moderately high	0.75	Moderate	0.58	Moderate	0.45	Moderate	0.41	Moderate	0.6	Moderate	0.49
Acronicta falcula	*Corylus Dagger Moth*	Moderate	0.55	Low	0	Low	-0.17	Low	0	Moderate	0.45	Moderate	0.41	Moderate	0.5	Moderately low	0.25
Acronicta funeralis	*Funerary dagger moth*	Moderately high	0.8	Low	0.13	Low	-0.17	High	0.83	Moderately high	0.7	Moderately high	0.66	Moderate	0.5	Moderate	0.49
Actinonaias ligamentina	*Mucket*	Moderately high	0.70	Moderately low	0.38	Moderately high	0.75	Moderately high	0.67	Moderately low	0.30	High	0.81	Low	0.20	Moderate	0.54
Aeshna sitchensis	*Zigzag darner*	Moderately high	0.75	Moderately low	0.25	Low	0.00	High	1.00	Moderate	0.45	Moderate	0.50	Moderate	0.60	Moderate	0.51
Aeshna subarctica	*Subarctic darner*	Moderately high	0.75	Moderately low	0.25	Low	0.00	High	1.00	Moderate	0.45	Moderate	0.50	Moderate	0.60	Moderate	0.51
Agapetus artesus	*Artesian Agapetus Caddisfly*	Low	0.05	Low	0.06	Low	-0.17	Moderately low	0.25	Low	0.05	Moderately high	0.72	Moderate	0.5	Moderately low	0.21
Agnetina annulipes	*Southern stone*	Moderately high	0.7	Moderately low	0.31	Low	0	High	0.83	Moderately low	0.25	Moderately high	0.63	Moderate	0.5	Moderate	0.46
Alasmidonta viridis	*Slippershell*	Low	0.20	Moderately low	0.31	Moderately low	0.25	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.35	Moderately low	0.36
Alces americanus	*Moose*	High	0.85	High	0.88	Moderately high	0.67	Moderately high	0.67	Moderate	0.44	High	0.84	Moderate	0.45	Moderately high	0.68
Amblycheila cylindriformis	*Great Plains tiger beetle*	Moderately high	0.70	Low	0.00	Low	0.17	High	1.00	High	0.90	Moderately high	0.78	Moderately high	0.70	Moderately high	0.61
Amblyopsis hoosieri	*Hoosier Cavefish*	Low	0.1	Moderate	0.5	Low	0.17	Moderately high	0.67	Low	0.13	Moderately high	0.63	Moderate	0.6	Moderately low	0.4
Amblyscirtes belliyes	*Bell's roadside skipper*	Moderately high	0.8	Moderately low	0.31	Low	-0.08	Low	0.08	Moderate	0.55	Moderately high	0.78	Moderate	0.5	Moderate	0.42
Amblyscirtes linda	*Linda's roadside skipper*	Low	0.2	Low	0.06	Low	0.08	Low	-0.08	Low	0.2	Moderately high	0.72	Moderate	0.5	Moderately low	0.24
Ambystoma opacum	*Marbled Salamander*	Moderately high	0.80	Moderately low	0.34	Moderate	0.58	High	0.83	Moderate	0.45	High	0.91	Moderately high	0.80	Moderately high	0.67
Ambystoma texanum	*Small-mouthed Salamander*	High	0.85	Moderate	0.41	Moderate	0.58	High	0.83	Moderate	0.45	High	0.84	Moderately high	0.70	Moderately high	0.67
Ammocrypta clara	*Western Sad Darter*	Moderate	0.5	Moderate	0.56	Moderate	0.5	Moderately high	0.67	Moderately low	0.31	Moderately high	0.66	Moderate	0.6	Moderate	0.54
Ammocrypta pellucida	*Eastern Sand Darter*	Moderate	0.55	Moderate	0.56	Moderate	0.5	Moderate	0.5	Moderately low	0.31	Moderately high	0.78	Moderately high	0.65	Moderate	0.55
Ammodramus savannarum	*Grasshopper Sparrow*	Moderately high	0.75	High	0.81	Moderately high	0.75	High	1	Moderately low	0.3	Moderately high	0.66	Moderate	0.45	Moderately high	0.67

Ammospiza leconteii	*LeConte's Sparrow*	Moderately high	0.65	Moderately high	0.63	Moderately high	0.75	High	0.83	Low	0	Moderate	0.5	Moderate	0.45	Moderate	0.54
Ammospiza nelsoni	*Nelson's Sparrow*	Moderately low	0.4	Moderately low	0.39	Moderate	0.58	High	0.83	Low	-0.1	Moderately high	0.72	Moderate	0.5	Moderate	0.48
Anabolia ozburni	*Ozburn's Northern Caddisfly*	Moderate	0.60	Low	0.06	Low	-0.08	Moderate	0.50	Moderately low	0.25	Moderate	0.50	Moderately low	0.38	Moderately low	0.31
Analetris eximia	*Extraordinary bow-legged minnow mayfly*	Moderate	0.45	Low	0.19	Low	-0.08	Moderate	0.5	Low	0.15	Moderately low	0.38	Moderate	0.5	Moderately low	0.3
Anas rubripes	*American black duck*	Moderately high	0.65	Moderately high	0.75	Moderately high	0.75	High	0.83	Low	0.2	Moderately high	0.66	Moderate	0.6	Moderately high	0.63
Anaxyrus [Bufo] cognatus	*Great Plains Toad*	Moderately high	0.65	Moderate	0.47	Moderately high	0.75	Moderately high	0.67	Moderately low	0.40	High	0.91	Moderate	0.60	Moderately high	0.63
Anaxyrus [Bufo] fowleri	*Fowler's Toad*	High	0.90	Moderately high	0.63	Moderately high	0.75	High	0.83	Moderately low	0.40	High	0.91	Moderate	0.60	Moderately high	0.72
Andrena rubi	*An andrenid bee*	Moderately low	0.4	Low	0	Low	-0.08	Low	-0.25	Moderate	0.6	Moderately low	0.38	Moderately high	0.7	Moderately low	0.25
Aneides aeneus	*Green Salamander*	Moderately low	0.40	Moderate	0.47	Low	0.17	High	1.00	Moderately low	0.25	High	0.84	Moderate	0.60	Moderate	0.53
Anguispira kochi	*Banded tigersnail*	Moderate	0.6	Moderate	0.5	Low	0.17	Moderately low	0.25	Low	0.2	Moderate	0.59	Moderate	0.6	Moderate	0.42
Anthidiellum notatum	*Eastern carder bee*	Moderately low	0.4	Low	-0.04	Low	0	Low	0	Low	0.1	Low	0.13	Low	0.2	Low	0.11
Antrostomus vociferus	*Eastern whip-poor-will*	Moderately high	0.65	Moderate	0.53	Moderate	0.58	Moderately high	0.67	Moderately low	0.25	Moderate	0.53	Moderate	0.45	Moderate	0.52
Appalachia arcana	*Michigan bog grasshopper*	Moderately low	0.3	Low	0	Low	-0.08	Moderate	0.42	Low	0.15	Low	0.19	Moderate	0.55	Moderately low	0.22
Aquila chrysaetos	*Golden Eagle*	Moderately high	0.75	Moderately high	0.72	Moderate	0.58	High	0.83	Moderately low	0.4	Moderate	0.47	Moderate	0.6	Moderately high	0.62
Arcidens confragosus	*Rock pocketbook*	Moderate	0.60	Moderate	0.44	Moderate	0.58	Moderately high	0.67	Low	0.20	High	0.81	Moderately low	0.25	Moderate	0.51
Argynnis atlantis	*Pahasapa fritillary*	Low	0.2	Moderately low	0.38	Moderate	0.42	Low	0.08	Moderately low	0.3	Moderately high	0.72	Moderate	0.5	Moderately low	0.37
Argynnis idalia	*Regal fritillary*	Moderately high	0.65	Moderately low	0.38	Moderate	0.42	Moderately low	0.25	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderate	0.48
Asio flammeus	*Short-eared owl*	High	0.85	Moderately high	0.75	Moderately high	0.75	Moderately high	0.67	Moderately low	0.3	Moderately high	0.66	Moderately low	0.35	Moderately high	0.62
Asio otus	*Long-eared owl*	Moderately high	0.75	Moderately high	0.79	Moderate	0.58	Moderate	0.5	Moderately low	0.25	Moderately high	0.66	Moderate	0.5	Moderate	0.58
Aspidoscelis sexlineatus	*Six-Lined Racerunner*	High	0.85	High	0.81	Moderately high	0.75	Moderate	0.50	Moderately low	0.40	Moderately high	0.66	Moderately high	0.70	Moderately high	0.67
Athene cunicularia	*Burrowing owl*	Moderately high	0.75	Moderately high	0.72	Moderate	0.42	Moderately high	0.67	Moderate	0.55	Moderate	0.5	Moderate	0.5	Moderate	0.59
Atrytone arogos	*Arogos skipper*	Moderate	0.5	Low	0.06	Low	-0.08	Moderately low	0.25	Low	0.2	Moderately high	0.72	Moderate	0.5	Moderately low	0.31
Atrytonopsis hianna	*Dusted skipper*	Moderate	0.6	Low	0.08	Low	0.08	Moderately low	0.25	Moderately low	0.3	Moderately high	0.72	Moderate	0.5	Moderately low	0.36
Attaneuria ruralis	*Giant stone*	Moderate	0.6	Moderately low	0.31	Low	0	Moderate	0.42	Moderately low	0.4	Moderately high	0.63	Moderate	0.5	Moderate	0.41
Auridius sandaraca	*Sanders' golden leafhopper*	Moderately low	0.40	Low	0.00	Low	-0.08	Low	0.08	Moderate	0.45	Moderate	0.59	Moderately high	0.70	Moderately low	0.31
Baetisca obesa	*Fork-headed armored mayfly*	Moderately high	0.65	Low	0.19	Low	-0.08	Moderately high	0.67	Moderately low	0.25	Moderate	0.5	Moderate	0.5	Moderately low	0.38
Bartramia longicauda	*Upland sandpiper*	Moderately high	0.75	Moderate	0.59	Moderately high	0.67	Moderate	0.5	Moderately low	0.25	Moderate	0.53	Moderately low	0.4	Moderate	0.53
Battus philenor	*Pipevine swallowtail*	High	0.85	Low	0.13	Moderate	0.58	Moderate	0.5	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderate	0.53
Boloria chariclea	*Arctic fritillary*	Moderate	0.55	Moderately low	0.31	Moderately low	0.25	High	0.83	Moderately low	0.3	Moderately high	0.61	Moderate	0.5	Moderate	0.48
Boloria freija	*Freija fritillary*	Moderately high	0.75	Low	0.16	Moderate	0.58	Moderate	0.42	Low	0.2	Moderately high	0.61	Moderate	0.5	Moderate	0.46

Boloria frigga	*Frigga fritillary*	Moderately high	0.75	Low	0.16	Moderate	0.58	High	0.83	Low	0.2	Moderate	0.58	Moderate	0.5	Moderate	0.52
