

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) 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.

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

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 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.lcfd.org/>)); 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 using largely data from these monitoring programs. All species of fish (Metzke et al. 2012) and mussels (Douglass & Stodola 2014) known from Illinois and 550 additional 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 IWAP. 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 1) (<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/what-we-do.html>], 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, 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 1) 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. 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. 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/>), 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 include an educational component addressing environmental awareness concerning reduction 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.

Challenges to Implementation (Stresses/Threats)

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/TWAP/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*)
- **Chinese Mystery Snail** (*Cipangopaludina chinensis*) and **Faucet Snail** (*Bithynia tentaculata*)
- **Dreissenid mussels** (Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*Dreissena rostriformis bugensis*))
- **Gobies** (Round Goby (*Neogobius melanostomus*) and Tubenose Goby (*Proterorhinus marmoratus*))
- **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 that are informed, connected, and empowered to support and assist with conservation actions they will not be prioritized over other activities.

Focal Species and Surrogates

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 Focal Areas.

Climate Change

While all 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*); Surrogate: 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 platorynchus*), 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*); Surrogate: 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 (Table 2).

Focal Species: Highfin Carpsucker (*Carpoides 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.

Focal Areas

Streams Campaign Focal Areas have been selected to indicate geographical locations where significant activity is expected to occur that benefits Campaign Goals (Figure 1). Focal 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 Focal 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 Important Areas (<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.

Focal species: Species that were intolerant of low dissolved oxygen concentration (IDNR & IEPA 2006) and/or high ammonia concentrations (USEPA 2013) were prioritized for these areas when possible (Table 2).

Actions

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, (2) Manage habitats through promoting natural processes, desired structure, and disturbance regimes for the benefit of native species, and (3) Develop resiliency and connectedness into habitats so species can adjust to landscape and environmental changes.

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>

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.*

- 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 Focal 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)
- 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)
- Encourage or require implementation and effectiveness monitoring in work plans on Public Lands or within projects supported by State funds. (1,2,5)
- 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.

- 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)
- 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.*

- 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)
- 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)
- 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)
- 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)
- 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.*

- Investigate the potential for aquatic species to disperse through the existing landscape (1,2,5)
- 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.*

- 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)
- Conduct effectiveness monitoring & assessment of efforts to reduce and mitigate impacts of Invasive Species. (1,2,4,5)
- 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)
- 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.*

- 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)
- Support programming that connects people to SGCN and their habitats (6)
- Promote citizen science projects, such as RiverWatch (<http://www.ngrrec.org/riverwatch/>) and the Illinois Odonate Survey (<http://www.illinoisodes.org/>), and support scientific collaborations that utilize data collected by these organizations (1,2,6)
- 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)
- Develop and implement assessment tools to monitor awareness, appreciation, and connection to nature/SGCN across the state (6)
- 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)

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Table 1. Activities in support of the Wildlife Action Plan Stream Campaign and their relationship to the Implementation Goals.

<u>Funding and Effort Sources</u>	<u>Activities Related to Streams Campaign</u>	<u>Percent Related to Implementation Goals</u>					
		<u>Goal 1</u>	<u>Goal 2</u>	<u>Goal 3</u>	<u>Goal 4</u>	<u>Goal 5</u>	<u>Goal 6</u>
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%

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Table 2. 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	use appropriate 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>)

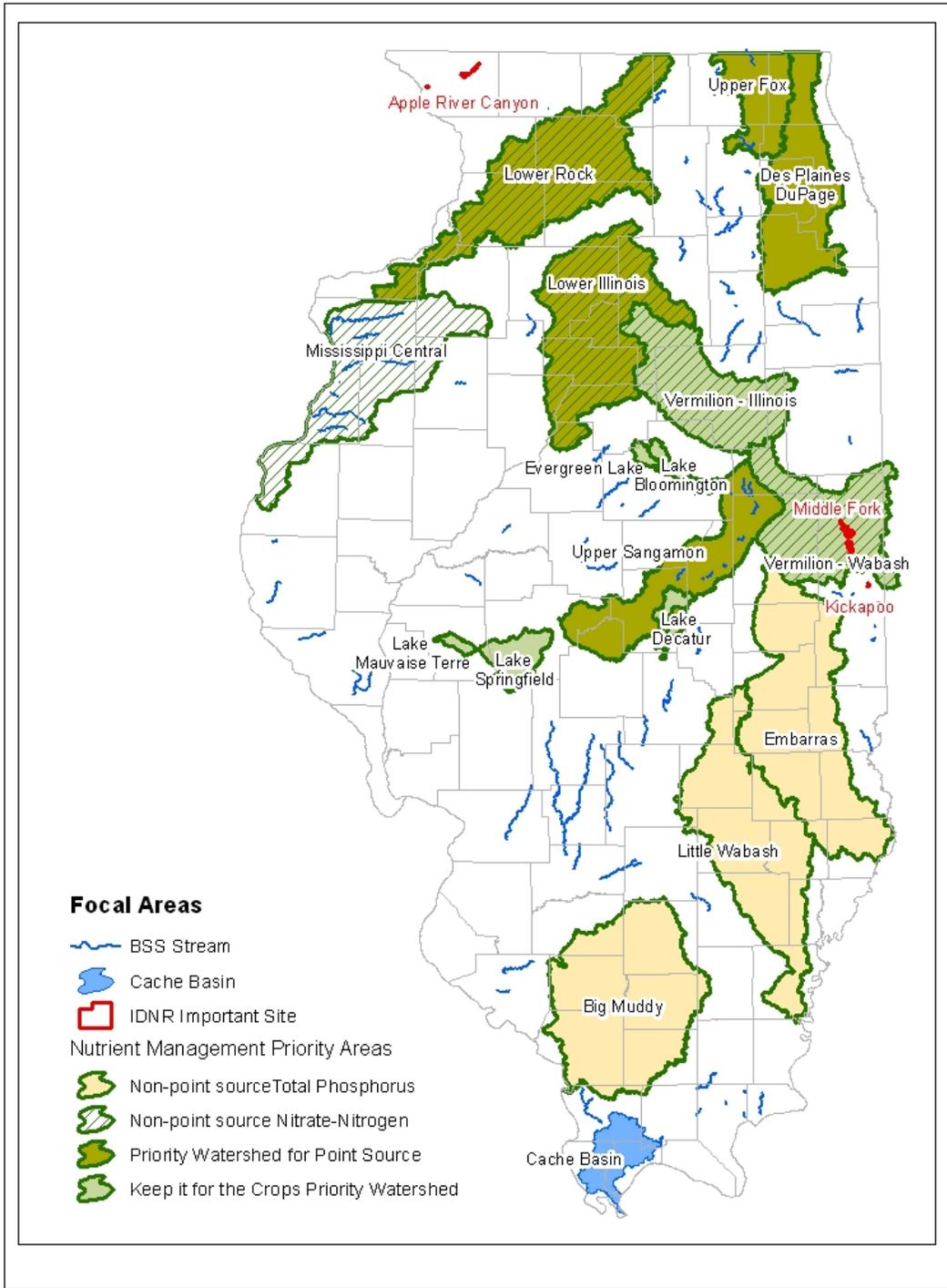


Figure 1. Streams Campaign Focal Areas have been compiled to emphasize priority areas associated with Biologically Significant Stream reaches (blue lines), initiatives to protect and enhance the Cache River Basin (blue polygon), IDNR Important Sites (red outlined), and Nutrient Management Priority Areas based on the Illinois Nutrient Loss Reduction Strategy (green outlined).