

# Interim Core Map Documentation for Illinois Cave Amphipod

## Version 1

**Review Completed:** April 2026

**Core Map Developer:** U.S. Environmental Protection Agency (EPA), Office of Pesticide Programs, based in part on information from the Center for Biological Diversity

## Species Summary

The Illinois cave amphipod is a species that lives in streams primarily in the dark zone of caves in parts of the Salem Plateau of Illinois. Little is known of the biology and habitat requirements of this species although it has been collected in mainstream gravel riffles, smaller tributary streams, rimstone pools, and from streams with silt overlying bedrock. As a group, amphipods require cool water temperatures and are intolerant of wide ranges in temperature. Limiting factors may include increased nutrient load, sedimentation, hydrologic changes and changes in water quality.

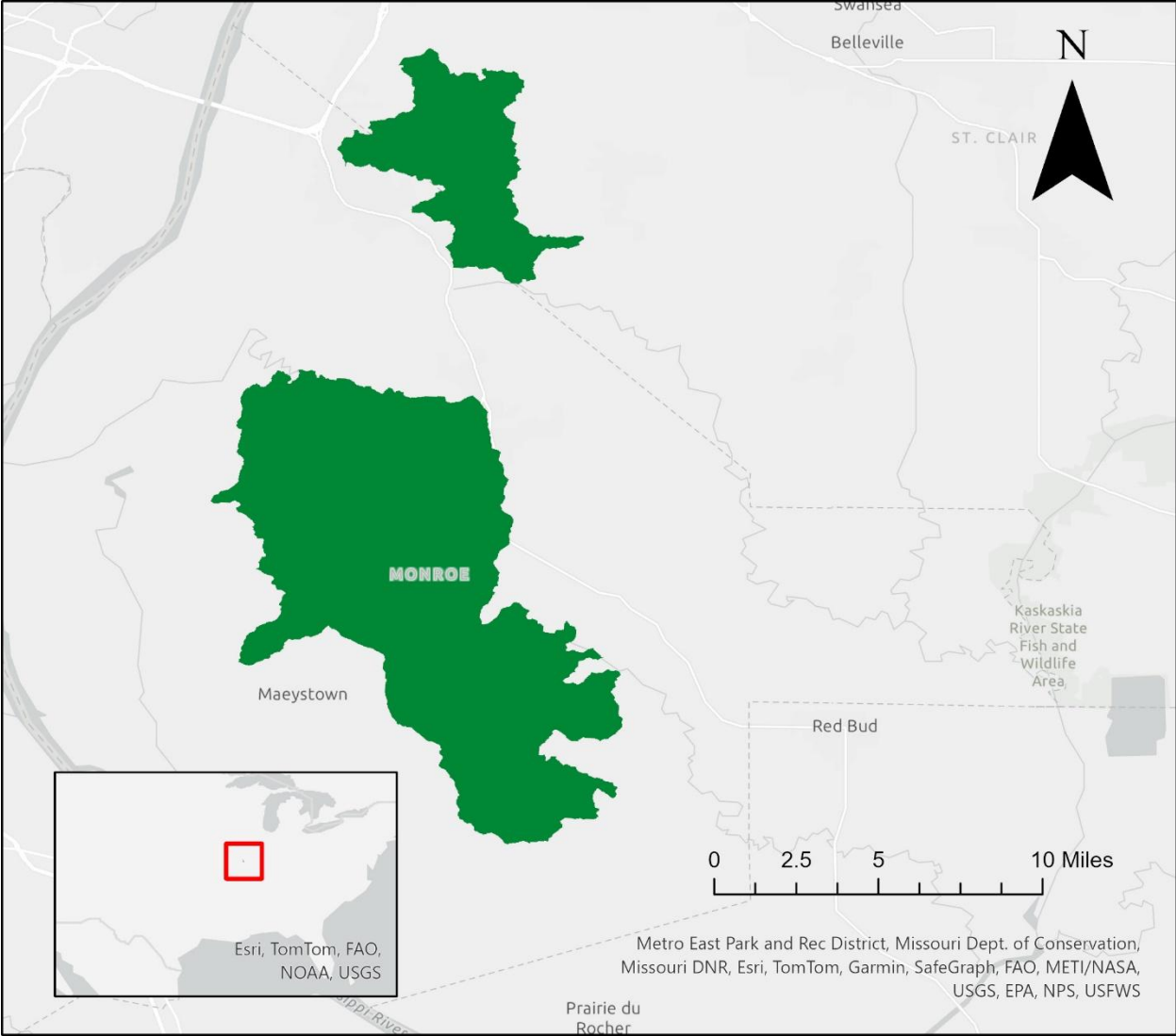
## Description of Core Map

This species is a very narrow endemic species. The Illinois cave amphipod historically occurred in a 230-square-kilometer (89-square-mile) area within the Salem Plateau karst region in Monroe and St. Clair Counties, Illinois (FWS 2002). Within this area, biologists documented ICA in the streams of 16 caves that occur in ten groundwater basins in three sub-regions between 1938 and 2014.

The U.S. Fish and Wildlife Service (FWS) Environmental Conservation Online System (ECOS) range map reflects monitored cave locations where the Illinois cave amphipod was located as of 2014. Based on the uncertainties related to limited monitoring over the last 10 years, USFWS does not currently have enough information to refine the Illinois cave amphipods' range any further (5-Year Review 202).

Additionally, portions of the Illinois cave amphipod habitat are contained within the Illinois Caverns State Natural Area, which is a 120-acre preserve owned by the Illinois Department of Natural Resources. Given the connectivity of the cave systems and associated waters and that the known locations described by FWS are found throughout the range, the core map selection for this species is based on its range.