Bombus affinis	Rusty patched bumble bee	Moderate	0.55	Low	0.19	Low	0	High	0.83	Moderately low	0.25	Moderate	0.53	Moderately high	0.7	Moderate	0.44
Bombus bohemicus	*Ashton cuckoo bumble bee*	Moderate	0.45	Low	0.06	Moderately low	0.25	High	0.83	Moderate	0.45	Moderate	0.41	Moderately high	0.8	Moderate	0.46
Bombus borealis	*Northern amber bumble bee*	Moderately high	0.75	Moderately low	0.31	Moderately low	0.25	High	0.83	Moderate	0.45	Moderate	0.53	Moderately high	0.8	Moderate	0.56
Bombus fervidus	*Yellow bumble bee*	Moderately high	0.75	Low	0.19	Moderately low	0.25	High	0.83	Moderate	0.45	Moderate	0.53	Moderately high	0.8	Moderate	0.54
Bombus pensylvanicus	*American Bumble Bee*	Moderately high	0.75	Moderately low	0.31	Moderately low	0.25	High	0.83	Moderate	0.50	Moderate	0.53	Moderately high	0.70	Moderate	0.55
Bombus sandersoni	*Sanderson's bumble bee*	Moderately high	0.75	Moderately low	0.31	Moderately low	0.25	High	0.83	Moderate	0.45	Moderate	0.53	Moderately high	0.8	Moderate	0.56
Bombus terricola	*Yellow banded bumble bee*	Moderately high	0.75	Moderately low	0.31	Moderately low	0.25	High	0.83	Moderate	0.45	Moderate	0.53	Moderately high	0.8	Moderate	0.56
Bombus vagans	*Half-black bumble bee*	Moderately high	0.75	Low	0.19	Moderate	0.58	High	0.83	Moderate	0.5	Moderate	0.44	Moderately high	0.8	Moderate	0.58
Botaurus lentiginosus	*American Bittern*	Moderate	0.55	Moderate	0.44	Moderately low	0.25	Moderate	0.58	Low	0	Moderate	0.59	Moderately low	0.4	Moderate	0.4
Brachionycha borealis	*Boreal brachionyncha*	Moderate	0.6	Low	0.13	Low	-0.17	Low	0	Low	0.2	Moderately high	0.66	Moderate	0.5	Moderately low	0.27
Brychius hungerfordi	*Hungerford's crawling water beetle*	Moderately low	0.35	Low	0.13	Low	0.08	Moderate	0.42	Low	0.20	Moderately high	0.72	Moderate	0.50	Moderately low	0.34
Butorides virescens	*Green heron*	Moderately high	0.7	Moderate	0.59	Moderately high	0.75	High	0.83	Moderately low	0.3	Moderate	0.59	Low	0.2	Moderate	0.57
Calephelis muticum	*Swamp metalmark*	Moderately low	0.4	Low	0.06	Low	0.17	Low	0	Moderately low	0.35	Moderately high	0.66	Moderate	0.5	Moderately low	0.31
Callophrys irus	*Frosted elfin*	Moderately low	0.4	Low	0.06	Low	0.17	Low	0	Moderately low	0.3	Moderately high	0.66	Moderate	0.5	Moderately low	0.3
Cambarunio iris	*Rainbow*	Moderate	0.60	Moderately low	0.38	Moderate	0.42	Moderately high	0.67	Low	0.10	Moderately high	0.75	Moderately low	0.35	Moderate	0.47
Cambarus maculatus	*Freckled Crayfish*	Moderately low	0.25	High	0.88	Low	0.08	Moderately high	0.67	Moderately low	0.25	Moderately high	0.66	Moderate	0.5	Moderate	0.47
Cambarus robustus	*Big Water Crayfish*	Moderately high	0.75	Moderately high	0.63	Moderate	0.5	High	0.83	Moderate	0.55	Moderate	0.47	Moderately high	0.7	Moderately high	0.63
Campeloma decisum	*Pointed campeloma*	High	0.90	Moderately high	0.63	Moderate	0.58	High	1.00	Moderate	0.45	Moderate	0.43	Moderate	0.45	Moderately high	0.63
Canachites canadensis	*Spruce grouse*	Moderate	0.55	High	0.81	Moderate	0.42	Low	0.17	Low	0.15	High	0.84	Moderately high	0.7	Moderate	0.52
Canis lupus	*Gray Wolf*	High	0.85	High	1.00	Moderately high	0.75	High	1.00	High	1.00	Moderately high	0.72	Moderately high	0.70	High	0.86
Caprimulgus carolinensis	*Chuck-will's-widow*	High	0.85	Moderately low	0.22	Moderate	0.58	High	0.83	Moderately low	0.25	Moderate	0.59	Moderate	0.45	Moderate	0.54
Carychium nannodes	*File thorn*	Moderate	0.5	Moderate	0.5	Low	0.17	Moderately low	0.25	Low	0.1	Moderate	0.59	Moderate	0.6	Moderately low	0.39
Catocala abbreviatella	*Abbreviated underwing*	Moderately low	0.4	Low	0.19	Moderate	0.42	Low	0.08	Moderately low	0.3	Moderately high	0.66	Moderate	0.5	Moderately low	0.36
Catocala amestris	*Three staff underwing*	Moderate	0.6	Moderately low	0.31	Moderate	0.42	Low	0.08	Moderately low	0.3	Moderately high	0.66	Moderate	0.5	Moderate	0.41
Catocala dulicola	*Quiet underwing*	Moderately high	0.7	Moderately low	0.31	Moderate	0.42	Moderately low	0.25	Moderately low	0.4	Moderately high	0.66	Moderate	0.5	Moderate	0.46
Catocala illecta	*Magdalen underwing*	Moderately high	0.8	Moderately low	0.31	Moderate	0.58	Moderately low	0.25	Moderately high	0.63	Moderately high	0.66	Moderate	0.5	Moderate	0.53
Catocala whitneyi	*Whitney's underwing*	Moderately low	0.4	Low	0.19	Moderately low	0.25	Low	-0.08	Low	0.2	Moderately high	0.66	Moderate	0.5	Moderately low	0.3
Centronyx henslowii	*Henslow's sparrow*	Moderately high	0.75	Moderately high	0.63	Moderate	0.58	High	0.83	Low	0.1	Moderate	0.59	Moderate	0.45	Moderate	0.56
Charadrius melodus	*Piping plover*	Moderately low	0.4	Moderately high	0.63	Moderate	0.42	Moderate	0.58	Low	0.1	Moderate	0.59	Moderate	0.6	Moderate	0.47

Chlidonias niger	*Black tern*	Moderate	0.55	Moderately high	0.63	Moderate	0.58	Moderate	0.58	Low	0.15	Moderately high	0.72	Moderate	0.5	Moderate	0.53
Chordeiles minor	*Common nighthawk*	Moderately high	0.75	Moderately low	0.31	Moderate	0.42	Moderately high	0.67	Moderate	0.55	Moderate	0.53	Moderately low	0.4	Moderate	0.52
Chrosomus erythrogaster	*Southern Redbelly Dace*	Moderate	0.6	Moderately high	0.69	Moderately low	0.33	Moderately high	0.67	Moderately low	0.31	Moderately high	0.72	Moderate	0.6	Moderate	0.56
Cicindela marginipennis	*Cobblestone tiger beetle*	Moderate	0.50	Low	0.19	Moderately low	0.25	High	1.00	Moderate	0.55	Moderately high	0.78	Moderate	0.50	Moderate	0.54
Cinclus mexicanus	*American dipper*	Moderate	0.55	Moderately high	0.78	Moderate	0.42	Moderately high	0.67	Low	0.1	Moderate	0.59	Moderate	0.6	Moderate	0.53
Circus hudsonius	*Northern harrier*	Moderately high	0.75	Moderately high	0.75	Moderate	0.58	High	0.83	Moderately low	0.4	Moderately high	0.72	Moderately low	0.4	Moderately high	0.63
Cistothorus palustris	*Marsh wren*	Moderately high	0.65	Moderately high	0.72	Moderate	0.58	High	0.83	Low	-0.1	Moderately high	0.78	Moderate	0.6	Moderate	0.58
Cistothorus stellaris	*Sedge wren*	Moderately high	0.75	Moderately high	0.63	Moderate	0.58	High	0.83	Low	0.05	Moderate	0.56	Moderately low	0.25	Moderate	0.52
Clemmys guttata	*Spotted Turtle*	High	0.85	Moderate	0.59	Moderate	0.50	Moderately high	0.67	Moderately low	0.25	Moderately high	0.66	Low	0.10	Moderate	0.52
Clinostomus elongatus	*Redside Dace*	Moderate	0.6	Moderately high	0.69	Moderately high	0.75	Moderate	0.5	Moderately low	0.31	Moderately high	0.66	Moderate	0.5	Moderate	0.57
Clonophis kirtlandii	*Kirtland's Snake*	Moderately high	0.65	Moderate	0.50	Low	0.00	Low	0.17	Moderately low	0.25	High	0.84	Moderately low	0.40	Moderate	0.40
Coccothraustes vespertinus	*Evening grosbeak*	Moderately high	0.75	High	0.88	Moderately low	0.25	Moderate	0.5	Low	0.2	Moderately low	0.38	Moderately low	0.4	Moderate	0.48
Coelioxys hunteri	*A leafcutter bee*	Moderately low	0.3	Low	0	Low	-0.08	Low	0.08	Moderate	0.6	Moderate	0.53	Moderately high	0.7	Moderately low	0.3
Colinus virginianus	*Northern bobwhite*	High	0.85	Moderate	0.56	Moderately high	0.75	High	0.83	Moderately low	0.35	Moderately high	0.66	Moderately low	0.3	Moderately high	0.61
Copablepharon michiganensis	*Michigan dune dart moth*	Moderately low	0.25	Low	0.06	Low	-0.25	Low	-0.17	Low	0.15	Moderately high	0.66	Moderate	0.5	Low	0.17
Coregonus artedi	*Cisco*	Moderately high	0.8	Moderate	0.53	Moderately high	0.75	Moderately high	0.67	Low	0.13	Moderately high	0.75	Moderately high	0.7	Moderately high	0.62
Coregonus kiyi	*Kiyi - Upper Great Lakes*	Moderate	0.56	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Low	0.13	Moderately high	0.75	Moderate	0.6	Moderate	0.53
Coregonus nipigon	*Nipigon Cisco*	Moderate	0.5	Moderate	0.56	Moderately high	0.67	Moderately high	0.67	Low	0.13	Moderately high	0.69	Moderately high	0.8	Moderate	0.57
Coregonus zenithicus	*Shortjaw Cisco*	Moderately high	0.75	Moderate	0.56	Moderate	0.58	Moderately high	0.67	Low	0.13	Moderately high	0.75	Moderate	0.6	Moderate	0.58
Cottus ricei	*Spoonhead Sculpin*	Moderate	0.6	Moderate	0.56	Moderate	0.58	Moderately high	0.67	Moderately low	0.31	Moderately high	0.75	Moderately high	0.7	Moderate	0.6
Coturnicops noveboracensis	*Yellow rail*	Moderately low	0.35	Moderate	0.5	Low	0.17	High	0.83	Low	0.15	Moderate	0.5	Moderate	0.45	Moderate	0.42
