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Status Revision and Update for Illinois' Fish Species in Greatest Need of Conservation

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Project Overview

The Illinois Comprehensive Wildlife Conservation Plan and Strategy, also known as the Illinois Wildlife Action Plan (WAP, IDNR 2005) was designed to promote the preservation or enhancement of wildlife populations and associated habitats. Furthermore, it provides a framework for development of science-based actions and management procedures for achieving conservation objectives. Critical to achieving these priorities is identification and thorough evaluation of Species in Greatest Need of Conservation (SGNC), or those species with a perilous ecological status based on eight criteria ranging from abundance to habitat requirements.

Initial selection and characterization of fish SGNC was based on three sources containing data through 1999 (INHS collection records) or 2004 (IDNR FAS and BIOTICS databases) and the opinions of a small number of experts. As periodic revisions to the SGNC are expected to occur every two to five years, a reevaluation of fish species using updated and additional data sources is appropriate. Reevaluation also provides an opportunity to incorporate additional data sources and to employ the expertise of a larger body of fisheries professionals. Accordingly, the primary goal of this study is to reconstruct tables containing SGNC evaluations using additional and newly available information.

Appendix I of the WAP contains a status summary of SGNC under eight criteria related to distribution, abundance and habitat requirements, along with a description of the primary habitat utilized by each species. For this reevaluation, seven fisheries databases were used to assess distribution and abundance of all fish SGNC and analyze temporal patterns in those assessments. Outputs of distribution and abundance analyses were used to determine species status under criterion 3 of Appendix I (rare or significantly declined in abundance or distribution from historic levels). The remaining criteria and habitat associations were assessed using a combination of consensus from 31 fisheries experts and an examination of pertinent literature. As part of the distribution analysis, statewide maps with temporally denoted collection record locations were developed for each species.

Appendix II of the WAP includes a list of stresses believed to impact distribution and abundance of SGNC and an evaluation of population size with trend assessments. Stresses were reevaluated through consensus of fisheries experts and examination of literature. Population size and trends were reevaluated by summarizing distribution and abundance analyses.

Results of this study will serve as draft updates of Appendix I and II for fish SGNC, with the ultimate goal of incorporating these reevaluations into the 2015 mandated WAP update. Revised distribution maps of all SGNC are also included with this report.

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- The many participants of the online surveys.

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1.1 Illinois Wildlife Action Plan

Plan composition and SGNC overview

The Illinois Wildlife Action Plan (WAP, IDNR 2005) serves as a guide for conserving the State's wildlife and critical habitat. A primary component of the WAP is the identification of Species in Greatest Need of Conservation (SNGC), or those species that are rare or declining and indicative of Illinois' wildlife diversity. Further, this group of species serves to focus conservation efforts by identifying objectives for each species and suggesting actions for maintaining or improving their status. For all taxonomic groups, including fish, SGNC were identified using eight criteria reflective of a species' abundance, distribution, habitat requirements, ecological role and amount of information available regarding the species.

Fish SGNC were selected through a multi-staged process. Those species populating the State and Federal Threatened and Endangered (T&E) list were automatically included as SGNC. The remaining species were chosen (within the framework of the eight selection criteria) using a combination of databases or publications and expert opinion. Abundance, distribution and population trends were derived mostly from the Illinois Department of Natural Resources' Fisheries Analysis System (IDNR FAS) streams and lakes databases. Ecological characteristics (habitat requirements, ecological role) were assessed by a small group of experts. These data were then summarized in Appendix I of the WAP. Appendix II of the WAP includes information regarding population trends (increasing or declining), objectives for those trends and a matrix of stressors that evaluates the degree to which an environmental stressor impacts the species' distribution and abundance. This table also was constructed using a combination of database information and expert opinion.

The fish SGNC list includes 80 species (31 T&E, and 49 other species). Each species was evaluated (at least in part) under the criteria and characteristics of Appendix I and II and its status appropriately documented.

Need for WAP update

The WAP calls for periodic revisions (at no greater than ten year intervals) of the entire document and more frequent updates of SGNC evaluations every two to five years. To date, no reevaluations of SGNC have been conducted, making the information in the WAP at least eight years old.

In addition to meeting mandated update activities, reevaluating the SGNC allows for incorporation of new data and additional sources. Much of the information used to analyze distribution and abundance of fish SGNC originated from a few sources. Given that sources of fisheries information have specific scopes relative to their goals and methods, acquiring and incorporating additional sources expands spatial coverage (for distribution analyses) and

increases accuracy of abundance analyses. Further, qualitative assessments (e.g., habitat associations), and to some degree the species included in the SGNC list, were based on opinions of a small number of individuals, and as such, reevaluation offers opportunity to utilize more experts during the assessment process.

1.2 Approach to reevaluation of SGNC

The overall approach to this study was to incorporate more recent fisheries data from more sources and utilize a more quantitative methodology in revising the WAP Appendices. This process began with acquiring fisheries databases and collections that include Illinois collection records and eliciting information from state fisheries experts. Each component of the Appendices was then individually evaluated using the acquired information.

Data collection and data source description
Quantitative assessments of fish species abundance and distribution required data sources with numerical (abundance) and location information. At a minimum, occurrence records with collection date and spatial data (e.g., latitude/longitude, verbal location descriptions) were needed to complete study objectives, but abundance (i.e., number collected), sampling effort (e.g., electrofishing time, seine hauls), and collection method were also required for some analyses. To locate such sources, a brief inquiry of fisheries experts was conducted to determine availability of such data, and ultimately, data were requested from nine entities; however, only six (for seven data sources) fulfilled our request (Table 1). Those sources are:

- Illinois Department of Natural Resources (IDNR) Fisheries Analysis System (FAS) streams database
- IDNR FAS lakes database
- Illinois Natural History Survey (INHS) museum collections database
- Illinois Natural Heritage Division Biodiversity Tracking and Conservation System (BIOTICS) database
- United States Geological Survey Long Term Resource Monitoring Program (LTRMP) database
- INHS Long Term Electrofishing (LTEF) program database
- University of Michigan Museum of Zoology (UMMZ) collections database

These data sources were utilized to evaluate the distribution and abundance of Illinois fishes for reevaluation of portions of Appendix I and II, although not all of these sources contained data appropriate for both measures (Table 1, Table 2). For instance, the BIOTICS database contained georeferenced spatial data that could be used for distribution analysis, but it did not contain collection effort data for density (abundance) calculations. However, some sources that lacked certain data types could still be used for those associated analyses by extrapolating information from additional sources. Such incomplete sources included the IDNR FAS streams and lakes databases, which did not include spatial data, although collection identifications contained information that could be joined to Illinois Environmental Protection Agency (IEPA) spatial

information, which does contain georeferenced data. Through this technique we were able to expand utility of available data.

In addition to quantitative distribution and abundance analyses, revision of Appendix I and II requires qualitative assessments of species conservation status or ranking, regional distribution, habitat preferences and environmental stressors. Illinois Endangered Species Protection Board publications (ISPB 2011, Nyboer *et al* 2006) and NatureServe Explorer (2011) were used to determine conservation status for each species (criteria 1 and 2 of Appendix I) and regional distribution patterns (criteria 5 and 6 of Appendix I). Habitat preferences (habitat association and criteria 4 and 7 of Appendix I) and environmental stressors (Appendix II) were determined using a combination of literature review and expert surveys.

Survey of Fisheries Experts

Habitat descriptions and criteria 4 and 7 of Appendix I along with all stressor evaluations in Appendix II are related to species characteristics that could not be assessed using information contained within databases. To evaluate these portions of the Appendices, a survey of fisheries experts was created to provide consensus regarding these characteristics and complete the associated portions of Appendix I and II.

SurveyMonkey (www.surveymonkey.com) was used to create and distribute surveys to targeted experts. The SurveyMonkey design system allows for complete customization using simple patterns and intuitive response mechanisms and then provides the ability to access and analyze results. Survey questions were reflective of Appendix components relative to habitat use and environmental stressors and were phrased so that responses could be used to reevaluate the WAP Appendices (Appendix B). Each survey component (question) represented a portion of an Appendix (e.g., a listing criterion, stressor evaluation) and selectable responses were based on information included in the Appendices. For instance, the survey questions related to the habitat association portion of Appendix I were constructed so that a variety of different habitat components could be selected to build a final determination of habitat preference (Appendix B). Because environmental stressors were evaluated on a temporal scale (i.e., past, present, future), a matrix-style question was created for assessment of stressors where participants could consider both condition and time period when answering (Appendix B). Minor modifications were made to the potential stressor list to remove redundancy and to add climate change. Participants were also asked to provide identifying information (name and association) and to assess their knowledge level for each species. They were permitted to provide additional comments regarding a particular species and to provide a list of species they feel warrant inclusion on the SGNC list.

Fifty-four of the fish species included in this study were evaluated in a series of three installments to reduce expert effort per survey (the remaining species were assessed using literature reviews). Each of these sub-surveys was distributed to the same group of potential participants and was structured with the same series of questions. All analyses were conducted using pooled data from all three surveys.

An initial list of potential participants for the survey was created from the Wildlife Action Team members and then expanded by including known fisheries experts from various state agencies and academic institutions. The Wildlife Action Team is comprised of a variety of fish and wildlife professionals in addition to administrative and planning personnel. Fisheries professionals were primarily from the IDNR, although individuals from the INHS, USFWS and several universities were included. All those contacted were asked to forward the participation request to any others that would be appropriate. In all, 66 individuals were directly contacted to participate in the survey (others were contacted via forwards) and 31 of those participated in at least one portion of the surveys. Number of experts participating in individual sub-surveys ranged from 14 to 24. Participants were allowed to skip individual species within the survey if they felt unqualified to provide an evaluation, and as such, number of participants ranged from two to twelve (mean = 6.7) for the evaluated species.

Species included in this study

Appendix I and II of the WAP includes 80 SGNC, and all of these species were evaluated under the criteria and characteristics within those Appendices. For several evaluations, the SGNC were divided into two groups; T&E species and remaining species, and methods used for those evaluations differed between the groups. Five additional game species were also included in evaluations in an effort to assess sportfish populations (Appendix A).

1.3 Reevaluation of habitat association.

Although not a selection criteria for inclusion on the SGNC list, a description of each species' habitat association is included as a general descriptor in Appendix I. Items included in these descriptions and the level of detail varies amongst species. In general, though, habitat associations can include descriptions of waterbody type, channel unit (i.e., riffle, run or pool) and substrate associations, along with several other characteristics that help define a species' habitat preference. Reevaluation of habitat association was done in such a way to create parallel assessments of preferred habitat characteristics (i.e., all potential habitat categories were assessed for each species). Approach to determining habitat associations was dependant upon which species was evaluated; non-T&E SGNC and sportfish were evaluated through expert surveys, while literature reviews were utilized for T&E species.

In an attempt to incorporate all possibilities for habitat association, survey questions were constructed in a manner in which each component is individually addressed and then used to build a detailed association. Habitat association was divided into four survey questions, one each for waterbody type, instream habitat type (channel unit), substrate and other characteristics (Appendix B). Consensus for the final determination of habitat association was taken from those components indicated by at least 50% of experts as preferred by a species (Table 3). Under these assessment procedures, a species could be associated with multiple characteristics within the same category. For instance, experts concur that highfin carpsucker preferred both streams and rivers within the waterbody type category of associations (Table 3). Reviewers most often associated non-T&E SGNC with streams (65%) and rivers (41%) and identified a relatively high association with sand (47%) and gravel (65%). Other habitat characteristics frequently selected

were high gradient (33%) and stable flow (31%), although low gradient and vegetation were also selected often (27% each). Sportfish were more variable in their habitat evaluations, often associating with multiple habitat types within the same category (Table 3).

T&E species were assessed by reviewing pertinent literature (NatureServe 2011, Nyboer *et al* 2006, Smith 1979) pertaining to habitat associations. This approach was used for T&E species since information on these species have been assessed in detail during periodic revisions and updates of the State's T&E species list and is relatively well documented. As with the other SGNC, details within the literature most often associated T&E species with streams (58%) and rivers (48%), although lakes/reservoirs (39%) are also common (Table 4). Sand (52%) and gravel (39%) were the most common substrate associations identified in the literature with vegetation (42%) recognized as a common habitat characteristic for T&E species.

Patterns of habitat association begin to emerge as dominate habitat types were compared amongst SGNC. Low-gradient waterbodies with vegetation (21%) and high-gradient waterbodies with gravel (21%) were the two most commonly identified habitat associations (Table 3, Table 4). The low-gradient types include backwaters, swamps, shallow lakes and slow moving streams with vegetation. Given the rarity of these waterbody types, and the scarcity of high quality aquatic vegetation, it is no surprise that fish species associated with these habitats also are rare. High-gradient waterbodies with gravel include headwater streams, substantial riffles in rivers and other flowing waters in topographically diverse landscapes where gravel is present. As many Illinois watersheds are dominated by low-gradient streams, and as sedimentation often blankets gravel and other course substrates, it is once again not difficult to appreciate that species associated with these habitats are rare.

1.4 Reevaluation of criteria 1 and 2.

The first two criteria in Appendix I directly reflect a species' status on Illinois' Threatened and Endangered Species List (criterion 1) and its global conservation rank (criterion 2). Status as threatened or endangered was noted from the Illinois Endangered Species Protection Boards' (IESPB) checklist (2011) and recorded in the revised Appendix I. A species' global conservation rank was determined from NatureServe Explorer (2011) species data and recorded in the revised Appendix I. Those species with a conservation rank of G1, G2 or G3 met criterion 2. In total, 31 species were either State threatened or endangered (one was also Federally endangered), and nine species were conservation rank G3 or lower (Table 5).

1.5 Reevaluation of criterion 3.

Criterion 3 (rare or declining) indicates a species' rarity (in abundance and distribution) and/or its trend in abundance and distribution. The original WAP employed a combination of data analyses (primarily INHS and IDNR databases), map reviews (INHS and *Fishes of Illinois* maps) and expert opinion to assess this criterion; however, quantitative analyses were not used to examine spatial or temporal trends.

Because this criterion incorporates several parameters, much of the quantitative work done during this study went towards evaluation of species distribution and abundance patterns. Our approach was not only to include as many appropriate data sources as possible for these evaluations, but also to apply associated analyses at multiple spatial and temporal scales to reveal potential trends. Ultimately, a species' status under criterion 3 is a combination of both abundance and distribution patterns, although the particular reason for inclusion (rare, declining, or both) is indicated in the revised Appendix I.

Distribution mapping

One component of criterion 3 includes an evaluation of spatial or distribution patterns that were examined using maps created by merging location information from the seven data sources. Developing these maps and their associated geodatabases represents the majority of the effort undertaken in this study and they provide a useful tool for assessing statewide and temporal patterns of distribution as well as identification of individual collection records.

For each SGNC and sportfish species, location information from each data source was compiled into a single table containing available spatial and temporal information and was provided to IDNR GIS staff. Because each data source expressed spatial information in a different manner (Table 1), geographical information (collection records) had to be transformed into a more consistent format or related to existing geospatial data before points could be mapped in ArcGIS. Available spatial data and methods for adjusting those data are:

- IDNR FAS streams database. IDNR stream records do not contain georeferenced location data, but are associated with IEPA stream stations. IDNR collection records were related to an IEPA spatial data layer and were mapped based on this layer. IDNR river stations follow a different nomenclature and utilize U.S. Coast Guard navigation mile markers. The INHS possessed georeferenced spatial information for the Illinois, Mississippi and Ohio Rivers, and those data were used to relate IDNR collection records to physical locations. IDNR Wabash River locations were in opposite order to those of U.S. Coast Guard navigation mile markers, so those data were reattributed to match the U.S. Coast Guard format before they were related to georeferenced information.
- IDNR FAS lakes database. IDNR lakes records did not have georeferenced location information. These collections are coded with a unique identification number that contains a numerical reference assigned to a body of water. Unfortunately, these identification numbers are not synonymous with IEPA lake station codes, so a direct relate of the two sources could not be made. However, the IDNR and IEPA data tables do contain waterbody name, and an attempt to link the two was made through this common attribute. IDNR and IEPA lake sampling locations do not entirely overlap (unlike stream stations) and as such, only 255 of the 958 IDNR sampled lakes could be related to IEPA spatial data. The majority of those waterbodies are larger lakes, and most of the unrelated station data is from small ponds and private lakes. For overlapping locations, IDNR collection records were related to an IEPA spatial data layer and were mapped based on this layer.
- INHS museum collections. INHS museum records contained mostly XY (latitude and longitude) coordinates associated with collections, but only verbal descriptions existed for

some older records. XY coordinates were simply added to the mapping project, but verbal descriptions of records were mapped using a variety of other spatial data layers (e.g., municipalities, roads) as reference. Most verbal descriptions named the waterbody from which the record was obtained and also contained some combination of county locations, nearest road crossings or towns, and distances from major landmarks. These were used to estimate record location, and a georeferenced point was created from the estimate and incorporated into the mapping project.

- BIOTICS database. BIOTICS records included XY coordinates, and these location data were incorporating into the mapping project.
- LTRMP database. The LTRMP program samples only four locations within Illinois, but within those locations (which can be 40 miles long or longer) are many sub-sites that are georeferenced by XY coordinates. Sub-sites were mapped using their associated coordinates.
- LTEF database. Most LTEF collection records were georeferenced by river mile (U.S. Coast Guard navigation mile), but some only used site number as location information. Those with river mile were related to existing navigation geospatial data. For those with site number, sites were first converted into a georeferenced format and then those spatial data were used to map records.
- UMMZ collections. Spatial information for these museum records were comprised almost entirely of verbal descriptions (2 of 2556 records had lat./long.). As with INHS verbal records, verbal descriptions were used to create a georeferenced data layer for incorporation into mapping projects.

For visualization of location data, we created two maps for each species (Appendix C): a source-based map, which indicates record origin (either collection museum or database), and a date-based map that categorizes records into one of four temporal periods (see below for description of time periods). These maps are static illustrations of a dynamic ArcGIS geodatabase, and are designed to be updated as new data become available.

Distribution analysis of SGNC

Three analyses were used to evaluate patterns of distribution for fish SGNC: Site-based proportional density, sample-based proportional density, and HUC-8 watershed distribution based on mapping results. In each of these analyses, patterns of distribution were assessed on a temporal scale by comparing recent collection records (those recorded between 2000 and 2010) to records from three historic time periods (1977-1999, 1950-1976, and pre 1950). Historic periods were chosen to represent certain eras of aquatic history: The 1977-1999 period corresponds to the post-Clean Water Act era, the 1950-1976 period corresponds to the pre-Clean Water Act era, and the pre 1950 era includes the earliest fisheries data. Because pre-1950 data is sparse and was collected sporadically (i.e., not part of standardized and extensive sampling program), these data are included in some discussions and in distribution maps, but are not used for quantitative evaluation of criteria 3.

Site-based and sample-based proportional density analyses were used to evaluate frequency of occurrence of a species at all sampled sites and for all sample events, respectively. Site-based analysis incorporates only the IDNR FAS streams database as this was the only source that had an

appropriate combination of repeatedly sampled locations and temporal coverage. Sample-based analysis used IDNR FAS streams, IDNR FAS lakes, LTRMP and LTEF databases (Table 2). For site-based analysis, number of sampled sites varies for each time period, and therefore, density was adjusted for total number of unique sites sampled during the associated period (i.e., proportional density). Adjusted proportional density was then used to calculate change in proportional density by comparing the recent (2000-2010) period to the two historic periods used for temporal analyses (1977-1999 and 1950-1976). Changes in proportional density values were used to evaluate statewide temporal patterns in species distribution. Quantitative thresholds for change in proportional density were defined to categorize relative change in distribution: +/- 24% was defined as minimal or no change, +/- 25-49% as moderate change, and ≥ 50% as high change. Sixty-two of the 85 SGNC and sportfish evaluated had a sufficient number of records present in the databases to conduct change in proportional density analysis (Table 6). If values are averaged between the two time period comparisons for SGNC only, 14 of those analyzed species (25%) had minimal change in site-based density and eight had minimal change in sample-based density (14%). Moderate increases were observed for five (9%) and three (5%) species, for site and sample-based analyses, respectively, while high increases were observed for 25 (44%) and 33 (58%) species. Moderate decreases occurred for five (9%) and four (7%) species, while high decreases occurred for eight (14%) and nine (16%) species. For sportfish, white and black crappie show declines, redear sunfish an increase, channel catfish a decline in site occurrence and largemouth bass no change (Table 6).

Frequency of occurrence in HUC-8 watersheds was used as a third evaluation of distribution. This assessment procedure employed all mapped data sources (Table 2) and number of populated HUC-8 watersheds was counted for each time period. Recent record of occurrence in watersheds was compared to the occurrence during the two historic time periods and change in HUC-8 watershed distribution was calculated. Those species with no recent record of occurrence were also noted. Frequency of occurrence in HUC-8 watersheds ranged from 0 to 42 (of 51 HUC-8 watersheds present in Illinois) for SGNC and 0 to 51 for sportfish (Table 7). For SGNC, 17 (22%) species increased and 39 (51%) species decreased in watershed occurrence when compared to the 1977-1999 period, while 29 (38%) increased and 28 (37%) decreased from the 1950-1976 period. From the 1950-1976 period, 24 (33%) SGNC exhibited a moderate increase and 16 (22%) a high increase, while 28 (38%) showed a moderate decrease and 10 (14%) a high decrease. From the 1977-1999 period, 12 (15%) displayed a moderate increase and 7 (9%) a high increase, while 31 (40%) showed a moderate decrease and 12 (15%) a high decrease. Four species (spring cavefish, sicklefin chub, northern brook lamprey, taillight shiner) have no collection records during the recent time period. For the five sportfish examined, all species exhibited only minimal or no change in watershed distribution (Table 7).

Distribution analyses showed no consistent pattern among SGNC and suggest that each species requires individual evaluation. Twenty-two (28%) species appear to be declining in distribution, 39 (49%) increasing and 19 (24%) appear relatively stable (Table 8). However, this type of distribution analyses may be insufficient to explain the true status of a species. For example, some species' distribution analyses resulted in an overall reporting of no change, but this was the result of a shift in HUC-8's where the species was observed. Such a shift in distribution was

observed for 18 SGNC which were not found during the recent time period at one or more historically occupied watersheds (HUC-8s) while the total number of watersheds that the species occupied did not change. Additionally, reported values represent a statewide evaluation and individual species may have exhibited shifts in distribution within individual watersheds (HUC-8s) that would not be reflected in this analysis.

Abundance analysis of SGNC

In addition to assessments of distribution changes, temporal patterns of abundance were also used to evaluate the rare and declining components of criterion 3. IDNR FAS streams and lakes, LTRMP and LTEF data contained numerical and sampling effort information (Table 2) and were used for this assessment. To control for differences in sampling procedures amongst these sampling programs only information from electrofishing events were used in abundance calculations. Data were recorded as fish per sample minute (CPUE) and an assessment was made at both statewide and intrasite scales. Once CPUE was determined, recent values were compared to historic values to calculate temporal changes in relative abundance. For statewide assessments, mean CPUE for each species was calculated for each time period and then used to make temporal comparisons (i.e., proportional change in abundance). Intrasite assessments used repeatedly sampled locations to determine temporal changes in abundance at one locale. For this measure, mean CPUE within a single location and time period was compared to the other time periods. Intrasite assessments were based on the mean intrasite change between recent and historic periods. The number of sites in which mean recent CPUE increased and the number of sites where it decreased relative to historic periods were also calculated to determine frequency of change in both categories.

Mean CPUE for those SGNC with abundance data ranged from 0.01 to 3.08 fish per minute and mean abundance across all species and time combinations was 0.23 fish per minute (Table 9). Overall mean proportional change from historic abundance was 5.30 with a range of 0.19 to 43.59 fish per minute. This high increase in proportional change seems to be a result of a few species with very high increases from the 1950-1976 time period. If we compare recent abundances to the 1977-1999 period the mean increase drops to 2.04 fish per minute. Statewide five SGNC exhibited a moderate decrease, four a high decrease, six a moderate increase, 20 a high increase, and the remaining species (41%) showed minimal change in CPUE between the recent and 1977-1999 periods. Four sportfish had minimal changes and black crappie had a high increase for statewide analyses.

Intrasite abundance calculations were not conducted for sportfish due to ongoing management activities, complex stocking history, and the large number of sites involved for each species. Of the remaining SGNC only 43 had sufficient intrasite data for temporal comparisons (recent vs. 1977-1999 historic) of mean abundance to be completed (Table 10). Five (12%) of these species exhibited moderate intrasite abundance increases, 31 (72%) high increases, three (7%) minimal changes, three moderate decreases, and one large decrease. In contrast, 20 (43%) of these showed net stateside increases (frequency of increasing vs. decreasing sample locations) in abundance, 20 (43%) had net decreases and six (13%) had equal numbers of increasing and decreasing locations.

Much like distribution analysis, each SGNC should be considered individually as no clear statewide patterns of abundance emerged for the group as a whole. Forty-three (72%) of the 60 evaluated SGNC were found to be increasing in abundance, eleven (18%) decreasing and six (10%) had either neutral or have mixed patterns (Table 8). Four sportfish were found to be increasing in abundance, while one (channel catfish) appears stable.

1.6 Reevaluation of criterion 4.

Species dependant on rare or vulnerable habitat (criterion 4) were evaluated through a combination of expert surveys and literature review. For non-T&E SGNC and sportfish, expert opinion (section 1.2) was utilized to assess status under this criterion. If ≥50% of responses fell into one category (yes or no) for a species, that response was used to classify the species under criterion 4. Of the 49 non-T&E SGNC, 37 (76%) meet criterion 4, 1 (2%) did not, and 11 (22%) have an unknown status (Table 11). Survey respondents were also allowed the opportunity to comment on what the rare or vulnerable habitat was that the species was dependant upon. Vegetated waterbodies (30%) and cool waters (24%) were the two most commonly listed habitat types for these species (Table 11). Two of the sportfish (largemouth bass and channel catfish) did not meet this criterion, while the remaining three did. Vegetation was listed as the dependent habitat characteristic for redear sunfish and black crappie.

T&E species were assessed by using the assigned habitat association (section 1.3, Table 4). Only those species with habitats that are (presumably) abundant were given a negative evaluation for criterion 4. In general, the habitat characteristics related to vegetation, large substrates, high slope and wetlands were considered rare. Under this evaluation procedure, six species (0.19) did not meet this criterion (Table 12) as most of these species require large rivers with sand or are Lake Michigan species.

1.7 Reevaluation of criterion 5.

Criterion 5 identifies those species endemic to Illinois or those in which the population is disjunct from the rest of the species' range. NatureServe Explorer (2011) watershed distribution maps were used to determine a species' distribution within North American, and those species with Illinois populations that are disjunct from others were designated under this criterion. Nine (0.11) SGNC met criterion 5, and no sportfish populations were found to be disjunct (Table 13).

1.8 Reevaluation of criterion 6.

Those species in which Illinois populations represent a significant portion of the global population are designated in criterion 6. Global population distribution was determined from NatureServe Explorer (2011) watershed distribution maps, and if a species' distribution was largely located in Illinois, that species would be affirmed under this criterion. No species was identified under this threshold.

1.9 Reevaluation of criterion 7.

Criterion 7 identifies those species that serve as representatives of a broad array of other species found in a particular habitat. Non-T&E species and sportfish were evaluated by experts through the online survey (section 1.2). Participants were asked if the species met this criterion, and if so, what community the species represented. If a consensus (≥50%) was reached for a species, that result was used as the status. Thirty-five (0.71) of the non-T&E SNGC received a positive assessment, two (0.04) a negative and twelve (0.24) an unknown or mixed result (Table 14). Of those determined to be representative species, twelve (0.33) were indicative of coolwater communities, while eight (0.22) were indicative of species requiring vegetation. Three sportfish (largemouth bass, white crappie, redear sunfish) received a positive categorization under this criterion, one did not (channel catfish) and one had a mixed result (black crappie).

T&E SGNC were assessed by utilizing habitat associations (section 1.3) and status under the original WAP. Ultimately, no changes were made to the original status of T&E species (in Appendix I), as there was no evidence to suggest alteration was necessary. Twenty-four (0.77) of the T&E species are representatives of community types and seven (0.23) are not (Table 15).

1.10 Reevaluation of criterion 8.

This criterion designates those species whose status is poorly known, but whose characteristics suggest inclusion on the SGNC list. The intent of this criterion is to indicate those species that are difficult to categorize under the other criteria due to lack of information regarding occurrence or ecological status. Non-T&E SGNC and sportfish were assessed under this criterion by comparing number of respondents for a species to the number of respondents participating in a survey. The foundation for this analysis is that species with relatively few respondents are also poorly understood by the body of experts as a whole. Those species in which <50% of respondents provided information were considered poorly understood. It is assumed, however, that being listed under one of the other criteria suggests a species should be included on the SGNC list (fulfilling the second portion of criterion 8). Sixteen (0.33) of the SGNC were categorized under criterion 8, although no sportfish were (Table 16). Within Table 16, some participation values are >1.00 as number of survey participants was calculated from those individuals that completed the survey (i.e., viewed each species even if they did not provide information for all). Those individuals that viewed some species, but quit before completing the survey were not counted as participants.

T&E species were evaluated by reviewing literature and indicating those species with relatively little information regarding habitat association, distribution and abundance. Those species with little or no distribution or abundance data within the data sources were also categorized under this criterion. Twenty (0.65) T&E species were determined to be poorly known (Table 17). Only five species switched categories from the original Appendix I, most either because targeted studies had been recently completed (removing that species from this criterion), or because thorough review yielded little data (adding a species to this criterion).

Section 2. Update the Status, Objectives, and Stressors to Illinois' Wildlife and Habitat Resources for fish and aquatic habitats in Appendix II (Job 2).

2.1 Approach to reevaluation of Appendix II.

Appendix II contains information regarding stressors affecting the distribution and abundance of fish SGNC. Expert opinion or available literature was utilized to assess the applicability of each stressor to each species and also to address the relative influence of that stressor. The appendix also identifies current population trends and establishes trend objectives for the 2025 horizon. These were evaluated using distribution and abundance data assessed in Job 1. The overall approach to reevaluation of Appendix II was to incorporate quantitative assessments into the trend and stressor analyses.

2.2 Reevaluation of current status and future objectives

The original WAP Appendix II identifies population status for each species, which includes a population estimate ('N'), a categorical population trend ranging from -2 to +2, and the threatened or endangered status listing. Also for each species are future objectives for these three status categories, which present the suggested population status for a 2025 horizon. Reevaluation of current status was completed by using distribution and abundance data to not only satisfy the population estimate, but also to assign a categorical trend rating; however, 'N' was divided into abundance and distribution categories to more accurately reflect population conditions (Table 18). Mean statewide CPUE abundance for the recent decade (Table 9) was used to report 'N Abundance', while number of HUC-8 watersheds inhabited (Table 7) was used to report 'N Distribution'. Current trends were transposed from Table 8, although values from that table were condensed into a single trend for abundance and for distribution. The 'Listing' column was transposed from appropriate literature (IESPB 2011, NatureServe Explorer 2011).

Status objectives reflect proposed goals for each SGNC. Once again, trend objectives were separated into abundance and distribution categories (Table 18). Values for these columns were either '0' if the species was increasing or maintaining levels in the appropriate category, or '+' if the species was decreasing or if it was maintaining a low distribution or abundance level. Objectives for 'N' were eliminated from the reevaluation as insufficient information was available to determine a value and because this column was largely unused in the original table. Objectives for listing status were completed by suggesting an increase in one status level (i.e., endangered to threatened, or threatened to delisted).

2.3 Reevaluation of stresses

The stresses matrix of Appendix II indicates which environmental conditions are likely to negatively impact distribution and abundance of SGNC. These stresses are divided into four general categories; habitat (physical components of the waterbody), community (interspecific interactions amongst species), population (characteristics of the species) and direct human

(anthropogenic impacts). To populate the reevaluated stresses matrix for non-T&E SGNC and sportfish, surveyed experts (section 1.2) were asked to indicate if each stressor impacted a species during the past, present or future (Appendix B). To reach a consensus for each stressor, the proportion of respondents selecting 'yes' to a particular stressor and time period combination was calculated (i.e., three values were calculated for each stressor; past, present and future). The mean of each of these three values was used as an affirmative value, with the exception of the climate change stressor, in which only the present and future values contributed to the mean. Because no response to a particular stressor question was considered a 'no' answer, proportion of respondents participating for a stressor was multiplied by the calculated affirmative value to reach a consensus value, which was used as the final assessment for the stressor. For example, if the mean affirmative value was 0.75, and five of ten (0.5) respondents participated in that stressor question, the final consensus values would be 0.375 (0.75*0.5). Consensus values ≥0.50 indicated a positive result for a stressor, while those <0.50 were not considered stressors. The mean number of stressors per species was 3.4 (of 17 categories) with a range of 0 to 12, and only two species did not have any identified stressors (Table 19).

Pertinent literature was used to complete the stresses matrix for T&E species. Each source (IESPB 2011, NatureServe Explorer 2011, Nyboer *et al.* 2006) was reviewed for items explicitly stated or inferred as stressors to a species. Components of the matrix listed as stressors were indicated as such (1), while those in direct conflict with a species' requirements were indicated as non-stressors (0). Many of the stressors were not addressed in the literature, and those items were assessed with an 'S', which indicated insufficient evidence to support a conclusion. Mean number of identified stressors per species was 4.3 (of 17 categories) with a range of 0 to 8 (Table 20).

For all SGNC, habitat stresses were most commonly affirmed as influencing distribution and abundance (0.41 mean positive result), followed by human (0.20), population (0.09) and community stresses (0.04). With respect to specific stressors, extent of habitat (0.65), sedimentation (0.58) and habitat composition (0.51) were most commonly identified. Parasites/disease was not identified for any species, and climate change, competitors, prey availability and genetics were identified for less than five percent of species (Table 19, Table 20).

2.4 Connectivity analysis

Habitat fragmentation, physical structures and dispersal potential are three items frequently included as stressors on SGNC in Appendix II. An objective of this study is to examine the extent of isolation and fragmentation of SGNC locations in Illinois waterways based on these factors. Our connectivity analysis was developed to identify barriers between known locations of individual species and use the geospatial relationships between them as a measure of isolation with an ultimate goal of defining independent populations.

The method for conducting connectivity analysis was to use potential isolating mechanisms (i.e., physical structures, large rivers or both) and species locations to identify clusters of physically connected stream networks which we refer to as artificial habitat units (AHU). Each AHU consists

of a group of unobstructed stream segments with one or more known locations for the assessed species. ArcGIS was used to identify AHUs and to measure the relative distance between AHUs where we have records of the species being present.

Recent records (2000-2010) from the distribution mapping (section 1.5) were used to determine species distributions for the connectivity analysis. Locations of physical structures were identified from the National Inventory of Dams (NID) and used to attribute stream arcs within our GIS (i.e., presence or absence of dams was indicated for each stream arc). The NID is the most complete statewide coverage of dams available and contains all large structures that would be appropriate for our analysis. Additional barriers (e.g., poorly designed or maintained culverts, low water crossings, beaver dams) were also identified in some parts of Illinois but they were not included in our connectivity analysis. Most structures that were not associated with the stream line work were either adjacent to waterbodies (and while connected did not block the main river network) or were associated with small stream channels that were not designated at 1:100,000 resolution of our GIS line work. Of the 1298 dams and physical structures present in Illinois 685 were present on Illinois streams and rivers (Figure 1). For our analysis, these were considered a complete barrier to fish movement. Large rivers (which can be barriers to movement for many small bodied stream species) were defined as with a link class ≥4 (essentially the largest 5th Order streams and bigger; Figure 1).

Connectivity analysis for each fish species required defining species-specific isolating mechanisms. Physical structures (i.e., dams) were considered barriers to all species, but large rivers were considered barriers only for stream species (i.e., rivers are not barriers to river species). Once isolating mechanisms were selected for the species, stream arcs containing them were removed from the geometric network of streams limiting connectivity through them. For example, stream arcs containing one or more dams (Figure 1) were disabled from the state-wide stream network creating "barriers" to connectivity between adjacent stream arcs. After fish records were associated to streams arcs, AHUs were defined by incorporating adjacent arcs into networks radiating from each fish location until a barrier was reached (Figure 2). Individual artificial habitat units represent all the connected (but not necessarily utilized) stream arcs associated with a species location. The suite of AHUs for the species represents the set of independent stream networks where it currently resides in Illinois (i.e., effectively "populations" for management purposes).

The most downstream point, or gateway (Figure 2), of an artificial habitat unit was used as a reference location for assessing the relative isolation between AHUs. We used these gateways and a modified transportation analysis in ArcGIS to determine the shortest possible route (pathway of connected streams arcs) between two AHUs. After identifying these routes, the number of physical barriers was enumerated between each pair-wise combination of gateways as a measure of isolation between them. We also calculated the distance between each gateway combination for another measure of isolation between AHUs. The mean distance between a gateway and all other gateways was used as a measure of relative isolation of an individual AHU:

Relative isolation = mean distance of one gateway to all others/mean distance of all pair-wise gateway comparisons

Two species were chosen to illustrate the connectivity analysis process. Western sand darter is a medium to large river species associated with sand habitats. Given that it inhabits rivers, connectivity analysis for this species began with the premise that only physical structures serve as barriers. Recent records and physical structures were used to identify artificial habitat units and distances were calculated between gateways (Figure 3). In all, 17 locations within three AHUs were identified, one in the Kaskaskia River, one in the southern portion of the Mississippi River and one in the central and northern portions of the Mississippi River. One barrier (and <1km) separates the two Mississippi River AHUs, and the Kaskaskia River AHU is separated from the others by two barriers and 152km. Relative measures indicate the Kaskaskia AHU is the most isolated. Ironcolor shiner was chosen as an example of a species with both physical structures and large rivers considered barriers. Nine AHUs from approximately 30 locations of ironcolor shiner were identified (Figure 4). One AHU in the Sangamon River/Illinois River watershed and eight in the Kankakee River/Iroquois River watershed were identified. Four structures and approximately 410km separate the Sangamon River and Kankakee River AHUs. A mean of only 31km separates the Iroquois River group of AHUs (min. 4km, max. 77km), and no physical structures exist between them (i.e., only large rivers separate these AHUs). This species illustrates the importance of assessing relative isolation in addition to identifying individual AHUs.

Section 3. Draft update of Appendix I and Appendix II.

Database analysis, GIS mapping, surveys of fisheries experts and literature reviews all were used to update and reevaluate Appendix I and Appendix II. Overall, a more quantitative approach to evaluate species was used than during the original construction of these tables, which should allow for increased repeatability of methods during future updates. Further, data assembled during this study can be used for assessments outside the scope of the Appendices, like spatially targeted evaluations of abundance and distribution, up to date and comprehensive species distribution maps and identification of research/monitoring needs. These analyses may also be used to evaluate the SGNC list itself and provide a framework for amending the list.

3.1 Draft reevaluation of Appendix I

The draft reevaluation of Appendix I (Appendix D) incorporates findings from relevant data analyses (section 1) and summarizes them into a format similar to that of the original WAP Appendix I. Habitat associations were transcribed from survey results and literature reviews (Table 3, Table 4), while criteria 2 and 3 are transcribed from appropriate sources (Table 5). Criterion 3 uses quantitative abundance and distribution analyses to assign a value and a categorical descriptor (R or D) to a species' population status (Table 8). Criteria 4, 7 and 8 rely on fisheries expert consensus to assign a status value. Consensus values ≥50% were used to affirm or reject status under criteria 4 and 7 (Table 11, Table 12, Table 14, Table 15), while criterion 8 was determined by observing response rates by survey participants or amount of available

information (Table 16, Table 17). Criteria 5 and 6 were determined by reviewing regional and global distribution maps (Table 13).

3.2 Draft reevaluation of Appendix II

Summaries of distribution and abundance analyses (section 1) and surveys of fisheries experts (section 2) were incorporated into the reevaluation of Appendix II (Appendix E). The original WAP Appendix II and the reevaluation are similar in format and information included, although the reevaluated table separates the distribution and abundance assessments while simplifying the stress matrix. Current status information was assembled from abundance calculations (Table 9), HUC-8 watershed distribution (Table 7), and their summaries (Table 8). Status objectives were based on trends in the current status information. Listing status was transcribed from appropriate sources (Table 5). Environmental stressors were evaluated through consensus of fisheries experts (Table 19) and from literature review (Table 20).

3.3 Validation of T&E species evaluation

Reevaluation of T&E species was approached in a manner differing from that of the other SGNC and sportfish. Specifically, these qualitative assessments were conducted primarily using a review of the literature rather than expert opinion. To ensure final evaluations were appropriate, draft versions of the reevaluated Appendices (containing T&E assessments) were reviewed by those experts that had participated in surveys. Unfortunately, response was limited, but those that did review the drafts had few concerns. Those suggestions were taken into consideration, and changes to the final Appendices (Appendix D, Appendix E) were made when appropriate.

3.4 Comparison of original and reevaluated Appendices.

Reevaluated Appendices maintained a similar format and data composition as those in the original WAP. Major changes include addition of sportfish to SGNC assessments, rare and/or declining differentiation in criterion 3 of Appendix I, elimination of 'N' objectives in Appendix II, separation of abundance and distribution categories of 'N' and trend analyses in Appendix II, simplification of stresses categories in Appendix II and stress assessment categories for T&E species in Appendix II. Many of these modifications were made to remove redundant information, exclude information inappropriate for the assessment of fish populations, or to include additional data and analyses. Additionally, reevaluated Appendices contain values for all analyses/criteria (i.e., no blanks occur within the tables for appropriate data).

Changes in the assignment of criteria between the original and reevaluated Appendix I occurred at 14 – 43% of possible assignments depending on the criterion (Table 21). Assignment of criterion 3 (rare or declining) varied the least between the two tables (likely due to a large number of species meeting this criterion) while assignment of criterion 8 (unknown status) changed the most. However, many of these changes were due to making assignments for criteria that were not assessed (i.e., left blank) in the original Appendix I. If we exclude these previously

unassigned criteria the mean number of changes between the two versions reduces from 35% to 16%. While some of the other changes were related to differences observed for the species (e.g., recent studies changing status under criterion 8), most were due to incorporating new data and use of qualitative analytical techniques.

As previously mentioned, the status and objectives in Appendix II have been modified for the reevaluation to reflect a quantitative assessment of abundance and distribution. The only comparable category in Appendix II is current trend where 55% (73% if previously unassigned records are included) of assignments changed in status (increasing, decreasing, neutral) between the original and reevaluated Appendix. Specific comparisons between the stresses matrix are difficult to make given the revised format in the reevaluation, but some general patterns can be observed. The original Appendix II has a higher mean number of affirmative stresses per species (7.6) than the reevaluation (3.8), and even when adjusted for differing number of stresses included in the table, the proportion of affirmations is still higher (0.38 vs. 0.22). Habitat stresses were the most common category of stressor for SGNC in both the original and reevaluated Appendix, while community stresses (reevaluated Appendix) and direct human stresses (original Appendix) were the least commonly identified (Table 22). Habitat extent and sedimentation were identified as frequent stressors in both versions of Appendix II, while parasites were not included for any species. The largest differences between the two tables occurred with disturbance/hydrology, fragmentation and recruitment stressors, where the original Appendix identified these 49% more frequently than did the experts surveyed for the reevaluation. Across all comparable stressors, the mean likelihood for a stressor to be identified was 23.9% higher in the original table.

The inherent consequence of the type of information provided within Appendix II and the manner in which it was assembled is the inability to discern why certain patterns are observed. More specifically, it is impossible to distinguish if a low frequency stressor does not impact many SGNC, or if little is known about the interaction between that stressor and the species being assessed. For instance, it is unlikely (given the number of fragmented populations and the high frequency of fragmentation related stressors for SGNC) that genetic stress influences such a small number of species (18% of species assessed). It is also unlikely that so few (1) species are, or will be, impacted by climate change. These results may reflect that fisheries experts are reluctant to comment on these complex ecological interactions without more information to guide their expectations.

3.5 QA/QC of data and analyses.

Several efforts were made to ensure accurate and appropriate data were used for this study and analyses were reflective of those data. Beyond standard QA/QC of data (e.g., verifying values between summarized tables used for analyses and the original data sources), additional methods were employed to mitigate the potential for errors in final evaluations and maps.

Record verification
To validate the accuracy of location information associated with fish records, distribution maps developed in this study were compared to existing maps (INHS 2006, Smith 1979) to identify those records outside of the known Illinois distribution for that species. We then attempted to verify questionable records by comparing the record to other data sources (i.e., multiple records from a disputed location added credibility) or by contacting the collecting entity for verification documentation. Unfortunately, most data records do not include voucher specimens with which to resolve these issues. During this study only the INHS collections staff were able to quickly verify database records with voucher specimens. Questionable records were eliminated from analyses unless the original collection documentation could be obtained and reviewed. Based on these reviews, appropriate corrections were made prior to analysis or mapping. These observations of questionable records and the difficulty in verifying them highlights the need to revise and implement a standardized vouchering process within the State's fisheries collection and monitoring programs.

QA/QC of data tables
Data gathering efforts for this study resulted in the creation of individual data tables for each analyzed species containing all available abundance and location information. These tables were subsequently used for abundance evaluation and mapping efforts. During the mapping process (i.e., converting species records to GIS format), data tables were reviewed to ensure all available data were present and that data were properly labeled and categorized. Mapping also identified those records with inaccurate location information. Most corrections made during this QA/QC layer were attributable to transcription errors; however, occasional errors in the databases themselves were observed, and those records had to be removed in most cases.

QA/QC of maps
Report maps (Appendix C) were constructed by GIS personnel and subsequently inspected for accuracy. In addition to verifying record locations and data inclusion, maps were checked against historic maps (INHS 2006, Smith 1979) to confirm accuracy of point distribution. Points outside of a species' known distribution were validated from the original data source (see *Record Verification* above), and those which were incorrect or unverifiable were removed.

3.6 Analysis of SGNC list.

Focal species for this study were those on the SGNC list and a group of commonly managed sportfish; however, data collection efforts and expert survey information allowed for analyses of additional species. These analyses aid in reevaluation of species included on the list and provide information for including additional species or removing species.

Identification of additional rare, declining or otherwise imperiled species
Several listing criteria for SGNC concern the patterns of species distribution. These criteria can be used to identify rare or declining species not on the current SNGC list. Statewide proportional density (number of sites the species was collected from relative to the total number of sites sampled) calculations were completed for all species included in the IDNR's FAS database

(n=218). Fifty-two of these species (24% of the species that IDNR tracks) were not recorded during the recent time period (2000-2010, Table 23), and 33 of these have never been recorded in Illinois streams FAS (Table 24). Some of these unrecorded species inhabit the Great Lakes or are exotic species that occur in neighboring states (Table 24). However, many of these species have been recorded by other agencies or programs. An additional 47 species (22%) were found at one percent or fewer of all sampled sites within the state during the recent time period. This is the threshold level (1% or fewer of all sampled sites) we have used to define a rare status in this study. If we exclude exotic species, hybrids, and sportfish that may have been stocked, eighteen of the 99 species observed at one percent or fewer sampled sites are not currently on the SGNC list (Table 25). Seventy species (32%) have seen a decline of 25% or more in the proportion of sites they were collected from during the recent period (2000-2010) relative to an earlier benchmark (1977-1999) and thirty of these species have declined fifty percent or more (Table 26). Eleven of the species that have decreased fifty percent or more (i.e., declining) are not currently on the SGNC list. These species are good candidates for further consideration during the future WAP update as species in greatest need of conservation and include 11 rare, 1 declining, and 10 species that were found to be both rare and declining (sportfish, hybrids and exotic species are excluded from these totals; Table 27).

Another method for indentifying candidate species not currently on the SGNC list is to use subnational (e.g., state) or global conservation rankings (Young 2011). A conservation ranking of '3' or less indicates vulnerability or imperilment, and even though the SGNC currently includes those with a global rank of G3 or less, the state rank has not been considered. Furthermore, species that are considered SGNC in other states within the same ecoregion as Illinois also may be in need of review. Twenty-eight species have a state conservation rank of S3 or less and are not on the SGNC list and an additional eight species are SGNC in states within Illinois' ecoregion (Table 27).

The SGNC list not only reflects those species currently imperiled, but also provides an opportunity to address those species that may become at risk in the future. The declining designation (based on proportional density) signifies some species in this category (Table 27), but other species may be included if future temperature, precipitation and landscape patterns are considered. NatureServe (2009) has produced an index that calculates a species' predicted response to climate change. The Illinois Chapter of the Nature Conservancy has completed vulnerability assessments for a group of focal fish species within the state (mostly current SGNC, Walk *et al.* 2011). Six species were rated as extremely vulnerable to climate change in at least one watershed and five other species were rated highly vulnerable (Table 28). All of these species are on the current SGNC list of the Illinois WAP. The Environmental Defense Fund has completed a similar assessment using the same tool for approximately 180 species in Illinois (Small-Lorenz 2012), and in this draft evaluation, 12 species rated extremely vulnerable and another 15 as highly vulnerable. Of those vulnerable species identified in this study, 17 are not on the current SGNC list (Table 28).

Suggested additional species

Fisheries experts participating in online surveys were asked to provide species they felt might be candidates for SGNC. Several experts responded, and these species were suggested: alligator gar, spotted gar, shortnose gar, bowfin, blue catfish, flathead catfish, rock bass, warmouth, pumpkinseed, pirate perch, grass pickerel, chestnut lamprey, tadpole madtom, mooneye, goldeye, stripetail darter, blackside darter, slenderhead darter, river darter, mud darter, bluntnose darter, fantail darter, slough darter, least darter, logperch, bluehead shiner, brassy minnow, western silvery minnow, flathead chub, spottail shiner, northern hogsucker, and spotted sucker. None of these species were added to the potential SGNC list (Table 27) based solely on experts' suggestions, but several of these species were found to be rare or declining rapidly (Table 23, Table 26) and were included under those criteria (i.e., the others were not rare or declining).

Species that may not warrant inclusion on the SGNC list

Converse to those rare and declining species that were not included on the SGNC list is a group of species that are on the list, but do not appear to meet the rare and declining criteria. These species have potential to be removed from the list, although it is recognized that their inclusion may rely heavily on other criteria not related to population size or trends. Proportional density and abundance calculations were used to identify SGNC that were not rare (Table 23, >0.01 proportional site density) and were not declining in abundance or proportional density (Table 9, Table 26). Eighteen species were identified under these criteria (Table 29), three of which are found at >0.10 of sites, a threshold that only 65 (30%) Illinois species meet.

Other information useful for potentially removing species from the SGNC list would include identifying transient species or those known from single-specimens and those that are now considered extirpated. For example, the taillight shiner has only been collected twice in Illinois, based on the information available to us, with the last record in 1988. Similarly cisco are now believed to be extirpated in the Illinois portion of Lake Michigan (Steve Robillard, IDNR, personal communication). These two species may warrant removal from the list if they no longer inhabit the state's waters and are no longer expected to.

Updating the SGNC list

Updates to SGNC information (regarding any taxonomic group) should not only include a reevaluation of species on the list but also an evaluation of species not previously listed. Further, a formal procedure should be in place for adding and removing species from the SGNC list. In general, species that meet at least one of the eight Appendix I criteria should be considered for inclusion, but no policies or thresholds exist for determining the requirements for adding species. The converse is also true; no guidelines exist for removing species as their status improves or if new information suggests their status is better than previously believed. This study has uncovered several species on the list that are trending upward (increasing in abundance and distribution) and several species that are not as rare as was once thought (Table 29). Statewide distribution analyses have shown that other species are rare and declining (Table 27), making them potential candidates as SGNC. Beyond using these types of analytical methods for

suggesting changes to the SGNC list, a process for considering species reintroduced (e.g., alligator gar) or newly recorded (e.g., redside dace, bleeding shiner) in the state should also be addressed.

3.7 Notes on specific species

Analysis of several species included anomalies or required annotation given the nature of associated data.

Muskellunge, northern pike, walleye, sauger
These four species are on the SGNC list, but only native stocks are included under the listing criteria. Unfortunately, it is impossible to distinguish between native and managed/stocked individuals or populations. Furthermore, stocking records for streams and rivers are neither consolidated statewide nor available in digital format. Fish are not restricted to waterbodies or locations were they are stocked, and movement of individuals also adds to the difficulty of distinguishing origin. For these reasons, all records for these species are included in analyses, and therefore, results may not reflect the status of native stocks. This is also true for species like smallmouth bass and spotted bass, which are/have been stocked, although the WAP does not consider native origin for species other than the four which are explicitly stated.

Redspotted sunfish
Redspotted sunfish have been the subject of experimental propagation and reintroduction within the past decade. The apparent extreme increase in abundance between recent and historic time periods (11.6 vs. 0.08 mean statewide CPUE) is a result of controlled breeding efforts at one location. Recent statewide CPUE is 0.05 if this site is excluded, which represents a decrease of 37% from historic values.

3.8 Applicability of WAP and SGNC criteria to fish

The WAP and the criteria used to populate the SGNC list were developed for application to a variety of taxonomic groups. Furthermore, procedures and criteria were often subjective in nature leaving room for individual interpretation.

Interpretation of Appendix I criteria
Several of the Appendix I criteria are subjective in that they rely on opinion rather than quantitative analysis. Furthermore, these criteria are general enough to be susceptible to interpretation, and as a consequence, individuals may differ on what they believe the criteria are asking. Criterion 7 (representative of other species) requires knowledge of both habitat preference and structure of certain fish community assemblages. Some survey participants interpreted the criterion as asking if a species was part of a community type (e.g., large river, gravel riffle, vegetated wetland), in which case most species fit this condition given their specific habitat associations. Other respondents associated this criterion to species that were not necessarily rare, but that were often part of a community that depended upon specific habitats that were rare and may contain potential SGNC (i.e., these species are indicators of community types and serve as surrogate determinates of species presence). These different interpretations

could lead to differences of opinion regarding the status of a species. Criterion 8 (status poorly known) is another example of the subjectivity of Appendix I. Given the rarity of species on the SGNC list, it is possible that nearly all are poorly understood and should meet this criterion. However, if this question is viewed in a relative manner, some species are more poorly known than others (e.g., targeted studies have been completed for some species). Again, interpretation could lead to different results.

Population identification and characterization

Criteria 5 (disjunct Illinois population) and 6 (Illinois' population is significant portion of global population) are difficult to assess given the complexity of patterns in population connectivity. This study used NatureServe (2011) maps to address criterion 5 and the analysis was conducted at the major watershed level (i.e., disjunct watersheds were those not adjacent to one another). This procedure does not consider fragmentation of populations within these major watersheds, nor does it recognize the possibility that adjacent watersheds may be disconnected. Connectivity analysis (section 2.4) is an initial attempt at answering these concerns, and pilot species have shown that many disconnected (isolated) populations can exist within seemingly connected watersheds, or that spatially separated watersheds may be connected through major waterways. Future evaluations of population connectivity may result in species status changes under criterion 5. Criterion 6 uses a relative measure (significant) to compare Illinois and global populations. This question requires the interpreter to consider the size of Illinois and global populations (although it's unknown if this means abundance, distribution or both) and what significant implies. For this study, distribution (NatureServe 2011) was used to determine proportion of the global population in Illinois. No Illinois species appear to meet this criterion, but given its subjectivity, it's reasonable to expect differing opinions (six fish species met this criterion in the original SGNC evaluation).

3.9 Incorporation of focused studies into SGNC evaluations

One objective of the WAP is to facilitate studies that add to knowledge regarding individual species, taxonomic groups or associated habitats. It is reasonable to expect, then, that these studies may provide information that may supersede or otherwise alter evaluation of SGNC. For example, in this update of the SGNC, expert consensus determined fifteen species preferred coolwater conditions. A recent survey and characterization of coolwater streams in Illinois (Hinz *et al*. 2011) determined only four species (brown trout, longnose dace, mottled sculpin and brook stickleback) in the state were likely coolwater obligates. What is unclear is how to weight professional consensus and pertinent studies when evaluating SGNC.

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Figures

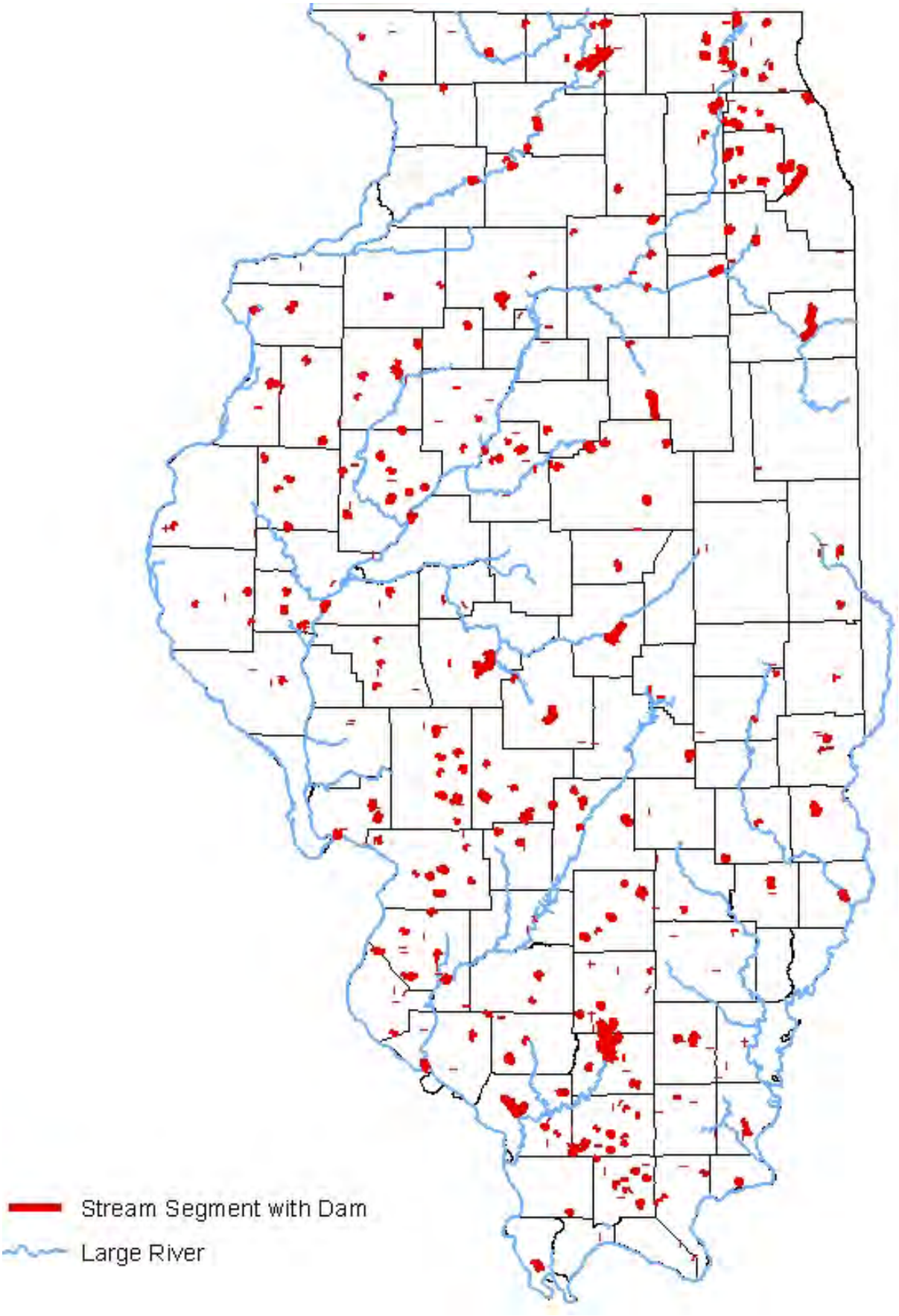


Figure 1. Locations of dams and physical structures in Illinois streams (based on National Inventory of Dams data) and large rivers (link class ≥4).

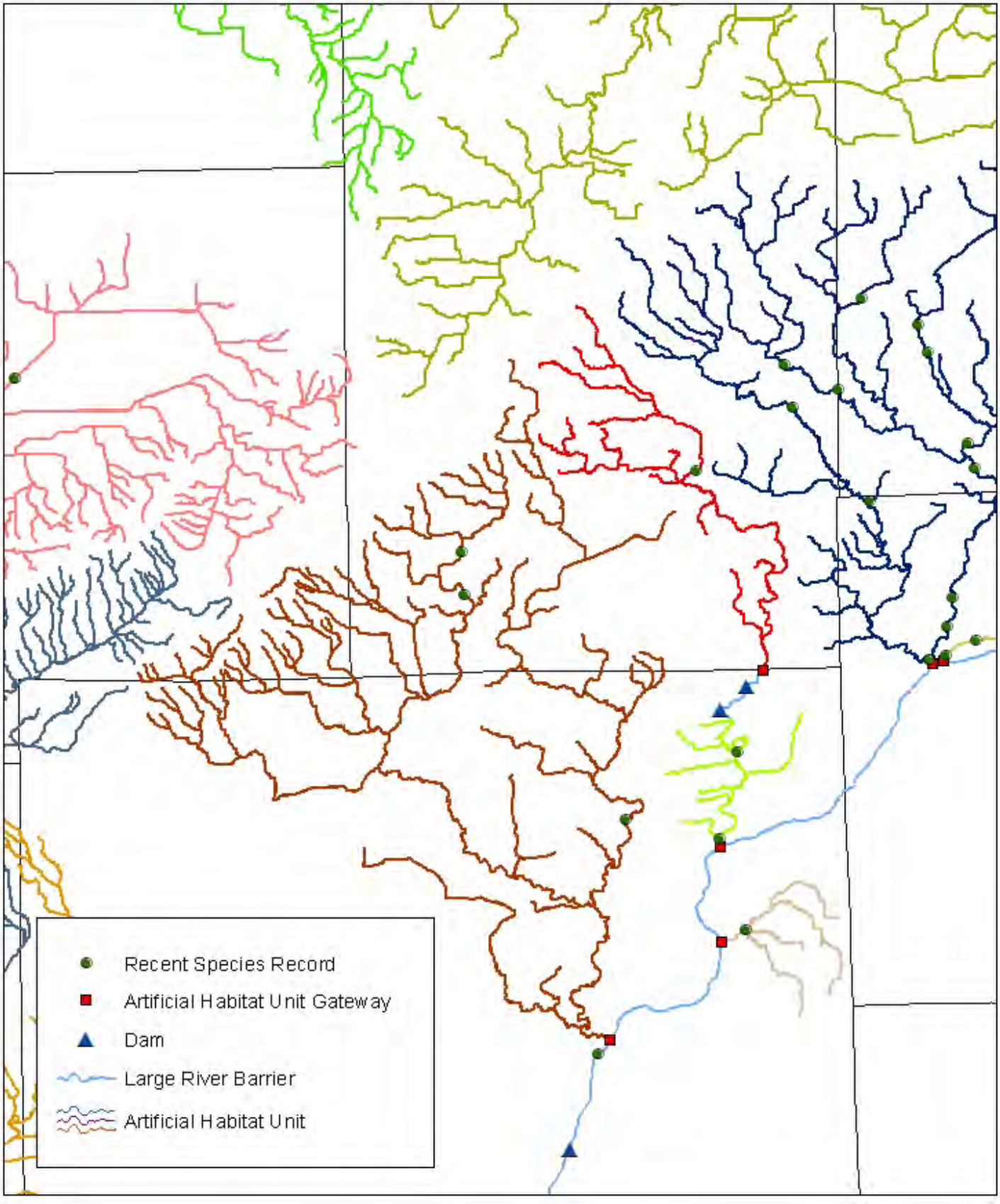


Figure 2. Example of connectivity analysis output using both physical structures and large rivers as barriers. Colored stream arcs represent artificial habitat units used to identify artificial habitat units.

Figure 3. Connectivity analysis for western sand darter identifying three artificial habitat units in Illinois.

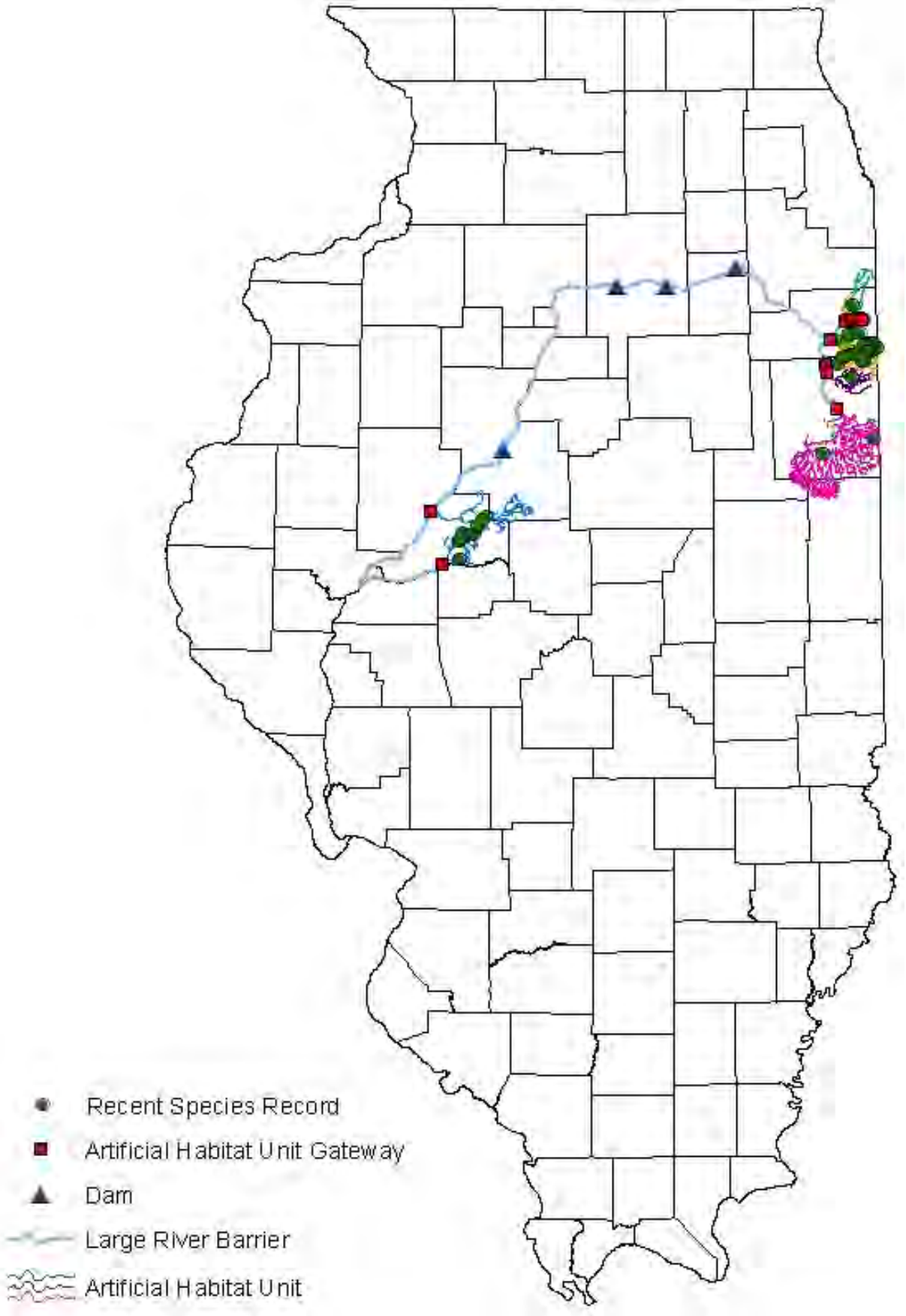


Figure 4. Connectivity analysis for ironcolor shiner identifying nine artificial habitat units in Illinois.

Tables

Table 1. Characteristics of fisheries databases and collections used for this study. Check-mark indicates the data type is present in the database, 'P' indicates items are partially (incompletely) present.

Database Name	Waterbody Type(s)	Collection Date	Abundance	Georeferenced Location	Verbal or Site Location	Collection Effort (time)	Collection Method	Date Range
IDNR Fisheries Analysis System (FAS) streams database:	streams, large rivers	√	√		√	√	√	1952-2009
IDNR Fisheries Analysis System (FAS) lakes database:	lakes	√	√		√	√	√	1982-2010
INHS Museum Collections:	all	√	P	√	√			1873-2010
Biodiversity Tracking and Conservation System (BIOTICS):	all	√	P	√				1935-2010
Long Term Resource Monitoring Program (LTRMP):	large rivers	√	√	√	√	√	√	1989-2010
Long Term Electrofishing Program (LTEF):	large rivers	√	√		√	√	√	1957-2010
University of Michigan Museum of Zoology (UMMZ) Collections:	all	√			√		P	1852-2001

Table 2. Database and analysis association. Check-marks indicate which data sources were used for analyses.

Database Name	Site-Based Proportional Density	Sample-Based Proportional Density	Mapping	HUC-8 Watershed Frequency	Statewide Abundance	Intrasite Abundance
IDNR Fisheries Analysis System (FAS) streams database:	√	√	√	√	√	√
IDNR Fisheries Analysis System (FAS) lakes database:		√	√	√	√	√
INHS Museum Collections:			√	√		
Biodiversity Tracking and Conservation System (BIOTICS):			√	√		
Long Term Resource Monitoring Program (LTRMP):		√	√	√	√	√
Long Term Electrofishing Program (LTEF):		√	√	√	√	√
University of Michigan Museum of Zoology (UMMZ) Collections:			√	√		

Table 3. Survey results for habitat association. N is number of respondents for questions (habitat component) and confidence is proportion of respondants relative to total survey participants (H=high, or ≥ 0.75; M=moderate, or 0.50-0.74; L=low, or <0.50). Shaded boxes are those ≥0.50 (i.e., affirmed habitat associations).

			Waterbody Association									Instream Habitat Association				
Common Name	**N**	**Confidence**	**Lakes**	**Lake Mich**	**River**	**Stream**	**Backwater**	**Swamp**	**Caves**	**N**	**Confidence**	**Riffle**	**Run**	**Pool**	**NA**
Non-T&E SGNC:															
American eel	11	H	0	0	100	54.5	9.1	9.1	0	8	M	0	25	62.5	50
Brown bullhead	10	H	90	0	30	0	80	60	0	10	H	0	0	60	40
Largescale stoneroller	11	H	0	0	9.1	100	0	0	0	10	H	90	60	10	0
Highfin carpsucker	11	H	0	0	81.8	63.6	0	0	0	10	H	50	90	40	10
Flier	7	H	14.3	0	0	71.4	100	100	0	7	H	0	0	100	0
Lake whitefish	6	H	0	100	0	0	0	0	0	6	H	0	0	0	100
Mottled sculpin	11	H	0	54.5	0	100	0	0	0	11	H	90.9	27.3	0	0
Banded sculpin	7	H	0	0	0	100	0	0	14.3	7	H	100	28.6	0	0
Lake chub	7	H	0	100	0	0	0	0	0	4	M	0	0	0	100
Crystal darter	4	H	0	0	75	50	0	0	0	3	M	66.7	100	0	0
Brook stickleback	9	H	0	22.2	0	88.9	22.2	0	0	6	M	0	33.3	66.7	33.3
Blue sucker	8	H	0	0	100	0	0	0	0	8	H	87.5	62.5	0	0
Blacktail shiner	6	H	0	0	0	100	0	0	0	5	H	40	80	60	0
Banded pygmy sunfish	7	H	0	0	0	14.3	57.1	100	0	6	H	0	0	50	50
Lake chubsucker	10	H	90	10	10	50	40	10	0	10	H	0	20	60	40
Northern pike	8	H	75	25	87.5	62.5	62.5	0	0	8	H	12.5	37.5	75	25
Muskellunge	5	H	60	40	60	20	20	0	0	5	H	20	40	40	40
Bluntnose darter	3	H	33.3	0	0	100	66.7	66.7	0	3	H	0	0	66.7	33.3
Fringed darter	4	H	0	0	0	100	0	0	0	4	H	100	50	25	0
Cypress darter	5	H	0	0	0	100	20	60	0	5	H	20	40	60	20
Spottail darter	5	H	0	0	0	100	0	0	0	4	M	75	50	100	0
Spring cavefish	7	H	0	0	0	0	0	14.3	100	6	H	0	0	33.3	66.7
Silver lamprey	5	H	20	0	100	60	0	0	0	4	H	50	25	25	50
American brook lamprey	5	H	0	0	40	100	0	0	0	4	H	75	75	50	0
Ribbon shiner	6	H	0	0	0	100	16.7	16.7	0	6	H	0	16.7	100	0
Sicklefin chub	2	H	0	0	100	0	0	0	0	2	H	50	0	0	50
Smallmouth bass	7	H	42.9	28.6	85.7	100	0	0	0	7	H	42.9	85.7	100	0
Spotted bass	3	H	0	0	100	100	0	0	0	3	H	33.3	66.7	100	0
Black redhorse	8	H	0	0	75	100	0	0	0	7	H	100	71.4	14.3	0
Fourhorn sculpin	3	H	0	66.7	0	33.3	0	0	0	2	M	50	50	50	50
Ghost shiner	4	H	0	0	100	25	0	0	0	2	M	0	0	50	50
Ozark minnow	8	H	0	0	12.5	100	0	0	0	6	H	50	83.3	66.7	0
Rosyface shiner	7	H	0	0	42.9	100	0	0	0	7	H	42.9	85.7	100	0
Silverband shiner	4	H	0	0	100	0	0	0	0	4	H	25	25	0	50
Mountain madtom	4	H	0	0	75	50	0	0	0	4	H	100	0	25	0
Slender madtom	8	H	0	0	37.5	100	0	0	0	8	H	100	12.5	12.5	0
Pugnose minnow	6	H	16.7	0	50	83.3	83.3	66.7	0	6	H	0	0	83.3	16.7
Yellow perch	7	H	100	100	42.9	0	28.6	0	0	7	H	14.3	14.3	71.4	28.6
Trout-perch	4	H	0	50	75	25	25	0	0	3	M	0	0	33.3	66.7
Southern redbelly dace	8	H	0	0	0	100	0	0	0	8	H	25	75	87.5	0
North American paddlefish	8	H	0	0	100	0	25	0	0	5	M	0	40	40	60
Blacknose dace	8	H	0	0	0	100	0	0	0	8	H	62.5	100	50	0
Longnose dace	7	H	0	85.7	0	85.7	0	0	0	7	H	71.4	42.9	0	28.6
Brook trout	3	H	0	100	0	66.7	0	0	0	3	H	33.3	33.3	33.3	66.7
Lake trout	3	H	0	100	0	0	0	0	0	2	M	0	0	0	100
Shovelnose sturgeon	7	H	0	0	100	0	0	0	0	4	M	75	50	0	25
Sauger	8	H	25	0	100	0	0	0	0	7	H	28.5	71.4	57.1	14.3
Walleye	9	H	77.8	33.3	100	22.2	11.1	0	0	8	H	37.5	50	87.5	12.5
Central mudminnow	8	H	0	0	0	62.5	87.5	75	0	9	H	0	11.1	66.7	33.3
Sportfish:															
Largemouth bass	8	H	100	12.5	75	12.5	87.5	12.5	0	8	H	0	25	75	37.5
Channel catfish	6	H	83.3	0	100	83.3	16.7	0	0	6	H	33.3	83.3	100	0
Redear sunfish	3	H	100	0	66.7	33.3	100	33.3	0	3	H	0	0	66.7	33.3
White crappie	4	H	100	0	75	0	50	0	0	4	H	0	25	75	50
Black crappie	4	H	100	0	100	25	75	0	0	4	H	0	0	50	50

Table 3 (continued). Survey results for habitat association.