The core map developed for the Illinois cave amphipod is considered interim. This core map will be used to develop pesticide use limitation areas (PULAs) that include Illinois cave amphipod. This core map incorporates information developed by FWS and made available to the public; however, the core map has not been formally reviewed by FWS. This interim core map may be revised in the future to incorporate expert feedback from FWS. This interim core map has a "limited" (2) best professional classification with respect to data interpretation. It consists of the species' range without additions or subtractions; however, the extent to which the species locations currently encompass the entire range is still uncertain. This core map does not replace or revise any range or designated critical habitat developed by FWS for this species.



**Figure 1: Interim core map for the Illinois cave amphipod.  
The total acreage is approximately 56,235 acres.**

**Table 1. Percentage of Interim Core Map Represented by NLCD<sup>21</sup> Land Covers and Associated Example Pesticide Use Sites/Types.**

| Example pesticide use sites/types | NLCD Landcover (Value)            | % of core map represented by landcover |
|-----------------------------------|-----------------------------------|--|
| Forestry                          | Deciduous Forest (41)             | 26.24                                  |
| Forestry                          | Evergreen Forest (42)             | 0.02                                   |
| Agriculture                       | Pasture/Hay (81)                  | 15.71                                  |
| Agriculture                       | Cultivated Crops (82)             | 43.64                                  |
| Mosquito adulticide, residential  | Open space, developed (21)        | 2.83                                   |
| Mosquito adulticide, residential  | Developed, Low intensity (22)     | 5.75                                   |
| Mosquito adulticide, residential  | Developed, Medium intensity (23)  | 2.18                                   |
| Invasive species control          | Woody Wetlands (90)               | 0.05                                   |
| Invasive species control          | Emergent Herbaceous Wetlands (95) | 0.03                                   |
| Invasive species control          | Open water (11)                   | 0.87                                   |
| Invasive species control          | Grassland/herbaceous (71)         | 0                                      |
| Invasive species control          | Scrub/shrub (52)                  | 0.06                                   |
| Invasive species control          | Barren land (rock/sand/clay; 31)  | 0.39                                   |
| <b>Total Acres</b>                | <b>Interim Core Map Acres</b>     | <b>56,235 Acres</b>                    |

