

Streams Campaign

Description

The Illinois landscape is dissected by stream and river channels and underlain with subsurface water. Three major rivers border the State of Illinois and are responsible for much of its characteristic shape. Other major freshwater habitats include bogs, fens, glacial lakes, ponds, reservoirs, spring seeps, swamps, and reservoirs. These vast aquatic resources provide vital ecosystem services to the citizens of Illinois and critical habitat for the other species that rely upon them. The Illinois Wildlife Action Plan addresses these habitats in several Campaigns including the Lake Michigan and Coastal Area Campaign, the Streams Campaign, and the Wetlands Campaign. The Streams Campaign focuses on maintaining robust communities of native wildlife and improving the capacity of lands and waterbodies to support populations of aquatic Species in Greatest Conservation Need (SGCN; Appendix 8) through restoration, enhancement, and protection.

Portions of Illinois are included in six Fish Habitat Partnerships (<http://fishhabitat.org/partnerships>) and four Landscape Conservation Cooperatives (<http://lccnetwork.org/find-an-lcc>). Common goals for these regional efforts include the protection of healthy waters, restoration of natural flows, reconnection of fragmented stream habitats, and the improvement of water quality by reducing sediment and nutrient loading. The Streams Campaign supports these goals and strives to have local efforts in Illinois contribute to regional conservation.

The Streams Campaign is organized around six basic themes that provide continuity and focus to Conservation Actions identified as priorities for effective aquatic conservation in Illinois. These themes broadly organize activities necessary to address critical stressors and evaluate the effectiveness of conservation actions on aquatic species and their habitats. Campaign Themes include Monitoring & Assessment, Protection & Stewardship, Flow Management & Water Quality, Fragmentation & Connectivity, Invasive Species & Wildlife Diseases, and Public Support & Action.

Goals

Our Vision is for Illinois' waters to support viable populations of all aquatic species native to the state. Goals were developed to assist with obtaining this vision through consensus of the Streams Campaign Steering Committee that consists of IDNR staff and statewide conservation partners (Hinze et al. 2015).

Campaign Goals:

- Viable populations of each SGCN will be supported
- Habitats will be managed for appropriate structure and function, including water quality, to support SGCN
- The public will have an awareness, appreciation, and connection to SGCN and associated habitats

Implementation Goals:

1. Illinois waters will support high biodiversity.
2. Abundance and distribution of SGCN will be increased or maintained.
3. High quality aquatic communities will be protected by conservation easement, public ownership, or designation as Illinois Nature Preserves, Land & Water Reserves, or Outstanding Resource Waters.
4. Illinois waters will fully support designated uses.
5. Illinois waters will provide appropriate physical habitat, hydrologic regimes, fluvial geomorphology, and connectivity to support SGCN.
6. The public's environmental awareness, appreciation, and connection to SGCN and their associated habitats will be increased.

Status as of 2015

Illinois contains over 119,000 miles of streams and rivers and 318,000 acres of lake and ponds (exclusive of Lake Michigan and the large border rivers) that provide ecosystem services throughout the state including supporting SGCN. Over 200 species of fish, 80 species of mussels, and 70 species of freshwater snails are known to have resided in Illinois waters along with numerous crayfish, frogs, salamanders, snakes, turtles, waterfowl, and hundreds of species of aquatic insects. Based on 2011 monitoring data aquatic life use was fully supported in 60.8% of stream miles and 92.2% of standing waters that were assessed in Illinois. Major potential sources of impairment for streams include atmospheric deposition of toxics, agriculture, channelization, municipal point sources, urban runoff, surface mining, and flow regulation. Potential sources of impairment for lakes are similar to those of streams but also include littoral area modifications, animal feeding operations, contaminated sediments, and on-site water treatment systems (IEPA 2014a).

Conservation of aquatic habitats and associated species continues to be a priority in Illinois. At least ten major funding and effort sources drove activities supporting Streams Campaign goals between 2005 and 2015 (Table 1). Thirty-five projects were funded with Illinois State Wildlife Grants (SWG) with twenty-three of these directly targeting SGCN. Thirty-two additional projects were sponsored by the Wildlife Preservation Fund (WPF) consisting primarily of biological surveys and evaluations of management actions. The Endangered Species Protection Board also sponsored six studies addressing the distribution and abundance of SGCN since 2005.

Monitoring & Assessment

The IDNR and IEPA conduct surface water and groundwater monitoring throughout the state with the assistance of numerous partners (e.g., USGS, USDA Forest Service, INHS). These efforts are aimed at assessments of aquatic life, designated use attainment, identification of impaired waters, trends in water quality, and evaluating the effectiveness of water-management programs (IEPA 2014b). Examples of additional efforts include those conducted by the Long Term Resource Monitoring Program (LTRMP; <http://www.umesc.usgs.gov/ltrmp.html>); the Long Term Illinois, Mississippi, Ohio, and Wabash River Fish Population Monitoring Program (LTEF, <http://wx.inhs.illinois.edu/fieldstations/irbs/research/ltef-website/>); monitoring by staff of Illinois Forest Preserve Districts (e.g., Forest Preserves of Cook County (<http://fpdcc.com/>), Lake County Forest Preserves (<http://www.lcfpd.org/>)); investigations by watershed groups and those of Citizen Scientists through RiverWatch (<http://www.ngrrec.org/riverwatch/>). The

recovery plan for the Illinois Cave Amphipod (*Gammarus acherondytes*) established surveys that were completed in 2007, 2011, and 2014 in cave systems where they were known to have occurred in the past. Although the Illinois cave amphipod was not found at two previous locations ten new populations were discovered resulting in fourteen known populations (Lewis and Lewis 2014).

Three separate initiatives were undertaken to assess the conservation status of SGCN in support of the Streams Campaign largely using data from these monitoring programs. All species of fish (Metzke et al. 2012) and mussels (Douglass & Stodola 2014) known from Illinois and 563 invertebrate taxa (Hinz & Zahniser 2015) were independently assessed for possible listing as SGCN using IWAP criteria. Updated status and statewide distribution maps for each of these species were completed using data compiled during these initiatives.

Bol et al. (2007) developed a multi-taxa rating system to categorize the integrity and diversity of aquatic biota and identify stream reaches with biological significance. This update and revision of the Biological Stream Characterization (BSC; Hite and Bertrand 1989, Bertrand et al. 1996) and the Biologically Significant Streams classification (Page et al. 1992) was identified as a priority in the 2005 Illinois Comprehensive Wildlife Conservation Plan & Strategy (CWCP). Over 1000 stream segments were rated in Bol et al. (2007) with 13% characterized as Class A for diversity and 9% as Class A for biotic integrity. One hundred twenty-two stream segments (9% of all stream segments rated) were identified as biologically significant (Figure 15) (<http://www.dnr.illinois.gov/conservation/BiologicalStreamratings/Pages/default.aspx>). Despite the magnitude of this effort less than 1% of stream segments in Illinois were able to be rated due to a lack of biological information from the vast majority of segments.

Protection & Stewardship

Illinois contains over 120 state protected areas including state parks, wildlife areas, and state forests many of which are adjacent to, or contain, bodies of water. Additional protection of land and water resources occurs through dedication as an Illinois Nature Preserve, registration as an Illinois Land and Water Reserve, or through the establishment of conservation easements (e.g., CRP/CREP). Forest Preserve Districts, County Conservation Districts, and Municipalities also protect and manage many aquatic resources under their jurisdictions. Illinois Land trusts and other nongovernmental organizations also actively protect and manage important aquatic habitats (e.g., The Wetlands Initiative [<http://www.wetlands-initiative.org/overview/>] The Nature Conservancy [<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/illinois/placesweprotect/index.htm>]). Federal protected areas include the Shawnee National Forest, Midewin National Tallgrass Prairie, and several National Wildlife Refuges (e.g., Chautauqua National Wildlife Refuge, Cypress Creek National Wildlife Refuge, Hackmatack National Wildlife Refuge, Meredosia National Wildlife Refuge). Stewardship activities conducted on these areas support SGCN statewide.

The mission of the Illinois Endangered Species Protection Board is to protect native plants and animals which are in danger of being lost from the wild. The Board maintains and periodically reviews the Illinois List, conducts research and surveys, and develops recovery plans in coordination with IDNR. Illinois currently lists as either endangered or threatened dozens of species associated with freshwaters including 35 fish, 26 mussels, 9 crustaceans, 5 salamanders, 5 turtles, 2 stoneflies and 2 dragonflies.

Protection of important aquatic habitats continues to occur in Illinois, supporting SGCN. Aquatic features were in, or adjacent to, eighty-eight Nature Preserves and Land & Water Reserves totaling

8,345 hectares that have been dedicated since 2005. Seventeen of these are within 0.5km of a SGCN record. The IDNR Owned, Managed, Leased and Purchased (OMLP) database identifies 80 properties that IDNR has added since 2005 including ten within 0.5km of an aquatic SGCN record. Since 2005, the Conservation Reserve Program has added, or renewed easements on 24,694 hectares of agricultural land in Illinois (15,916 properties of which 107 are also in the Conservation Reserve Enhancement Program) under the filter strip (CP21) or riparian buffer (CP22) practices. Two hundred twenty-eight of these easements were within 0.5km of a SGCN record of an aquatic species.