			Substrate Association							Other Habitat Characteristics						
Common Name	**N**	**Confidence**	**Sand**	**Gravel**	**Rock**	**Wood**	**Silt**	**N**	**Confidence**	**ligh gradier**	**ow gradier**	**Still**	**Coolwater**	**Veg**	**Turbid**	**Stable flow**
Non-T&E SGNC:																
American eel	5	L	0	20	60	20	60	4	L	25	75	25	0	0	0	0
Brown bullhead	8	H	37.5	25	12.5	25	87.5	10	H	0	50	80	0	90	0	0
Largescale stoneroller	10	H	10	90	50	0	0	9	H	77.8	0	0	22.2	0	0	55.6
Highfin carpsucker	9	H	77.8	100	11.1	0	22.2	12	H	62.5	25	0	0	0	0	37.5
Flier	3	L	0	0	0	0	100	7	H	0	57.1	85.7	0	85.7	0	14.3
Lake whitefish	2	L	100	100	50	0	0	3	M	0	0	0	100	0	0	0
Mottled sculpin	11	H	0	100	0	0	0	11	H	81.8	9.1	0	81.8	0	0	45.5
Banded sculpin	7	H	14.3	85.7	85.7	0	0	6	H	83.3	16.7	0	83.3	0	0	66.7
Lake chub	6	H	100	100	0	0	0	5	M	0	0	40	100	0	0	0
Crystal darter	4	L	100	100	0	0	0	2	L	50	50	0	0	0	0	0
Brook stickleback	2	H	0	0	0	0	100	9	H	0	11.1	11.1	77.8	88.9	0	22.2
Blue sucker	8	H	50	100	50	0	0	6	M	83.3	0	0	0	0	0	16.7
Blacktail shiner	6	H	100	16.7	0	16.7	0	5	H	60	20	0	0	0	0	60
Banded pygmy sunfish	4	M	0	0	0	0	100	7	H	0	57.1	85.7	0	100	0	0
Lake chubsucker	5	M	100	20	0	20	60	10	H	0	40	50	10	100	0	30
Northern pike	6	H	83.3	83.3	83.3	50	50	8	H	0	50	75	50	100	0	12.5
Muskellunge	4	H	75	75	100	50	25	5	H	0	40	80	60	100	0	0
Bluntnose darter	2	M	0	0	0	0	100	3	H	0	66.7	33.3	0	33.3	0	66.7
Fringed darter	4	H	25	75	75	0	0	3	M	33.3	33.3	0	0	0	0	66.7
Cypress darter	3	M	33.3	33.3	0	0	100	5	H	0	60	60	0	80	0	20
Spottail darter	4	M	0	25	100	0	0	5	H	40	40	0	20	0	0	60
Spring cavefish	3	L	33.3	66.7	66.7	0	0	7	H	0	14.3	14.3	71.4	0	0	57.1
Silver lamprey	3	M	66.7	100	0	0	0	2	L	0	50	0	0	0	0	50
American brook lamprey	4	H	75	75	50	0	25	3	M	33.3	33.3	0	0	0	0	33.3
Ribbon shiner	5	H	100	20	0	0	80	6	H	0	100	16.7	0	66.7	16.7	16.7
Sicklefin chub	2	H	100	50	0	0	0	2	H	0	0	0	0	0	50	50
Smallmouth bass	7	H	28.6	100	100	57.1	0	7	H	100	42.9	28.6	71.4	14.3	0	42.9
Spotted bass	3	H	0	100	33.3	33.3	0	2	M	100	100	0	0	0	0	100
Black redhorse	7	H	71.4	100	28.6	0	0	7	H	85.7	14.3	0	28.6	0	0	42.9
Fourhorn sculpin	2	M	50	50	100	0	0	2	M	0	50	0	100	0	0	0
Ghost shiner	2	M	100	50	0	0	100	2	M	0	50	50	0	0	0	0
Ozark minnow	7	H	14.3	100	28.6	0	0	7	H	85.7	14.3	0	42.9	0	0	42.9
Rosyface shiner	7	H	57.1	100	14.3	0	14.3	6	H	83.3	33.3	0	16.7	0	0	66.7
Silverband shiner	3	H	100	100	0	0	0	2	M	50	0	0	0	0	0	50
Mountain madtom	4	H	100	100	0	0	0	4	H	75	25	25	0	50	0	25
Slender madtom	8	H	12.5	87.5	75	0	12.5	7	H	85.7	14.3	0	28.6	0	0	71.4
Pugnose minnow	5	H	20	0	0	20	100	6	H	0	83.3	66.7	0	100	0	16.7
Yellow perch	6	H	100	100	50	16.7	50	7	H	0	71.4	57.1	42.9	85.7	0	0
Trout-perch	3	M	33.3	66.7	0	100	33.3	3	M	0	100	66.7	0	33.3	0	66.7
Southern redbelly dace	7	H	71.4	100	42.9	28.6	28.6	8	H	50	25	0	75	12.5	0	75
North American paddlefish	4	M	75	75	0	0	50	6	H	0	100	16.7	0	0	16.7	16.7
Blacknose dace	8	H	50	100	37.5	12.5	0	8	H	100	0	0	62.5	0	0	62.5
Longnose dace	7	H	28.6	100	71.4	0	0	6	H	83.3	0	0	33.3	0	0	50
Brook trout	3	H	0	100	33.3	0	0	3	H	33.3	0	0	100	0	0	0
Lake trout	1	L	0	100	100	0	0	2	M	0	0	50	100	0	0	0
Shovelnose sturgeon	6	H	66.7	83.3	33.3	0	33.3	4	M	75	50	0	0	0	25	0
Sauger	7	H	85.7	100	71.4	0	28.6	8	H	25	87.5	25	37.5	0	12.5	12.5
Walleye	8	H	62.5	100	62.5	0	0	7	M	71.4	57.1	42.9	71.4	28.6	0	28.6
Central mudminnow	9	H	22.2	0	0	11.1	77.8	9	H	0	55.6	88.9	44.4	77.8	11.1	22.2
Sportfish:																
Largemouth bass	7	H	57.1	85.7	42.9	85.7	71.4	8	H	0	75	87.5	0	87.5	0	25
Channel catfish	6	H	66.7	100	66.7	50	33.3	6	H	16.7	66.7	83.3	0	16.7	16.7	50
Redear sunfish	2	M	50	100	0	50	100	3	H	0	66.7	100	0	100	0	33.3
White crappie	3	H	100	100	66.7	100	66.7	4	H	0	75	100	0	50	0	25
Black crappie	3	H	100	100	33.3	100	66.7	4	H	0	75	100	0	75	0	25

Table 4. T&E species habitat associations. "1" indicates species-habitat component association.

	Waterbody Association							Instream Habitat Association		
Common Name	**Lakes**	**Lake Mich.**	**River**	**Stream**	**Backwater**	**Swamp**	**Caves**	**Riffle**	**Run**	**Pool**
Lake sturgeon	1		1							
Western sand darter			1							
Eastern sand darter			1							
Longnose sucker	1	1		1						
Cisco		1								
Gravel chub			1							
Bluebreast darter			1	1				1		
Iowa darter	1			1	1	1				
Harlequin darter			1	1						
Banded killifish	1									
Starhead topminnow	1				1	1				
Cypress minnow	1			1	1	1				
Bigeye chub				1						
Pallid shiner			1							1
Northern brook lamprey			1	1						
Least brook lamprey			1	1				1		
Redspotted sunfish				1	1	1				
Bantam sunfish	1				1	1				
Sturgeon chub			1							
River redhorse			1							
Greater redhorse	1		1							
River chub			1	1						
Pugnose shiner	1			1						
Bigeye shiner				1						
Ironcolor shiner				1		1				
Blackchin shiner	1			1						
Blacknose shiner	1			1						
Taillight shiner	1			1	1	1				
Weed shiner				1						
Northern madtom			1	1						
Pallid sturgeon			1							

Table 4 (continued). T&E species habitat associations.

	Substrate Association					Other Habitat Characteristics						
Common Name	**Sand**	**Gravel**	**Rock**	**Wood**	**Silt**	**High gradient**	**Low gradient**	**Still**	**Coolwater**	**Veg**	**Turbid**	**Stable flow**
Lake sturgeon		1	1									
Western sand darter	1						1					
Eastern sand darter	1											
Longnose sucker												
Cisco												
Gravel chub	1	1										
Bluebreast darter			1			1						
Iowa darter										1		
Harlequin darter		1		1		1						
Banded killifish	1	1								1		
Starhead topminnow										1		
Cypress minnow	1				1							
Bigeye chub	1	1								1		
Pallid shiner	1											
Northern brook lamprey	1	1										
Least brook lamprey		1										
Redspotted sunfish							1			1		
Bantam sunfish										1		
Sturgeon chub	1										1	
River redhorse		1				1						
Greater redhorse	1	1	1									
River chub		1	1			1						
Pugnose shiner							1			1		
Bigeye shiner	1	1								1		
Ironcolor shiner	1									1		
Blackchin shiner										1		
Blacknose shiner	1									1		
Taillight shiner										1		
Weed shiner	1									1		
Northern madtom	1					1						
Pallid sturgeon	1	1									1	

Table 5. Criteria 1 and 2 rankings for SGNC: State and Federal threatened or endangered status and global conservation rank.

Common Name	State Status	Federal Status	Global Ranking
Non-T&E SGNC:			
American eel			G4
Brown bullhead			G5
Largescale stoneroller			G5
Highfin carpsucker			G4/G5
Flier			G5
Lake whitefish			G5
Mottled sculpin			G5
Banded sculpin			G5
Lake chub			G5
Crystal darter			G3
Brook stickleback			G5
Blue sucker			G3/G4
Blacktail shiner			G5
Banded pygmy sunfish			G5
Lake chubsucker			G5
Northern pike			G5
Muskellunge			G5
Bluntnose darter			G5
Fringed darter			G4
Cypress darter			G5
Spottail darter			G4/G5
Spring cavefish			G4/G5
Silver lamprey			G5
American brook lamprey			G4
Ribbon shiner			G5
Sicklefin chub			G3
Smallmouth bass			G5
Spotted bass			G5
Black redhorse			G5
Fourhorn sculpin			G5
Ghost shiner			G5
Ozark minnow			G5
Rosyface shiner			G5
Silverband shiner			G5
Mountain madtom			G4
Slender madtom			G5
Pugnose minnow			G5
Yellow perch			G5
Trout-perch			G5
Southern redbelly dace			G5
North American paddlefish			G4
Blacknose dace			G5
Longnose dace			G5
Brook trout			G5
Lake trout			G5
Shovelnose sturgeon			G4
Sauger			G5
Walleye			G5
Central mudminnow			G5

Table 5 (continued). Criteria 1 and 2 rankings for SGNC: State and Federal threatened or endangered status and global conservation rank.

Common Name	State Status	Federal Status	Global Ranking
Sportfish:			
Largemouth bass			G5
Channel catfish			G5
Redear sunfish			G5
White crappie			G5
Black crappie			G5
T&E SGNC:			
Lake sturgeon	E		G3/G4
Western sand darter	E		G3
Eastern sand darter	T		G4
Longnose sucker	T		G5
Cisco	T		G5
Gravel chub	T		G4
Bluebreast darter	E		G4
Iowa darter	T		G5
Harlequin darter	E		G5
Banded killifish	T		G5
Starhead topminnow	T		G4
Cypress minnow	E		G5
Bigeye chub	E		G5
Pallid shiner	E		G4
Northern brook lamprey	E		G4
Least brook lamprey	T		G5
Redspotted sunfish	E		G5
Bantam sunfish	T		G5
Sturgeon chub	E		G3
River redhorse	T		G4
Greater redhorse	E		G4
River chub	E		G5
Pugnose shiner	E		G3
Bigeye shiner	E		G5
Ironcolor shiner	T		G4
Blackchin shiner	T		G5
Blacknose shiner	E		G4
Taillight shiner	E		G5
Weed shiner	E		G5
Northern madtom	E		G3
Pallid sturgeon	E	E	G2

Table 6. Site-based and sample-based change in proportional density for fish SGNC. Temporal comparisons are between the most recent decade (≥ 2000) and the post-clean water act era (1977-1999) or the pre-clean water act era (1950-1976).

		Change in number of sites containing species			Change in number of samples containing species	
Common Name	**n sites**	**≥ 2000 /1977-1999**	**≥ 2000 /1950-1976**	**n samples**	**≥ 2000 /1977-1999**	**≥ 2000 /1950-1976**
Non-T&E SGNC:						
American eel	97	0.08	0.07	139	0.15	0.04
Brown bullhead	39	0.52	1.32	64	1.01	1.72
Largescale stoneroller	83	2.77	n/a	102	4.76	n/a
Highfin carpsucker	421	0.54	1.05	735	0.58	0.94
Flier	45	0.77	1.25	47	1.15	1.37
Lake whitefish	0	n/a	n/a	0	n/a	n/a
Mottled sculpin	18	5.00	n/a	23	9.76	n/a
Banded sculpin	50	1.00	n/a	87	0.81	n/a
Lake chub	2	n/a	n/a	4	n/a	n/a
Crystal darter	0	n/a	n/a	0	n/a	n/a
Brook stickleback	37	1.06	n/a	40	1.46	n/a
Blue sucker	76	0.69	1.19	220	1.04	2.58
Blacktail shiner	8	7.00	n/a	12	16.10	n/a
Banded pygmy sunfish	3	2.00	n/a	3	2.93	n/a
Lake chubsucker	26	11.50	10.16	31	20.49	12.76
Northern pike	311	0.62	0.48	595	0.50	0.40
Muskellunge	22	n/a	1.75	25	n/a	2.60
Bluntnose darter	37	1.12	8.39	42	1.62	9.57
Fringed darter	8	1.67	n/a	11	2.56	n/a
Cypress darter	6	2.00	n/a	6	2.93	n/a
Spottail darter	18	0.60	1.32	23	0.68	0.68
Spring cavefish	0	n/a	n/a	0	n/a	n/a
Silver lamprey	25	0.17	0.33	39	0.17	0.14
American brook lamprey	18	0.29	n/a	20	0.37	n/a
Ribbon shiner	73	0.59	0.92	93	0.69	0.79
Sicklefin chub	0	n/a	n/a	0	n/a	n/a
Smallmouth bass	1109	1.06	1.80	2560	1.10	2.13
Spotted bass	385	0.68	1.08	937	0.97	1.47
Black redhorse	263	0.89	27.16	420	0.94	37.14
Fourhorn sculpin	0	n/a	n/a	0	n/a	n/a
Ghost shiner	7	0.50	0.88	16	0.73	0.91
Ozark minnow	32	1.91	n/a	44	3.49	n/a
Rosyface shiner	248	1.18	29.37	336	1.77	41.70
Silverband shiner	50	0.40	6.18	124	1.30	7.29
Mountain madtom	12	0.57	1.77	15	0.65	0.91
Slender madtom	78	2.50	24.29	100	2.93	30.08
Pugnose minnow	68	0.74	6.18	102	1.06	8.89
Yellow perch	112	0.71	0.64	245	0.48	0.45
Trout-perch	4	0.50	0.44	28	0.37	0.46
Southern redbelly dace	135	1.40	4.09	160	2.28	5.24
North American paddlefish	92	0.52	0.12	123	0.71	0.13
Blacknose dace	218	1.23	8.61	270	1.90	11.24
Longnose dace	15	4.00	n/a	19	2.51	n/a
Brook trout	0	n/a	n/a	0	n/a	n/a
Lake trout	0	n/a	n/a	0	n/a	n/a
Shovelnose sturgeon	38	0.89	1.77	88	1.15	4.22
Sauger	475	0.61	0.42	1578	0.65	2.70
Walleye	483	0.66	0.57	1208	0.49	0.49
Central mudminnow	80	3.00	n/a	87	4.33	n/a
Sportfish:						
Largemouth bass	2205	0.94	1.10	5680	0.90	1.03
Channel catfish	1638	0.73	0.73	5151	0.81	1.00
Redear sunfish	232	0.90	3.03	394	1.53	n/a
White crappie	983	0.45	0.32	2826	0.48	0.30
Black crappie	1019	0.76	0.48	3400	0.66	0.53

Table 6 (continued). Site-based and sample-based change in proportional density for fish SGNC.

		Change in number of sites containing species			Change in number of samples containing species	
Common Name	**n**	**≥ 2000 /1977-1999**	**≥ 2000 /1950-1976**	**n**	**≥ 2000 /1977-1999**	**≥ 2000 /1950-1976**
T&E SGNC:						
Lake sturgeon	0	n/a	n/a	0	n/a	n/a
Western sand darter	7	2.50	n/a	10	5.86	n/a
Eastern sand darter	9	2.33	n/a	13	6.83	n/a
Longnose sucker	0	n/a	n/a	0	n/a	n/a
Cisco	0	n/a	n/a	0	n/a	n/a
Gravel chub	28	0.69	4.86	49	0.49	5.47
Bluebreast darter	6	1.50	1.32	8	3.66	2.28
Iowa darter	4	n/a	n/a	5	n/a	n/a
Harlequin darter	2	n/a	n/a	2	n/a	n/a
Banded killifish	0	n/a	n/a	1	n/a	n/a
Starhead topminnow	19	4.00	1.32	20	6.34	1.48
Cypress minnow	1	n/a	n/a	1	n/a	n/a
Bigeye chub	15	6.00	5.30	18	10.98	6.84
Pallid shiner	2	n/a	n/a	2	n/a	n/a
Northern brook lamprey	4	n/a	n/a	4	n/a	n/a
Least brook lamprey	1	n/a	n/a	1	n/a	n/a
Redspotted sunfish	18	1.25	n/a	20	2.01	n/a
Bantam sunfish	2	1.00	n/a	2	1.46	n/a
Sturgeon chub	0	n/a	n/a	0	n/a	n/a
River redhorse	54	0.70	1.05	153	0.37	0.98
Greater redhorse	18	1.25	n/a	19	1.63	n/a
River chub	5	0.50	0.22	5	0.73	0.23
Pugnose shiner	3	0.50	n/a	3	0.73	n/a
Bigeye shiner	32	0.80	1.06	38	0.95	1.18
Ironcolor shiner	29	3.83	n/a	38	6.48	n/a
Blackchin shiner	3	n/a	n/a	3	n/a	n/a
Blacknose shiner	5	0.25	n/a	5	0.37	n/a
Taillight shiner	0	n/a	n/a	0	n/a	n/a
Weed shiner	24	2.67	3.53	26	2.93	3.65
Northern madtom	1	n/a	n/a	1	n/a	n/a
Pallid sturgeon	0	n/a	n/a	0	n/a	n/a

Table 7. HUC-8 watershed distribution and proportional distribution change. Time periods used for temporal analyses represent the most recent decade (2000-2010), post-clean water act (1977-1999), pre-clean water act (1950-1976) and pre-1950 (<1950).

	Number of location records				Proportional change in locations	
Species	**<1950**	**1950-1976**	**1977-1999**	**2000-2010**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**
Non-T&E SGNC:						
American eel	4	19	25	7	0.28	0.37
Brown bullhead	0	11	28	26	0.93	2.36
Largescale stoneroller	10	8	12	10	0.83	1.25
Highfin carpsucker	1	23	40	29	0.73	1.26
Flier	4	8	7	8	1.14	1.00
Lake whitefish	0	0	1	1	1.00	n/a
Mottled sculpin	0	5	7	5	0.71	1.00
Banded sculpin	2	7	8	8	1.00	1.14
Lake chub	0	1	2	4	2.00	4.00
Crystal darter	2	3	1	2	2.00	0.67
Brook stickleback	2	7	11	9	0.82	1.29
Blue sucker	2	10	12	14	1.17	1.40
Blacktail shiner	2	2	3	4	1.33	2.00
Banded pygmy sunfish	1	4	3	1	0.33	0.25
Lake chubsucker	8	10	11	10	0.91	1.00
Northern pike	0	19	22	21	0.95	1.11
Muskellunge	0	0	18	26	1.44	n/a
Bluntnose darter	12	6	12	12	1.00	2.00
Fringed darter	0	2	2	2	1.00	1.00
Cypress darter	2	3	1	2	2.00	0.67
Spottail darter	1	1	3	3	1.00	3.00
Spring cavefish	1	2	2	0	0.00	0.00
Silver lamprey	4	19	10	4	0.40	0.21
American brook lamprey	0	6	7	3	0.43	0.50
Ribbon shiner	7	11	12	8	0.67	0.73
Sicklefin chub	3	2	1	0	0.00	0.00
Smallmouth bass	1	37	42	41	0.98	1.11
Spotted bass	0	11	18	16	0.89	1.45
Black redhorse	0	10	19	24	1.26	2.40
Fourhorn sculpin	0	0	0	0	n/a	n/a
Ghost shiner	12	15	14	7	0.50	0.47
Ozark minnow	5	7	6	5	0.83	0.71
Rosyface shiner	1	2	17	17	1.00	8.50
Silverband shiner	0	11	15	14	0.93	1.27
Mountain madtom	1	3	3	2	0.67	0.67
Slender madtom	6	12	13	17	1.31	1.42
Pugnose minnow	0	18	14	10	0.71	0.56
Yellow perch	0	15	20	21	1.05	1.40
Trout-perch	4	8	7	1	0.14	0.13
Southern redbelly dace	7	21	20	21	1.05	1.00
North American paddlefish	3	12	16	9	0.56	0.75
Blacknose dace	0	18	20	18	0.90	1.00
Longnose dace	1	3	4	3	0.75	1.00
Brook trout	0	1	3	1	0.33	1.00
Lake trout	0	2	2	2	1.00	1.00
Shovelnose sturgeon	2	3	12	7	0.58	2.33
Sauger	0	15	33	33	1.00	2.20
Walleye	0	19	41	37	0.90	1.95
Central mudminnow	2	20	17	17	1.00	0.85

Table 7 (continued). HUC-8 watershed distribution and proportional distribution change.

	Number of location records				Proportional change in locations	
Species	**<1950**	**1950-1976**	**1977-1999**	**2000-2010**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**
Sportfish:						
Largemouth bass	0	49	50	51	1.02	1.04
Channel catfish	1	44	51	51	1.00	1.16
Redear sunfish	0	39	39	36	0.92	0.92
White crappie	0	42	49	49	1.00	1.17
Black crappie	0	40	50	49	0.98	1.23
T&E SGNC:						
Lake sturgeon	1	2	8	1	0.13	0.50
Western sand darter	2	8	7	6	0.86	0.75
Eastern sand darter	3	3	2	2	1.00	0.67
Longnose sucker	0	1	3	3	1.00	3.00
Cisco	1	1	1	0	0.00	0.00
Gravel chub	2	6	5	4	0.80	0.67
Bluebreast darter	1	1	1	1	1.00	1.00
Iowa darter	0	8	7	5	0.71	0.63
Harlequin darter	0	1	2	1	0.50	1.00
Banded killifish	2	3	2	5	2.50	1.67
Starhead topminnow	6	7	8	8	1.00	1.14
Cypress minnow	1	0	1	1	1.00	n/a
Bigeye chub	3	4	3	3	1.00	0.75
Pallid shiner	6	2	2	3	1.50	1.50
Northern brook lamprey	0	1	2	0	0.00	0.00
Least brook lamprey	0	2	2	2	1.00	1.00
Redspotted sunfish	3	5	8	8	1.00	1.60
Bantam sunfish	2	1	2	1	0.50	1.00
Sturgeon chub	1	0	1	1	1.00	n/a
River redhorse	3	3	9	10	1.11	3.33
Greater redhorse	1	0	3	4	1.33	n/a
River chub	0	3	1	3	3.00	1.00
Pugnose shiner	7	1	3	3	1.00	3.00
Bigeye shiner	5	12	9	5	0.56	0.42
Ironcolor shiner	1	4	4	4	1.00	1.00
Blackchin shiner	1	3	1	2	2.00	0.67
Blacknose shiner	4	6	5	4	0.80	0.67
Taillight shiner	0	0	1	0	0.00	n/a
Weed shiner	9	5	6	6	1.00	1.20
Northern madtom	0	2	1	1	1.00	0.50
Pallid sturgeon	0	1	0	1	n/a	1.00

Table 8. Summary of distribution and abundance trends. Symbols indicate average trend between 2000-2010 and other time periods; ≤24% change = neutral (n), 25-49% = moderate (-,+), ≥50% = (--, ++). Blanks indicate lack of sufficient data for associated analysis.

	Distribution change			Abundance change	
	HUC-8	Site-based	Sample-based	Statewide	Intrasite
Common Name	Watershed	Proportion	Proportion	CPUE	CPUE
Non-T&E SGNC:					
American eel	--	--	--	+	n
Brown bullhead	++	n	n	-	n
Largescale stoneroller	n	++	++	n	++
Highfin carpsucker	n	n	n	+	n
Flier	n	n	+	++	++
Lake whitefish	n				
Mottled sculpin	n	++	++	++	
Banded sculpin	n	n	n	++	++
Lake chub	++			-	
Crystal darter	+				
Brook stickleback	n	n	+	++	++
Blue sucker	+	n	++	++	++
Blacktail shiner	++	++	++	++	
Banded pygmy sunfish	--	++	++	++	
Lake chubsucker	n	++	++	++	+
Northern pike	n	-	--	+	++
Muskellunge	+	++	++	n	++
Bluntnose darter	++	++	++	++	++
Fringed darter	n	++	++	--	-
Cypress darter	+	++	++	n	--
Spottail darter	++	n	-	++	
Spring cavefish	--				
Silver lamprey	--	--	--	+	
American brook lamprey	--	--	--	+	++
Ribbon shiner	-	n	n	++	++
Sicklefin chub	--				
Smallmouth bass	n	+	++	++	++
Spotted bass	n	n	n	n	++
Black redhorse	++	++	++	++	++
Fourhorn sculpin					
Ghost shiner	--	-	n	-	
Ozark minnow	n	++	++	n	++
Rosyface shiner	++	++	++	n	n
Silverband shiner	n	n	++	++	++
Mountain madtom	-	n	n		
Slender madtom	+	++	++	++	++
Pugnose minnow	-	++	++	+	++
Yellow perch	n	-	--	+	++
Trout-perch	--	--	--	--	
Southern redbelly dace	n	++	++	+	++
North American paddlefish	-	--	--	n	-
Blacknose dace	n	++	++	++	++
Longnose dace	n	++	++	++	--
Brook trout	-				
Lake trout	n				
Shovelnose sturgeon	+	+	++	++	n
Sauger	+	-	++	++	++
Walleye	+	-	-	++	++
Central mudminnow	n	++	++	++	++

Table 8 (continued). Summary of distribution and abundance trends.

	Distribution change			Abundance change	
	HUC-8	Site-based	Sample-based	Statewide	Intrasite
Common Name	Watershed	Proportion	Proportion	CPUE	CPUE
Sportfish:					
Largemouth bass	n	n	n	++	
Channel catfish	n	-	n	n	
Redear sunfish	n	++	++	++	
White crappie	n	--	--	++	
Black crappie	n	-	-	++	
T&E SGNC:					
Lake sturgeon	--				
Western sand darter	n	++	++	++	++
Eastern sand darter	n	++	++	++	
Longnose sucker	++				
Cisco	--				
Gravel chub	-	++	++	-	+
Bluebreast darter	n	+	++	++	+
Iowa darter	-			-	
Harlequin darter	-				
Banded killifish	++			++	--
Starhead topminnow	n	++	++	++	
Cypress minnow	n				
Bigeye chub	n	++	++	++	++
Pallid shiner	++				
Northern brook lamprey	--				
Least brook lamprey	n				
Redspotted sunfish	+	+	++	++	-
Bantam sunfish	-	n	+	-	
Sturgeon chub	n				
River redhorse	++	n	-	++	++
Greater redhorse	+	+	++	n	++
River chub	++	--	--	++	
Pugnose shiner	++	--	-	--	
Bigeye shiner	--	n	n	++	n
Ironcolor shiner	n	++	++	++	--
Blackchin shiner	+			++	++
Blacknose shiner	-	--	--	++	++
Taillight shiner	--				
Weed shiner	n	++	++	n	-
Northern madtom	-				
Pallid sturgeon	n				

Table 9. Mean statewide abundance and proportional change in abundance.

	N Samples			Mean CPUE			Mean proportional change in mean CPUE	
Common Name	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**
Non-T&E SGNC:								
American eel	19	134	49	0.05	0.04	0.03	1.19	1.59
Brown bullhead	220	380	6	0.10	0.12	0.46	0.83	0.21
Largescale stoneroller	71	32	0	0.95	1.09	n/a	0.87	n/a
Highfin carpsucker	298	1005	77	0.12	0.12	0.06	0.99	1.98
Flier	23	24	0	0.12	0.07	n/a	1.70	n/a
Lake whitefish	0	0	0	n/a	n/a	n/a	n/a	n/a
Mottled sculpin	15	3	0	1.01	0.54	n/a	1.87	n/a
Banded sculpin	29	58	0	0.88	0.42	n/a	2.07	n/a
Lake chub	9	4	0	0.10	0.16	n/a	0.63	n/a
Crystal darter	0	0	0	n/a	n/a	n/a	n/a	n/a
Brook stickleback	26	8	0	0.44	0.05	n/a	8.77	n/a
Blue sucker	179	170	13	0.07	0.05	0.02	1.28	2.84
Blacktail shiner	61	55	0	0.10	0.06	n/a	1.82	n/a
Banded pygmy sunfish	2	3	0	0.07	0.04	n/a	1.66	n/a
Lake chubsucker	45	69	1	0.21	0.24	0.01	0.87	17.48
Northern pike	491	765	129	0.07	0.06	0.05	1.23	1.53
Muskellunge	426	406	0	0.10	0.11	n/a	0.86	n/a
Bluntnose darter	24	22	1	0.10	0.05	0.02	2.00	5.88
Fringed darter	7	4	0	0.17	0.33	n/a	0.50	n/a
Cypress darter	4	2	0	0.09	0.08	n/a	1.13	n/a
Spottail darter	6	19	2	0.69	0.07	0.03	9.32	20.91
Spring cavefish	0	0	0	n/a	n/a	n/a	n/a	n/a
Silver lamprey	14	46	10	0.06	0.06	0.03	0.99	2.01
American brook lamprey	5	24	0	0.09	0.07	n/a	1.28	n/a
Ribbon shiner	29	59	4	0.20	0.28	0.05	0.73	4.11
Sicklefin chub	0	0	0	n/a	n/a	n/a	n/a	n/a
Smallmouth bass	2387	2628	200	0.45	0.45	0.06	0.99	7.18
Spotted bass	671	892	40	0.13	0.15	0.16	0.87	0.80
Black redhorse	217	323	2	0.44	0.55	0.02	0.80	25.91
Fourhorn sculpin	0	0	0	n/a	n/a	n/a	n/a	n/a
Ghost shiner	3	22	8	0.03	0.04	0.09	0.80	0.39
Ozark minnow	29	14	0	2.78	3.08	n/a	0.90	n/a
Rosyface shiner	205	166	0	0.80	0.67	n/a	1.20	n/a
Silverband shiner	296	347	1	0.10	0.09	0.04	1.19	2.35
Mountain madtom	1	0	0	0.02	n/a	n/a	n/a	n/a
Slender madtom	65	29	0	0.36	0.18	n/a	2.03	n/a
Pugnose minnow	95	101	7	0.07	0.06	0.03	1.22	2.16
Yellow perch	1334	686	51	0.11	0.34	0.05	0.33	2.48
Trout-perch	2	4	21	0.03	0.05	0.10	0.66	0.33
Southern redbelly dace	72	35	0	0.98	0.68	n/a	1.43	n/a
North American paddlefish	32	55	72	0.04	0.04	0.07	0.95	0.60
Blacknose dace	122	95	1	0.70	0.88	0.02	0.80	41.33
Longnose dace	12	8	0	0.42	0.15	n/a	2.73	n/a
Brook trout	0	0	0	n/a	n/a	n/a	n/a	n/a
Lake trout	0	0	0	n/a	n/a	n/a	n/a	n/a
Shovelnose sturgeon	62	58	4	0.09	0.10	0.03	0.85	3.56
Sauger	2241	7105	391	0.18	0.13	0.09	1.34	1.99
Walleye	1575	4847	225	0.22	0.16	0.06	1.37	3.90
Central mudminnow	79	38	0	0.45	0.08	n/a	5.72	n/a
Sportfish:								
Largemouth bass	16718	18439	850	1.05	1.06	0.20	0.99	5.18
Channel catfish	10279	12554	747	0.31	0.35	0.22	0.89	1.43
Redear sunfish	2372	2117	11	1.14	1.25	0.03	0.91	33.47
White crappie	4732	7549	783	0.75	0.64	0.21	1.16	3.47
Black crappie	5644	9079	847	0.37	0.24	0.23	1.58	1.61

Table 9 (continued). Mean statewide abundance and proportional change in abundance.

	N Samples			Mean CPUE			Mean proportional change in mean CPUE	
Common Name	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**
T&E SGNC:								
Lake sturgeon	0	0	0	n/a	n/a	n/a	n/a	n/a
Western sand darter	15	7	0	0.22	0.09	n/a	2.51	n/a
Eastern sand darter	18	3	0	0.08	0.04	n/a	1.75	n/a
Longnose sucker	0	0	0	n/a	n/a	n/a	n/a	n/a
Cisco	0	0	0	n/a	n/a	n/a	n/a	n/a
Gravel chub	11	45	1	0.04	0.22	0.03	0.18	1.21
Bluebreast darter	7	3	2	0.14	0.14	0.02	0.97	8.24
Iowa darter	3	8	0	0.03	0.04	n/a	0.73	n/a
Harlequin darter	0	1	0	0.02	n/a	n/a	n/a	n/a
Banded killifish	3	1	0	0.12	0.05	n/a	2.45	n/a
Starhead topminnow	25	4	4	0.48	0.03	0.14	15.03	3.41
Cypress minnow	0	1	0	n/a	0.03	n/a	n/a	n/a
Bigeye chub	19	5	2	0.26	0.17	0.11	1.55	2.38
Pallid shiner	1	0	0	0.03	n/a	n/a	n/a	n/a
Northern brook lamprey	0	4	0	n/a	0.01	n/a	n/a	n/a
Least brook lamprey	0	1	0	n/a	0.03	n/a	n/a	n/a
Redspotted sunfish	14	10	0	11.55	0.08	n/a	139.36	n/a
Bantam sunfish	1	3	0	0.05	0.07	n/a	0.73	n/a
Sturgeon chub	0	0	0	n/a	n/a	n/a	n/a	n/a
River redhorse	71	127	13	0.19	0.06	0.04	3.06	4.99
Greater redhorse	12	12	0	0.12	0.11	n/a	1.02	n/a
River chub	2	2	2	0.04	0.04	0.02	1.22	2.10
Pugnose shiner	1	2	0	0.01	0.03	n/a	0.36	n/a
Bigeye shiner	14	24	1	0.74	0.52	0.02	1.44	43.59
Ironcolor shiner	38	18	0	0.62	0.33	n/a	1.90	n/a
Blackchin shiner	25	10	0	0.22	0.03	n/a	7.24	n/a
Blacknose shiner	5	9	0	0.53	0.06	n/a	8.23	n/a
Taillight shiner	0	0	0	n/a	n/a	n/a	n/a	n/a
Weed shiner	23	8	0	0.36	0.35	n/a	1.03	n/a
Northern madtom	1	0	0	0.02	n/a	n/a	n/a	n/a
Pallid sturgeon	0	0	0	n/a	n/a	n/a	n/a	n/a

Table 10. Mean intrasite abundance and proportional change in mean intrasite abundance.

	N Samples			Mean CPUE			Mean proportional change in mean CPUE		N sites increase	N sites decrease
Common Name	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**	**in abundance**	**in abundance**
Non-T&E SGNC:										
American eel	3	10	7	0.03	0.02	0.03	1.01	n/a	1	1
Brown bullhead	25	25	1	0.08	0.11	0.43	1.83	0.16	11	11
Largescale stoneroller	9	9	0	1.78	2.58	n/a	3.12	n/a	3	6
Highfin carpsucker	66	74	14	0.15	0.18	0.06	1.51	0.94	25	39
Flier	5	5	0	0.23	0.09	n/a	4.95	n/a	3	2
Lake whitefish	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mottled sculpin	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Banded sculpin	15	15	0	0.76	0.66	n/a	1.65	n/a	8	6
Lake chub	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Crystal darter	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Brook stickleback	3	3	0	0.12	0.07	n/a	2.25	n/a	2	0
Blue sucker	16	16	2	0.06	0.05	0.02	1.50	1.59	8	8
Blacktail shiner	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Banded pygmy sunfish	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lake chubsucker	12	12	0	0.12	0.16	n/a	1.42	n/a	5	6
Northern pike	80	93	24	0.07	0.06	0.04	1.51	2.30	57	50
Muskellunge	22	22	0	0.09	0.08	n/a	1.57	n/a	13	9
Bluntnose darter	2	2	0	0.20	0.05	n/a	10.34	n/a	1	1
Fringed darter	2	2	0	0.07	0.13	n/a	0.71	n/a	0	2
Cypress darter	1	1	0	0.03	0.13	n/a	0.21	n/a	0	1
Spottail darter	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Spring cavefish	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Silver lamprey	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
American brook lamprey	3	3	0	0.12	0.05	n/a	2.95	n/a	3	0
Ribbon shiner	9	10	1	0.34	0.30	0.03	2.31	n/a	3	6
Sicklefin chub	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Smallmouth bass	283	291	45	0.59	0.43	0.08	2.78	11.68	205	110
Spotted bass	86	89	8	0.15	0.20	0.07	1.32	5.31	43	44
Black redhorse	47	47	0	0.54	0.37	n/a	3.56	n/a	26	20
Fourhorn sculpin	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ghost shiner	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ozark minnow	5	5	0	5.31	3.61	n/a	5.88	n/a	3	2
Rosyface shiner	50	50	0	0.71	0.79	n/a	4.39	n/a	27	23
Silverband shiner	7	7	0	0.05	0.11	n/a	1.64	n/a	2	5
Mountain madtom	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Slender madtom	12	12	0	0.33	0.21	n/a	2.62	n/a	5	7
Pugnose minnow	13	13	0	0.06	0.03	n/a	3.32	n/a	9	4
Yellow perch	55	60	7	0.22	0.30	0.04	5.58	0.66	19	33
Trout-perch	0	1	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Southern redbelly dace	11	11	0	1.25	0.67	n/a	3.54	n/a	8	3
North American paddlefish	8	14	9	0.03	0.03	0.19	0.91	0.53	1	5
Blacknose dace	28	28	0	0.74	0.77	n/a	3.44	n/a	12	16
Longnose dace	2	2	0	0.06	0.15	n/a	0.45	n/a	0	2
Brook trout	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lake trout	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Shovelnose sturgeon	13	13	1	0.07	0.07	0.03	1.27	1.00	4	5
Sauger	98	115	33	0.38	0.29	0.08	2.00	2.54	52	54
Walleye	148	157	36	0.17	0.15	0.04	1.76	6.06	87	72
Central mudminnow	5	5	0	0.19	0.07	n/a	3.53	n/a	3	2

Table 10 (continued). Mean intrasite abundance and proportional change in mean intrasite abundance.

	N Samples			Mean CPUE			Mean proportional change in mean CPUE		N sites increase	N sites decrease
Common Name	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000**	**1977-1999**	**1950-1976**	**≥ 2000/1977-1999**	**≥ 2000/1950-1976**	**in abundance**	**in abundance**
T&E SGNC:										
Lake sturgeon	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Western sand darter	2	2	0	0.18	0.11	n/a	3.90	n/a	1	1
Eastern sand darter	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Longnose sucker	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cisco	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gravel chub	7	7	0	0.05	0.17	n/a	1.37	n/a	3	3
Bluebreast darter	1	1	0	0.18	0.13	n/a	1.38	n/a	1	0
Iowa darter	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Harlequin darter	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Banded killifish	1	1	0	0.00	0.05	n/a	0.02	n/a	0	1
Starhead topminnow	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cypress minnow	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bigeye chub	1	1	0	0.58	0.20	n/a	2.94	n/a	1	0
Pallid shiner	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Northern brook lamprey	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Least brook lamprey	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Redspotted sunfish	3	3	0	0.02	0.05	n/a	0.69	n/a	0	2
Bantam sunfish	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sturgeon chub	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
River redhorse	12	13	8	0.18	0.07	0.04	2.90	12.35	16	3
Greater redhorse	2	2	0	0.16	0.02	n/a	9.70	n/a	2	0
River chub	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pugnose shiner	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bigeye shiner	5	5	0	0.56	1.51	n/a	0.93	n/a	1	4
Ironcolor shiner	1	1	0	0.02	2.44	n/a	0.01	n/a	0	1
Blackchin shiner	4	4	0	0.15	0.04	n/a	6.89	n/a	3	1
Blacknose shiner	2	2	0	0.13	0.02	n/a	6.21	n/a	2	0
Taillight shiner	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Weed shiner	2	2	0	0.20	0.69	n/a	0.59	n/a	0	2
Northern madtom	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pallid sturgeon	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 11. Survey results for rare or vulnerable habitat criterion. Values are proportion of respondents that selected a response (yes, no, unknown). N is number of respondents for questions (habitat component) and confidence is proportion of respondants relative to total survey participants (H=high, or ≥ 0.75; M=moderate, or 0.50-0.74; L=low, or <0.50). Shaded boxes are those ≥0.50 (i.e., affirmed habitat associations). Consensus habitat type is most common response of respondents.

Common Name	N	Confidence	Yes	No	Unknown	Consensus Habitat Type
Non-T&E SGNC:						
American eel	11	H	63.6	18.2	18.2	Unfragmented large rivers
Brown bullhead	10	H	60.0	20.0	20.0	Vegetation
Largescale stoneroller	11	H	81.8	9.1	9.1	Clear water, gravel riffles
Highfin carpsucker	12	H	50.0	50.0	25.0	Clear or silt free water
Flier	7	H	100.0	0.0	0.0	Wetlands, backwaters, vegetation
Lake whitefish	6	H	16.7	33.3	50.0	
Mottled sculpin	10	H	80.0	0.0	20.0	Coolwater streams, Lake Michigan, clear, high gradient
Banded sculpin	7	H	71.4	0.0	28.6	Coolwater streams, high flow, rocky substrate
Lake chub	5	M	60.0	0.0	40.0	Shallow zones of Lake Michigan
Crystal darter	4	H	0.0	25.0	75.0	
Brook stickleback	9	H	88.9	11.1	0.0	Coolwater streams, vegetation
Blue sucker	7	H	85.7	14.3	0.0	Deep riffles
Blacktail shiner	5	H	80.0	20.0	0.0	High velocity
Banded pygmy sunfish	7	H	100.0	0.0	0.0	Vegetation, wetlands
Lake chubsucker	10	H	80.0	10.0	10.0	Clear water, vegetated lakes
Northern pike	8	H	87.5	12.5	0.0	Coolwater streams, clear water, wetlands
Muskellunge	5	H	80.0	20.0	0.0	Coolwater streams, clear water
Bluntnose darter	3	H	66.7	33.3	0.0	Backwaters and lakes with vegetation
Fringed darter	5	H	20.0	20.0	60.0	
Cypress darter	5	H	60.0	20.0	20.0	Clear streams, vegetation
Spottail darter	6	H	50.0	16.7	33.3	Rocky streams
Spring cavefish	7	H	71.4	0.0	28.6	Springs, caves
Silver lamprey	4	H	25.0	25.0	50.0	
American brook lamprey	5	H	40.0	20.0	40.0	None listed
Ribbon shiner	5	H	60.0	20.0	20.0	Vegetation
Sicklefin chub	2	H	100.0	0.0	0.0	None listed
Smallmouth bass	6	H	83.3	16.7	0.0	Gravel, rock, clear streams
Spotted bass	3	H	66.7	33.3	0.0	Clear streams
Black redhorse	8	H	75.0	25.0	0.0	Clear water, riffles, high flow
Fourhorn sculpin	4	H	50.0	0.0	50.0	Deep zones of Lake Michigan
Ghost shiner	3	H	0.0	33.3	66.7	
Ozark minnow	6	H	83.3	16.7	0.0	Coolwater streams, clear streams
Rosyface shiner	6	H	66.7	16.7	16.7	Clear streams
Silverband shiner	3	H	66.7	33.3	0.0	None listed
Mountain madtom	5	H	40.0	20.0	40.0	Riffles
Slender madtom	8	H	50.0	25.0	25.0	Riffles, high gradient
Pugnose minnow	5	H	80.0	20.0	0.0	Clear streams, vegetation
Yellow perch	7	H	57.1	28.6	14.3	Vegetation
Trout-perch	5	H	20.0	0.0	80.0	
Southern redbelly dace	8	H	87.5	12.5	0.0	Coolwater streams
North American paddlefish	8	H	62.5	25.0	12.5	Large rivers
Blacknose dace	8	H	87.5	12.5	0.0	Coolwater waters, headwater streams
Longnose dace	6	H	83.3	16.7	0.0	Hard substrates
Brook trout	4	H	25.0	50.0	25.0	
Lake trout	3	H	33.3	33.3	33.3	None listed
Shovelnose sturgeon	7	H	57.1	28.6	14.3	Large rivers
Sauger	10	H	70.0	10.0	20.0	Sand, gravel or rock
Walleye	9	H	77.8	22.2	0.0	Coolwater waters, gravel or rock for spawning
Central mudminnow	9	H	77.8	22.2	0.0	Vegetation, wetlands
Sportfish:						
Largemouth bass	8	H	37.5	62.5	0.0	
Channel catfish	5	H	20.0	80.0	0.0	
Redear sunfish	3	H	100.0	0.0	0.0	Vegetation
White crappie	3	H	66.7	33.3	0.0	None listed
Black crappie	3	H	100.0	0.0	0.0	Vegetation

Table 12. Evaluation of rare or vulnerable habitat criterion for T&E species. "1" indicates species meets this criterion "0" indicates it does not.

Common Name	Published Habitat Association	Evaluation Assessment
T&E SGNC:		
Lake sturgeon	Lakes and rivers with gravel and rock	1
Western sand darter	Low-gradient rivers with sand	0
Eastern sand darter	Rivers with sand	0
Longnose sucker	Lakes, Lake Michigan streams	0
Cisco	Lake Michigan	0
Gravel chub	Rivers with sand and gravel	1
Bluebreast darter	High-gradient riffles in rivers and streams with rock	1
Iowa darter	Lakes, streams, backwaters and swamps with vegetation	1
Harlequin darter	High-gradient rivers and streams with gravel and wood	1
Banded killifish	Lakes with sand, gravel and vegetation	1
Starhead topminnow	Lakes, backwaters and swamps with vegetation	1
Cypress minnow	Lakes, swamps, backwaters and streams with sand and silt	1
Bigeye chub	Streams with sand and gravel, vegetation	1
Pallid shiner	Pools of rivers with sand	0
Northern brook lamprey	Streams and rivers with sand and gravel	1
Least brook lamprey	Riffles with gravel in rivers and streams	1
Redspotted sunfish	Backwaters, swamps and low-gradient streams, vegetation	1
Bantam sunfish	Backwaters, swamps and lakes with vegetation	1
Sturgeon chub	Turbid rivers with sand	0
River redhorse	High-gradient rivers with gravel	1
Greater redhorse	Rivers and lakes with sand, gravel and rock	1
River chub	High-gradient rivers and streams with gravel and rock	1
Pugnose shiner	Lakes and low-gradient streams with vegetation	1
Bigeye shiner	Streams with sand, gravel and vegetation	1
Ironcolor shiner	Streams and swamps with sand and vegetation	1
Blackchin shiner	Lakes and streams with vegetation	1
Blacknose shiner	Lakes and streams with sand and vegetation	1
Taillight shiner	Backwaters, lakes, streams and swamps with vegetation	1
Weed shiner	Streams with sand and vegetation	1
Northern madtom	High-gradient streams and rivers with sand	1
Pallid sturgeon	Turbid rivers with sand and gravel	1

Table 13. Evaluation of endemic to Illinois or Illinois' population disjunct criterion. "1" indicates species meets criterion, "0" indicates it does not.

Common Name	Evaluation Assessment
Non-T&E SGNC:	
American eel	0
Brown bullhead	1
Largescale stoneroller	0
Highfin carpsucker	0
Flier	0
Lake whitefish	0
Mottled sculpin	0
Banded sculpin	0
Lake chub	0
Crystal darter	0
Brook stickleback	0
Blue sucker	0
Blacktail shiner	0
Banded pygmy sunfish	0
Lake chubsucker	0
Northern pike	0
Muskellunge	0
Bluntnose darter	0
Fringed darter	0
Cypress darter	0
Spottail darter	0
Spring cavefish	1
Silver lamprey	0
American brook lamprey	0
Ribbon shiner	0
Sicklefin chub	0
Smallmouth bass	0
Spotted bass	0
Black redhorse	0
Fourhorn sculpin	0
Ghost shiner	0
Ozark minnow	0
Rosyface shiner	0
Silverband shiner	0
Mountain madtom	0
Slender madtom	0
Pugnose minnow	0
Yellow perch	0
Trout-perch	0
Southern redbelly dace	0
North American paddlefish	0
Blacknose dace	0
Longnose dace	0
Brook trout	0
Lake trout	0
Shovelnose sturgeon	0
Sauger	0
Walleye	0
Central mudminnow	0

Table 13 (continued). Evaluation of endemic to Illinois or Illinois' population disjunct criterion.

Common Name	Evaluation Assessment
Sportfish:	
Largemouth bass	0
Channel catfish	0
Redear sunfish	0
White crappie	0
Black crappie	0
T&E SGNC:	
Lake sturgeon	0
Western sand darter	0
Eastern sand darter	0
Longnose sucker	0
Cisco	0
Gravel chub	0
Bluebreast darter	0
Iowa darter	0
Harlequin darter	1
Banded killifish	0
Starhead topminnow	1
Cypress minnow	0
Bigeye chub	0
Pallid shiner	1
Northern brook lamprey	0
Least brook lamprey	0
Redspotted sunfish	1
Bantam sunfish	0
Sturgeon chub	0
River redhorse	0
Greater redhorse	0
River chub	0
Pugnose shiner	0
Bigeye shiner	0
Ironcolor shiner	1
Blackchin shiner	0
Blacknose shiner	0
Taillight shiner	0
Weed shiner	1
Northern madtom	1
Pallid sturgeon	0

Table 14. Survey results for representative of a broad array of other species criterion. Values are proportion of respondents that selected a response (yes, no, unknown). N is number of respondents and confidence is proportion of respondants relative to total survey participants (H=high, or ≥ 0.75; M=moderate, or 0.50-0.74; L=low, or <0.50). Shaded boxes are those ≥0.50 (i.e., affirmed habitat associations). Consensus community type is most common response of respondents.

Common Name	N	Confidence	Yes	No	Unknown	Consensus Community Type
Non-T&E SGNC:						
American eel	12	H	41.7	50	8.3	
Brown bullhead	9	H	55.6	33.3	11.1	Vegetation
Largescale stoneroller	11	H	63.6	18.2	18.2	Coolwater streams
Highfin carpsucker	9	H	55.6	22.2	22.2	High quality streams, low silt
Flier	5	M	80	0	20	Vegetation
Lake whitefish	6	H	66.7	16.7	16.7	Native salmonids, deep zone Lake Michigan
Mottled sculpin	10	H	80	0	20	Coolwater streams
Banded sculpin	7	H	71.4	0	28.6	Coolwater streams
Lake chub	6	H	83.3	0	16.7	Nearshore Lake Michigan
Crystal darter	4	H	0	25	75	
Brook stickleback	7	H	71.4	28.6	0	Coolwater streams, vegetation
Blue sucker	5	M	100	0	0	Large river riffles, benthic
Blacktail shiner	4	M	50	50	0	High velocity
Banded pygmy sunfish	7	H	100	0	0	Vegetation, wetlands
Lake chubsucker	8	H	87.5	12.5	0	Vegetated lakes
Northern pike	8	H	75	25	0	Coolwater streams, vegetation
Muskellunge	5	H	80	20	0	Coolwater streams
Bluntnose darter	3	H	100	0	0	
Fringed darter	5	H	40	0	60	
Cypress darter	5	H	20	20	60	
Spottail darter	5	H	60	20	20	Rock
Spring cavefish	7	H	57.1	28.6	14.3	Springs
Silver lamprey	5	H	40	20	40	None listed
American brook lamprey	4	H	25	25	50	
Ribbon shiner	4	M	50	25	25	None listed
Sicklefin chub	1	M	0	0	100	
Smallmouth bass	7	H	57.1	28.6	14.3	Clear streams
Spotted bass	3	H	33.3	66.7	0	
Black redhorse	5	M	60	20	20	Riffles
Fourhorn sculpin	3	H	33.3	0	66.7	
Ghost shiner	2	M	50	50	0	None listed
Ozark minnow	5	M	80	20	0	Coolwater streams, clear streams
Rosyface shiner	4	M	75	25	0	Clear streams
Silverband shiner	2	M	50	50	0	None listed
Mountain madtom	4	H	25	25	50	
Slender madtom	7	H	71.4	0	28.6	Riffles
Pugnose minnow	4	M	75	25	0	Clear streams, vegetation
Yellow perch	7	H	57.1	14.3	28.6	None listed
Trout-perch	5	H	20	20	60	
Southern redbelly dace	5	M	80	20	0	Coolwater streams, headwater streams
North American paddlefish	7	H	85.7	14.3	0	Large rivers
Blacknose dace	5	M	100	0	0	Coolwater streams, headwater streams
Longnose dace	4	M	75	25	0	Coolwater streams
Brook trout	4	H	75	0	25	Coolwater streams, Lake Michigan
Lake trout	3	H	66.7	0	33.3	Deep water Lake Michigan
Shovelnose sturgeon	7	H	85.7	0	14.3	Large rivers
Sauger	9	H	66.7	0	33.3	Large rivers
Walleye	9	H	66.7	11.1	22.2	Large rivers, lakes
Central mudminnow	7	H	87.5	14.3	0	Coolwater steams, vegetation
Sportfish:						
Largemouth bass	8	H	62.5	37.5	0	None listed
Channel catfish	6	H	16.7	83.3	0	
Redear sunfish	3	H	100	0	0	Vegetation
White crappie	4	H	50	50	0	None listed
Black crappie	4	H	100	0	0	Vegetation

Table 15. Evaluation of representative of broad array of species criterion for T&E species. "1" indicates species meets this criterion, "0" indicates it does not.

Common Name	Evaluation Assessment
T&E SGNC:	
Lake sturgeon	1
Western sand darter	1
Eastern sand darter	1
Longnose sucker	1
Cisco	1
Gravel chub	1
Bluebreast darter	1
Iowa darter	1
Harlequin darter	1
Banded killifish	1
Starhead topminnow	1
Cypress minnow	0
Bigeye chub	1
Pallid shiner	0
Northern brook lamprey	0
Least brook lamprey	0
Redspotted sunfish	1
Bantam sunfish	1
Sturgeon chub	1
River redhorse	1
Greater redhorse	0
River chub	1
Pugnose shiner	1
Bigeye shiner	1
Ironcolor shiner	1
Blackchin shiner	1
Blacknose shiner	1
Taillight shiner	0
Weed shiner	1
Northern madtom	0
Pallid sturgeon	1

Table 16. Evaluation of poorly known status criterion. Survey participants are those who completed the survey, species participants are those completing the species.

Common Name	Number of survey participants	Number of species participants	Proportion completing species
Non-T&E SGNC:			
American eel	14	12	0.86
Brown bullhead	14	10	0.71
Largescale stoneroller	13	11	0.85
Highfin carpsucker	13	12	0.92
Flier	13	7	0.54
Lake whitefish	14	6	0.43
Mottled sculpin	14	11	0.79
Banded sculpin	14	7	0.50
Lake chub	13	7	0.54
Crystal darter	14	5	0.36
Brook stickleback	13	9	0.69
Blue sucker	13	9	0.69
Blacktail shiner	13	6	0.46
Banded pygmy sunfish	13	7	0.54
Lake chubsucker	13	10	0.77
Northern pike	6	8	1.33
Muskellunge	6	5	0.83
Bluntnose darter	3	3	1.00
Fringed darter	14	5	0.36
Cypress darter	14	6	0.43
Spottail darter	14	6	0.43
Spring cavefish	14	7	0.50
Silver lamprey	14	5	0.36
American brook lamprey	14	5	0.36
Ribbon shiner	13	6	0.46
Sicklefin chub	13	2	0.15
Smallmouth bass	6	7	1.17
Spotted bass	6	3	0.50
Black redhorse	13	8	0.62
Fourhorn sculpin	14	4	0.29
Ghost shiner	13	4	0.31
Ozark minnow	13	8	0.62
Rosyface shiner	13	8	0.62
Silverband shiner	13	4	0.31
Mountain madtom	14	5	0.36
Slender madtom	14	9	0.64
Pugnose minnow	13	6	0.46
Yellow perch	6	7	1.17
Trout-perch	14	5	0.36
Southern redbelly dace	13	7	0.54
North American paddlefish	14	8	0.57
Blacknose dace	13	8	0.62
Longnose dace	13	7	0.54
Brook trout	6	4	0.67
Lake trout	6	3	0.50
Shovelnose sturgeon	14	7	0.50
Sauger	6	8	1.33
Walleye	6	9	1.50
Central mudminnow	13	9	0.69
Sportfish:			
Largemouth bass	6	8	1.33
Channel catfish	6	6	1.00
Redear sunfish	6	3	0.50
White crappie	6	4	0.67
Black crappie	6	4	0.67

Table 17. Evaluation of poorly known status criterion for T&E species. "1" indicates species meets the criterion, "0" indicates it does not.

Common Name	Evaluation Assessment
T&E SGNC:	
Lake sturgeon	1
Western sand darter	0
Eastern sand darter	0
Longnose sucker	0
Cisco	0
Gravel chub	1
Bluebreast darter	0
Iowa darter	0
Harlequin darter	1
Banded killifish	1
Starhead topminnow	1
Cypress minnow	1
Bigeye chub	1
Pallid shiner	1
Northern brook lamprey	1
Least brook lamprey	0
Redspotted sunfish	0
Bantam sunfish	1
Sturgeon chub	1
River redhorse	1
Greater redhorse	1
River chub	1
Pugnose shiner	0
Bigeye shiner	1
Ironcolor shiner	1
Blackchin shiner	0
Blacknose shiner	1
Taillight shiner	1
Weed shiner	0
Northern madtom	1
Pallid sturgeon	1

Table 18. Current and proposed future status and trends. N Abundance reported as CPUE (#/minute), N distribution reported as number of HUC-8 watersheds inhabited. For current abundance and distribution trends, 0 is stable (-24% to +24% change from historic levels), -1 and +1 are moderate decrease or increase (25-49% change), -2 and +2 are high decrease or increase (≥50% change). For future abundance and distribution, proposed trends are reported for 2025 horizon relative to current N. Trend categories are maintain current trend (0), reverse declining trend (+) or increase low abundance or distribution (+).

	Current Status					Status Objectives		
Common Name	*N Abundance*	*N Distribution*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Abundance Trend*	*Distribution Trend*	*Listing*
Non-T&E SGNC:								
American eel	0.05	7	+1	-2		0	+	
Brown bullhead	0.10	26	-1	+1		+	0	
Largescale stoneroller	0.95	10	+1	+2		0	0	
Highfin carpsucker	0.12	29	+1	0		0	0	
Flier	0.12	8	+2	0		0	0	
Lake whitefish	unknown	1	n/a	0		+	+	
Mottled sculpin	1.01	5	+2	+2		0	0	
Banded sculpin	0.88	8	+2	0		0	0	
Lake chub	0.10	4	-1	+2		+	0	
Crystal darter	unknown	2	n/a	+1		+	0	
Brook stickleback	0.44	9	+2	0		0	0	
Blue sucker	0.07	14	+2	+1		0	0	
Blacktail shiner	0.10	4	+2	+2		0	0	
Banded pygmy sunfish	0.07	1	+2	+1		0	0	
Lake chubsucker	0.21	10	+1	+2		0	0	
Northern pike	0.07	21	+1	-1		0	+	
Muskellunge	0.10	26	+1	+2		0	0	
Bluntnose darter	0.10	12	+2	+2		0	0	
Fringed darter	0.17	2	-1	+2		+	0	
Cypress darter	0.09	2	-1	+2		+	0	
Spottail darter	0.69	3	+2	0		0	+	
Spring cavefish	unknown	0	n/a	-2		+	+	
Silver lamprey	0.06	4	+1	-2		0	+	
American brook lamprey	0.09	3	+1	-2		0	+	
Ribbon shiner	0.20	8	+2	0		0	0	
Sicklefin chub	unknown	0	n/a	-2		+	+	
Smallmouth bass	0.45	41	+2	+1		0	0	
Spotted bass	0.13	16	+1	0		0	0	
Black redhorse	0.44	24	+2	+2		0	0	
Fourhorn sculpin	unknown	0	n/a	n/a		+	+	
Ghost shiner	0.03	7	-1	-1		+	+	
Ozark minnow	2.78	5	+1	+2		0	0	
Rosyface shiner	0.80	17	0	+2		0	0	
Silverband shiner	0.10	14	+2	+1		0	0	
Mountain madtom	0.02	2	n/a	0		+	+	
Slender madtom	0.36	17	+2	+2		0	0	
Pugnose minnow	0.07	10	+1	+1		0	0	
Yellow perch	0.11	21	+1	-1		0	+	
Trout-perch	0.03	1	-2	-2		+	+	
Southern redbelly dace	0.98	21	+1	+2		0	0	
North American paddlefish	0.04	9	0	-2		0	+	
Blacknose dace	0.70	18	+2	+2		0	0	
Longnose dace	0.42	3	0	+2		0	0	
Brook trout	unknown	1	n/a	-1		+	+	
Lake trout	unknown	2	n/a	0		+	+	
Shovelnose sturgeon	0.09	7	+1	+1		0	0	
Sauger	0.18	33	+2	+1		0	0	
Walleye	0.22	37	+2	0		0	0	
Central mudminnow	0.45	17	+2	+2		0	0	

Table 18 (continued). Current and proposed future status and trends.

	Current Status					Status Objectives		
Common Name	*N Abundance*	*N Distribution*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Abundance Trend*	*Distribution Trend*	*Listing*
Sportfish:								
Largemouth bass	1.05	51	+2	0		0	0	
Channel catfish	0.31	51	0	0		0	0	
Redear sunfish	1.14	36	+2	+2		0	0	
White crappie	0.75	49	+2	-2		0	+	
Black crappie	0.37	49	+2	-1		0	+	
T&E SGNC:								
Lake sturgeon	unknown	1	n/a	-2	SE	+	+	ST
Western sand darter	0.22	6	+2	+2	SE	0	0	ST
Eastern sand darter	0.08	2	+2	+2	ST	0	0	Delist
Longnose sucker	unknown	3	n/a	+2	ST	+	0	Delist
Cisco	unknown	0	n/a	-2	ST	+	+	Delist
Gravel chub	0.04	4	0	+1	ST	0	0	Delist
Bluebreast darter	0.14	1	+1	+1	SE	0	0	ST
Iowa darter	0.03	5	-1	-1	ST	+	+	Delist
Harlequin darter	0.02	1	n/a	-1	SE	+	+	ST
Banded killifish	0.12	5	0	+2	ST	0	0	Delist
Starhead topminnow	0.48	8	+2	+2	ST	0	0	Delist
Cypress minnow	unknown	1	n/a	0	SE	+	+	ST
Bigeye chub	0.26	3	+2	+2	SE	0	0	ST
Pallid shiner	0.03	3	n/a	+2	SE	+	0	ST
Northern brook lamprey	unknown	0	n/a	-2	SE	+	+	ST
Least brook lamprey	unknown	2	n/a	0	ST	+	+	Delist
Redspotted sunfish	11.55	8	+1	+1	SE	0	0	ST
Bantam sunfish	0.05	1	-1	0	ST	+	+	Delist
Sturgeon chub	unknown	1	n/a	0	SE	+	+	ST
River redhorse	0.19	10	+2	0	ST	0	0	Delist
Greater redhorse	0.12	4	+1	+1	SE	0	0	ST
River chub	0.04	3	+2	0	SE	0	+	ST
Pugnose shiner	0.01	3	-2	0	SE	+	+	ST
Bigeye shiner	0.74	5	+1	0	SE	0	+	ST
Ironcolor shiner	0.62	4	0	+2	ST	0	0	Delist
Blackchin shiner	0.22	2	+2	+1	ST	0	0	Delist
Blacknose shiner	0.53	4	+2	-2	SE	0	+	ST
Taillight shiner	unknown	0	0	-2	SE	+	+	ST
Weed shiner	0.36	6	0	+2	SE	0	0	ST
Northern madtom	0.02	1	n/a	-1	SE	+	+	ST
Pallid sturgeon	unknown	1	n/a	0	SE, FE	+	+	ST

Table 19. Survey results for stressor evaluation. Values are mean proportion of affirmations for past, present and future periods (except climate change, which only includes present and future). Shaded boxes are those ≥0.50. N is number of respondents participating for a species, confidence is proportion of those participating in stressor evaluation (High, H = ≥0.75; Medium, M = 0.50-0.74; Low, L = ≤0.49).

			Habitat Stresses							Community Stresses				Population Stresses					Human Stresses	
Common Name	**N**	**Confidence**	*Extent*	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Chemical Pollutants*	*Sedimentation*	*Competitors*	*Predators*	*Parasites-Disease*	*Prey-Food*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Structures*	*Climate Change*
Non-T&E SGNC:																			
American eel	12	H	37.2	33.3	7.4	22.2	0	14.8	7.4	0	0	0	0	0	66.7	14.8	7.4	62.9	11.1
Brown bullhead	10	H	66.7	37.1	53	22.2	49.3	56	59.3	0	0	0	7.4	0	14.8	14.8	0	3.7	11.1
Largescale stoneroller	11	H	60	36.7	43.3	36.7	0	20	66.7	10	10	10	0	0	30	6.7	0	36.7	30
Highfin carpsucker	12	M	50	50	45.8	45.8	16.7	33.4	66.7	37.5	0	12.5	8.3	0	41.7	16.7	0	50	6.3
Flier	7	H	71.4	47.7	57.1	42.9	28.6	50.1	42.9	0	0	14.3	0	0	28.6	19	0	9.5	21.4
Lake whitefish	6	M	0	0	0	0	58.3	0	0	8.3	25	8.3	16.7	16.7	0	16.7	16.7	0	0
Mottled sculpin	11	H	70	56.6	46.7	30	20	33.4	46.7	6.7	3.3	0	3.3	6.7	33.3	6.7	3.3	43.3	30
Banded sculpin	7	H	76.2	42.9	42.9	57.1	4.8	23.8	47.7	4.8	4.8	0	4.8	9.5	33.3	9.5	4.8	42.3	35.7
Lake chub	7	M	26.7	6.7	20	0	40	13.3	26.6	20	26.6	0	13.3	0	13.3	26.7	0	13.3	20
Crystal darter	5	L	33.4	33.4	33.4	0	0	16.7	33.4	33.4	33.4	0	0	0	50	33.4	0	83.3	0
Brook stickleback	9	H	50	12.5	45.9	29.2	29.1	29.2	41.7	0	0	0	0	0	0	0	0	8.3	25
Blue sucker	9	H	71.4	57.2	38.1	23.8	9.5	38.1	71.4	9.5	0	0	0	0	47.6	9.5	0	76.2	21.4
Blacktail shiner	6	H	66.6	26.7	40	13.3	0	0	66.7	6.7	0	0	0	20	0	26.7	0	0	10
Banded pygmy sunfish	7	H	71.4	52.4	61.9	28.6	9.5	33.3	47.6	0	0	0	0	0	52.4	9.5	0	4.8	7.1
Lake chubsucker	10	H	63.3	56.6	36.7	20	36.7	26.7	43.3	6.7	0	0	0	0	43.3	13.3	6.7	16.7	20
Northern pike	8	H	85.7	57.1	71.4	42.9	28.6	19.1	80.9	9.5	0	0	23.8	0	33.3	57.1	9.5	38.1	35.7
Muskellunge	5	H	100	50	46.7	13.3	40	20	53.3	13.3	0	6.7	33.3	6.7	33.3	73.3	20	33.3	50
Bluntnose darter	3	H	44.5	44.5	55.6	22.2	44.5	22.2	44.5	0	0	0	0	0	22.2	22.2	0	22.2	16.5
Fringed darter	5	M	33.4	33.4	33.4	22.2	0	11.1	11.1	0	0	0	0	0	44.5	0	0	33.3	0
Cypress darter	6	M	41.7	33.4	33.4	41.7	33.4	41.7	58.3	0	0	0	0	0	33.4	0	0	25	12.5
Spottail darter	6	M	50	50	41.7	50	0	8.3	25	0	0	0	0	0	33.4	0	0	33.4	25
Spring cavefish	7	H	72.3	50	50	83.3	0	27.8	22.2	0	0	0	0	16.7	38.9	5.6	0	16.7	25
Silver lamprey	5	M	33.4	44.5	33.3	11.1	0	11.1	44.5	0	0	0	0	0	44.5	11.1	0	77.8	12.5
American brook lamprey	5	M	66.7	66.7	55.6	11.1	0	33.3	66.7	0	0	0	0	0	44.5	11.1	0	77.8	12.5
Ribbon shiner	6	H	53.4	33.3	40	60	13.3	20	46.7	33.4	0	0	0	0	26.7	13.3	0	33.3	10
Sicklefin chub	2	H	50	50	50	0	0	0	50	0	0	0	0	0	50	0	0	100	0
Smallmouth bass	7	H	85.8	52.4	71.4	57.1	47.6	38.1	85.7	9.5	0	0	9.5	0	28.6	57.1	9.5	66.6	21.4
Spotted bass	3	H	55.6	22.2	22.2	22.2	22.2	0	77.6	22.2	0	0	0	0	0	33.4	0	44.5	16.5
Black redhorse	8	H	83.3	66.7	55.6	22.2	0	50	55.6	22.2	0	0	0	0	50	5.6	0	33.3	8.3
Fourhorn sculpin	4	M	33.4	33.4	33.4	0	16.7	16.7	0	16.7	33.4	0	16.7	0	50	16.7	16.7	50	0
Ghost shiner	4	L	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ozark minnow	8	H	66.6	52.4	52.4	23.8	0	42.9	71.4	0	0	0	0	0	28.6	0	0	28.6	28.6
Rosyface shiner	8	H	57.1	19.1	28.6	42.9	0	14.3	86.6	0	0	0	0	0	16.7	0	0	16.7	28.6
Silverband shiner	4	M	50	66.7	50	0	0	0	66.7	0	0	0	0	0	66.7	0	0	50	0
Mountain madtom	5	M	66.7	55.5	55.5	0	0	0	44.5	0	0	0	0	0	33.3	11.1	0	66.7	0
Slender madtom	9	H	61.9	42.9	57.1	47.6	4.6	0	61.9	0	0	0	0	0	33.3	4.6	0	47.6	7.1
Pugnose minnow	6	H	77.8	66.7	61.2	27.7	22.2	33.3	44.5	0	0	0	0	0	33.3	0	0	5.6	8.3
Yellow perch	7	H	72.3	22.2	72.3	11.1	66.7	33.4	72.3	38.9	16.7	0	27.7	0	16.7	55.6	22.2	0	25
Trout-perch	5	M	44.4	33.4	55.6	11.1	11.1	11.1	44.5	0	0	0	0	0	44.5	11.1	0	44.5	16.5
Southern redbelly dace	7	H	85.7	71.4	38.1	66.7	0	66.6	71.4	0	0	0	0	0	47.6	0	9.5	23.8	28.6
North American paddlefish	8	H	45.8	52.5	45.8	41.7	50	33.3	37.5	41.7	0	0	25	0	54.2	25	8.3	62.5	6.3
Blacknose dace	8	H	79.2	70.8	66.7	54.2	0	33.3	75	0	0	0	0	0	25	8.3	8.3	33.3	18.8
Longnose dace	7	M	75	50	50	50	0	50	100	0	0	0	0	0	50	0	0	50	37.5
Brook trout	4	M	50	50	50	0	83.3	33.4	66.7	83.3	66.7	33.4	50	50	100	100	0	83.3	25
Lake trout	3	M	0	0	33.4	0	83.3	33.4	33.4	83.3	83.3	33.4	83.3	0	0	83.3	50	0	25
Shovelnose sturgeon	7	H	55.6	55.6	50	11.1	11.1	16.7	44.5	11.1	0	5.6	11.1	5.6	66.7	11.1	22.2	33.4	0
Sauger	8	H	58.4	37.5	50	16.8	16.7	16.7	62.5	12.5	0	0	8.3	0	25	50	20.1	37.5	18.8
Walleye	9	H	66.7	37.1	59.3	29.6	22.2	33.3	70.4	7.4	0	0	14.8	0	14.8	55.5	14.8	48.2	22
Central mudminnow	9	H	58.4	45.8	54.1	45.8	16.7	29.2	37.5	0	0	0	0	0	29.2	0	0	12.5	18.8
Sportfish:																			
Largemouth bass	8	H	47.6	19.1	52.4	23.8	23.8	19.1	61.9	9.5	0	4.8	28.6	9.5	0	38.1	23.8	14.3	0
Channel catfish	6	H	46.7	26.7	13.3	33.4	46.6	13.3	66.6	13.3	13.3	0	0	0	13.3	46.7	13.3	0	10
Redear sunfish	3	H	55.6	44.5	44.5	0	77.8	44.5	77.8	55.6	0	0	22.2	0	33.3	55.6	0	0	33.3
White crappie	4	H	58.4	16.7	16.7	33.4	66.7	0	66.7	33.4	0	0	16.7	0	0	58.4	41.7	0	0
Black crappie	4	H	91.7	33.4	33.4	16.7	66.7	16.7	91.7	16.7	0	0	16.7	0	0	66.7	41.7	0	12.5

Table 20. Identified stresses to T&E species. "1" indicates a stress for species, "0" indicates not a stress, "S" indicates insufficient evidence to evaluate stress.