## Evaluation of Known Location Information

There are four datasets with known location information for this species:

- Descriptions of locations provided by FWS
- Occurrence locations included in iNaturalist
- Occurrence locations included in the Global Biodiversity Information Facility (GBIF)
- Occurrence locations included in NatureServe

EPA evaluated these four sets of data to inform or support the core map. iNaturalist and GBIF did not have recent or high-quality observations for the Illinois cave amphipod. Occurrences from the Public occurrences from the NatureServe Pro data explorer were also too coarse to offer a refinement to the core map.

Collectively, the publicly available occurrence data did not support expanding the core map beyond the range for its outer boundary.

<sup>1</sup> Dewitz, J., 2023, National Land Cover Database (NLCD) 2021 Products: U.S. Geological Survey data release, <https://doi.org/10.5066/P9JZ7AO3>

## Approach Used to Create Core Map

The core map was developed using the “Process EPA Uses to Develop Core Maps for Draft Pesticide Use Limitation Areas for Species Listed by the U.S. Fish & Wildlife Service (FWS) and their Designated Critical Habitats<sup>3</sup>” (referred to as “the process”). This core map was developed by EPA using the four steps described in the process document:

1. Compile available information for a species
2. Identify core map type
3. Develop the core map for the species
4. Document the core map

For step 1, EPA compiled available information for the Illinois cave amphipod from FWS, as well as observation information available from various publicly available sources. The information compiled for the Illinois cave amphipod is included in **Appendix 1**. Influential information that impacted the development of the core map included:

- The species range is limited to the karst regions in the Salem Plateau in Monroe and St. Clair Counties, Illinois.
- No occurrence data or reliable, mappable habitat characteristics were found to refine the core map.

For step 2, EPA used the compiled information to identify the core map type. EPA compared known location data to the range and found that these known locations are consistent with the species range. Based on the narrow range that and the lack of known location data, EPA selected the range to use as the species core map. For step 3, EPA used the ECOS species range for the Illinois cave amphipod.

## Discussion of Approaches and Data that were Considered but not Included in Core Map

EPA did not explore approaches other than those described in this documentation.

## Appendix 1. Information Compiled for Species

### Recent FWS documents

- Five Year Review (2025) ([https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/species\\_nonpublish/22155.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/22155.pdf))
- Five Year Review (2020) ([https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/species\\_nonpublish/2955.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/2955.pdf))
- Five Year Review (2011) ([https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public\\_docs/species\\_nonpublish/1820.pdf](https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1820.pdf))
- Illinois Cave Amphipod (*Gammarus acherondytes*) Recovery Plan (2002) ([https://ecos.fws.gov/docs/recovery\\_plan/020920.pdf](https://ecos.fws.gov/docs/recovery_plan/020920.pdf))

