

# Species Planning Document Template

Detailed instructions and examples can be found in the Species Planning Document Standards and Guidelines on the [Recovery Guidance](#) website

**SCIENTIFIC NAME: COTTUS BAIRDII**

**COMMON NAME: MOTTLED SCULPIN**

**AUTHOR: BRIAN METZKE, IDNR, MOTTLED SCULPIN SPECIES LEAD**

**DATE: 6/26/2023**

**SPECIES PHOTO:**



## **Species Planning Document Goal**

The Species Planning Document identifies conservation objectives and inventories and prioritizes actions to achieve the objectives.

### **1. Need for Conservation**

- A. Brief synthesis of the species' status. Broad assessments of the species' status and trends as described in the SSA are provided. Trends (or contemporary status, at a minimum) for each of the three SSA components (distribution, abundance, population viability) should be addressed, with spatial and temporal scale identified.

Mottled Sculpin distribution has been stable during the past 20 years in inland waters of Illinois, but the species is presumed extirpated from the Illinois portion of Lake Michigan. No trends in survey site abundance were identified and no assessment of abundance at coarser spatial resolutions was attempted. Extant Element Occurrences (EOs) are present in four major watersheds (Rock River, Fox River, Des Plaines River, and Vermilion River of the Wabash River). All four major watersheds have at least one EO ranked B (the highest rank achieved by any Mottled Sculpin EO), but nearly half of ranked EOs are C or worse.

B. Identify the stressors and threats currently acting upon the species. Characterize each item by providing the spatial extent, frequency, and intensity of each stressor or threat.

- i. Stressors: factors that constrain productivity, development, or reproductive success (e.g., predation, disease, lack of mates, salinization, unsuitable temperature, or moisture conditions)

*High Temperature.* Descriptions of Mottled Sculpin habitat often include “cold” or “cool” streams that are spring or groundwater-fed. Preferred thermal regime and upper thermal tolerance of Mottled Sculpin remains unclear, although most sources conclude that the species is intolerant of high temperatures (25-30°C). As most streams in Illinois are likely to exceed suitable temperature conditions (Hinz, Jr. et al. 2011), distribution of Mottled Sculpin is limited to portions of Illinois with concentrations of relatively cool streams.

*Sedimentation.* Adult Mottled Sculpin do not appear to be intolerant of fine sediments, but sediments may reduce egg survival and decrease density of invertebrates. Sedimentation may reduce abundance by limiting food resources and population viability by reducing recruitment.

*Chlorides.* No chloride toxicity tests or ecological studies could be found for Mottled Sculpin, but acute and chronic impacts to fishes have been observed at chloride concentrations ranging from 433-18,000 mg/L. It is likely chloride concentrations in some Illinois streams (e.g., urbanized areas) impact survival or fitness of Mottled Sculpin and may decrease population viability.

*Low flow/homogenous flow.* Suitability of flow characteristics is likely complex (e.g., the species inhabits both lentic and lotic systems), but Mottled Sculpin is likely intolerant of conditions typically of extended periods of low flow. That Mottled Sculpin are often found in flowing portions of streams may be more related to presence of insect prey and relatively light sedimentation than related to flow itself. Insufficient flow conditions, at multiple spatial scales, may limit distribution or density of Mottled Sculpin.

*Predation.* Both interspecific predation and cannibalism of Mottled Sculpin have been recorded. It is unclear if Mottled Sculpin frequently are depredated in the relatively diverse Illinois waters or if cannibalism is frequent. Presence of predators likely decreases local abundance of Mottled Sculpin.

*Competition:* Inter- and intraspecific competition for prey and habitat may reduce abundance, distribution, or population viability of Mottled Sculpin.

*Pollutants (not listed above).* Pollutants, like heavy metals and hormones, are likely to negatively impact Mottled Sculpin abundance, distribution, or population viability

- ii. Threats: processes or events that cause harm to the species, typically by producing stressors (e.g., harvest, invasive species, land development, climate change, habitat loss or fragmentation)

*Watershed and riparian zone alteration.* Conversion of watersheds for urban development and agricultural production has resulted in stream degradation that includes excessive sedimentation, eutrophication, increased variability in flow regimes, increased temperature, increased chemical pollutant concentrations, and habitat homogenization. These alterations limit Mottled Sculpin distribution and may reduce abundance and population viability.