	Habitat Stresses							Community Stresses				Population Stresses				Human Stresses	
Common Name	*Extent*	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Chemical Pollutants*	*Sedimentation*	*Competitors*	*Predators*	*Parasites-Disease*	*Prey-Food*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Structures*	*Climate Change*
T&E SGNC:																	
Lake sturgeon	S	S	1	1	S	1	1	S	S	S	S	S	S	S	1	1	S
Western sand darter	S	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Eastern sand darter	1	S	S	S	S	1	1	S	S	S	S	S	S	S	S	1	S
Longnose sucker	0	0	0	S	1	1	0	S	S	S	S	S	1	S	S	1	S
Cisco	0	0	0	S	1	1	0	1	1	S	S	S	S	S	1	0	S
Gravel chub	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Bluebreast darter	S	S	S	S	S	1	1	S	S	S	S	S	S	S	S	1	S
Iowa darter	1	1	1	1	1	1	0	S	S	S	S	S	S	S	S	S	S
Harlequin darter	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Banded killifish	1	S	1	S	S	1	0	S	1	S	S	S	S	S	S	S	S
Starhead topminnow	1	S	1	1	S	1	1	S	1	S	S	S	S	S	S	S	S
Cypress minnow	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Bigeye chub	1	S	1	1	S	1	1	S	S	S	S	S	S	1	S	1	S
Pallid shiner	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Northern brook lamprey	S	S	S	S	S	1	S	S	S	S	S	S	S	S	S	1	S
Least brook lamprey	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Redspotted sunfish	1	S	1	1	S	1	0	S	S	S	S	S	S	S	S	S	S
Bantam sunfish	1	1	1	S	S	1	0	S	S	S	S	S	S	S	S	S	S
Sturgeon chub	1	1	1	1	1	S	1	S	S	S	S	S	S	S	S	1	S
River redhorse	S	S	S	1	S	1	1	S	S	S	S	S	S	S	S	S	S
Greater redhorse	S	S	S	1	S	1	1	S	S	S	S	S	S	S	S	1	S
River chub	S	S	1	1	S	S	1	S	S	S	S	S	S	S	S	1	S
Pugnose shiner	1	S	1	1	S	1	1	S	1	S	S	S	S	S	S	1	S
Bigeye shiner	S	S	S	1	S	S	1	S	S	S	S	S	S	S	S	1	S
Ironcolor shiner	S	1	S	S	S	1	1	S	S	S	S	S	S	S	S	S	S
Blackchin shiner	1	S	1	S	S	1	1	S	1	S	S	S	S	S	S	S	S
Blacknose shiner	1	S	1	S	S	S	1	S	S	S	S	S	S	S	S	S	S
Taillight shiner	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Weed shiner	S	S	S	S	S	1	1	S	S	S	S	S	S	S	S	S	S
Northern madtom	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	S	S
Pallid sturgeon	1	S	1	1	S	S	S	S	S	S	S	1	1	1	1	1	S

Table 21. Changes in criteria status between original and reevaluated Appendix I.

	Criteria					
Evaluation	**3**	**4**	**5**	**6**	**7**	**8**
Original N 'Yes' Status	71	46	6	6	45	36
Reevaluated N 'Yes' Status	72	67	9	0	59	36
N Change in Status*	7	33	7	6	8	18
Proportional Change in Status**	0.14	0.41	0.38	0.36	0.35	0.43

*Includes both change in status and blank values.

**Combined proportional status change for all SGNC.

Table 22. Comparison of stresses in original and reevaluated Appendix II. Change in proportion between Appendices reported as original proportion - reevaluated proportion.

Original Appendix II:

	Habitat Stresses						Community Stresses							Population Stresses				Direct Human Stresses		
	Extent	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Pollutants - Sediment*	*Competitors*	*Predators*	*Parasites - Disease*	*Prey - Food*	*Hosts*	*Invasives/Exotics*	*Other Symbionts*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Killing*	*Disturbance*	*Structure/Infrastructure*
Number of affirmatives (N=71):	58	55	59	58	27	63	30	23	0	3	1	33	0	14	38	49	12	4	5	15
Proportion:	0.82	0.77	0.83	0.82	0.38	0.89	0.42	0.32	0.00	0.04	0.01	0.46	0.00	0.20	0.54	0.69	0.17	0.06	0.07	0.21

Reevaluated Appendix II:

	Habitat Stresses							Community Stresses				Population Stresses				Human Stresses	
	Extent	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Chemical Pollutants*	*Sedimentation*	*Competitors*	*Predators*	*Parasites-Disease*	*Prey-Food*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Structures*	*Climate Change*
Number of affirmatives (N=80):	52	28	40	23	9	27	46	3	7	0	2	2	14	13	4	32	1
Proportion:	0.65	0.35	0.50	0.29	0.11	0.34	0.58	0.04	0.09	0.00	0.03	0.03	0.18	0.16	0.05	0.40	0.01

Absolute prop. change between Appendices (orig. - reeval.):	0.17	0.42	0.33	0.53	0.27	n/a	n/a	0.39	0.24	0.00	0.02	0.17	0.36	0.53	0.12	-0.19	n/a

Table 23. Site- and sample-based proportional density of all Illinois fish species. Values are number of sites or samples in a time period relative to total number of sites sampled or samples collected. Time periods are recent decade (≥2000), post-clean water act (1977-1999) and pre-clean water act (1950-1976)

	Proportional Density					
	Site-based			Sample-based		
Common Name	≥ 2000	1977-1999	1950-1976	≥ 2000	1977-1999	1950-1976
American brook lamprey	0.003	0.010	0	0.001	0.004	0
Alewife	0	0.001	0.002	0	0.001	0.001
Alligator gar	0	0.001	0	0	0.001	0
Alabama shad	0	0.001	0	0	0.001	0
American eel	0.004	0.046	0.051	0.002	0.017	0.042
Atlantic salmon	0	0	0	0	0	0
Banded darter	0.117	0.061	0.002	0.080	0.026	0.001
Banded killifish	0	0	0	0	0	0
Brassy minnow	0	0.004	0	0	0.001	0
Banded sculpin	0.019	0.019	0	0.011	0.013	0
Blubreast darter	0.002	0.001	0.002	0.002	0.001	0.001
Blue catfish	0.026	0.033	0.035	0.025	0.029	0.026
Blackchin shiner	0.002	0	0	0.001	0	0
Bigmouth buffalo	0.188	0.270	0.374	0.169	0.260	0.357
Bigeye chub	0.009	0.001	0.002	0.005	0.001	0.001
Bigeye shiner	0.009	0.011	0.008	0.005	0.005	0.004
Bighead carp	0.033	0.005	0	0.024	0.002	0
Bluehead shiner	0	0	0	0	0	0
Black buffalo	0.135	0.157	0.047	0.112	0.103	0.025
Blackfin cisco	0.001	0.001	0	0.001	0.001	0
Blacknose dace	0.087	0.071	0.010	0.052	0.027	0.005
Brook stickleback	0.014	0.013	0	0.007	0.005	0
Brook trout	0	0	0	0	0	0
Black bullhead	0.111	0.212	0.219	0.059	0.091	0.135
Black crappie	0.235	0.308	0.487	0.204	0.347	0.521
Blackside darter	0.230	0.157	0.088	0.136	0.065	0.046
Bluegill	0.745	0.794	0.657	0.630	0.720	0.641
Bloater	0	0	0	0	0	0
Black redhorse	0.091	0.103	0.003	0.057	0.061	0.002
Bluntnose minnow	0.745	0.731	0.392	0.517	0.383	0.180
Blackstripe topminnow	0.449	0.332	0.145	0.280	0.140	0.087
Bigmouth shiner	0.249	0.284	0.116	0.152	0.118	0.056
Blacknose shiner	0.001	0.003	0	0.001	0.001	0
Bowfin	0.093	0.167	0.253	0.080	0.136	0.196
Banded pygmy sunfish	0.001	0.001	0	0.001	0.001	0
Brown bullhead	0.009	0.017	0.007	0.005	0.009	0.003
Brindled madtom	0.028	0.022	0.037	0.023	0.010	0.019
Brook silverside	0.171	0.186	0.044	0.127	0.119	0.023
Brown trout	0.002	0.001	0	0.001	0.001	0
Bantam sunfish	0.001	0.001	0	0.001	0.001	0
Blackspotted topminnow	0.071	0.091	0	0.041	0.049	0
Blacktail shiner	0.005	0.001	0	0.004	0.001	0

Table 23 (continued). Site- and sample-based proportional density of all Illinois fish species.

	Proportional Density					
	Site-based			Sample-based		
Common Name	≥ 2000	1977-1999	1950-1976	≥ 2000	1977-1999	1950-1976
Burbot	0	0	0	0	0	0
Bluntnose darter	0.014	0.013	0.002	0.007	0.005	0.001
Bullhead minnow	0.198	0.204	0.039	0.177	0.152	0.023
Blue sucker	0.020	0.029	0.017	0.030	0.029	0.012
Carp	0.565	0.772	0.727	0.511	0.769	0.814
Channel catfish	0.408	0.562	0.561	0.428	0.600	0.542
Creek chubsucker	0.120	0.128	0.094	0.072	0.051	0.050
Central mudminnow	0.045	0.015	0	0.023	0.005	0
Chestnut lamprey	0.004	0.013	0.020	0.002	0.006	0.014
Coho salmon	0.002	0.001	0	0.001	0.001	0
Channel shiner	0.055	0.017	0	0.045	0.008	0
Common shiner	0.107	0.135	0.076	0.067	0.059	0.036
Central stoneroller	0.521	0.135	0.007	0.353	0.132	0.003
Creek chub	0.530	0.483	0.246	0.351	0.207	0.134
Crystal darter	0	0	0	0	0	0
Cisco	0	0	0	0	0	0
Cyress darter	0.003	0.001	0	0.001	0.001	0
Cyress minnow	0	0.001	0	0	0.001	0
Dusky darter	0.037	0.033	0.013	0.027	0.015	0.006
Emerald shiner	0.220	0.289	0.185	0.237	0.286	0.122
Eastern sand darter	0.005	0.002	0	0.005	0.001	0
Fantial darter	0.161	0.118	0.008	0.103	0.051	0.005
Flathead catfish	0.204	0.284	0.241	0.231	0.304	0.204
Fall chinook salmon	0	0	0	0	0	0
Fringed darter	0.004	0.002	0	0.002	0.001	0
Fathead minnow	0.133	0.197	0.057	0.072	0.079	0.026
Flathead chub	0	0.001	0.002	0	0.001	0.001
Flier	0.013	0.016	0.010	0.006	0.006	0.005
Fourhorn sculpin	0	0	0	0	0	0
Freshwater drum	0.313	0.430	0.487	0.351	0.537	0.591
Freckled madtom	0.048	0.061	0.007	0.030	0.027	0.003
Ghost shiner	0.001	0.003	0.002	0.001	0.001	0.001
Gilt darter	0	0	0	0	0	0
Goldfish	0.056	0.091	0.069	0.041	0.069	0.050
Goldeye	0.041	0.065	0.125	0.036	0.057	0.104
Golden redhorse	0.428	0.496	0.261	0.311	0.337	0.166
Golden shiner	0.181	0.227	0.111	0.102	0.123	0.067
Grass carp	0.085	0.036	0.002	0.069	0.015	0.001
Greenside darter	0.042	0.030	0.010	0.033	0.013	0.005
Grass pickerel	0.199	0.194	0.167	0.114	0.087	0.089
Greater redhorse	0.007	0.006	0	0.004	0.002	0
Green sunfish	0.772	0.825	0.519	0.561	0.516	0.309
Gravel chub	0.008	0.012	0.002	0.004	0.009	0.001
Gizzard shad	0.423	0.573	0.589	0.418	0.625	0.669

Table 23 (continued). Site- and sample-based proportional density of all Illinois fish species.

	Proportional Density					
	Site-based			Sample-based		
Common Name	≥ 2000	1977-1999	1950-1976	≥ 2000	1977-1999	1950-1976
Harlequin darter	0	0.001	0.002	0	0.001	0.001
Highfin carpsucker	0.095	0.178	0.091	0.058	0.113	0.063
Hornyhead chub	0.381	0.294	0.056	0.273	0.136	0.026
Inland silversides	0.016	0.007	0	0.016	0.003	0
Johnny darter	0.457	0.375	0.177	0.308	0.162	0.096
Lake chub	0	0.001	0	0	0.001	0
Lake sturgeon	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0
Lake whitefish	0	0	0	0	0	0
Least brook lamprey	0	0.001	0	0	0.001	0
Lake chubsucker	0.017	0.001	0.002	0.010	0.001	0.001
Least darter	0.004	0.001	0	0.003	0.001	0
Longnose dace	0.009	0.002	0	0.004	0.002	0
Largemouth bass	0.666	0.706	0.606	0.544	0.621	0.565
Longnose sucker	0	0	0	0	0	0
Longnose gar	0.103	0.149	0.221	0.073	0.122	0.192
Logperch	0.132	0.145	0.077	0.087	0.091	0.040
Longear sunfish	0.390	0.408	0.256	0.312	0.265	0.158
Largescale stoneroller	0.045	0.016	0	0.027	0.006	0
Mimic shiner	0.024	0.034	0.008	0.014	0.013	0.004
Mosquitofish	0.179	0.152	0.035	0.104	0.066	0.019
Mountain madtom	0.003	0.005	0.002	0.001	0.002	0.002
Mooneye	0.023	0.063	0.210	0.018	0.052	0.217
Mottled sculpin	0.011	0.002	0	0.007	0.001	0
Mud darter	0.036	0.042	0.008	0.021	0.016	0.004
Muskellunge	0.010	0.006	0	0.006	0.002	0
Northern brook lamprey	0	0.003	0	0	0.001	0
Northern hog sucker	0.249	0.277	0.111	0.177	0.161	0.063
Northern madtom	0.001	0	0	0.001	0	0
Northern pike	0.065	0.106	0.136	0.041	0.082	0.103
Northern studfish	0.001	0	0	0.001	0	0
Ninespine stickleback	0	0.002	0	0	0.001	0
Orangethroat darter	0.223	0.123	0.030	0.143	0.055	0.015
Orangespotted sunfish	0.294	0.286	0.279	0.228	0.241	0.217
Iowa darter	0	0.002	0.002	0	0.001	0.001
Oriental weatherfish	0	0	0	0	0	0
Ozark minnow	0.016	0.008	0	0.011	0.003	0
Paddlefish	0.010	0.020	0.086	0.007	0.009	0.050
Pallid sturgeon	0	0	0	0	0	0
Pink salmon	0	0	0	0	0	0
Plains minnow	0	0	0.002	0	0	0.001
Pallid shiner	0.001	0	0	0.001	0	0
Pirate perch	0.155	0.148	0.113	0.092	0.058	0.056
Pumpkinseed	0.056	0.076	0.059	0.033	0.071	0.036

Table 23 (continued). Site- and sample-based proportional density of all Illinois fish species.

	Proportional Density					
	Site-based			Sample-based		
Common Name	≥ 2000	1977-1999	1950-1976	≥ 2000	1977-1999	1950-1976
Pugnose minnow	0.021	0.028	0.003	0.014	0.013	0.002
Pugnose shiner	0.001	0.001	0	0.001	0.001	0
Rainbow darter	0.068	0.042	0.027	0.047	0.026	0.014
Rainbow smelt	0	0	0	0	0	0
Ribbon shiner	0.017	0.029	0.019	0.008	0.012	0.012
Rainbow trout	0.004	0.002	0	0.002	0.001	0
Ironcolor shiner	0.017	0.004	0	0.011	0.002	0
Redfin shiner	0.371	0.329	0.184	0.226	0.140	0.102
Red shiner	0.391	0.460	0.204	0.293	0.230	0.106
Rock bass	0.184	0.161	0.123	0.131	0.115	0.084
Round goby	0.009	0	0	0.005	0	0
Rosefin shiner	0	0	0	0	0	0
Round whitefish	0	0	0	0	0	0
River chub	0.001	0.001	0.003	0.001	0.001	0.002
Redear sunfish	0.077	0.085	0.025	0.065	0.043	0.012
Rudd	0	0	0	0	0	0
River carpsucker	0.251	0.406	0.478	0.246	0.418	0.516
River darter	0.006	0.004	0	0.003	0.001	0
River redhorse	0.014	0.020	0.013	0.010	0.027	0.010
River shiner	0.051	0.065	0.045	0.040	0.055	0.027
Rosyface shiner	0.099	0.084	0.003	0.065	0.036	0.002
Smallmouth buffalo	0.219	0.326	0.433	0.258	0.400	0.457
Sauger	0.096	0.156	0.229	0.105	0.178	0.304
Sand shiner	0.509	0.506	0.182	0.359	0.240	0.094
Striped x White bass	0.032	0.026	0	0.028	0.011	0
Silver carp	0.072	0.010	0	0.062	0.003	0
Spotted sucker	0.135	0.131	0.131	0.106	0.099	0.092
Sea lamprey	0	0	0	0	0	0
Steelcolor shiner	0.090	0.117	0.066	0.072	0.056	0.041
Spotfin shiner	0.362	0.341	0.125	0.306	0.251	0.073
Sturgeon chub	0	0	0	0	0	0
Stargazing darter	0	0	0	0	0	0
Slenderhead darter	0.137	0.120	0.015	0.088	0.052	0.008
Shortnose gar	0.152	0.195	0.300	0.142	0.184	0.295
Shorthead redhorse	0.332	0.420	0.264	0.271	0.360	0.217
Shovelnose sturgeon	0.012	0.013	0.007	0.013	0.011	0.003
Starhead topminnow	0.009	0.002	0.007	0.005	0.001	0.003
Silverjaw minnow	0.112	0.101	0.099	0.081	0.045	0.063
Sicklefin chub	0	0	0	0	0	0
Skipjack herring	0.068	0.096	0.106	0.097	0.111	0.088
Slough darter	0.044	0.074	0.010	0.025	0.025	0.005
Slender madtom	0.041	0.016	0.002	0.023	0.008	0.001
Slimy sculpin	0	0	0	0	0	0
Smallmouth bass	0.376	0.356	0.209	0.313	0.300	0.156

Table 23 (continued). Site- and sample-based proportional density of all Illinois fish species.

	Proportional Density					
	Site-based			Sample-based		
Common Name	≥ 2000	1977-1999	1950-1976	≥ 2000	1977-1999	1950-1976
Spring cavefish	0	0	0	0	0	0
Spoonhead sculpin	0	0	0	0	0	0
Spotted bass	0.100	0.146	0.093	0.117	0.121	0.080
Speckled chub	0.004	0.008	0	0.002	0.003	0
Spottail darter	0.004	0.007	0.003	0.002	0.003	0.003
Spotted gar	0.039	0.041	0.035	0.026	0.018	0.028
Spottail shiner	0.039	0.054	0.034	0.025	0.048	0.019
Southern redbelly dace	0.055	0.039	0.013	0.032	0.014	0.006
Spotted (Redspotted) sunfish	0.007	0.006	0	0.004	0.002	0
Striped bass	0.017	0.022	0	0.019	0.009	0
Stonecat	0.184	0.181	0.047	0.113	0.081	0.026
Stripetail darter	0.005	0.014	0	0.002	0.008	0
Striped mullet	0.003	0.002	0	0.002	0.001	0
Striped shiner	0.305	0.274	0.077	0.212	0.134	0.043
Suckermouth minnow	0.251	0.358	0.111	0.162	0.161	0.064
Silver chub	0.053	0.077	0.042	0.044	0.042	0.036
Silver lamprey	0.002	0.013	0.007	0.001	0.006	0.008
Silvery minnow	0.105	0.062	0.044	0.090	0.032	0.037
Silver redhorse	0.155	0.193	0.067	0.099	0.138	0.048
Silverband shiner	0.010	0.026	0.002	0.006	0.015	0.001
Tiger muskie	0	0.003	0	0	0.001	0
Threadfin shad	0.057	0.069	0.012	0.069	0.046	0.007
Mozambique tilapia	0	0	0	0	0	0
Taillight shiner	0	0	0	0	0	0
Tubnose goby	0	0	0	0	0	0
Tadpole madtom	0.138	0.131	0.040	0.077	0.050	0.021
Troutperch	0.001	0.001	0.002	0.001	0.001	0.001
Threespine stickleback	0	0.002	0	0	0.003	0
Tiger trout	0	0	0	0	0	0
Quillback	0.317	0.474	0.320	0.220	0.355	0.248
Walleye	0.109	0.166	0.190	0.085	0.177	0.172
Warmouth	0.118	0.192	0.168	0.102	0.133	0.122
White catfish	0	0.001	0	0	0.001	0
Weed shiner	0.012	0.004	0.003	0.006	0.002	0.002
White bass	0.152	0.251	0.357	0.207	0.373	0.410
White crappie	0.158	0.352	0.498	0.150	0.325	0.519
White perch	0.007	0.003	0	0.006	0.001	0
White sucker	0.592	0.543	0.305	0.402	0.263	0.162
Western sand darter	0.004	0.001	0	0.003	0.001	0
Saugeye hybrid	0.004	0.009	0	0.002	0.003	0
Western silvery minnow	0.001	0.001	0.003	0.001	0.001	0.002
Yellow bullhead	0.477	0.455	0.273	0.298	0.212	0.155
Yellow perch	0.027	0.038	0.042	0.017	0.035	0.037
Yellow bass	0.077	0.127	0.072	0.059	0.085	0.040

Table 24. Species included in the IDNR streams FAS database without collection records.

Common name	Scientific name
Atlantic salmon	*Salmo salar*
Banded killifish	*Fundulus diaphanus*
Bloater	*Coregonus hoyi*
Bluehead shiner	*Pteronotropis hubbsi*
Brook trout	*Salvelinus fontinalis*
Burbot	*Lota lota*
Cisco	*Coregonus artedi*
Crystal darter	*Crystallaria asprella*
Fall chinook salmon	*Oncorhynchus tshawytscha*
Fourhorn sculpin	*Myoxocephalus quadricornis*
Gilt darter	*Percina evides*
Lake sturgeon	*Acipenser fulvescens*
Lake trout	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Longnose sucker	*Catostomus catostomus*
Mozambique tilapia	*Tilapia mossambica*
Oriental weatherfish	*Misgurnus anguillicaudatus*
Pallid sturgeon	*Scaphirhynchus albus*
Pink salmon	*Oncorhynchus gorbuscha*
Rainbow smelt	*Osmerus mordax*
Rosefin shiner	*Lythrurus ardens*
Round whitefish	*Prosopium cylindraceum*
Rudd	*Scardinius erythrophthalmus*
Sea lamprey	*Petromyzon marinus*
Sicklefin chub	*Macrhybopsis meeki*
Slimy sculpin	*Cottus cognatus*
Spoonhead sculpin	*Cottus ricei*
Spring cavefish	*Forbesichthys agassizi*
Stargazing darter	*Percina uranidea*
Sturgeon chub	*Macrhybopsis gelida*
Taillight shiner	*Notropis maculatus*
Tiger trout	*Salvelinus fontinalis x Salmo trutta*
Tubnose goby	*Proterorhinus marmoratus*

Table 25. Species recorded at one percent or fewer sample locations (IDNR streams FAS) and not currently included on the SGNC list.

Common name	Proportional density (2000-2010 period)
Alabama shad	0
Alligator gar	0
Bleeding shiner	0
Bloater	0
Brassy minnow	0
Burbot	0
Chestnut lamprey	0.004
Flathead chub	0
Least darter	0.004
Ninespine stickleback	0
Plains minnow	0
Redside dace	0
River darter	0.006
Round whitefish	0
Slimy sculpin	0
Speckled chub	0.004
Stripetail darter	0.005
Threespine stickleback	0

Table 26. Proportional change in site-based proportional density between the ≥2000 (most recent decade) and 1977-1999 (post-clean water act) time periods.

Common Name	≥2000/1977-1999	Common Name	≥2000/1977-1999
Alabama shad	0.00	Brown bullhead	0.52
Alewife	0.00	Brown trout	3.00
Alligator gar	0.00	Bullhead minnow	0.97
American brook lamprey	0.29	Burbot	n/a
American eel	0.08	Carp	0.73
Atlantic salmon	n/a	Central mudminnow	3.00
Banded darter	1.91	Central stoneroller	3.85
Banded killifish	n/a	Channel catfish	0.73
Banded pygmy sunfish	2.00	Channel shiner	3.22
Banded sculpin	1.00	Chestnut lamprey	0.28
Bantam sunfish	1.00	Cisco	n/a
Bigeye chub	6.00	Coho salmon	3.00
Bigeye shiner	0.80	Common shiner	0.80
Bighead carp	6.43	Creek chub	1.10
Bigmouth buffalo	0.70	Creek chubsucker	0.94
Bigmouth shiner	0.88	Crystal darter	n/a
Black buffalo	0.86	Cyress darter	2.00
Black bullhead	0.52	Cyress minnow	0.00
Black crappie	0.76	Dusky darter	1.11
Black redhorse	0.89	Eastern sand darter	2.33
Blackchin shiner	n/a	Emerald shiner	0.76
Blackfin cisco	1.00	Fall chinook salmon	n/a
Blacknose dace	1.23	Fantial darter	1.36
Blacknose shiner	0.25	Fathead minnow	0.68
Blackside darter	1.46	Freshwater drum	0.73
Blackspotted topminnow	0.77	Flathead catfish	0.72
Blackstripe topminnow	1.35	Flathead chub	0.00
Blacktail shiner	7.00	Flier	0.77
Bloater	n/a	Fourhorn sculpin	n/a
Blubreast darter	1.50	Freckled madtom	0.79
Blue catfish	0.80	Fringed darter	1.67
Blue sucker	0.69	Ghost shiner	0.50
Bluegill	0.94	Gilt darter	n/a
Bluehead shiner	n/a	Gizzard shad	0.74
Bluntnose darter	1.12	Golden redhorse	0.86
Bluntnose minnow	1.02	Golden shiner	0.80
Bowfin	0.56	Goldeye	0.63
Brassy minnow	0.00	Goldfish	0.61
Brindled madtom	1.28	Grass carp	2.33
Brook silverside	0.92	Grass pickerel	1.02
Brook stickleback	1.06	Gravel chub	0.69
Brook trout	n/a	Greater redhorse	1.25

Table 26 (continued). Proportional change in site-based proportional density between the ≥2000 and 1977-1999 time periods .

Common Name	≥2000/1977-1999	Common Name	≥2000/1977-1999
Green sunfish	0.94	Pallid shiner	n/a
Greenside darter	1.40	Pallid sturgeon	n/a
Harlequin darter	0.00	Pumpkinseed	0.74
Highfin carpsucker	0.54	Pink salmon	n/a
Hornyhead chub	1.30	Pirate perch	1.05
Inland silversides	2.10	Plains minnow	n/a
Iowa darter	0.00	Pugnose minnow	0.74
Ironcolor shiner	3.83	Pugnose shiner	0.50
Johnny darter	1.22	Quillback	0.67
Lake chub	0.00	Rainbow darter	1.61
Lake chubsucker	11.50	Rainbow smelt	n/a
Lake sturgeon	n/a	Rainbow trout	2.00
Lake trout	n/a	Red shiner	0.85
Lake whitefish	n/a	Redear sunfish	0.90
Largemouth bass	0.94	Redfin shiner	1.13
Largescale stoneroller	2.77	Ribbon shiner	0.59
Least brook lamprey	0.00	River carpsucker	0.62
Least darter	3.00	River chub	0.50
Logperch	0.91	River darter	1.60
Longear sunfish	0.96	River redhorse	0.70
Longnose dace	4.00	River shiner	0.78
Longnose gar	0.69	Rock bass	1.14
Longnose sucker	n/a	Rosefin shiner	n/a
Mimic shiner	0.70	Rosyface shiner	1.18
Mooneye	0.36	Round goby	n/a
Mosquitofish	1.18	Round whitefish	n/a
Mottled sculpin	5.00	Rudd	n/a
Mountain madtom	0.57	Sand shiner	1.01
Mozambique tilapia	n/a	Sauger	0.61
Mud darter	0.88	Saugeye hybrid	0.42
Muskellunge	1.75	Sea lamprey	n/a
Ninespine stickleback	0.00	Shorthead redhorse	0.79
Northern brook lamprey	0.00	Shortnose gar	0.78
Northern hog sucker	0.90	Shovelnose sturgeon	0.89
Northern madtom	n/a	Sicklefin chub	n/a
Northern pike	0.62	Silver carp	7.46
Northern studfish	n/a	Silver chub	0.69
Orangespotted sunfish	1.03	Silver lamprey	0.17
Orangethroat darter	1.82	Silver redhorse	0.80
Oriental weatherfish	n/a	Silverband shiner	0.40
Ozark minnow	1.91	Silverjaw minnow	1.10
Paddlefish	0.52	Silvery minnow	1.68

Table 26 (continued). Proportional change in site-based proportional density between the ≥2000 and 1977-1999 time periods .

Common Name	≥2000/1977-1999	Common Name	≥2000/1977-1999
Skipjack herring	0.71	White bass	0.61
Slender madtom	2.50	White catfish	0.00
Slenderhead darter	1.14	White crappie	0.45
Slimy sculpin	n/a	White perch	2.25
Slough darter	0.59	White sucker	1.09
Smallmouth bass	1.06	Yellow bass	0.60
Smallmouth buffalo	0.67	Yellow bullhead	1.05
Southern redbelly dace	1.40	Yellow perch	0.71
Speckled chub	0.45		
Spoonhead sculpin	n/a		
Spotfin shiner	1.06		
Spottail darter	0.60		
Spottail shiner	0.73		
Spotted (Redspotted) sunfish	1.25		
Spotted bass	0.68		
Spotted gar	0.95		
Spotted sucker	1.03		
Spring cavefish	n/a		
Stargazing shiner	n/a		
Starhead topminnow	4.00		
Steelcolor shiner	0.77		
Stonecat	1.02		
Striped bass	0.77		
Striped mullet	1.33		
Striped shiner	1.11		
Striped x White bass	1.23		
Stripetail darter	0.37		
Sturgeon chub	n/a		
Suckermouth minnow	0.70		
Tadpole madtom	1.06		
Taillight shiner	n/a		
Threadfin shad	0.82		
Threespine stickleback	0.00		
Tiger muskie	0.00		
Tiger trout	n/a		
Troutperch	0.50		
Tubnose goby	n/a		
Walleye	0.66		
Warmouth	0.62		
Weed shiner	2.67		
Western sand darter	2.50		
Western silvery minnow	2.00		

Table 27. Species possessing characteristics that suggest need for conservation. Species on this list are rare (≤0.01 site proportional density), declining (≥0.50 decline in site proportional density from 1997- 1999), have a state (S) or global (G) conservation rank of 3 or less, are SGNC in within Illinois' ecoregion (GIS Gap analysis), or are vulnerable to climate change. Species excluded from this list are sportfish, exotic or exhibit a proportional density > 10% of sites and has experienced a < 25% decline.

Common name	Reason for inclusion
Alabama shad	G3 global conservation rank, rare, declining
Alligator gar	G3 global conservation rank, rare, declining
Bigmouth buffalo	S3S4 state conservation rank
Blackspotted topminnow	S3S4 state conservation rank
Bleeding shiner	rare
Bloater	S1 state conservation rank, rare
Bowfin	S3 state conservation rank
Brassy minnow	S1S2 state conservation rank, rare, declining
Brindled madtom	S3 state conservation rank
Burbot	S1S2 state conservation rank, rare
Chestnut lamprey	S3 state conservation rank, rare, declining
Dusky darter	S2S3 state conservation rank
Flathead chub	GIS gap analysis, rare, declining
Freckled madtom	S2S3 state conservation rank
Goldeye	S2S3 state conservation rank
Greenside darter	S3 state conservation rank
Least darter	S2S3 state conservation rank, rare
Longnose gar	S3 state conservation rank
Mimic shiner	S3 state conservation rank
Mooneye	S2S3 state conservation rank, declining
Mud darter	S3 state conservation rank
Ninespine stickleback	S1S2 state conservation rank, rare, declining
Plains minnow	S2 state conservation rank, rare
Pumpkinseed	S3S4 state conservation rank
Quillback	GIS Gap Analysis
Rainbow darter	GIS Gap Analysis
Redside dace	G3G4 global conservation rank, rare
River darter	S2S3 state conservation rank, rare
River shiner	GIS Gap Analysis
Round whitefish	rare
Silver chub	GIS Gap Analysis
Skipjack herring	S3 state conservation rank
Slimy sculpin	S1 state conservation rank, rare
Slough darter	GIS Gap Analysis
Smallmouth buffalo	S3S4 state conservation rank
Speckled chub	G3 global conservation rank, rare, declining
Spotted gar	S2S3 state conservation rank
Steelcolor shiner	S3 state conservation rank
Stripetail darter	S2S3 state conservation rank, rare, declining
Suckermouth minnow	GIS Gap Analysis
Tadpole madtom	GIS Gap Analysis
Threespine stickleback	rare, declining
Western silvery minnow	S2 state conservation rank

Table 28. Extremely (EV) or highly vulnerable (HV) fish species as assessed by Walk et al. (2011) and Small-Lorenz (2012). Walk et al. categorization is representative of the most vulnerable assessment from all watersheds evaluations. Species also may not have been assessed (n/a) or may have received a lower vulnerability ranking (LR). Muskellunge was evaluated by fisheries experts as stressed by climate change.

Common Name	Walk et al. Category	Small-Lorenz Category
American brook lamprey	EV	LR
Banded darter	n/a	EV
Banded pygmy sunfish	n/a	EV
Blackchin shiner	n/a	HV
Blacknose dace	EV	EV
Bluebreast darter	n/a	EV
Brindled madtom	n/a	HV
Brook stickleback	HV	EV
Brown trout	n/a	HV
Central mudminnow	HV	LR
Central stoneroller	n/a	HV
Cypress darter	n/a	HV
Eastern sand darter	HV	LR
Fantail darter	n/a	EV
Flier	HV	LR
Greenside darter	n/a	EV
Hornyhead chub	n/a	EV
Iowa darter	HV	LR
Ironcolor shiner	EV	LR
Mottled sculpin	EV	EV
Muskellunge	n/a	LR
Ninespine stickleback	n/a	HV
Northern brook lamprey	n/a	HV
Orangethroat darter	n/a	HV
Rainbow darter	n/a	HV
Rainbow smelt	n/a	HV
River shiner	n/a	HV
Sea lamprey	n/a	HV
Smallmouth bass	n/a	HV
Southern redbelly dace	EV	EV
Spottail darter	n/a	HV
Steelcolor shiner	n/a	HV
Stonecat	n/a	EV
Weed shiner	EV	LR

Table 29. Species with abundance and distribution patterns suggesting they are not rare or declining. Species on this list are, at a minimum, not rare (> 0.01 site-based proportional density) and are not decreasing in abundance or distribution.

Common name	Reason
Highfin carpsucker	> 0.05 proportional density
Mottled sculpin	> 0.01 proportional density, increasing in abundance and distribution
Banded sculpin	> 0.01 proportional density, increasing in abundance and distribution
Brook stickleback	> 0.01 proportional density, increasing in abundance and distribution
Blue sucker	> 0.01 proportional density, increasing in abundance and distribution
Lake chubsucker	> 0.01 proportional density, increasing in abundance and distribution
Bluntnose darter	> 0.01 proportional density, increasing in abundance and distribution
Smallmouth bass	> 0.25 proportional density, increasing in abundance and distribution
Spotted bass	> 0.10 proportional density
Black redhorse	> 0.05 proportional density, increasing in abundance and distribution
Ozark minnow	> 0.01 proportional density, increasing in abundance and distribution
Rosyface shiner	> 0.05 proportional density, increasing in abundance and distribution
Slender madtom	> 0.01 proportional density, increasing in abundance and distribution
Southern redbelly dace	> 0.05 proportional density, increasing in abundance and distribution
Blacknose dace	> 0.05 proportional density, increasing in abundance and distribution
Shovelnose sturgeon	> 0.01 proportional density, increasing in abundance and distribution
Sauger	> 0.05 proportional density, increasing in abundance
Walleye	> 0.10 proportional density, increasing in abundance

Appendix A

List of evaluated SGNC and sportfish.

Appendix A. List of evaluated Species in Greatest Need of Conservation (SGNC) and sportfish.

Common Name	Scientific Name	Category
American eel	*Lampetra appendix*	Non-T&E SGNC
Brown bullhead	*Ameiurus nebulosus*	Non-T&E SGNC
Largescale stoneroller	*Campostoma oligolepis*	Non-T&E SGNC
Highfin carpsucker	*Carpiodes velifer*	Non-T&E SGNC
Flier	*Centrarchus macropterus*	Non-T&E SGNC
Lake whitefish	*Coregonus clupeaformis*	Non-T&E SGNC
Mottled sculpin	*Cottus bairdii*	Non-T&E SGNC
Banded sculpin	*Cottus carolinae*	Non-T&E SGNC
Lake chub	*Couesius plumbeus*	Non-T&E SGNC
Crystal darter	*Crystallaria asprella*	Non-T&E SGNC
Brook stickleback	*Culaea inconstans*	Non-T&E SGNC
Blue sucker	*Cycleptus elongatus*	Non-T&E SGNC
Blacktail shiner	*Cyprinella venusta*	Non-T&E SGNC
Banded pygmy sunfish	*Elassoma zonatum*	Non-T&E SGNC
Lake chubsucker	*Erimyzon sucetta*	Non-T&E SGNC
Northern pike	*Esox lucius*	Non-T&E SGNC
Muskellunge	*Esox masquinongy*	Non-T&E SGNC
Bluntnose darter	*Etheostoma chlorosoma*	Non-T&E SGNC
Fringed darter	*Etheostoma crossopterum*	Non-T&E SGNC
Cypress darter	*Etheostoma proeliare*	Non-T&E SGNC
Spottail darter	*Etheostoma squamiceps*	Non-T&E SGNC
Spring cavefish	*Forbesichthys agassizi*	Non-T&E SGNC
Silver lamprey	*Ichthyomyzon unicuspis*	Non-T&E SGNC
American brook lamprey	*Lampetra appendix*	Non-T&E SGNC
Ribbon shiner	*Lythrurus fumeus*	Non-T&E SGNC
Sicklefin chub	*Macrhybopsis meeki*	Non-T&E SGNC
Smallmouth bass	*Micropterus dolomieu*	Non-T&E SGNC
Spotted bass	*Micropterus punctulatus*	Non-T&E SGNC
Black redhorse	*Moxostoma duquesnei*	Non-T&E SGNC
Fourhorn sculpin	*Myoxocephalus quadricornis*	Non-T&E SGNC
Ghost shiner	*Notropis buchanani*	Non-T&E SGNC
Ozark minnow	*Notropis nubilus*	Non-T&E SGNC
Rosyface shiner	*Notropis rubellus*	Non-T&E SGNC
Silverband shiner	*Notropis shumardi*	Non-T&E SGNC
Mountain madtom	*Noturus eleutherus*	Non-T&E SGNC
Slender madtom	*Noturus exilis*	Non-T&E SGNC
Pugnose minnow	*Opsopoeodus emiliae*	Non-T&E SGNC
Yellow perch	*Perca flavescens*	Non-T&E SGNC
Trout-perch	*Percopsis omiscomaycus*	Non-T&E SGNC
Southern redbelly dace	*Phoxinus erythrogaster*	Non-T&E SGNC
North American paddlefish	*Polyodon spathula*	Non-T&E SGNC
Blacknose dace	*Rhinichthys atratulus*	Non-T&E SGNC
Longnose dace	*Rhinichthys cataractae*	Non-T&E SGNC
Brook trout	*Salvelinus fontinalis*	Non-T&E SGNC
Lake trout	*Salvelinus namaycush*	Non-T&E SGNC
Shovelnose sturgeon	*Scaphirhynchus platorynchus*	Non-T&E SGNC
Sauger	*Stizostedion canadense*	Non-T&E SGNC
Walleye	*Stizostedion vitreum*	Non-T&E SGNC

Appendix A (continued). List of evaluated Species in Greatest Need of Conservation (SGNC) and sportfish.

Common Name	Scientific Name	Category
Central mudminnow	*Umbra limi*	Non-T&E SGNC
Largemouth bass	*Micropterus salmoides*	Sportfish
Channel catfish	*Ictalurus punctatus*	Sportfish
Redear sunfish	*Lepomis microlophus*	Sportfish
White crappie	*Pomoxis annularis*	Sportfish
Black crappie	*Pomoxis nigromaculatus*	Sportfish
Lake sturgeon	*Acipenser fulvescens*	T&E SGNC
Western sand darter	*Ammocrypta clara*	T&E SGNC
Eastern sand darter	*Ammocrypta pellucida*	T&E SGNC
Longnose sucker	*Catostomus catostomus*	T&E SGNC
Cisco	*Coregonus artedii*	T&E SGNC
Gravel chub	*Erimystax x-punctatus*	T&E SGNC
Bluebreast darter	*Etheostoma camurum*	T&E SGNC
Iowa darter	*Etheostoma exile*	T&E SGNC
Harlequin darter	*Etheostoma histrio*	T&E SGNC
Banded killifish	*Fundulus diaphanus*	T&E SGNC
Starhead topminnow	*Fundulus dispar*	T&E SGNC
Cypress minnow	*Hybognathus hayi*	T&E SGNC
Bigeye chub	*Hybopsis amblops*	T&E SGNC
Pallid shiner	*Scaphirhynchus albus*	T&E SGNC
Northern brook lamprey	*Ichthyomyzon fossor*	T&E SGNC
Least brook lamprey	*Lampetra aepyptera*	T&E SGNC
Redspotted sunfish	*Lepomis miniatus*	T&E SGNC
Bantam sunfish	*Lepomis symmetricus*	T&E SGNC
Sturgeon chub	*Macrhybopsis gelida*	T&E SGNC
River redhorse	*Moxostoma carinatum*	T&E SGNC
Greater redhorse	*Moxostoma valenciennesi*	T&E SGNC
River chub	*Nocomis micropogon*	T&E SGNC
Pugnose shiner	*Notropis anogenus*	T&E SGNC
Bigeye shiner	*Notropis boops*	T&E SGNC
Ironcolor shiner	*Notropis chalybaeus*	T&E SGNC
Blackchin shiner	*Notropis heterodon*	T&E SGNC
Blacknose shiner	*Notropis heterolepis*	T&E SGNC
Taillight shiner	*Notropis maculatus*	T&E SGNC
Weed shiner	*Notropis texanus*	T&E SGNC
Northern madtom	*Noturus stigmosus*	T&E SGNC
Pallid sturgeon	*Scaphirhynchus albus*	T&E SGNC

Appendix B

Format used for survey of fisheries experts.

Fish SGNC - Minnow, suckers, sunfish

1. Respondent Information

This information will be used to evaluate characteristics of respondents. None of this information will be used to identify individuals within prepared documents, nor will it be distributed to any other groups or individuals.

***1. Respondent Name**

***2. Respondent Title/Position and Organization (e.g. fishery professional, academic professional, graduate student, non-for-profit professional).**

3. Respondent Email Address (in case we need clarification regarding answers to survey).

Fish SGNC - Minnow, suckers, sunfish

2. Largescale stoneroller (Campostoma oligolepis)

Please provide your assessment of this species' population status, habitat preference, and stressors. You may skip all or parts of this page if you choose.

1. Is the species rare in Illinois or has it significantly declined in abundance or distribution from historical levels? You may select multiple options.

- [ ] Rare
- [ ] Declined in abundance from historical levels
- [ ] Declined in distribution from historical levels
- [ ] Increased in abundance from historical levels
- [ ] Increased in distribution from historical levels
- [ ] Stable
- [ ] Unknown status

2. Is the species dependent upon a rare or vulnerable habitat for one or more life history needs? Select one option.

- ◯ Yes
- ◯ No
- ◯ Unknown

If yes, please specify habitat.

3. Is the species representative of broad array of other species found in a particular habitat? This is a focal species that is indicative of a particular community type (e.g. coolwater, near-shore Lake Michigan, large river). Select one option.

- ◯ Yes
- ◯ No
- ◯ Unknown

If yes, please specify community type.

Fish SGNC - Minnow, suckers, sunfish

4. What is the preferred waterbody type of this species? Select one or more options for species' preferred waterbody.

- [ ] Lakes/reservoirs
- [ ] Lake Michigan
- [ ] Rivers
- [ ] Streams
- [ ] Backwaters
- [ ] Swamps
- [ ] Caves

5. What is the preferred habitat type of this species? Select one or more options for species' preferred instream habitat type.

- [ ] Riffle
- [ ] Run
- [ ] Pool
- [ ] N/A (habitat preferrence does not fit these categories)

6. What is the preferred substrate of this species? Select one or more options for species' preferred stubstrate.

- [ ] Sand
- [ ] Gravel
- [ ] Rock
- [ ] Wood
- [ ] Silt/mud

7. Does the species have a preferrence for a special category of habitat? Select one or more options for species' preference for specific habitat characteristics.

- [ ] High-gradient
- [ ] Low-gradient
- [ ] Still waters
- [ ] Cold/coolwater
- [ ] Vegetation
- [ ] High turbidity
- [ ] Stable base flow

Fish SGNC - Minnow, suckers, sunfish

8. Which factors are stressors of the species? Select one or more stressors that impact distribution or abundance of this species. Select the time period(s) at which a stressor impacts the species.

	Past stressor	Current stressor	Future stressor
Habitat availability (amount or extent)	☐	☐	☐
Habitat fragmentation	☐	☐	☐
Habitat structure (composition)	☐	☐	☐
Hydrological disturbance (drought, flooding)	☐	☐	☐
Invasives/exotics	☐	☐	☐
Chemical pollution	☐	☐	☐
Sedimentation	☐	☐	☐
Competitors (competition for resources)	☐	☐	☐
Predators	☐	☐	☐
Parasites and disease	☐	☐	☐
Prey availability	☐	☐	☐
Genetic constraints	☐	☐	☐
Dispersal (barriers or isolation)	☐	☐	☐
Recruitment	☐	☐	☐
Mortality (high death rate)	☐	☐	☐
Structures (dams, roads, utilities)	☐	☐	☐
Climate change	☐	☐	☐

Other (please specify stressor and time period)

9. Would you like to provide comments or clarifications regarding your assessment of this species?

10. How would you rate your ability/knowledge in assessing this species?

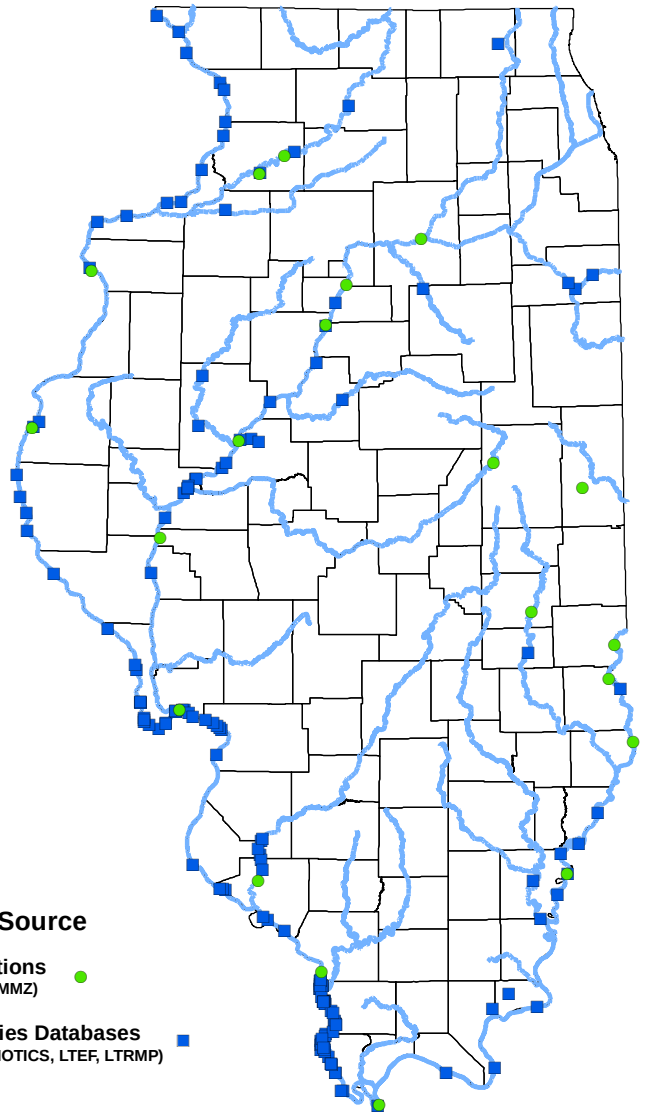
- ◯ Highly knowledgeable
- ◯ Fairly knowledgeable
- ◯ Not knowledgeable

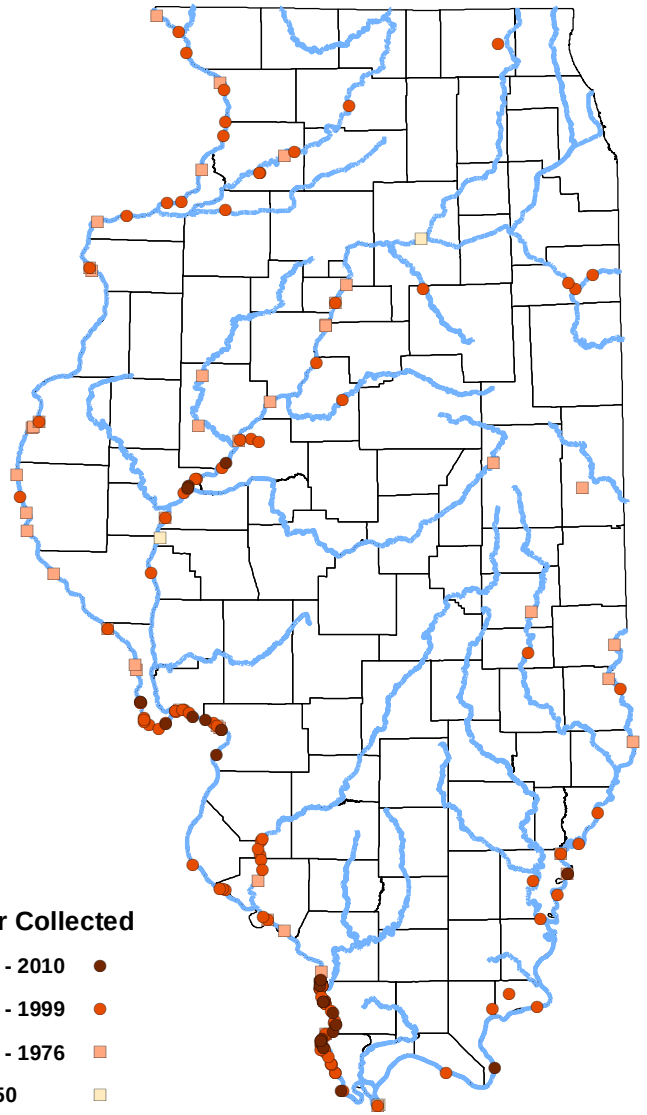
Appendix C

Distribution maps for SGNC.

(no collection records for fourhorn sculpin)
(no museum collection records for muskellunge, sauger, walleye, longnose sucker, lake sturgeon)

American eel(*Anguilla rostrata*)





Brown bullhead*(Ameiurus nebulosus)*

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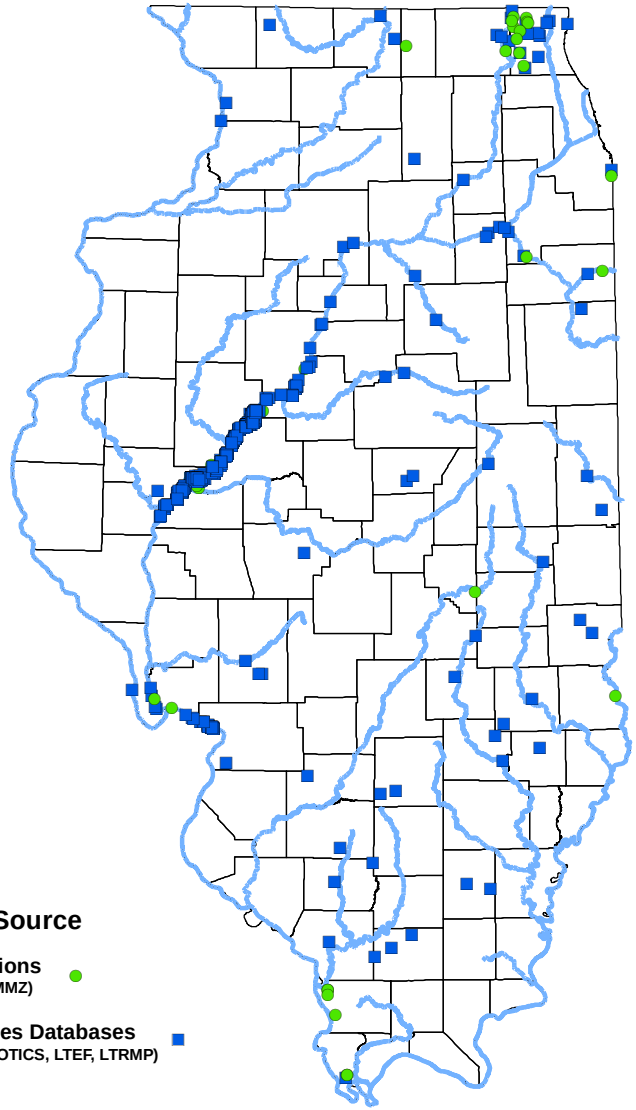
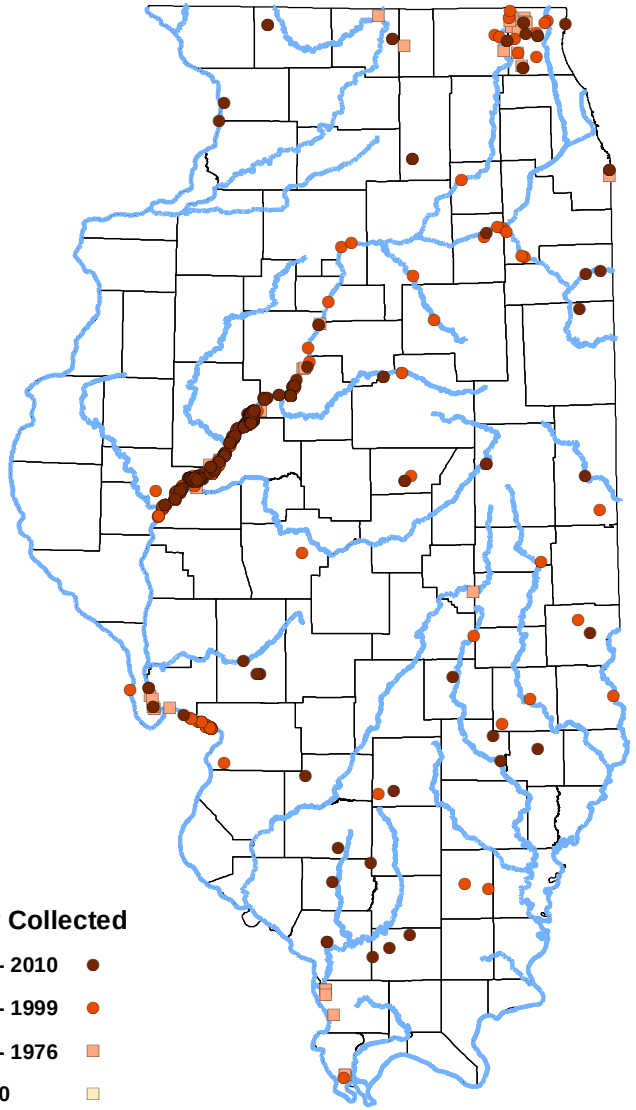


Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

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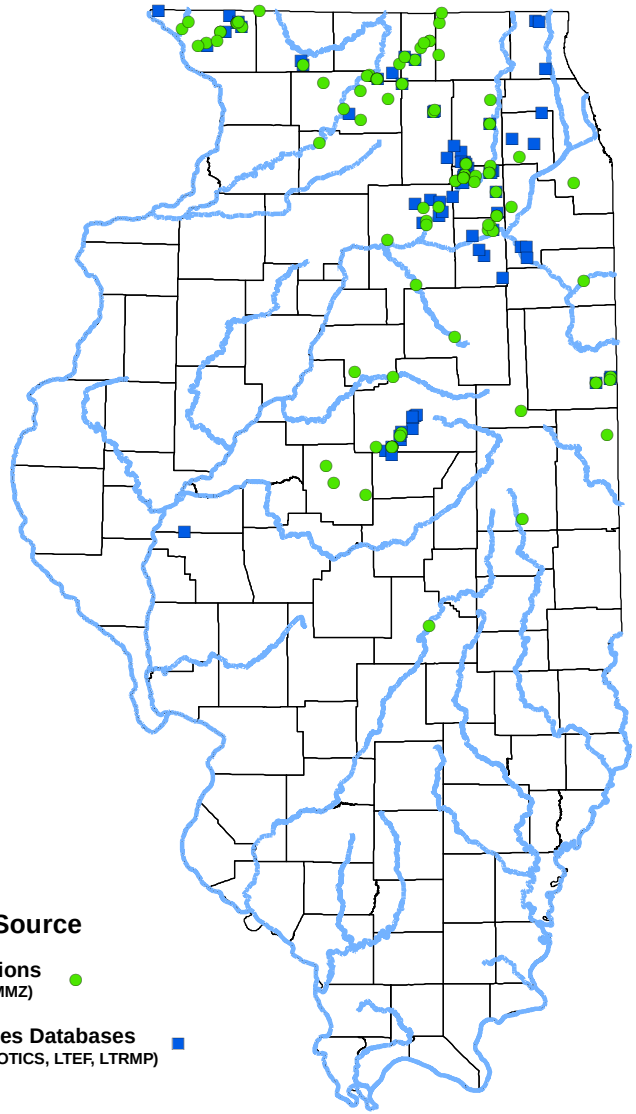
Largescale stoneroller*(Campostoma oligolepis)*



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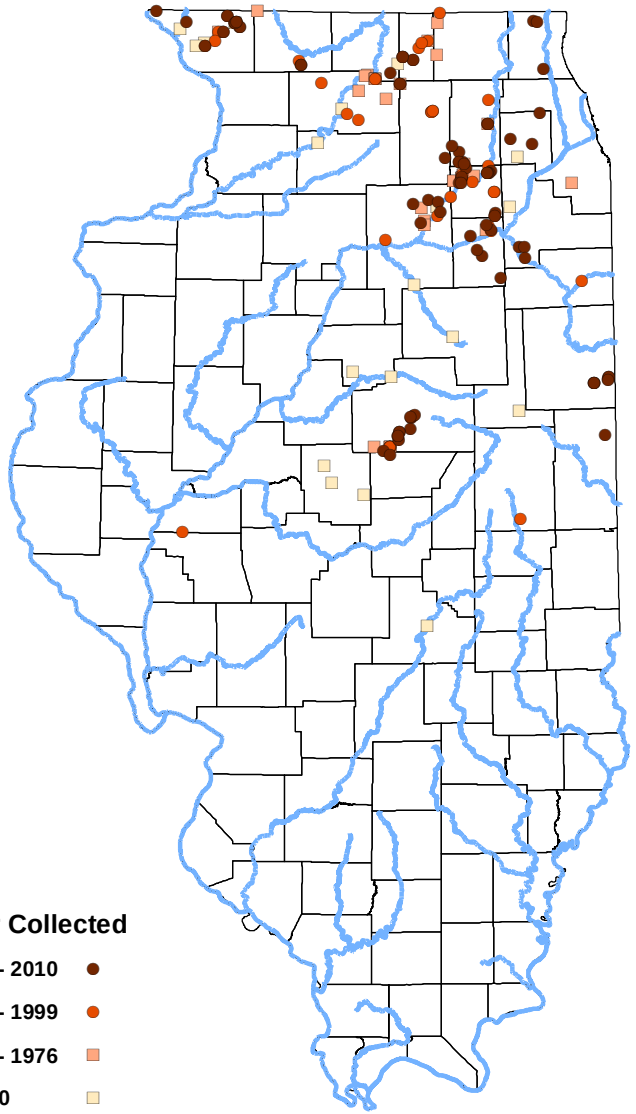
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

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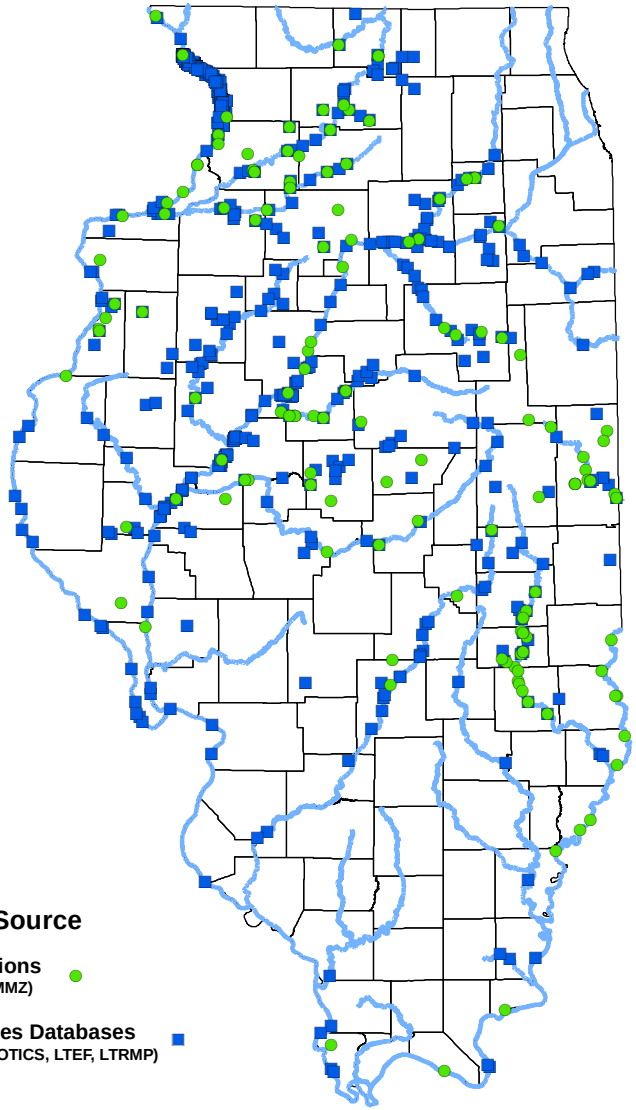
Highfin carpsucker*(Carpiodes velifer)*



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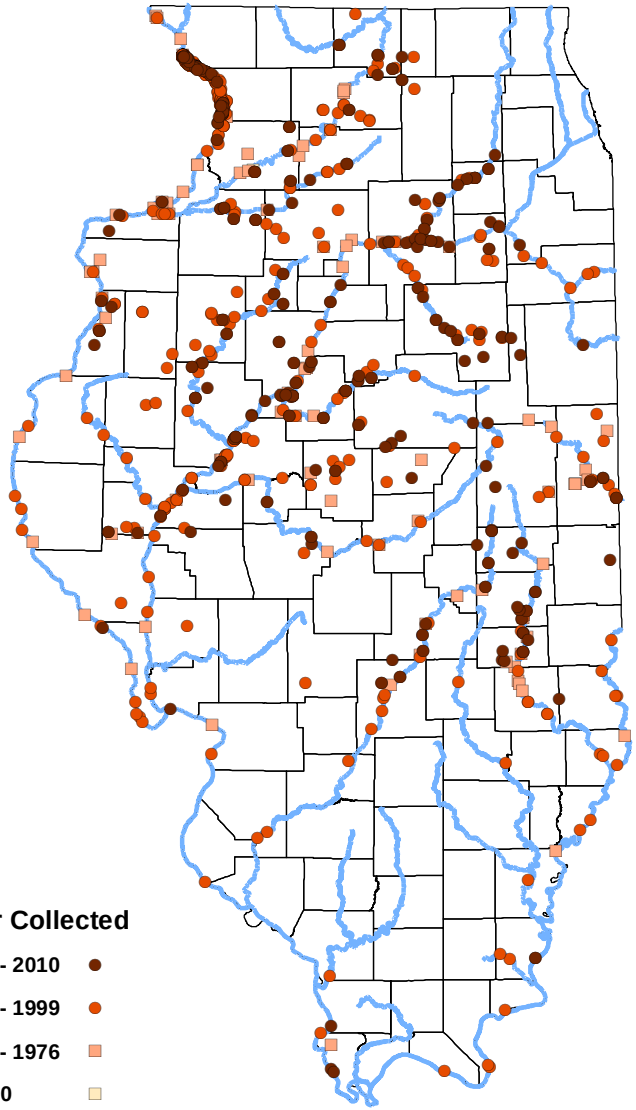

Year Collected

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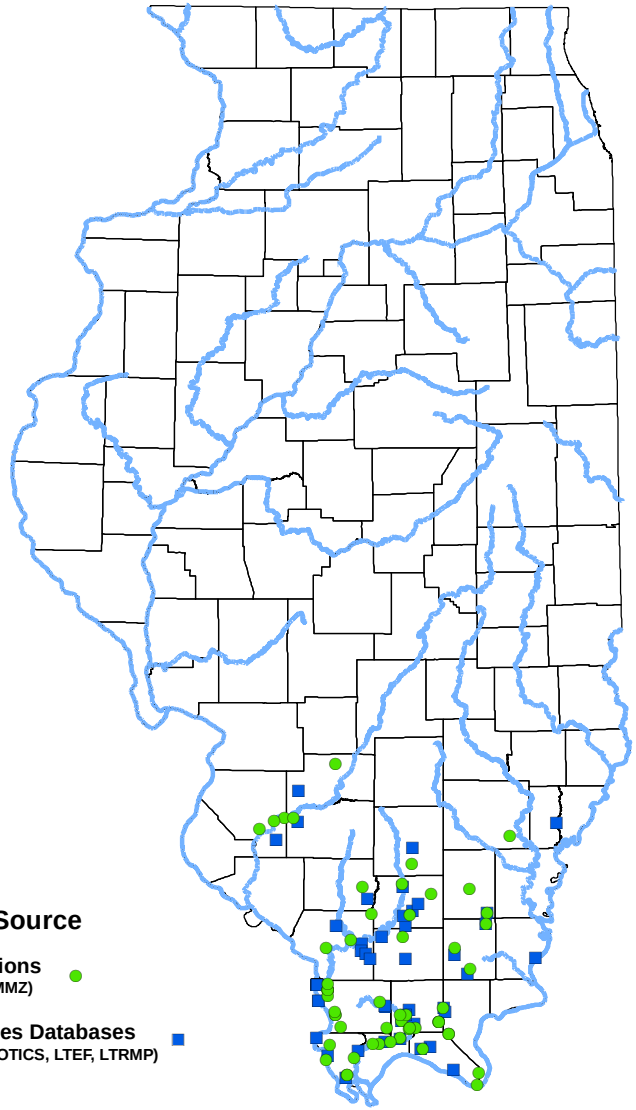
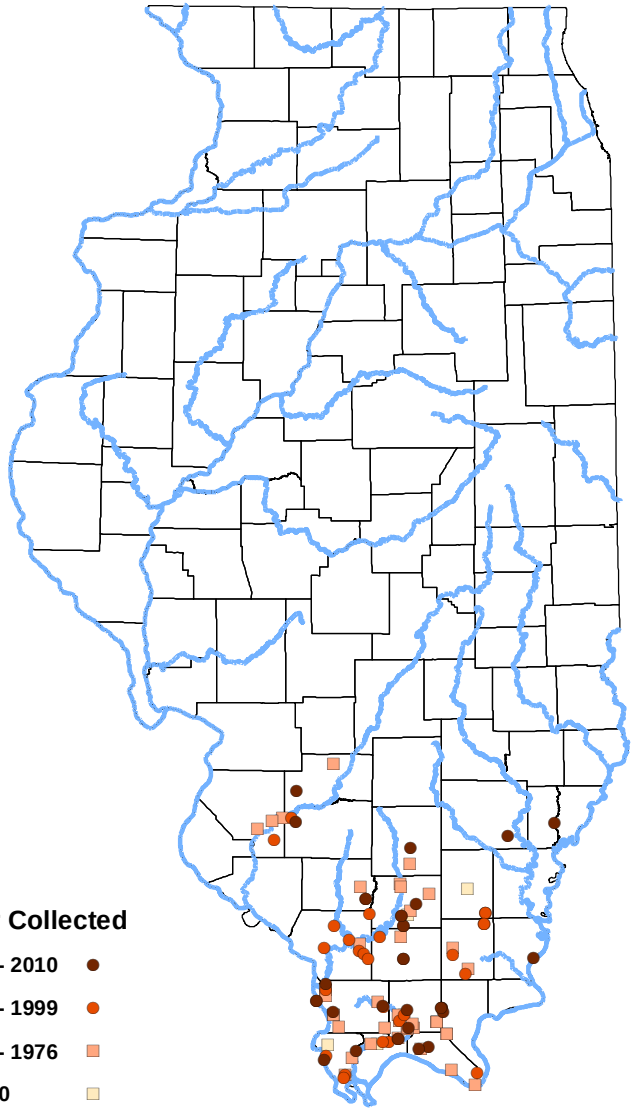
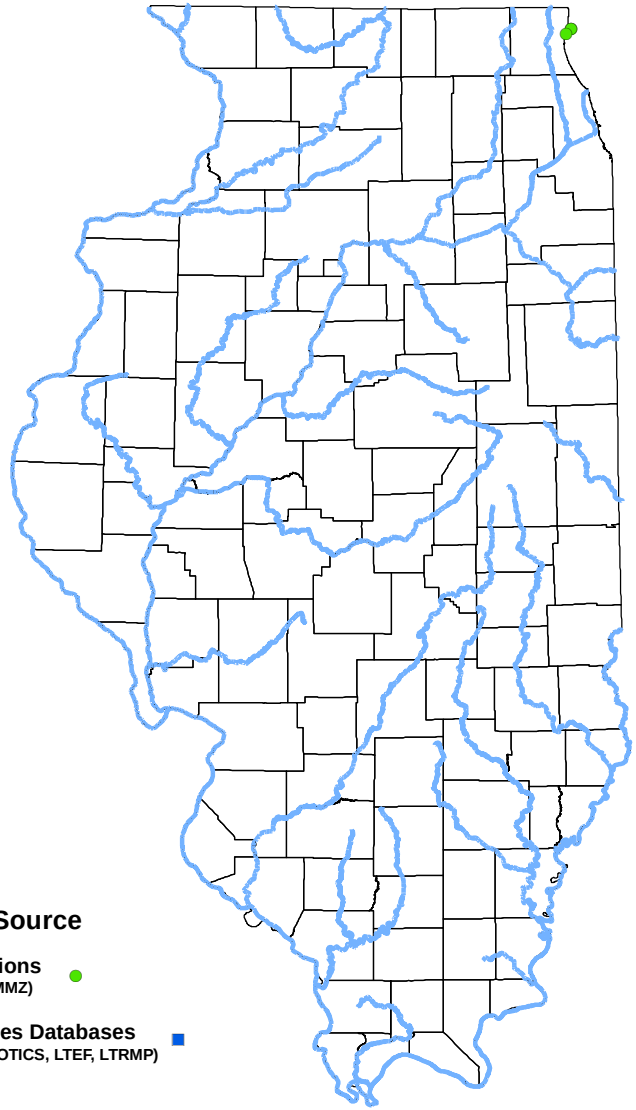
Flier(*Centrarchus macropterus*)





Lake whitefish*(Coregonus clupeaformis)*



Data Source

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Fisheries Databases
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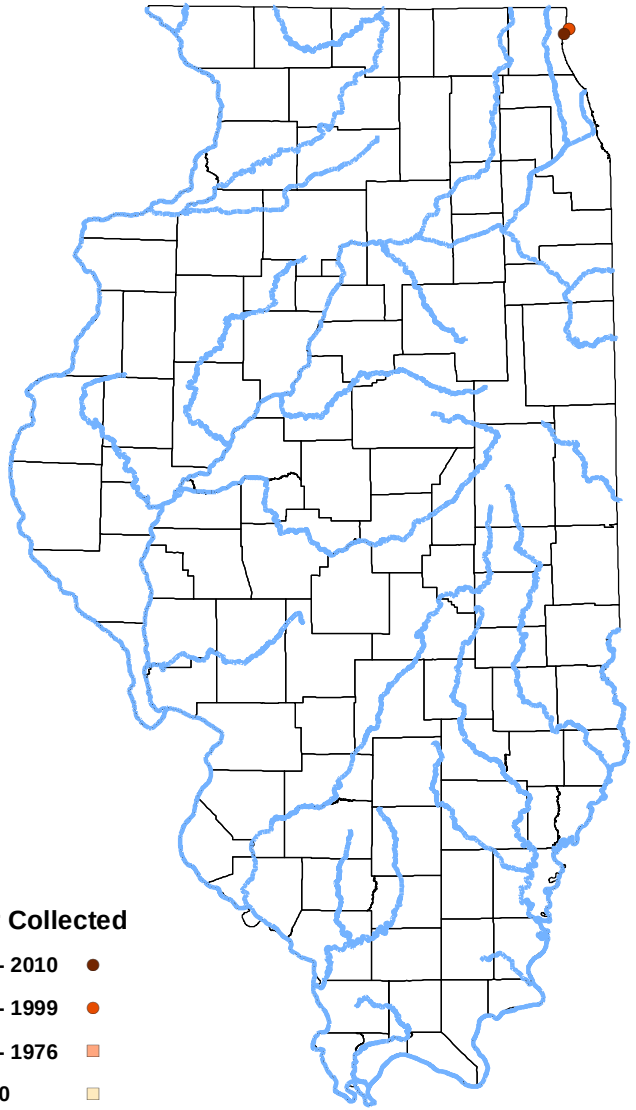