Couesius plembeus	*Lake Chub*	Moderately high	0.7	Moderate	0.59	Moderate	0.58	Moderately high	0.67	Moderately low	0.31	Moderately high	0.78	Moderate	0.6	Moderately high	0.61
Cryptobranchus alleganiensis	*Eastern Hellbender*	Moderately low	0.25	Moderate	0.56	Low	0.08	Moderately high	0.67	Moderately low	0.30	Moderately high	0.72	Moderate	0.60	Moderate	0.45
Cryptotis parva	*Least Shrew*	High	0.85	Moderate	0.56	Moderate	0.50	Moderate	0.58	Moderately high	0.63	Moderately high	0.78	Moderately high	0.80	Moderately high	0.67
Crystallaria asprella	*Crystal Darter*	Moderately low	0.4	Moderately high	0.69	Low	0.17	Moderately high	0.67	Low	0.19	Moderately high	0.72	Moderate	0.6	Moderate	0.49
Cyanocitta cristata	*Blue Jay*	High	1	High	0.84	High	0.83	High	0.83	Moderately low	0.4	Moderate	0.5	Moderately high	0.7	Moderately high	0.73
Cyclonaias tuberculata	*Purple wartyback*	Moderately high	0.70	Moderate	0.44	Moderately high	0.75	Moderate	0.50	Low	0.20	High	0.81	Low	0.20	Moderate	0.51
Cycnia collaris	Unexpected milkweed moth	Moderately high	0.8	Moderately low	0.31	Moderate	0.5	Moderately low	0.25	Moderate	0.6	Moderately high	0.66	Moderate	0.5	Moderate	0.52
Cyprogenia stegaria	*Fanshell*	Moderately low	0.30	Moderately low	0.31	Moderately low	0.25	Moderately high	0.67	Moderately low	0.30	Moderately high	0.66	Moderately low	0.30	Moderately low	0.40
Danaus plexippus	*Monarch*	High	0.9	Moderately low	0.31	Moderate	0.42	Moderately high	0.67	Moderately low	0.3	Moderately high	0.72	Moderate	0.5	Moderate	0.54
Dargida rubripennis	Pink streak	Moderately high	0.8	Low	0.06	Low	0	Moderately low	0.25	Moderate	0.45	Moderately high	0.66	Moderate	0.5	Moderately low	0.39

Dichagyris reliqua	*Relict dart moth*	Low	0.2	Low	0.06	Low	-0.17	Low	-0.08	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.23
Discus patulus	*Domed disc*	Moderate	0.6	Moderate	0.5	Low	-0.08	Moderately low	0.25	Low	0.1	Moderate	0.59	Moderate	0.6	Moderately low	0.37
Discus shimekii	*Striate disc snail*	Moderate	0.5	Moderate	0.5	Low	-0.08	Moderately low	0.25	Low	0.2	Moderate	0.5	Moderate	0.6	Moderately low	0.35
Dorydiella kansana	*Kansan spikerush leafhopper*	Moderately low	0.40	Low	0.06	Moderately low	0.33	Low	0.08	Moderately low	0.25	Moderate	0.59	Moderate	0.50	Moderately low	0.32
Dryobius sexnotatus	*Six-banded longhorn beetle*	Moderately high	0.75	Low	-0.19	Low	-0.25	Low	0	Moderately low	0.3	Low	0.19	Moderate	0.45	Low	0.18
Eacles imperialis	*Imperial pine moth*	Moderate	0.5	Moderately low	0.31	Moderately low	0.25	Moderate	0.42	Moderately low	0.3	Moderately high	0.72	Moderate	0.5	Moderate	0.43
Elassoma zonatum	*Banded Pygmy Sunfish*	Moderate	0.6	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Low	0.19	Moderate	0.53	Moderate	0.6	Moderate	0.51
Ellipsaria lineolata	*Butterfly mussel*	Moderate	0.60	Moderate	0.44	Moderate	0.58	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Moderately low	0.30	Moderate	0.48
Ellipsoptera lepida	*Ghost tiger beetle*	Moderate	0.50	Low	0.19	Low	0.17	High	1.00	High	0.95	Moderately high	0.78	Moderate	0.50	Moderate	0.58
Ellipsoptera nevadica makosika	*Indian Creek Tiger Beetle*	Low	0.00	Low	0.13	Low	-0.08	High	1.00	Moderate	0.50	Moderately high	0.78	Moderate	0.50	Moderate	0.40
Elliptio complanata	*Eastern elliptio*	Moderately high	0.70	Moderate	0.44	High	0.83	Moderately high	0.67	Moderately low	0.30	High	0.81	Moderately low	0.25	Moderate	0.57
Elliptio crassidens	*Elephantear*	Moderate	0.60	Moderate	0.44	Moderate	0.42	Moderate	0.50	Low	0.10	Moderately high	0.75	Moderately low	0.30	Moderate	0.44
Emydoidea blandingii	*Blanding's Turtle*	High	0.85	Moderate	0.59	Moderately low	0.33	Moderately high	0.67	Low	0.20	Moderately high	0.66	Low	0.20	Moderate	0.50
Epioblasma curtisii	*Curtis' Pearly Mussel*	Low	0.10	Moderately low	0.31	Low	0.17	Moderate	0.42	Low	0.10	Moderately high	0.66	Moderately low	0.30	Moderately low	0.29
Epioblasma perobliqua	*White catspaw*	Low	0.05	Moderately low	0.31	Low	0.17	Moderate	0.42	Low	0.20	Moderately high	0.66	Moderately low	0.30	Moderately low	0.30
Epioblasma rangiana	*Northern rifffleshell*	Low	0.20	Moderately low	0.31	Low	0.17	Moderately high	0.67	Low	0.10	High	0.81	Moderately low	0.30	Moderately low	0.37
Epioblasma triquetra	*Snuffbox*	Low	0.20	Low	0.06	Moderately low	0.33	Moderately high	0.67	Low	0.10	High	0.81	Moderately low	0.30	Moderately low	0.35
Epitheca petechialis	*Dot-winged baskettail*	High	0.95	Moderately low	0.25	Moderately low	0.25	High	1.00	Moderate	0.45	Moderate	0.59	Moderate	0.50	Moderate	0.57
Erebia discoidalis	*Red-disked alpine*	Moderate	0.6	Low	0.19	Moderate	0.5	Moderately high	0.67	Moderate	0.55	Moderately high	0.72	Moderate	0.5	Moderate	0.53
Erebia mancinus	*Taiga alpine*	Moderately high	0.65	Low	0.19	Moderate	0.42	Moderately high	0.67	Moderate	0.55	Moderately high	0.72	Moderate	0.44	Moderate	0.52
Erimyzon claviformis	*Western Creek Chubsucker*	Moderately high	0.65	Moderately high	0.63	Moderate	0.58	High	0.83	Low	0.19	Moderately high	0.66	Moderately high	0.7	Moderately high	0.61
Erora laeta	*Early hairstreak*	Moderately low	0.4	Low	0.19	Low	0.17	Moderately low	0.33	Moderate	0.5	Moderately high	0.72	Moderate	0.5	Moderate	0.4
Erynnis martialis	Mottled duskywing	Moderately low	0.4	Low	0.06	Low	-0.08	Low	-0.08	Moderate	0.5	Moderately high	0.72	Moderate	0.5	Moderately low	0.29
Erynnis persius	*Persius duskywing*	Moderately low	0.35	Low	0.06	Low	-0.08	Low	-0.08	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.27
Etheostoma microperca	*Least Darter*	Moderately high	0.65	Moderate	0.54	Moderate	0.58	Moderately high	0.67	Low	0.19	Moderately high	0.66	Moderate	0.6	Moderate	0.55
Etheostoma nianguae	*Niangua Darter*	Low	0.2	Low	0.16	Low	0.17	Moderately high	0.67	Moderately low	0.31	Moderately high	0.63	Moderate	0.6	Moderately low	0.39
Etheostoma spectabile	*Orangethroat Darter*	Moderate	0.6	Moderately high	0.66	Moderate	0.42	High	0.83	Moderately low	0.31	Moderately high	0.75	Moderate	0.6	Moderate	0.6
Euchloe ausonides	*Large marble*	Moderately high	0.8	Moderately low	0.31	Moderately low	0.33	Moderately low	0.25	Moderately low	0.4	Moderately high	0.72	Moderate	0.5	Moderate	0.47
Euconulus alderi	*Marsh hive snail*	Moderate	0.55	Moderate	0.5	Low	-0.25	Moderately low	0.25	Low	0.2	Moderate	0.59	Moderate	0.6	Moderately low	0.35
Eucosma bipunctella	Two-spotted eucosma	Moderate	0.5	Low	0.19	Low	0	Low	0.08	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.33

Eucosma giganteana	*Giant eucosma moth*	Moderately high	0.70	Moderately low	0.25	Low	0.08	Low	0.00	Moderate	0.55	Moderate	0.56	Moderate	0.60	Moderately low	0.39
Euphyes dukesi	*Dukes' skipper*	Moderately low	0.40	Low	0.08	Low	-0.08	Moderately low	0.25	Moderate	0.56	Moderately high	0.66	Moderately low	0.35	Moderately low	0.32
Euxoa aurulenta	Dune cutworm	Moderate	0.5	Moderately low	0.31	Low	0	Low	0	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.35
Falco peregrinus	*Peregrine falcon*	High	0.95	Moderately high	0.75	Moderately low	0.33	High	1	Moderate	0.55	Moderately high	0.66	Moderate	0.5	Moderately high	0.68
Falco sparverius	*American kestrel*	High	0.9	Moderately high	0.75	Moderately high	0.67	High	0.83	Moderately high	0.65	Moderately high	0.66	Moderate	0.5	Moderately high	0.71
Faxonius eupunctus	*Coldwater Crayfish*	Moderately low	0.25	Moderate	0.56	Moderate	0.58	Moderately high	0.67	Moderately low	0.38	Moderate	0.59	Moderate	0.6	Moderate	0.52
Faxonius immunis	*Calico Crayfish*	High	0.9	High	0.88	Moderate	0.5	Moderately high	0.67	Moderately high	0.63	Moderate	0.59	Moderately low	0.4	Moderately high	0.65
Faxonius marchandi	*Mammoth Springs Crayfish*	Low	0.15	Moderate	0.56	Moderate	0.58	Moderately high	0.67	Moderately low	0.25	Moderately high	0.75	Moderately high	0.7	Moderate	0.52
Faxonius peruncus	*Big Creek Crayfish*	Low	0.15	High	0.81	Moderately low	0.25	Moderately high	0.67	Moderately low	0.4	Moderate	0.47	Moderate	0.6	Moderate	0.48