Protection efforts have also targeted some subterranean habitats. In 2014, the Illinois Nature Preserves Commission dedicated the Paul Wightman Subterranean Nature Preserve, a 535 acre site that surrounds the IDNR Fogelpole Cave Nature Preserve and includes a significant portion of the groundwater recharge area of the Fogelpole Cave system. Fogelpole Cave is one of the largest and least disturbed cave systems in Illinois and includes several miles of underground streams.

Stream enhancement activities have improved habitats for SGCN throughout the state. The Illinois Department of Natural Resources (IDNR) has participated in thirteen stream restorations since 2005 including five within 0.5km of an aquatic SGCN. The US Fish and Wildlife Service's Partners for Fish and Wildlife Program has completed 23 stream restorations in Illinois since 2005. Five of these projects occurred within 0.5km of an aquatic SGCN.

Conservation efforts associated with subterranean aquatic habitats and their specialized fauna are also underway in Illinois. Efforts to delineate groundwater recharge areas associated with known locations of Illinois Cave Amphipod have been supported by the Illinois Wildlife Preservation Fund. A vulnerability assessment identifying potential threats to this species and their habitats is currently underway with funding through a State Wildlife Grant.

Flow Management & Water Quality

Water resources are intensively used throughout Illinois for agriculture, domestic and industrial supply, navigation, and recreation. Activities supporting these uses have included the development of agricultural drainage networks, flood control dams and levees, water withdrawal and storage systems, water treatment and distribution systems, cooling water reservoirs, and recreational lakes. Engineering activities directed at agricultural drainage, flood control, navigation, and wastewater processing have greatly improved the quality of life for the residents of Illinois. However, these agricultural and urban development activities have also dramatically transformed how water moves across the landscape along with the quantity and makeup of the materials this water carries. Few, if any, watersheds in Illinois are free from the influence of these activities.

The USACE operates two large reservoirs on the Kaskaskia River (Lake Shelbyville and Carlyle Lake), one large reservoir on the Big Muddy River (Rend Lake) and the Illinois Waterway that includes a series of eight locks designed to provide navigation between the Mississippi River and the Great Lakes. Flows are managed for flood control, navigation, water supply, and recreational uses. Water control structures are also managed at many lakes, ponds, reservoirs, and wetlands for the benefit of recreation, water supply, or local flood control, often with little consideration for downstream environmental impacts.

The Illinois Nutrient Loss Reduction Strategy (State of Illinois 2015a; <http://www.epa.illinois.gov/topics/water-quality/watershed-management/excess-nutrients/nutrient-loss-reduction-strategy/index>) is a partnership program that seeks to reduce nitrogen and phosphorus

loading to streams by encouraging implementation of best management practices in targeted watersheds. The goal of the Strategy is to improve water quality within Illinois and reduce nutrient loading to the Mississippi River. Eighteen watersheds (Figure 15) have been prioritized for Strategy implementation, and each watershed has a reduction goal for nitrate-nitrogen and for phosphorus. Under the IEPA 319 Grant Program, 139 projects to reduce non-point source pollution were initiated in the past 10 years (Table 1). Twenty-four of these projects are within 0.5km of a SGCN record.

The Illinois Mud to Parks Program (<http://www.dnr.illinois.gov/conservation/m2p/Pages/default.aspx>) provides funds for reuse of sediment dredged from rivers and lakes. More than fifteen agencies, institutions and private companies have contributed funds, effort or research for the Mud to Parks Program. Projects within this program have improved aquatic habitats by removing sediments from the Illinois River (and backwater lakes), the Fox River and Lake Michigan for reuse as topsoil, landfill caps and strip-mine reclamation material.

Fragmentation & Connectivity

Much of the infrastructure that supports water resource use in Illinois can also isolate local sections of the river channel from upstream or downstream reaches or from the adjacent floodplain. Longitudinal fragmentation can occur from dams, perched or poorly maintained culverts, or seasonal drying of some stream segments. Highly maintained channels and an expansive levee system can alleviate many of the problems associated with flooding but also restrict streams, and associated species, from their floodplains.

Dam modifications and removals in Illinois are designed to support biodiversity, provide appropriate habitat, and to improve environmental awareness and public safety. The Illinois Dam Removal Initiative (<http://www3.illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=2&RecNum=10665>) was started in 2012 and designed to remove or modify 12 dams on the Des Plaines and Chicago Rivers in Cook County. State-wide since 2005 IDNR has approved permits for thirty-five dam removals of which nine have occurred within 0.5km of an aquatic SGCN.

Invasive Species & Wildlife Diseases

Aquatic Nuisance Species (ANS) include non-native viruses, algae, plants, mollusks, fish or other organisms that cause harm when introduced into aquatic ecosystems. ANS impact systems by altering habitats, shifting trophic dynamics, or by causing direct mortality of native species. Illinois-Indiana Sea Grant has developed an extensive outreach program to prevent ANS from spreading between waterways. Developed in partnership with the IDNR the “Be a Hero – Transport Zero” campaign encourages application of three simple steps to equipment (remove, drain, and dry) used in Illinois waterways to assist in the fight against invasive species (<http://www.iiseagrant.org/ais/transportzero.php>).

Asian Carp have expanded their distribution since 2005 in some parts of the Upper Mississippi and Ohio River Basins. Efforts to restrict this spread in Illinois waters increased dramatically with the start of the Asian Carp Program in 2009 that focused on restricting access to the Great Lakes through the Chicago Area Waterway System (CAWS). The development of the Asian Carp Control Strategy Framework in 2010 established a goal of creating a systematic multi-tiered defense against Asian Carp (<http://www.asiancarp.us/>). Activities are now focused on directly preventing Asian Carp dispersal toward the Great Lakes with an extensive monitoring program, evaluation and improvements of the

USACE electric dispersal barriers in the Chicago Sanitary and Ship Canal (CSSC), and an active research component that includes application of additional technologies as barriers to movement (e.g., waterguns, CO₂). In 2014, the Illinois Department of Natural Resources formed an Invasive Species Unit to prevent illegal movement of Asian Carp by fish transportation companies, commercial fisherman, or bait dealers who may sell or transport live fish. These efforts appear to be effectively preventing the establishment of new breeding populations of Asian Carp although continued vigilance is required.

Public Support & Action

Illinois contains a vibrant and active community focused on freshwater conservation that includes NGOs (e.g., Prairie Rivers Network, Sierra Club, The Nature Conservancy), Federal Agencies (e.g., USFWS, USACE, USDA, USGS), State Agencies (e.g., IDNR, IDOA, IDOT, IEPA), Conservation Partnerships (e.g., Chicago Wilderness (<http://www.chicagowilderness.org/>), Fox River Ecosystem Partnership (<http://www.foxriverecosystem.org/>), National Fish Habitat Partnerships, Landscape Conservation Cooperatives), and private citizens. A critical role provided by this community is the support of outreach and educational services to the people of Illinois. Twenty percent of the 139 projects initiated in the past 10 years under the IEPA 319 Grant Program have included an educational component addressing environmental awareness of non-point source pollution. Other examples of ongoing activities include the Illinois Master Naturalists program (<http://web.extension.illinois.edu/mn/>) designed to engage citizens in environmental stewardship by providing science-based education, the RiverWatch volunteer stream monitoring program for Citizen Scientists, and IDNR sponsored fishing clinics that occur throughout the state and introduce young people to aquatic conservation.

Stresses and Threats to Wildlife and Habitat

Agriculture, Pollution, Residential & Commercial Development, and Invasive Species were the top four ranked threats identified in a survey of Illinois conservation partners. With the exception of some Invasive Species these are primarily threats that cause stress by modifying the characteristics of the aquatic habitat from altered rates of flow and/or associated loads (e.g., sediment, nutrients).

Climate Change

Freshwater habitats and species are consistently rated as highly vulnerable to climate change (e.g., Staudinger et al. 2015, Walk et al. 2011). Expected changes include increases in water temperature, altered hydrology brought about by differences in the timing and intensity of precipitation events, and higher rates of erosion and delivery of sediment and chemical loads (Hall 2012). Climate change is expected to interact with hydrology, water chemistry, and biological interactions in complex ways and is considered a “threat multiplier” that will increase the magnitude of other stressors (CNA Corporation 2007). The implications of an altered climate should be considered as part of the challenge to implementation of each of the Campaign Themes.

Walk et al. (2011) conducted 584 climate change vulnerability assessments for 162 SGCN in Natural Divisions and Watersheds of Illinois using NatureServe’s Climate Change Vulnerability Index (CCVI; Young et al. 2011). High proportions of mollusk and fish SGCN were rated as Extremely Vulnerable or Highly Vulnerable to climate change. In most cases crustaceans in streams and cave systems were also rated as Moderately Vulnerable or Highly Vulnerable. These assessments identified greater exposure, a

limited ability to disperse, and increased sensitivity to thermal change (for coolwater species) as the primary factors associated with climate vulnerability for these species.

Monitoring & Assessment

The sheer magnitude of effort required to adequately monitor the conservation status of aquatic SGCN is immense. Over 180 SGCN are associated with freshwater habitats including amphibians, fish, snakes, turtles, and many invertebrates (e.g., crustaceans, mussels, insects). Current monitoring efforts are primarily designed to assess fisheries or water quality objectives rather than the conservation status of individual species populations. Therefore, existing programs as they are currently executed may not be sufficient to assess the status of all aquatic SGCN.

Protection & Stewardship

The Illinois landscape is over 90 percent privately owned with most of this actively managed for agriculture or other high intensity use. For aquatic systems that integrate water, and associated materials, from throughout their watersheds this can result in systemic problems that cannot be solved by local stewardship activities where protected lands occur. These twin challenges of small public landholdings and high intensity landuse require comprehensive watershed planning, coordination between public and private land managers, and cooperation toward a shared vision of land stewardship for conservation goals to be achieved.