Year Collected

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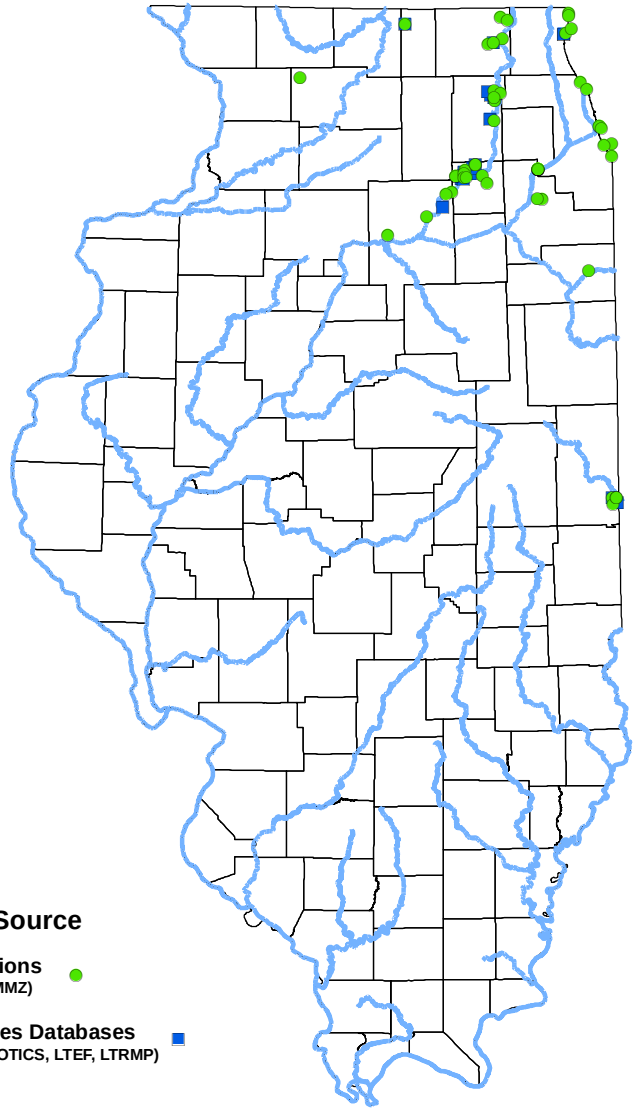
Mottled sculpin*(Cottus bairdii)*



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Fisheries Databases
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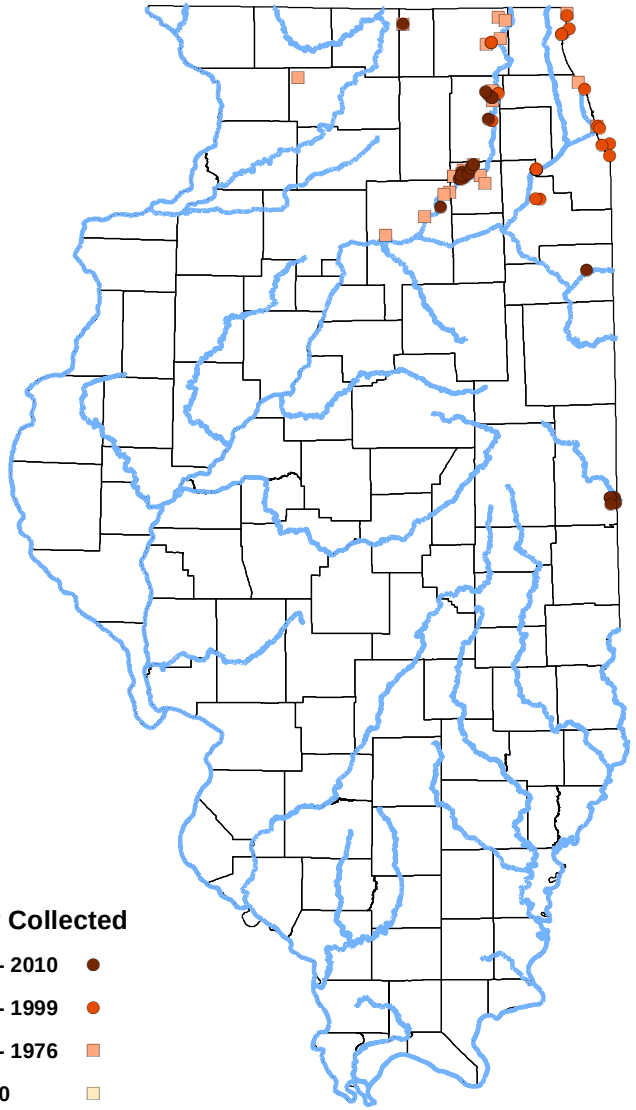

Year Collected

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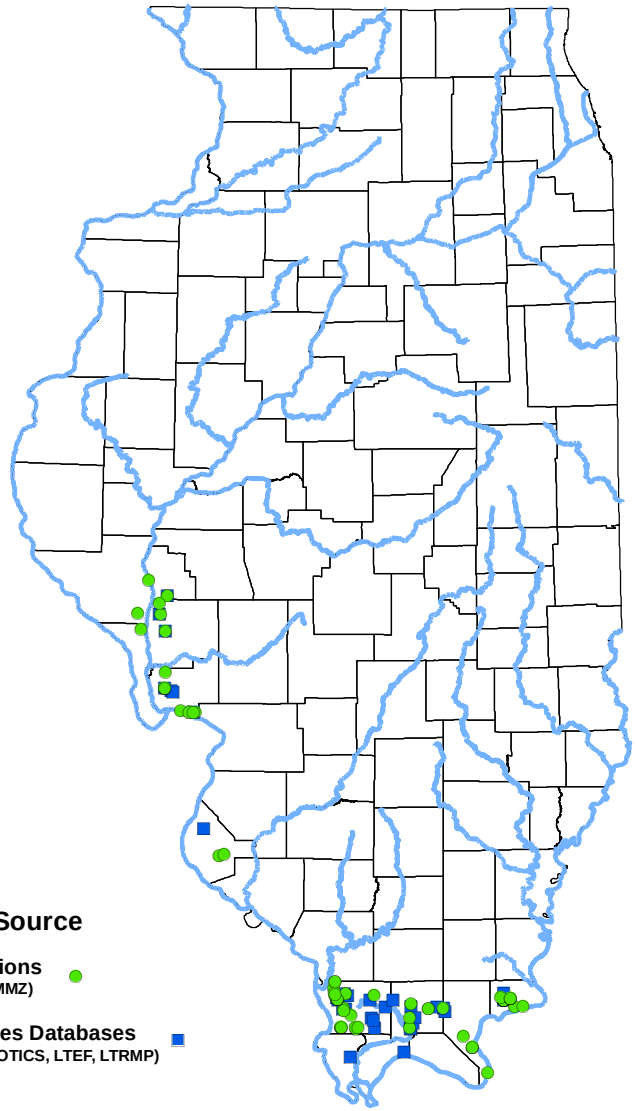
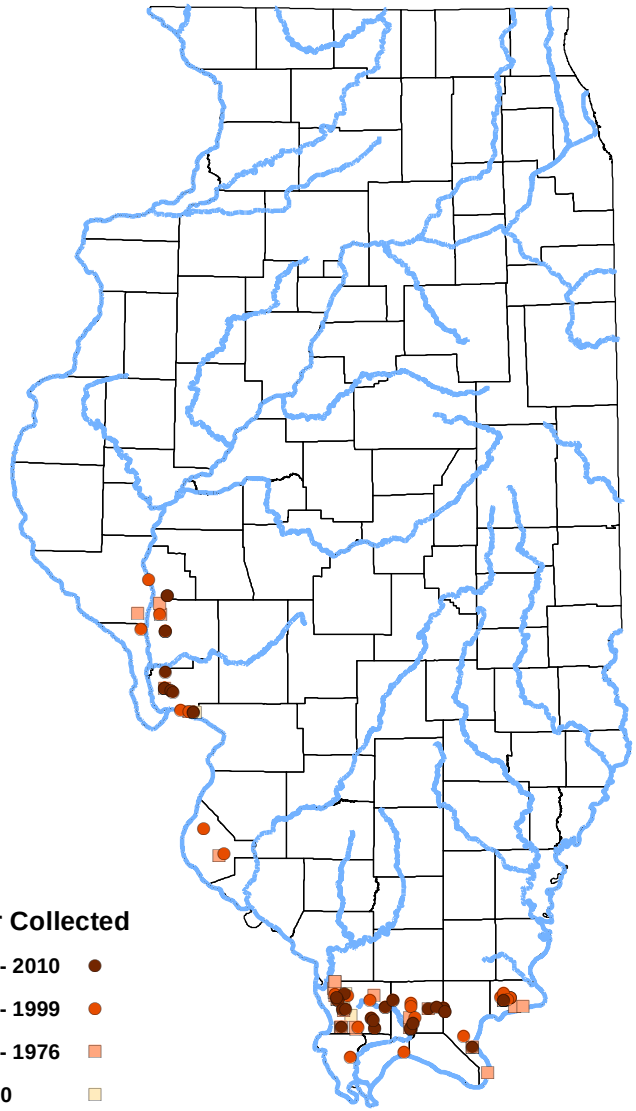
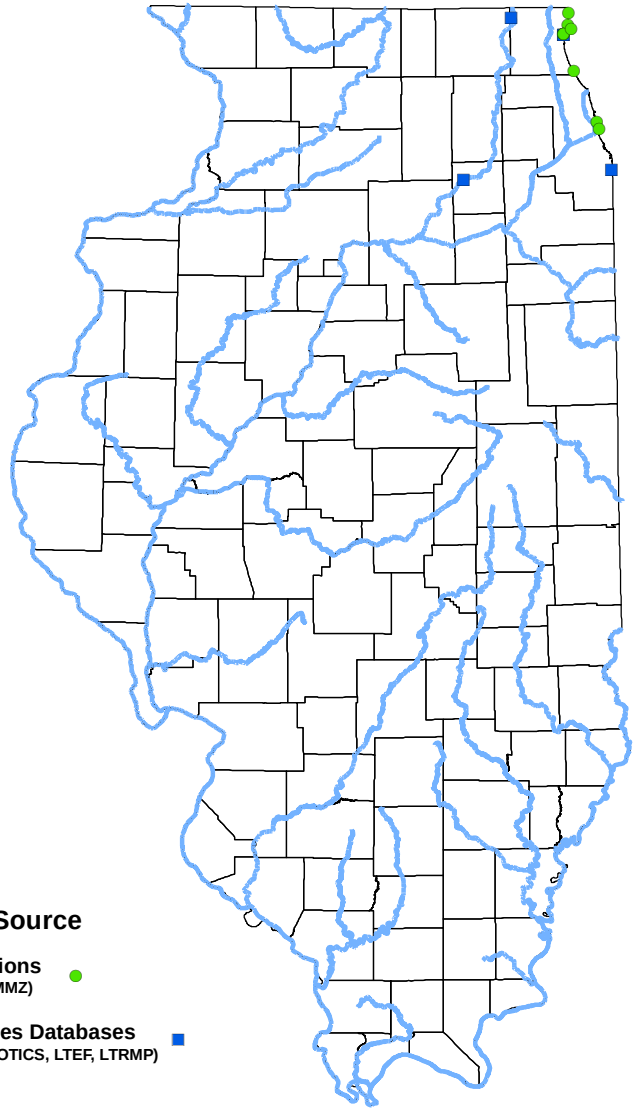
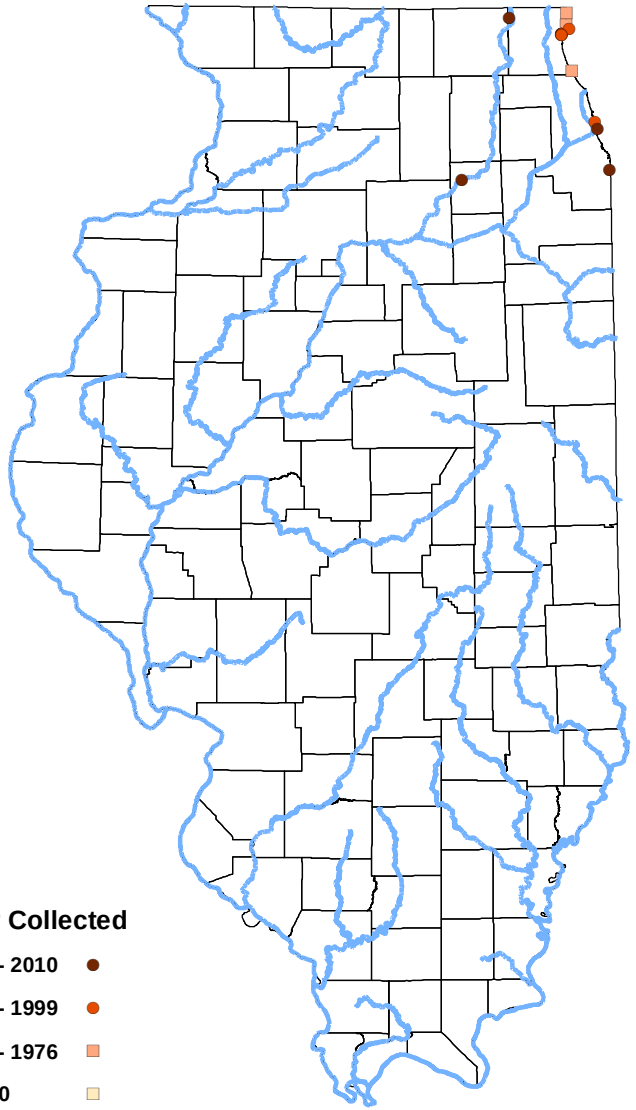
Banded sculpin*(Cottus carolinae)*



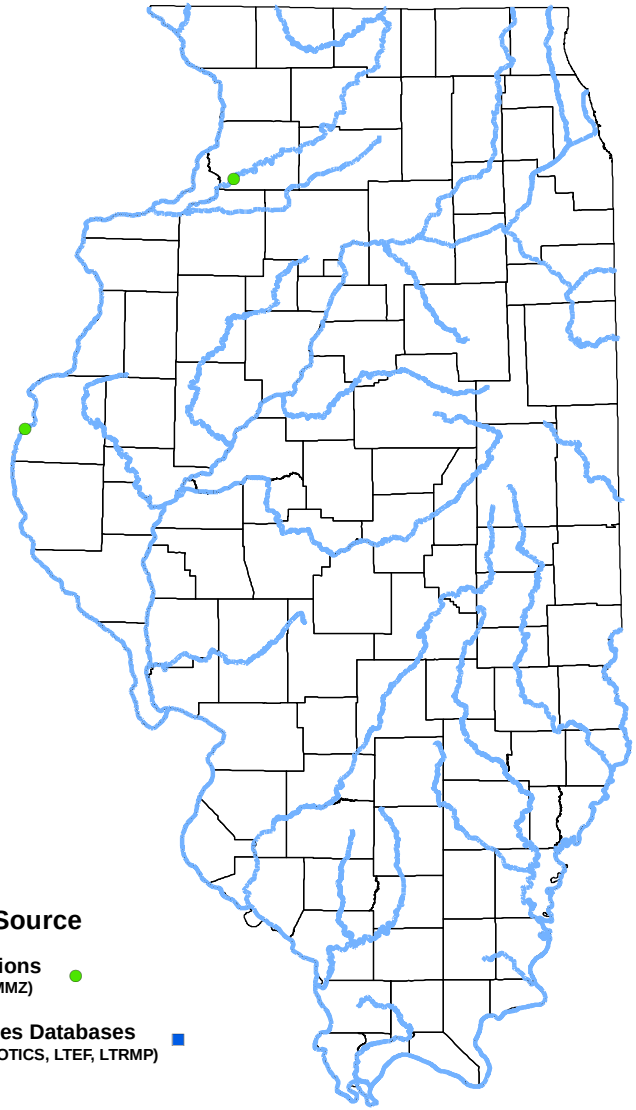


Lake chub*(Couesius plumbeus)*





Crystal darter*(Crystallaria asprella)*



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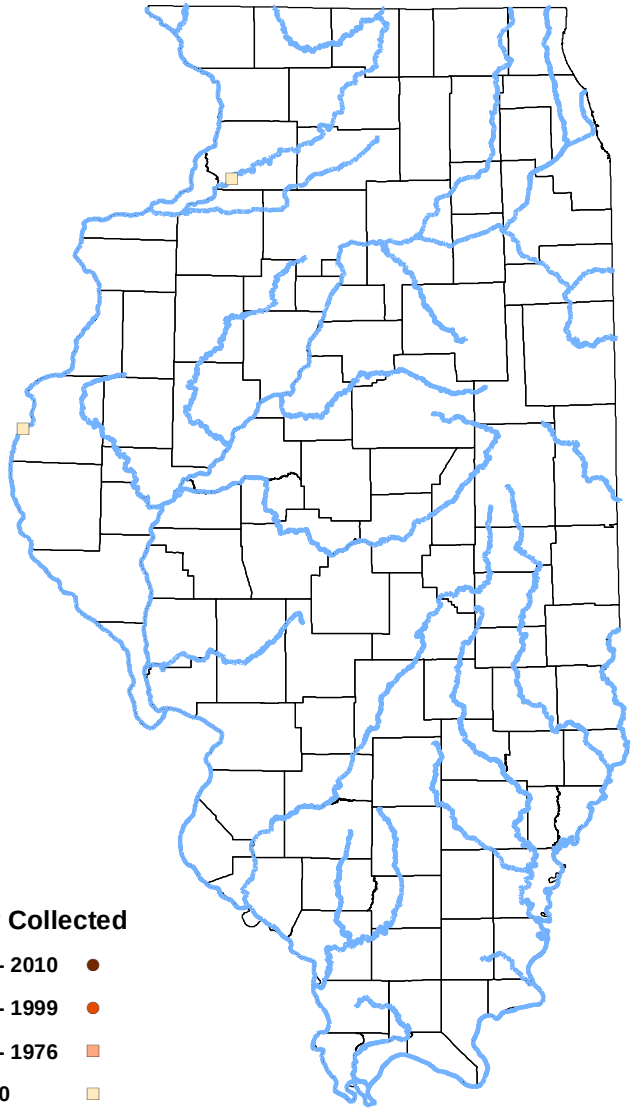

Year Collected

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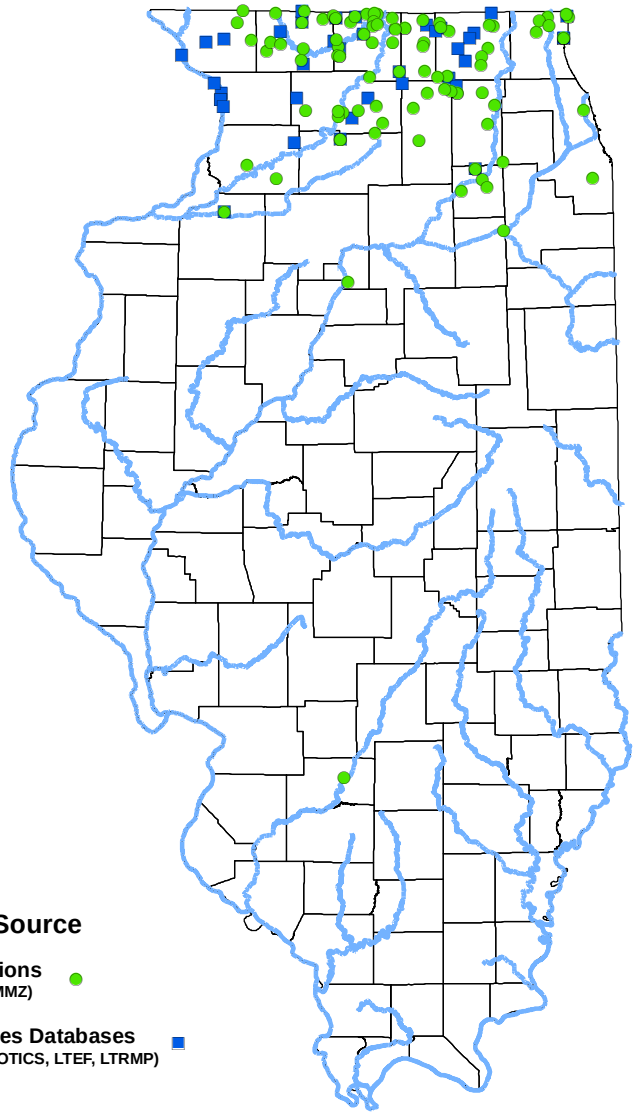
Brook stickleback*(Culaea inconstans)*



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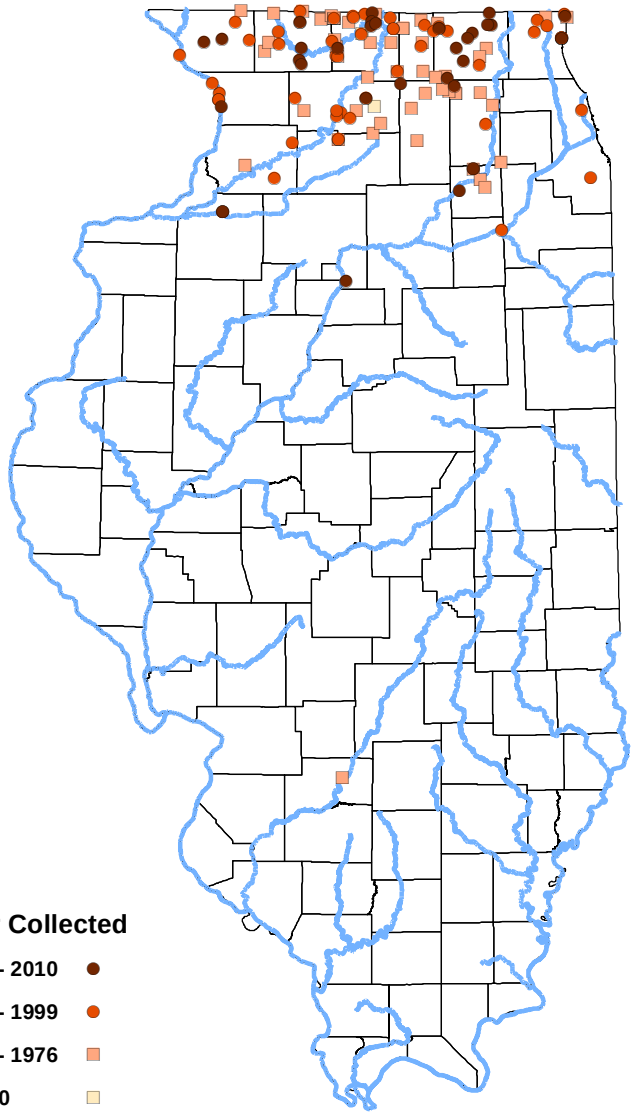

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Blue sucker*(Cycleptus elongatus)*

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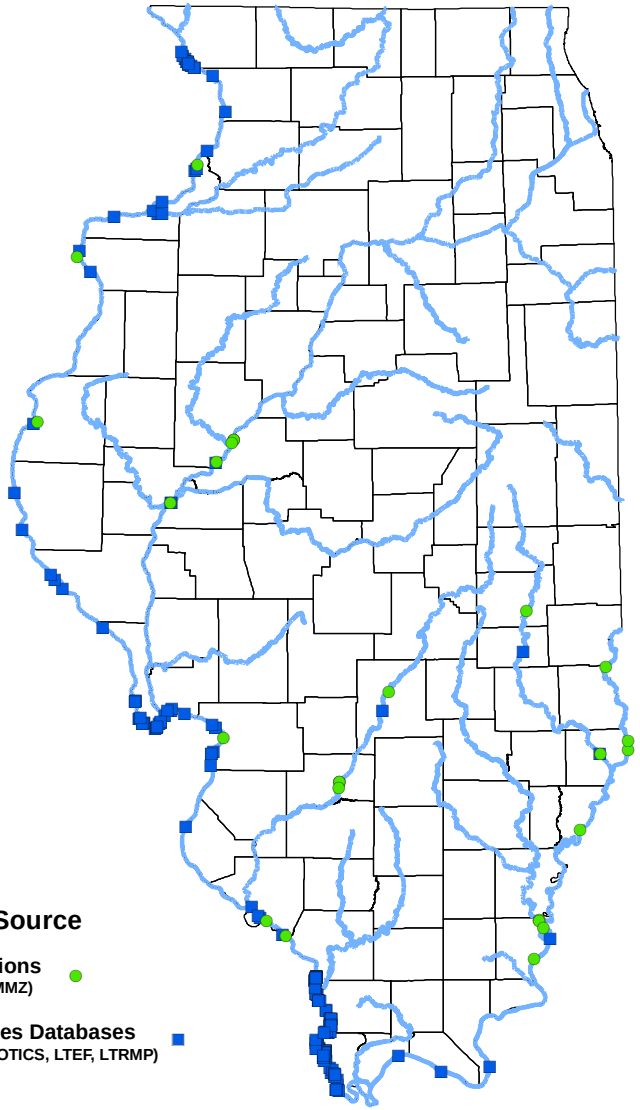

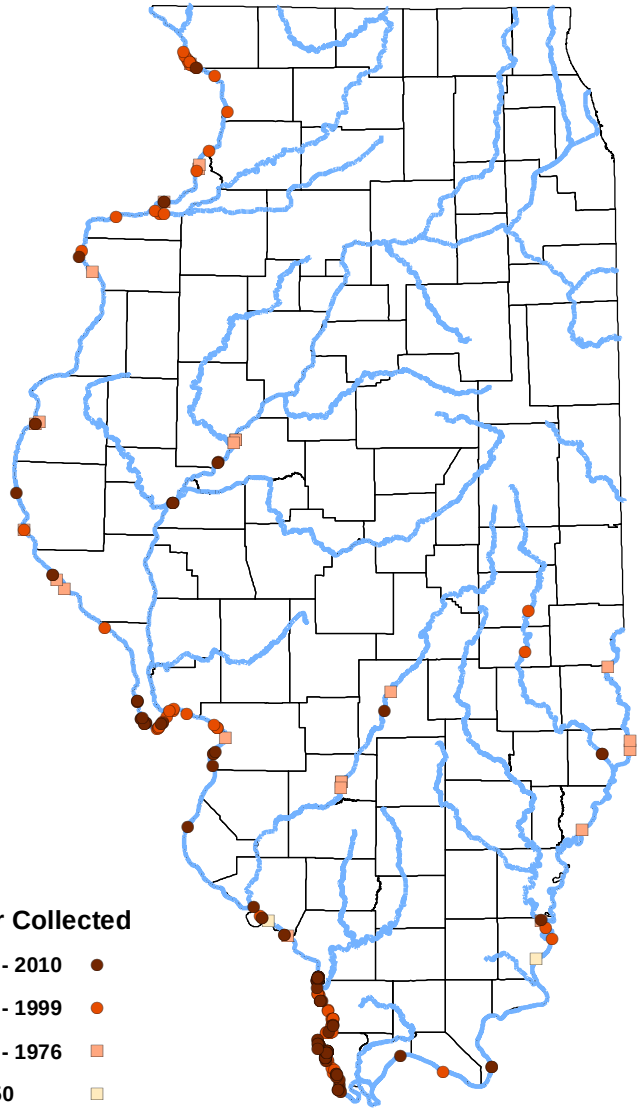

Blacktail shiner*(Cyprinella venusta)*

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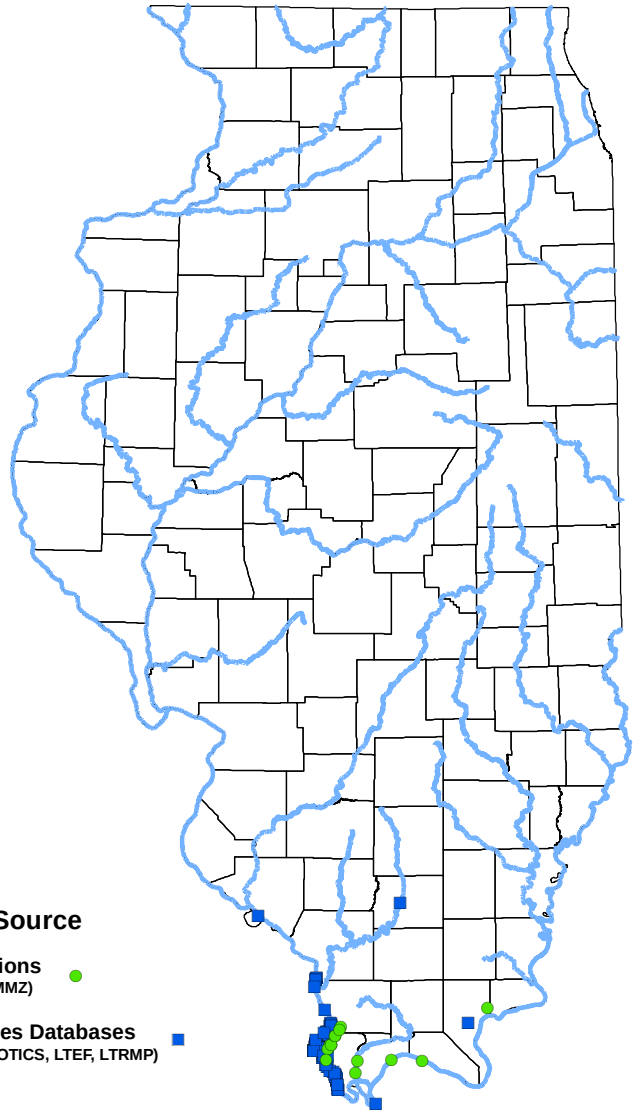

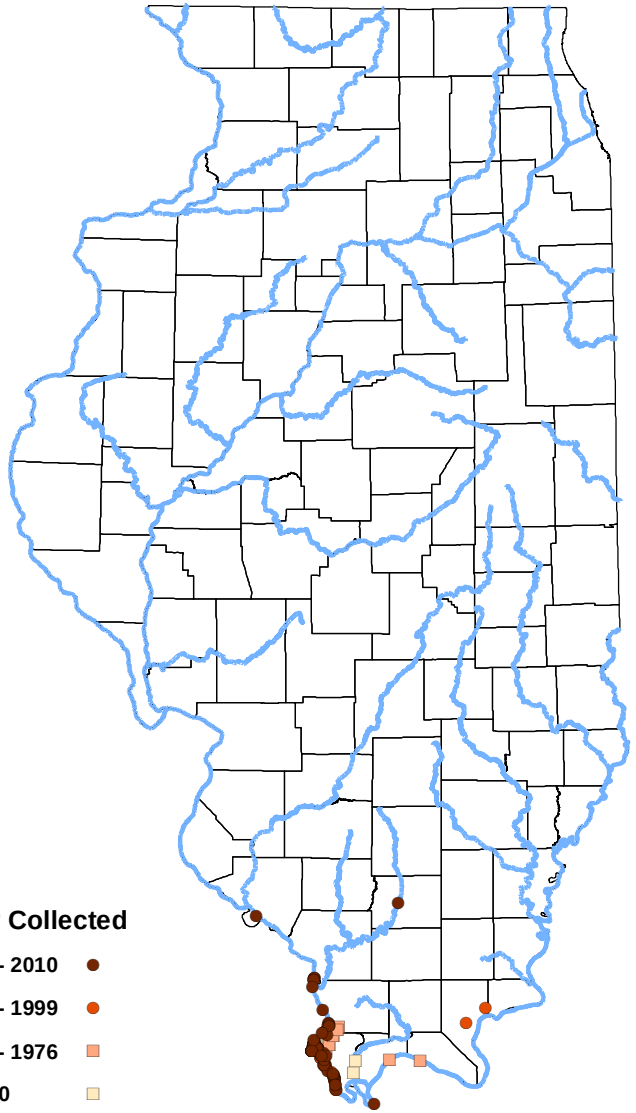

Banded pygmy sunfish*(Elassoma zonatum)*

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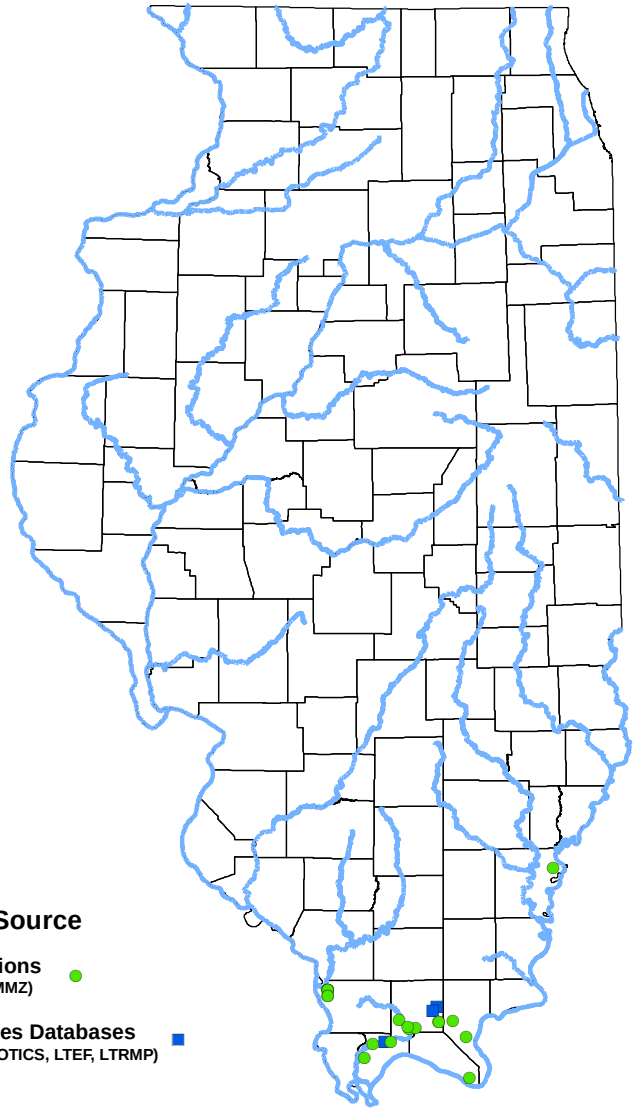
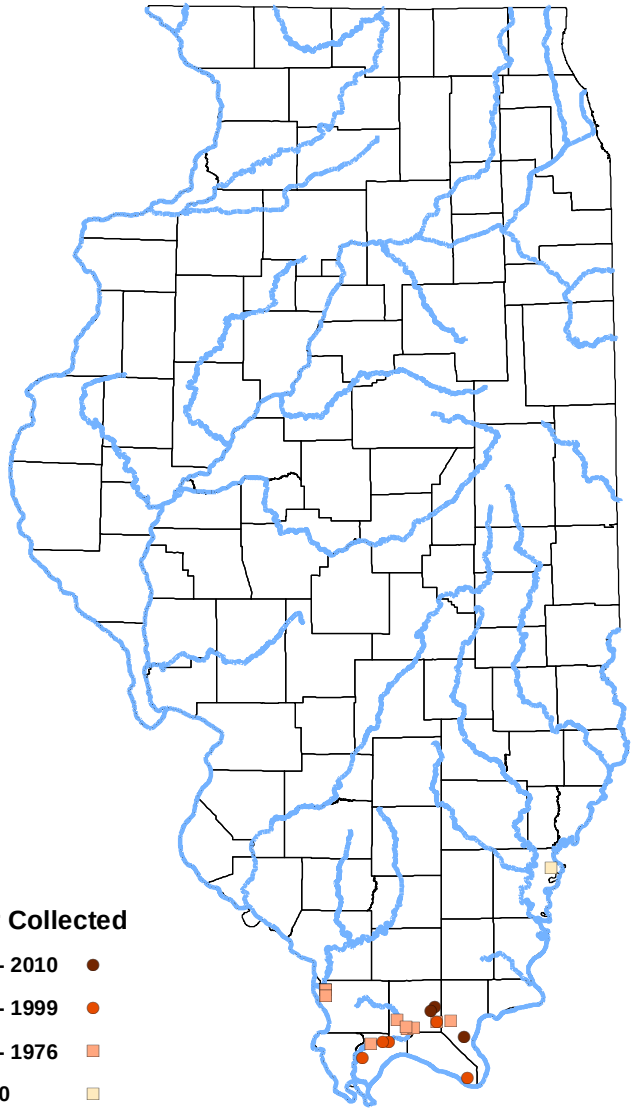
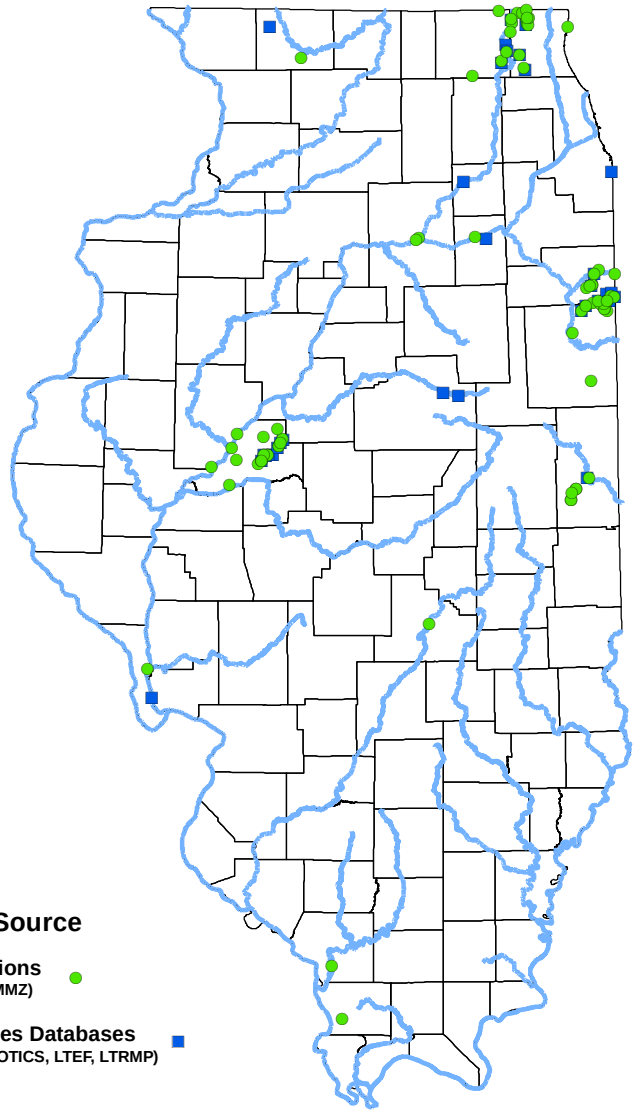




Lake chubsucker*(Erimyzon sucetta)*



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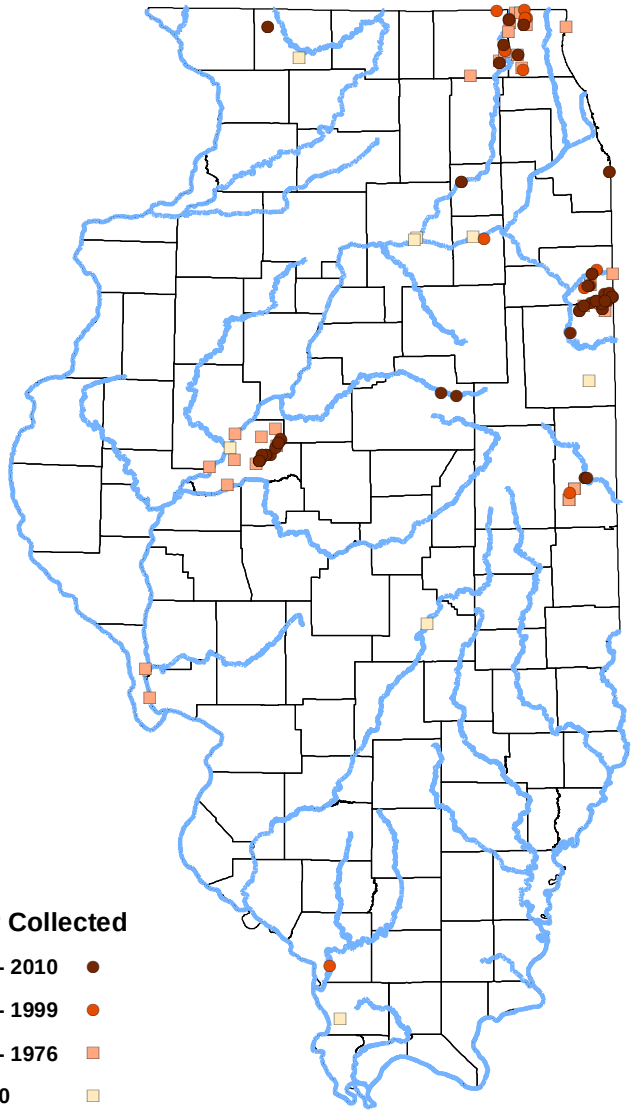
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

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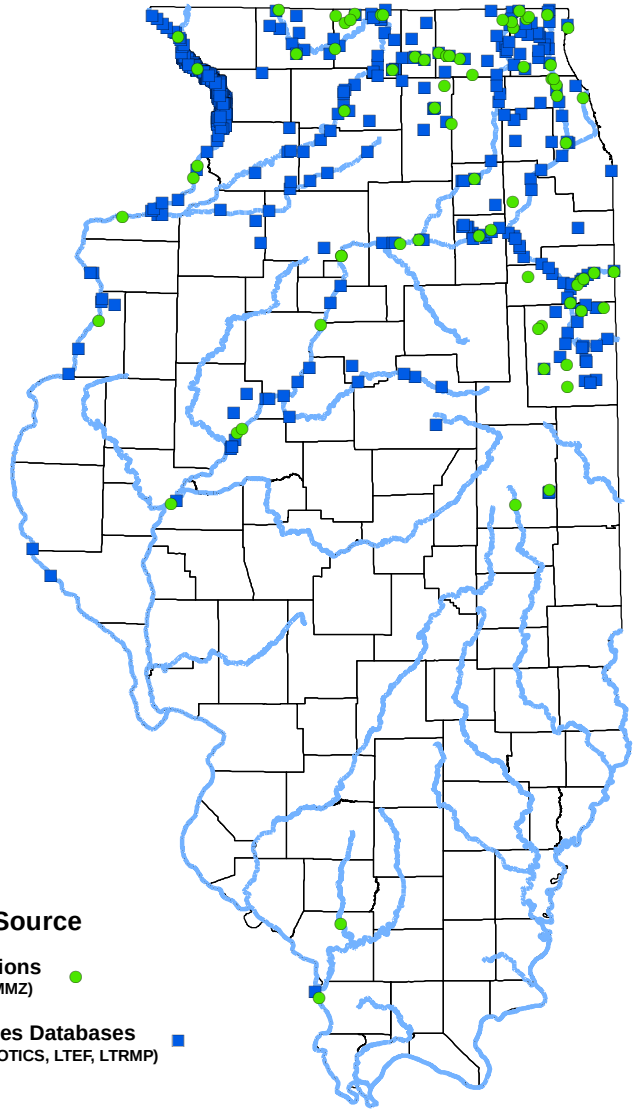
Northern pike(*Esox lucius*)



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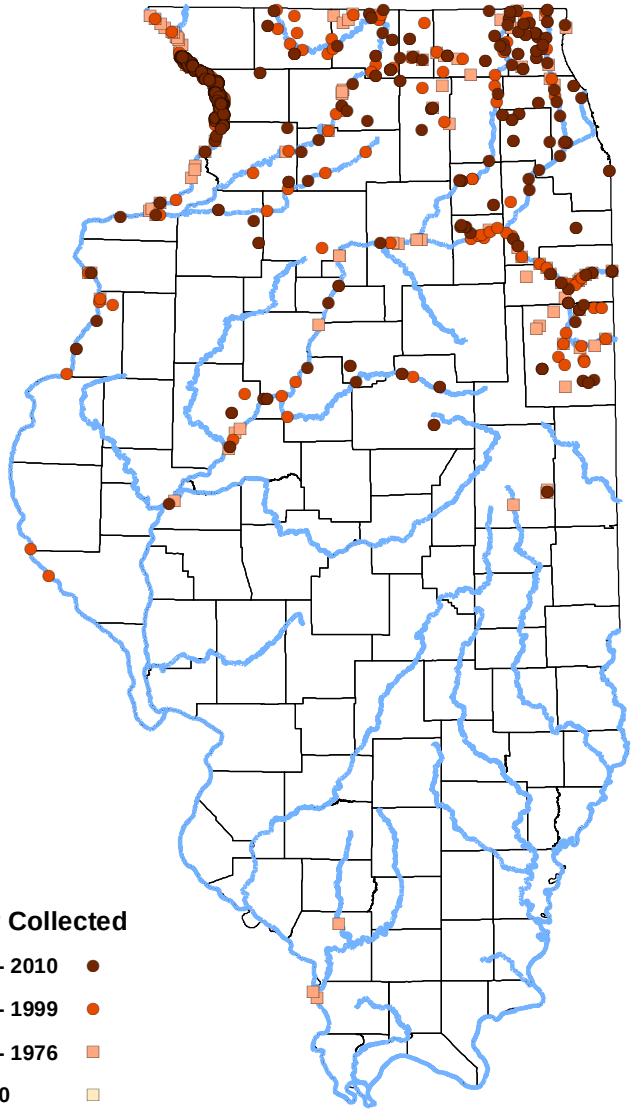

Year Collected

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1977 - 1999

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Muskellunge*(Esox masquinongy)*

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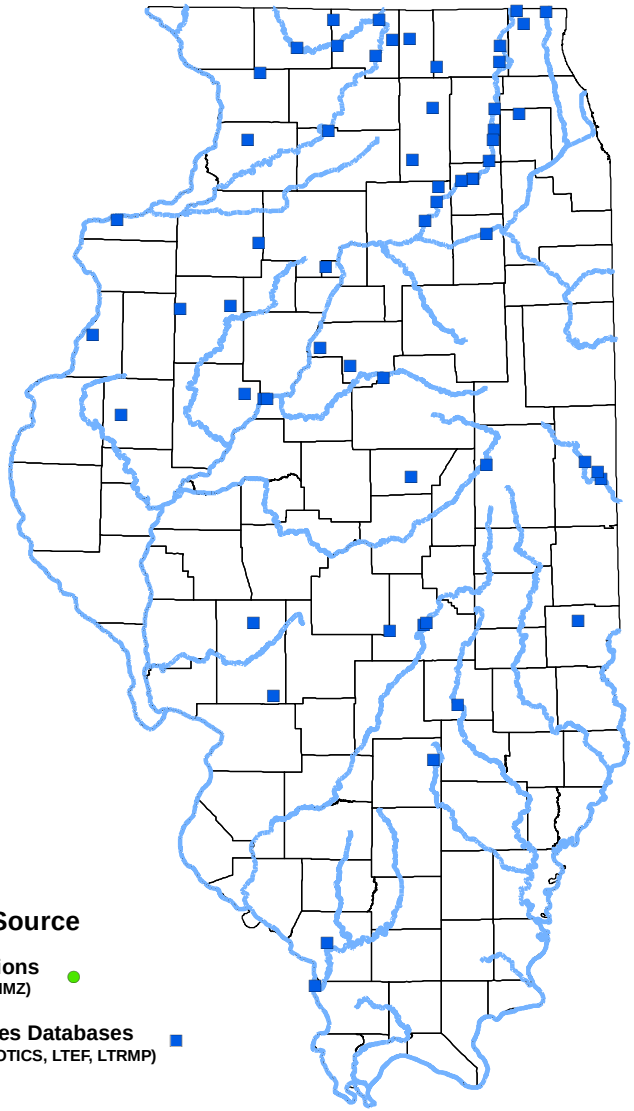

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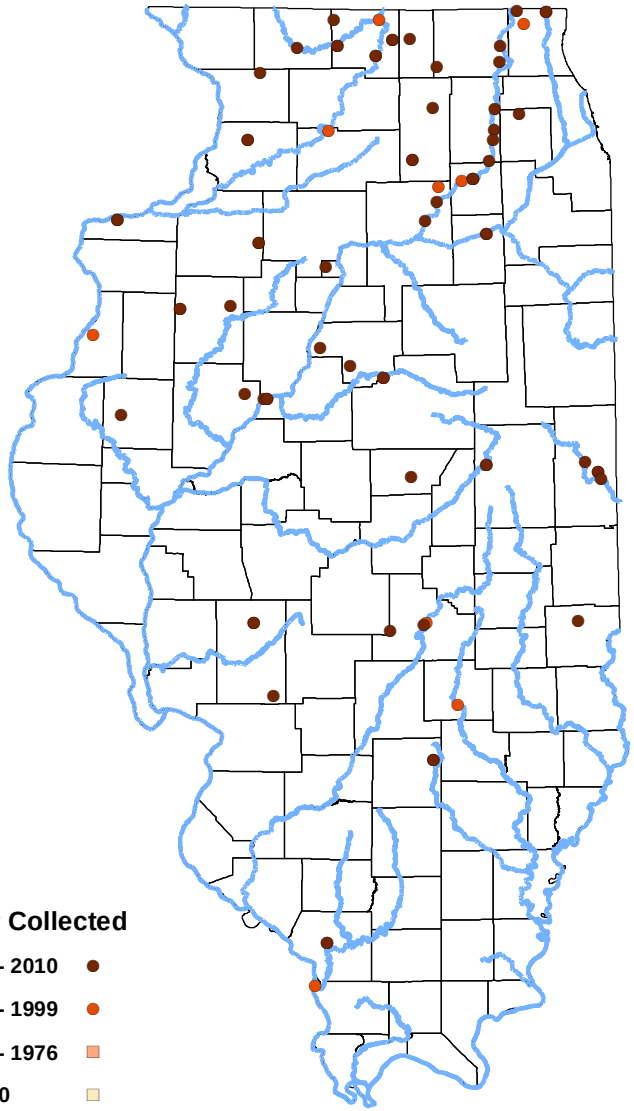

Year Collected

2000 - 2010

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Bluntnose darter(*Etheostoma chlorosoma*)

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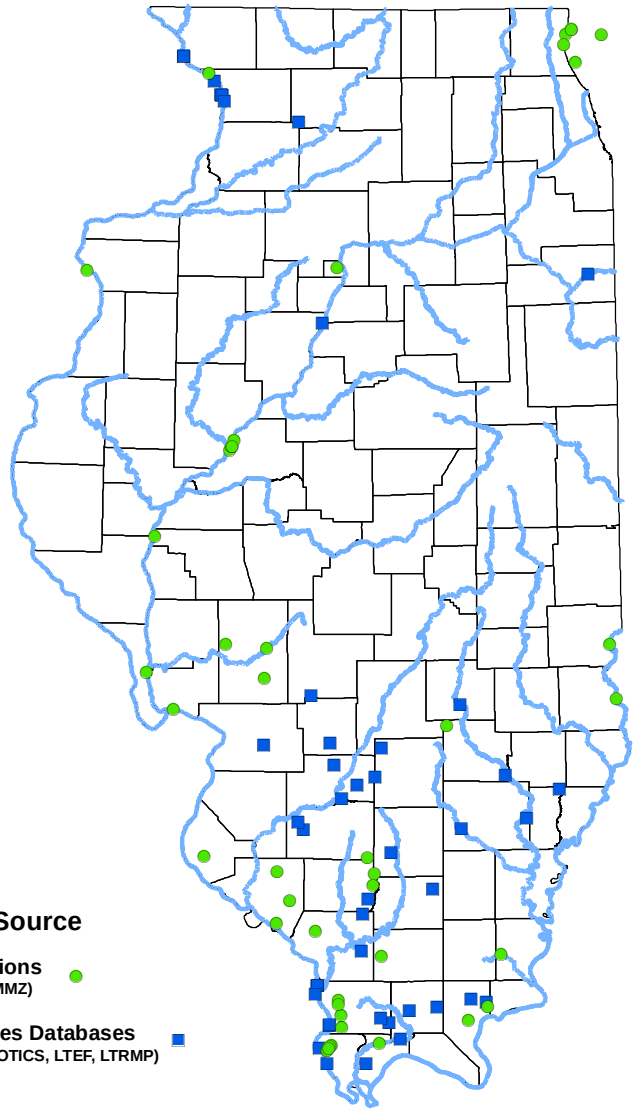
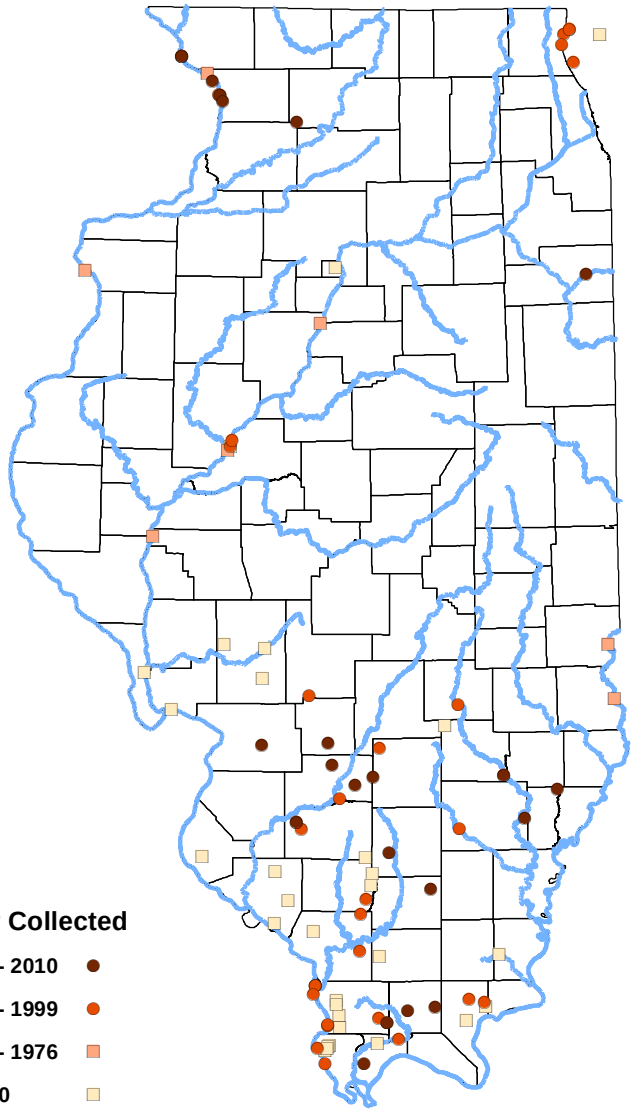
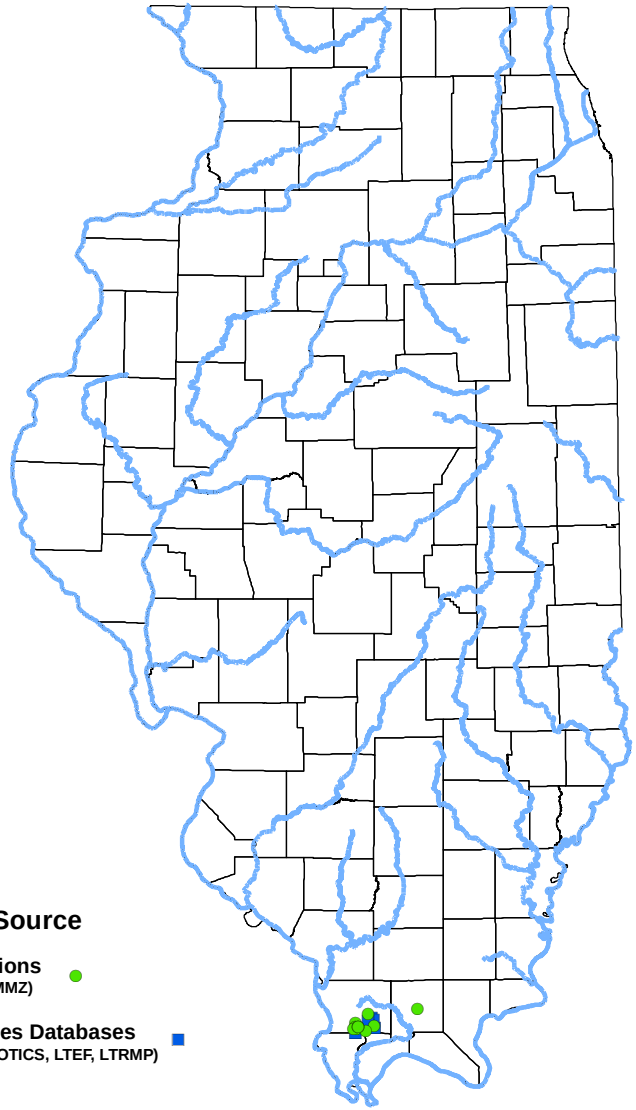
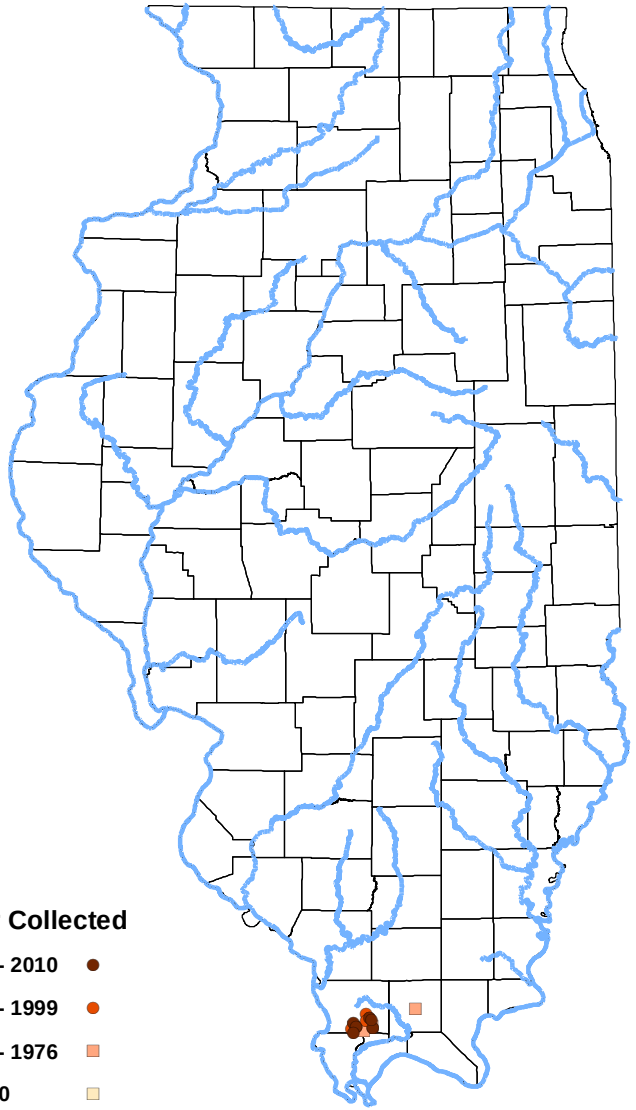




Fringed darter(*Etheostoma crossopterum*)





Cypress darter*(Etheostoma proeliare)*

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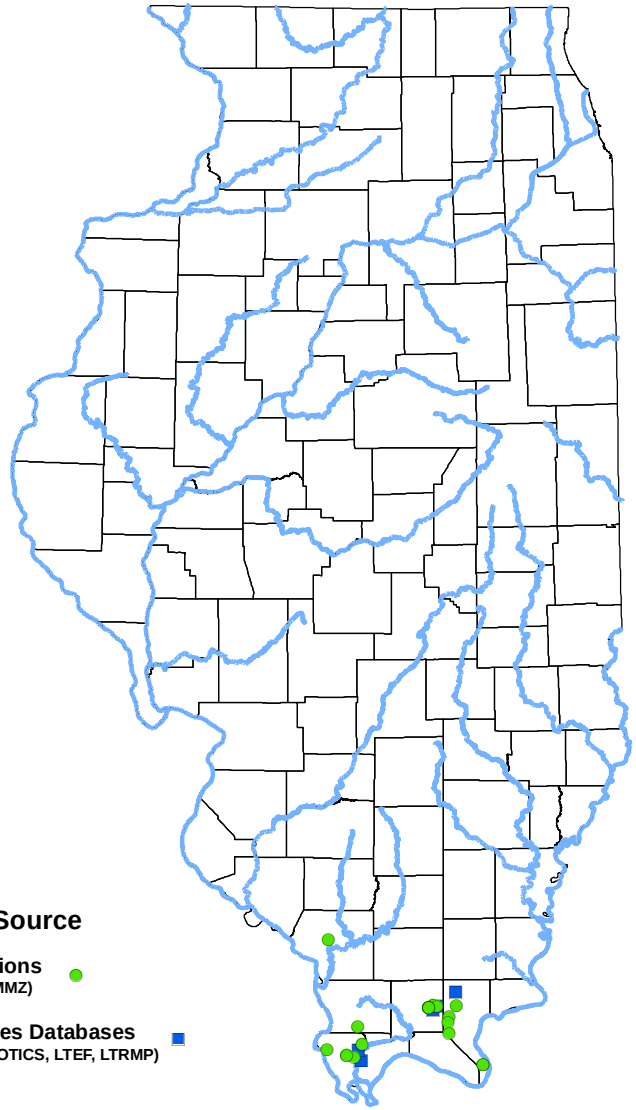
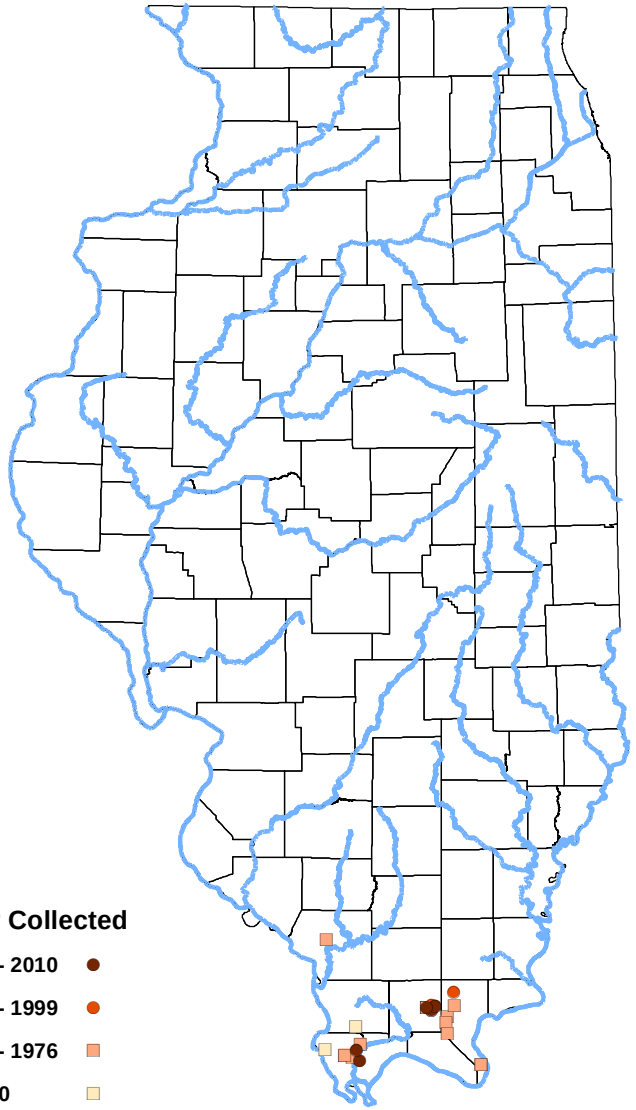
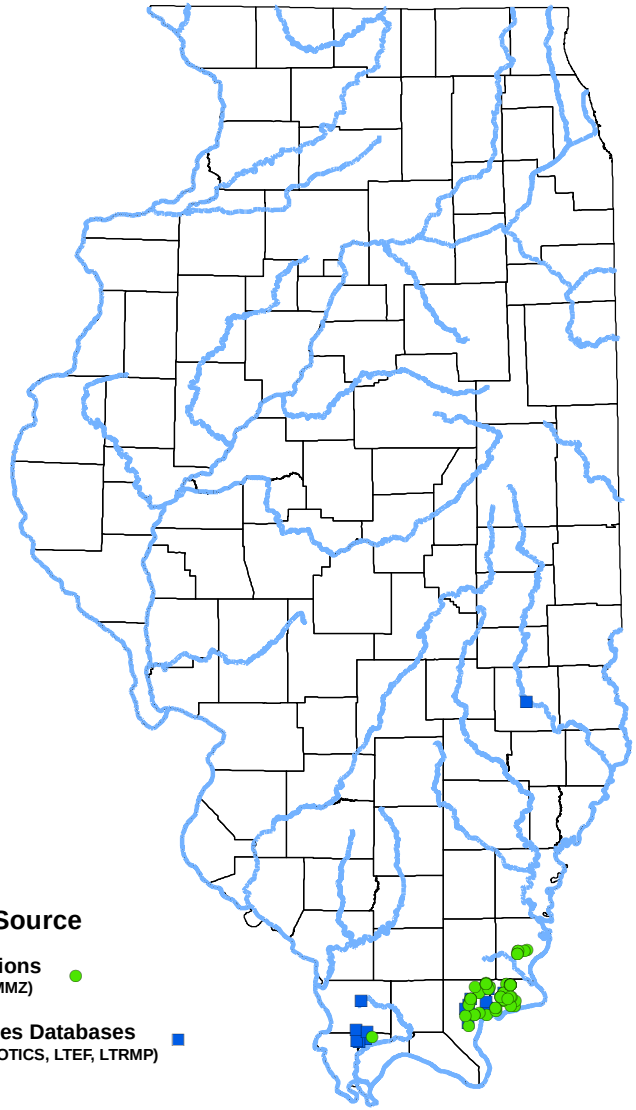
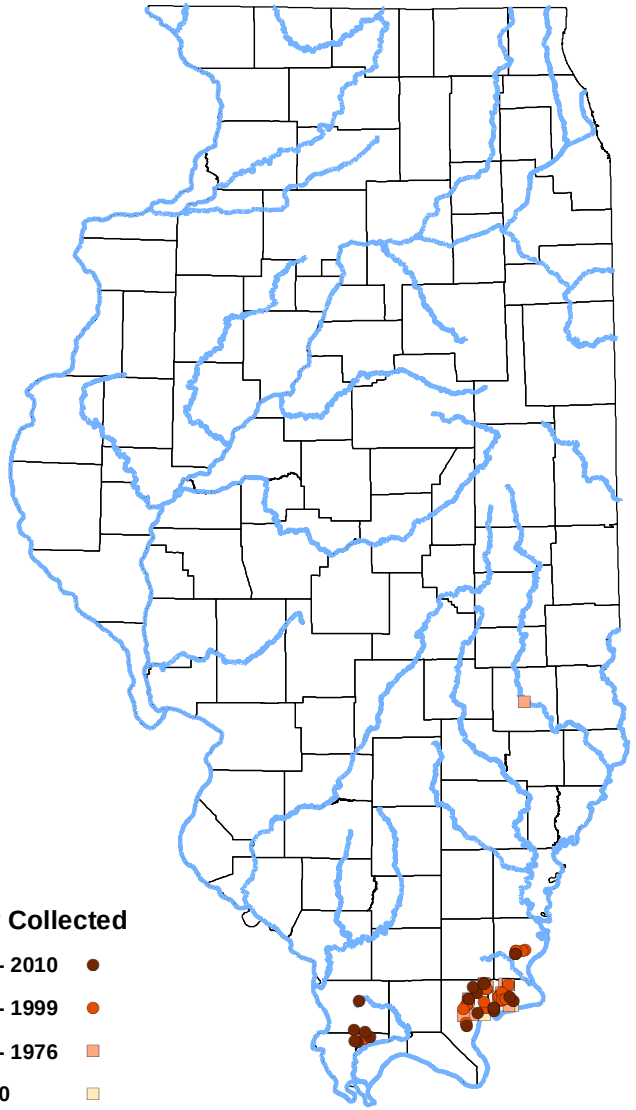




Spottail darter*(Etheostoma squamiceps)*





Spring cavefish(*Forbesichthys agassizi*)

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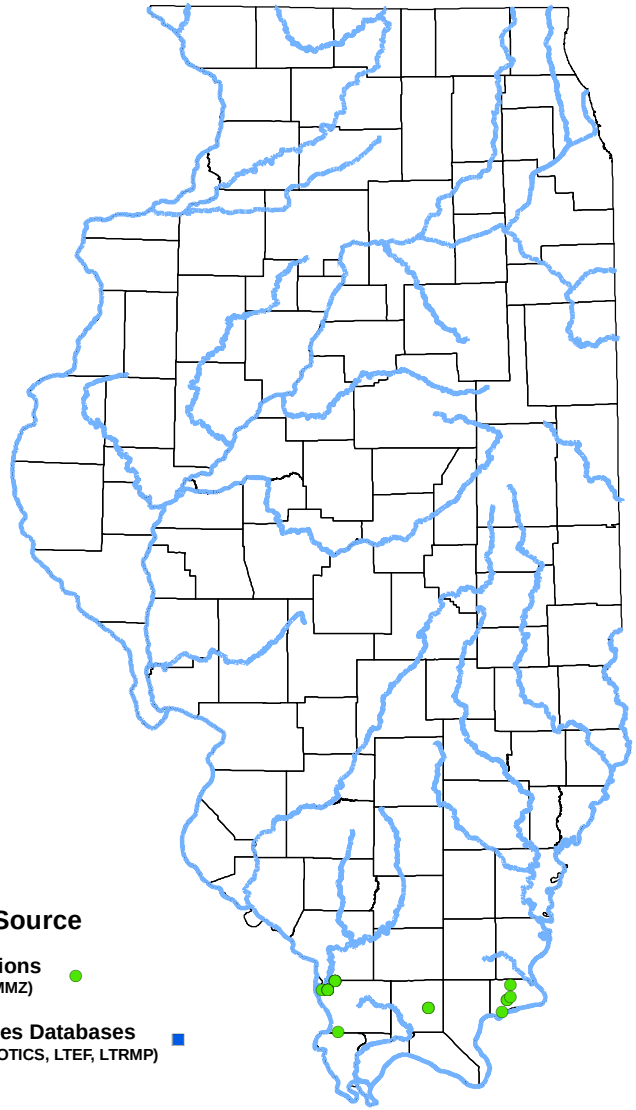

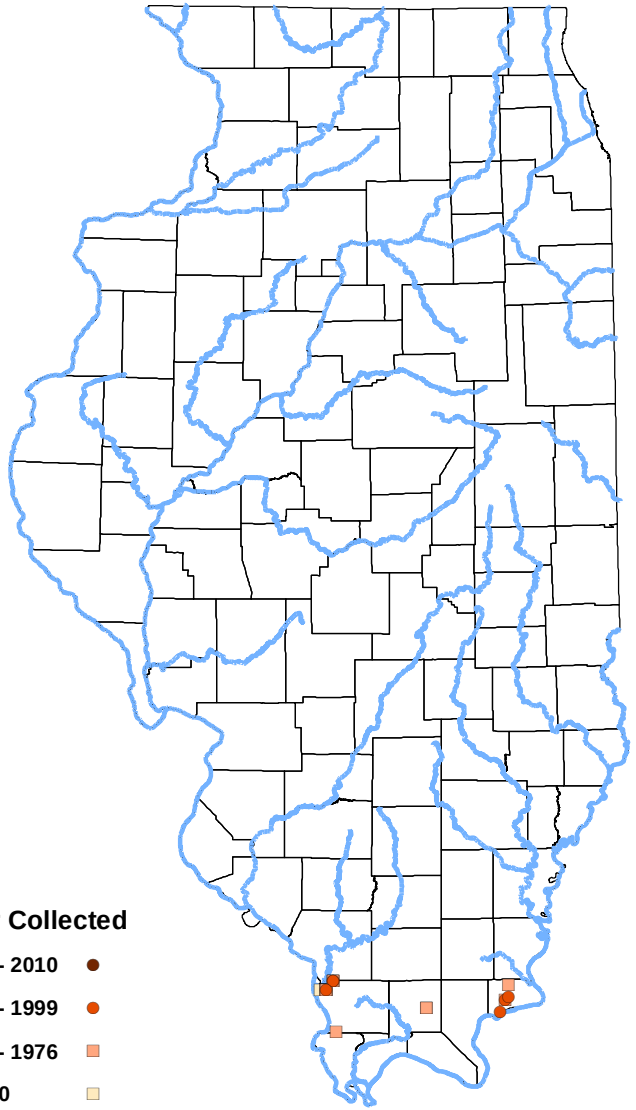

Silver lamprey*(Ichthyomyzon unicuspis)*

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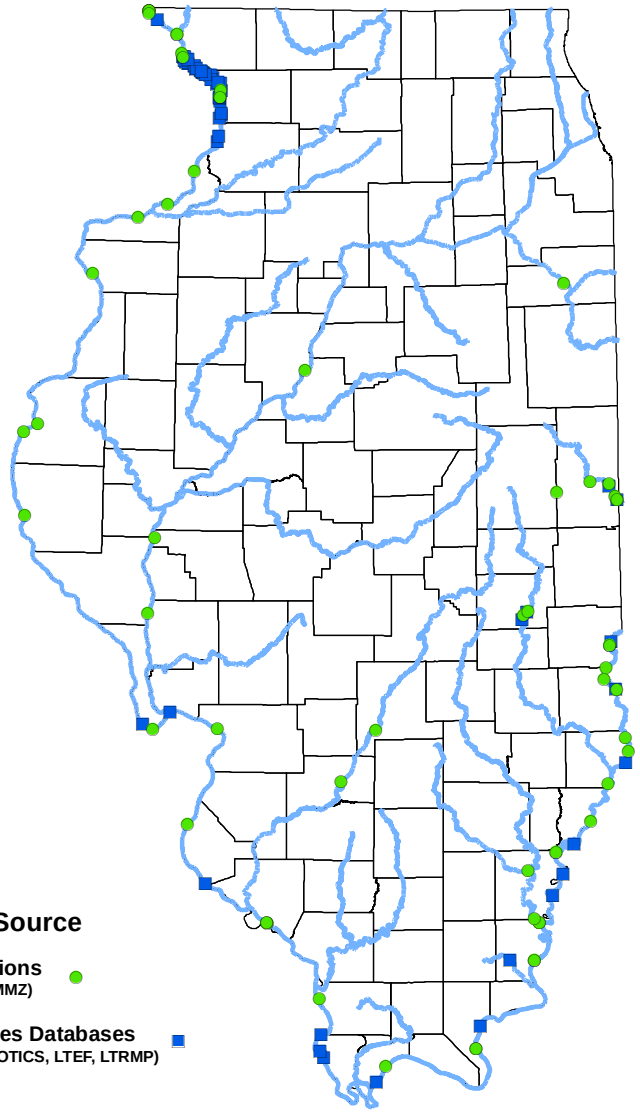