Faxonius quadruncus	*St Francis River Crayfish*	Low	0.15	High	0.81	Moderately low	0.25	Moderately high	0.67	Moderately low	0.4	Moderate	0.47	Moderately high	0.7	Moderate	0.49
Faxonius roberti	*Spring River Crayfish*	Low	0.15	Low	0.19	Moderate	0.58	Moderately high	0.67	Moderately low	0.35	Moderate	0.5	Moderately high	0.7	Moderate	0.45
Felis concolor	*Cougar*	Moderately high	0.75	High	1.00	Moderate	0.42	High	1.00	High	0.88	Moderately high	0.78	Moderate	0.60	Moderately high	0.77
Fitchiella robertsonii	*Robertson's flightless planthopper*	Moderately low	0.40	Low	-0.06	Low	-0.08	Low	0.08	Moderate	0.45	Moderate	0.41	Moderate	0.55	Moderately low	0.25
Flexamia huroni	*Lake Huron Leafhopper*	Low	0.15	Low	0.06	Moderately low	0.33	Low	0.08	Moderately low	0.25	Moderate	0.59	Moderate	0.50	Moderately low	0.28
Flexamia reflexa	*Reflexed bluestem leafhopper*	Moderate	0.60	Low	0.08	Moderately low	0.33	Moderately high	0.67	Moderately low	0.25	Moderate	0.46	Moderate	0.60	Moderate	0.43
Fundulus dispar	*Starhead Topminnow*	Moderate	0.6	Moderate	0.56	Moderate	0.42	High	0.83	Moderate	0.44	Moderately high	0.63	Moderate	0.6	Moderate	0.58
Gallinula galeata	*Common gallinule*	Moderately high	0.75	Moderately high	0.66	Moderate	0.58	High	0.83	Moderately low	0.3	Moderate	0.56	Moderate	0.55	Moderately high	0.61
Gavia immer	*Common loon*	Moderately high	0.7	Moderately high	0.66	Moderate	0.5	Moderate	0.5	Low	0.2	Moderately high	0.66	Moderately low	0.4	Moderate	0.52
Glaucomys sabrinus	*Northern flying squirrel*	High	0.85	Moderately high	0.75	Moderately high	0.75	High	0.83	High	0.81	Moderately high	0.78	Moderately high	0.75	Moderately high	0.79
Glyphopsyche missouri	*Missouri Glyphopsyche Caddisfly*	Low	0.00	Low	0.06	Low	-0.08	Moderate	0.50	Low	0.10	Moderate	0.56	Moderately low	0.38	Moderately low	0.22
Glyptemys insculpta	*Wood Turtle*	Moderately high	0.65	Moderate	0.59	Moderate	0.42	Moderately high	0.67	Low	0.20	Moderately high	0.66	Low	0.20	Moderate	0.48
Goera stylata	*Stalked Weighted-case Caddisfly*	Moderate	0.60	Low	0.06	Low	0.00	Moderately high	0.67	Low	0.15	Moderate	0.50	Moderate	0.50	Moderately low	0.35
Gomphurus ventricosus	*Skillet clubtail*	Moderate	0.60	Moderately low	0.25	Moderately low	0.25	Moderate	0.58	Moderate	0.45	Moderate	0.59	Moderate	0.50	Moderate	0.46
Graptemys pseudogeographica	*False Map Turtle*	High	0.90	Moderately high	0.75	Moderate	0.58	High	0.83	Moderately low	0.40	Moderately high	0.66	Low	0.10	Moderately high	0.60
Haliaeetus leucocephalus	*Bald eagle*	Moderately high	0.65	Moderate	0.59	High	0.83	High	1	Moderate	0.55	Moderate	0.59	Moderately low	0.35	Moderately high	0.65
Helmitheros vermivorum	*Worm-eating warbler*	Moderately high	0.65	Moderate	0.59	Moderate	0.42	High	0.83	Low	-0.15	Moderate	0.59	Moderately low	0.4	Moderate	0.48
Helopicus nalatus	*Ozark springfly*	Moderate	0.6	Low	0.06	Low	0	High	0.83	Low	0.15	Moderate	0.5	Moderate	0.5	Moderately low	0.38
Hemaris gracilis	Slender clearwing	Moderately high	0.7	Moderately low	0.31	Moderately low	0.33	Low	0.08	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderate	0.44
Hemidactylium scutatum	*Four-toed Salamander*	Moderately high	0.75	Moderate	0.53	Moderately low	0.33	Moderate	0.50	Moderately low	0.35	High	0.84	Moderate	0.45	Moderate	0.54

Hendersonia occulta	*Cherrystone drop*	Moderately low	0.25	Moderate	0.5	Low	0	Moderately low	0.25	Low	0.05	Moderately high	0.75	Moderate	0.6	Moderately low	0.34
Hesperia dacotae	*Dakota skipper*	Moderately low	0.4	Low	0.19	Low	0.17	Moderately low	0.25	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.38
Hesperia metea	Cobweb skipper	Moderately high	0.7	Low	0.19	Moderate	0.5	Moderately low	0.25	Moderate	0.55	Moderately high	0.72	Moderate	0.5	Moderate	0.49
Hesperia ottoe	*Ottoe skipper*	Moderately low	0.4	Low	0.19	Low	0.08	Low	0.08	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.35
Hesperia sassacus	*Indian skipper*	High	0.9	Low	0.13	Moderate	0.58	Moderate	0.58	Moderately high	0.7	Moderately high	0.72	Moderate	0.5	Moderate	0.59
Hiodon tergisus	*Mooneye*	Moderately high	0.65	Moderately high	0.72	Moderate	0.5	High	0.83	Moderately low	0.31	High	0.81	Moderate	0.5	Moderately high	0.62
Holbrookia maculata	*Common Lesser Earless Lizard*	Moderately high	0.7	Moderate	0.56	Moderate	0.5	Moderately low	0.33	Moderately low	0.35	Moderately high	0.72	Moderately high	0.65	Moderate	0.54
Holocentropus milaca	*A Polycentropodid Caddisfly*	Moderate	0.50	Low	0.06	Low	0.00	Moderately high	0.67	Low	0.15	Moderate	0.50	Moderate	0.50	Moderately low	0.34
Homoeoneuria ammophila	*Sand-loving brush-legged mayfly*	Moderate	0.5	Low	0.19	Low	-0.08	Moderately high	0.67	Moderately low	0.25	Moderately low	0.38	Moderate	0.5	Moderately low	0.34
Homoplectra doringa	*A Hydropsychid Caddisfly*	Moderate	0.60	Low	0.06	Low	0.17	Moderately high	0.67	Moderately low	0.25	Moderate	0.50	Moderate	0.50	Moderately low	0.39
Hydroprogne caspia	*Caspian tern*	Moderately high	0.65	Moderately high	0.69	Moderate	0.42	Moderately high	0.67	Low	0.2	Moderate	0.5	Moderately low	0.4	Moderate	0.5
Hydroptila waskesia	*Waskesiu Microcaddisfly*	Moderate	0.60	Low	0.06	Low	0.00	Moderately low	0.33	Low	0.15	Moderate	0.50	Moderate	0.50	Moderately low	0.31
Hylocichla mustelina	*Wood thrush*	Moderate	0.55	Moderate	0.59	Moderate	0.58	High	0.83	Low	0.05	Moderate	0.5	Moderate	0.5	Moderate	0.52
Ichtyomyzon fossor	*Northern Brook Lamprey*	Moderate	0.60	Moderately low	0.34	Moderate	0.42	High	0.83	Low	0.15	Moderate	0.53	Moderate	0.50	Moderate	0.48
Ictalurus furcatus	*Blue Catfish*	High	0.9	High	0.81	High	1	High	1	Moderately high	0.69	Moderate	0.59	Moderately high	0.8	High	0.83
Isogenoides varians	*Rock island springfly*	Moderate	0.6	Low	0.06	Low	0	High	0.83	Moderately low	0.35	Moderate	0.41	Moderate	0.5	Moderately low	0.39
Ixobrychus exilis	*Least bittern*	Moderate	0.55	Low	0.13	Moderate	0.58	High	1	Low	0.15	Moderate	0.59	Moderately low	0.25	Moderate	0.46
Lampsilis abrupta	*Pink mucket*	Moderately low	0.30	Moderately low	0.25	Low	0.17	Moderate	0.50	Low	0.20	Moderately high	0.66	Moderately low	0.25	Moderately low	0.33
Lampsilis brittsi	*Northern brokenray*	Low	0.15	Moderately low	0.38	Moderate	0.58	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.25	Moderately low	0.40
Lampsilis fasciola	*Wavy-rayed Lampmussel*	Moderate	0.60	Moderately low	0.38	Moderate	0.58	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.35	Moderate	0.48
Lampsilis higginsii	*Higgins Eye*	Moderately low	0.35	Moderate	0.44	Moderate	0.58	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Moderately low	0.35	Moderate	0.45
Lampsilis ovata	*Pocketbook*	Moderately high	0.70	Moderately low	0.38	Moderately high	0.75	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Moderate	0.50	Moderate	0.54
Lanius ludovicianus	*Migrant loggerhead shrike*	Moderately high	0.7	Moderate	0.59	Low	-0.08	High	0.83	Low	0.05	Moderate	0.56	Moderately high	0.7	Moderate	0.48
Lasioglossum fedorense	*A sweat bee*	Moderately low	0.4	Low	0	Moderately low	0.25	Low	0.08	Moderate	0.55	Moderate	0.53	Moderately high	0.7	Moderately low	0.36
Lasioglossum oenotherae	*Evening primrose sweat bee*	Moderate	0.55	Low	0.06	Moderately low	0.25	Low	0.17	Moderate	0.55	Moderately high	0.66	Moderate	0.55	Moderately low	0.4
Lasioglossum heterognathus	*Wide-mouthed sweat bee*	Moderately low	0.4	Low	0	Low	0	Moderate	0.42	Moderately low	0.4	Moderate	0.53	Moderately high	0.7	Moderately low	0.35
Lasionycta secedens	A noctuid moth	Moderately low	0.4	Moderately low	0.31	Low	0.17	Low	0.08	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.36
Lasionycta taigata	*A noctuid moth*	Moderate	0.6	Moderately low	0.31	Low	-0.25	Moderately low	0.25	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.35
Lasiurus cinereus	Hoary bat	Moderately high	0.75	Moderately high	0.66	Moderate	0.58	High	1	Moderately high	0.7	Moderate	0.5	Moderately low	0.4	Moderately high	0.66

Lasmigona compressa	*Creek heelsplitter*	Moderate	0.60	Moderately low	0.38	Moderate	0.42	High	0.83	Low	0.20	Moderately high	0.66	Moderately low	0.35	Moderate	0.49
Lasmigona costata	*Flutedshell*	Moderately high	0.70	Moderate	0.44	Moderate	0.42	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.35	Moderate	0.48