Flow Management & Water Quality

Major stressors associated with agricultural, residential, and commercially developed landscapes include changes in the timing and magnitude of storm flows and associated loads, fragmentation and loss of lateral connectivity with the floodplain, and altered thermal regimes (State of Illinois 2015b). Unnaturally high levels of nutrients, sediment, and some unregulated substances may also stress our aquatic biota. Groundwater and other subterranean waters are subject to similar threats as surface waters since these habitat types are physically linked by the movement of water within the landscape. Subterranean waters are especially vulnerable to groundwater withdrawals and contamination from sediment or chemical loading in areas of groundwater recharge and near cave entrances.

Fragmentation & Connectivity

A major stressor associated with developed landscapes is fragmentation of habitats and loss of connectivity between populations. Fragmentation can restrict SGCN from habitats required by their life histories (e.g., fish spawning in floodplains) and prevent movements of individuals into adjacent areas that supplement existing populations. This lack of connectivity increases the vulnerability of populations to extirpation and limits the establishment of new ones. Subterranean habitats and headwater streams are especially vulnerable to fragmentation as they have few physical connections to similar habitats and often host specialized organisms with limited dispersal capacity.

Invasive Species & Wildlife Diseases

(<http://www.dnr.illinois.gov/conservation/IWAP/Pages/InvasiveSpecies.aspx>)

Native species can be stressed by invasive species through predation, competition, or habitat alteration. Wildlife disease can further weaken already stressed individuals or in some cases cause direct mortality.

Asian Carp are a major concern in the Upper Mississippi River and Ohio River basins due to the potential for direct competition for food (plankton) used by larval and juvenile stages of native fish and by certain invertebrate species.

The following Invasive Species and Wildlife Diseases are of primary concern for the Streams Campaign:

- **Asian Carp** (Bighead Carp (*Hypophthalmichthys nobilis*), Black Carp (*Mylopharyngodon piceus*), Grass Carp (*Ctenopharyngodon idella*), Silver Carp (*Hypophthalmichthys molitrix*)) and **Common Carp** (*Cyprinus carpio*)
- **Gobies** (Round Goby (*Neogobius melanostomus*) and Tubenose Goby (*Proterorhinus marmoratus*))
- **Dreissenid mussels** (Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*Dreissena rostriformis bugensis*))
- **Chinese Mystery Snail** (*Cipangopaludina chinensis*) and **Faucet Snail** (*Bithynia tentaculata*)
- **Rusty Crayfish** (*Orconectes rusticus*)
- **Purple Loosestrife** (*Lythrum salicaria*), **Eurasian Milfoil** (*Myriophyllum spicatum*), and other listed injurious aquatic weeds
(<http://www.ilga.gov/commission/jcar/admincode/017/017008050000200R.html>)
- **VHS** (Viral Hemorrhagic Septicemia)
- Potential threats also include **Didymo** (*Didymosphenia geminata*) and **New Zealand Mudsnail** (*Potamopyrgus antipodarum*)

Public Support & Action

Most watersheds in Illinois cross many jurisdictional and ownership boundaries and are used for multiple purposes (e.g., agriculture, recreation, water supply). Since aquatic species are supported by the ecological functioning of their watersheds, public support is required for effective conservation planning and action. Without citizens who are informed, connected, and empowered conservation actions that support SGCN or their habitats will not be prioritized over other activities.

Focal Species

Focal Species are SGCN selected for use in monitoring and assessment of the effectiveness of conservation actions associated with particular habitats or stressors. Surrogates are selected for use when SGCN are too rare or vulnerable to monitor or study directly and to represent multiple SGCN with similar life histories, sensitivities to stressors, or that reside in similar habitats. In some cases we selected indices, or groups of species, as surrogates to represent the condition of the waterbody where range restrictions limit the selection of a single species. Our approach for the Streams Campaign was to select several species and surrogates that span the range of aquatic habitats occurring statewide and that are appropriate for monitoring and assessment of the effectiveness of Conservation Actions. Focal species (or surrogates) were also targeted for Campaign Themes and Campaign Focus Areas.

Climate Change

While all aquatic SGCN may respond to changes in water temperature or altered hydrology those with restricted distributions, limited dispersal capacity, and thermal preferences near the edge of current conditions are expected to be more vulnerable to changes in climate.

Focal Species: American Brook Lamprey (*Lethenteron appendix*), Brook Stickleback (*Culaea inconstans*), Mottled Sculpin (*Cottus bairdii*), Banded Sculpin (*Cottus carolinae*); **Surrogates:** Ephemeroptera, Plecoptera, Trichoptera (EPT), Plain Pocketbook (*Lampsilis cardium*), Pimpleback (*Amphinaias pustulosa*).

Monitoring & Assessment

Natural variability in physical conditions between Illinois waterbodies requires selection of Focal Species and surrogates for several broad habitat types in addition to several applicable statewide.

Statewide Focal Species: Smallmouth Bass (*Micropterus dolomieu*), Spotted Bass (*Micropterus punctulatus*), Highfin Carpsucker (*Carpionodes velifer*), Creek Heelsplitter (*Lasmigona compressa*), Pistolgrip (*Tritogonia verrucosa*). **Surrogates:** EPT; Fish Index of Biotic Integrity (IBI), freshwater mussel diversity.

Headwater Streams & Springs Habitats: Southern Redbelly Dace (*Chrosomus erythrogaster*), Spring Cavefish (*Forbesichthys agassizii*); **Surrogates:** EPT

Wadeable and Non-wadeable Stream Habitats: Smallmouth Bass, Spotted Bass, Highfin Carpsucker; **Surrogates:** Redhorses (*Moxostoma spp.*), EPT, fish IBI, freshwater mussel diversity

Large Rivers and Backwater Habitats: Sturgeon [Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*), Lake Sturgeon (*Acipenser fulvescens*), Pallid Sturgeon (*Scaphirhynchus albus*)], North American Paddlefish (*Polyodon spathula*), Bluntnose Darter (*Etheostoma chlorosoma*), Smooth Softshell Turtle (*Apalone mutica*); **Surrogates:** Gars (Alligator Gar (*Attactosteus spatula*), Shortnose Gar (*Lepisosteus platostomus*), Longnose Gar (*Lepisosteus osseus*), Spotted Gar (*Lepisosteus oculatus*)), Pimpleback.

Lakes and Pond Habitats: Yellow Perch (*Perca flavescens*), Iowa Darter (*Etheostoma exile*), Least Darter (*Etheostoma microperca*), Brown Bullhead (*Ameiurus nebulosus*); **Surrogates:** Odonata

Subterranean Habitats: Spring Cavefish (*Forbesichthys agassizii*), Illinois Cave Amphipod (*Gammarus acherondytes*), Hine's Emerald Dragonfly (*Somatochlora hineana*). **Surrogates:** Species associated with the subterranean system under study.

Protection & Stewardship

Conservation Actions occur across the range of freshwater habitats in Illinois and have the potential to impact each SGCN through protection and management of their habitat. Stewardship activities undertaken to benefit individual species, or groups of species, should use the response(s) of these species as an assessment tool.

Focal Species: *targeted SGCN*, Endangered & Threatened species; **Surrogates:** fish IBI, mussel diversity.

Flow Management & Water Quality

Highly developed landscapes are often associated with rapidly alternating high and low flow conditions, sedimentation, and spikes in pollutant loads. Species requiring clear gravel substrates are expected to be sensitive to these flow conditions. Focal species associated with altered water quality based on sensitivity to low dissolved oxygen (sensitive fish and mussels) or elevated ammonia levels (sensitive mussels) have also been selected for Nutrient Management Priority Areas (see Table 18).

Focal Species: Highfin Carpsucker (*Carpionodes velifer*), Gravel Chub (*Erimystax x-punctatus*).

Fragmentation & Connectivity

Species which make spawning migrations, use floodplains during part of their life history, or are relatively immobile are all sensitive to fragmentation of habitats in different ways.

Focal Species: Sturgeon [Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*), Lake Sturgeon (*Acipenser fulvescens*), Pallid Sturgeon (*Scaphirhynchus albus*)], North American Paddlefish (*Polyodon spathula*); **Surrogates:** Redhorses (*Moxostoma* spp.), Rosyface Shiner (*Notropis rubellus*), Spotted Gar (*Lepisosteus oculatus*).

Invasive Species & Wildlife Diseases

Minimizing the impact of Aquatic Nuisance Species (ANS) on SGCN requires tracking their presence, reducing their numbers, and preventing their spread to new areas.

Focal Species: none selected; **Surrogates:** fish IBI, mussel diversity.

Focus Areas

Streams Campaign Focus Areas have been selected to indicate geographical locations where significant activity is expected to occur that benefits Campaign Goals (Figure 15). Focus Areas correspond with aquatic biodiversity hotspots of statewide importance and areas identified in existing conservation initiatives with strong public and State support. Focal species and surrogates were selected for Focus Areas corresponding with known stressors and SGCN or Surrogates in these areas.