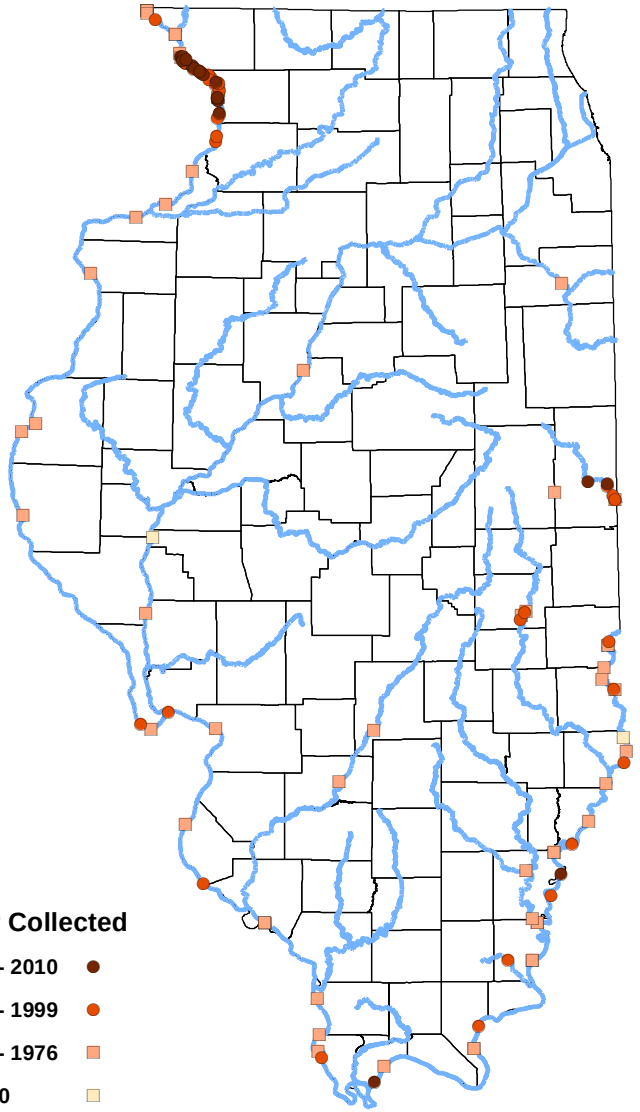

American brook lamprey*(Lampetra appendix)*

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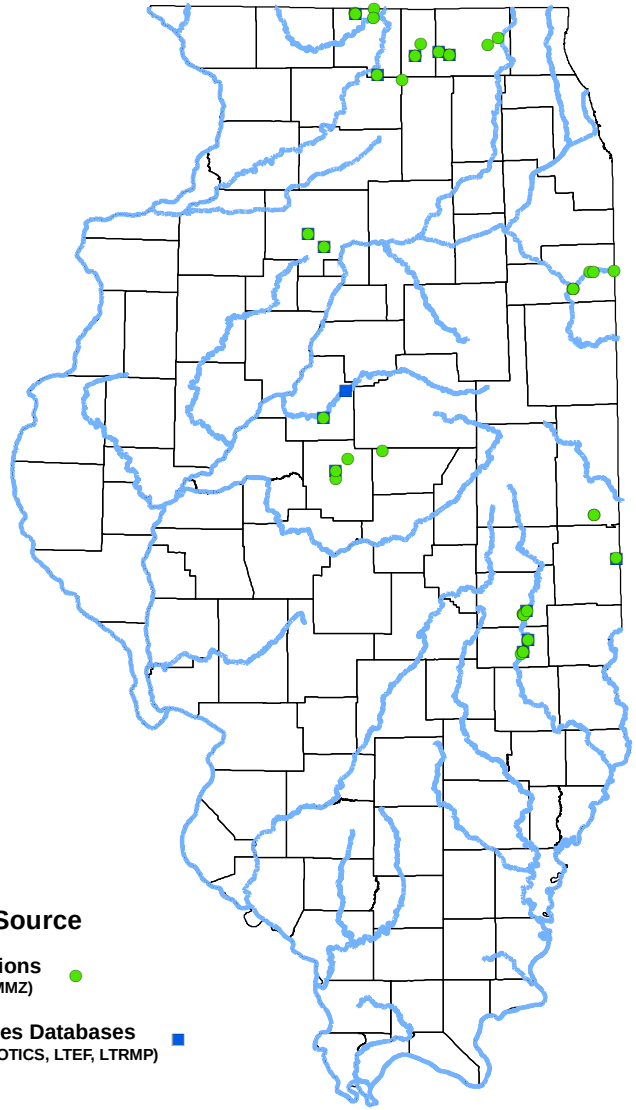
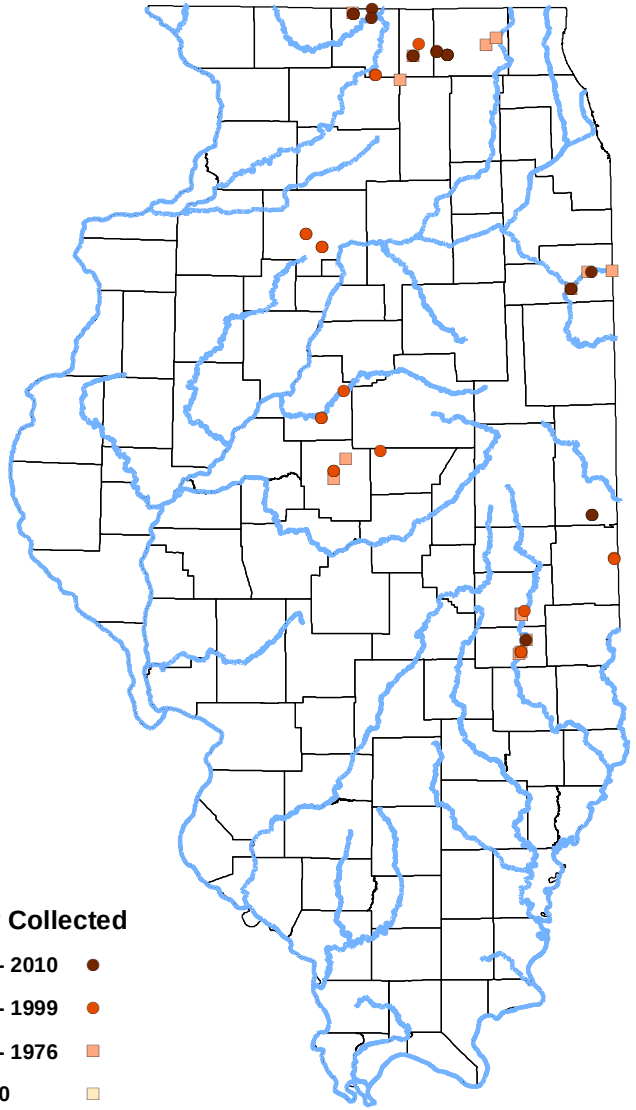


Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

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Ribbon shiner*(Lythrurus fumeus)*

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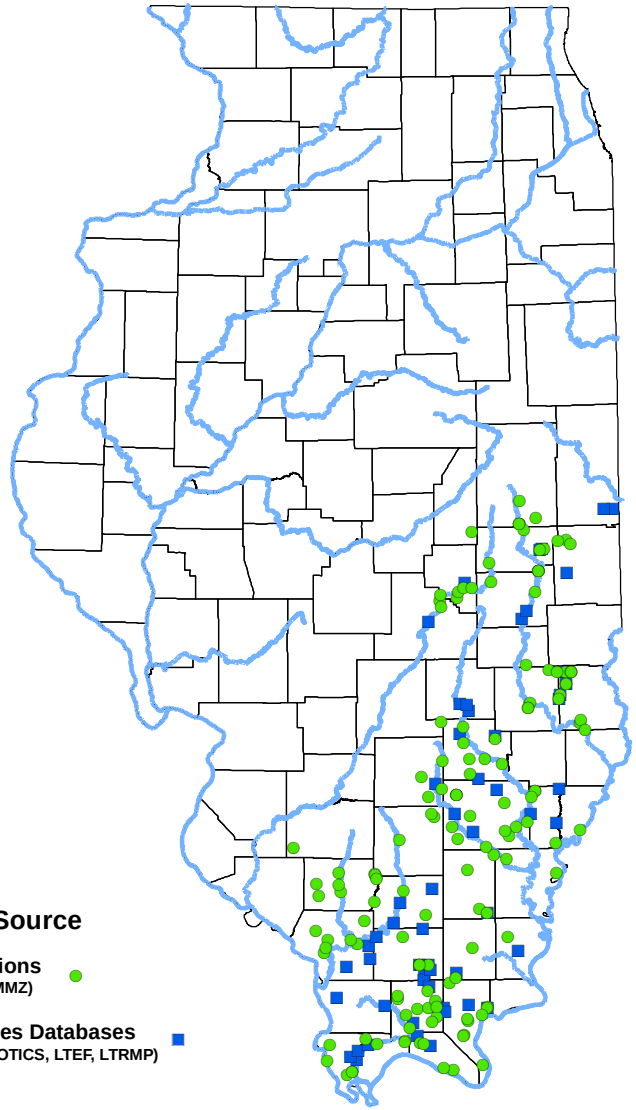

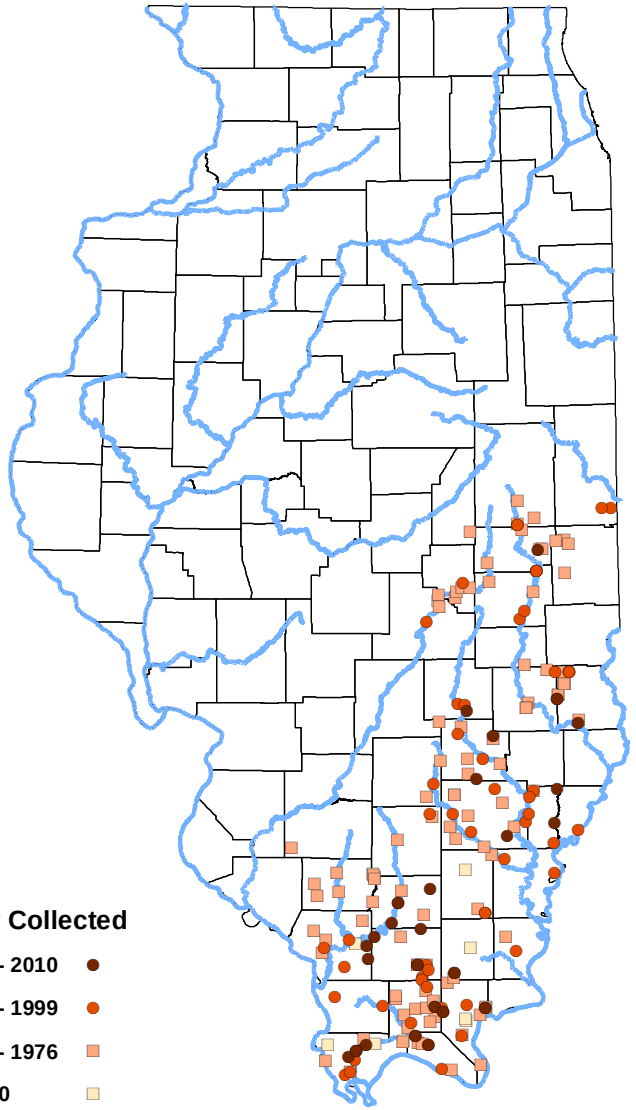

Sicklefin chub(*Macrhybopsis meeki*)

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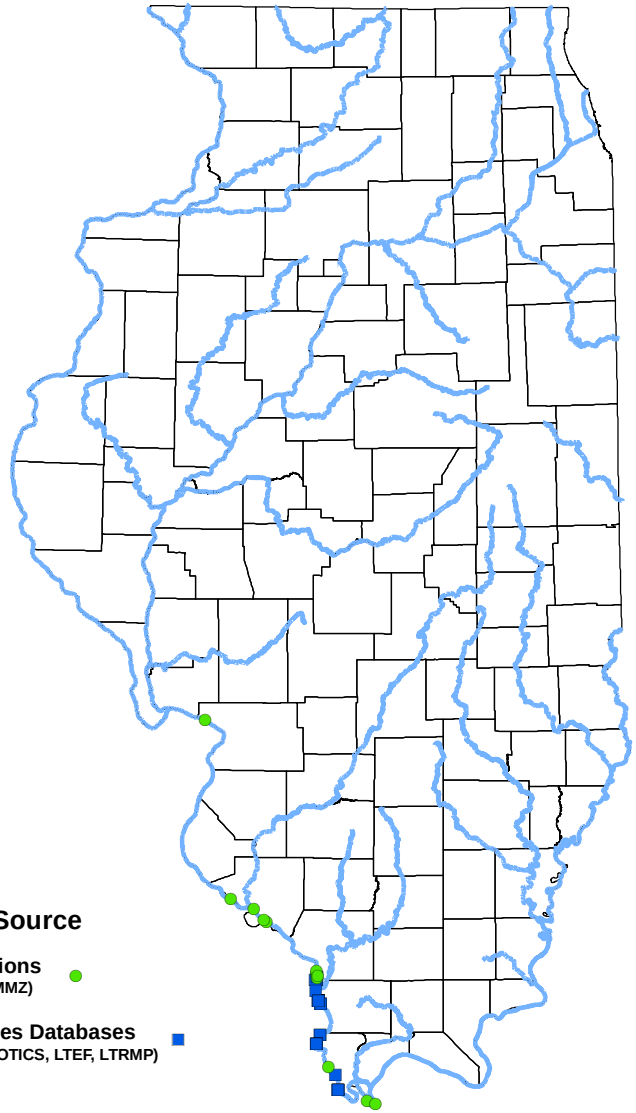
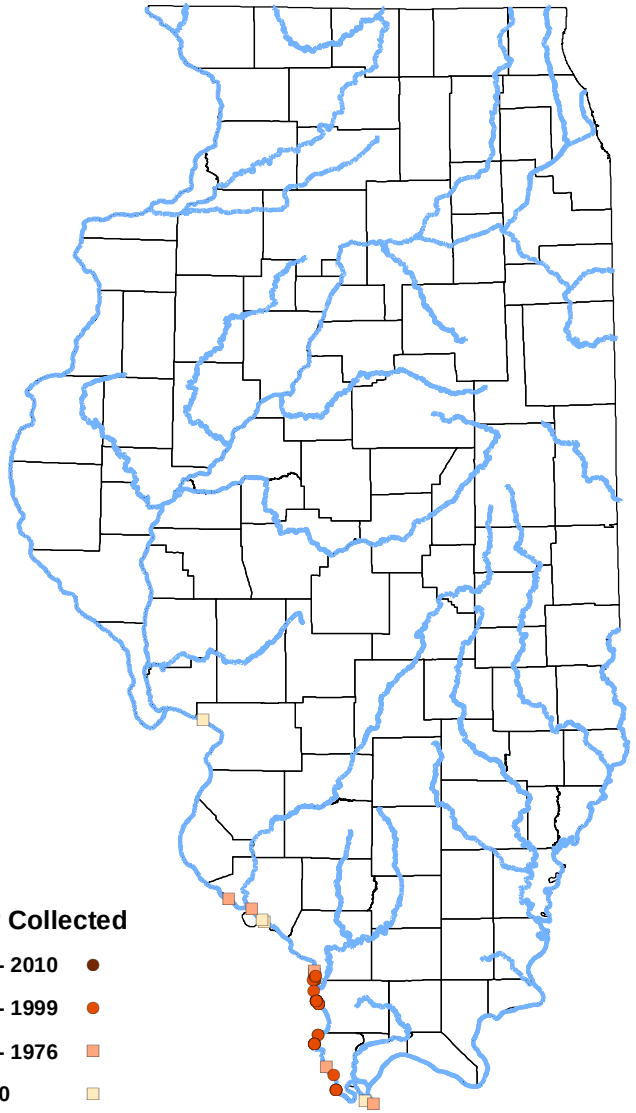
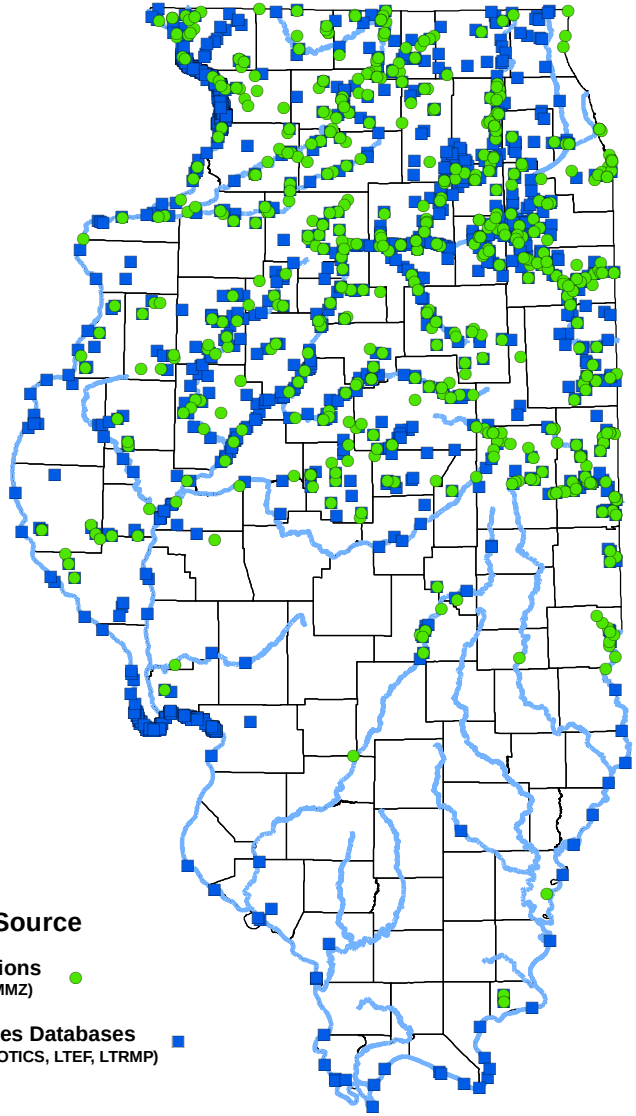
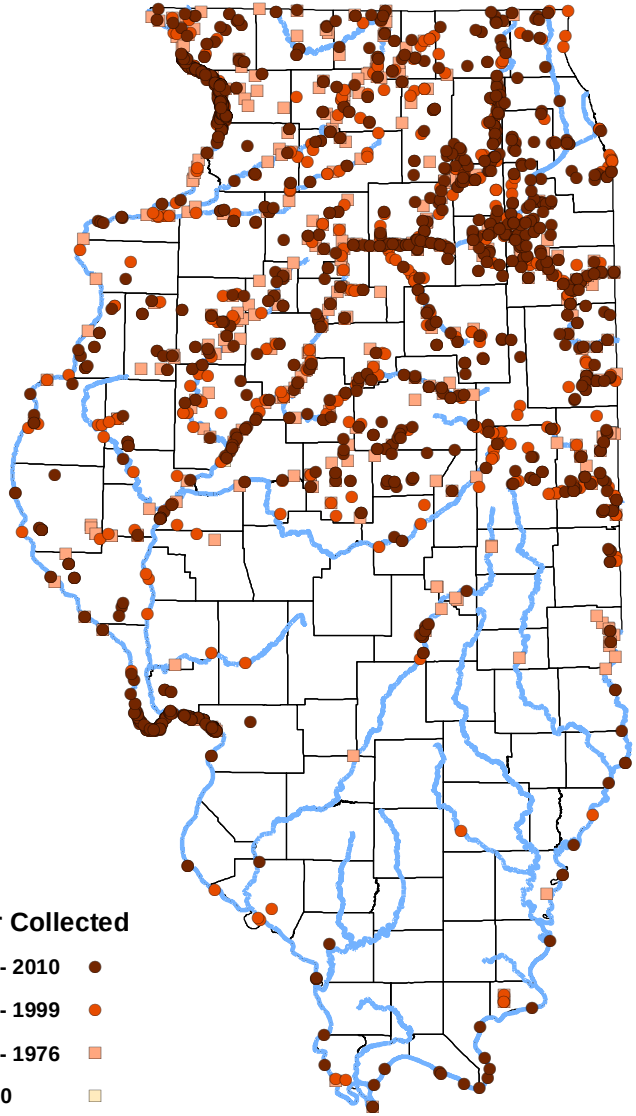


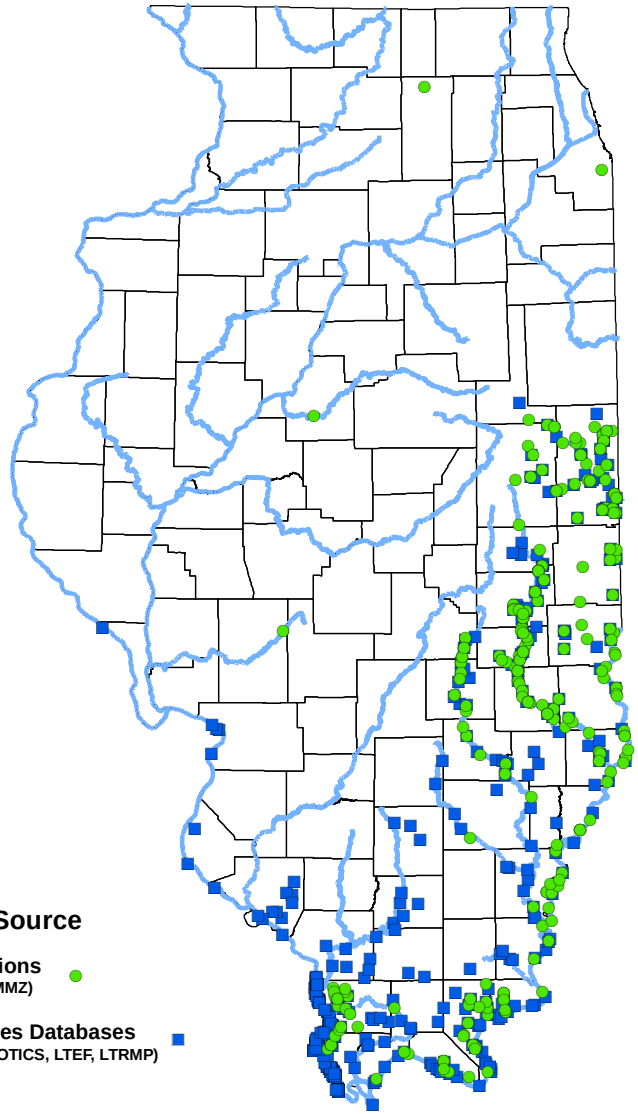


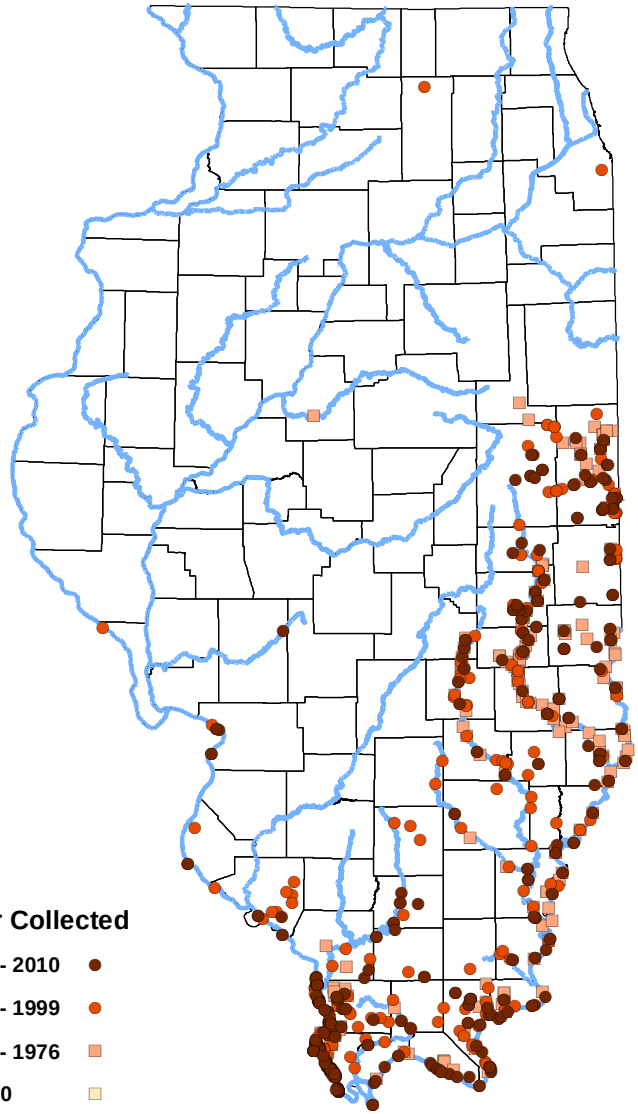
Smallmouth bass(*Micropterus dolomieu*)





Spotted bass(*Micropterus punctulatus*)





Black redhorse*(Moxostoma duquesnei)*

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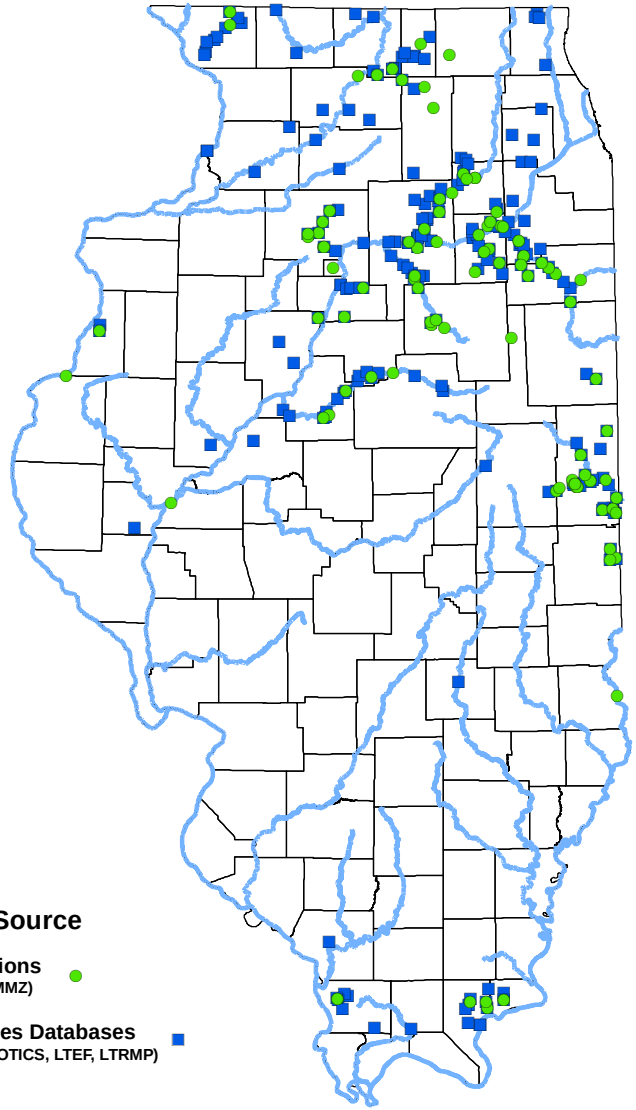
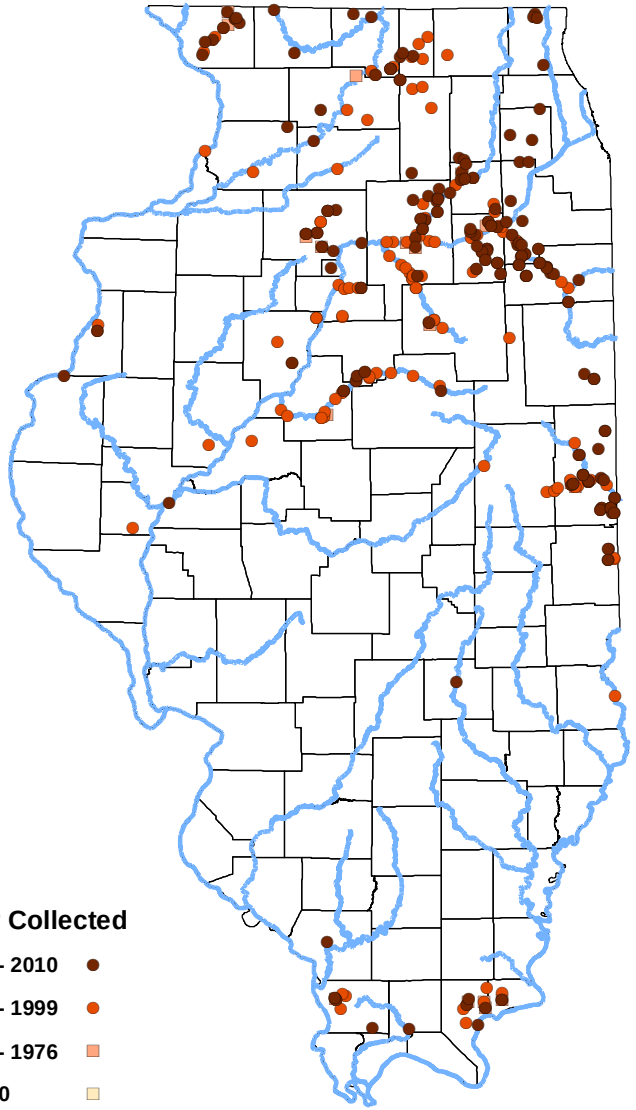


Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

- 2000 - 2010
- 1977 - 1999
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Ghost shiner*(Notropis buchanani)*

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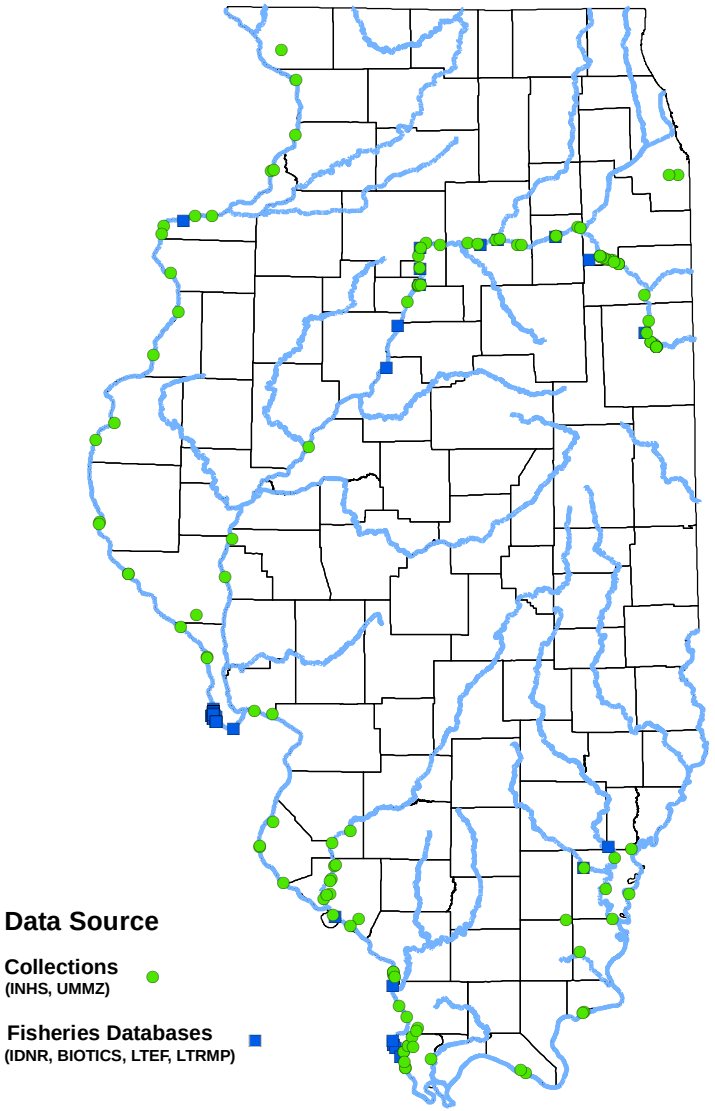

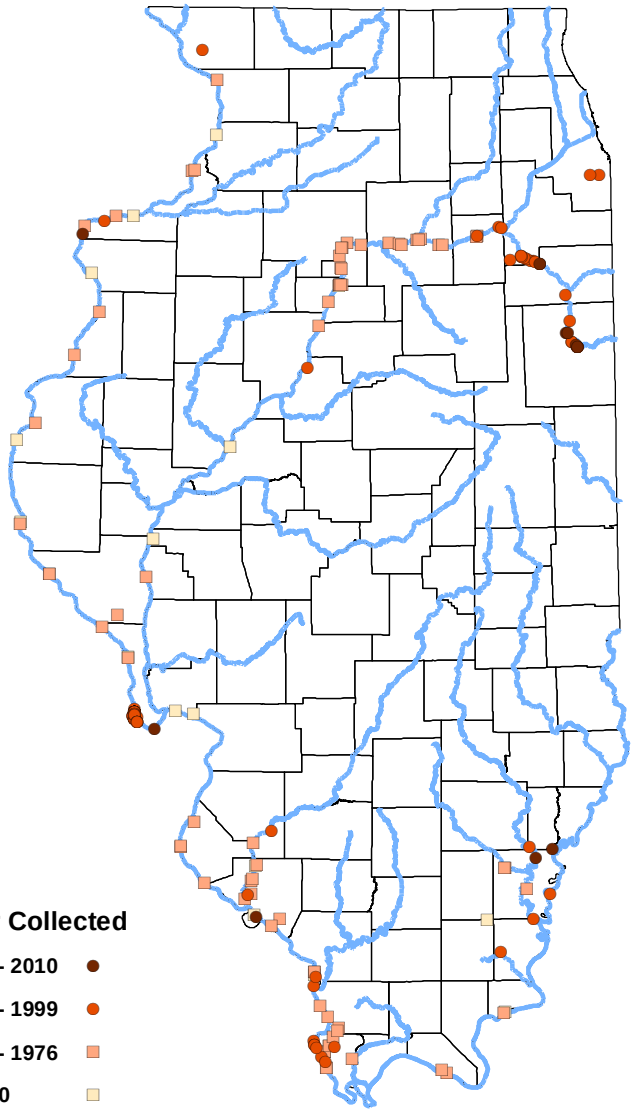

Ozark minnow(*Notropis nubilus*)

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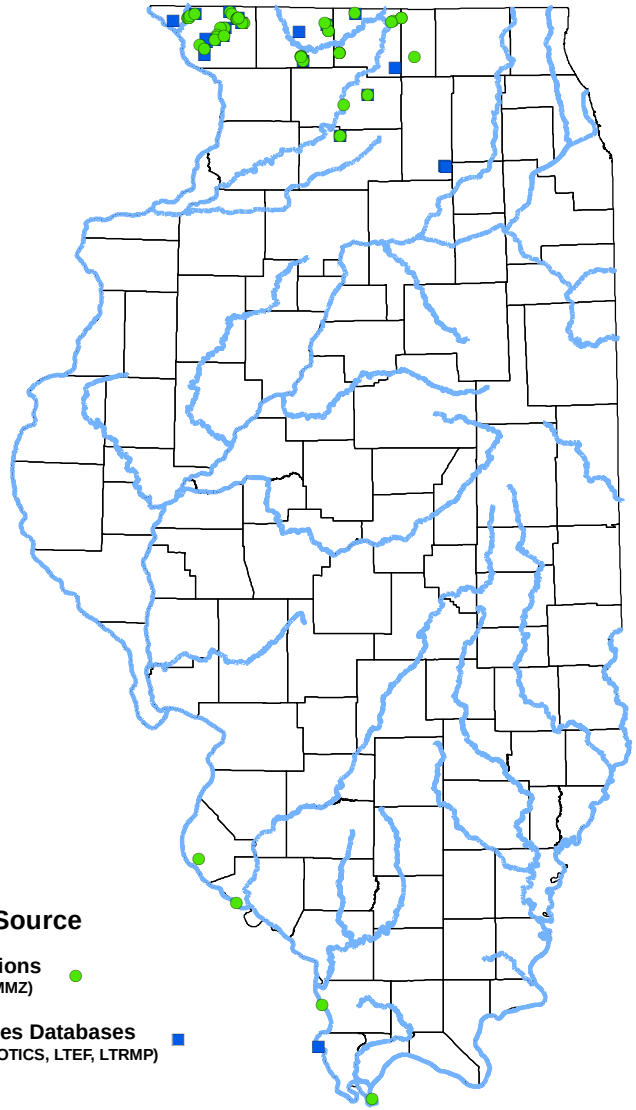
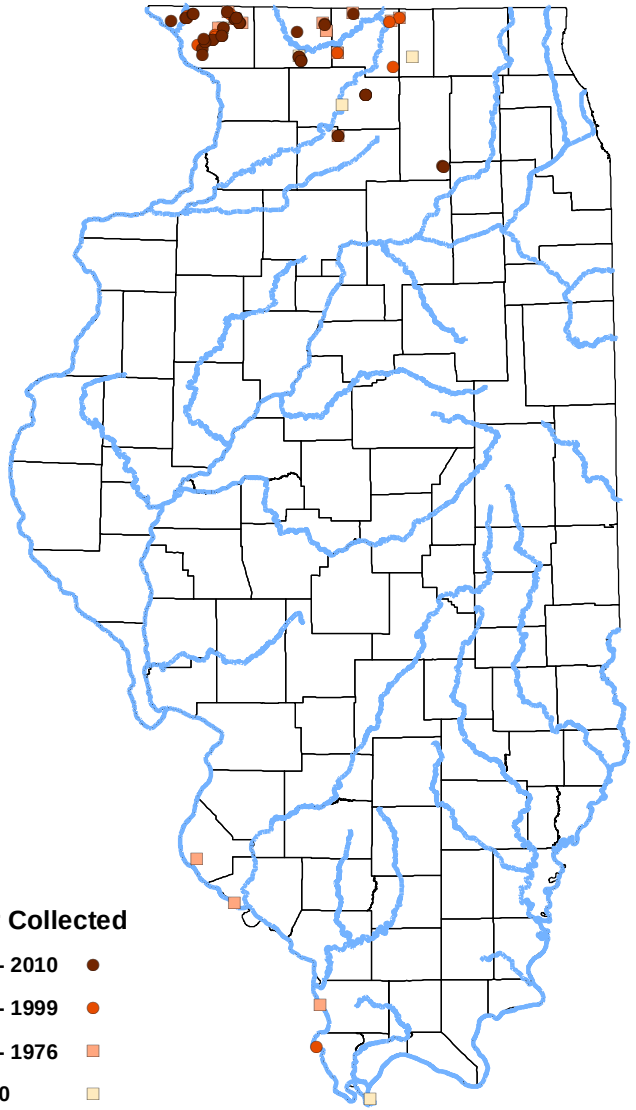
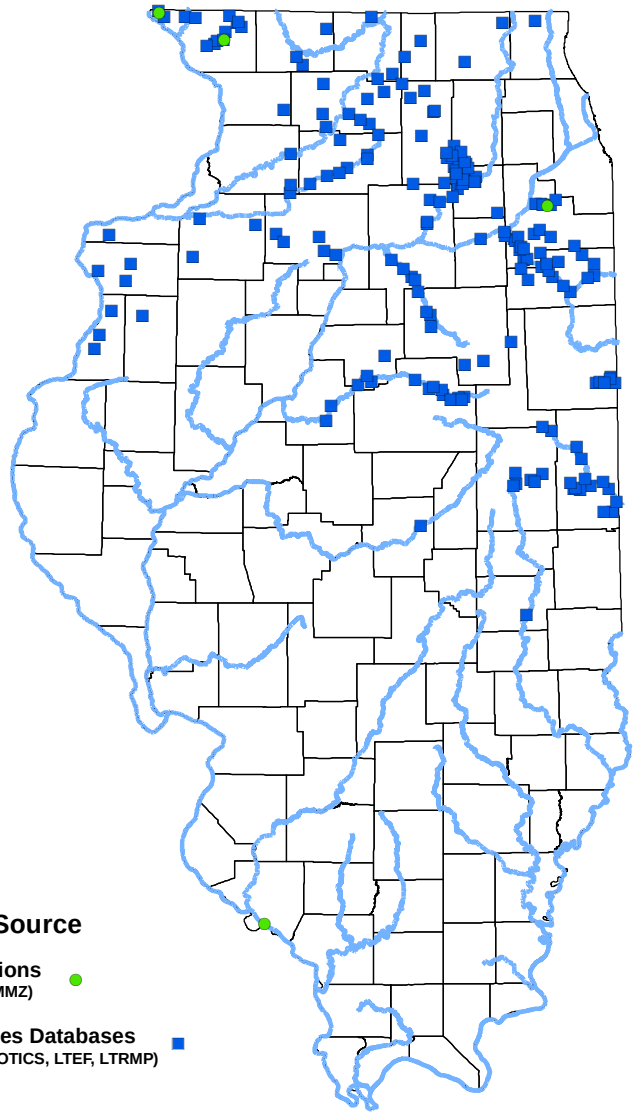
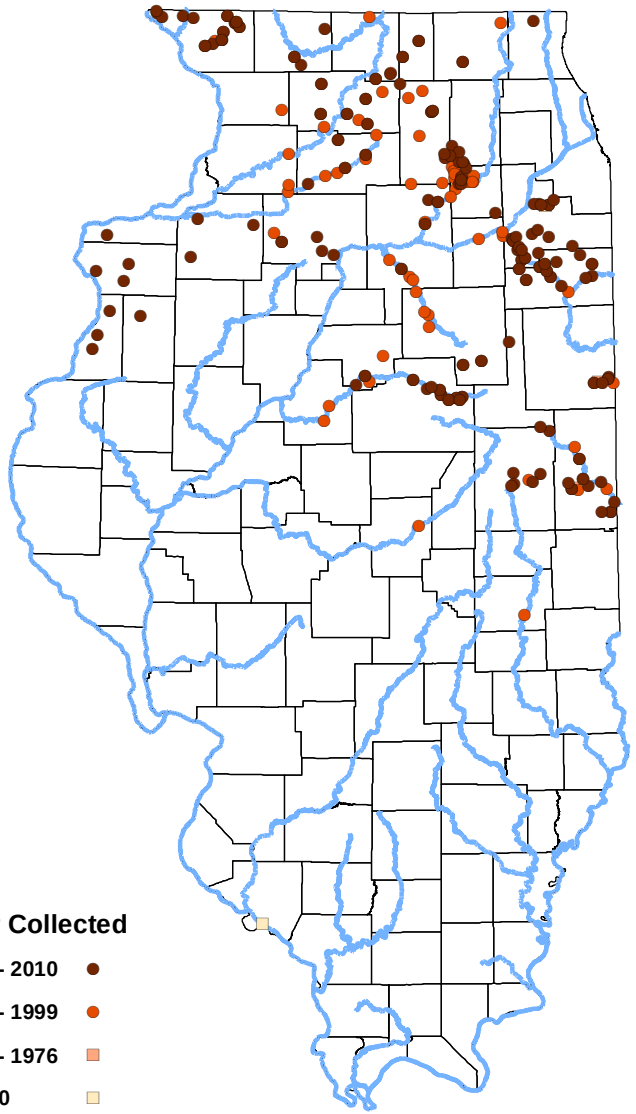


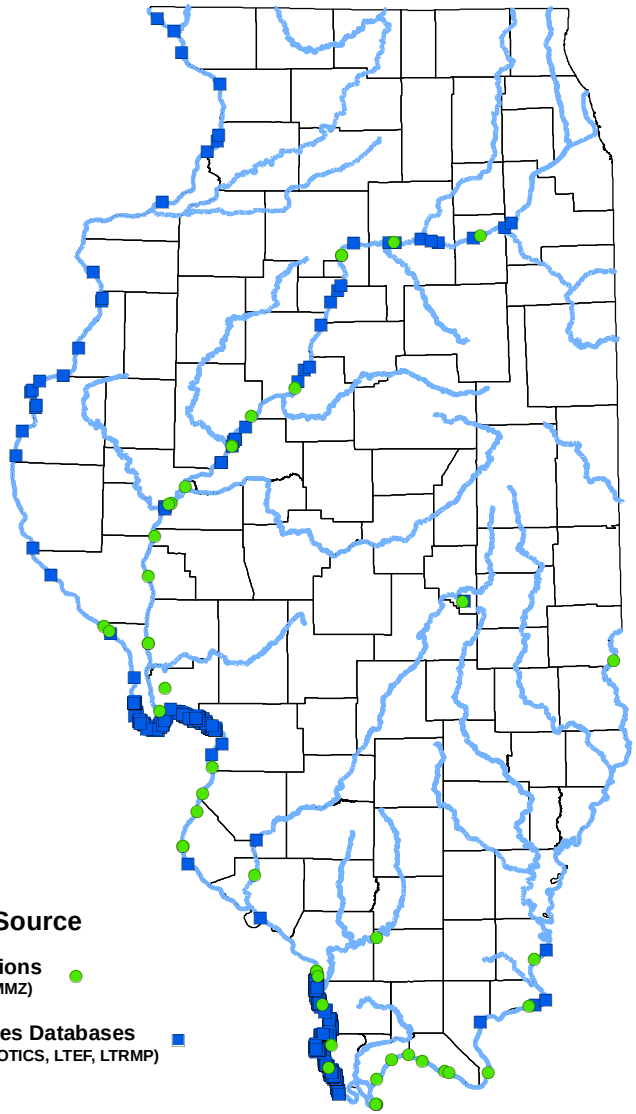


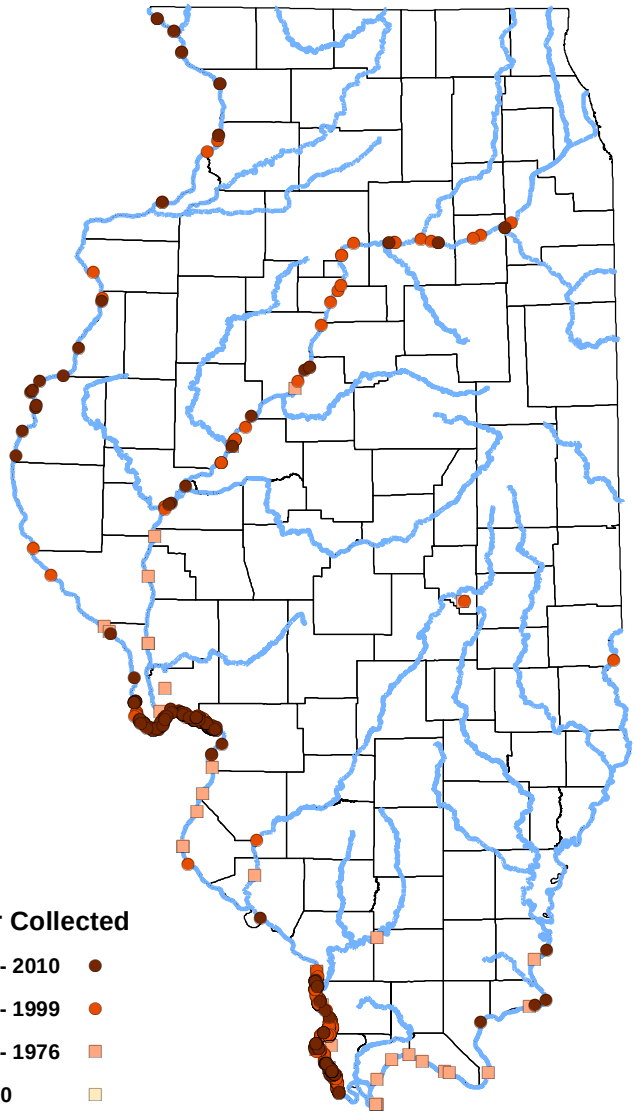
Rosyface shiner*(Notropis rubellus)*



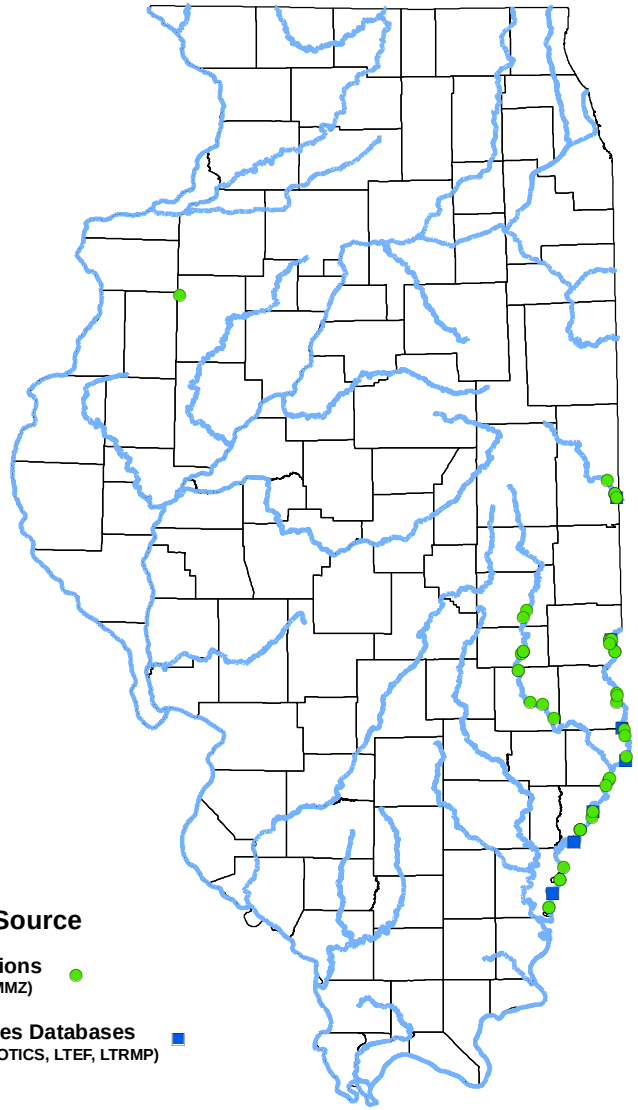


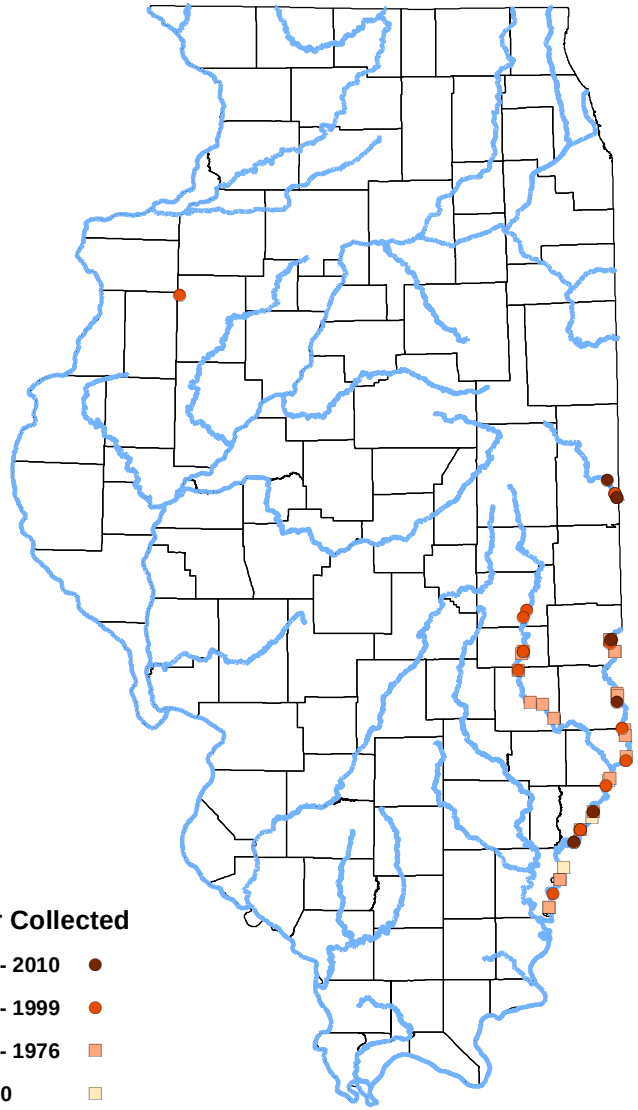
Silverband shiner*(Notropis shumardi)*



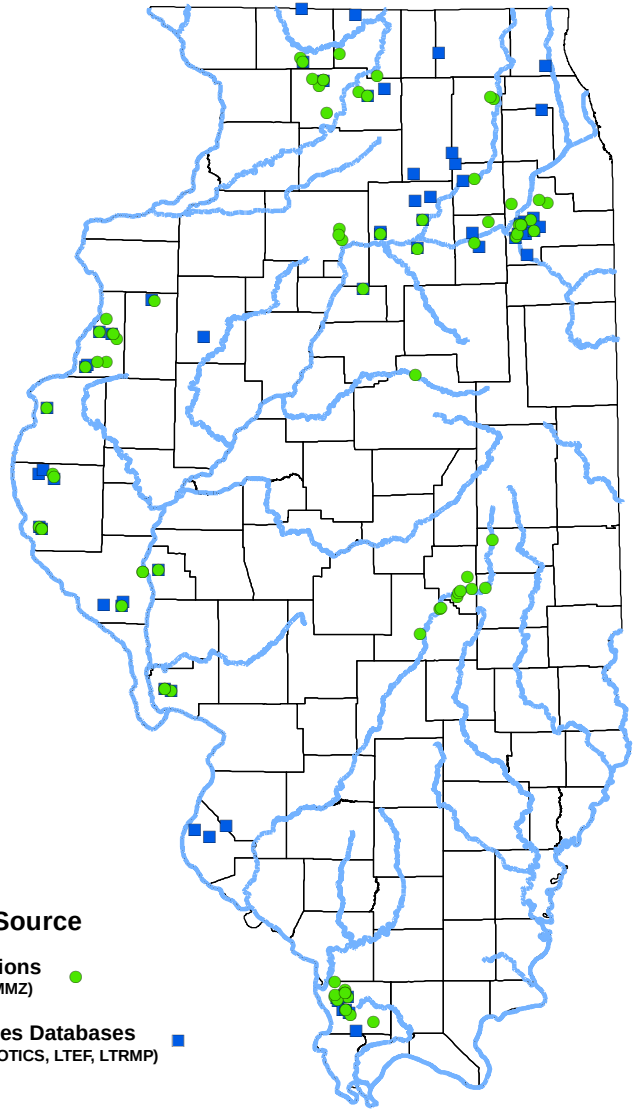


Mountain madtom*(Noturus eleutherus)*





Slender madtom*(Noturus exilis)*



Data Source

Collections
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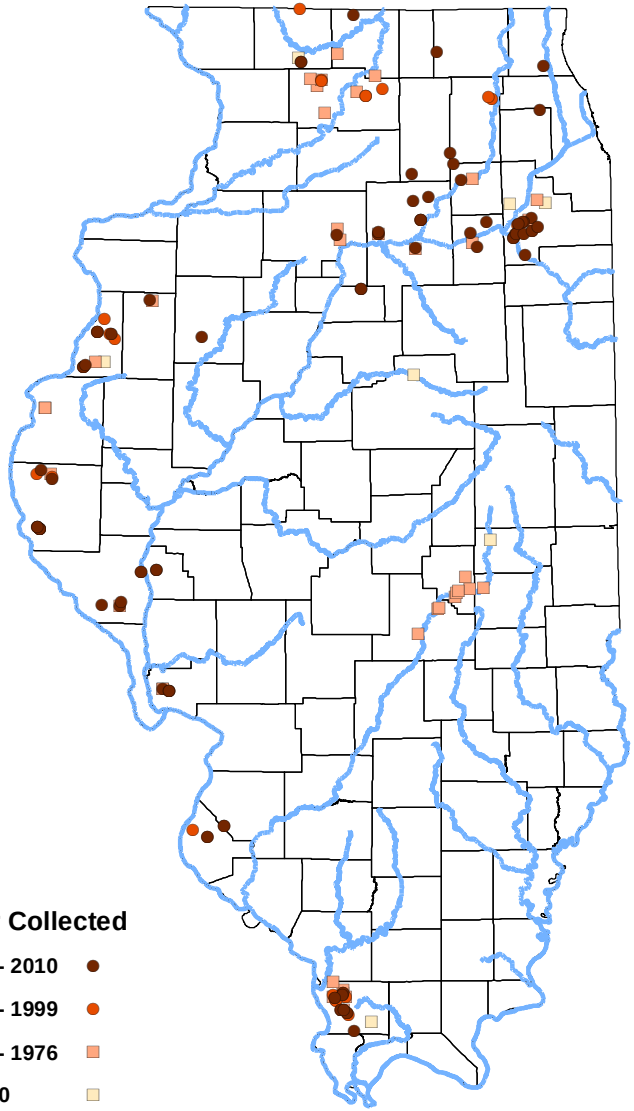

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2000 - 2010

1977 - 1999

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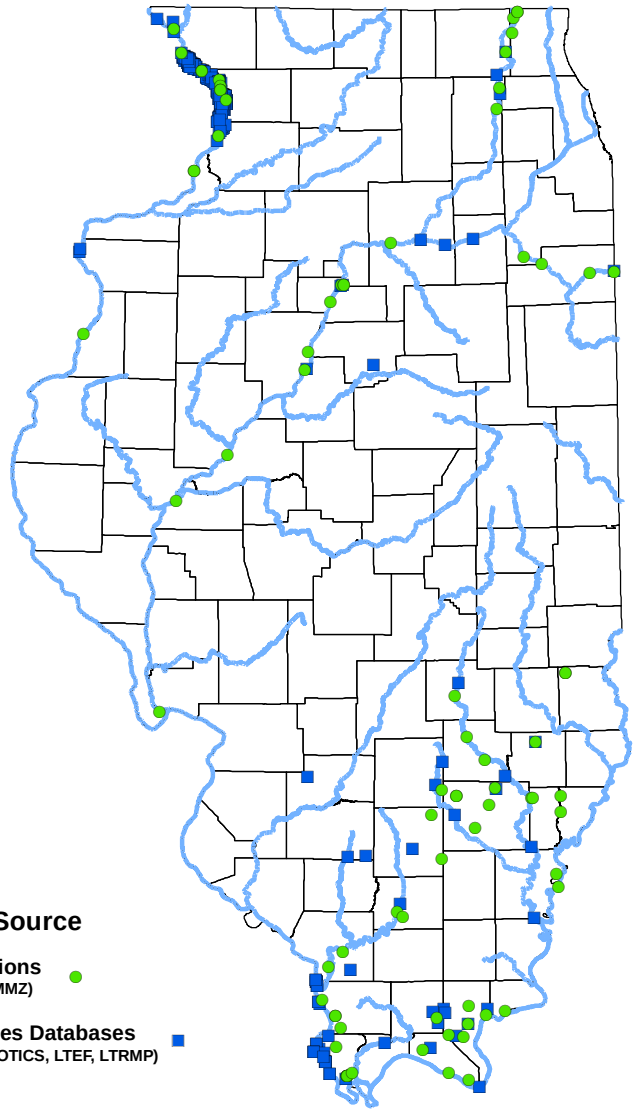
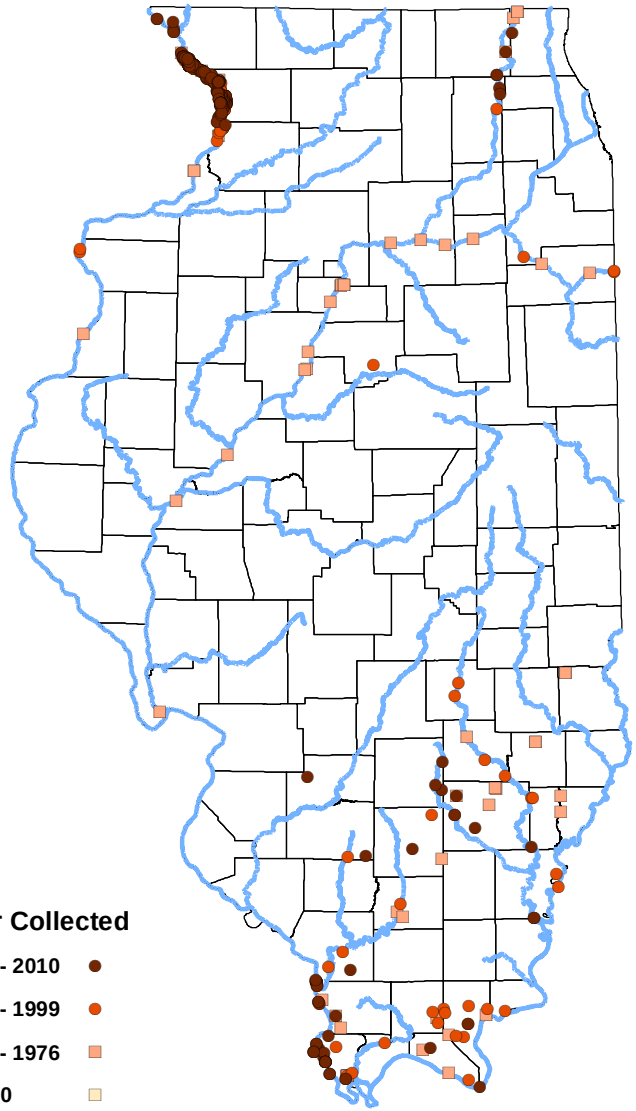
Pugnose minnow(*Opsopoeodus emiliae*)





Yellow perch(*Perca flavescens*)

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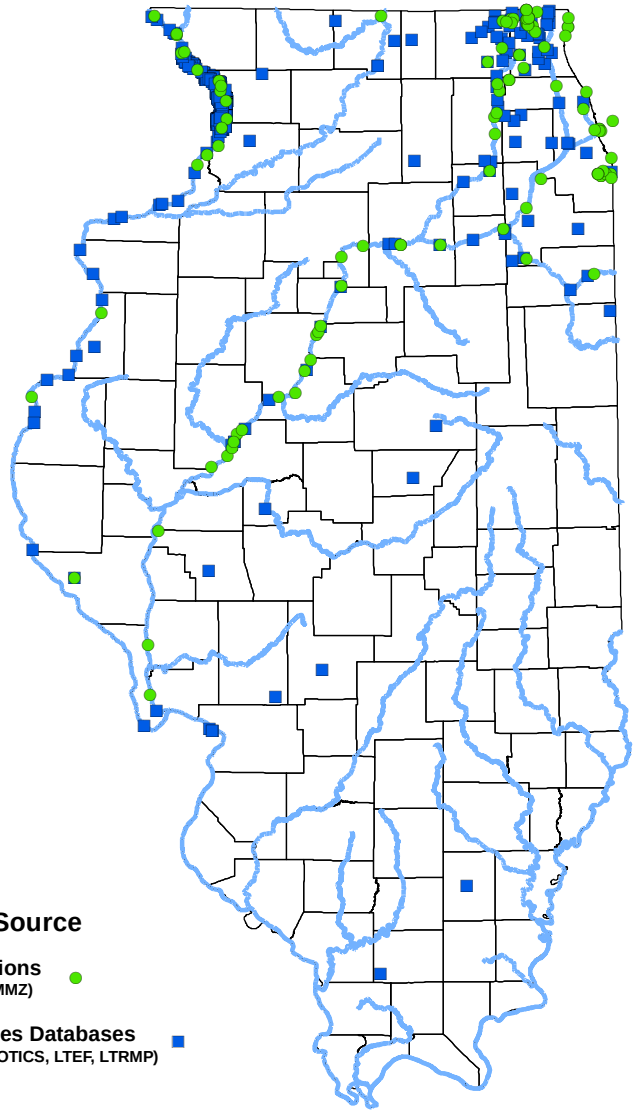

Data Source

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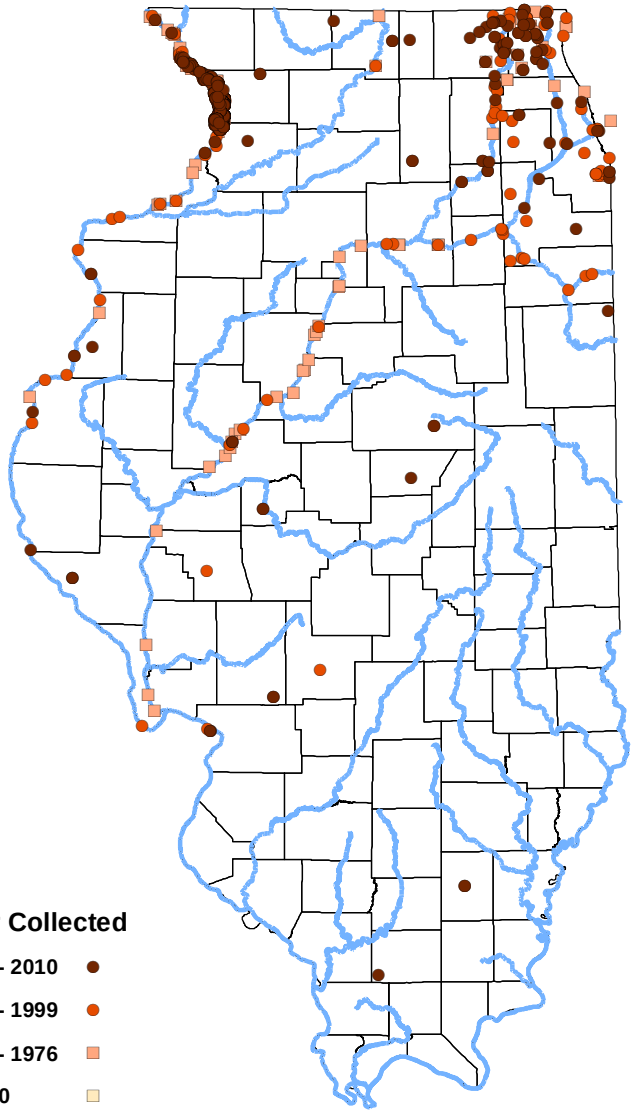

Year Collected

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Trout-perch*(Percopsis omiscomaycus)*

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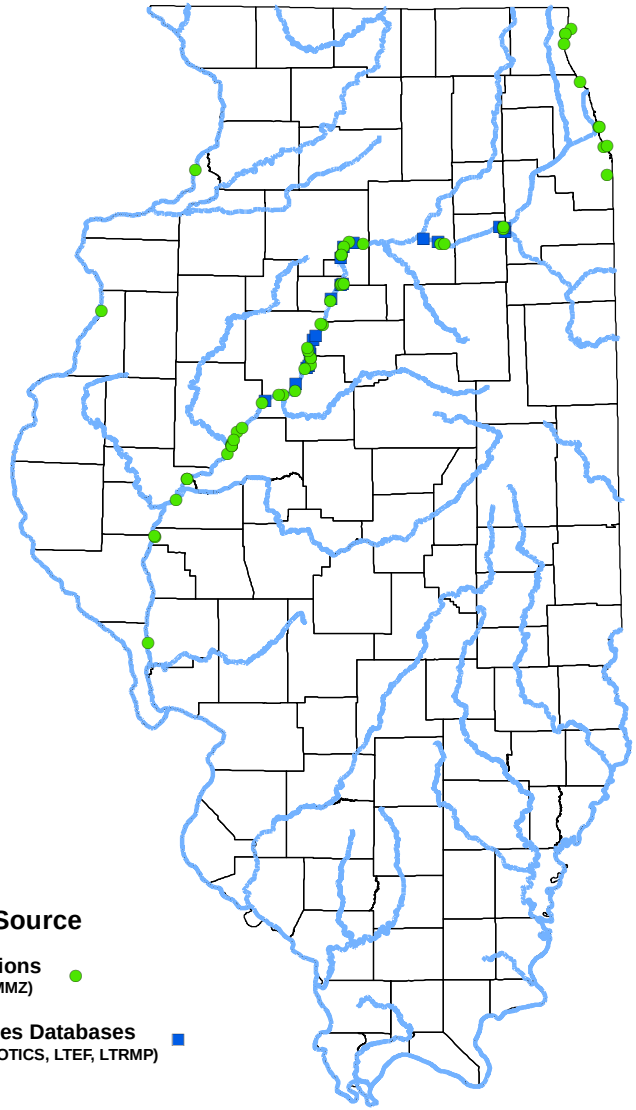

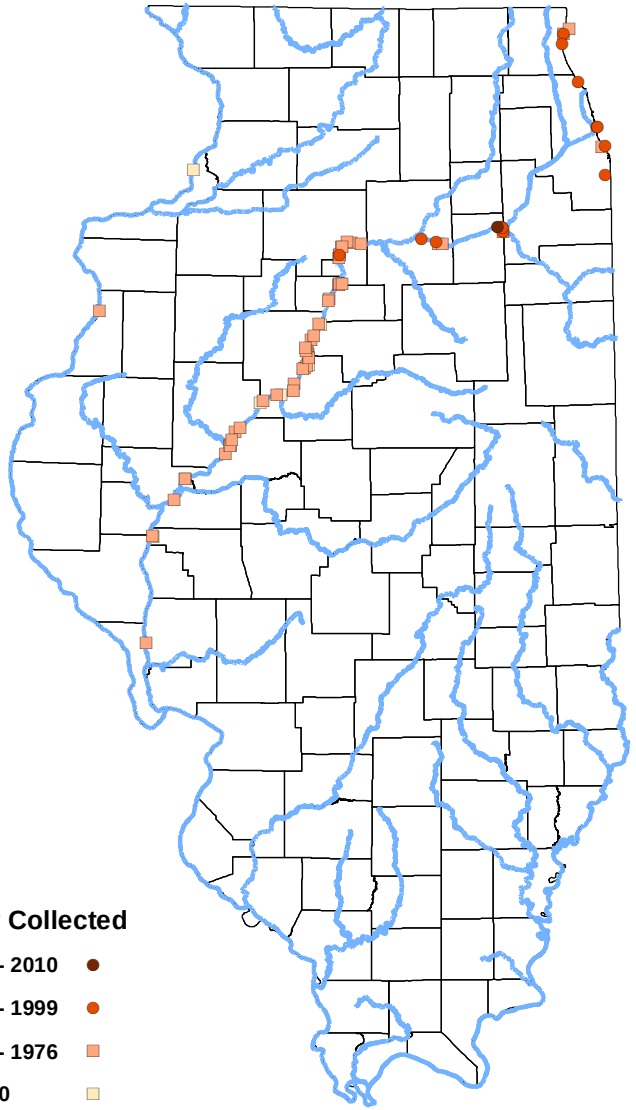

Southern redbelly dace*(Phoxinus erythrogaster)*

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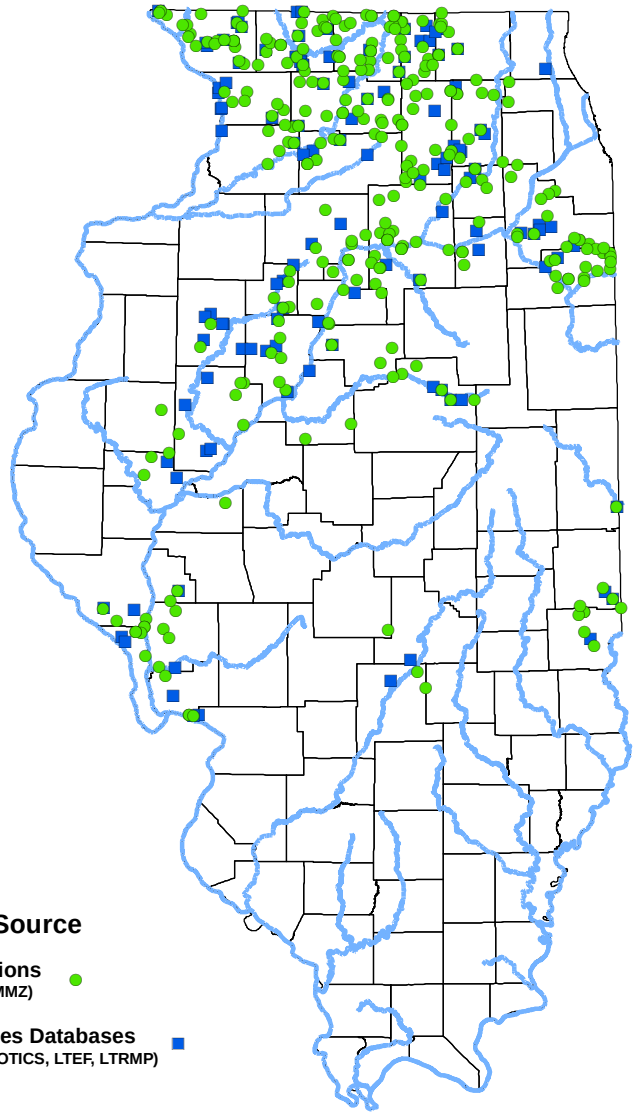
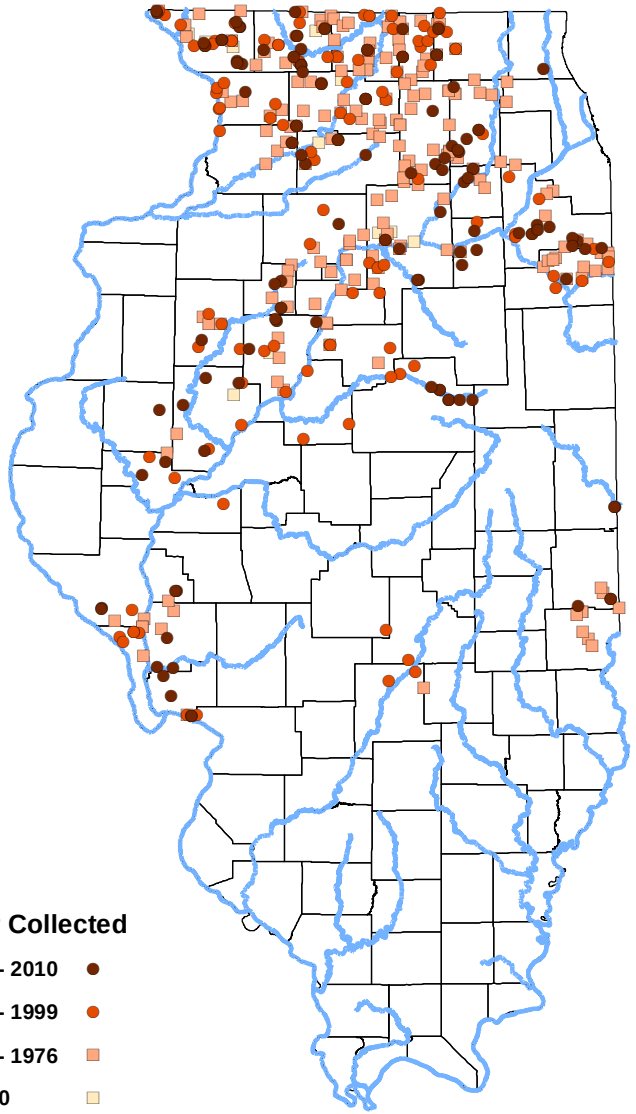
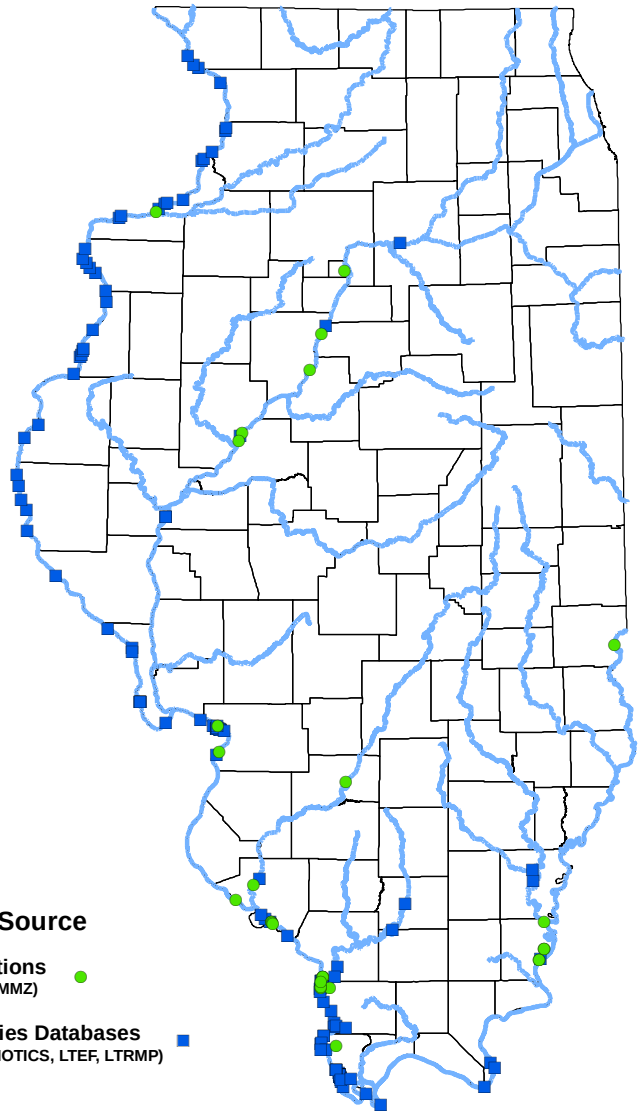
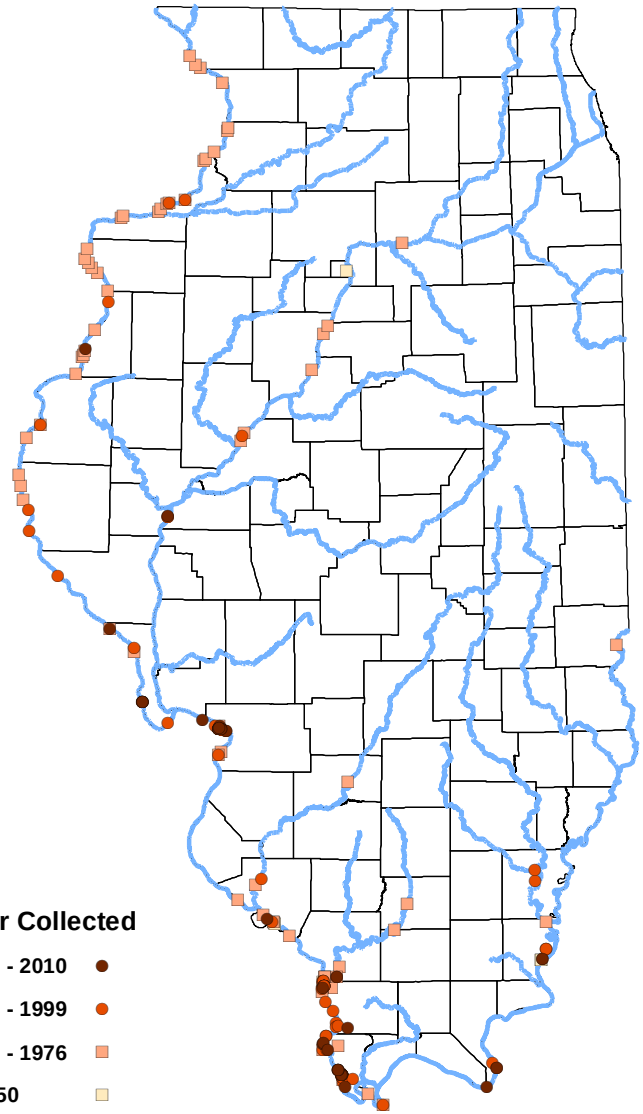