Lepisosteus oculatus	*Spotted Gar*	Moderately high	0.65	Moderately high	0.66	Moderately low	0.25	High	0.83	Moderately low	0.31	Moderately high	0.78	Moderately high	0.7	Moderate	0.6
Lepyronia angulifera	*Angular spittlebug*	Moderate	0.50	Low	0.00	Moderately low	0.33	Low	0.17	Moderate	0.55	Moderately high	0.69	Moderately high	0.75	Moderate	0.43
Lepyronia gibbosa	*Great Plains Spittle bug*	Moderately high	0.75	Low	0.13	Moderately low	0.25	Moderate	0.58	Moderately high	0.80	Moderately high	0.69	Moderately high	0.75	Moderate	0.56
Ligumia subrostrata	*Pondmussel*	Moderately high	0.70	Moderate	0.44	Moderate	0.58	Moderate	0.50	Moderately low	0.30	High	0.81	Moderately low	0.25	Moderate	0.51
Limnephilus janus	*Two-faced Northern Caddisfly*	Moderate	0.60	Low	0.06	Low	0.00	Moderate	0.50	Low	0.15	Moderate	0.50	Moderately low	0.38	Moderately low	0.31
Limotettix elegans	*Elegant spikerush leafhopper*	Moderately low	0.40	Low	0.00	Low	-0.08	Low	0.08	Moderate	0.45	Moderate	0.59	Moderately high	0.70	Moderately low	0.31
Liodessus cantralli	*Cantrall's bog beetle*	Moderate	0.60	Moderately low	0.25	Low	0.08	High	1.00	Moderately low	0.35	Moderately high	0.72	Moderately high	0.63	Moderate	0.52
Lithobates [Rana] areolatus	*Northern Crawfish Frog*	Moderately high	0.75	Moderate	0.47	Moderate	0.42	Moderately high	0.67	Moderately low	0.25	High	0.84	Moderate	0.60	Moderate	0.57
Lithobates [Rana] blairi	*Plains Leopard Frog*	High	0.90	Moderate	0.50	Moderately high	0.75	High	0.83	Low	0.15	Moderately high	0.75	Moderate	0.60	Moderately high	0.64
Lithobates [Rana] palustris	*Pickerel Frog*	Moderately high	0.80	Moderately low	0.38	Moderate	0.42	High	0.83	Moderately high	0.65	High	0.91	Moderate	0.60	Moderately high	0.65
Lithobates [Rana] septentrionalis	*Mink Frog*	Moderately high	0.80	Moderate	0.50	Moderate	0.42	High	0.83	Moderately low	0.30	Moderately high	0.72	Moderate	0.60	Moderate	0.60
Lota lota	*Burbot*	Moderately high	0.7	Moderately high	0.69	Moderate	0.58	Moderately high	0.67	Low	0.19	Moderately high	0.75	Moderate	0.6	Moderate	0.6
Lucilla singleyana	*Smooth coil*	High	0.95	Moderately high	0.63	Moderate	0.5	Low	0.17	Moderately high	0.65	Moderately high	0.66	Moderate	0.6	Moderate	0.59
Lymnaea stagnalis	*Swamp Lymnaea*	Moderately high	0.75	Moderately high	0.63	Moderate	0.58	High	1.00	Moderate	0.45	Moderate	0.43	Moderately low	0.35	Moderate	0.60
Lynx canadensis	*Canada lynx*	Moderately high	0.75	High	1.00	Moderately high	0.75	Moderate	0.50	Moderately high	0.63	Moderately high	0.78	Moderate	0.60	Moderately high	0.72
Maccaffertium bednariki	*A flat-headed mayfly*	Moderately low	0.25	Low	0.19	Low	-0.08	Moderately high	0.67	Low	0.1	Moderately low	0.38	Moderate	0.5	Moderately low	0.29
Margaritifera monodonta	*Spectaclecase*	Moderately low	0.30	Moderate	0.44	Low	0.17	Moderate	0.50	Moderately low	0.30	Moderately high	0.75	Low	0.20	Moderately low	0.38
Mediappendix exilis	*Pleistocene catinella*	Moderately low	0.3	Moderate	0.5	Low	0	Moderately low	0.25	Low	0.1	Moderate	0.53	Moderate	0.5	Moderately low	0.31
Mediappendix gelida	*Frigid ambersnail*	Moderately low	0.3	Moderate	0.5	Low	-0.17	Moderately low	0.25	Low	0.1	Moderately high	0.66	Moderate	0.6	Moderately low	0.32
Megalonaias nervosa	*Washboard*	Moderately high	0.70	Moderate	0.44	Moderately high	0.75	Moderately high	0.67	Moderately low	0.30	Moderately high	0.69	Low	0.20	Moderate	0.53
Melanerpes erythrocephalus	*Red-headed Woodpecker*	Moderately high	0.75	Moderately high	0.72	Moderate	0.58	High	0.83	Low	0.1	Moderately high	0.66	Moderately high	0.8	Moderately high	0.63
Melanoplus flavidus	*Green desert grasshopper*	High	0.85	Low	0.13	Moderately low	0.33	Moderate	0.58	Moderately high	0.80	Moderately high	0.66	Moderately high	0.63	Moderate	0.57
Melanoplus viridipes	*Green-legged grasshopper*	Moderately high	0.80	Low	0.13	Moderately low	0.33	Moderate	0.42	Moderately high	0.80	Moderately high	0.66	Moderately high	0.63	Moderate	0.54
Melanoplus walshii	*Walsh's short-winged grasshopper*	Moderately high	0.80	Low	0.13	Low	0.17	Moderate	0.58	Moderately high	0.65	Moderately high	0.66	Moderately high	0.63	Moderate	0.52
Meropleon ambifusca	*Newman's brocade*	Moderate	0.6	Moderately low	0.31	Low	-0.25	Low	0	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.33
Mesomphix cupreus	*Copper button snail*	Moderate	0.5	Moderately high	0.69	Low	0	Moderately low	0.25	Moderately low	0.3	Moderately high	0.66	Moderate	0.6	Moderate	0.43
Microtus ochrogaster	*Prairie Vole*	Moderately high	0.75	Moderate	0.56	Moderately high	0.75	Moderate	0.58	High	0.88	Moderately high	0.72	Moderately high	0.70	Moderately high	0.71

Microtus pinetorum	*Woodland vole*	High	0.85	Moderate	0.44	Low	0.08	High	1.00	High	1.00	Moderately high	0.72	Moderately high	0.65	Moderately high	0.68
Moxostoma carinatum	*River Redhorse*	Moderate	0.6	Moderately high	0.63	Moderate	0.42	Moderate	0.5	Moderately low	0.31	Moderately high	0.66	Moderate	0.6	Moderate	0.53
Myotis lucifugus	Little brown bat	Moderately high	0.65	Moderately high	0.72	Moderate	0.5	High	0.83	Moderately high	0.7	Moderately high	0.66	Moderate	0.6	Moderately high	0.67
Myotis septentrionalis	Northern long-eared bat	Moderately high	0.65	Moderately high	0.63	Moderately low	0.33	High	0.83	Moderate	0.5	Moderate	0.59	Moderately low	0.35	Moderate	0.56
Myotis sodalis	Indiana bat	Moderately low	0.25	Moderate	0.59	Moderately low	0.25	High	0.83	Moderately low	0.35	Moderately high	0.66	Moderately low	0.3	Moderate	0.46
Nannothemis bella	*Elfin skimmer*	High	0.85	Low	0.06	Low	0.00	Moderate	0.58	Moderate	0.45	Moderate	0.59	Moderate	0.50	Moderate	0.43
Necturus maculosus	*Mudpuppy*	Moderately high	0.65	Moderate	0.50	Moderate	0.42	Moderate	0.50	Moderately low	0.35	Moderately high	0.72	Moderately low	0.35	Moderate	0.50
Neoconocephalus lyristes	*Bog conehead*	Moderately high	0.70	Low	0.13	Moderately low	0.33	Moderate	0.58	Moderate	0.50	Moderate	0.56	Moderately high	0.75	Moderate	0.51
Neogale frenata	*Long-tailed weasel*	High	0.90	High	0.88	Moderate	0.58	High	1.00	High	1.00	Moderately high	0.78	Moderately high	0.65	High	0.83
Neonympha mitchellii	Mitchell's satyr	Low	0.2	Low	0.06	Low	0	Low	0.17	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.29
Nerodia erythrogaster	*Copper-bellied Water Snake*	Moderate	0.55	Moderate	0.53	Moderately low	0.25	Moderate	0.50	Moderate	0.50	High	0.91	Moderately low	0.25	Moderate	0.50
Nicrophorus americanus	*American Burying Beetle*	Moderate	0.55	Moderately low	0.31	Low	0.17	Moderate	0.5	Moderate	0.55	Moderate	0.53	Moderately high	0.8	Moderate	0.49
Notophthalmus viridescens	*Eastern Newt*	High	0.90	Moderate	0.59	Moderate	0.58	High	0.83	Moderate	0.55	High	0.91	Moderately low	0.35	Moderately high	0.67
Notropis anogenus	*Pugnose Shiner*	Moderate	0.5	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Low	0.19	Moderately high	0.63	Moderate	0.6	Moderate	0.51
Notropis dorsalis	*Bigmouth Shiner*	Moderately high	0.7	Moderate	0.59	Moderate	0.58	Moderately high	0.67	Moderate	0.44	Moderately high	0.66	Moderate	0.6	Moderately high	0.61
Notropis ozarcanus	*Ozark Shiner*	Moderately low	0.3	Moderately low	0.22	Moderately low	0.33	Moderately low	0.25	Low	0.19	Moderately high	0.63	Moderate	0.6	Moderately low	0.36
Notropis photogenis	*Silver Shiner*	Moderate	0.6	Moderate	0.53	Moderately high	0.75	Moderately high	0.67	Moderately low	0.31	Moderately high	0.72	Moderate	0.6	Moderate	0.6
Noturus miurus	*Brindled madtom*	Moderate	0.5	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Moderately low	0.31	Moderately low	0.31	Moderate	0.5	Moderate	0.47
Noturus stigmosus	*Northern Madtom*	Moderately high	0.7	Moderate	0.56	Moderate	0.42	High	0.83	Low	0.19	Moderate	0.47	Moderate	0.6	Moderate	0.54
Numenius americanus	*Long-billed curlew*	Moderately high	0.75	Moderate	0.53	Moderate	0.42	High	0.83	Low	0	Moderate	0.47	Moderately low	0.3	Moderate	0.47
Nycticeius humeralis	Evening bat	High	0.9	Moderate	0.56	Low	0	High	0.83	Moderately low	0.3	Moderate	0.53	Moderate	0.45	Moderate	0.51