Biologically Significant Stream Reaches

(<http://www.dnr.illinois.gov/conservation/BiologicalStreamratings/Pages/default.aspx>)

Illinois' Biologically Significant Stream (BSS) ratings (Page et al. 1992) were designed to expand the Biological Stream Characterization (BSC; Hite & Bertrand 1989, Bertrand et al. 1996) by identifying stream reaches with high species richness or very rare species. These products, and their subsequent revisions, have formed the backbone of stream conservation planning in Illinois for over 25 years. Since the most recent revisions (Bol et al. 2007, State of Illinois 2008) many hundreds of additional fish, macroinvertebrate (<http://www.epa.illinois.gov/topics/water-quality/watershed-management/resource-assessments/index>), and especially mussel samples (<http://www.inhs.illinois.edu/collections/mollusk/swg/>) have been collected throughout Illinois.

Focal species: BSS reaches were identified as segments with high ecological integrity or biological diversity in multiple taxonomic groups (e.g., Fish, Mussels, EPT, Crayfish). Conservation efforts should focus on maintaining the qualifying features of each reach.

Cache River

Despite over a century of widespread hydrological alteration and land clearing the Cache River continues to flow through rich wetlands that hold some of the highest quality natural communities in the State of Illinois. The area is listed as a wetland of international importance by the Ramsar Convention and contains the northernmost cypress/tupelo swamp in the USA. The Cache River Joint Venture was formed in 1991 with a goal of protecting and restoring this important wetland river system by restoring habitat, reducing sediment loading, and restoring base flow to the lower basin.

Focal species: Species associated with backwater habitats or requiring continuous flows were prioritized within the Cache River (Banded Pygmy Sunfish (*Elassoma zonatum*), Banded Sculpin (*Cottus carolinae*), Pugnose Minnow (*Opsopoeodus emiliae*), Little Spectaclecase (*Villosa lienosa*); Surrogates: EPT.)

IDNR Implementation Sites

(<http://www.dnr.illinois.gov/conservation/IWAP/Pages/IDNRImportantAreas.aspx>)

Areas with the greatest opportunity for implementation of IWAP goals and actions were identified by the Office of Resource Conservation and the Office of Land Management for properties that are owned and managed by IDNR. Apple River Canyon State Park and the Vermilion River at Middle Fork State Fish & Wildlife Area and at Kickapoo State Recreation Area were identified for the Streams Campaign.

Focal species: Species that were intolerant of sediment and other pollutants (Smogor 2000) were prioritized when possible for Apple River Canyon State Park (Carmine Shiner (*Notropis percobromus*), Ozark Minnow (*Notropis nubilus*), Smallmouth Bass (*Micropterus dolomieu*)) and the Vermilion River (Bigeye Chub (*Hybopsis amblops*), Bluebreast Darter (*Etheostoma camurum*), Wavy-rayed Lampmussel (*Lampsilis fasciola*)).

Nutrient Management Priority Areas

(<http://www.epa.illinois.gov/topics/water-quality/watershed-management/excess-nutrients/index>)

The Illinois Nutrient Loss Reduction Strategy (State of Illinois 2015a) builds on existing efforts and identifies priority watersheds for nutrient loss reduction through regulatory and voluntary efforts to reduce loads from wastewater treatment and runoff from urban and agricultural landscapes (Figure 15).

Focal species: Species that are intolerant to low dissolved oxygen concentrations (IDNR & IEPA 2006) and/or high ammonia concentrations (USEPA 2013) were prioritized for these areas when possible (see Table 18).

Actions

The Streams Campaign Steering Committee and our conservation partners were surveyed to identify conservation actions required to address threats to SGCN and their habitats. We received over 200 recommendations for Conservation Actions associated with the Streams Campaign from our partners in conservation and research organizations. We reviewed each recommended Action and consolidated these when possible. Conservation Actions were then sent to the Streams Campaign Technical Committee for review (Hinz et al. 2015). Suggested changes, including additions, were incorporated into the Actions presented here.

The Actions included within this Campaign section are provided to help guide the next 10 years of implementation. While other Actions may be needed and larger Goals could be set, the Campaign prioritizes the Actions contained in this section as realistic, achievable and most needed within the next 10 years to best aid in meeting the overarching goals of the Wildlife Action Plan to: (1) Establish desired number and distribution of viable populations for each SGCN and target focal species by 2025, (2) Manage habitats through promoting disturbance regimes for the benefit of native species, (3) Develop resiliency and connectedness into habitats so species can adjust to landscape and environmental changes, and (4) Foster an awareness, appreciation, and connection to SGNC and associated habitats among the public.

Implementation Actions (numbers following actions refer to the Implementation Goal(s) they address)

Monitoring & Assessment:

Need: *The conservation status of SGCN, and their habitats, changes over time in response to conservation actions as well as with new and existing stressors. Monitoring is necessary to track status and assess trends associated with current conditions and management activities.*

Outcomes: *Conservation status and trends will be regularly updated and appropriate for use in adaptive management of aquatic SGCN and their habitats.*

1. Continue statewide comprehensive monitoring & assessment programs focused on the conservation status of aquatic SGCN. (1,2,5)
 - Examine the efficiency of existing biological monitoring in Illinois to assess the conservation status of SGCN and modify or expand monitoring efforts where needed. (1,2,4,5)
 - Conduct targeted surveys for SGCN and Watch Listed species statewide, especially in undersampled habitat types, protected areas, and Campaign Focus Areas. (1,2,5)
 - Conduct status and vulnerability assessments of native species. (1,2)
 - Conduct vulnerability assessments of protected habitats (e.g., Nature Preserves) (1,2,3,5)
 - Develop efficient and effective assessment methods for SGCN that are difficult to collect using standard survey methods and approaches. (1,2,5)
 - Develop biodiversity benchmarks for aquatic habitats situated in the developed landscapes (urban and agricultural) of Illinois (1,2,4,5)
2. Initiate a sentinel monitoring program for a broad range of habitat conditions & taxa to improve trend analysis and assessment (1,2,5)

- Expand annual monitoring of water temperature, water quality, and other habitat measures in aquatic systems statewide. (1,2,4,5)
 - Expand annual monitoring of biological assemblages in aquatic habitats statewide. (1,2,4,5)
3. Encourage or require implementation and effectiveness monitoring in work plans on Public Lands or within projects supported by State funds. (1,2,5)
 4. Evaluate the success of, and potential barriers to, recruitment (reproduction) of SGCN. (1,2,5)

Protection & Stewardship:

Need: *Rare habitats often support SGCN and can be especially vulnerable to disturbances associated with adjacent areas. Maintaining these habitats may require additional protection or management activities to support viable populations of SGCN. Prioritization of vulnerable habitats associated with SGCN will allow for more efficient and effective use of limited conservation resources.*

Outcomes: *Priority habitats will be protected and managed effectively improving the viability of SGCN populations.*

5. Identify and prioritize areas associated with SGCN for protection, enhancement, and restoration. (1,2,3,5)
 - Develop benchmarks for identification or designation of Illinois waters as Biologically Significant Streams, Land & Water Reserves, Nature Preserves, or Outstanding Resource Waters (1,2,3,4,5)
 - Protect, enhance, and restore aquatic habitats where priorities have been identified. (1,2,3,5)
 - Acquire land where existing SGCN populations are declining and require protection, enhancement, or restoration (1,2,3)
 - Delineate groundwater contribution areas for associated Protected Lands (e.g., Nature Preserves, Land & Water Reserves). (1,2,3,5)
 - Develop BMPs and alternative strategies for deicing roads near ecologically sensitive areas. (4,5)
6. Develop and begin implementation of recovery plans for state-listed aquatic species. (1,2,3,5)
 - Identify habitat requirements and limiting factors for SGCN and develop recommendations to address them where information is lacking (1,2,5)

Flow Management & Water Quality:

Need: *Unnatural flow regimes and compromised water quality are recognized stressors to aquatic biota. Minimizing these stressors by effective management of stormwater and low flows, and concurrent improvements to water quality will improve aquatic habitats for SGCN.*

Outcomes: *Improved resilience and quality of aquatic habitats will increase the viability of SGCN populations.*

7. Assist with implementation of the Illinois Nutrient Loss Reduction Strategy (1,2,4,5,6)
 - Initiate efforts to require nutrient management plans for lands receiving State or Federal funds. (3,4,5)

8. Explore efforts to develop environmental flows for Illinois waterbodies (1,2,4,5,6)
 - Develop strategies for naturalizing hydrologic regimes to benefit SGCN. (1,2,5)
 - Initiate efforts to establish and protect flows for ecological needs (1,2,4,5,6)
9. Assess, grow, and increase the impact of buffer easement programs (1,2,3,4,5,6)
 - Focus programs on reducing sediment and nutrient inputs to aquatic systems (1,2,4,5)
 - Develop statewide guidance for establishment and management of riparian buffers on waterbodies throughout Illinois (1,2,3,4,5)
10. Improve the compatibility of implementation of drainage law and other statutes with the needs of SGCN and their habitats including those of Endangered & Threatened Species. (1,2,3,4,5)
 - Review Illinois drainage law and allowable drainage and channel maintenance practices to identify changes needed to minimize impacts on SGCN. (1,2,3,4,5)
 - Review flowage easements and associated plans for their effectiveness on flood reduction and minimizing environmental impact on SGCN. (3,4,5)
 - Develop guidance consisting of a model local stormwater ordinance for use by counties and local community planning organizations that address the needs of SGCN. (1,2,4,5)
11. Identify and quantify the principle stressors for SGCN in aquatic systems associated with flow modifications, water chemistry, and physical “habitat” quality and availability. (1,2,5)
 - Identify impacts of “Contaminants of Emerging Concern” (e.g., Pharmaceuticals and Personal Care Products [PPCPs], Coal-Tar Sealants) on aquatic SGCN. (1,2,5)