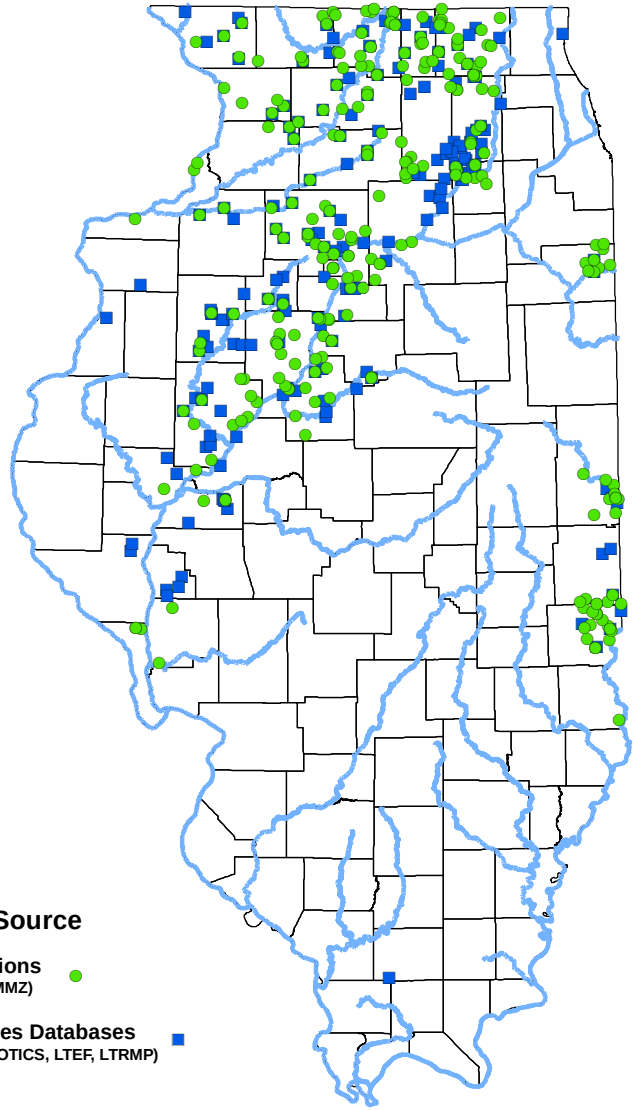


Paddlefish(*Polyodon spathula*)





Blacknose dace(*Rhinichthys atratulus*)



Data Source

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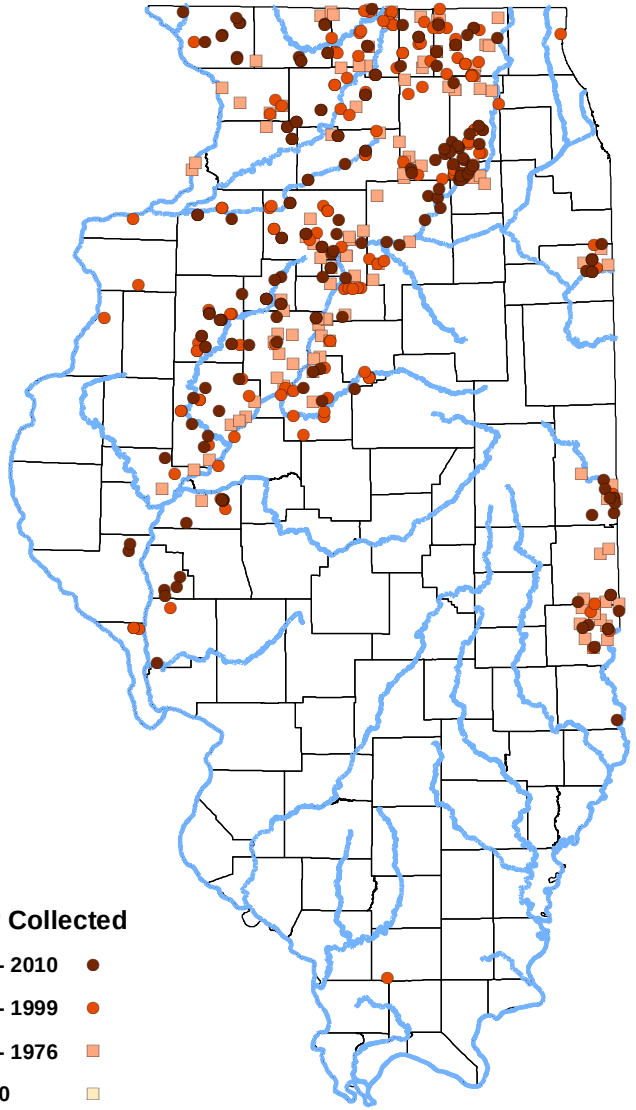

Year Collected

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Longnose dace(*Rhinichthys cataractae*)

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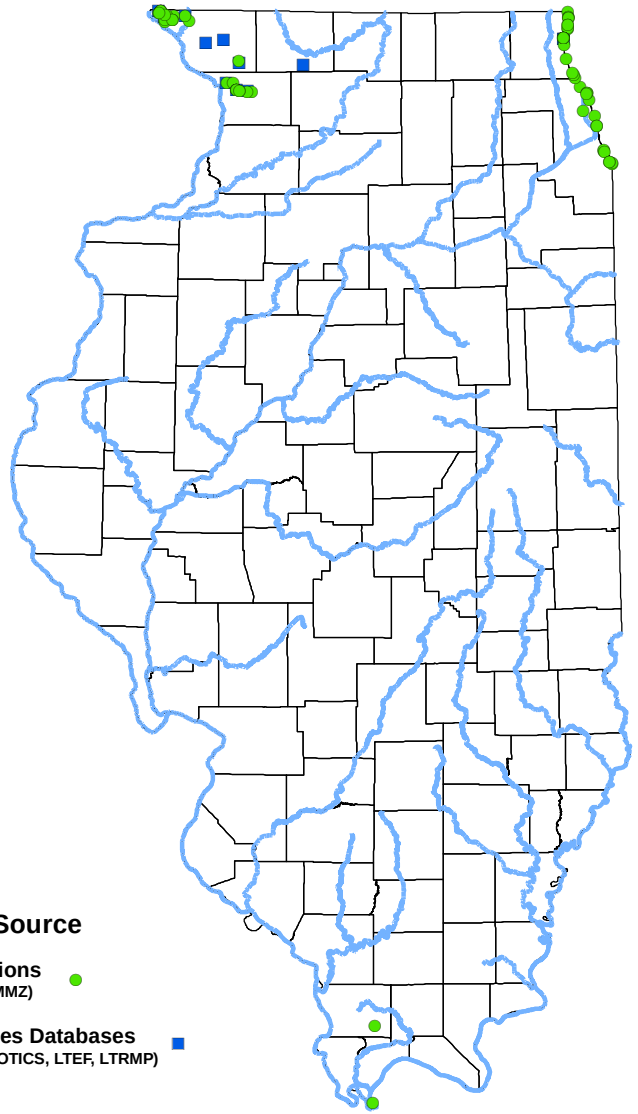
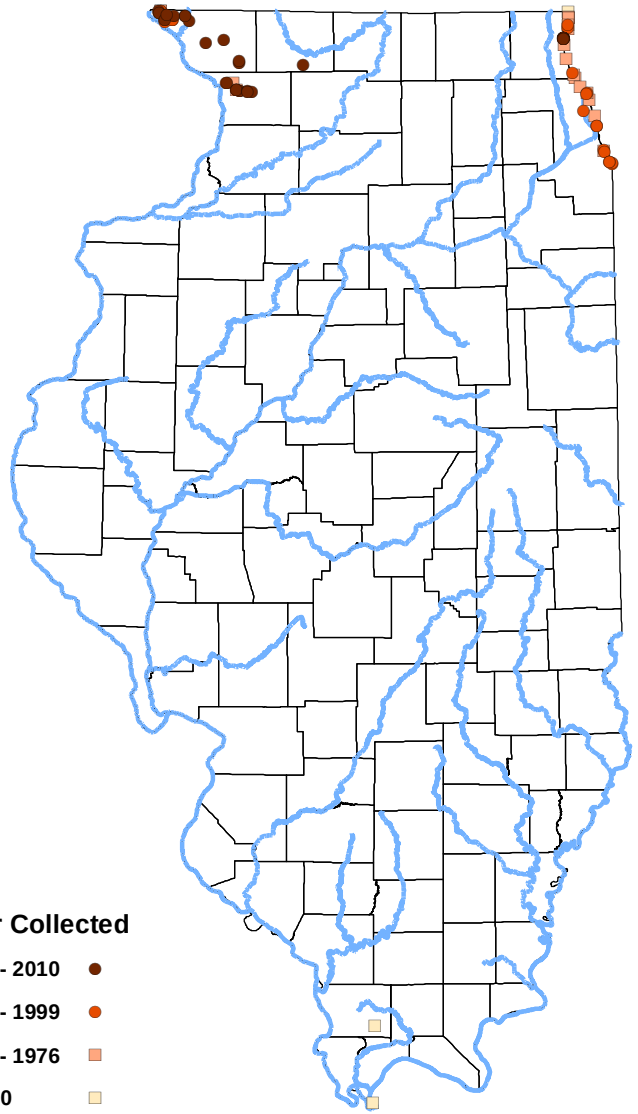
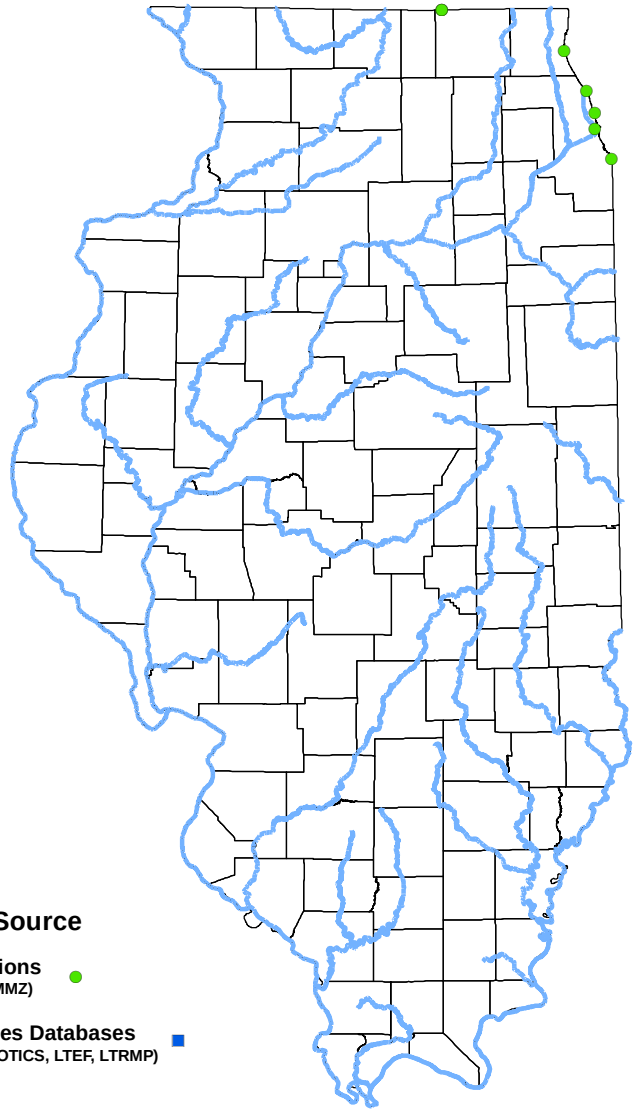




Brook trout(*Salvelinus fontinalis*)



Data Source

Collections
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Fisheries Databases
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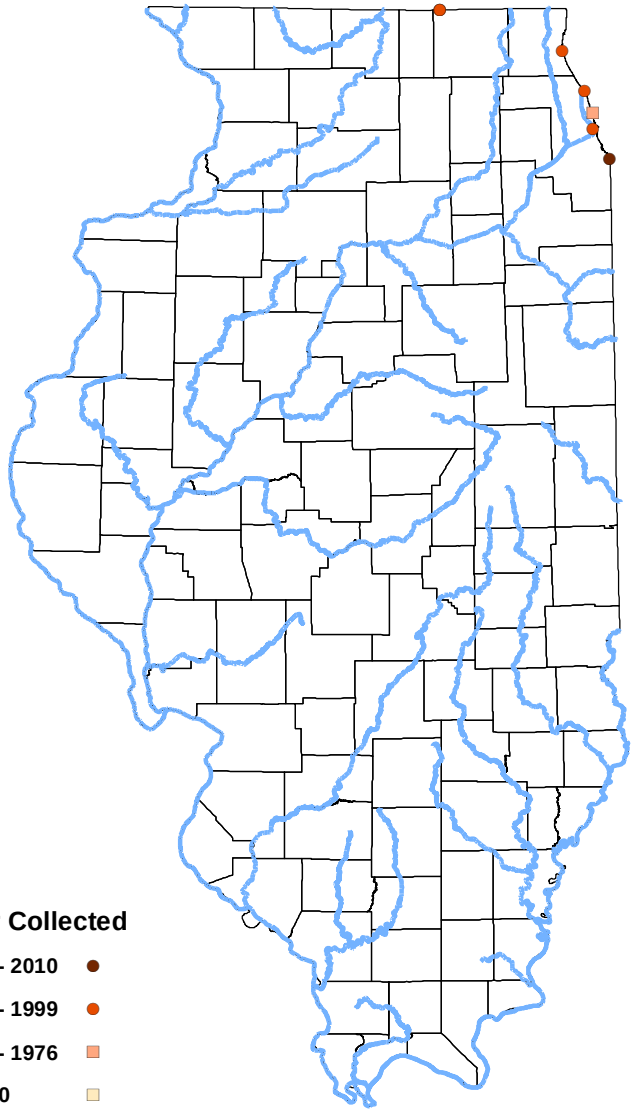

Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

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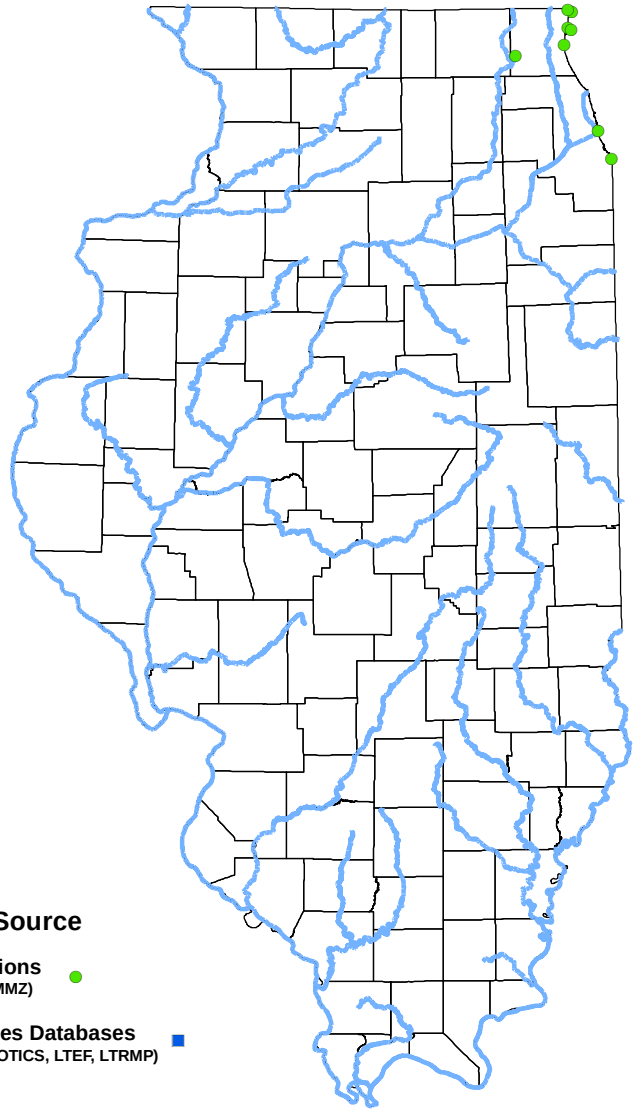
Lake trout(*Salvelinus namaycush*)



Data Source

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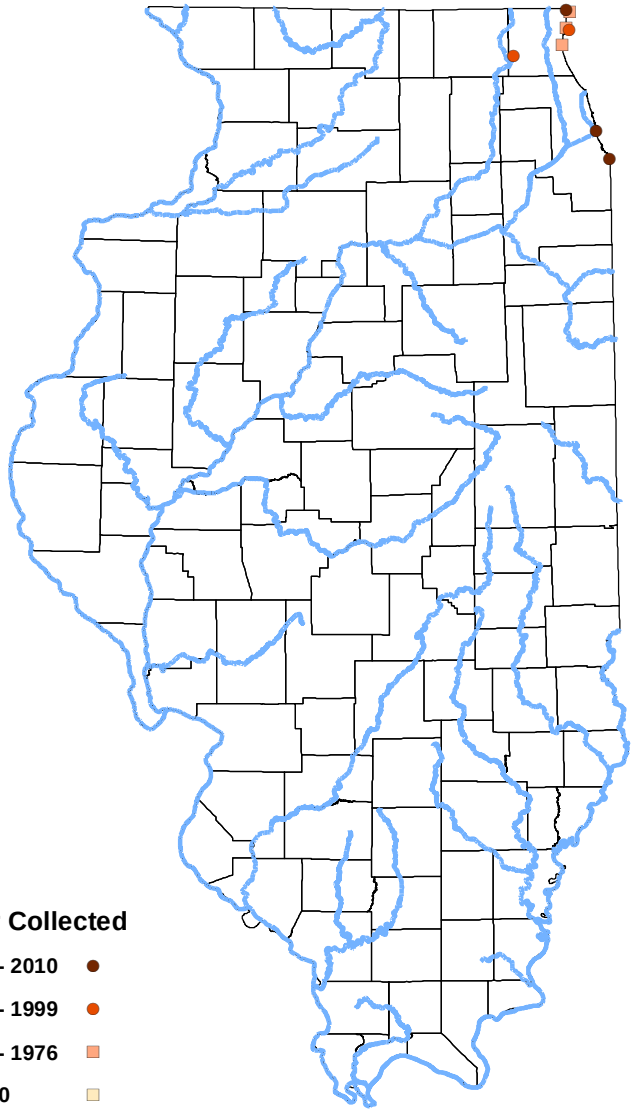

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Shovelnose sturgeon(*Scaphirhynchus platorynchus*)

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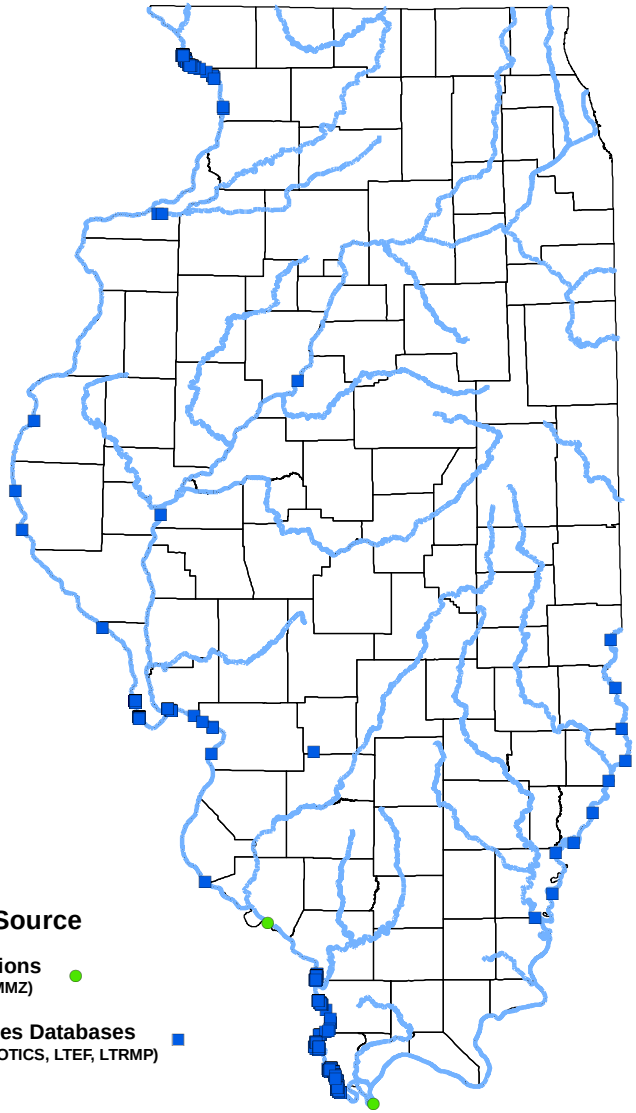
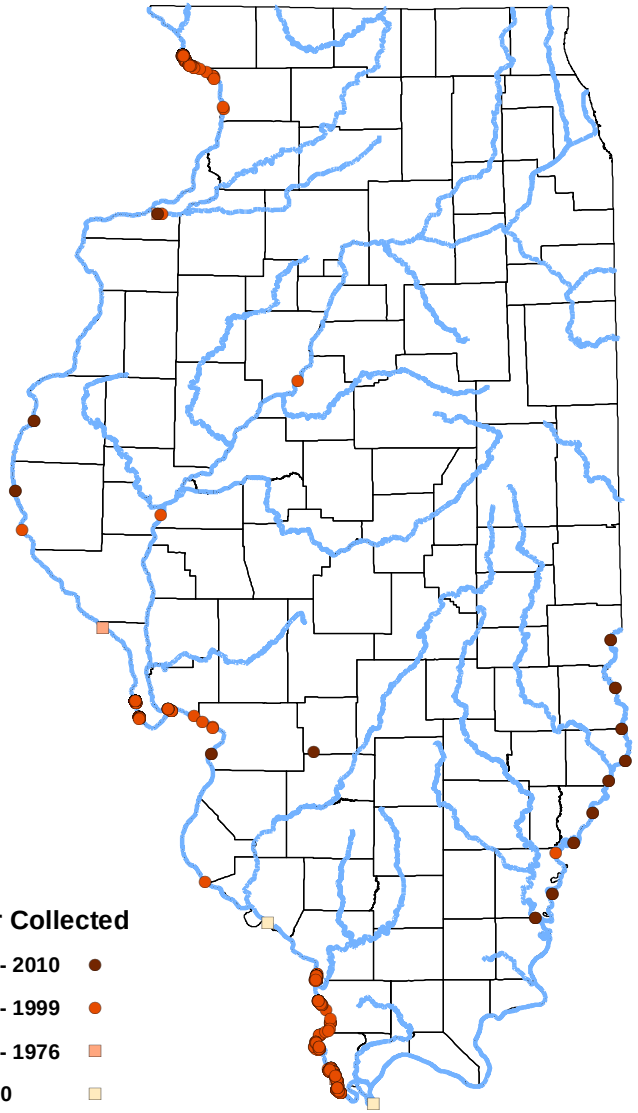
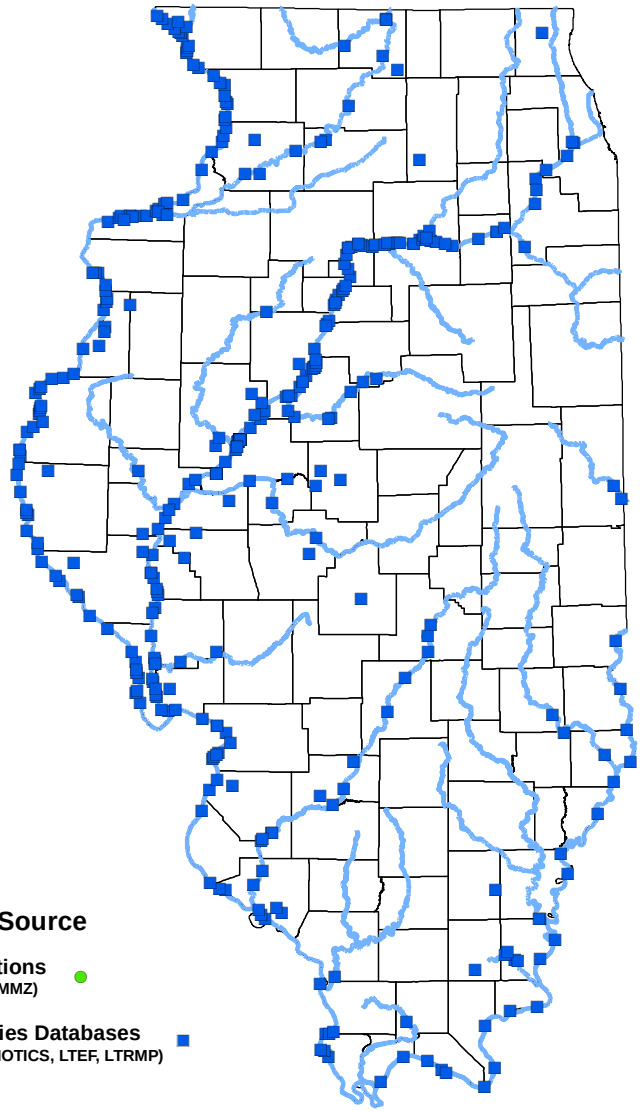
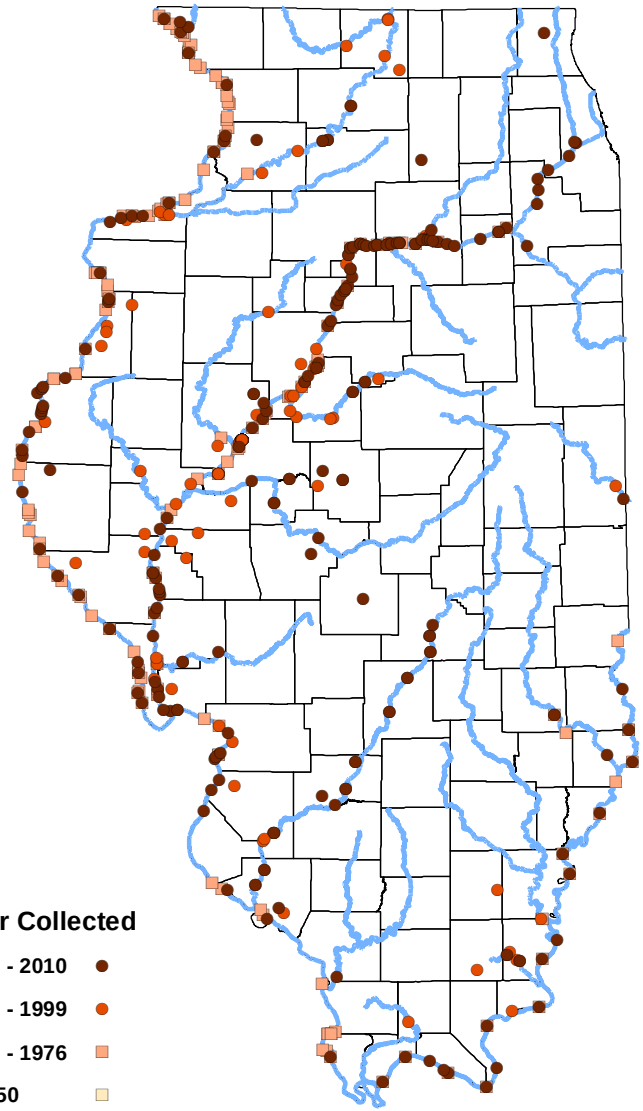


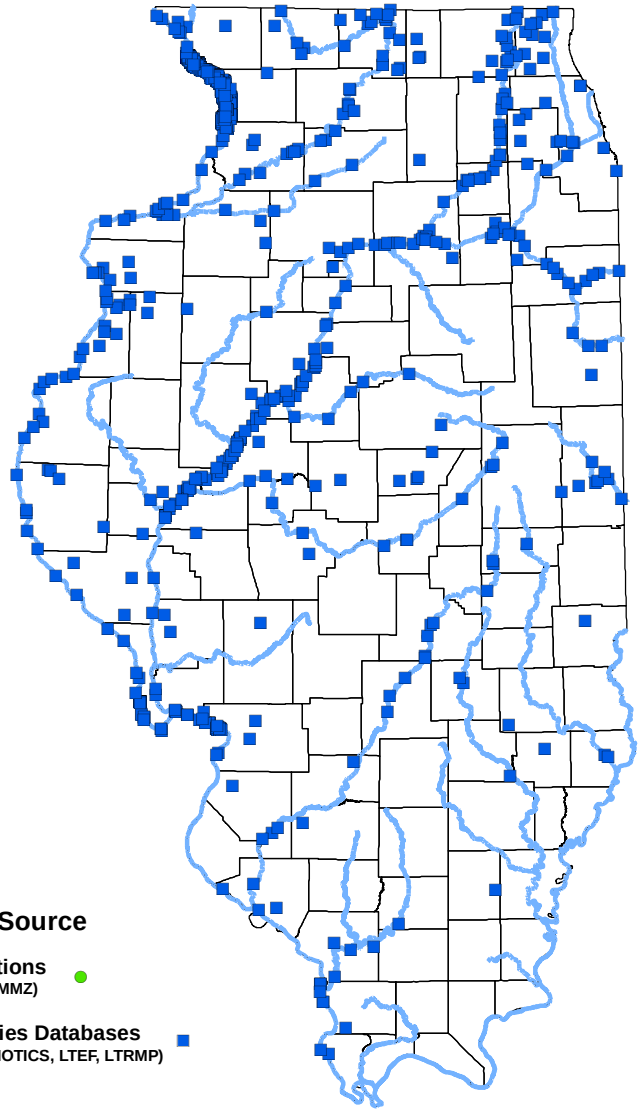


Sauger(*Stizostedion canadense*)





Walleye*(Stizostedion vitreum)*



Data Source

Collections
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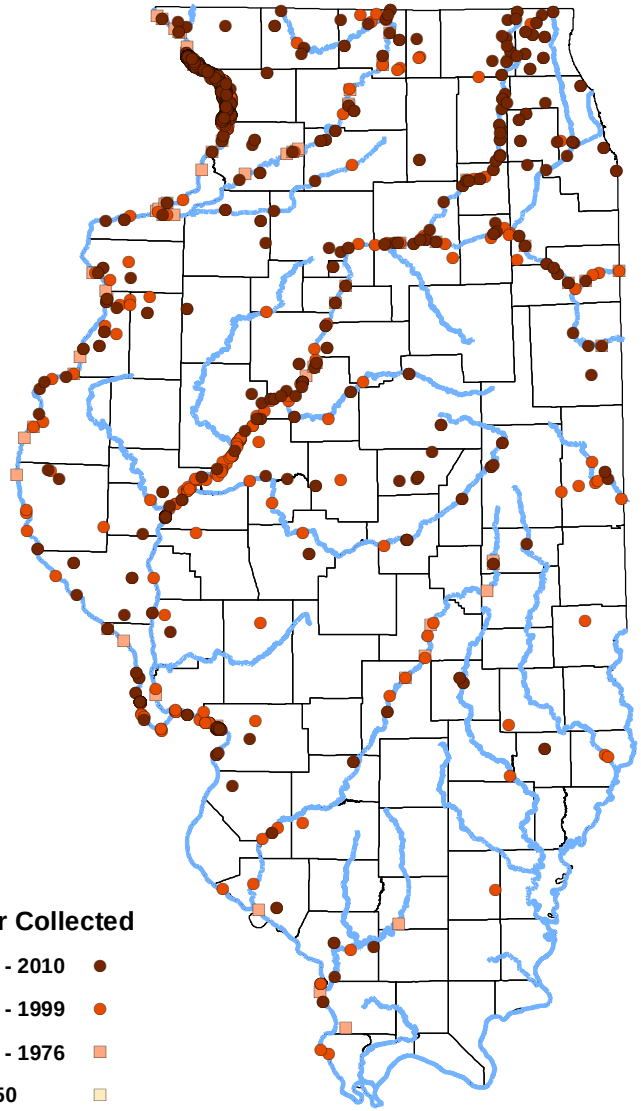

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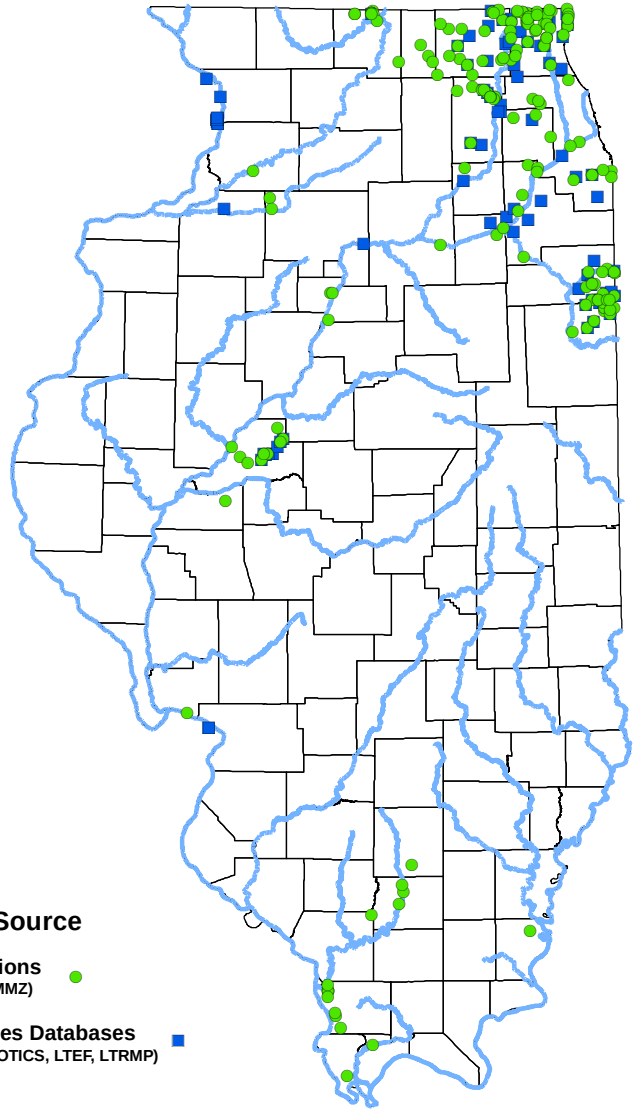
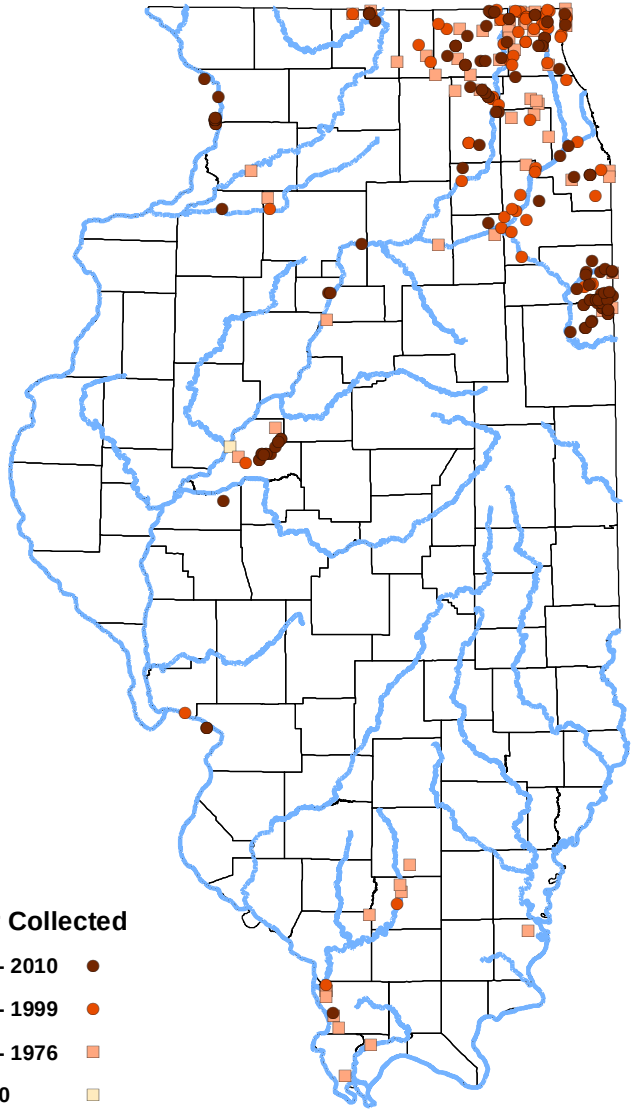
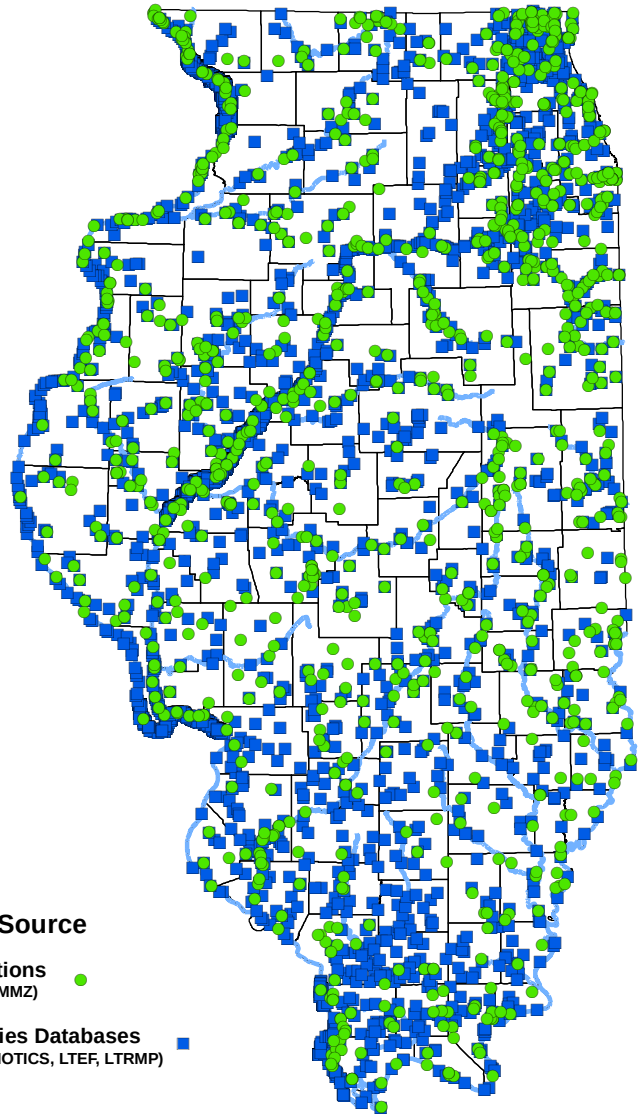
Central mudminnow*(Umbra limi)*





Largemouth bass(*Micropterus salmoides*)



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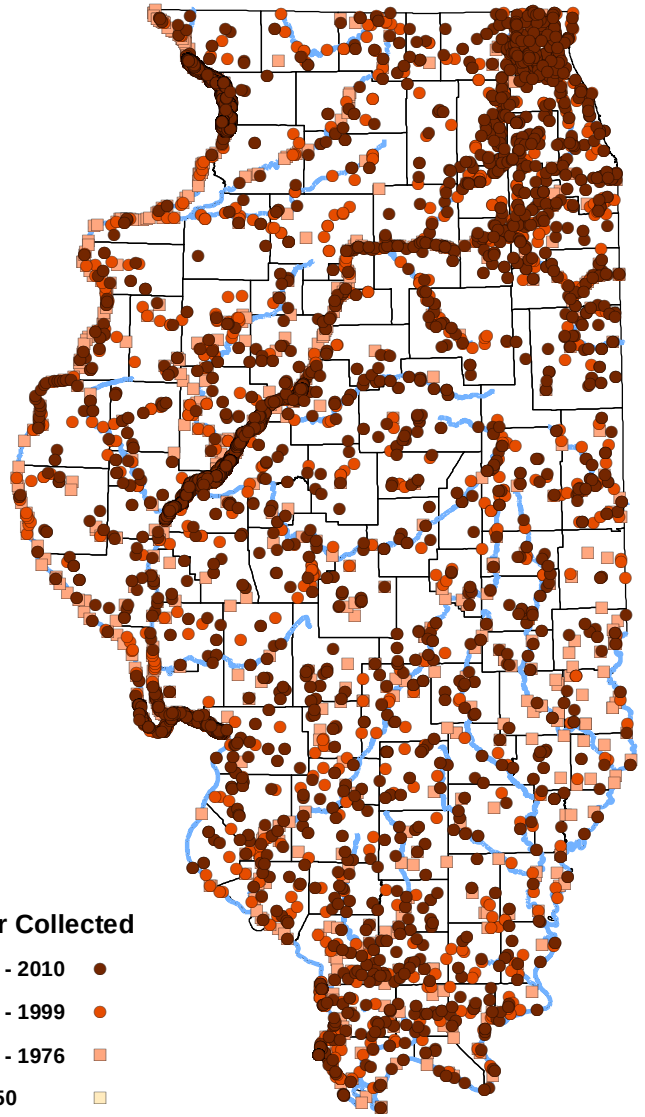

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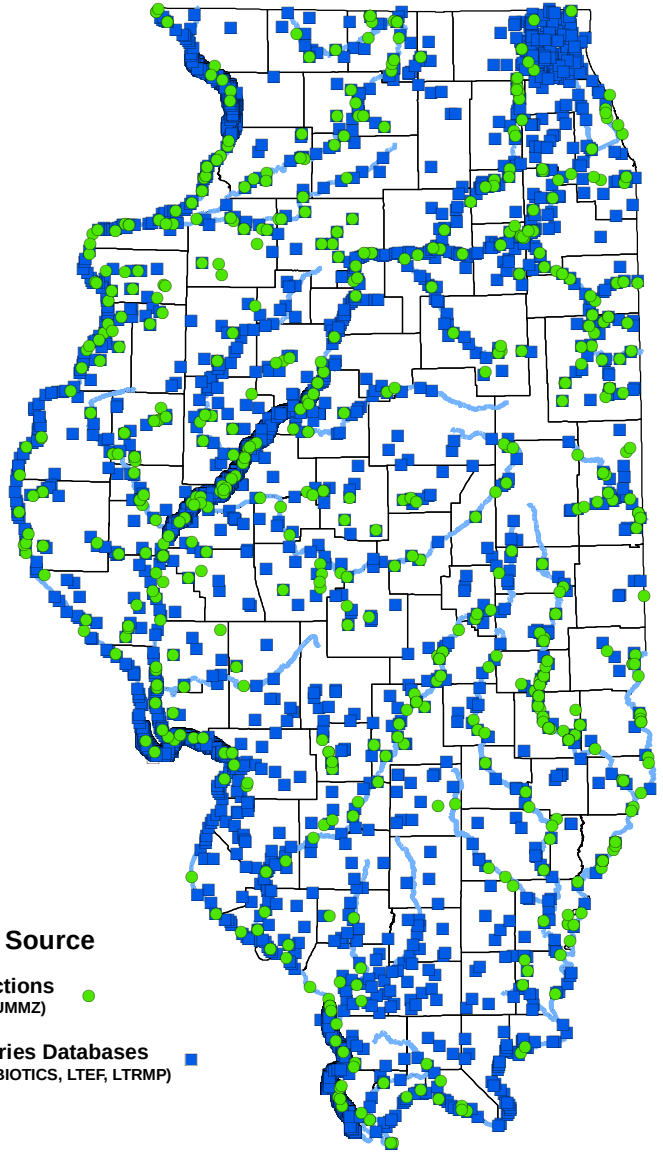
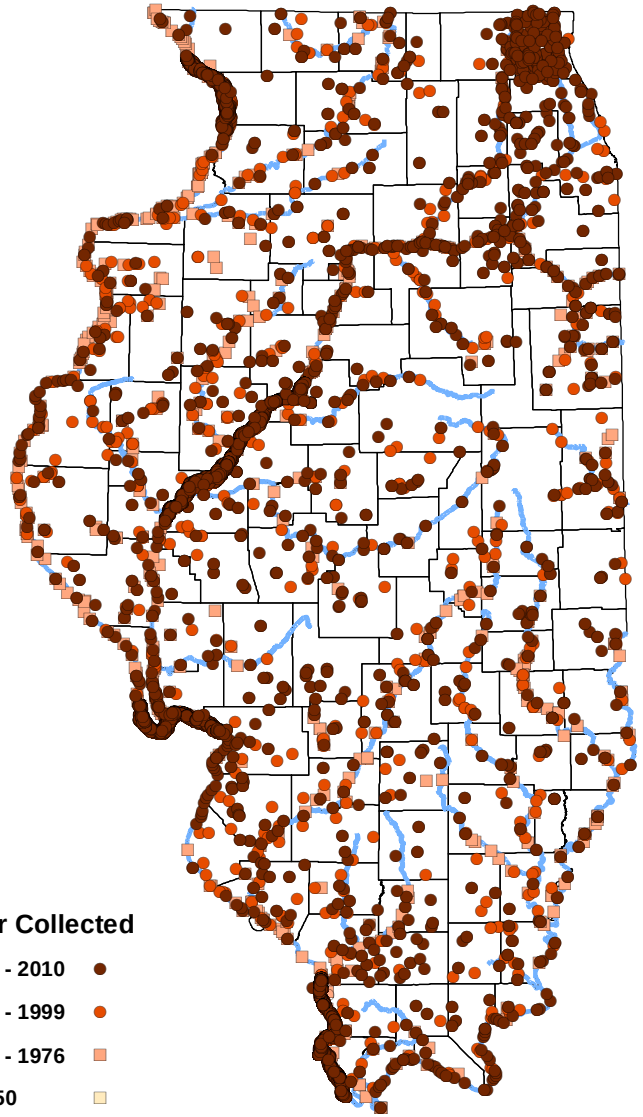
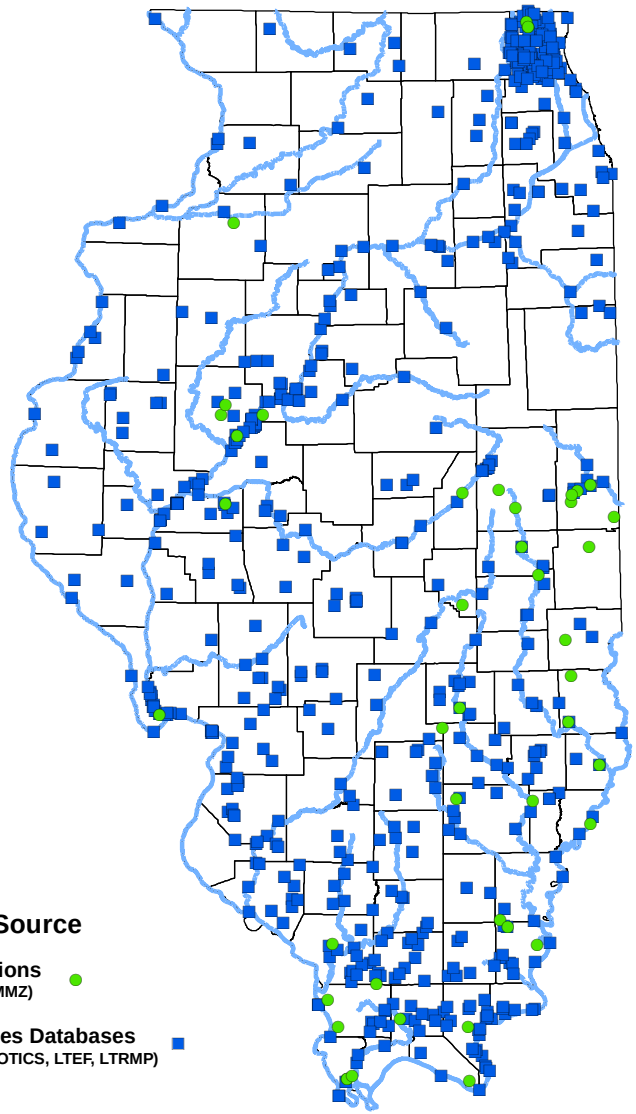
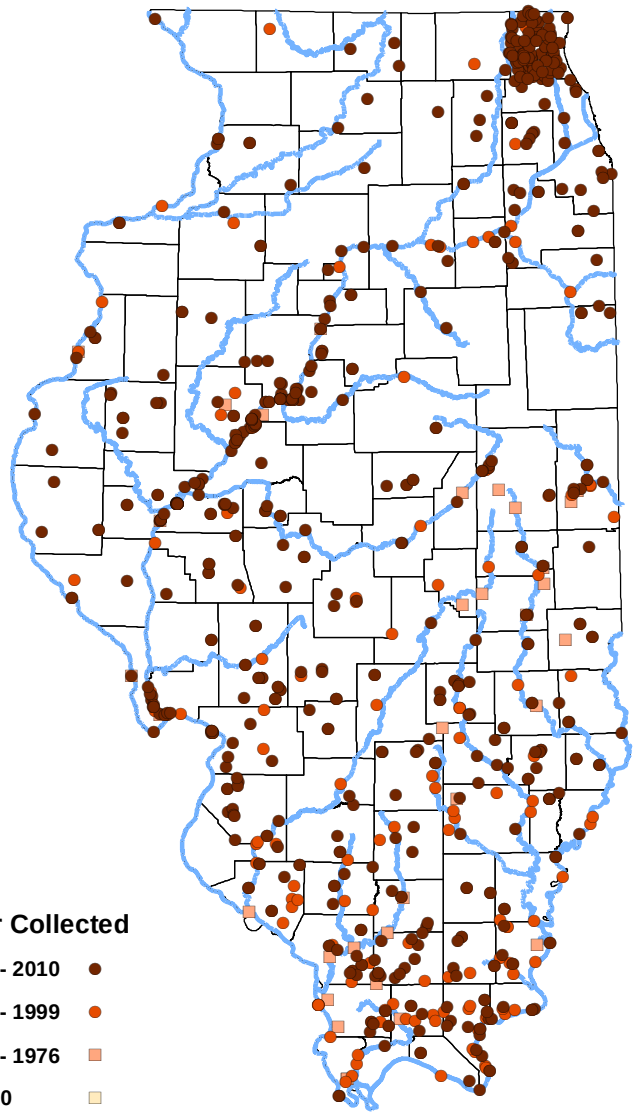
Channel catfish*(Ictalurus punctatus)*



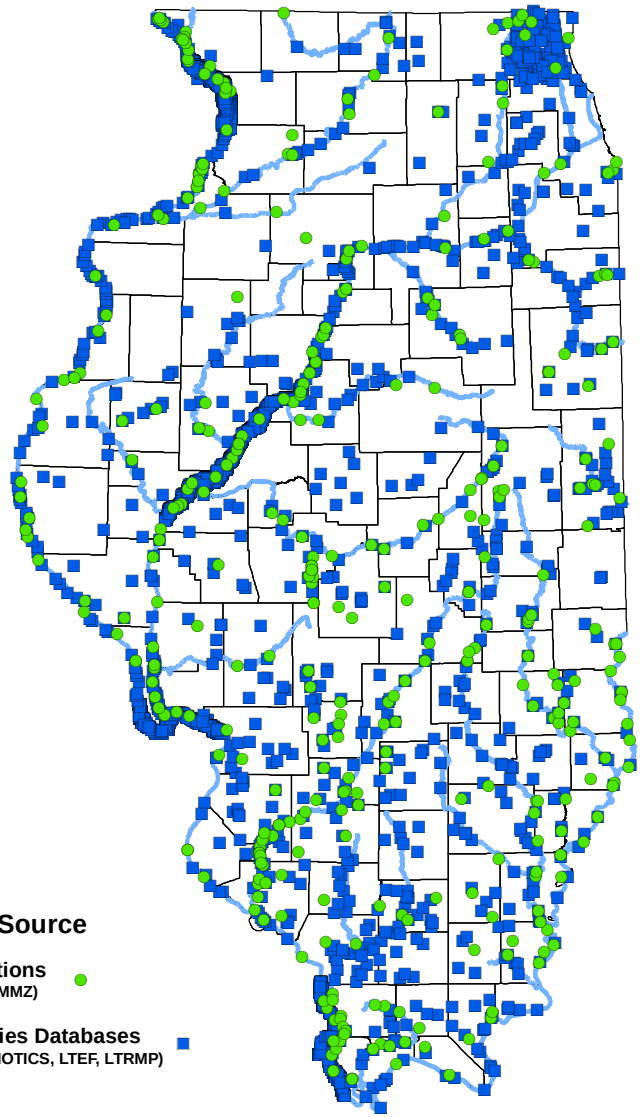


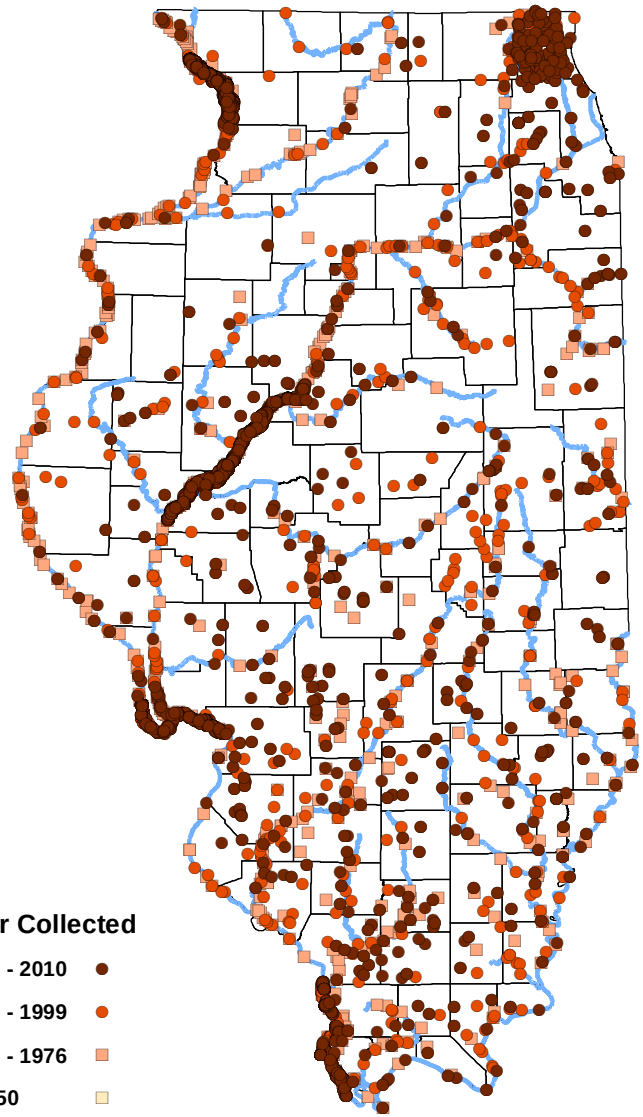
Redear sunfish*(Lepomis microlophus)*



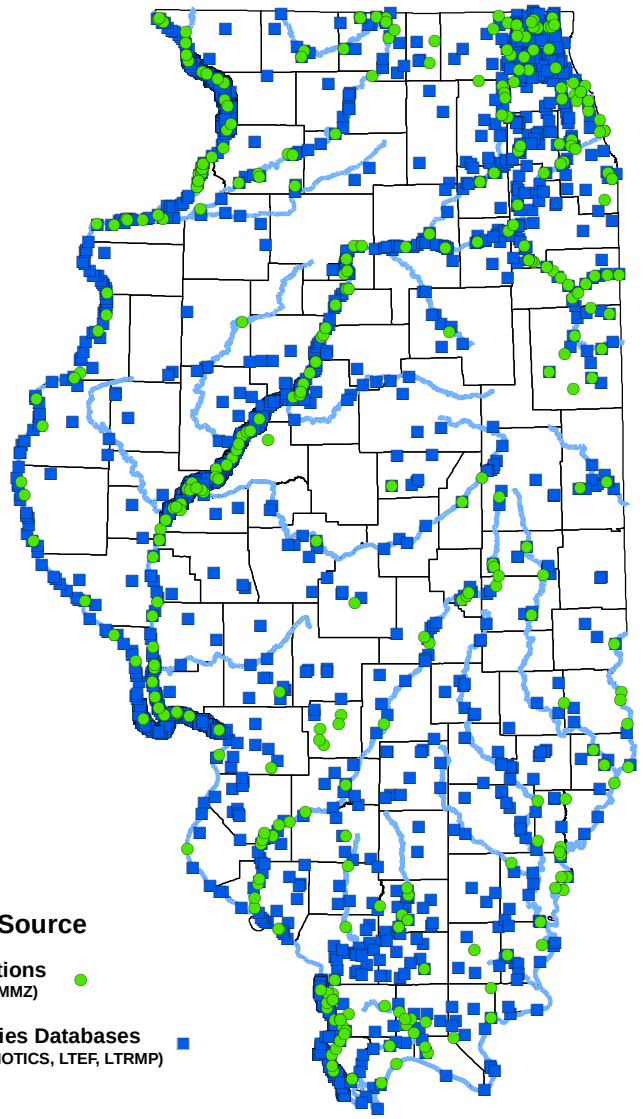


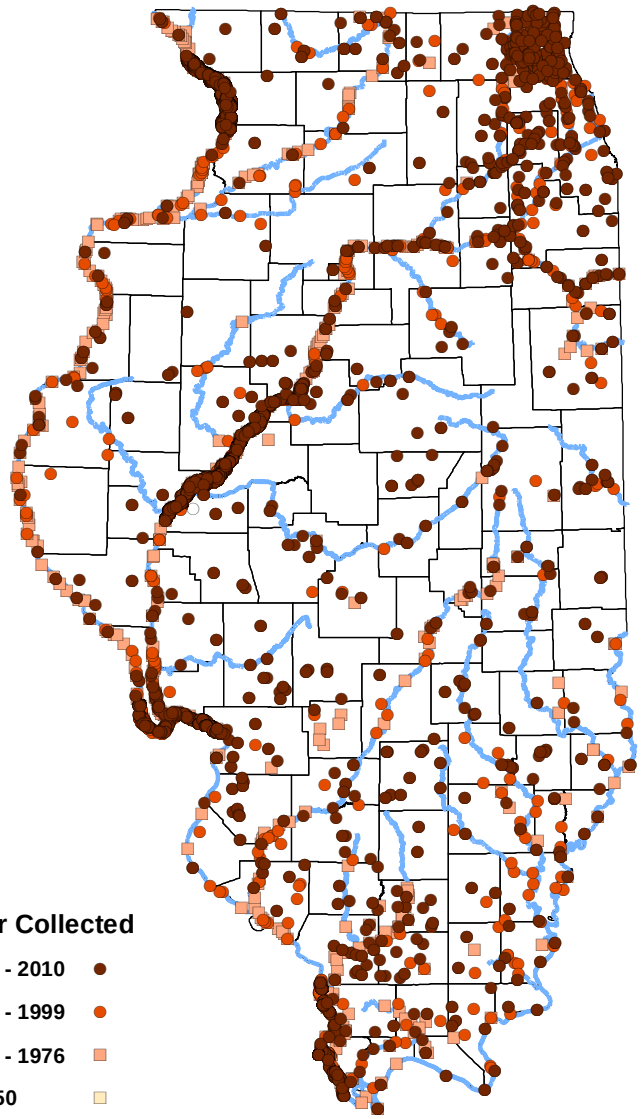
White crappie*(Pomoxis annularis)*



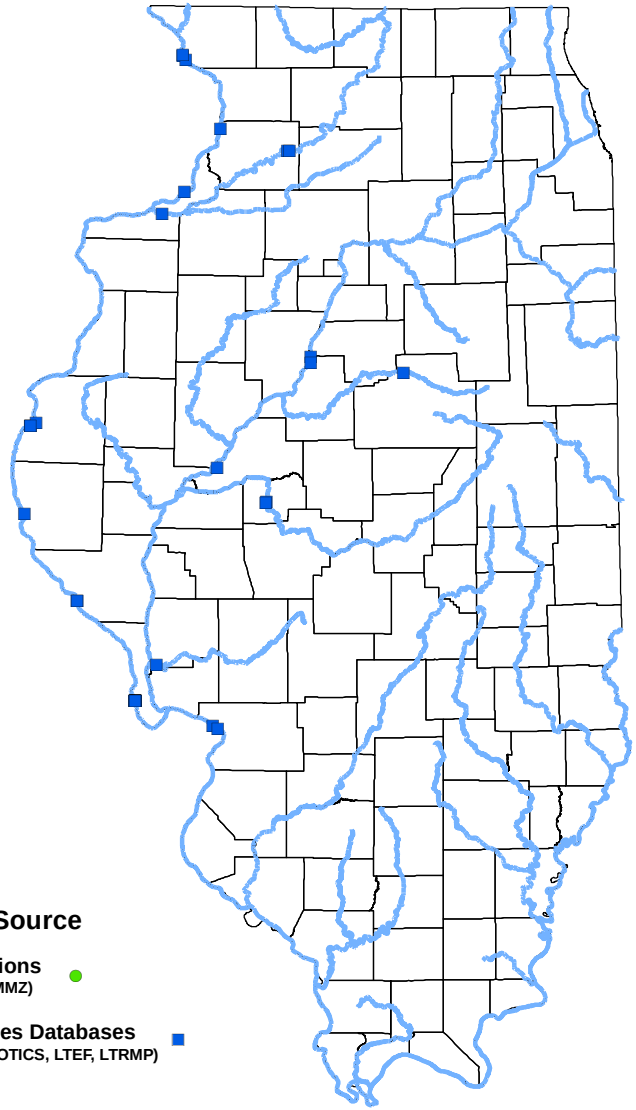


Black crappie*(Pomoxis nigromaculatus)*





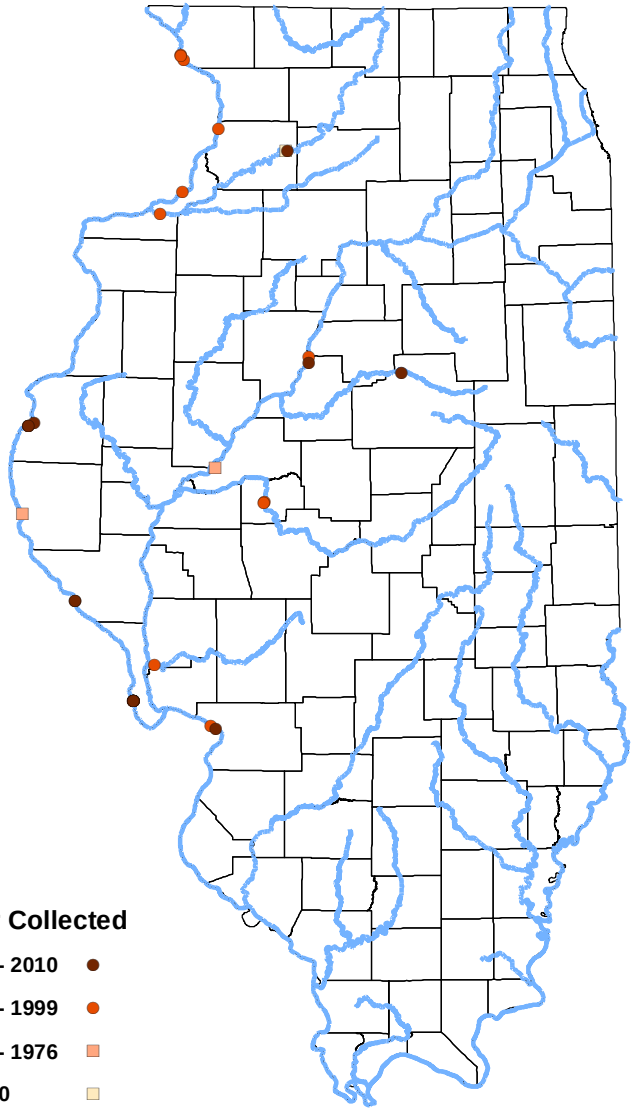
Lake sturgeon(*Acipenser fulvescens*)



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

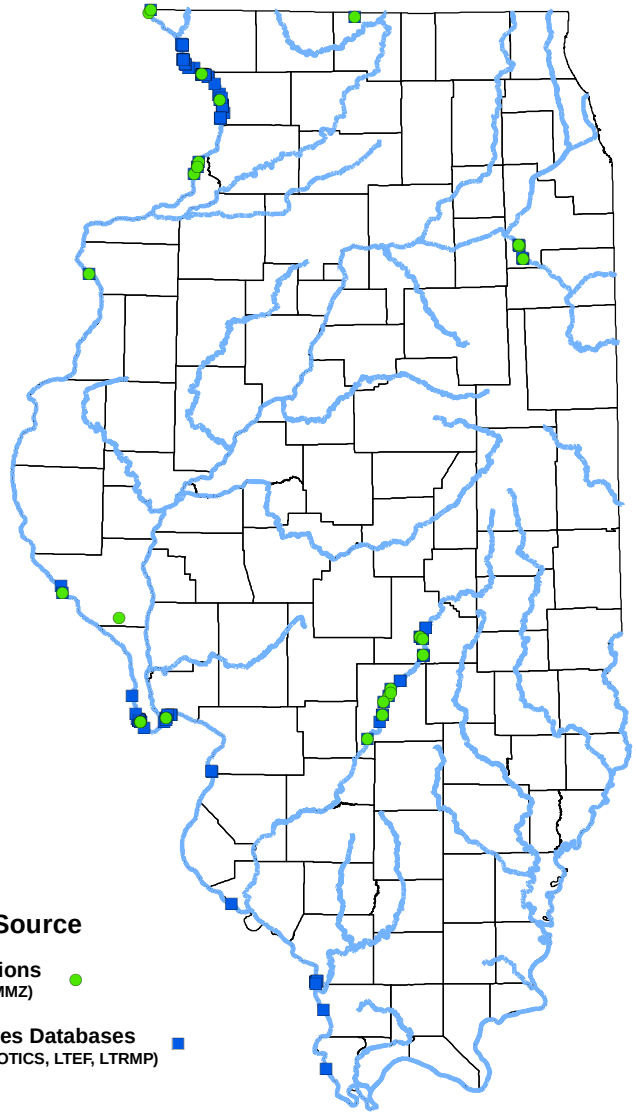
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

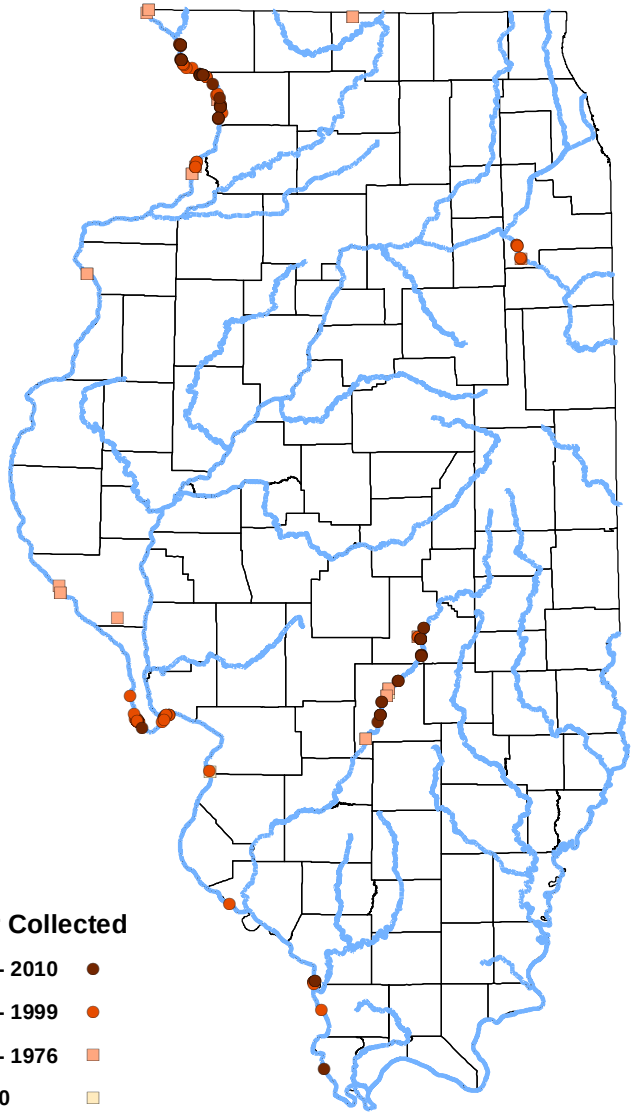
Western sand darter(*Ammocrypta clara*)



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

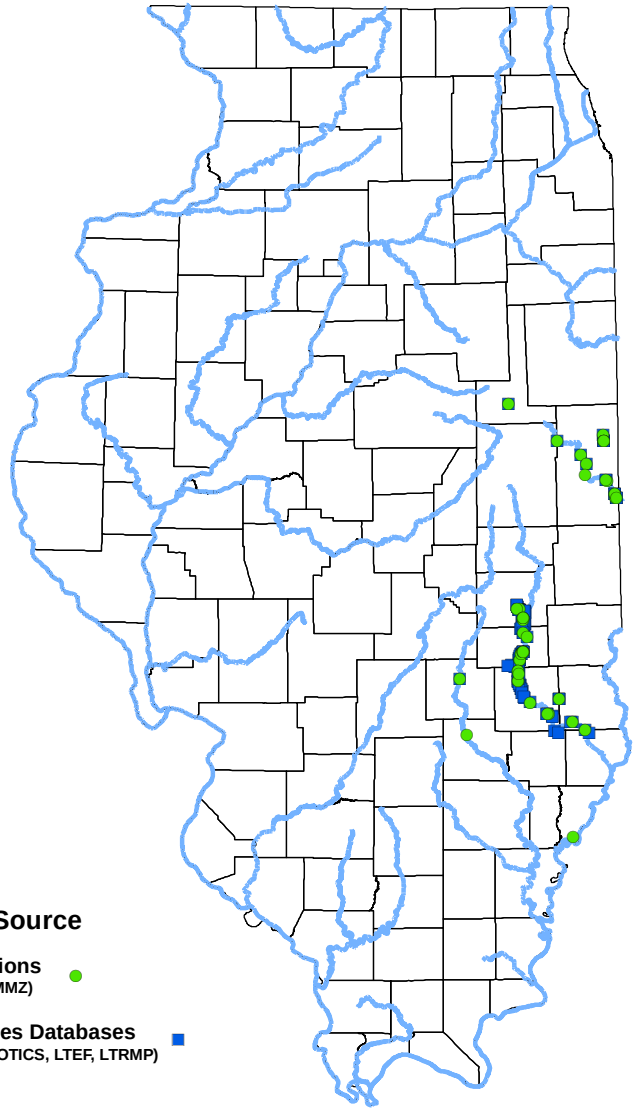
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

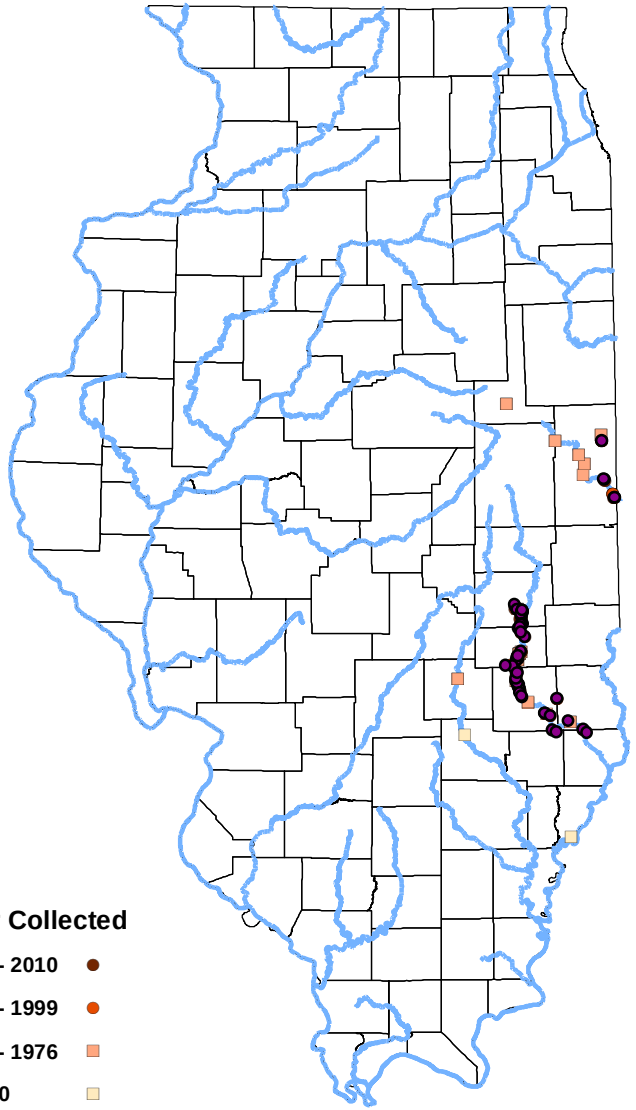
Eastern sand darter(*Ammocrypta pellucida*)