Nycticorax nycticorax	*Black-crowned night-heron*	High	0.9	Moderately high	0.63	High	0.83	Moderate	0.5	Low	0.2	Moderately high	0.66	Moderate	0.5	Moderately high	0.6
Oarisma poweshiek	*Poweshiek skipperling*	Low	0.2	Low	0.06	Low	0	Low	-0.08	Low	0.2	Moderately high	0.72	Moderate	0.5	Moderately low	0.23
Obliquaria reflexa	*Threehorn wartyback*	Moderate	0.60	Moderate	0.44	Moderate	0.42	Moderately high	0.67	Low	0.20	Moderately high	0.66	Moderately low	0.35	Moderate	0.48
Obovaria olivaria	*Hickorynut*	Moderate	0.60	Moderate	0.44	Moderate	0.42	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Low	0.20	Moderate	0.44
Obovaria subrotunda	*Round hickorynut*	Moderate	0.60	Moderately low	0.31	Moderately low	0.25	Moderately high	0.67	Low	0.20	Moderately high	0.66	Moderately low	0.25	Moderate	0.42
Ochrotrichia contorta	*Contorted Ochrotrichian Micro Caddisfly*	Low	0.15	Low	0.06	Low	0.08	Moderate	0.50	Low	0.10	Moderate	0.50	Moderate	0.50	Moderately low	0.27
Oecanthus laricis	*Tamarack tree cricket*	Moderately low	0.25	Low	-0.06	Low	-0.08	Low	0.08	Low	-0.05	Moderate	0.41	Moderately high	0.8	Low	0.19
Oeneis macounii	*Macoun's arctic*	Moderate	0.6	Moderately low	0.31	Moderately low	0.33	Moderately low	0.25	Moderately low	0.35	Moderately high	0.66	Moderately low	0.38	Moderate	0.41
Opheodrys vernalis	*Smooth Green Snake*	High	0.85	Moderate	0.53	Low	0.17	High	0.83	Moderately low	0.35	Moderately high	0.66	Moderate	0.60	Moderate	0.57
Ophiogomphus anomalus	*Extra-striped clubtail*	Moderate	0.45	Moderately low	0.25	Moderately low	0.25	Moderate	0.58	Moderately low	0.25	Moderately high	0.63	Moderately high	0.63	Moderate	0.43

Ophiogomphus howei	*Pygmy snaketail*	Moderate	0.60	Moderately low	0.25	Moderately low	0.25	Moderate	0.58	Moderately low	0.25	Moderately high	0.63	Moderately high	0.63	Moderate	0.45
Oporornis agilis	*Connecticut warbler*	Moderate	0.5	Moderately low	0.31	Moderately high	0.75	High	0.83	Low	-0.05	Moderate	0.5	Moderately low	0.25	Moderate	0.44
Opsopoeodus emiliae	*Pugnose Minnow*	Moderate	0.6	Moderately low	0.22	Moderate	0.58	Moderate	0.5	Moderate	0.44	Moderate	0.56	Moderate	0.6	Moderate	0.5
Orchelimum concinnum	*Red-faced meadow katydid*	Moderately high	0.70	Moderately low	0.25	Moderate	0.50	Moderate	0.58	Moderate	0.50	Moderate	0.56	Moderately high	0.75	Moderate	0.55
Orchelimum delicatum	*Delicate meadow katydid*	Moderately high	0.80	Moderately low	0.25	Moderate	0.50	Moderate	0.58	Moderate	0.60	Moderate	0.56	Moderately high	0.75	Moderate	0.58
Orconectes stygocaneyi	*Caney Mountain Cave Crayfish*	Low	0	Moderately low	0.33	Low	-0.08	Moderately high	0.67	Moderately low	0.25	Moderately high	0.78	Low	0.15	Moderately low	0.3
Oreohelix strigosa	*Cooper's Rocky Mountain snail*	Moderately low	0.25	Moderate	0.5	Low	-0.17	Moderate	0.42	Low	0.05	Moderately high	0.72	Moderate	0.6	Moderately low	0.34
Orphulella pelidna	*Green desert grasshopper*	High	0.90	Low	0.13	Moderate	0.42	Moderate	0.58	Moderately high	0.80	Moderately high	0.69	Moderately high	0.63	Moderate	0.59
Osmia subfasciata	*A mason bee*	High	0.85	Low	0	Low	0	High	0.83	Moderate	0.6	Moderate	0.44	Moderate	0.55	Moderate	0.47
Paetulunio fabalis	*Rayed bean*	Moderate	0.45	Moderately low	0.31	Moderate	0.42	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.25	Moderate	0.41
Pantherophis spiloides	*Gray Rat Snake*	High	0.90	Moderately high	0.63	High	0.83	High	0.83	Moderate	0.60	Moderately high	0.72	Moderate	0.45	Moderately high	0.71
Pantherophis vulpinus	*Eastern Fox Snake*	Moderately high	0.65	Moderate	0.53	Moderately low	0.25	High	0.83	Moderately low	0.35	Moderately high	0.69	Moderate	0.45	Moderate	0.54
Papaipema astuta	*Yellow stoneroot borer*	Moderate	0.6	Low	0.06	Low	-0.08	Low	-0.17	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.28
Papaipema aweme	*Aweme borer moth*	Moderate	0.5	Low	0	Low	0	Low	-0.17	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.26
Papaipema beeriana	*Blazing star stem borer*	Moderate	0.45	Low	0.06	Low	-0.08	Low	-0.17	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.25
Papaipema cerina	*Golden borer moth*	Moderate	0.55	Low	0.06	Low	-0.08	Low	0	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.29
Papaipema maritima	*Maritime sunflower borer moth*	Moderate	0.5	Low	0.06	Low	-0.08	Low	0	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.28
Papaipema sciata	*Culvers root borer*	Moderate	0.5	Low	0.06	Low	-0.08	Low	0	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.28
Papaipema silphii	*Silphium borer moth*	Moderate	0.5	Low	0.06	Low	-0.08	Low	0	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.28
Papaipema speciosissima	*Osmunda borer moth*	Moderate	0.5	Low	0.06	Low	-0.08	Low	0	Moderately low	0.35	Moderate	0.56	Moderate	0.6	Moderately low	0.28
Papilio joanae	Ozark swallowtail	Moderately low	0.3	Low	0.13	Low	0	Moderately low	0.25	Moderately low	0.4	Moderately high	0.72	Moderate	0.5	Moderately low	0.33
Parkesia motacilla	*Louisiana waterthrush*	Moderately high	0.7	Moderate	0.57	Moderately high	0.67	Moderately high	0.67	Low	-0.1	Moderate	0.53	Moderate	0.45	Moderate	0.5
Paroxya hoosier	*Hoosier grasshopper*	Moderate	0.60	Low	0.00	Low	0.00	Moderate	0.58	Moderately low	0.40	Moderate	0.50	Moderately high	0.63	Moderately low	0.39
Patera pennsylvanica	*Proud globelet*	Moderately high	0.7	Moderate	0.56	Low	0	Moderately low	0.25	Moderately low	0.3	Moderately high	0.66	Moderate	0.6	Moderate	0.44
Pelecanus erythrorhynchos	*American white pelican*	Moderately high	0.65	Moderately high	0.69	Moderate	0.58	Moderate	0.5	Low	0.05	Moderate	0.59	Moderately low	0.4	Moderate	0.49
Percina copelandi	*Channel Darter*	Moderate	0.6	Moderate	0.59	Moderate	0.42	Moderately high	0.67	Moderately low	0.31	Moderately high	0.72	Moderately high	0.7	Moderate	0.57
Percina cymatotaenia	*Bluestripe darter*	Moderately low	0.25	Moderate	0.56	Low	0.17	Moderately high	0.67	Low	0.19	Moderate	0.56	Moderate	0.6	Moderate	0.43
Percina evides	*Gilt Darter*	Moderate	0.6	Moderately high	0.66	Moderate	0.58	Moderately high	0.67	Low	0.19	Moderately high	0.72	Moderate	0.6	Moderate	0.57
Percina shumardi	*River Darter*	Moderately high	0.7	Moderately high	0.66	Moderate	0.58	Moderately high	0.67	Moderate	0.56	Moderately high	0.66	Moderately high	0.7	Moderately high	0.65

Percopsis omiscomaycus	*Trout Perch*	Moderately high	0.7	Moderately high	0.66	Moderate	0.58	Moderately high	0.67	Low	0.19	Moderately high	0.66	Moderate	0.6	Moderate	0.58
Perimyotis subflavus	Tricolored bat	Moderately high	0.65	Moderate	0.59	Low	0.17	High	0.83	Moderate	0.5	Moderately high	0.66	Moderate	0.6	Moderate	0.57
Perlesta dakota	*Dakota Stone*	Moderately low	0.35	Moderately low	0.31	Low	0	Moderate	0.42	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderately low	0.39
Phalarous tricolor	*Wilson's phalarope*	Moderate	0.55	Moderately high	0.63	Moderate	0.5	High	0.83	Low	0	Moderately high	0.63	Moderately low	0.4	Moderate	0.5
Phenacomys ungava	*Eastern Heather Vole*	Moderately high	0.75	High	0.88	Moderate	0.42	Low	0.17	Low	0.19	Moderately high	0.78	High	0.85	Moderate	0.58
Philomycus carolinianus	*Carolina mantleslug*	High	0.9	Moderate	0.56	Low	0.17	Moderately low	0.25	Moderate	0.45	Moderately high	0.66	Moderate	0.5	Moderate	0.5
Photedes includens	*Included cordgrass borer moth*	Moderately low	0.4	Moderately low	0.25	Low	-0.25	Low	0	Moderately low	0.3	Moderate	0.41	Moderate	0.5	Moderately low	0.23
Photedes inops	*Spartina moth*	Moderately low	0.4	Moderately low	0.25	Low	0	Low	-0.17	Low	0.2	Moderate	0.41	Moderate	0.5	Moderately low	0.23
Phyciodes batesii	Tawny crescent	Moderate	0.6	Moderately low	0.31	Low	0.17	Moderately high	0.67	Moderately low	0.4	Moderately high	0.72	Moderate	0.5	Moderate	0.48
Picoides arcticus	*Black-backed woodpecker*	Moderate	0.55	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Moderately low	0.35	Moderate	0.53	Moderate	0.45	Moderate	0.5
Pieris oleracea	Eastern veined white	Moderately high	0.8	Moderately low	0.31	Moderate	0.5	Moderately low	0.25	Moderate	0.55	Moderately high	0.72	Moderate	0.5	Moderate	0.52