Fragmentation & Connectivity:

Need: *Fragmented populations are at greater risk of extirpation from stochastic events, genetic isolation, or temporal changes in habitat conditions. Artificial barriers that fragment populations by preventing dispersal and by altering local habitat can put additional stress on native populations. Reducing fragmentation of habitats will alleviate these stressors on SGCN.*

Outcomes: *Increased connectivity of aquatic habitats and increased resilience of SGCN populations.*

12. Investigate the potential for aquatic species to disperse through the existing landscape (1,2,5)
13. Develop a comprehensive approach for identifying barriers (e.g., dams, levees, dewatered reaches) that fragment aquatic habitats and no longer provide essential services. (1,2,5)
 - Identify BMPs and opportunities where reconnection would benefit SGCN. (1,2,5)
 - Remove or modify barriers where possible to benefit SGCN and their habitats. (1,2,5)

Invasive Species & Wildlife Diseases:

Need: *Invasive species and wildlife diseases have been identified as important stressors to both native species and their habitats. Improved identification, prevention, and control of new threats, along with management of existing threats will benefit SGCN that share habitats with Invasive Species.*

Outcomes: *Stresses associated with Invasive Species will be reduced or mitigated to the benefit of native species and their habitats.*

14. Assist the Asian Carp Regional Coordinating Committee’s work as described in the Asian Carp Control Strategy Framework and the Monitoring & Response Plan (ACRCC 2015a,b) (1,2,6)

15. Conduct effectiveness monitoring & assessment of efforts to reduce and mitigate impacts of Invasive Species. (1,2,4,5)
16. Develop and implement a sentinel monitoring program for detecting changes in distributions of known threats and identifying new aquatic invasive species or wildlife diseases in Illinois. (2,4,6)
17. Investigate the cumulative impacts of landuse alteration, climate change, and invasive species on SGCN and aquatic species assemblages. (1,2,3,5)

Public Support & Action:

Need: *Conservation of SGCN will require public support and action. Awareness, appreciation, and connection to these species is a prerequisite for such support and action. Furthermore, awareness and connection to nature have a positive influence on human well-being (Russell et al. 2013).*

Outcomes: *Citizens of Illinois will be empowered to support and assist with the conservation of their natural resources including SGCN and their habitats.*

18. Provide informational programming that builds awareness and appreciation of SGCN, their habitats and threats, including the water cycle, ecological flows, storm water, and current policies, practices, and laws related to aquatic SGCN (6)
19. Develop and promote programming that connects people to SGCN and their habitats (6)
20. Promote citizen science projects, such as RiverWatch (<http://www.ngrrec.org/riverwatch/>) and the Illinois Odonate Survey (<http://www.illinoisodes.org/>), and develop and encourage scientific collaborations that utilize data collected by these organizations (1,2,6)
21. Provide information to citizens about ways they can contribute to aquatic conservation, such as water conservation, rain gardens, permeable surfaces, responsible medicine disposal, invasive species prevention, nutrient reduction, and alternative de-icing strategies (4,5,6)
22. Develop and implement assessment tools to monitor awareness, appreciation, and connection to nature/SGCN across the state (6)
23. Collaborate with resource managers to identify, evaluate, and/or disseminate guidance and outreach materials focused on best management practices related to stewardship and management of aquatic species (1,2,5)

Management Resources

An updated list of links to documents, recommendation, contacts, grant opportunities, and other resources for the Streams Campaign, the other campaigns, and the wildlife action plan in general are found on the Illinois Wildlife Action Plan's website at:

<http://www.dnr.illinois.gov/conservation/IWAP/Pages/default.aspx#tabitem5>

Performance Measures

Outcome performance measures are designed to assess the overall impact of undertaking conservation actions on Implementation Goals. Output performance measures are designed to assess how active the program is at working toward the Implementation Goals.

Overarching Goal	Streams Campaign Implementation Goal	Type	Performance Measure
Viable Populations	Biodiversity	Outcome	BSS quality stream segments (total # or stream km)
		Outcome	Mean native taxa richness of waterbody is maintained or increases (for fish, mussels, EPT).
		Output	Number of conservation plans and recovery plans developed for aquatic SGNC (annual total)
		Output	Number of reintroduction or translocation projects for aquatic SGNC (initiated annually or currently funded)
Viable Populations	Abundance & Distribution	Outcome	Focal Species abundance (relative abundance) is maintained or increased within Focus Areas
		Outcome	Focal Species distribution is maintained or increased within Focus Areas (Mean number of reaches [waterbodies] with recent observations; proportion of reaches evaluated)
		Output	Number of waterbodies surveyed for SGNC (annual total)
		Output	Number of vulnerability assessments conducted for SGNC (annual total)
Habitat Management	Protection of High Quality Communities	Outcome	Percentage of BSS reaches with protected status (based on stream length or number of reaches)
		Outcome	Waterbodies under protected status (acres or stream length)
		Outcome	Percentage of aquatic SGNC with >2 populations (recent observation locations) within protected areas.
		Output	Waterbodies, stream kilometers, or total area that have received permanent protected status (e.g., Illinois Nature Preserve, annual total)
		Output	Waterbodies, stream kilometers, or total area that have received term-limited protected status (e.g., long-term easements; annual total)

Overarching Goal	Streams Campaign Implementation Goal	Type	Performance Measure
Habitat Management	Support Designated Uses	Outcome	Percentage of evaluated reaches meeting aquatic life designated use
		Outcome	Percentage of evaluated reaches fully supporting all designated uses
		Output	ratio of impaired waters (CWA 303(d) list) receiving Section 319 program funding to eligible impaired (Category 5) waters [based on biennial integrated report]
		Output	TMDLs or Category 4b plans completed (number per year)
Habitat Resiliency and Connectedness	Provide Habitat for SGCN	Outcome	Connected stream reaches statewide (total or mean length)
		Outcome	Major dams with functioning fish passage systems (percent)
		Outcome	Number of reaches (waterbodies) with recent observations of T&E species
		Outcome	Change in distribution and/or abundance of fragmentation & connectivity focal species (and surrogates)
		Outcome	Habitat quality measures of waterbodies are maintained or improve (QHEI, IHI, fish IBI, mussel diversity)
		Output	Habitat enhancement projects conducted annually (number, acres or stream km, funds expended)
Public Awareness, Appreciation, Connection	Public Awareness, Appreciation, Connection	Outcome	Proportion of individuals donating to Wildlife Preservation Fund on IL State Income Tax returns.
		Outcome	Proportion of Public with an awareness of IESPB, INPC, or Invasive Species Programs (requires initiating surveys)
		Outcome	Proportion of public who have knowledge of and attachment to local aquatic natural areas and species (requires initiating an attachment survey)
		Output	Number of hits on Streams Campaign Web page
		Output	Number of requests for IDNR educational information kits related to aquatic habitats or species
		Output	Outreach events held relating to aquatic habitats or species (number of events, number of participants)

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Table 17. Activities in support of the Wildlife Action Plan Streams Campaign and their relationship to the Implementation Goals.

Funding and Effort Sources	Activities Related to Streams Campaign	Percent Related to Implementation Goals					
		Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
State Wildlife Grants	35 projects	23%	34%	6%	0%	29%	9%
Wildlife Protection Fund Grants	32 projects	38%	31%	0%	0%	28%	6%
Endangered Species Protection Board projects	6 studies	0%	100%	0%	0%	0%	0%
EPA 319 projects	139 projects	93%	17%	0%	56%	37%	20%
Nature preserve/Land and water reserve additions	88 properties	0%	19%	100%	0%	0%	0%
DNR OMLP purchases	80 properties	0%	13%	100%	0%	0%	0%
CRP/CREP additions in riparian enhancement practices	15,916 properties (107 in CREP)	0%	1%	100%	0%	0%	0%
Dam removals	35 removals	100%	26%	0%	0%	100%	0%
IDNR-driven stream restorations	13 projects	100%	38%	0%	0%	100%	0%
FWS Partners Program stream restorations	23 projects	100%	23%	0%	0%	100%	0%

Table 18. Focal species selected for Nutrient Management Priority Areas based on the Illinois Nutrient Management Loss Strategy. Available at <http://www.epa.illinois.gov/topics/water-quality/monitoring/strategy/index>