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

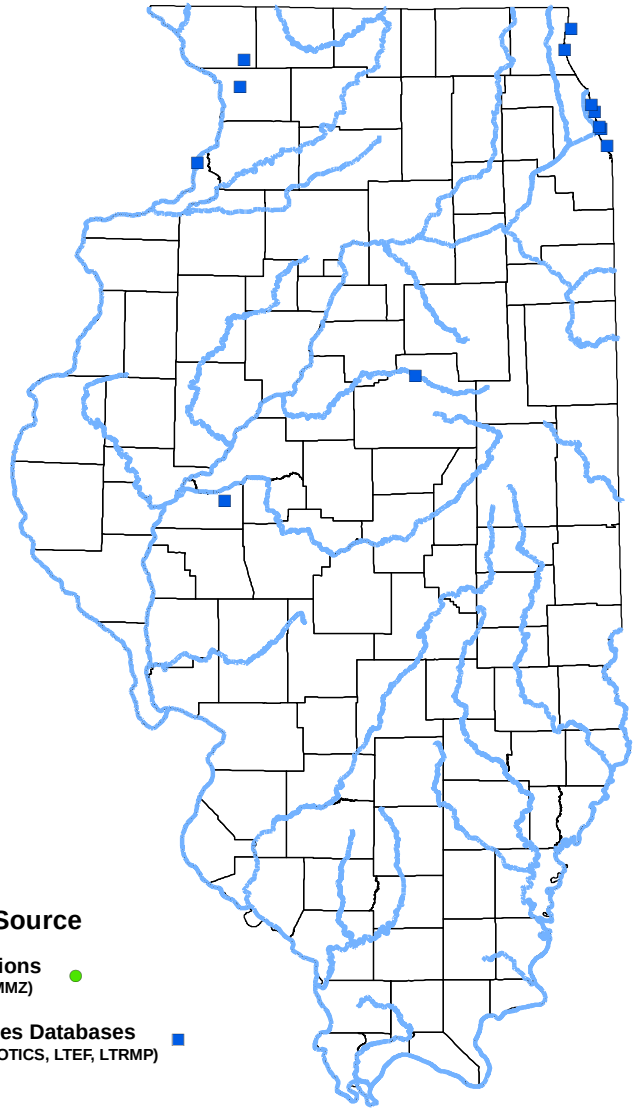
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

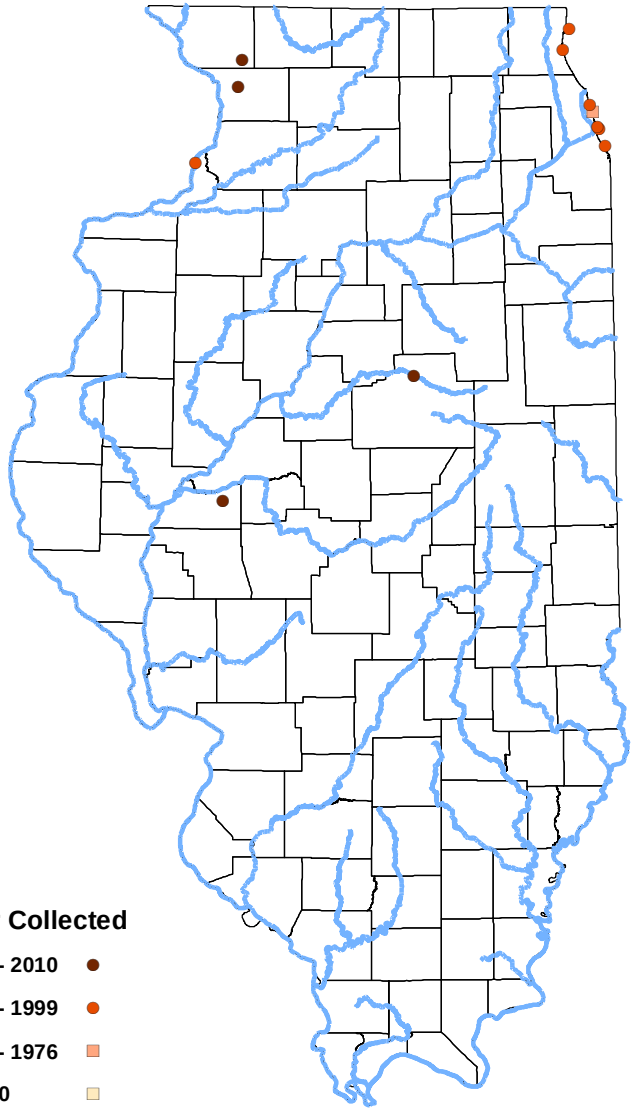
Longnose sucker *(Catostomus catostomus)*



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

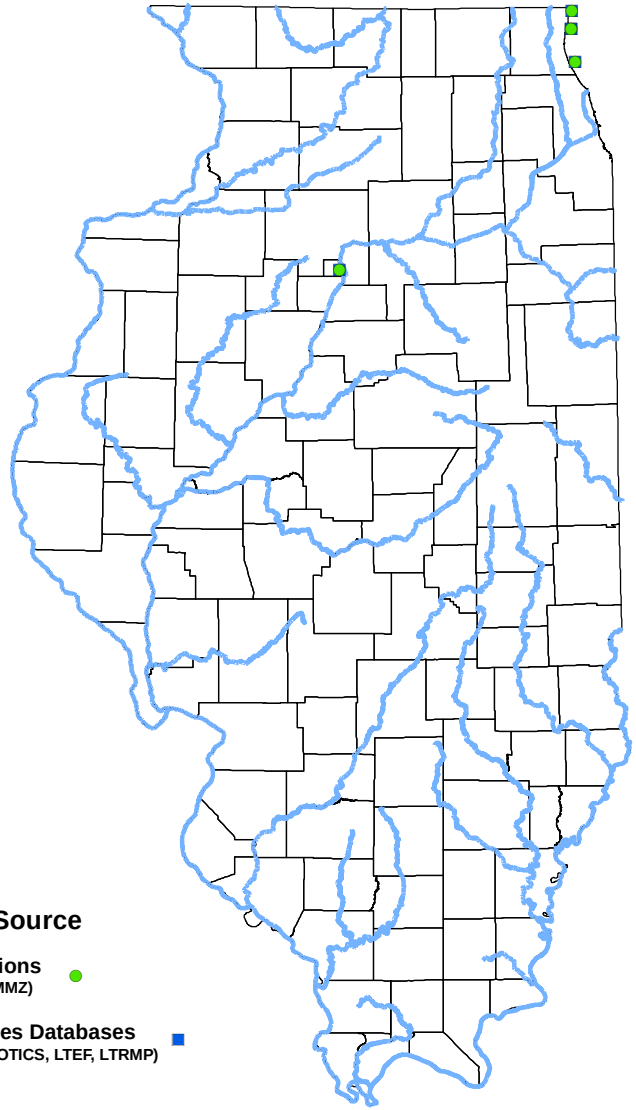
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

Cisco*(Coregonus artedii)*



Data Source

Collections
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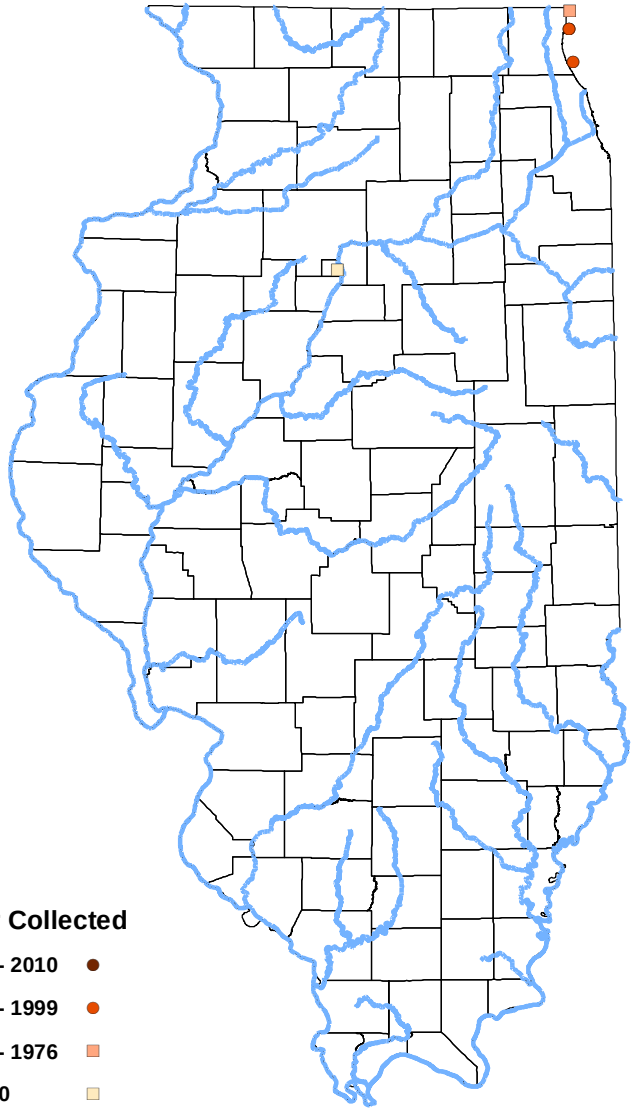
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

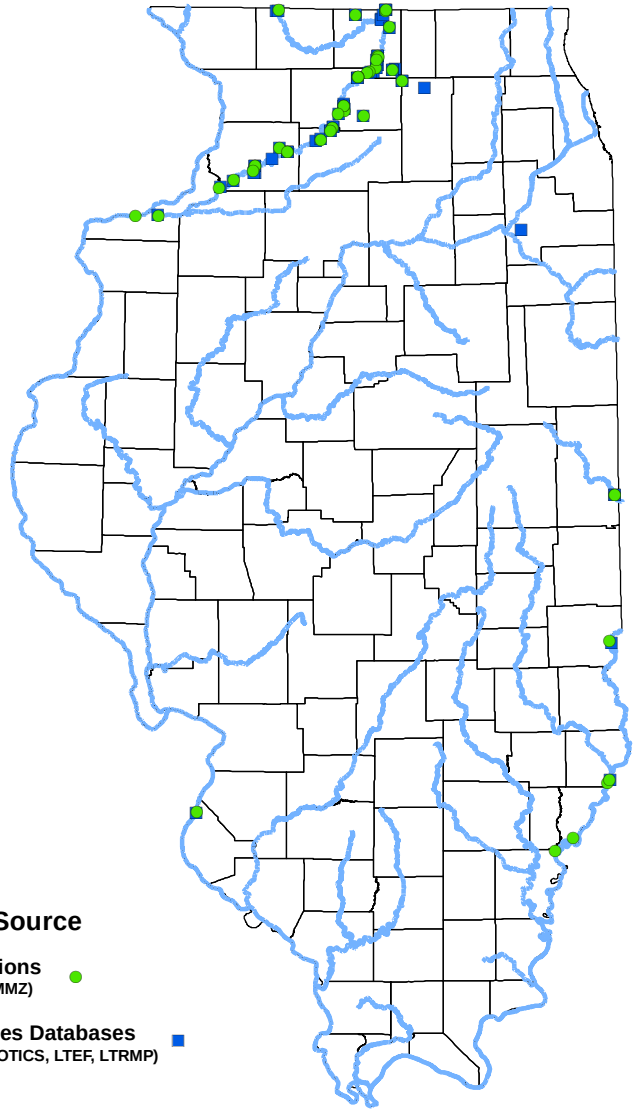
2000 - 2010

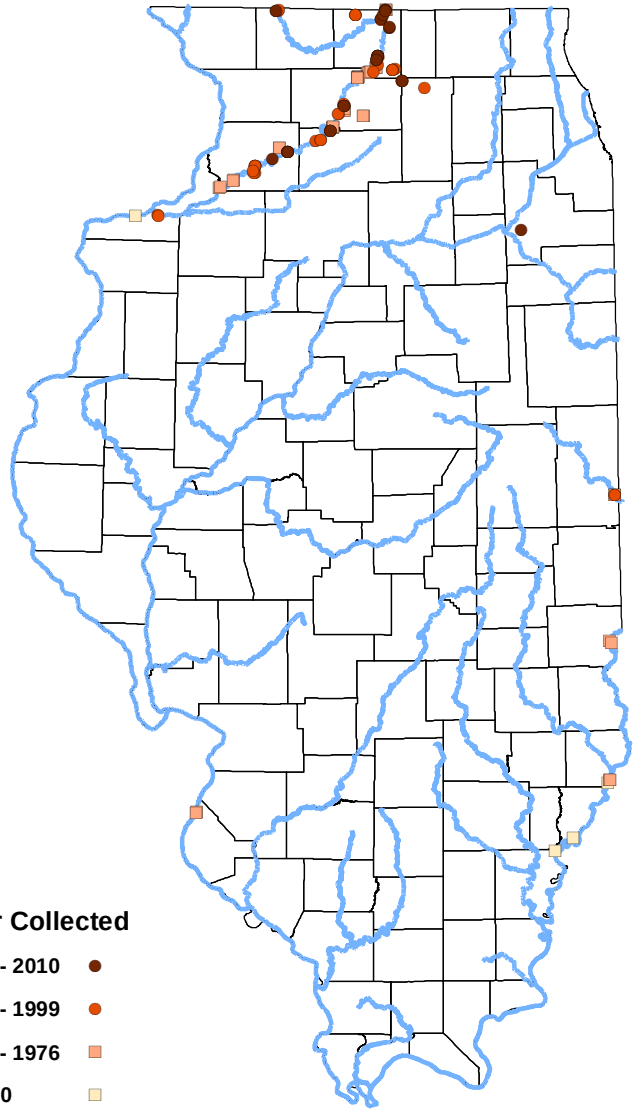
1977 - 1999

1950 - 1976

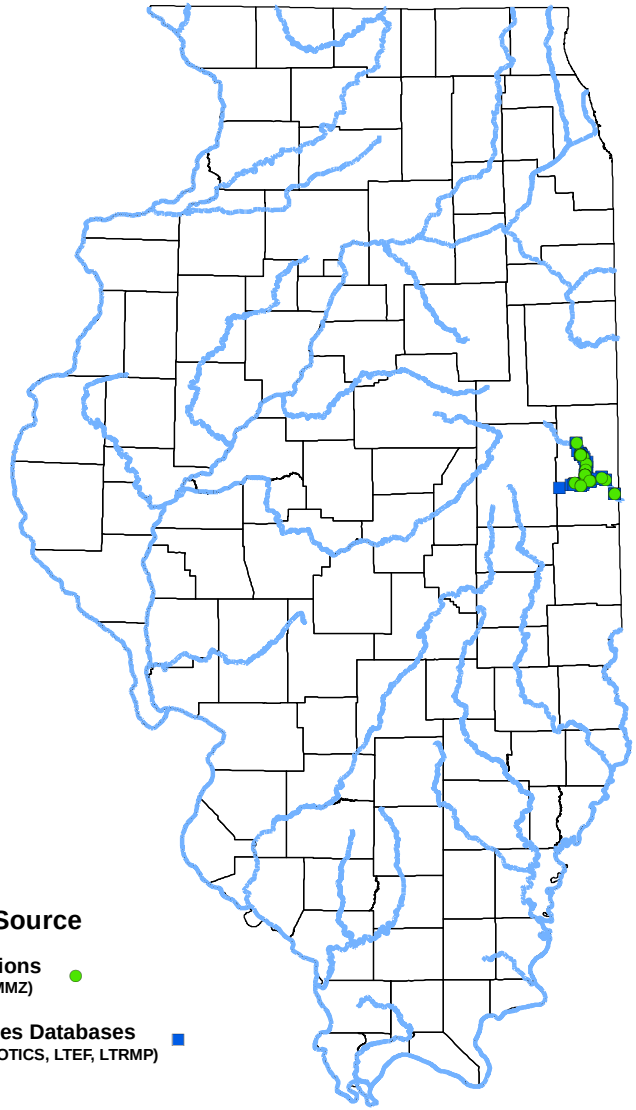
< 1950

Gravel chub*(Erimystax x-punctatus)*





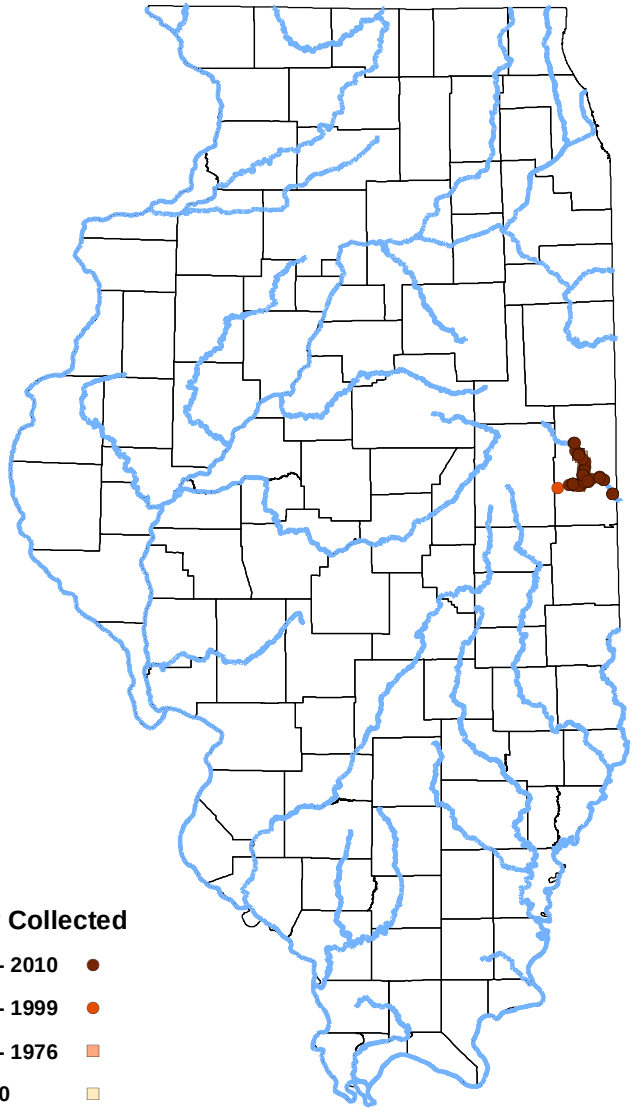
Bluebreast darter *(Etheostoma camurum)*



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

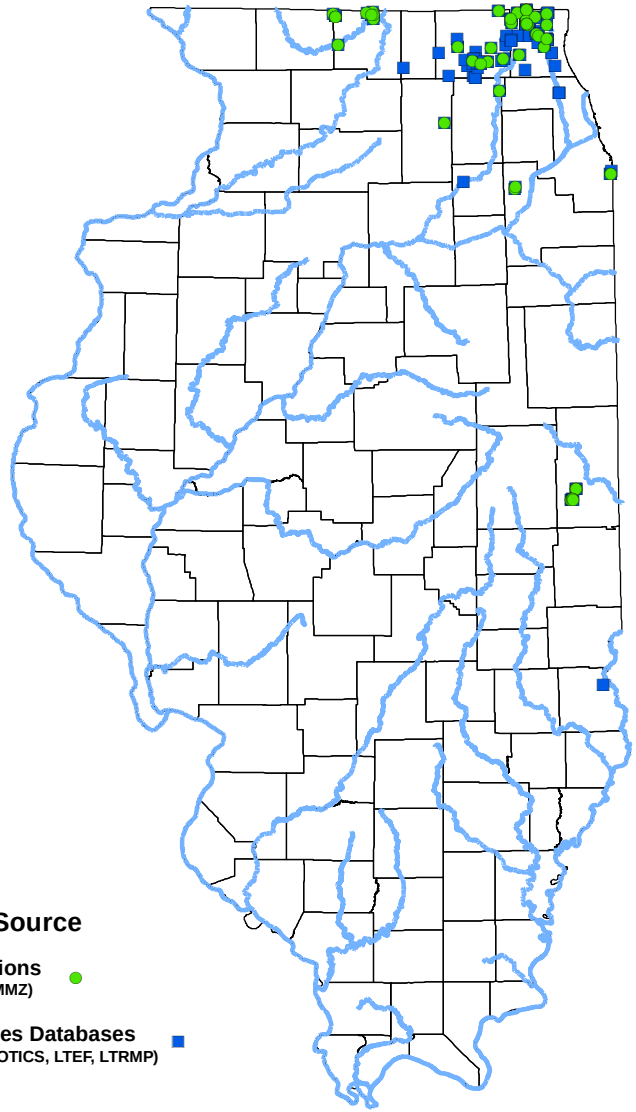
2000 - 2010

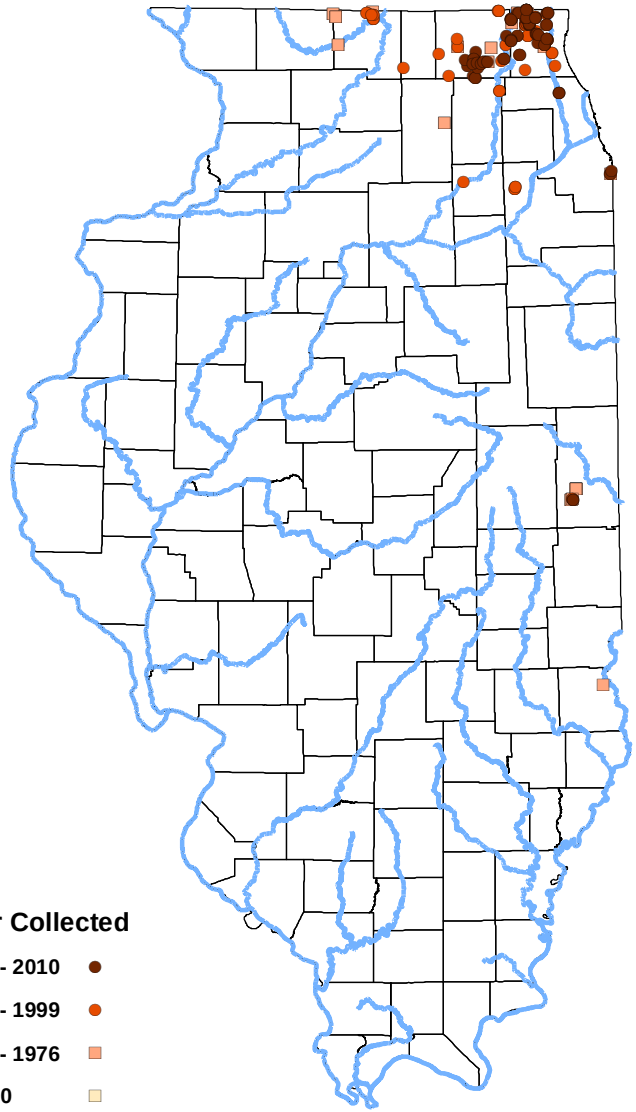
1977 - 1999

1950 - 1976

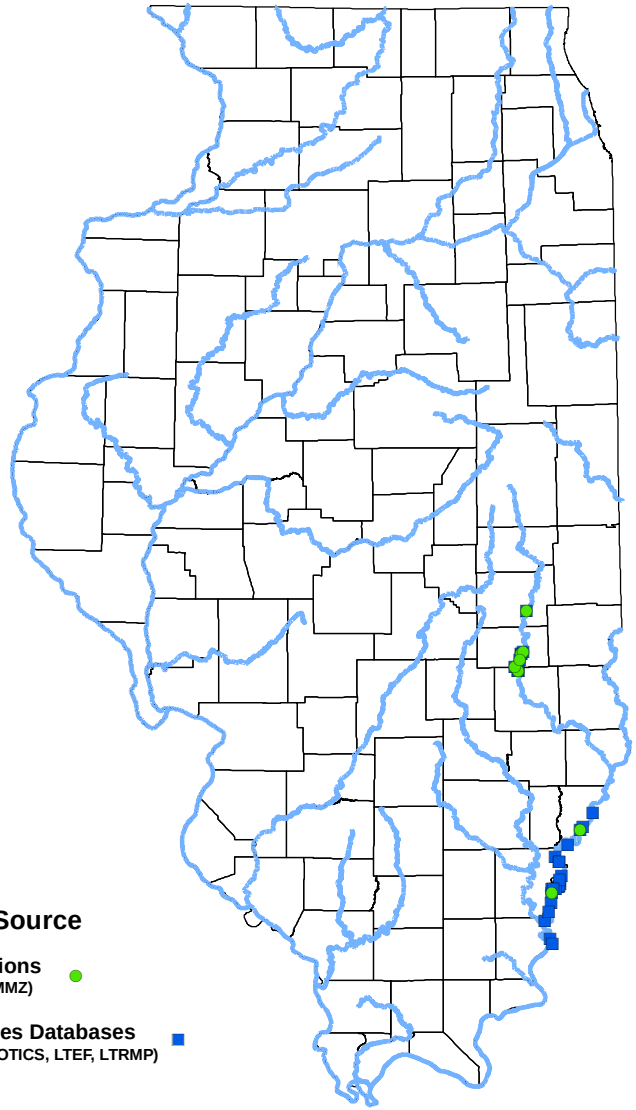
< 1950

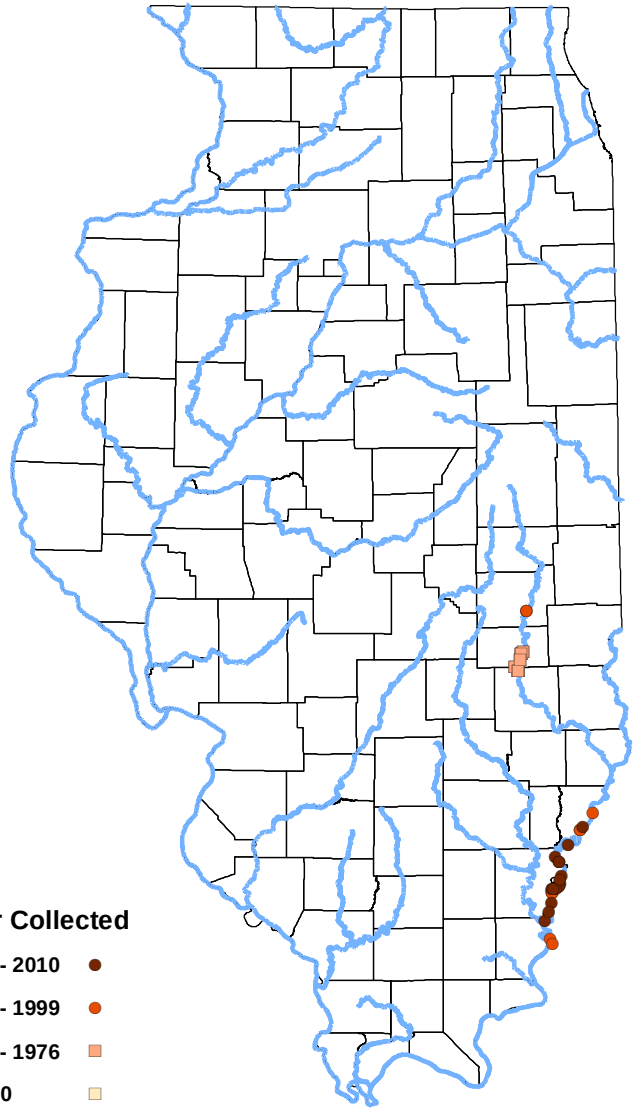
Iowa darter*(Etheostoma exile)*





Harlequin darter *(Etheostoma histrio)*





Banded killifish*(Fundulus diaphanus)*

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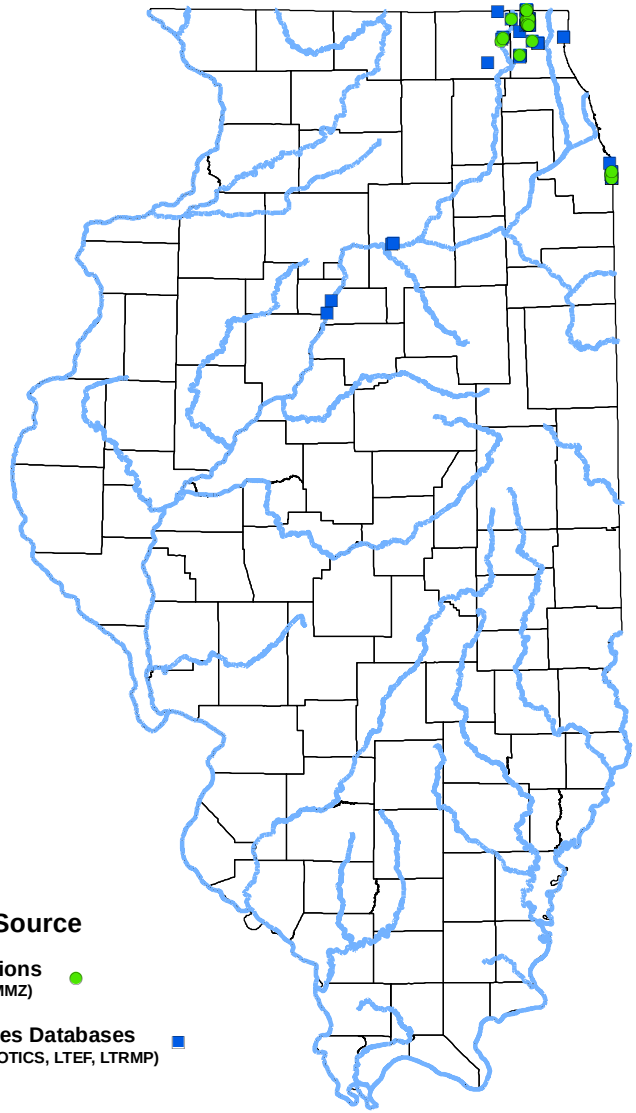
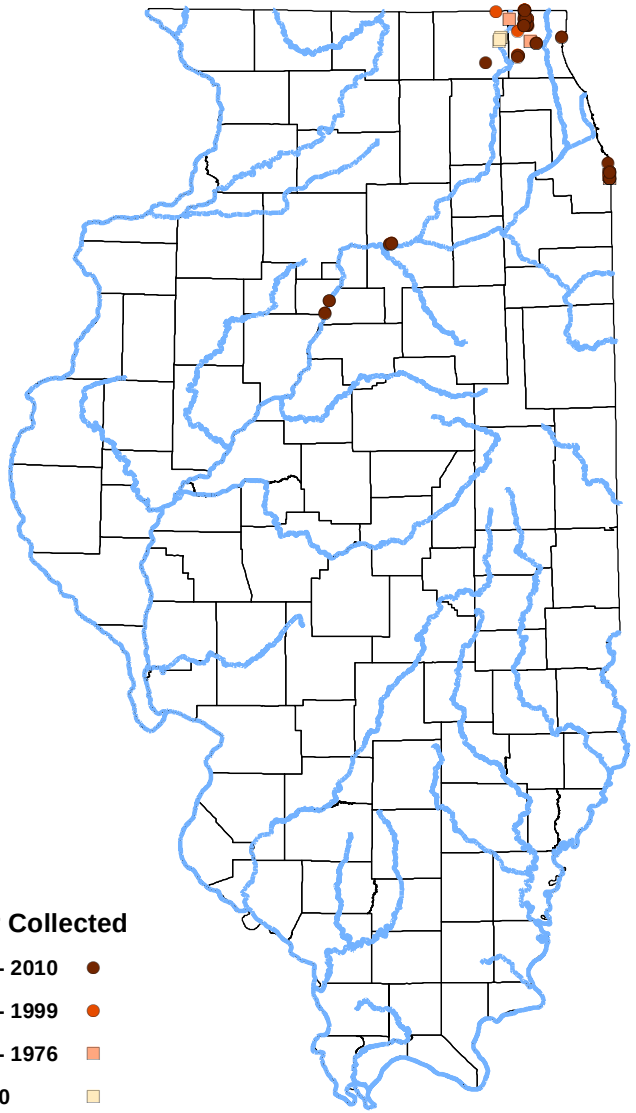
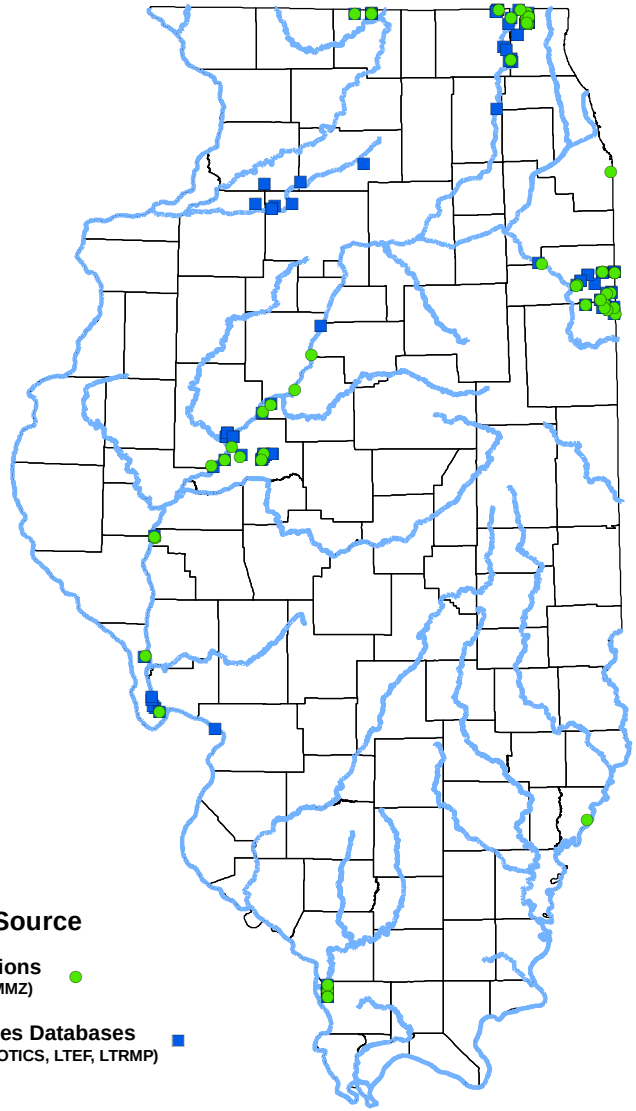
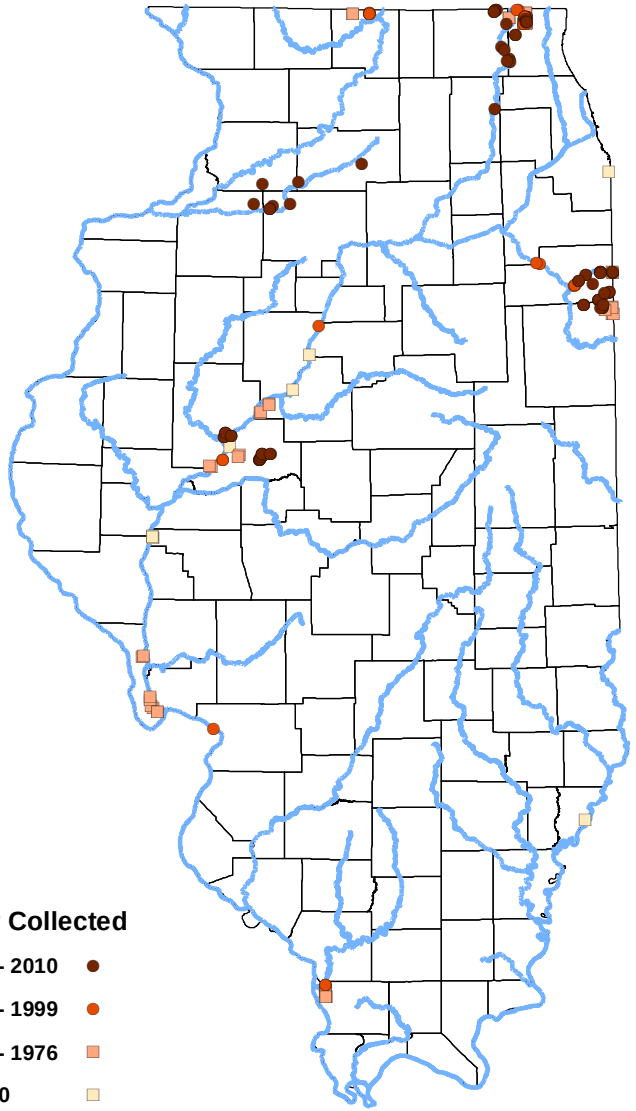




Starhead topminnow(*Fundulus dispar*)





Cypress minnow(*Hybognathus hayi*)

ILLINOIS NATURAL HISTORY SURVEY
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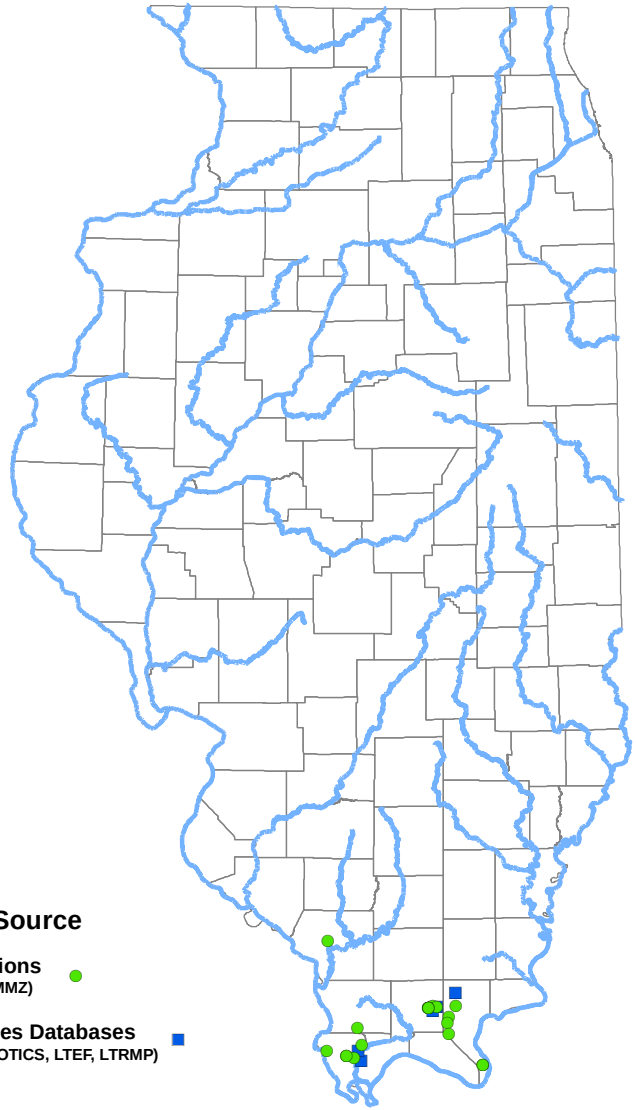
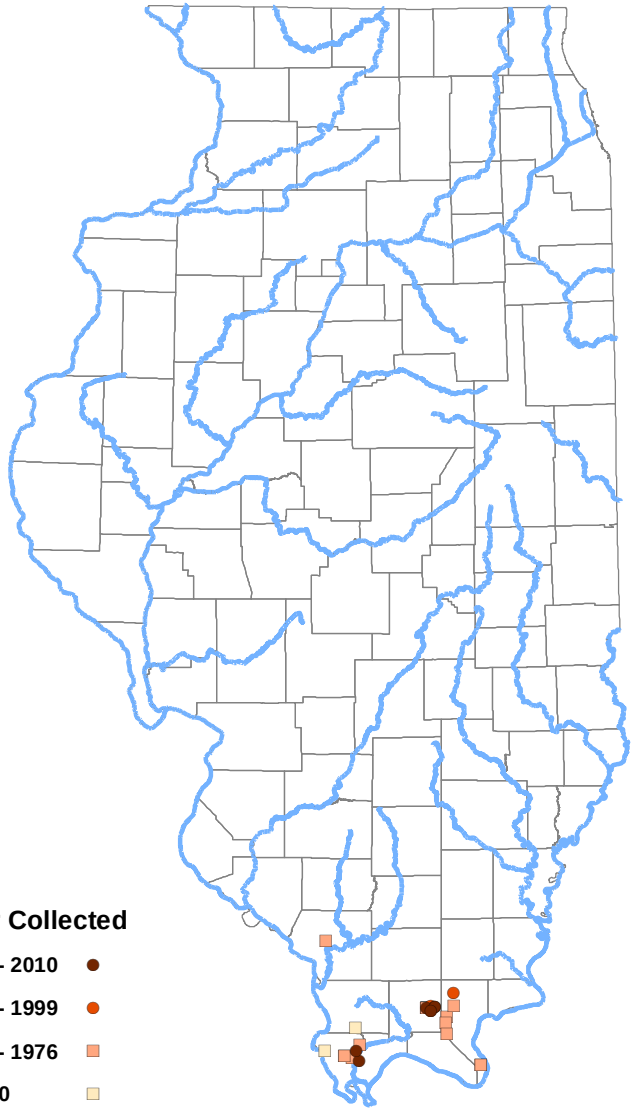
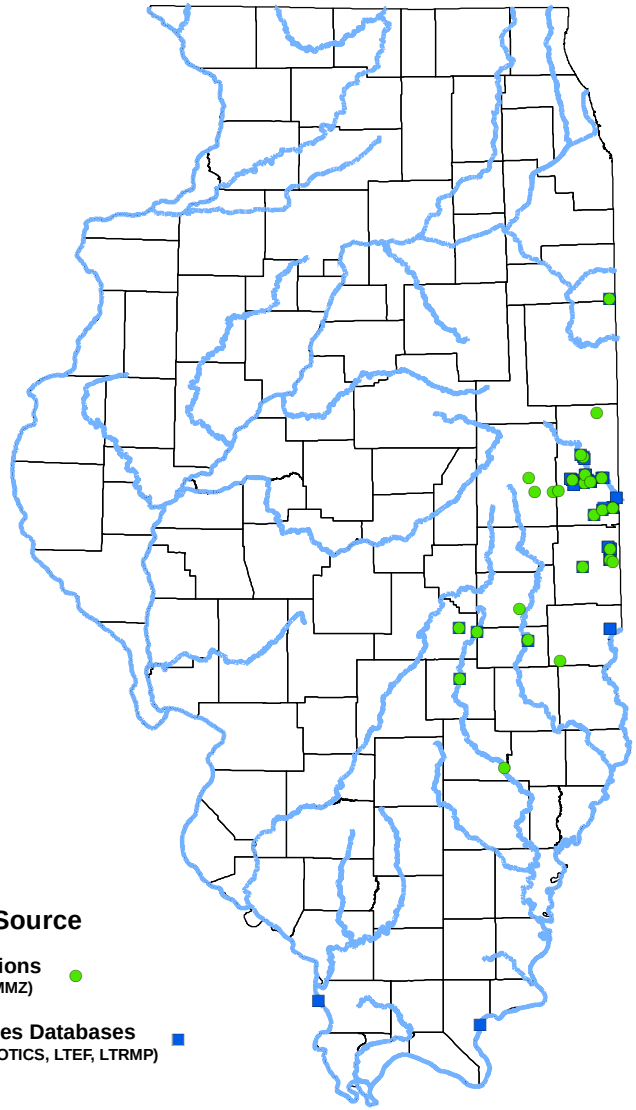




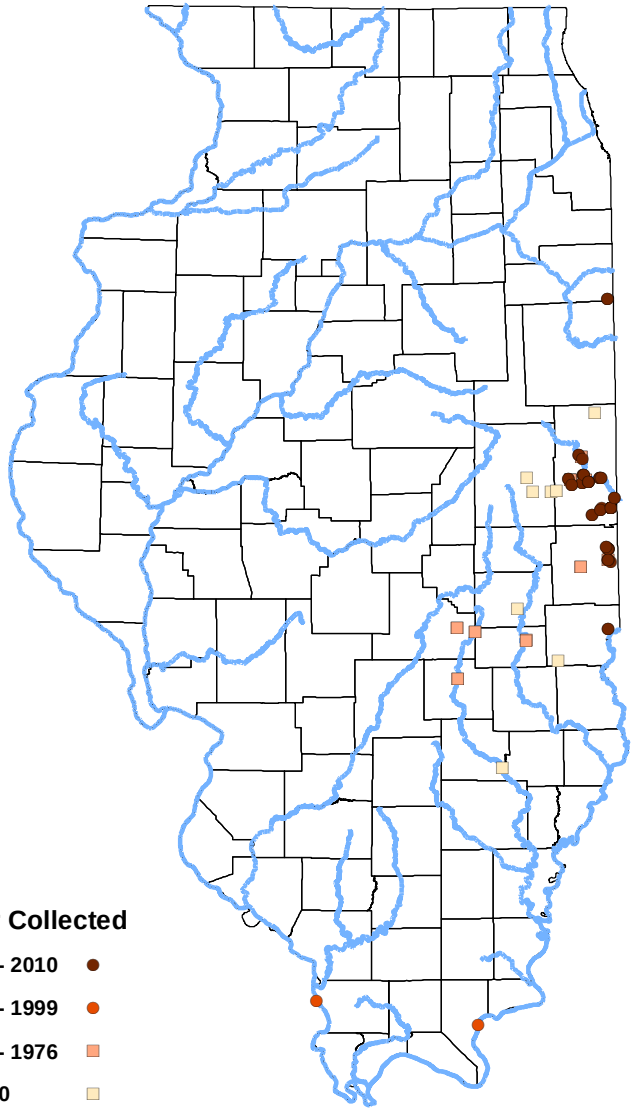
Bigeye chub*(Hybopsis amblops)*



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

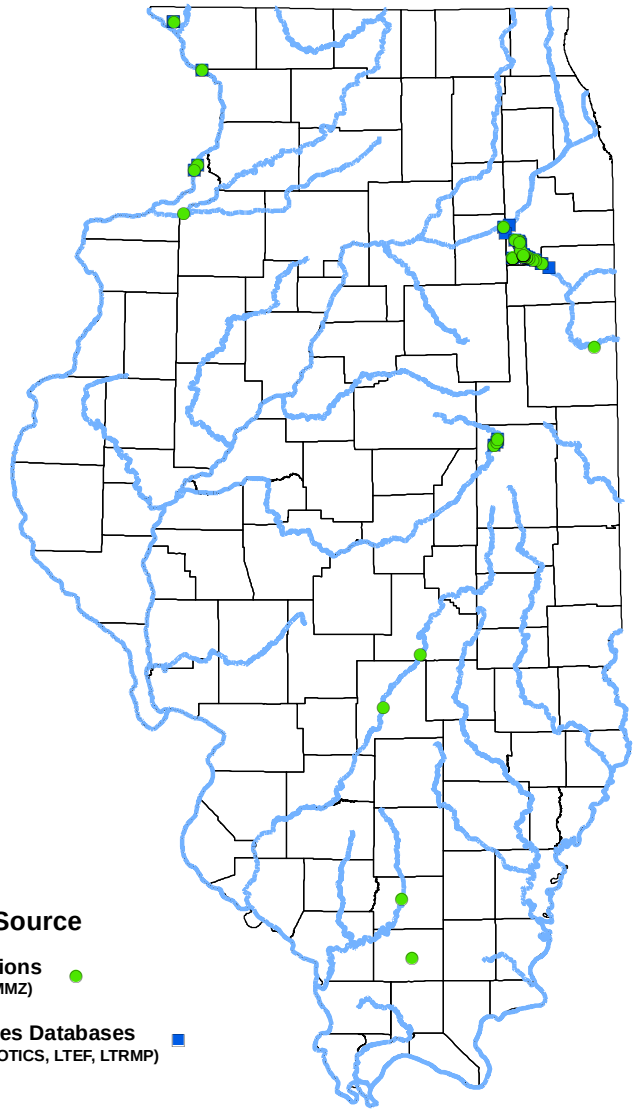
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

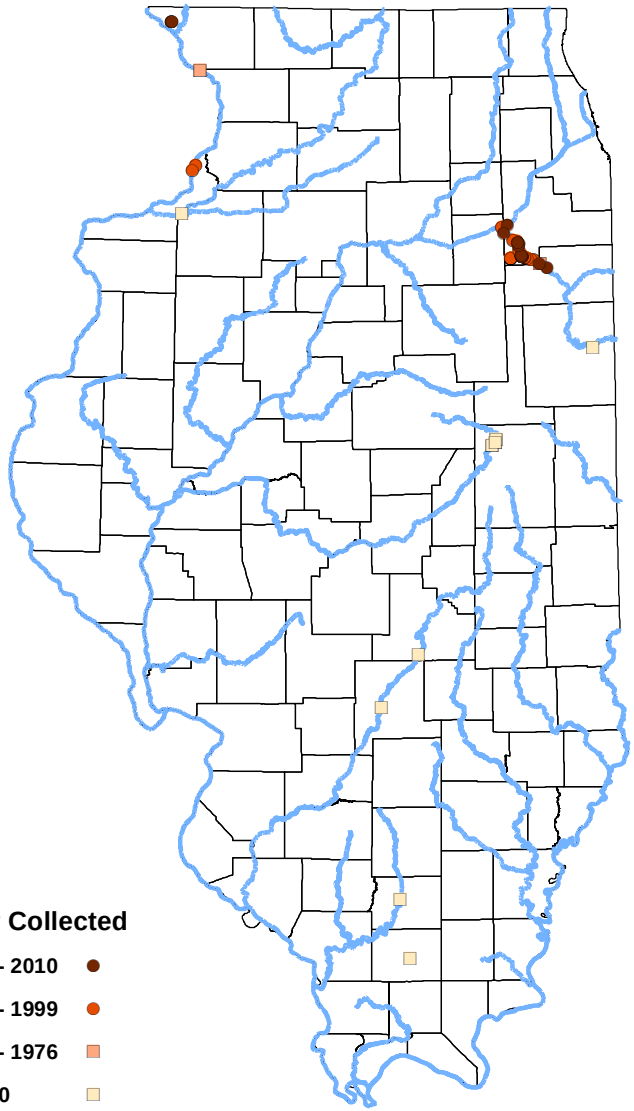
Pallid shiner(*Hybopsis amnis*)



Data Source

Collections
(INHS, UMMZ)

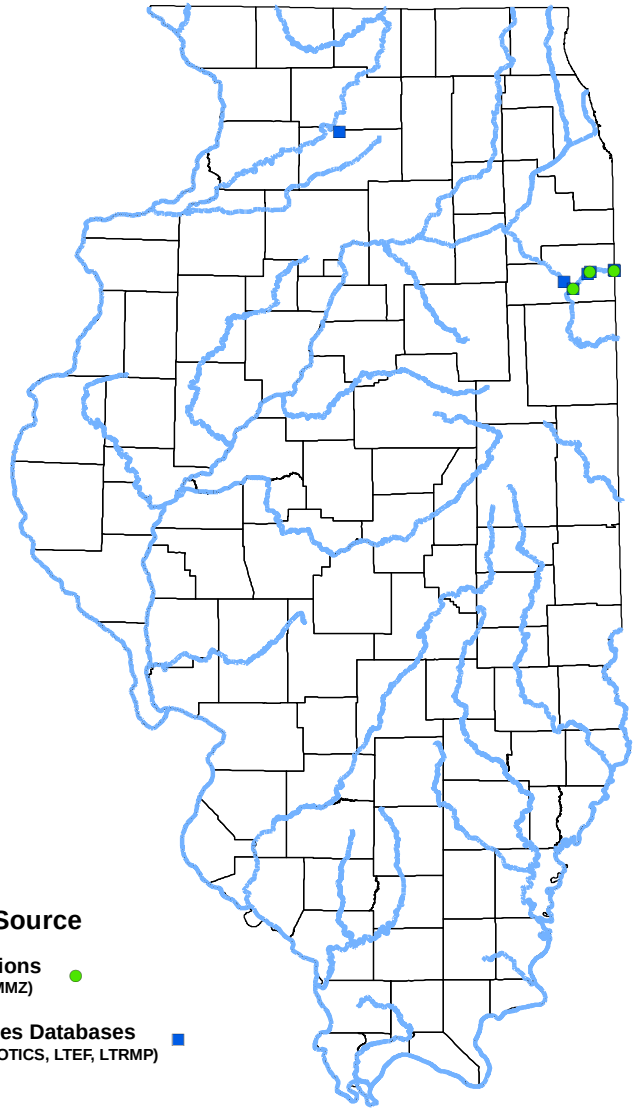
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

- 2000 - 2010
- 1977 - 1999
- 1950 - 1976
- < 1950

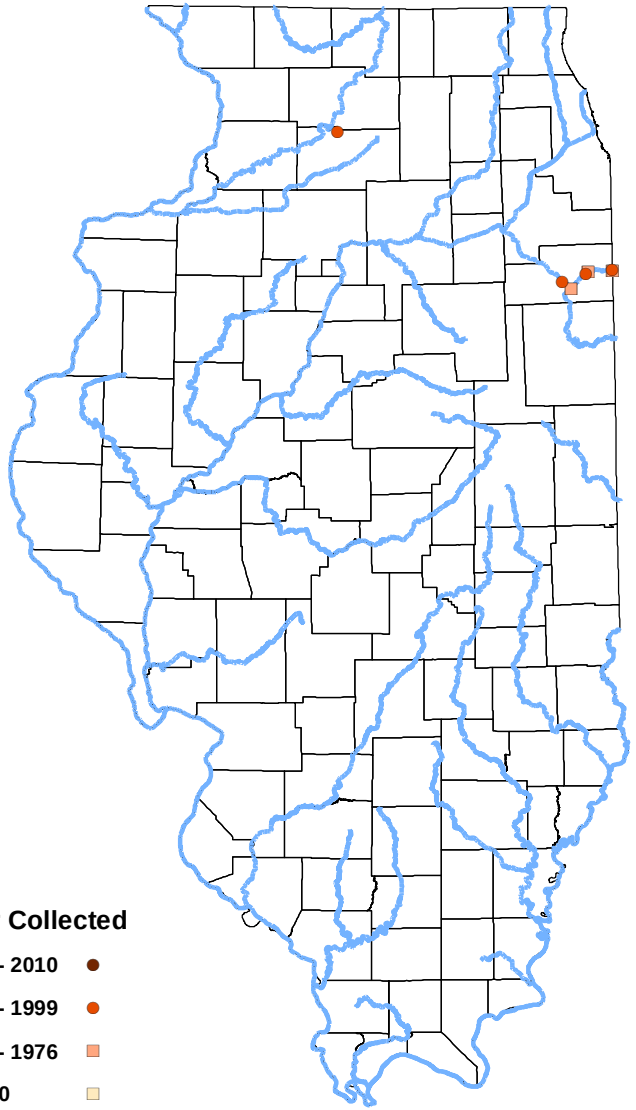
Northern brook lamprey*(Ichthyomyzon fossor)*



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

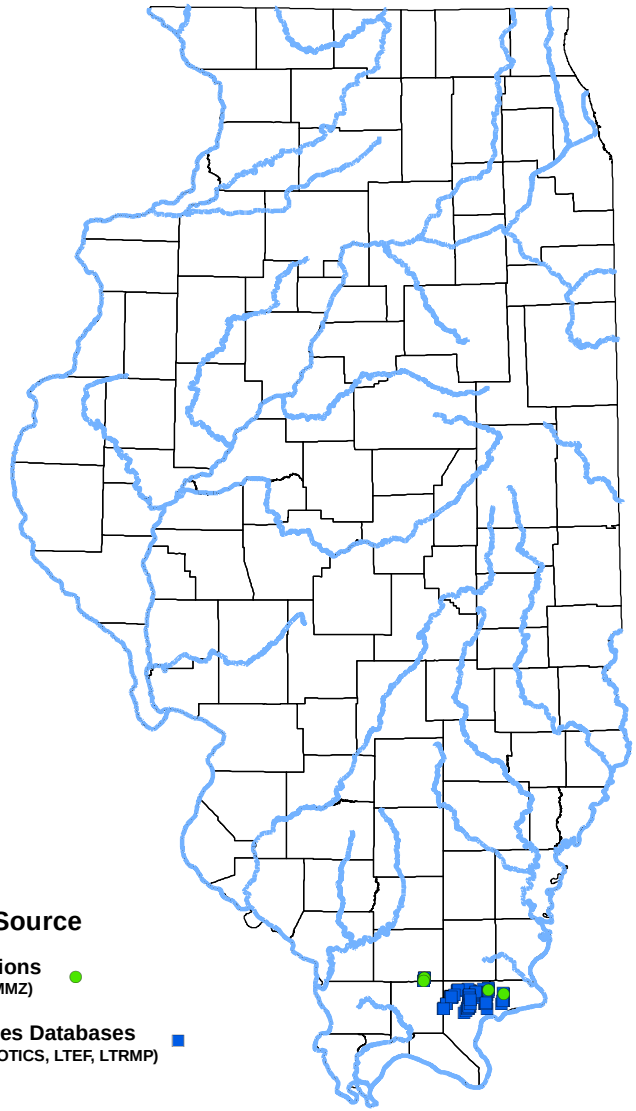
2000 - 2010

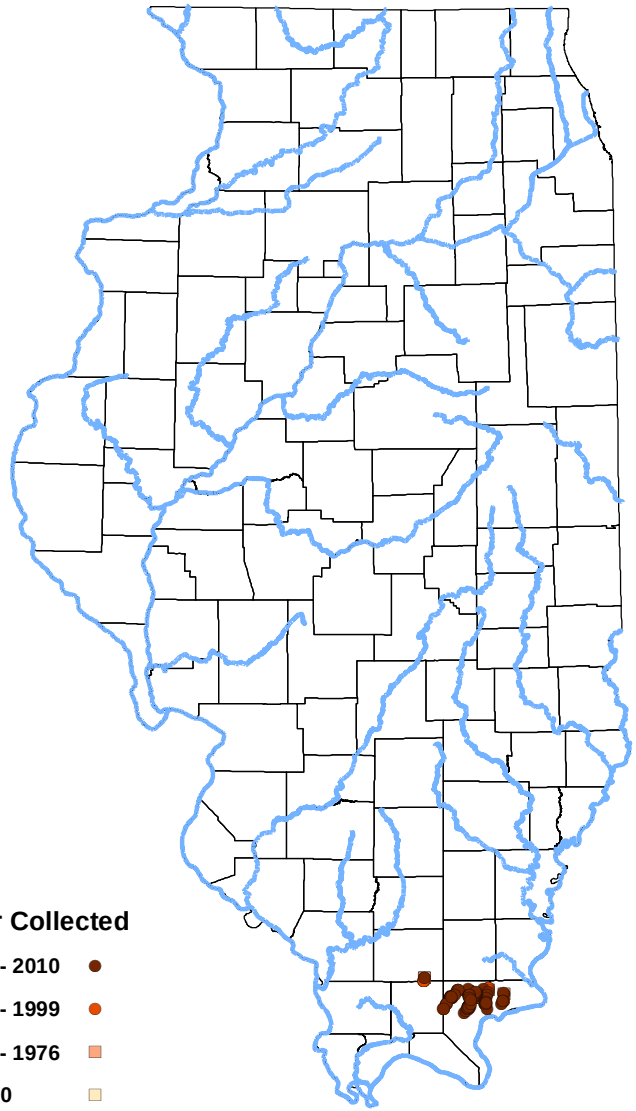
1977 - 1999

1950 - 1976

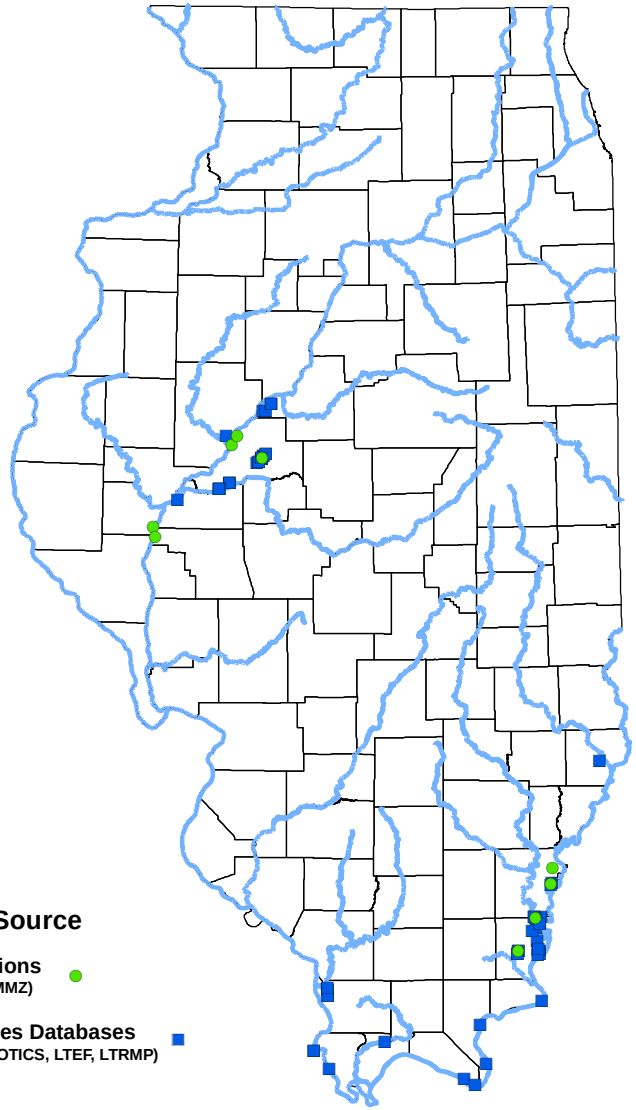
< 1950

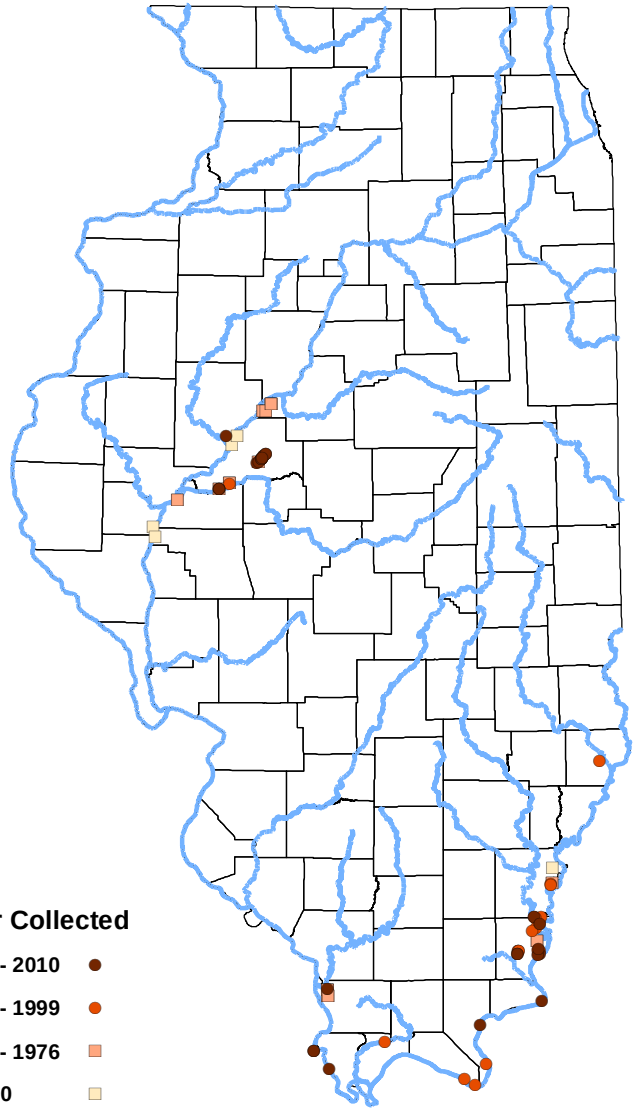
Least brook lamprey*(Lampetra aepyptera)*



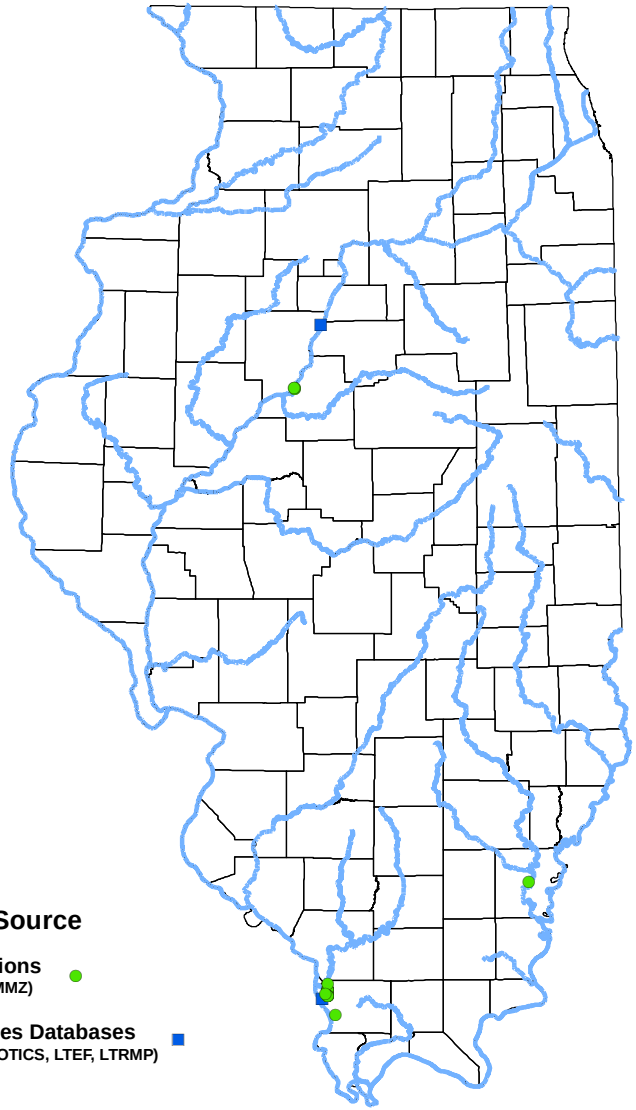


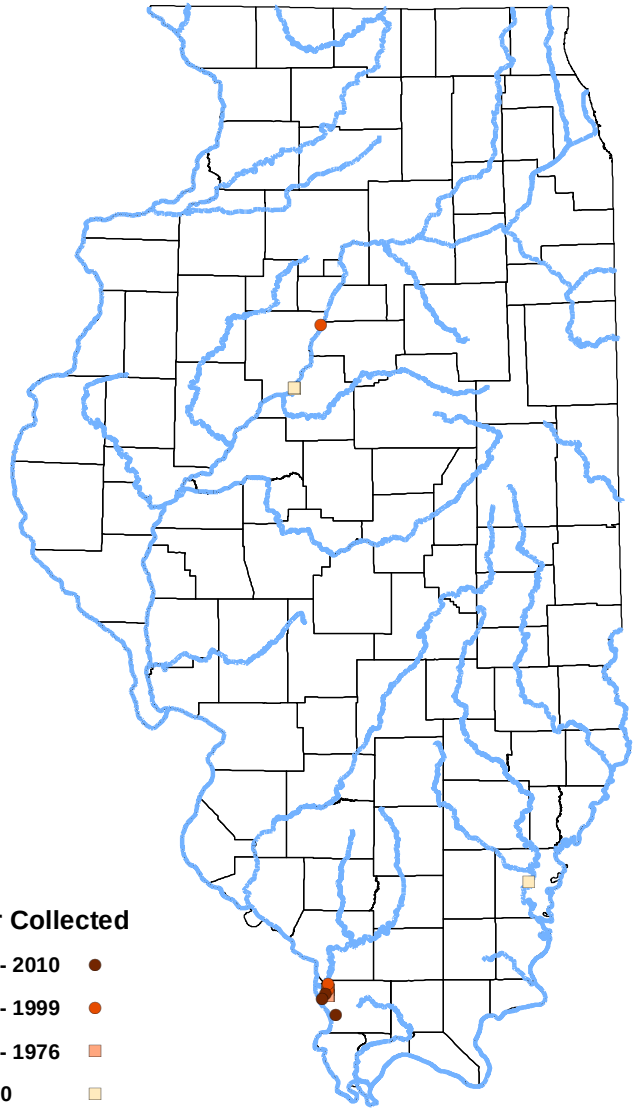
Redspotted sunfish*(Lepomis miniatus)*





Bantam sunfish*(Lepomis symmetricus)*





Sturgeon chub*(Macrhybopsis gelida)*

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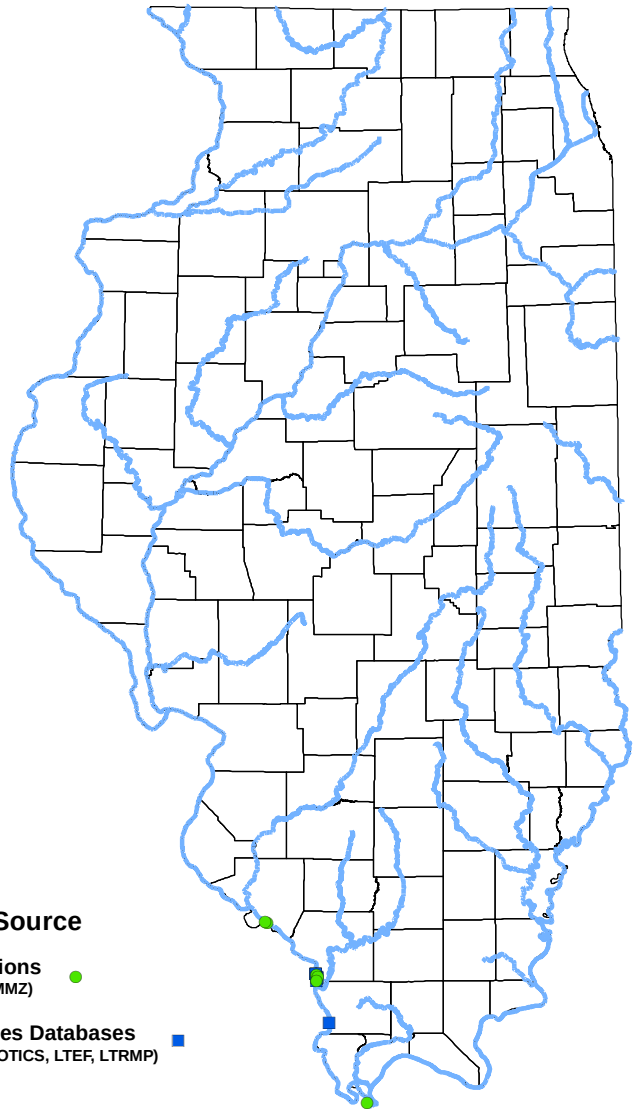
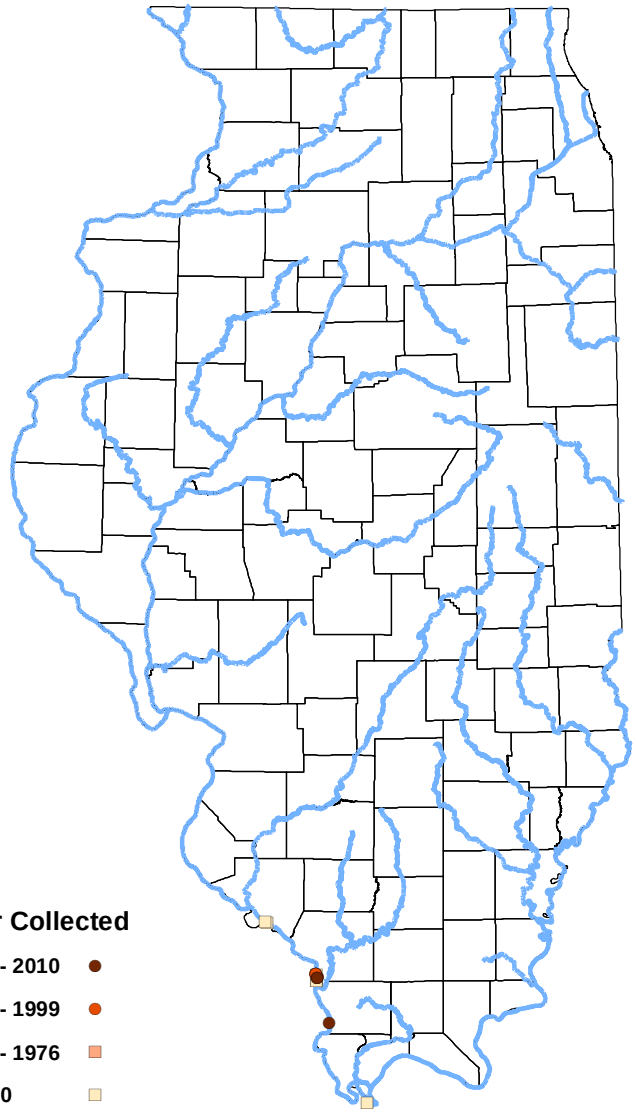
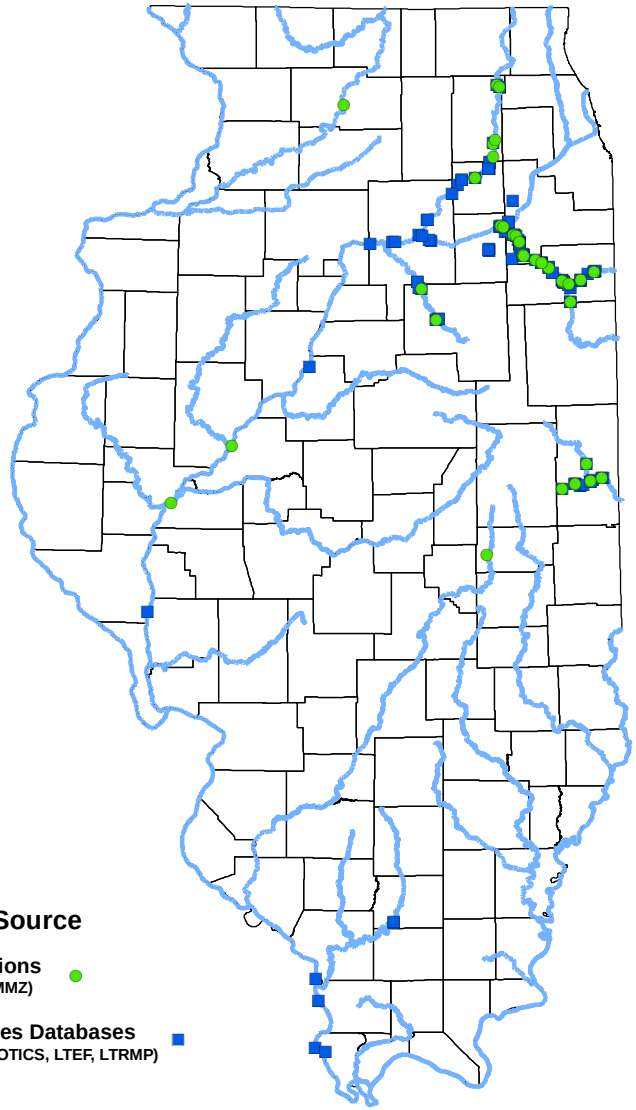
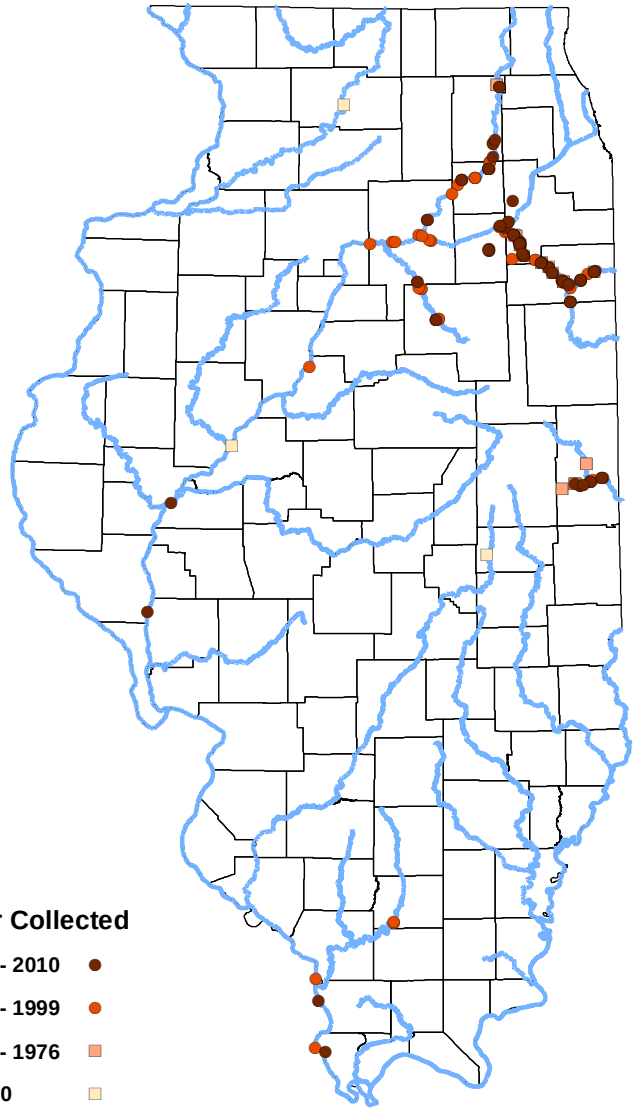