### Background information

- Status
  - Federally listed as endangered in 1998
- Habitat, life history and ecology
  - Recovery Plan (2002):
    - The Illinois cave amphipod is a species that lives in streams primarily in the dark zone of caves in parts of the Salem Plateau of Illinois. Little is known of the biology and habitat requirements of this species although it has been collected in mainstream gravel riffles, smaller tributary streams, rimstone pools, and from streams with silt overlying bedrock. As a group, amphipods require cool water temperatures and are intolerant of wide ranges in temperature. Limiting factors may include increased nutrient load, sedimentation, hydrologic changes and changes in water quality.
- Taxonomy
  - 5-Year Review (2011)
    - In 2008, Venarsky et al. completed a population genetics study on the Illinois cave amphipod by comparing individuals from the Renault and Waterloo Sub-regions, and within multiple caves and multiple recharge areas within these sub-regions. The nine populations sampled were from Rick's Pit (Pumphouse Cave), Snow White Cave, Pautler Cave, Pautler Cave/Danes Cave, Reverse Stream Cave, and Frog Cave in the Waterloo Sub-region; Spider Cave, Illinois Caverns, and Fogelpole Cave in the Renault Subregion. DNA was isolated from Illinois cave amphipods and the mitochondrial cytochrome c oxidase subunit I (COI) gene was used to evaluate whether gene flow was occurring between sub-regions, or between recharge areas within the sub-regions. Researchers identified 11 unique haplotypes from the 80 Illinois cave amphipods sampled (five from Waterloo, six from Renault). They found that the haplotypes were not shared by the two sub-regions and that the populations in the Waterloo and Renault Sub-regions are genetically distinct. Three of the haplotypes were shared by populations in two or more caves and recharge areas indicating some gene flow exists between them, most likely during high water events. The research suggested that source populations for future artificial augmentation be located as closely as possible to the reintroduction site, preferably within the same recharge area.

- Overall threat statement
    - 5-Year Review (2020):
      - Currently, the criteria for downlisting the Illinois cave amphipod are partially met. These criteria include at least five viable stable populations in five separate groundwater basins. Currently, we consider the Illinois cave amphipod to be present in seven populations in seven groundwater basins, fulfilling part of the downlisting criteria. However, the counts of six of these populations have fluctuated between monitoring efforts from 2001 and 2014, so we do not consider the populations of these six caves to be stable. IDNR and conservation organizations have made efforts at some caves to improve the Illinois cave amphipod habitat, acquire land to conserve the area at and around caves, and improve management practices affecting groundwater recharge at Illinois cave amphipod caves. However, across the Illinois cave amphipod's range, we do not have demonstrated increase in the use of best management practices in the groundwater recharge areas affecting Illinois cave amphipod populations in order to reduce the threat of habitat loss and degradation of groundwater quality from agriculture, rural housing, and urbanization. Furthermore, biologists have documented new threats affecting two populations that may have extirpated the Illinois cave amphipod from Fogelpole and Wednesday Caves. Based on these factors, the best scientific information currently available does not meet the criteria to downlist the species from endangered to threatened.
  - Evidence of pesticide threat
    - Recovery Plan (2002):
      - The species survival is threatened by factors affecting shallow karst groundwater. These include agricultural and residential pesticides and fertilizers; human and animal wastes from residential sewage disposal systems and livestock; sedimentation from agricultural and residential runoff; oil well production; surface runoff from roads, storm sewers, and increased surface paving due to urban development; sinkhole dumping of solid waste; and disruption of groundwater flow paths from quarry operations. Excessive visitation to caves and over-collecting for scientific purposes may also threaten the species.
  - Relevant pesticide use sites
    - Recovery Plan (2002):
      - County level pesticide usage was noted in the 2002 recovery plan, and noted a variety of pesticides are used in the glacial till of Monroe and St. Clair Counties in the spring and summer.
1. Background information on Species:
    - **Status:** Endangered 09-03-1998
    - **Taxonomy:** amphipod (*Gammarus acherondytes*)
    - Resiliency - low: *“groundwater recharge areas affecting ICA populations in order to reduce the threat of habitat loss and degradation of groundwater quality from agriculture, rural housing, and urbanization. Furthermore, biologists have documented new threats affecting two populations that may have extirpated ICA from Fogelpole and Wednesday Caves.” 2020 FWS 5-year review*
    - Redundancy - low: [Research] to evaluate whether gene flow was occurring between sub-regions, or between recharge areas within the sub-regions. FWS Recovery Plan