Plebejus idas	*Nabokov's blue*	Moderately low	0.25	Low	0.06	Low	-0.08	Low	0	Moderately low	0.3	Moderately high	0.72	Moderate	0.5	Moderately low	0.25
Plebejus samuelis	*Karner blue*	Moderately low	0.25	Low	0.19	Moderate	0.58	Low	0	Low	0.1	Moderately high	0.66	Moderate	0.5	Moderately low	0.33
Plestiodon fasciatus	*Five-Lined Skink*	Moderately high	0.75	Moderately high	0.69	Moderately low	0.25	Moderate	0.5	Moderate	0.45	Moderately high	0.72	Moderate	0.6	Moderate	0.57
Plestiodon multivirgatus	*Many-lined Skink*	Moderately high	0.7	Moderate	0.56	Moderate	0.42	Moderately high	0.67	Moderate	0.55	Moderate	0.56	Moderately high	0.7	Moderate	0.59
Plethobasus cyphyus	*Sheepnose*	Moderate	0.60	Moderately low	0.31	Moderate	0.50	Moderately high	0.67	Low	0.10	Moderately high	0.66	Moderately low	0.25	Moderate	0.44
Plethodon cinereus	*Eastern Red-backed Salamander*	High	1.00	Moderately low	0.38	High	0.92	High	0.83	Moderate	0.45	Moderately high	0.72	Moderately low	0.25	Moderately high	0.65
Pleurobema cordatum	*Ohio pigtoe*	Moderate	0.60	Moderately low	0.31	Moderate	0.42	Moderately high	0.67	Moderately low	0.30	High	0.81	Low	0.20	Moderate	0.47
Pleurobema plenum	*Rough pigtoe*	Moderate	0.55	Moderately low	0.38	Moderately low	0.25	Moderate	0.42	Moderately low	0.30	Moderately high	0.66	Low	0.20	Moderately low	0.39
Pleurobema sintoxia	*Round pigtoe*	Moderate	0.60	Moderately low	0.38	Moderate	0.42	Moderately high	0.67	Low	0.10	Moderately high	0.66	Low	0.20	Moderate	0.43
Pluvialis dominica	*American Golden-Plover*	Moderate	0.55	Moderate	0.44	Moderately high	0.75	High	0.83	Low	0	Moderate	0.56	Moderate	0.45	Moderate	0.51
Poanes massasoit	Mulberrywing skipper	Moderate	0.6	Low	0.06	Low	0.17	Moderately low	0.25	Moderately low	0.25	Moderately high	0.72	Moderate	0.5	Moderately low	0.36
Poanes viator	Broad-winged skipper	High	0.9	Moderately low	0.31	Moderate	0.5	Moderately low	0.25	Moderate	0.56	Moderate	0.56	Moderate	0.5	Moderate	0.51
Podiceps grisegena	*Red-necked grebe*	Moderate	0.55	Moderately low	0.38	Moderate	0.58	High	0.83	Low	0.1	Moderate	0.59	Moderate	0.5	Moderate	0.51
Poecile hudsonicus	*Boreal chickadee*	Moderate	0.45	Moderately high	0.75	Moderately high	0.75	High	0.83	Moderately low	0.25	Moderately low	0.34	Moderately low	0.4	Moderate	0.54
Polyamia herbida	*Prairie panic grass leafhopper*	Moderately low	0.40	Low	-0.06	Low	-0.08	Low	0.08	Moderate	0.45	Moderate	0.59	Moderately high	0.70	Moderately low	0.30
Polygonia gracilis	Hoary comma	High	0.9	Moderately low	0.31	Moderate	0.5	Moderate	0.42	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderate	0.54
Polygonia progne	Gray comma	High	0.85	Moderately low	0.31	Moderate	0.5	Moderate	0.5	Moderate	0.55	Moderate	0.57	Moderate	0.5	Moderate	0.54
Polyodon spathula	*Paddlefish*	Moderate	0.6	Moderate	0.5	Moderate	0.42	Moderately high	0.67	Moderate	0.44	Moderately high	0.75	Moderately low	0.4	Moderate	0.54

Potamilus alatus	*Pink heelsplitter*	Moderately high	0.75	Moderate	0.44	Moderate	0.58	Moderate	0.50	Low	0.20	Moderately high	0.66	Moderately low	0.25	Moderate	0.48
Potamilus capax	*Fat pocketbook*	Moderate	0.60	Moderate	0.44	Moderate	0.58	Moderate	0.50	Moderately low	0.30	Moderately high	0.75	Moderate	0.50	Moderate	0.52
Proserpinus flavofasciata	*Yellow-banded day sphinx moth*	Moderate	0.45	Low	-0.19	Moderately low	0.33	Low	0.17	Moderately low	0.4	Moderate	0.41	Moderate	0.6	Moderately low	0.31
Proserpinus juanita	*Juanita sphinx moth*	High	0.95	Moderately low	0.38	Moderate	0.42	Moderate	0.42	Moderate	0.45	Moderately high	0.72	Moderate	0.5	Moderate	0.55
Protonotaria citrea	*Prothonotary Warbler*	Moderate	0.55	Moderate	0.59	Moderate	0.58	Moderately high	0.67	Low	0.05	Moderately high	0.66	Moderate	0.5	Moderate	0.51
Protoptila erotica	*Erotic Saddle-case Caddisfly*	Moderate	0.60	Low	0.06	Low	0.17	Moderately high	0.67	Low	0.15	Moderate	0.50	Moderate	0.50	Moderately low	0.38
Pseudacris maculata	*Boreal chorus frog*	High	0.90	Moderate	0.47	Moderately high	0.75	High	0.83	Moderate	0.45	High	0.91	Moderate	0.60	Moderately high	0.70
Pseudemys concinna	*River Cooter*	High	0.90	Moderately high	0.72	Moderately high	0.75	High	0.83	Moderately low	0.40	Moderately high	0.78	Low	0.20	Moderately high	0.65
Psinidia fenestralis	*Atlantic-coast locust*	Moderately high	0.80	Moderately low	0.25	Moderate	0.42	Moderate	0.58	Moderately high	0.80	Moderately high	0.69	Moderately high	0.63	Moderate	0.59
Ptychobranchus fasciolaris	*Kidneyshell*	Moderate	0.50	Moderately low	0.31	Moderate	0.42	Moderate	0.50	Low	0.10	Moderately high	0.75	Low	0.20	Moderately low	0.40
Pyrgus centaureae	Grizzled skipper	Low	0.2	Low	0.06	Low	-0.17	Low	-0.08	Low	0.2	Moderately high	0.72	Moderate	0.5	Moderately low	0.2
Quadrula fragosa	*Winged mapleleaf*	Moderate	0.45	Moderately low	0.38	Moderately low	0.25	Moderate	0.50	Moderately low	0.30	Moderately high	0.75	Moderately low	0.25	Moderate	0.41
Quadrula nodulata	*Wartyback*	Moderate	0.60	Moderate	0.44	Moderately high	0.75	Moderately high	0.67	Moderately low	0.30	Moderately high	0.66	Moderately low	0.25	Moderate	0.52
Quadrula pustulosa	*Pimpleback*	Moderate	0.60	Moderate	0.44	High	0.83	Moderately high	0.67	Moderately low	0.30	Moderately high	0.69	Moderately low	0.35	Moderate	0.55
Quadrula Quadrula	*Mapleleaf*	Moderate	0.60	Moderate	0.44	High	0.83	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Moderately low	0.40	Moderate	0.53
Rallus elegans	*King rail*	Moderate	0.55	Moderate	0.56	Moderately high	0.75	Moderate	0.58	Low	-0.15	Moderately high	0.78	Moderately low	0.35	Moderate	0.49
Rallus limicola	*Virginia Rail*	Moderately high	0.65	Moderately high	0.69	Moderate	0.58	High	0.83	Low	0.1	Moderately high	0.72	Moderate	0.55	Moderate	0.59
Regina septemvittata	*Queen Snake*	Moderately high	0.65	Moderate	0.59	Moderate	0.42	Moderately high	0.67	Moderate	0.50	High	0.91	Moderately low	0.35	Moderate	0.58
Reginaia ebenus	*Ebonyshell*	Moderate	0.60	Moderate	0.44	Moderately high	0.75	Moderately high	0.67	Moderately low	0.30	Moderately high	0.66	Low	0.20	Moderate	0.52
Rhinichthys cataractae	*Longnose Dace*	Moderately high	0.75	Moderate	0.56	Moderately high	0.75	Moderately high	0.67	Low	0.19	Moderately high	0.66	Moderately high	0.7	Moderately high	0.61
Sagittunio nasutus	*Eastern pondmussel*	Moderate	0.60	Moderately low	0.38	Moderate	0.58	Moderate	0.50	Moderately low	0.30	Moderately high	0.66	Moderately low	0.25	Moderate	0.47
Salvelinus fontinalis	*Brook Trout*	Moderately high	0.8	Moderately high	0.63	Moderate	0.42	High	0.83	Moderate	0.44	Moderately high	0.66	Moderately high	0.7	Moderately high	0.64
Sander canadensis	*Sauger*	Moderately high	0.65	Moderate	0.56	Moderate	0.58	High	0.83	Moderate	0.56	High	0.81	Moderately high	0.7	Moderately high	0.67
Satyrium favonius	Northern oak hairstreak	Moderate	0.55	Low	0.19	Moderate	0.42	Low	0.08	Moderately low	0.4	Moderately high	0.72	Moderate	0.5	Moderate	0.41
Sceloporus grasiosus	*Sagebrush Lizard*	Moderately high	0.7	High	0.81	Moderate	0.42	Moderate	0.5	Moderately low	0.35	Moderately high	0.66	Moderately high	0.7	Moderate	0.59
Schinia hulstia	Hulst's flower moth	Moderate	0.5	Low	0.19	Low	-0.25	Low	0	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.29
Schinia indiana	Phlox moth	Moderately high	0.65	Low	0.19	Low	0	Low	0.08	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.36
Schinia lucens	*Leadplant flower moth*	Moderate	0.6	Low	0.19	Low	-0.25	Low	0.08	Low	0.2	Moderately high	0.72	Moderate	0.5	Moderately low	0.29
Scolopax minor	*American woodcock*	Moderately high	0.7	Moderately high	0.66	Moderate	0.58	High	0.83	Low	0.15	Moderately high	0.72	Moderate	0.5	Moderate	0.59
Serratella frisoni	*Frison's serratellan mayfly*	Moderate	0.6	Low	0.19	Low	-0.08	Moderately high	0.67	Moderately low	0.25	Moderately low	0.38	Moderate	0.5	Moderately low	0.36

Setophaga caerulescens	*Black-throated blue warbler*	Moderate	0.55	Moderate	0.59	High	0.83	High	0.83	Low	0	Moderately high	0.66	Moderate	0.6	Moderate	0.58
Setophaga cerulea	*Cerulean warbler*	Moderate	0.55	Moderate	0.56	Moderately high	0.75	Moderate	0.5	Low	0.2	Moderate	0.59	Moderately high	0.7	Moderate	0.55