Nutrient Management Priority Area	Focal Species for Priority Area
Priority Watersheds for Agricultural Non-Point Sources (Total Phosphorus)	
Big Muddy River Watershed	Spotted Bass, Spotted Gar, Pugnose Minnow
Embarras River Watershed	Steelcolor Shiner, Northern Hogsucker, Pistolgrip (<i>Tritogonia verrucosa</i>)
Little Wabash River Watershed	Steelcolor Shiner, Northern Hogsucker, Little Wabash Crayfish (<i>Orconectes stannardi</i>)
Priority Watersheds for Agricultural Non-Point Sources (Nitrate-Nitrogen)	
Lower Illinois River-Senachwine Lake Watershed	Black Redhorse, Northern Hogsucker
Lower Rock River Watershed	Fantail Darter, Northern Hogsucker, Black Sandshell
Mississippi Central Watershed	Statewide Focal Species
Vermilion-Illinois River Watershed	Fantail Darter, Northern Hogsucker, Smallmouth Bass
Vermilion-Wabash River Watershed	Steelcolor Shiner, Wavy-rayed Lampmussel (<i>Lampsilis fasciola</i>)
Priority Watersheds for Point Sources	
Upper Fox River Watershed	Northern Hogsucker, Smallmouth Bass, Ellipse
Des Plaines River/DuPage River Watershed	Northern Hogsucker, Smallmouth Bass, Ellipse
Upper Sangamon River Watershed	Fantail Darter, Steelcolor Shiner, Pistolgrip, Creek Heelsplitter (<i>Lasmigona compressa</i>)
Lower Rock River Watershed	Fantail Darter, Northern Hogsucker, Black Sandshell
Lower Illinois River-Senachwine Lake Watershed	Black Redhorse, Northern Hogsucker
Keep it for the Crop Priority Watersheds	
Evergreen Lake Watershed	Statewide Focal Species
Lake Bloomington Watershed	Ellipse (<i>Venustaconcha ellipsiformis</i>)
Lake Decatur Watershed	Steelcolor Shiner, Fantail Darter, Smallmouth Bass
Vermilion-Illinois River Watershed	Fantail Darter, Northern Hogsucker, Smallmouth Bass
Lake Mauvaise Terre Watershed	Statewide Focal Species
Lake Springfield Watershed	Statewide Focal Species
Lake Vermilion Watershed	Northern Hogsucker, Smallmouth Bass
Salt Fork Vermilion River Watershed	Steelcolor Shiner, Northern Hogsucker, Wavy-rayed Lampmussel, Rainbow (<i>Villosa iris</i>)

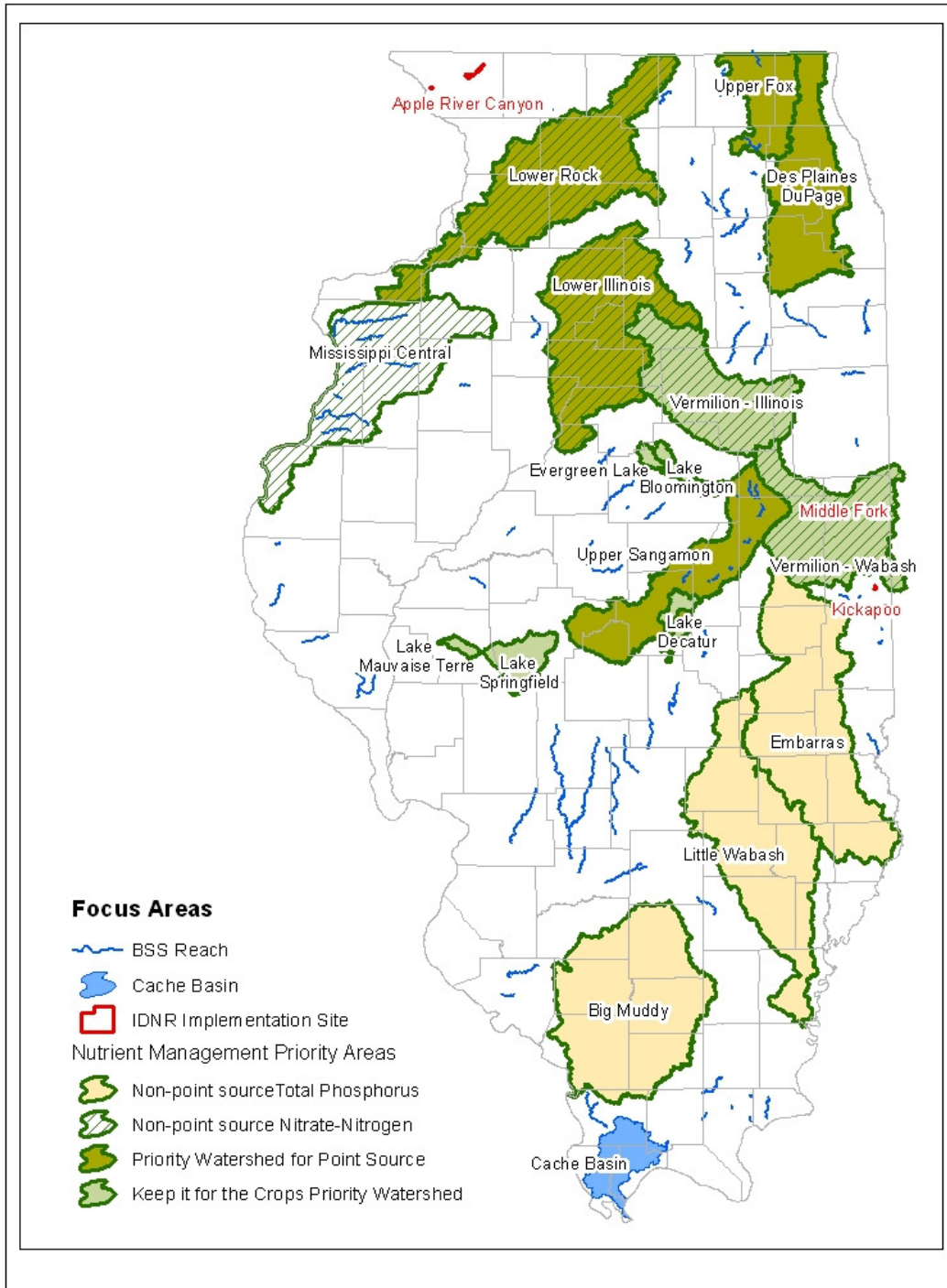


Figure 15. Streams Campaign Focus Areas have been compiled to emphasize priority areas associated with Biologically Significant Stream reaches (blue lines), initiatives to protect and enhance the Cache River Basin (blue polygon), IDNR Implementation Sites (red outlined), and Nutrient Management Priority Areas based on the Illinois Nutrient Loss Reduction Strategy (green outlined).

Appendix 8. Status and stresses to Illinois Species in Greatest Need of Conservation addressed in the Streams Campaign. Definitions and methods:

Common Name: Commonly recognized name for the species.

Scientific Name: Currently recognized name for the species based on the most recently available literature.

Campaign Habitat: Major habitat type where the species occurs in Illinois.

Specific Habitat: More detail habitat location for species in Illinois.

Historic Status: Number of Counties, or HUC8 watershed for fish and mussels, with records from before 1980.

Current Status: Number of Counties, or HUC8 watersheds for fish and mussels, with recent records (last 20 years).

Trend: Trends were based on the change in distribution of the species by comparing their Current and Historic Status. If a change less than 25% was observed the trend was recorded as 0, changes with magnitudes between 25-49% were coded as +1 (distribution increased) or -1 (distribution decreased), changes greater than 50% were coded as +2 (distribution increased) or -2 (distribution decreased).

Stressors: Each stressor type was rated as either a recognized stressor (1), not a recognized stressor (0), or as having not enough information to make a rating (NMI=Need More Information).

Appendix 8. Status and stresses to Illinois Species in Greatest Conservation Need addressed in the Streams Campaign.

Common Name	Scientific Name	Campaign Habitat	Specific Habitat	Historic Status	Current Status	Trend	Habitat Stresses						Community Stresses						Population Stresses				Direct Human Stressors						
							Extent	Fragmentation	Composition-structure	Distribution/Hydrology	Invasives/Exotics	Pollutants-Sediment	Competitors	Predators	Parasites/Disease	Prey/Food	Hosts	Invasive/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures/Infrastructure			
FISH																													
Alabama Shad	<i>Alosa alabamiae</i>	Major River	River	2	0	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Alligator Gar	<i>Atractosteus spatula</i>	Backwater	Backwater, Floodplain Lake	4	0	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
American Brook Lamprey	<i>Lethenteron appendix</i>	Creek	Riffle, Run, Pool of Stream with Sand, Gravel, Rock	11	3	-2	1	1	1	0	0	1	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	1		
American Eel	<i>Anguilla rostrata</i>	River, Major River	Pool of River, Stream	29	7	-2	0	0	0	0	0	0	0	0	0	0	0	NMI	NMI	NMI	0	1	0	0	NMI	NMI	1		
Banded Pygmy Sunfish	<i>Elassoma zonatum</i>	Backwater, Swamp, Creek	Low-Gradient or Still Pool of Backwater, Stream, Swamp with Silt, Vegetation	5	1	1	1	1	1	0	0	0	0	0	0	0	0	NMI	NMI	NMI	0	1	0	0	NMI	NMI	0		
Bantam Sunfish	<i>Lepomis symmetricus</i>	Backwater, Swamp, Large Reservoir	Backwater, Swamp, Lake with Vegetation	3	2	0	1	1	1	NMI	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Bigeye Chub	<i>Hybopsis amblops</i>	Creek	Stream with Sand, Gravel, Vegetation	8	3	2	1	NMI	1	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1	NMI	NMI	NMI	1			
Bigeye Shiner	<i>Notropis boops</i>	Creek	Stream with Sand, Gravel, Vegetation	19	5	0	NMI	NMI	NMI	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1		
Blacktail Shiner	<i>Cyprinella venusta</i>	Creek	High-Gradient Run, Pool of Stream with Stable Flow, Sand	4	4	2	1	0	0	0	0	1	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0		
Bleeding Shiner	<i>Luxilus zonatus</i>	Creek	High-Gradient Stream	0	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI		
Bluebreast Darter	<i>Etheostoma camurum</i>	River, Creek	High-Gradient Riffle in River, Stream with Rock	1	1	1	NMI	NMI	NMI	NMI	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1		
Brassy Minnow	<i>Hybognathus hankinsoni</i>	Creek	Pool of Stream	10	1	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI		
Brown Bullhead	<i>Ameiurus nebulosus</i>	Backwater, Swamp	Still Pool of Lake, Backwater, Swamp with Silt, Vegetation	31	26	1	1	0	1	0	0	1	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0		
Chestnut Lamprey	<i>Ichthyomyzon castaneus</i>	Major River, River	River	20	6	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI		
Crystal Darter	<i>Crystallaria asprella</i>	Major River, River, Creek	Riffle, Run in River, Stream	2	2	1	0	0	0	0	0	0	0	0	0	0	0	NMI	NMI	NMI	0	1	0	0	NMI	NMI	1		
Cypress Darter	<i>Etheostoma proeliare</i>	Creek, Swamp	Low-Gradient or Still Pool of Stream, Swamp with Silt, Vegetation	4	2	2	0	0	0	0	0	1	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0		
Cypress Minnow	<i>Hybognathus hayi</i>	Larger Reservoir, Swamp, Backwater, Creek	Lake, Swamp, Backwater, Stream with Sand, Silt	4	2	0	1	NMI	1	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1		
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	Major River, River	River with Sand	4	2	2	1	NMI	NMI	NMI	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1		