- Representation - low: *five viable stable populations in five separate groundwater basins. Currently, we consider ICA to be present in seven populations in seven groundwater basins, fulfilling part of the downlisting criteria. However, the counts of six of these populations have fluctuated between monitoring efforts from 2001 and 2014.” 2020 FWS 5-year review*
2. Relevant recovery goals, criteria and actions
    - Recovery Plan (2002): Need 1. Habitat Protection The degradation of habitat through the contamination of groundwater is believed to be the primary threat to the Illinois cave amphipod. Karst terrain, where this amphipod is found, is a geologic land formation typified by sinkholes and fissures that provide direct and rapid conduits for water and water-borne material from the surface to the groundwater, thereby avoiding the filtering and cleansing mechanisms normally provided by overlying soils. In addition, bacterial contamination from human and livestock wastes and excessive visitation can impact this species.
  3. Habitat:
    - The Illinois cave amphipod is a species that lives in streams primarily in the dark zone of caves in parts of the Salem Plateau of Illinois. Little is known of the biology and habitat requirements of this species although it has been collected in mainstream gravel riffles, smaller tributary streams, rimstone pools, and from streams with silt overlying bedrock. As a group, amphipods require cool water temperatures and are intolerant of wide ranges in temperature. Limiting factors may include increased nutrient load, sedimentation, hydrologic changes and changes in water quality.
  4. Critical Habitat:
    - FWS has not designated a critical habitat for this species.
  5. Known Locations:
    - Occurrences Described in GBIF: [https://www.gbif.org/occurrence/search?taxon\\_key=2219854](https://www.gbif.org/occurrence/search?taxon_key=2219854)
      - 7 observations are described caves in parts of the Salem Plateau of Illinois.
    - Occurrences Described in NatureServe: <https://explorer.natureserve.org/pro/Welcome>
      - NatureServe has several documented locations consistent with the indigenous range.
    - Occurrences Described in [iNaturalist](#): one research grade observations which was in the [USFWS ECOS range](#).

Collectively, the occurrence data from public databases do not support expanding the outer bounds of the core map beyond the species current range.

Known locations described by FWS (FWS 5-Year Review, 2020)

- The Illinois cave amphipod historically occurred in a 230-square-kilometer area within the Salem Plateau karst region in Monroe and St. Clair Counties, Illinois (FWS 2002). Within this area, biologists documented the Illinois cave amphipod in the streams of 16 caves that occur in ten groundwater basins in three sub-regions between 1938 and 2014. We provide additional details on the Illinois cave amphipod’s occurrence and status in each cave, groundwater basin, and sub-region under Abundance, population trends, demographic features, or demographic trends and in Table 1.
- Since biologists first documented the Illinois cave amphipod, its historical range has decreased. Before its listing in 1998, biologists determined the Illinois cave amphipod had been extirpated from Stemler Cave as early as 1993. This represents extirpation from one groundwater basin and one sub-region (Table 1).

- Since 2007, biologists have consistently monitored 10 caves and observed ICA in all of these except Wednesday and Fogelpole Caves (Table 1). We are uncertain of the species' status in Wednesday Cave. If we determine the Illinois cave amphipod are extirpated from Wednesday Cave in the future, this would represent a decrease in the Illinois cave amphipod's range at the cave-level but not necessarily from the Ann Briar Groundwater Basin or Renault Sub-Region since other caves occur in this groundwater basin and sub-region (Table 1). We are also uncertain of the Illinois cave amphipod's status in Fogelpole Cave. If we determine ICA are extirpated from Fogelpole Cave in the future, this would represent an extirpation from Fogelpole Groundwater Basin and the Columbia Sub-Region (Table 1). Based on the uncertainties about the Illinois cave amphipod's status at Wednesday and Fogelpole Caves, we currently do not have enough information to determine if the Illinois cave amphipod's range has decreased since our last status review.