Setophaga citrina	*Hooded warbler*	Moderately high	0.65	Moderate	0.59	High	0.83	Moderately high	0.67	Moderately low	0.3	Moderate	0.59	Moderate	0.45	Moderate	0.58
Setophaga kirtlandii	*Kirtland's Warbler*	Moderately low	0.35	Moderate	0.41	Moderate	0.42	Moderate	0.5	Low	0	Moderate	0.59	Moderate	0.6	Moderate	0.41
Simpsonaias ambigua	*Salamander mussel*	Moderately low	0.35	Low	0.19	Low	0.17	Moderate	0.50	Low	0.10	Moderately high	0.66	Moderately low	0.25	Moderately low	0.32
Siphloplecton interlineatum	*Flapless cleft-footed minnow mayfly*	Moderate	0.6	Low	0.19	Low	-0.08	Moderately high	0.67	Moderately low	0.25	Moderately low	0.38	Moderate	0.5	Moderately low	0.36
Siren nettingi	*Western Lesser Siren*	Moderately high	0.70	Moderate	0.56	Low	0.00	High	0.83	Moderately low	0.40	High	0.84	Moderately low	0.40	Moderate	0.53
Sistrurus catenatus	*Eastern Massasauga*	Moderately high	0.70	Moderately high	0.66	Low	0.17	Moderately high	0.67	Moderately low	0.35	High	0.84	Moderate	0.55	Moderate	0.56
Somatochlora hineana	*Hine's emerald dragonfly*	Moderately low	0.35	Low	0.19	Moderate	0.42	Moderately high	0.67	Moderately high	0.65	Moderately high	0.66	Moderate	0.60	Moderate	0.50
Somatochlora incurvata	*Incurvate emerald*	Moderately high	0.70	Moderately low	0.31	Low	0.17	High	1.00	Moderately low	0.30	Moderately high	0.63	Moderate	0.50	Moderate	0.51
Sparbarus lacustris	*Lacustrine small square-gilled mayfly*	Moderately high	0.75	Low	0.19	Low	-0.08	Moderately high	0.67	Low	0.2	Moderately low	0.38	Moderate	0.5	Moderately low	0.37
Spiza americana	*Dickcissel*	Moderately high	0.65	Moderately high	0.63	Moderately high	0.67	High	0.83	Moderate	0.45	Moderately high	0.66	Moderate	0.5	Moderately high	0.63
Stagnicola woodruffi	*Coldwater pondsnail*	Moderately low	0.35	Moderately high	0.63	Moderately low	0.33	High	1.00	Moderate	0.45	Moderately low	0.34	Moderately low	0.35	Moderate	0.49
Sterna hirundo	*Common tern*	Moderately high	0.8	Moderate	0.59	High	0.92	High	0.83	Low	0.2	Moderate	0.59	Moderately low	0.3	Moderately high	0.61
Sterna forsteri	*Forster's Tern*	Moderate	0.55	Moderate	0.59	Moderately high	0.75	Moderately high	0.67	Low	-0.15	Moderate	0.56	Moderately low	0.35	Moderate	0.47
Striatura meridionalis	*Median striate*	Moderate	0.6	Moderate	0.5	Low	-0.25	Moderately high	0.67	Moderately low	0.4	Moderate	0.59	Moderate	0.6	Moderate	0.44
Sturnella magna	*Eastern meadowlark*	Moderately high	0.8	Moderately high	0.66	Moderate	0.58	High	0.83	Low	0.15	Moderate	0.56	Moderate	0.6	Moderate	0.6
Stylurus amnicola	*Riverine clubtail*	Moderately high	0.80	Moderately low	0.25	Moderately low	0.25	Moderate	0.58	Moderately low	0.30	Moderately high	0.63	Moderately high	0.63	Moderate	0.49
Sylvilagus aquaticus	*Swamp rabbit*	Moderate	0.55	Moderately high	0.63	Low	0.08	High	1.00	High	1.00	High	0.81	Moderately high	0.75	Moderately high	0.69
Synaptomys borealis	*Northern Bog Lemming*	Moderately high	0.65	Moderate	0.44	Low	0.08	Moderate	0.42	Moderately low	0.25	Moderately high	0.78	Moderately high	0.65	Moderate	0.47
Tachopterix thoreyi	*Grey petatail*	Moderately high	0.65	Low	0.19	Moderately low	0.25	High	1.00	Moderately low	0.30	Moderately high	0.72	Moderate	0.60	Moderate	0.53
Terrapene carolina	*Eastern Box Turtle*	High	0.85	Moderately high	0.69	Moderately high	0.75	Moderately high	0.67	Moderately low	0.35	Moderate	0.53	Low	0.20	Moderate	0.58
Thamnophis butleri	*Butler's Garter Snake*	Moderately high	0.65	Moderate	0.53	Moderately high	0.75	Moderately high	0.67	Moderately low	0.25	High	0.91	Moderate	0.45	Moderately high	0.60
Thymallus arcticus	*Arctic Grayling*	Moderately high	0.7	Moderately high	0.63	Moderate	0.5	Moderately high	0.67	Moderately low	0.31	Moderate	0.59	Moderate	0.6	Moderate	0.57
Toxolasma lividus	*Purple lilliput*	Moderate	0.45	Moderately low	0.38	Moderate	0.42	Moderately high	0.67	Low	0.20	Moderately high	0.66	Moderately low	0.35	Moderate	0.44
Toxolasma parvum	*Lilliput*	Moderate	0.60	Moderately low	0.38	Moderate	0.42	Moderately high	0.67	Low	0.20	Moderately high	0.69	Moderately low	0.25	Moderate	0.46
Toxolasma texasiense	*Texas lilliput*	Moderate	0.50	Moderately low	0.38	Moderately high	0.75	Moderate	0.50	Low	0.20	Moderately high	0.69	Moderately low	0.25	Moderate	0.47
Triaenodes flavescens	*Bronze Long-horned Caddisfly*	Moderate	0.60	Low	0.06	Low	0.00	Moderate	0.50	Moderately low	0.35	Moderate	0.50	Moderate	0.50	Moderately low	0.36
Trimerotropis huroniana	*Lake Huron locust*	Moderately low	0.25	Low	0.00	Moderately low	0.33	Moderate	0.58	Moderate	0.45	Moderately low	0.34	Moderate	0.44	Moderately low	0.34

Tringa solitaria	*Solitary sandpiper*	Moderate	0.55	Low	0	Moderate	0.42	High	0.83	Low	0.1	Moderately high	0.72	Low	0.05	Moderately low	0.38
Truncilla donaciformis	*Fawnsfoot*	Moderate	0.60	Moderate	0.44	Moderate	0.42	Moderate	0.50	Low	0.20	Moderately high	0.66	Moderately low	0.35	Moderate	0.45
Truncilla truncata	*Deertoe*	Moderately high	0.70	Moderate	0.44	Moderate	0.58	Moderate	0.50	Moderately low	0.30	Moderately high	0.75	Moderately low	0.25	Moderate	0.50
Tympanuchus phasianellus	*Sharp-tailed grouse*	Moderately high	0.75	Moderate	0.47	Moderate	0.42	High	0.83	Moderately low	0.3	High	0.91	Moderate	0.45	Moderate	0.59
Tyrannus tyrannus	*Eastern Kingbird*	High	0.9	Moderate	0.59	Moderately high	0.75	High	1	Moderately low	0.3	Moderate	0.59	Moderately low	0.4	Moderately high	0.65
Tyto alba	*Barn owl*	High	0.85	High	0.88	Moderately high	0.75	High	0.83	Moderately low	0.35	Moderately high	0.66	Moderately low	0.4	Moderately high	0.67
Utterbackia imbecillis	*Paper pondshell*	High	0.95	Moderately low	0.38	High	0.83	High	0.83	Moderately low	0.30	Moderately high	0.72	Moderately low	0.35	Moderately high	0.62
Vallonia parvula	*Trumpet vallonia*	Moderate	0.5	Moderate	0.5	Low	-0.25	Moderately low	0.25	Moderately high	0.65	Moderately high	0.66	Moderate	0.5	Moderate	0.4
Valvata perdepressa	*Purplecap valvata*	Moderately low	0.35	Moderately high	0.63	Low	0.00	High	1.00	Moderate	0.45	Moderately low	0.34	Moderately low	0.35	Moderate	0.45
Venustaconcha ellipsiformis	*Ellipse*	Moderate	0.50	Moderately low	0.31	Moderate	0.58	Moderately high	0.67	Moderately low	0.30	High	0.81	Moderately low	0.25	Moderate	0.49
Vermivora chrysoptera	*Golden-winged warbler*	Moderate	0.55	Moderate	0.47	Moderately high	0.75	Moderately high	0.67	Low	0.1	Moderately high	0.66	Moderately low	0.4	Moderate	0.51
Vertigo arthuri	*Callused Vertigo*	Moderate	0.6	Moderate	0.5	Low	-0.08	Moderately high	0.75	Moderately low	0.4	Moderate	0.53	Moderately high	0.65	Moderate	0.48
Vertigo bollesiana	*Delicate vertigo*	Moderately low	0.25	Moderate	0.5	Low	-0.17	Moderate	0.42	Moderately low	0.3	Moderate	0.41	Moderately low	0.4	Moderately low	0.3
Vertigo meramecensis	*Bluff Vertigo*	Moderately low	0.35	Moderate	0.5	Low	-0.17	Moderate	0.42	Moderately low	0.3	Moderately high	0.66	Moderate	0.55	Moderately low	0.37
Vertigo tridentata	*Honey Vertigo*	Moderate	0.6	Moderate	0.5	Low	0.17	Moderate	0.42	Moderately low	0.3	Moderate	0.59	Moderate	0.5	Moderate	0.44
Villosa lienosa	*Little spectaclecase*	Moderate	0.60	Moderately low	0.38	Moderately high	0.75	Moderately high	0.67	Moderately low	0.30	Moderately high	0.66	Moderately low	0.25	Moderate	0.51
Vulpes velox	*swift fox*	Moderately high	0.65	High	0.88	Moderate	0.58	High	1.00	High	0.94	Moderately high	0.72	Moderate	0.60	Moderately high	0.77
Williamsonia fletcheri	*Ebony boghaunter*	Moderately high	0.75	Moderately low	0.25	Low	0.00	High	1.00	Moderately low	0.25	Moderate	0.50	Moderate	0.50	Moderate	0.46
Xanthocephalus xanthocephalus	*Yellow-headed blackbird*	Moderately high	0.65	Moderately high	0.66	Moderate	0.58	High	0.83	Low	-0.1	Moderate	0.59	Moderately low	0.4	Moderate	0.52
Xestia mixta	Mixta Xestia moth	Moderate	0.5	Moderately low	0.31	Low	-0.25	Moderately low	0.25	Moderately low	0.35	Moderately high	0.72	Moderate	0.5	Moderately low	0.34
Zonitoides limatulus	*Dull gloss*	Moderately low	0.25	Moderate	0.5	Low	-0.25	Moderate	0.42	Low	0.1	Moderately high	0.66	Moderate	0.6	Moderately low	0.32