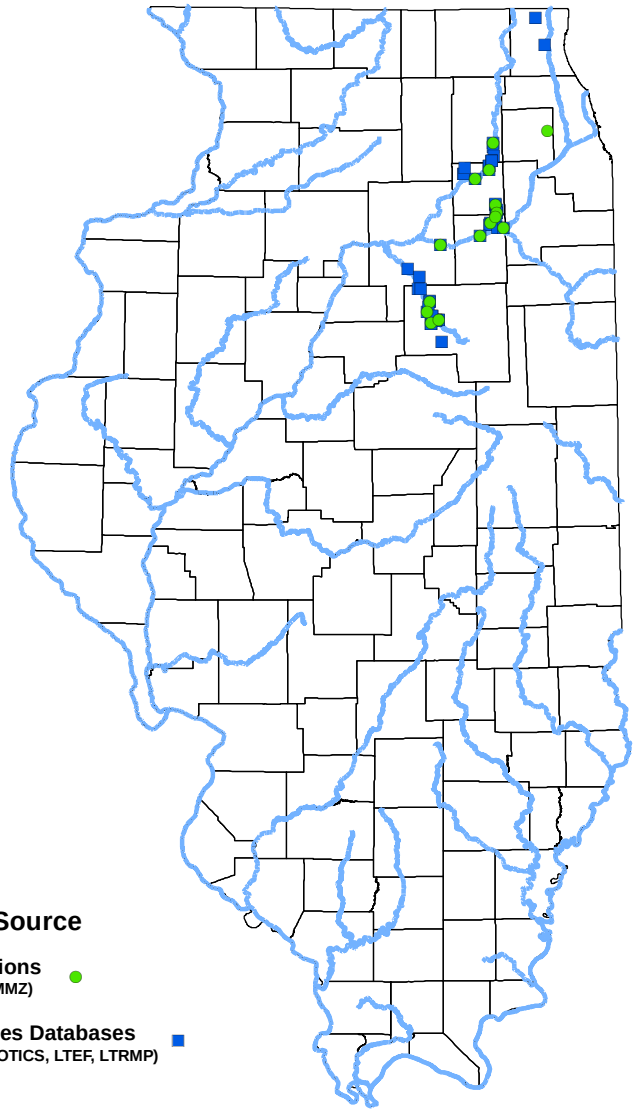


River redhorse(*Moxostoma carinatum*)





Greater redhorse(*Moxostoma valenciennesi*)



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
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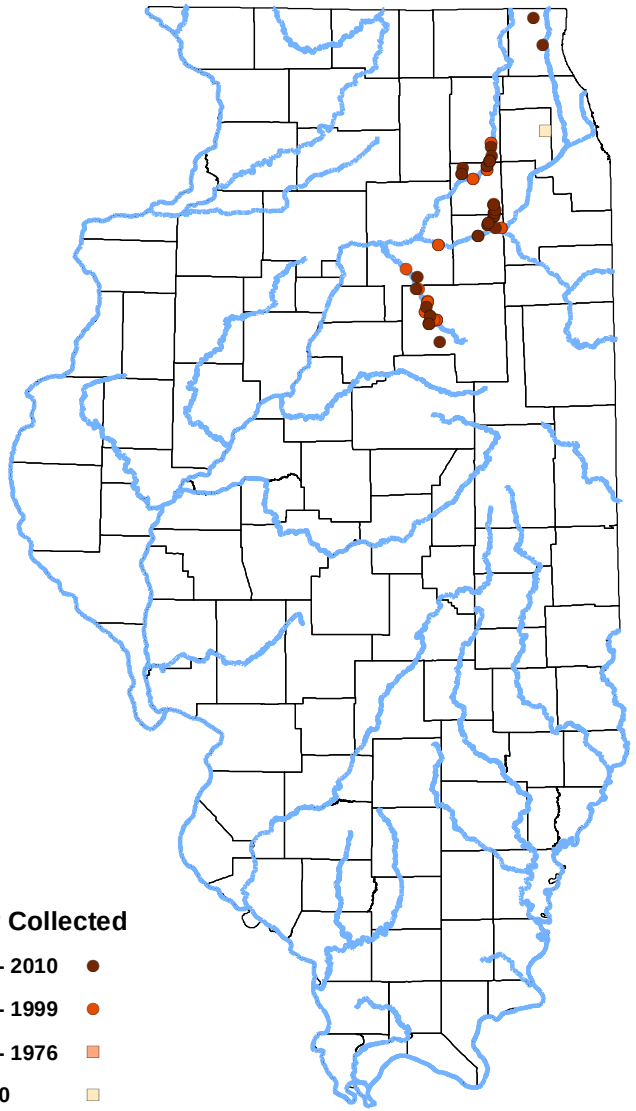


Year Collected

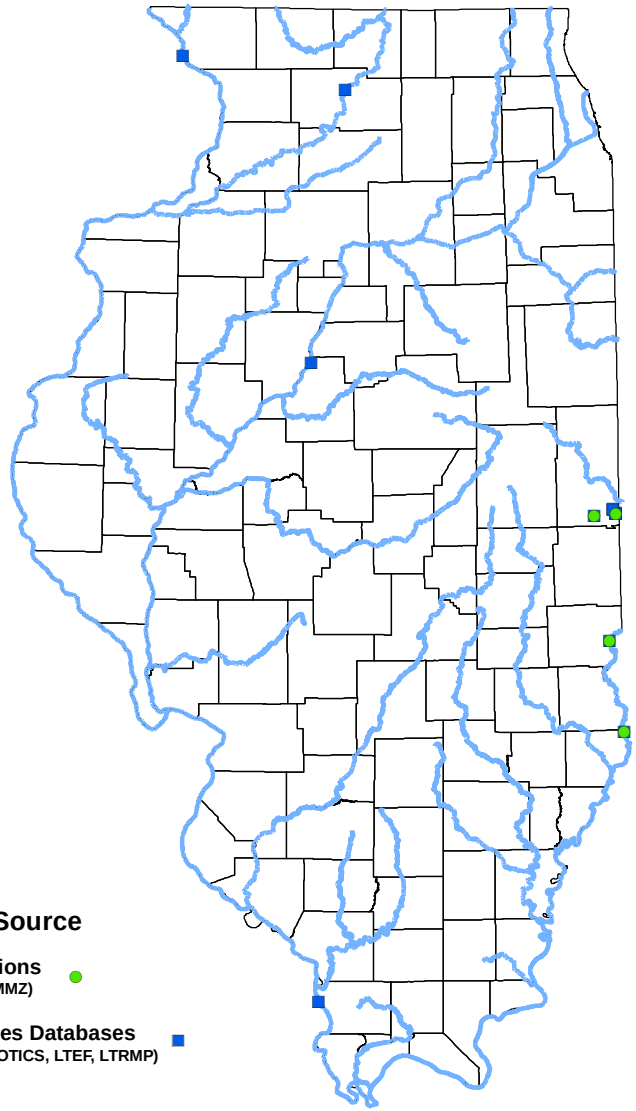
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

River chub*(Nocomis micropogon)*



Data Source

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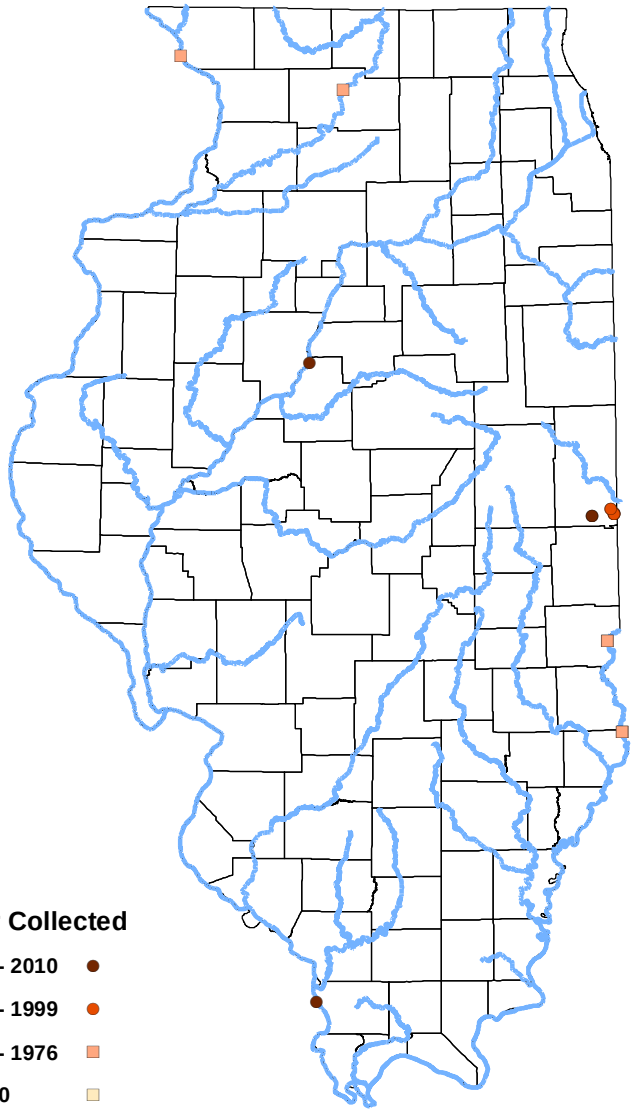

Year Collected

2000 - 2010

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Pugnose shiner*(Notropis anogenus)*

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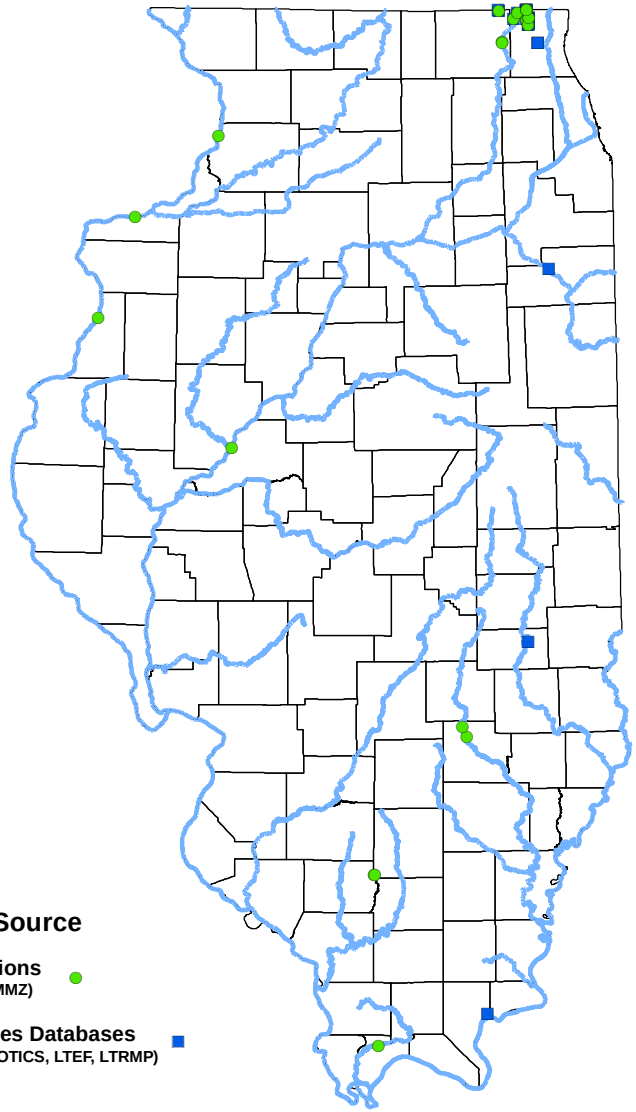
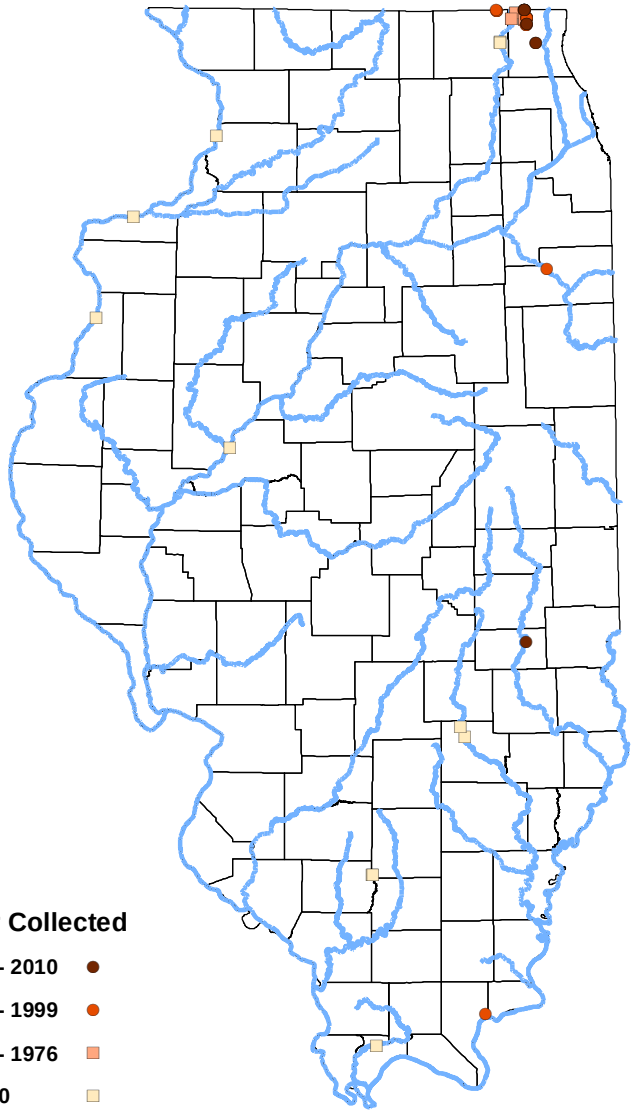
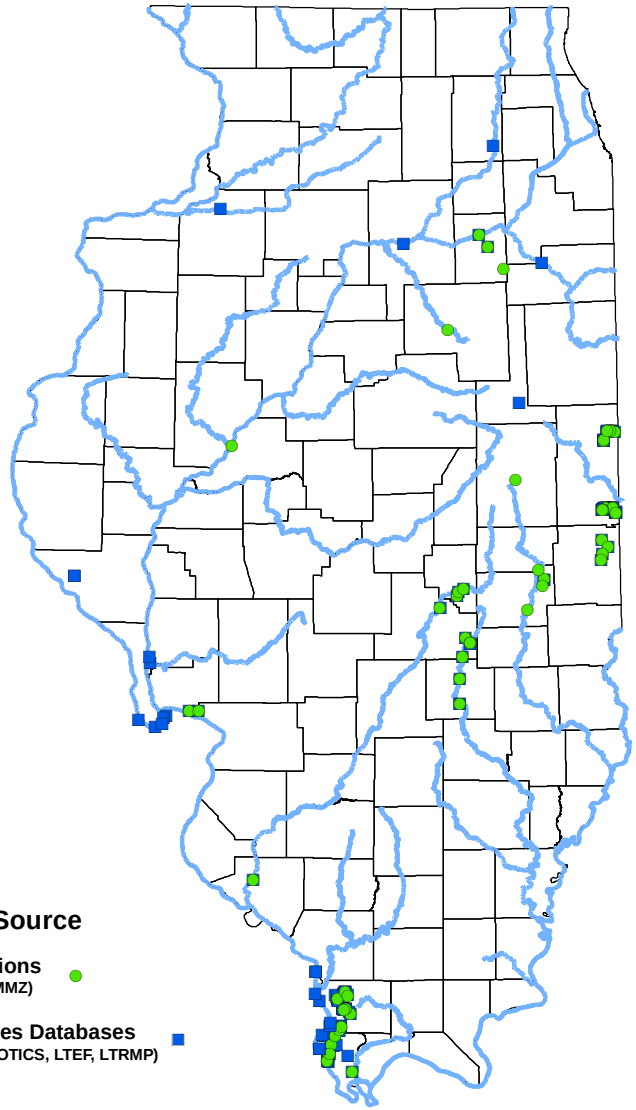
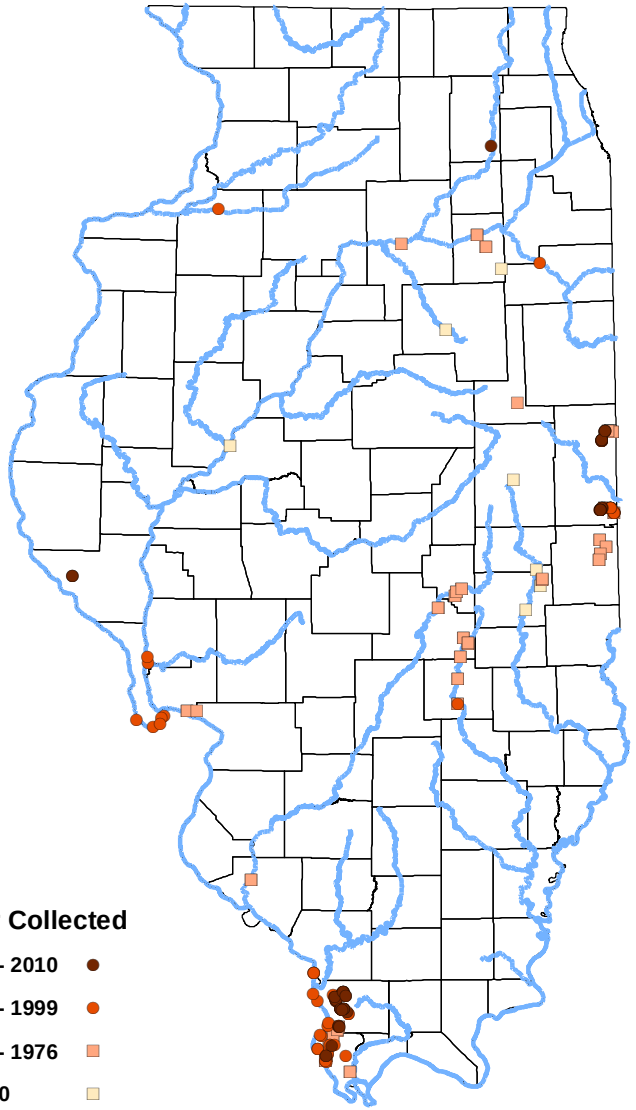




Bigeye shiner*(Notropis boops)*





Ironcolor shiner*(Notropis chalybaeus)*

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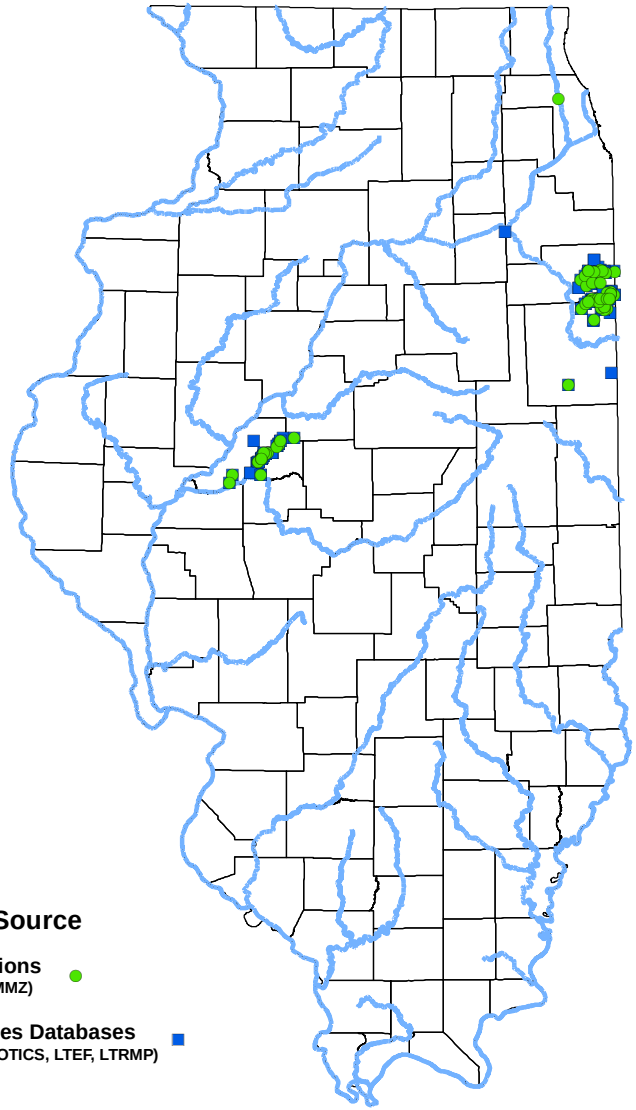
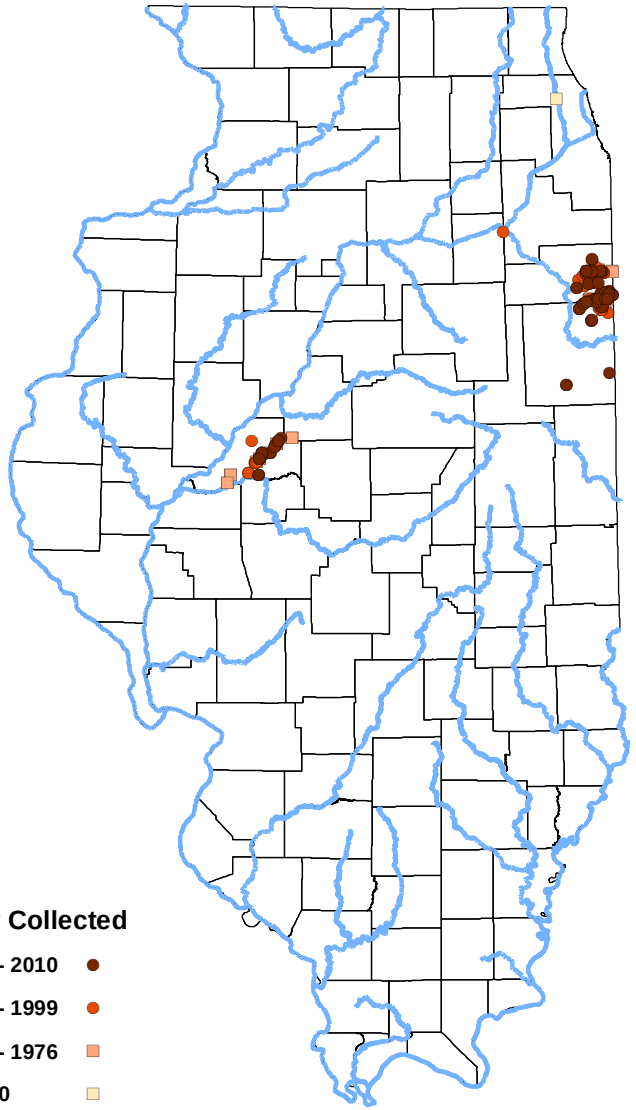


Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

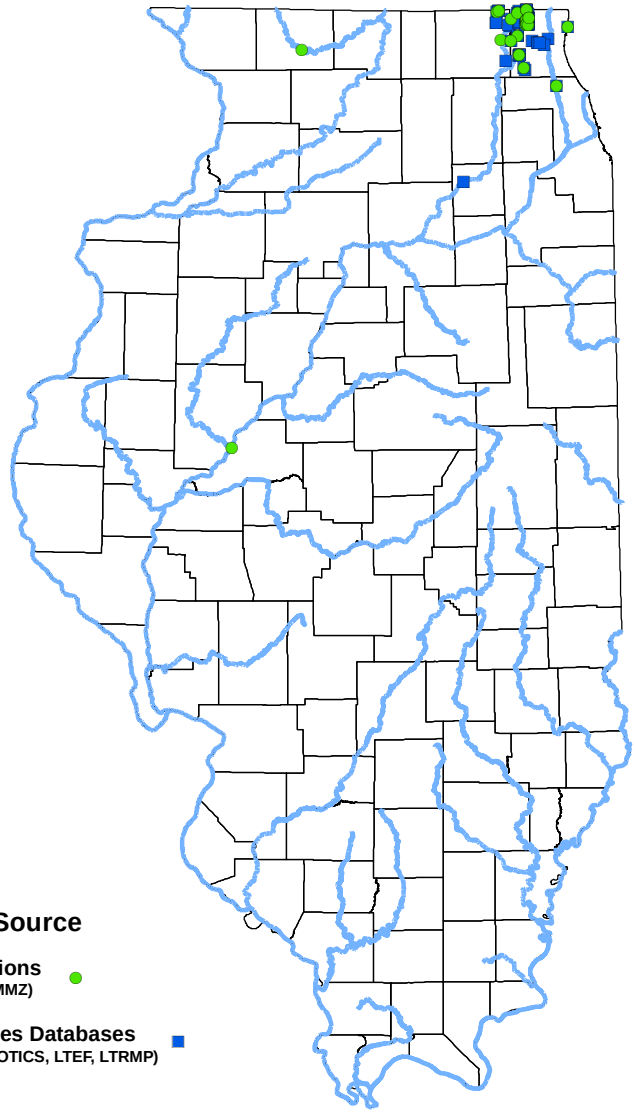
2000 - 2010

1977 - 1999

1950 - 1976

< 1950

Blackchin shiner*(Notropis heterodon)*



Data Source

Collections
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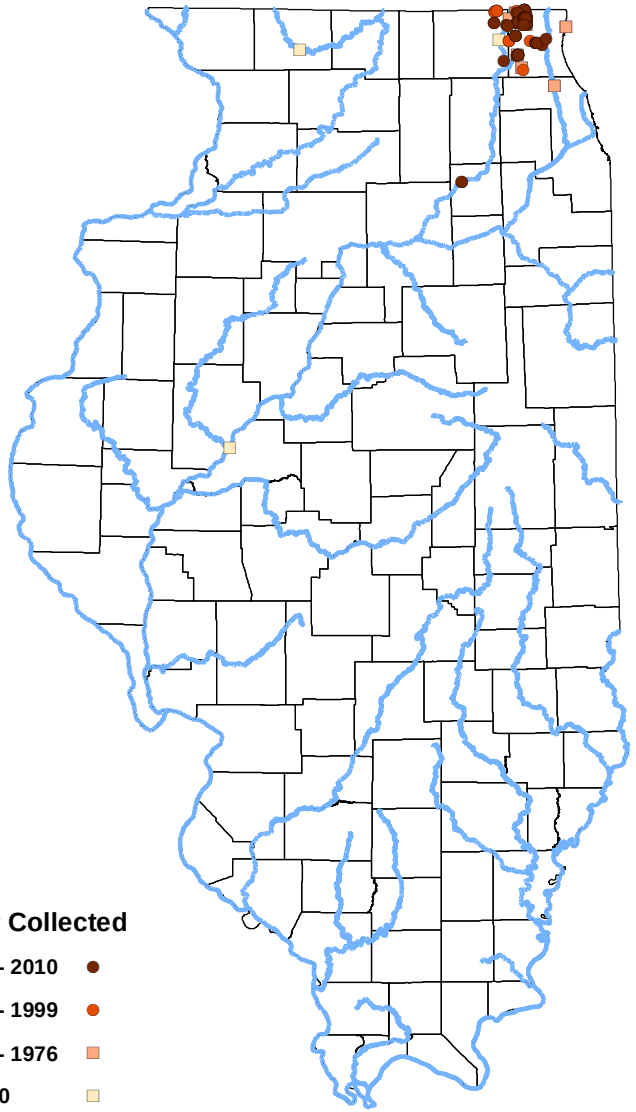
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

< 1950

Blacknose shiner*(Notropis heterolepis)*

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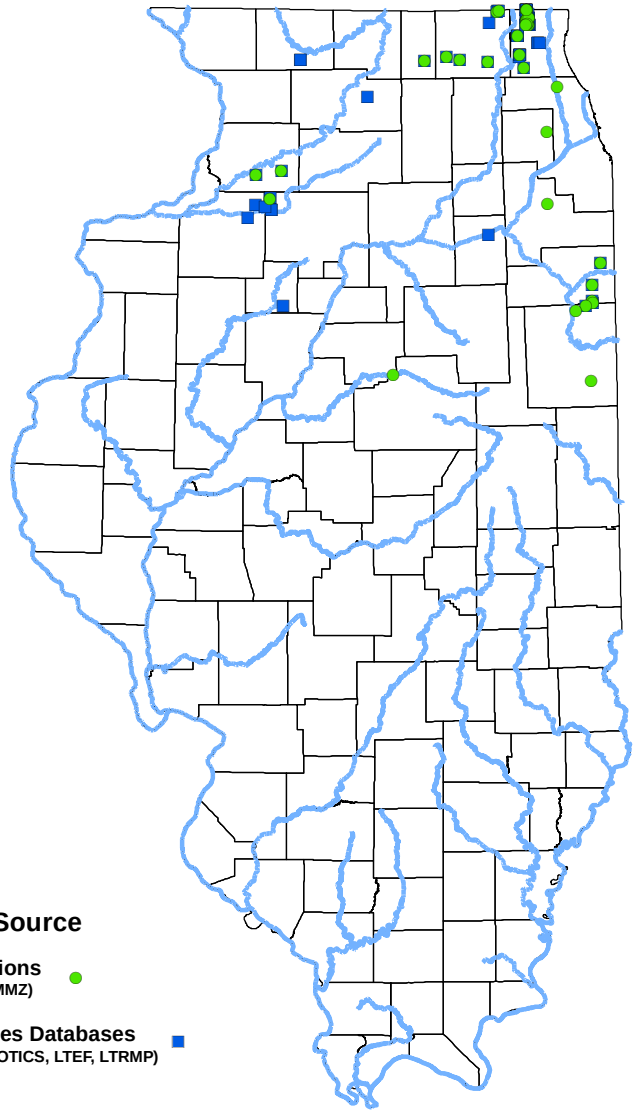

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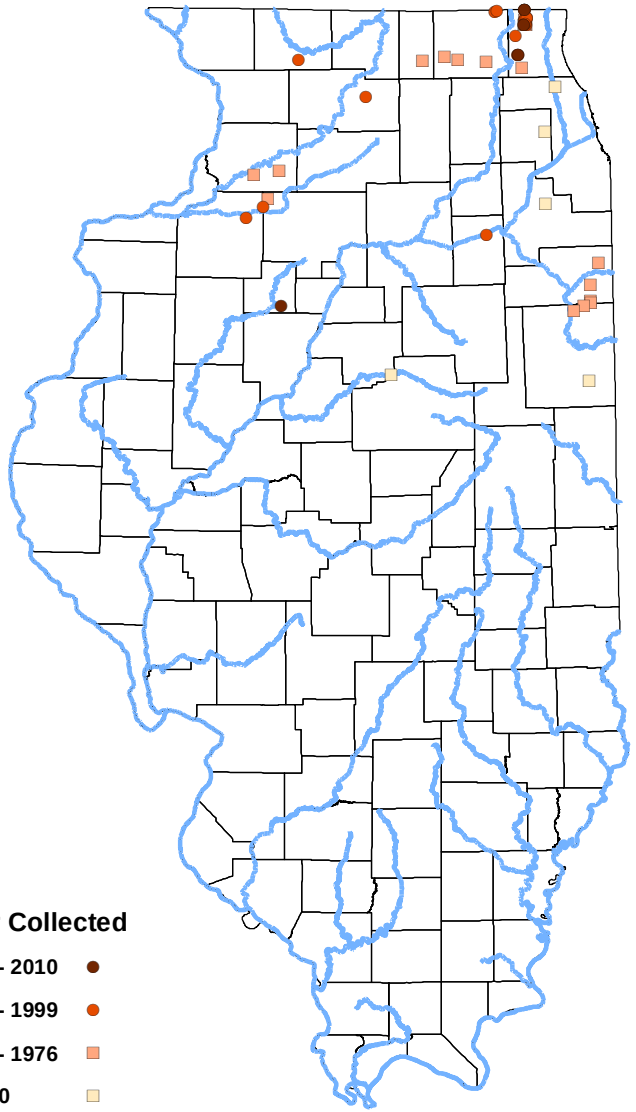
Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

< 1950

Taillight shiner*(Notropis maculatus)*

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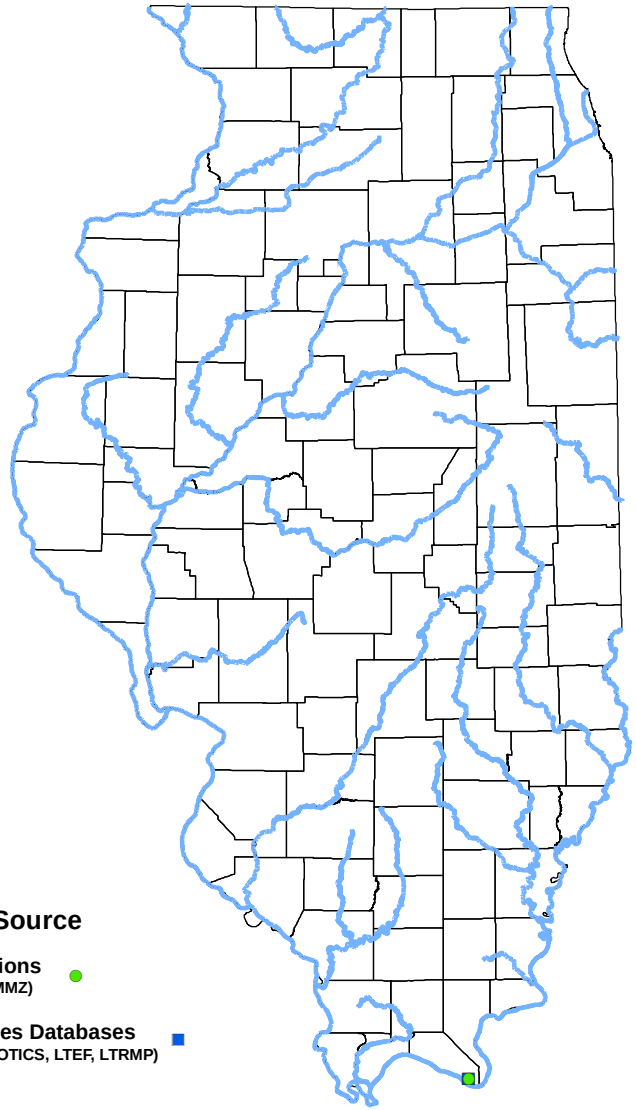
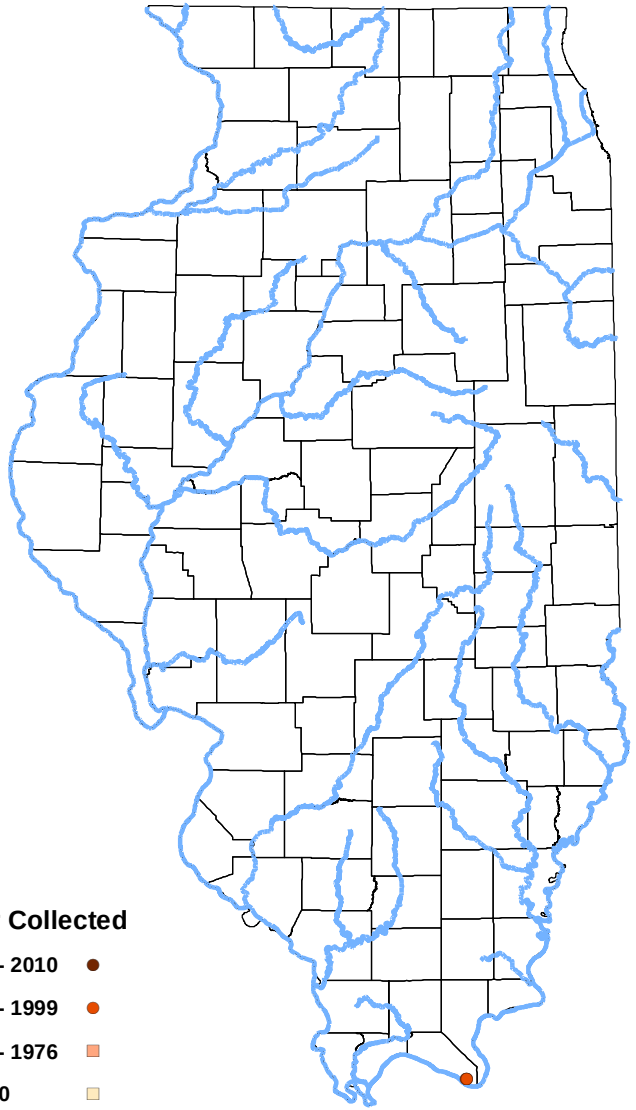


Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

2000 - 2010

1977 - 1999

1950 - 1976

< 1950

Weed shiner(*Notropis texanus*)

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

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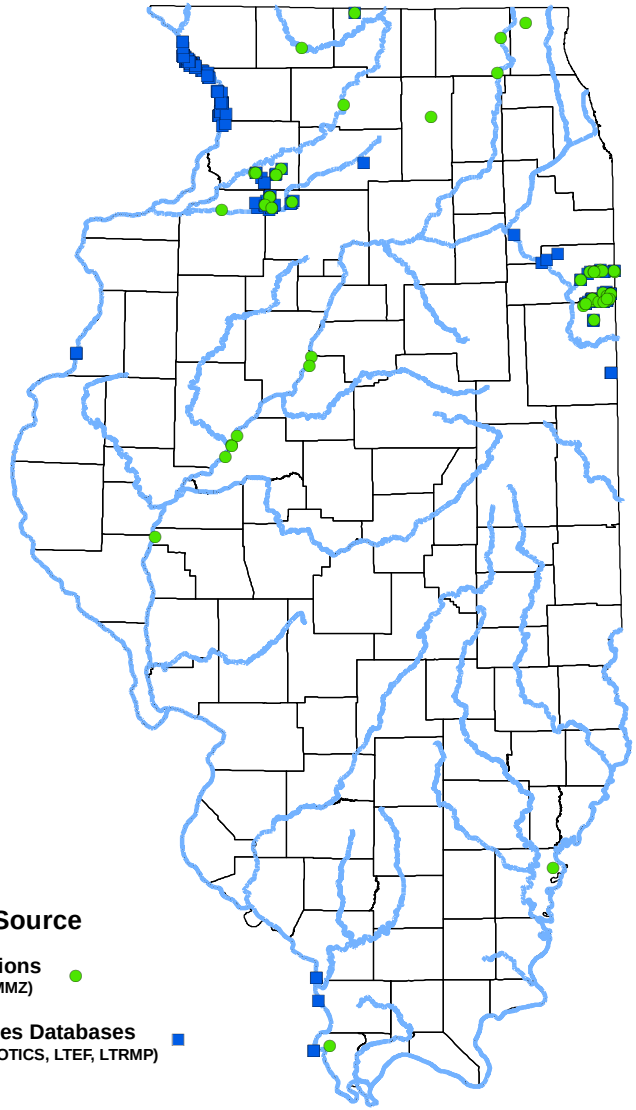
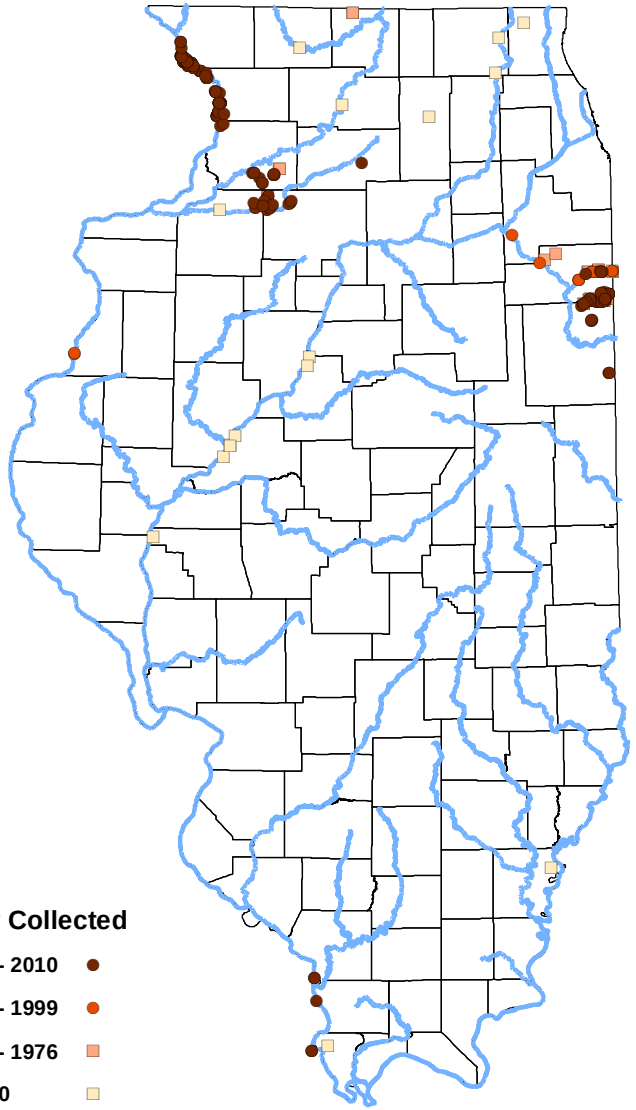
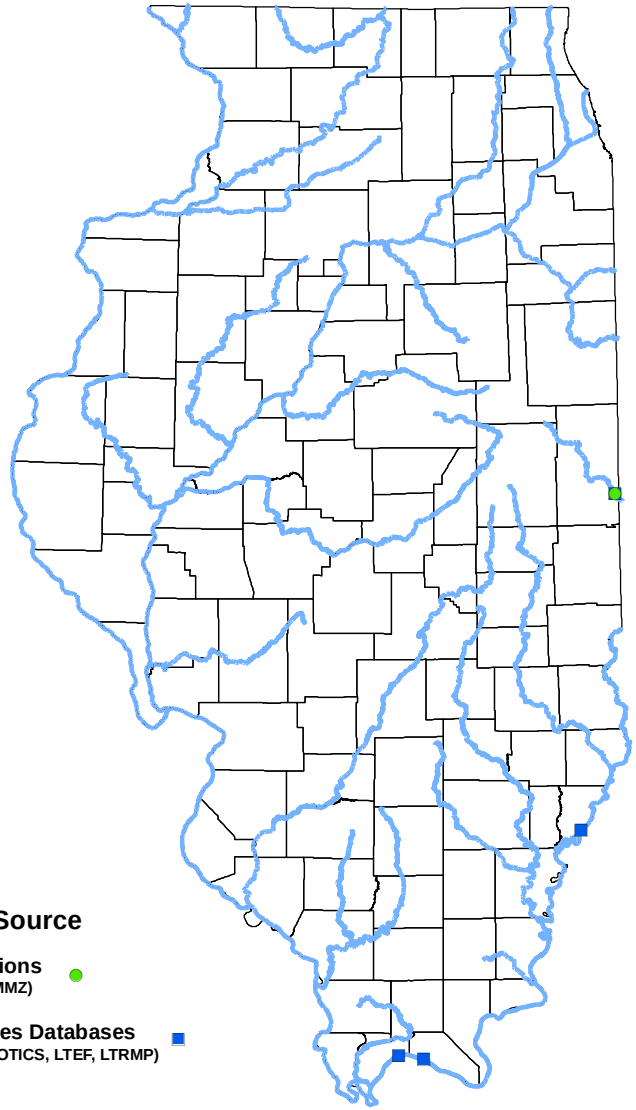




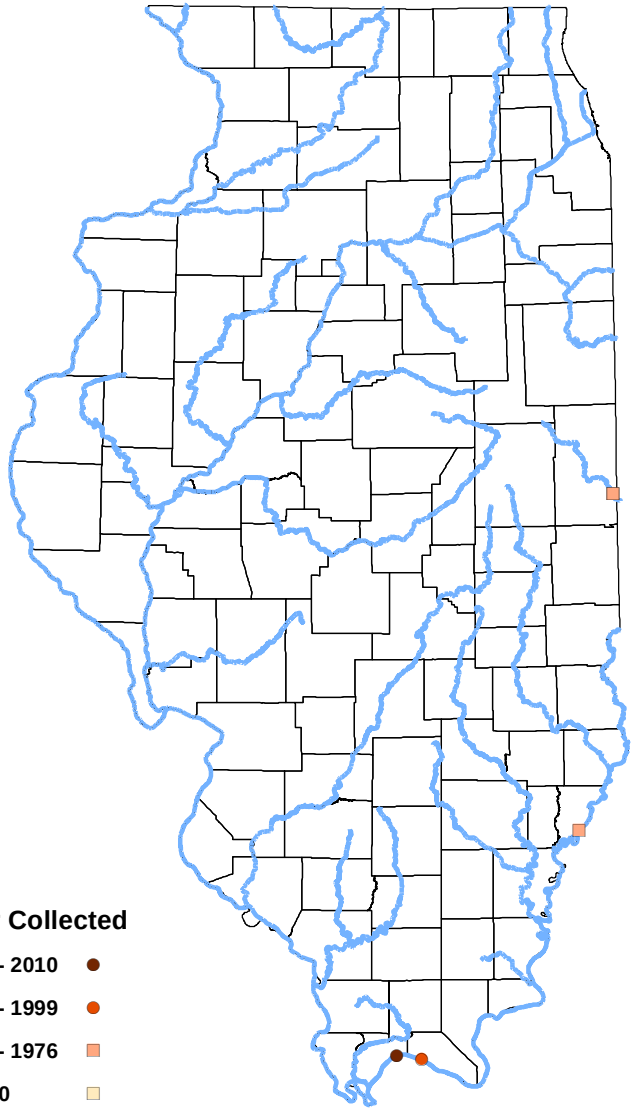
Northern madtom*(Noturus stigmosus)*



Data Source

Collections
(INHS, UMMZ)

Fisheries Databases
(IDNR, BIOTICS, LTEF, LTRMP)



Year Collected

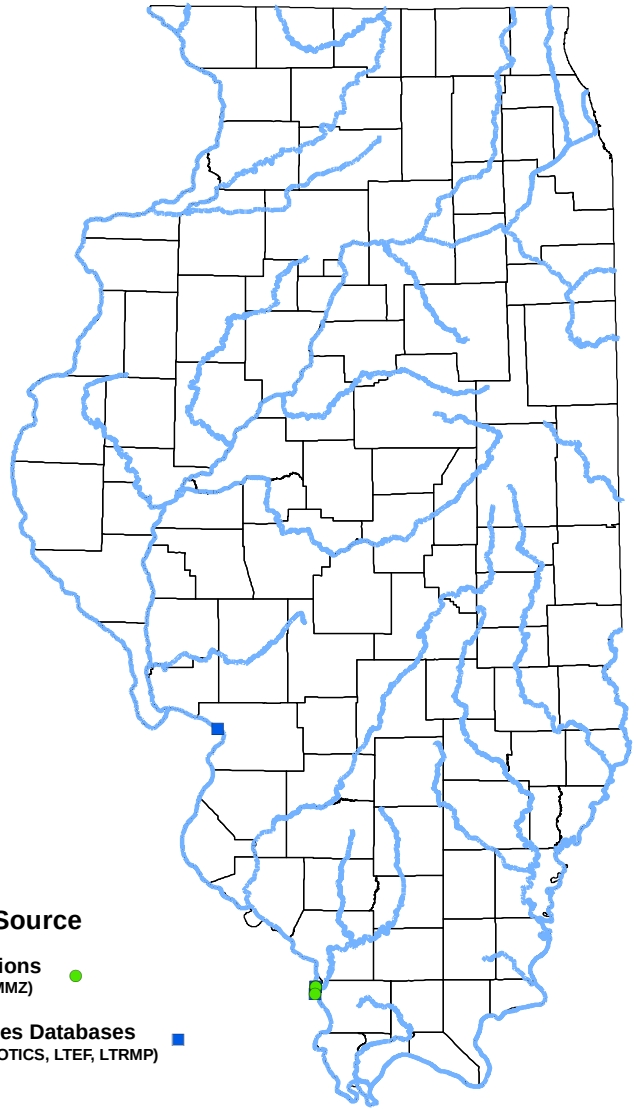
2000 - 2010

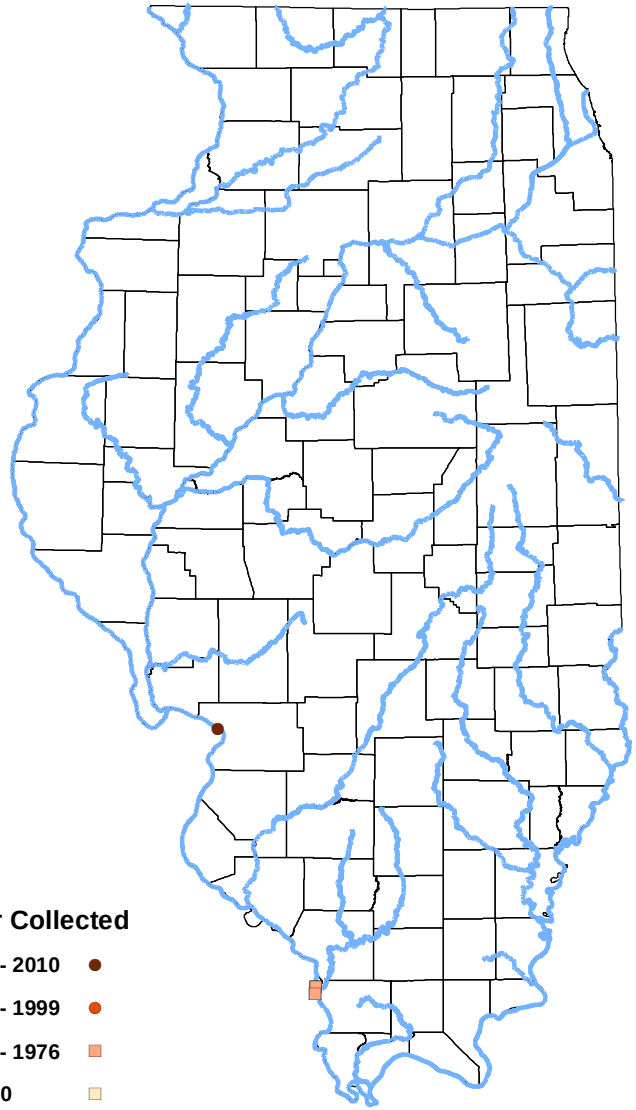
1977 - 1999

1950 - 1976

< 1950

Pallid sturgeon*(Scaphirhynchus albus)*





Appendix D

Draft revision of Appendix I.

Appendix D. Draft revision of Species in Greatest Need of Conservation for Illinois as identified by eight criteria (Appendix I).

Criteria:

1. State and Federal threatened or endangered status.
2. Global conservation rank.
3. Rare (R) or has significantly declined (D) in abundance or distribution from historic levels.
4. Dependent upon rare or vulnerable habitat.
5. Endemic to Illinois, or Illinois population is disjunct.
6. Illinois population is significant proportion of global population.
7. Representative of a broad array of other species for a particular habitat.
8. Status is poorly known.

		Criteria (1=meets criterion, 0=does not meet criterion)							
Common Name	**Habitat Association**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Non-T&E SGNC and Game Species:									
American eel	Pools of rivers and streams	0	G4	1, R&D	1	0	0	0	0
Brown bullhead	Still pools of lakes, backwaters, swamps with silt and vegetation	0	G5	1, R	1	1	0	1	0
Largescale stoneroller	High-gradient riffles and runs of streams with gravel, rock and stable flow	0	G5	1, R	1	0	0	1	0
Highfin carpsucker	High-gradient riffles and runs of streams with sand and gravel	0	G4, G5	0	0	0	0	1	0
Flier	Still, low-gradient pools if streams, backwaters and swamps with vegetation	0	G5	1, R	1	0	0	1	0
Lake whitefish	Lake Michigan	0	G5	1, R	0	0	0	1	1
Mottled sculpin	Lake Michigan or high-gradient riffles in coolwater streams with gravel	0	G5	1, R	1	0	0	1	0
Banded sculpin	High-gradient riffles in streams with gravel, rock and stable flow	0	G5	1, R	1	0	0	1	0
Lake chub	Lake Michigan over sand and gravel	0	G5	1, R	1	0	0	1	0
Crystal darter	Riffles and runs in rivers and streams	0	G3	1, R	0	0	0	0	1
Brook stickleback	Pools of coolwater streams with silt and vegetation	0	G5	1, R	1	0	0	1	0
Blue sucker	High-gradient riffles and runs of rivers with sand, gravel and rock	0	G3, G4	1, R	1	0	0	1	0
Blacktail shiner	High-gradient runs and pools of streams with stable flow and sand	0	G5	1, R	1	0	0	0	1
Banded pygmy sunfish	Low-gradient or still pools of backwaters and swamps with silt and vegetation	0	G5	1, R	1	0	0	1	0
Lake chubsucker	Lakes and still pools of streams with sand, silt and vegetation	0	G5	1, R	1	0	0	1	0
Northern pike	Lakes and low-gradient or still pools of backwaters, streams and rivers with vegetation	0	G5	1, D	1	0	0	1	0
Muskellunge	Lakes and still rivers with sand, gravel, rock, wood and vegetation	0	G5	1, R	1	0	0	1	0
Bluntnose darter	Low-gradient pools of streams, backwaters and swamps with silt and stable flow	0	G5	1, R	1	0	0	1	0
Fringed darter	Riffles and runs of streams with gravel, rock and stable flow	0	G5	1, R&D	0	0	0	0	1
Cypress darter	Low-gradient or still pools of streams and swamps with silt and vegetation	0	G5	1, R&D	1	0	0	0	1
Spottail darter	Riffles, runs and pools of streams with rock and stable flow	0	G4, G5	1, R	1	0	0	1	1
Spring cavefish	Coolwater caves with gravel, rock and stable flow	0	G4, G5	1, R&D	1	1	0	1	0
Silver lamprey	Riffles of rivers and streams with sand and gravel	0	G5	1, R&D	0	0	0	0	1
American brook lamprey	Riffles, runs and pools of streams with sand, gravel and rock	0	G4	1, R&D	0	0	0	0	1
Ribbon shiner	Low-gradient pools of streams with sand, silt and vegetation	0	G5	1, R	1	0	0	1	1
Sicklefin chub	Turbid riffles of rivers with sand, gravel and stable flow	0	G3	1, R&D	1	0	0	0	1
Smallmouth bass	Runs and pools of high-gradient rivers and streams with gravel, rock and wood	0	G5	0	1	0	0	1	0
Spotted bass	Runs and pools of rivers and streams with gravel and stable flow	0	G5	0	1	0	0	0	0
Black redhorse	High-gradient of riffles and runs of rivers and streams with sand and gravel	0	G5	0	1	0	0	1	0
Fourhorn sculpin	Sand, gravel and rock in Lake Michigan	0	G5	1, R	0	0	0	0	1
Ghost shiner	Low-gradient or still pools of rivers with sand, gravel and silt	0	G5	1, R&D	0	0	0	0	1
Ozark minnow	Riffles, runs and pools of high-gradient streams with gravel	0	G5	1, R	1	0	0	1	0
Rosyface shiner	Runs and pools of high-gradient streams with sand, gravel and stable flow	0	G5	0	1	0	0	1	0
Silverband shiner	High-gradient rivers with sand, gravel and stable flow	0	G5	1, R	1	0	0	0	1
Mountain madtom	High-gradient riffles in rivers and streams with sand, gravel and vegetation	0	G4	1, R	0	0	0	0	1
Slender madtom	High-gradient riffles in streams with gravel, rock and stable flow	0	G5	1, R	1	0	0	1	0
Pugnose minnow	Low-gradient or still pools of rivers, streams, backwaters and swamps with silt and vegetation	0	G5	1, R	1	0	0	1	1
Yellow perch	Lake Michigan, lakes or low-gradient or still pools of rivers with sand, gravel, rock, silt and vegetation	0	G5	1, R&D	1	0	0	1	0
Trout-perch	Lake Michigan and low-gradient or still rivers with gravel, wood and stable flow	0	G5	1, R&D	0	0	0	0	1

Appendix D (continued). Draft revision of Species in Greatest Need of Conservation for Illinois as identified by eight criteria (Appendix I).

		Criteria (1=meets criterion, 0=does not meet criterion)							
Common Name	**Habitat Association**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Southern redbelly dace	Runs and pools of high-gradient streams with sand, gravel and stable flow	0	G5	0	1	0	0	1	0
North American paddlefish	Low-gradient rivers with sand, gravel and silt	0	G4	1, R&D	1	0	0	1	0
Blacknose dace	Riffles, runs and pools of high-gradient streams with sand, gravel and stable flow	0	G5	0	1	0	0	1	0
Longnose dace	Lake Michigan or riffles in high-gradient streams with sand, gravel, rock and stable flow	0	G5	1, R	1	0	0	1	0
Brook trout	Lake Michigan or coolwater streams with gravel	0	G5	1, R&D	0	0	0	1	0
Lake trout	Lake Michigan	0	G5	1, R	0	0	0	1	0
Shovelnose sturgeon	Riffles and runs of rivers with sand and gravel	0	G4	1, R	1	0	0	1	0
Sauger	Low-gradient runs and pools of rivers with sand, gravel and rock	0	G5	0	1	0	0	1	0
Walleye	Lakes or runs and pools of rivers with sand, gravel and rock	0	G5	1, D	1	0	0	1	0
Central mudminnow	Low-gradient or still pools streams, backwaters and swamps with silt and vegetation	0	G5	1, R	1	0	0	1	0
Sportfish:									
Largemouth bass	Pools of lakes and low-gradient or still rivers and backwaters with sand, gravel, wood, silt and stable flow	0	G5	0	0	0	0	1	0
Channel catfish	Lakes or low-gradient or still runs and pools of rivers and streams with sand, gravel, rock, wood and stable flow	0	G5	0	0	0	0	0	0
Redear sunfish	Lakes or low-gradient or still pools of rivers and streams with sand, gravel, silt, wood and vegetation	0	G5	0	1	0	0	1	0
White crappie	Lakes and low-gradient or still pools of backwaters and rivers with vegetation	0	G5	1, D	1	0	0	0	0
Black crappie	Lakes and low-gradient or still pools of backwaters and rivers with sand, gravel, wood, silt, and vegetation	0	G5	1, D	1	0	0	1	0
T&E SGNC:									
Lake sturgeon	Lakes and rivers with gravel and rock	SE	G3, G4	1, R	1	0	0	1	1
Western sand darter	Low-gradient rivers with sand	SE	G3	1, R	1	0	0	1	0
Eastern sand darter	Rivers with sand	ST	G4	1, R	1	0	0	1	0
Longnose sucker	Lakes, Lake Michigan streams	ST	G5	1, R	1	0	0	1	0
Cisco	Lake Michigan	ST	G5	1, R&D	0	0	0	1	0
Gravel chub	Rivers with sand and gravel	ST	G4	1, R&D	1	0	0	1	1
Bluebreast darter	High-gradient riffles in rivers and streams with rock	SE	G4	1, R	1	0	0	1	0
Iowa darter	Lakes, streams, backwaters and swamps with vegetation	ST	G5	1, R&D	1	0	0	1	0
Harlequin darter	High-gradient rivers and streams with gravel and wood	SE	G5	1, R&D	1	1	0	1	1
Banded killifish	Lakes with sand, gravel and vegetation	ST	G5	1, R	1	0	0	1	1
Starhead topminnow	Lakes, backwaters and swamps with vegetation	ST	G4	1, R&D	1	1	0	1	1
Cypress minnow	Lakes, swamps, backwaters and streams with sand and silt	SE	G5	1, R&D	1	0	0	0	1
Bigeye chub	Streams with sand and gravel, vegetation	SE	G5	1, R	1	0	0	1	1
Pallid shiner	Pools of rivers with sand	SE	G4	1, R&D	1	1	0	0	1
Northern brook lamprey	Streams and rivers with sand and gravel	SE	G4	1, R&D	1	0	0	0	1
Least brook lamprey	Riffles with gravel in rivers and streams	ST	G5	1, R	1	0	0	0	0
Redspotted sunfish	Backwaters, swamps and low-gradient streams with vegetation	SE	G5	1, R	1	1	0	1	0
Bantam sunfish	Backwaters, swamps and lakes with vegetation	ST	G5	1, R&D	1	0	0	1	1
Sturgeon chub	Turbid rivers with sand	SE	G3	1, R	1	0	0	1	1
River redhorse	High-gradient rivers with gravel	ST	G4	1, R&D	1	0	0	1	1
Greater redhorse	Rivers and lakes with sand, gravel and rock	SE	G4	1, R	1	0	0	0	1
River chub	High-gradient rivers and streams with gravel and rock	SE	G5	1, R	1	0	0	1	1
Pugnose shiner	Lakes and low-gradient streams with vegetation	SE	G3	1, R&D	1	0	0	1	0
Bigeye shiner	Streams with sand, gravel and vegetation	SE	G5	1, R	1	0	0	1	1
Ironcolor shiner	Streams and swamps with sand and vegetation	ST	G4	1, R	1	1	0	1	1
Blackchin shiner	Lakes and streams with vegetation	ST	G5	1, R	1	0	0	1	0
Blacknose shiner	Lakes and streams with sand and vegetation	SE	G4	1, R	1	0	0	1	1
Taillight shiner	Backwaters, lakes, streams and swamps with vegetation	SE	G5	1, R&D	1	0	0	0	1
Weed shiner	Streams with sand and vegetation	SE	G5	1, R	1	1	0	1	0
Northern madtom	High-gradient streams and rivers with sand	SE	G3	1, R&D	1	1	0	0	1
Pallid sturgeon	Turbid rivers with sand and gravel	SE, FE	G2	1, R	1	0	0	1	1

Appendix E

Draft revision of Appendix II.

Appendix E. Draft revision of Stresses to Illinois' Wildlife (Appendix II).

Current Status:
N Abundance = Statewide CPUE (#/minute)
N Distribution = Number of HUC-8 watersheds inhabited
Abundance and Distribution Trends = 0 is stable (-24% to +24% change from historic levels), -1 and +1 are moderate decrease or increase (25-49% change), -2 and +2 are high decrease or increase (≥50% change).
Listing = State or Federal threatened or endangered status

Status Objectives:
Abundance and Distribution Trends = Proposed change from current N for 2025 horizon. Maintain current trend (0), reverse declining trend (+) or increase low abundance or distribution (+).
Listing = Proposed listing status for 2025 horizon.

Stressor assessments (non-T&E SGNC and game species):
1 = ≥ 50% expert consensus
0 = < 50% expert consensus

Stressor assessments (T&E species):
1 = recognized (published) stressor to species
0 = not a stressor to species (i.e., stressor is a requirement of this species, or stressor does not exist for this species)
S = insufficient evidence to make determination (published information is not available or clear for this stressor)

	Current Status					Status Objectives			Habitat Stresses							Community Stresses				Population Stresses				Human Stresses	
Common Name	*N Abundance*	*N Distribution*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Extent*	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Chemical Pollutants*	*Sedimentation*	*Competitors*	*Predators*	*Parasites-Disease*	*Prey-Food*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Structures*	*Climate Change*
Non-T&E SGNC:																									
American eel	0.05	7	+1	-2		0	+		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Brown bullhead	0.10	26	-1	+1		+	0		1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Largescale stoneroller	0.95	10	+1	+2		0	0		1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Highfin carpsucker	0.12	29	+1	0		0	0		1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Flier	0.12	8	+2	0		0	0		1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Lake whitefish	0.00	1	n/a	0		+	+		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mottled sculpin	1.01	5	+2	+2		0	0		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Banded sculpin	0.88	8	+2	0		0	0		1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake chub	0.10	4	-1	+2		+	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crystal darter	0.00	2	n/a	+1		+	0		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Brook stickleback	0.44	9	+2	0		0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue sucker	0.07	14	+2	+1		0	0		1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Blacktail shiner	0.10	4	+2	+2		0	0		1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Banded pygmy sunfish	0.07	1	+2	+1		0	0		1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Lake chubsucker	0.21	10	+1	+2		0	0		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern pike	0.07	21	+1	-1		0	+		1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Muskellunge	0.10	26	+1	+2		0	0		1	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1
Bluntnose darter	0.10	12	+2	+2		0	0		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fringed darter	0.17	2	-1	+2		+	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cypress darter	0.09	2	-1	+2		+	0		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Spottail darter	0.69	3	+2	0		0	+		1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Spring cavefish	0.00	0	n/a	-2		+	+		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver lamprey	0.06	4	+1	-2		0	+		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
American brook lamprey	0.09	3	+1	-2		0	+		1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Ribbon shiner	0.20	8	+2	0		0	0		1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sicklefin chub	0.00	0	n/a	-2		+	+		1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0
Smallmouth bass	0.45	41	+2	+1		0	0		1	1	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0
Spotted bass	0.13	16	+1	0		0	0		1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Black redhorse	0.44	24	+2	+2		0	0		1	1	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0
Fourhorn sculpin	0.00	0	n/a	n/a		+	+		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Ghost shiner	0.03	7	-1	-1		+	+		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ozark minnow	2.78	5	+1	+2		0	0		1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Rosyface shiner	0.80	17	0	+2		0	0		1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Silverband shiner	0.10	14	+2	+1		0	0		1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0
Mountain madtom	0.02	2	n/a	0		+	+		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Slender madtom	0.36	17	+2	+2		0	0		1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pugnose minnow	0.07	10	+1	+1		0	0		1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow perch	0.11	21	+1	-1		0	+		1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0
Trout-perch	0.03	1	-2	-2		+	+		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern redbelly dace	0.98	21	+1	+2		0	0		1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0

Appendix E (continued). Draft revision of Stresses to Illinois' Wildlife (Appendix II).

	Current Status					Habitat Stresses									Community Stresses				Population Stresses				Human Stresses	
Common Name	*N Abundance*	*N Distribution*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Abundance Trend*	*Distribution Trend*	*Listing*	*Extent*	*Fragmentation*	*Composition-Structure*	*Disturbance/Hydrology*	*Invasives/Exotics*	*Chemical Pollutants*	*Sedimentation*	*Competitors*	*Predators*	*Parasites-Disease*	*Prey-Food*	*Genetics*	*Dispersal*	*Recruitment*	*Mortality*	*Structures*	*Climate Change*
North American paddlefish	0.04	9	0	-2		0	+		0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0
Blacknose dace	0.70	18	+2	+2		0	0		1	1	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0
Longnose dace	0.42	3	0	+2		0	0		1	1	1	1	0	1	1	0	0	0	0	0	1	0	0	1	0
Brook trout	0.00	1	n/a	-1		+	+		1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0
Lake trout	0.00	2	n/a	0		+	+		0	0	0	0	1	0	0	1	1	0	1	0	0	1	1	0	0
Shovelnose sturgeon	0.09	7	+1	+1		0	0		1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Sauger	0.18	33	+2	+1		0	0		1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Walleye	0.22	37	+2	0		0	0		1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Central mudminnow	0.45	17	+2	+2		0	0		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sportfish:																									
Largemouth bass	1.05	51	+2	0		0	0		0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Channel catfish	0.31	51	0	0		0	0		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Redear sunfish	1.14	36	+2	+2		0	0		1	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0
White crappie	0.75	49	+2	-2		0	+		1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0
Black crappie	0.37	49	+2	-1		0	+		1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0
T&E SGNC:																									
Lake sturgeon	0.00	1	n/a	-2	SE	+	+	ST	S	S	1	1	S	1	1	S	S	S	S	S	S	S	1	1	S
Western sand darter	0.22	6	+2	+2	SE	0	0	ST	S	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Eastern sand darter	0.08	2	+2	+2	ST	0	0	Delist	1	S	S	S	S	1	1	S	S	S	S	S	S	S	S	1	S
Longnose sucker	0.00	3	n/a	+2	ST	+	0	Delist	0	0	0	S	1	1	0	S	S	S	S	S	1	S	S	1	S
Cisco	0.00	0	n/a	-2	ST	+	+	Delist	0	0	0	S	1	1	0	1	1	S	S	S	S	S	1	0	S
Gravel chub	0.04	4	0	+1	ST	0	0	Delist	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Bluebreast darter	0.14	1	+1	+1	SE	0	0	ST	S	S	S	S	S	1	1	S	S	S	S	S	S	S	S	1	S
Iowa darter	0.03	5	-1	-1	ST	+	+	Delist	1	1	1	1	1	1	0	S	S	S	S	S	S	S	S	S	S
Harlequin darter	0.02	1	n/a	-1	SE	+	+	ST	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Banded killifish	0.12	5	0	+2	ST	0	0	Delist	1	S	1	S	S	1	0	S	1	S	S	S	S	S	S	S	S
Starhead topminnow	0.48	8	+2	+2	ST	0	0	Delist	1	S	1	1	S	1	1	S	1	S	S	S	S	S	S	S	S
Cypress minnow	0.00	1	n/a	0	SE	+	+	ST	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	1	S
Bigeye chub	0.26	3	+2	+2	SE	0	0	ST	1	S	1	1	S	1	1	S	S	S	S	S	S	1	S	1	S
Pallid shiner	0.03	3	n/a	+2	SE	+	0	ST	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Northern brook lamprey	0.00	0	n/a	-2	SE	+	+	ST	S	S	S	S	S	1	S	S	S	S	S	S	S	S	S	1	S
Least brook lamprey	0.00	2	n/a	0	ST	+	+	Delist	S	S	S	S	S	S	1	S	S	S	S	S	S	S	S	1	S
Redspotted sunfish	11.55	8	+1	+1	SE	0	0	ST	1	S	1	1	S	1	0	S	S	S	S	S	S	S	S	S	S
Bantam sunfish	0.05	1	-1	0	ST	+	+	Delist	1	1	1	S	S	1	0	S	S	S	S	S	S	S	S	S	S
Sturgeon chub	0.00	1	n/a	0	SE	+	+	ST	1	1	1	1	1	S	1	S	S	S	S	S	S	S	S	1	S
River redhorse	0.19	10	+2	0	ST	0	0	Delist	S	S	S	1	S	1	1	S	S	S	S	S	S	S	S	S	S
Greater redhorse	0.12	4	+1	+1	SE	0	0	ST	S	S	S	1	S	1	1	S	S	S	S	S	S	S	S	1	S
River chub	0.04	3	+2	0	SE	0	+	ST	S	S	1	1	S	S	1	S	S	S	S	S	S	S	S	1	S
Pugnose shiner	0.01	3	-2	0	SE	+	+	ST	1	S	1	1	S	1	1	S	1	S	S	S	S	S	S	1	S
Bigeye shiner	0.74	5	+1	0	SE	0	+	ST	S	S	S	1	S	S	1	S	S	S	S	S	S	S	S	1	S
Ironcolor shiner	0.62	4	0	+2	ST	0	0	Delist	S	1	S	S	S	1	1	S	S	S	S	S	S	S	S	S	S
Blackchin shiner	0.22	2	+2	+1	ST	0	0	Delist	1	S	1	S	S	1	1	S	1	S	S	S	S	S	S	S	S
Blacknose shiner	0.53	4	+2	-2	SE	0	+	ST	1	S	1	S	S	S	1	S	S	S	S	S	S	S	S	S	S
Taillight shiner	0.00	0	0	-2	SE	+	+	ST	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Weed shiner	0.36	6	0	+2	SE	0	0	ST	S	S	S	S	S	1	1	S	S	S	S	S	S	S	S	S	S
Northern madtom	0.02	1	n/a	-1	SE	+	+	ST	1	S	1	1	S	1	1	S	S	S	S	S	S	S	S	S	S
Pallid sturgeon	0.00	1	n/a	0	SE, FE	+	+	ST	1	S	1	1	S	S	S	S	S	S	S	1	1	1	1	1	S