**Table 2a. Illinois cave amphipod occurrence and status from observations, collections and monitoring between 1938 and 2015; Columbia and Renault Sub-regions**

| Sub-Region                 | Columbia           | Renault         | Renault          | Renault         | Renault         |
|----------------------------|--------------------|-----------------|------------------|-----------------|-----------------|
| Groundwater Basin          | Stemler            | Fogelpole       | Illinois Caverns | Krueger-Dry Run | Krueger-Dry Run |
| Cave                       | Stemler            | Fogelpole       | Morrison's Cave  | Krueger-Dry Run | Spider          |
| <b>1938</b>                | p <sup>13,14</sup> | nm              | 25 <sup>1</sup>  | nm              | nm              |
| <b>1965<sup>1</sup></b>    | P                  | 1               | 14               | 1               | nm              |
| <b>1974<sup>2</sup></b>    | nm <sup>15</sup>   | nm              | 6                | nm              | nm              |
| <b>1986</b>                | nm                 | 1 <sup>2</sup>  | nm               | 0 <sup>16</sup> | nm              |
| <b>1992</b>                | nm                 | p <sup>16</sup> | 20 <sup>2</sup>  | nm              | nm              |
| <b>1993</b>                | 0                  | 10 <sup>2</sup> | 1 <sup>2</sup>   | 0 <sup>16</sup> | nm              |
| <b>1995<sup>2</sup></b>    | 0                  | 19              | 56               | 2               | nm              |
| <b>1998<sup>3</sup></b>    | 0                  | 0               | 0                | nm              | 25              |
| <b>1999<sup>3</sup></b>    | 0                  | nm              | nm               | nm              | nm              |
| <b>2000<sup>4</sup></b>    | 0                  | 7               | 7                | nm              | 0               |
| <b>2001<sup>5</sup></b>    | nm                 | 17              | 5                | Access denied   | 0               |
| <b>2003<sup>6</sup></b>    | 0 <sup>7</sup>     | 1               | nm               | Access denied   | 28              |
| <b>2004<sup>7</sup></b>    | 0                  | nm              | nm               | Access denied   | nm              |
| <b>2007<sup>8</sup></b>    | nm                 | 11              | 16               | Access denied   | 12              |
| <b>2008<sup>9</sup></b>    | 0                  | P               | P                | Access denied   | P               |
| <b>2011<sup>10</sup></b>   | nm                 | 0               | 3                | Access denied   | 10              |
| <b>2014<sup>11</sup></b>   | nm                 | 0               | 6                | Access denied   | 2               |
| <b>Last Record</b>         | 1965               | 2008            | 2014             | 1999            | 2014            |
| <b>Last Survey</b>         | 2006               | 2014            | 2014             | 2000            | 2014            |
| <b>Status<sup>12</sup></b> | extirpated         | unknown         | present          | unknown         | present         |

<sup>1</sup> J. Holsinger collection in Webb et al. 1998

<sup>2</sup> Illinois Natural History Survey in Webb et al. 1998

<sup>3</sup> Lewis et al. 1999

<sup>4</sup> Lewis 2000

<sup>5</sup> Lewis 2001

<sup>6</sup> Lewis 2003

<sup>7</sup> Panno et al. 2006

<sup>8</sup> Lewis and Lewis 2007

<sup>9</sup> Vernasky et al. 2009

<sup>10</sup> Lewis and Lewis 2011

<sup>11</sup> Lewis and Lewis 2014

<sup>12</sup> Because biologists last monitored ICA over 5 years ago, we presume the status of ICA at each cave based on the available information

<sup>13</sup> Hubricht and Mackin 1940

<sup>14</sup> The designation "P" stands for present. Biologists did not provide a count but did note their observation of ICA at the site.

<sup>15</sup> The designation "nm" stands for not monitored. Biologists did not monitor particular caves for various reasons.