Common Name	Scientific Name	Campaign Habitat	Specific Habitat	Historic Status	Current Status	Trend	Habitat Stresses						Community Stresses						Population Stresses			Direct Human Stressors				
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Pugnose Minnow	<i>Opsopoeodus emiliae</i>	Major River, River, Creek, Backwater, Swamp	Low-Gradient or Still Pool of River, Stream, Backwater, Swamp with	22	10	1	1	1	1	0	0	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0
Pugnose Shiner	<i>Notropis anogenus</i>	Large Reservoir, Creek	Lake, Low-Gradient Stream with Vegetation	7	3	0	1	NMI	1	1	NMI	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1
Redside Dace	<i>Clinostomus elongatus</i>	Creek	Pool of Stream	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Redspotted Sunfish	<i>Lepomis miniatus</i>	Backwater, Swamp, Creek	Backwater, Swamp, Low-Gradient Stream with Vegetation	10	8	1	1	NMI	1	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Ribbon Shiner	<i>Lythrurus fumeus</i>	Creek	Low-Gradient Pool of Stream with Sand, Silt, Vegetation	14	8	0	1	0	0	1	0	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0
River Chub	<i>Nocomis micropogon</i>	Major River, Creek	High-Gradient River, Stream with Gravel, Rock	4	3	0	NMI	NMI	1	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1
River Darter	<i>Percina shumardi</i>	Major River	River with Gravel or Mixed Sand	15	11	2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
River Redhorse	<i>Moxostoma carinatum</i>	Major River, River	High-Gradient River with Gravel	14	10	0	NMI	NMI	NMI	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Shoal Chub	<i>Macrhybopsis hyostoma</i>	Major River, River	Riffle in River	27	14	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Sicklefin Chub	<i>Macrhybopsis meeki</i>	Major River	Turbid Riffle of River with Sand, Gravel, Stable Flow	6	1	-2	1	1	1	0	0	1	0	0	0	0	NMI	NMI	NMI	0	1	0	0	NMI	NMI	1
Silverband Shiner	<i>Notropis shumardi</i>	Major River, River	High-Gradient River with Sand, Gravel, Stable Flow	20	14	1	1	1	1	0	0	1	0	0	0	0	NMI	NMI	NMI	0	1	0	0	NMI	NMI	1
Spottail Darter	<i>Etheostoma squamiceps</i>	Creek	Riffle, Run, Pool of Stream with Rock, Stable Flow	31	3	0	1	1	0	1	0	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0
Spring Cavefish	<i>Forbesichthys agassizii</i>	Cave(Aquatic), Creek	Coolwater Cave, Stream with Gravel or Rock, Stable Flow	2	3	-2	1	1	1	0	0	0	0	0	0	0	NMI	NMI	NMI	0	0	0	0	NMI	NMI	0
Stripetail Darter	<i>Etheostoma kennicotti</i>	Creek	Pool, Headwater of Stream with Gravel	3	3	-2	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Sturgeon Chub	<i>Macrhybopsis gelida</i>	Major River	Turbid River with Sand	2	1	0	1	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1
Taillight Shiner	<i>Notropis maculatus</i>	Backwater, Large Reservoir, Creek,	Backwater, Lake, Stream, Swamp with Vegetation	0	1	-2	NMI	NMI	NMI	NMI	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Weed Shiner	<i>Notropis texanus</i>	Creek	Stream with Sand, Vegetation	12	6	2	NMI	NMI	NMI	NMI	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Western Sand Darter	<i>Ammocrypta clara</i>	Major River, River	Low-Gradient River with Sand	13	6	2	NMI	NMI	1	1	NMI	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	1
Yellow Perch	<i>Perca flavescens</i>	Lake Michigan, Major River, River	Lake Michigan, Lake or Low-Gradient or Still Pool	22	21	-1	1	0	1	0	1	1	0	0	0	0	NMI	NMI	NMI	0	0	1	0	NMI	NMI	0

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HERPTILE - Amphibian																										
Hellbender	<i>Cryptobranchus alleganiensis</i>	Creek	Clear Rock Bottomed River, Stream	6	1	-2	1	1	1	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0	0	0
Mudpuppy	<i>Necturus maculosus</i>	River	Rocky-bottom Stream, Lake	40	12	-2	1	1	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	0	1
Spotted Dusky Salamander	<i>Desmognathus conanti</i>	Creek	Headwater Stream, Adjacent Riparian Area	2	2	0	1	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0	1	0	1	1
HERPTILE - Reptile																										
Alligator Snapping Turtle	<i>Macrochelys temminckii</i>	River, Swamp	River, Swamp	13	0	-2	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0
Queesnake	<i>Regina septemvittata</i>	River, Stream	Clear Running River, Stream with Rocky Bottom	18	10	-1	1	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	1
River Cooter	<i>Pseudemys concinna</i>	Floodplain lake, Slough, Backwater	River, Slough or Backwater Lake	13	6	-1	1	0	1	1	0	0	0	1	1	0	0	0	0	1	0	1	1	0	1	1
Smooth Softshell Turtle	<i>Apalone mutica</i>	River	Sand-Bottomed Stream, River	35	9	-2	0	1	1	1	0	1	0	1	1	0	0	0	0	1	1	1	0	1	0	0
INVERTEBRATE - Coleoptera (Beetles)																										
Variiegated False Water Penny Beetle	<i>Dicranopselaphus variegatus</i>	Stream	Creek (Larvae), Riparian Areas (Adults)	NMI	NMI	NMI	1	1	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
INVERTEBRATE - Crustaceans																										
Bigclaw Crayfish	<i>Orconectes placidus</i>	Stream	Gravel, Rocky Stream, River	NMI	4	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Bousfield's Amphipod	<i>Gammarus bousfieldi</i>	River	Gravel Shoal of Ohio River	NMI	3	NMI	0	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Cavespring Crayfish	<i>Cambarus tenebrosus</i>	Stream	Rocky Stream, Springs, Cave	NMI	5	NMI	1	1	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Illinois Cave Amphipod	<i>Gammarus acherondytes</i>	Subterranean	Cave	NMI	2	NMI	1	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Illinois Crayfish	<i>Orconectes illinoiensis</i>	Stream	Stream	NMI	9	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Indiana Crayfish	<i>Orconectes indianensis</i>	Stream	Rocky Stream	NMI	7	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Kentucky Crayfish	<i>Orconectes kentuckiensis</i>	Stream	Rocky Stream	NMI	1	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Little Wabash Crayfish	<i>Orconectes stannardi</i>	Stream	Creek, Riffle	NMI	8	NMI	1	1	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Shrimp Crayfish	<i>Orconectes lancifer</i>	Lakes, Reservoir	Deep Water at Horseshoe Lake	NMI	1	NMI	1	0	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
INVERTEBRATE - Ephemeroptera (Mayflies)																										
a mayfly	<i>Anafrptilum album</i>	River	Medium to Large River	6	1	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Clay Burrowing Mayfly	<i>Pentagenia vittigera</i>	River	Large River	34	6	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Flatheaded Mayfly	<i>Raptoheptagenia cruentata</i>	River	Large River	9	1	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Fork Gilled Mayfly	<i>Paraleptophlebia ontario</i>	Stream	Small Wooded Stream	3	2	NMI	1	1	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
Large Minnow Mayfly	<i>Isonychia arida</i>	River	Large River	1	2	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI
a mayfly	<i>Siphonurus marshalli</i>	Stream	Small Stream	4	3	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI
Minnetonka Flatheaded Mayfly	<i>Stenacron minnetonka</i>	River	Small to Large River	8	4	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI

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Pecatonica River Mayfly	<i>Acanthametropus pecatonica</i>	River	Large Sandy River	1	NMI	NMI	0	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Say's Large Minnow Mayfly	<i>Isonychia sayi</i>	River	Large River	5	2	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Spiny Crawler Mayfly	<i>Dannella lita</i>	River	Small to Large River	3	6	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
a mayfly	<i>Dannella simplex</i>	River	Small to Large River	4	2	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
White Sand-River Mayfly	<i>Pseudiron centralis</i>	River	Large River	7	3	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Small Minnow Mayfly	<i>Camelobaetidium waltzi</i>	Stream	Medium to Large River	0	1	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
INVERTEBRATE - Mollusks (Hydrobiidae)																											
Missouri Cave Snail	<i>Fontigens antroecetes</i>	Stream	River	NMI	NMI	-2	0	1	1	1	0	1	0	0	0	0	0	0	0	1	1	1	1	0	0	1	
Mud Amnicola	<i>Amnicola limosa</i>	Stream	River	NMI	NMI	NMI	0	1	1	1	0	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	
INVERTEBRATE - Mollusks (Pleuroceridae)																											
Onyx Rocksnail	<i>Leptoxis praerosa</i>	Stream	River	NMI	NMI	-2	0	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	1	
Shawnee Rocksnail	<i>Lithasia obovata</i>	Stream	River	NMI	5	-2	0	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	1	
INVERTEBRATE - Odonata (Dragonflies & Damselflies)																											
Canada darner	<i>Aeshna canadensis</i>	Lakes, Reservoir	Lake Margin, Sluggish Stream	2	4	NMI	1	0	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Elusive Clubtail	<i>Stylurus notatus</i>	River	Large River	11	8	NMI	0	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Hine's Emerald Dragonfly	<i>Somatochlora hineana</i>	Wet Meadow	Fen, Seep	NMI	3	NMI	1	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Spatterdock Darner	<i>Rhionaeschna mutata</i>	Pond	Pond, Swamp	2	NMI	NMI	1	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
INVERTEBRATE - Plecoptera (Stoneflies)																											
Austin Springfly	<i>Hydroperla fugitans</i>	River	Large River	9	6	NMI	0	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Central Stone	<i>Acroneuria frisoni</i>	Stream	Small to Medium Permanent Stream	14	9	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Common Stone	<i>Acroneuria abnormis</i>	River	Large River	21	9	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Illinois Winter Stonefly	<i>Allocapnia illinoensis</i>	Stream	Small Wooded Stream	1	1	NMI	1	1	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Mottled Willowfly	<i>Strophopteryx fasciata</i>	River	Small to Large River	13	8	NMI	0	0	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Ozark Forestfly	<i>Prostoia ozarkensis</i>	Stream	Small Wooded Stream	1	1	NMI	1	1	0	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Robust Springfly	<i>Diplperla robusta</i>	Stream	Small, Permanent Stream	0	1	NMI	0	0	0	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
Small Willowfly	<i>Taeniopteryx lita</i>	River	Large River	4	4	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Two-Lined Stone	<i>Perlesta golconda</i>	River	Medium to Large River	6	9	NMI	0	1	1	1	1	1	0	0	0	0	0	NMI	NMI	0	0	0	0	NMI	NMI	NMI	
INVERTEBRATE - Trichoptera (Caddisflies)																											
Large River Net-Spinning Caddisfly	<i>Hydropsyche arinale</i>	River	Medium to Large River	9	5	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Net-Spinning Caddisfly	<i>Cheumatopsyche speciosa</i>	River	Medium to Large River	12	2	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Caddisfly	<i>Chimarra aterrima</i>	Stream	Spring, Springbrook	5	4	NMI	1	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Caddisfly	<i>Hydropsyche cuanis</i>	River	Medium to Large River	6	4	NMI	0	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Sandboil Caddisfly	<i>Frenesia missa</i>	Stream	Spring, Springbrook	4	5	NMI	1	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	
Seep Inhabiting Net-Spinning Caddisfly	<i>Diplectrona metequi</i>	Stream	Seep	2	2	NMI	1	1	1	1	1	1	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	NMI	

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MUSSELS																											
Black Sandshell	<i>Ligumia recta</i>	River	Riffle, Gravel or Sand	32	15	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Bleufer	<i>Potamilus purpuratus</i>	River	Slow Flow, Fine Substrate	5	4	0	1	1	0	1	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0
Butterfly	<i>Ellipsaria lineolata</i>	Major River	Swift Flow, Sand, Gravel	18	9	-1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	1	1	1	1	0
Clubshell	<i>Pleurobema clava</i>	River	Swift Flow, Cobble to Sand	5	1	-2	0	1	1	1	0	1	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1
Creek Heelsplitter	<i>Lasmigona compressa</i>	Creek	Sand or Gravel	22	21	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0
Ebonyshell	<i>Fusconaia ebena</i>	Major River	Swift Flow, Sand, Gravel	18	4	-1	0	1	0	1	1	1	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1
Elephantear	<i>Elliptio crassidens</i>	Major River	Swift Flow	17	3	-1	1	1	1	1	1	1	0	0	0	0	1	1	0	0	1	1	1	1	1	1	0
Elktoe	<i>Alasmidonta marginata</i>	River	Swift Flow	23	15	-1	0	1	1	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0
Ellipse	<i>Venustaconcha ellipsiformis</i>	Creek	Swift Flow, Cobble to Sand	21	15	-1	1	1	1	1	0	1	0	0	0	0	1	0	0	0	1	1	1	0	1	0	0
Fanshell	<i>Cyprogenia stegaria</i>	River	Swift Flow, Gravel	6	0	-2	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	0	0	1	0	0
Fat Pocketbook	<i>Potamilus capax</i>	River	Sand, Gravel, Muck	11	5	-1	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0
Flutedshell	<i>Lasmigona costata</i>	River	Sand or Gravel	27	12	-1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
Gulf Mapleleaf	<i>Quadrula nobilis</i>	Major River	Sand, Gravel, Muck	3	2	-1	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	1	0	0	0	1	0
Higgins Eye	<i>Lampsilis higginsii</i>	Major River	Sand or Gravel	12	2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	0	0	1	0
Kidneyshell	<i>Ptychobranthus fasciolaris</i>	River	Fine to Coarse Substrate	7	2	-1	0	1	0	1	0	1	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1
Little Spectaclecase	<i>Villosa lienosa</i>	Creek	Sand, Muck, Edge	10	6	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0
Louisiana Fatmucket	<i>Lampsilis hydiana</i>	Creek	Slow Flow, Sand, Gravel, Muck	13	12	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monkeyface	<i>Theliderma metanevra</i>	River	Sand or Gravel	22	15	-1	0	1	0	1	0	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0
Northern Riffleshell	<i>Epioblasma rangiana</i>	River	Riffle, Coarse Substrates	2	1	-1	0	1	1	1	0	1	0	0	0	0	1	0	0	1	1	1	1	0	0	1	0
Ohio Pigtoe	<i>Pleurobema cordatum</i>	River	Sand or Gravel	5	1	-2	0	0	0	1	1	1	0	0	0	0	0	1	0	1	1	1	0	0	0	1	0
Orangefoot Pimpleback	<i>Plethobasus cooperianus</i>	River	Swift Flow, Cobble to Sand	1	0	-2	0	1	0	1	1	1	0	0	0	0	1	1	0	1	1	1	1	0	0	1	0
Pink Mucket	<i>Lampsilis abrupta</i>	Major River	Swift Flow, Rocky Substrate	6	0	-2	0	1	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	0	0
Pistolgrip	<i>Tritogonia verrucosa</i>	River	Sand, Gravel, Muck	38	29	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
Pocketbook	<i>Lampsilis ovata</i>	Creek	All Substrates	4	1	-2	0	1	1	1	0	1	0	0	0	0	1	0	0	1	1	1	0	0	1	1	1
Purple Lilliput	<i>Toxolasma lividum</i>	Creek	Sand, Muck, Root, Edge	7	3	0	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0
Purple Wartback	<i>Cyclonaias tuberculata</i>	River	Swift Flow, Coarse Substrate	7	5	-1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Rabbitsfoot	<i>Theliderma cylindrica</i>	River	Sand or Gravel	2	2	-2	0	1	0	1	0	1	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1
Rainbow	<i>Villosa iris</i>	Creek	Sand or Gravel	15	1	-2	0	1	0	1	0	1	0	0	0	1	1	0	0	1	1	1	1	0	0	1	0
Rayed Bean	<i>Villosa fabalis</i>	Creek	Flow, Fine Substrate, Vegetation	2	1	-2	1	1	1	1	0	1	0	0	0	0	1	0	0	1	1	1	0	0	0	1	0
Salamander Mussel	<i>Simpsonaias ambigua</i>	River	Coarse Substrate, Slab Rock	12	1	-2	1	1	1	1	0	1	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0

Common Name	Scientific Name	Campaign Habitat	Specific Habitat	Historic Status	Current Status	Trend	Habitat Stresses						Community Stresses						Population Stresses			Direct Human Stressors					
							Extent	Fragmentation	Composition-structure	Distribution/Hydrology	Invasives/Exotics	Pollutants-Sediment	Competitors	Predators	Parasites/Disease	Prey/Food	Hosts	Invasive/Exotics	Other Symbionts	Genetics	Dispersal	Recruitment	Mortality	Killing	Disturbance	Structures/Infrastructure	
Scaleshell	<i>Leptodea leptodon</i>	River	Flow	10	1	-2	1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0
Sheepnose	<i>Plethobasus cyphus</i>	River	Swift Flow, Cobble to Sand	16	3	-2	1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	1	1	0	0	1	1
Slippershell	<i>Alasmidonta viridis</i>	Creek	Sand, Gravel, Muck	25	17	-1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0
Snuffbox	<i>Epioblasma triquetra</i>	River	Riffle, Coarse Substrates	17	1	-2	0	1	1	1	0	1	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1
Spectaclecase	<i>Margaritifera monodonta</i>	Major River	Gravel, Muck, Roots	6	1	-2	0	1	0	1	1	1	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0
Spike	<i>Elliptio dilatata</i>	River	Coarse Substrate	40	18	0	1	1	1	1	0	1	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0
Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i>	Creek	Flow, Coarse Substrate	3	1	-1	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0