<sup>16</sup> Webb et al. 1993

**Table 2a. Illinois cave amphipod occurrence and status from observations, collections and monitoring between 1938 and 2015; Waterloo Sub-regions**

| Sub-Region           | Waterloo    | Waterloo       | Waterloo       | Waterloo  | Waterloo    | Waterloo  | Waterloo                | Waterloo       | Waterloo | Waterloo      | Waterloo  |
|----------------------|-------------|----------------|----------------|-----------|-------------|-----------|-------------------------|----------------|----------|---------------|-----------|
| Groundwater Basin    | Annbriar    | Annbriar       | Annbriar       | Annbriar  | Dual Spring | Frog Cave | Luhr Spring             | Madonna-ville  | Pautler  | Pautler       | Pautler   |
| Cave                 | Cedar Ridge | Reverse Stream | Triple Delight | Wednesday | Snow White  | Frog Cave | Pump House (Rick's Pit) | Madonna-ville  | Danes    | Pautler (KCI) | Rose Hole |
| 1938                 | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 1965 <sup>1</sup>    | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | 4             | nm        |
| 1974 <sup>2</sup>    | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 1986                 | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | 1 <sup>2</sup> | nm       | nm            | nm        |
| 1992                 | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 1993                 | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 1995 <sup>2</sup>    | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | 0              | nm       | nm            | nm        |
| 1998 <sup>3</sup>    | 6           | nm             | nm             | nm        | nm          | nm        | nm                      | 0              | 12       | nm            | nm        |
| 1999 <sup>3</sup>    | nm          | nm             | nm             | 9         | nm          | 21        | nm                      | nm             | nm       | 60            | 32        |
| 2000 <sup>4</sup>    | nm          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 2001 <sup>5</sup>    | **          | 9              | P              | 2         | P           | 80        | P                       | nm             | nm       | 36            | nm        |
| 2003 <sup>6</sup>    | **          | 23             | nm             | nm        | 2           | 20        | 7                       | nm             | nm       | 18            | nm        |
| 2004 <sup>7</sup>    | **          | nm             | nm             | nm        | nm          | nm        | nm                      | nm             | nm       | nm            | nm        |
| 2007 <sup>8</sup>    | **          | 70             | 17             | 9         | 1           | 24        | 6                       | nm             | nm       | 2             | nm        |
| 2008 <sup>9</sup>    | **          | P              | nm             | nm        | P           | P         | P                       | nm             | P        | P             | nm        |
| 2011 <sup>10</sup>   | **          | nm             | nm             | 1         | 3           | 30        | 4                       | nm             | nm       | 8             | nm        |
| 2014 <sup>11</sup>   | **          | 9              | nm             | 0         | 2           | 14        | 4                       | nm             | nm       | 12            | nm        |
| Last Record          | 1998        | 2014           | 2007           | 2011      | 2014        | 2014      | 2014                    | 1986           | 2008     | 2014          | 1999      |
| Last Survey          | 1998        | 2014           | 2007           | 2014      | 2014        | 2014      | 2014                    | 1998           | 2008     | 2014          | 1999      |
| Status <sup>12</sup> | unknown     | present        | unknown        | unknown   | present     | present   | present                 | unknown        | unknown  | present       | unknown   |

\*\* Determined to be inaccessible due to size

<sup>1</sup> J. Holsinger collection in Webb et al. 1998

<sup>2</sup> Illinois Natural History Survey in Webb et al. 1998

<sup>3</sup> Lewis et al. 1999

<sup>4</sup> Lewis 2000

<sup>5</sup> Lewis 2001

<sup>6</sup> Lewis 2003

<sup>7</sup> Panno et al. 2006

<sup>8</sup> Lewis and Lewis 2007

<sup>9</sup> Vernasky et al. 2009

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<sup>12</sup> Because biologists last monitored ICA over 5 years ago, we presume the status of ICA at each cave based on the available information

<sup>13</sup> Hubricht and Mackin 1940

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<sup>15</sup> The designation "nm" stands for not monitored. Biologists did not monitor particular caves for various reasons.

<sup>16</sup> Webb et al. 1993



**Figure 2. Species Range from FWS for the Illinois cave amphipod The range was last updated in 2022.**