*Fragmentation/dispersal limitation.* Mottled Sculpin are a benthic species with morphological characteristics that do not facilitate rapid or long-distance dispersal. Barriers to dispersal may further limit dispersal; however, it is unclear what structures or conditions may act as dispersal barriers. Dams impede dispersal for most fishes, as do dry stream reaches, but large rivers and reaches of poor water quality also may limit Mottled Sculpin dispersal. Local populations that experience limited dispersal are likely less resilient to environmental perturbations, which may lead to decreased population viability.

*Exotic species/invasive species.* Round Goby have shown a negative correlation with Mottled Sculpin abundance and distribution in Lake Michigan, but the impact of Round Goby in inland waters is unknown. Trout and other stocked exotic fishes may depredate Mottled Sculpin. Interactions with exotic and invasive species may reduce abundance, distribution, and population viability of Mottled Sculpin.

*Flow modification.* As no Mottled Sculpin have been recorded from impounded stream reaches it is assumed reservoirs produce unsuitable habitat. In portions of Mottled Sculpin's range irrigation from surface or groundwater supplies reduces stream discharge. Flow modification may reduce distribution of Mottled Sculpin.

*Deicing salts/salinization of freshwater.* Chloride concentrations in surface and groundwater is increasing, especially in northeastern Illinois where the majority of Mottled Sculpin EOs occur. Increasing chloride concentrations may decrease Mottled Sculpin distribution and abundance, if they are not already doing so.

*Climate Change.* Increased summer temperatures and decreased summer precipitation may lead to drying of headwater streams in which Mottled Sculpin occur. Mottled Sculpin has been classified as highly vulnerable to climate change in the Rock River and Des Plaines River watersheds and extremely vulnerable in the Fox River watershed. In Illinois, those streams that are at the threshold of thermal or flow suitability for Mottled Sculpin may transition to unsuitable and decrease the species' distribution.

*Harvest/bait/aquarium trade.* It is unclear if Mottled Sculpin in Illinois are harvested during angling/microfishing or for the bait and aquarium trade. Several websites describe angling for Mottled Sculpin or using Mottled Sculpin as bait for desired species, like trouts. Harvest of Mottled Sculpin may reduce local abundance.

- C. Identify information needs. A list of data inadequacies that will hinder the management of the species.

*Habitat associations.* Most information regarding Mottled Sculpin habitat associations is anecdotal. Evaluating relationships, both correlative and causal, between physical, chemical, and biological stream and watershed characteristics and the distribution, abundance, and population viability of Mottled Sculpin can improve conservation planning and management of the species.

*Emerging threats.* Identifying intensity of emerging threats, stressors, and their causes, like chloride pollution and climate change, will improve predictions of future trends in Mottled Sculpin distribution, abundance, and population viability.

*Improved resolution of monitoring.* Most survey information for Mottled Sculpin is supplied by survey programs that infrequently sample locales, and do not sample the types of streams, Mottled Sculpin

inhabit. Increasing spatial density and frequency of surveys and broadening the types of habitats included in surveys may improve accuracy of status assessments.

*Dispersal patterns.* Estimating dispersal distance and frequency, exchange of individuals between populations or EOs, and permeability of barriers to dispersal will facilitate identification of populations and evaluation of population redundancy.

*Evaluation of population viability.* Viability of populations (or at other management units) is unknown. Evaluation of viability will assess relative importance of each population (or unit) in the context of conservation objectives.

*Identification of conservation actions.* Complex interactions between landscape, climate, and stream characteristics make identification of conservation actions that may maintain or enhance Mottled Sculpin populations difficult. Evaluating and identifying potential conservation actions, either theoretically or with experiments and trials, would improve conservation outcomes.

## **2. Conservation Objectives**

A. Conservation objectives. A description of desired conservation outcomes written as objectives (i.e., measurable). Objectives shall be ordered according to priority (highest priority first).

1. Maintain at least one rank B or better EO in each of the four major watersheds where Mottled Sculpin occur.
2. Reevaluate EO ranks as new information becomes available.
3. Delineate populations in Illinois to better identify conservation units and evaluate population redundancy.
4. Evaluate spatiotemporal patterns of abundance, distribution, and demographics at multiple scales.
5. Refine life history and habitat association information with an emphasis on identifying stream reach, riparian, and watershed characteristics that can be impacted by conservation actions.
6. Maintain suitable Mottled Sculpin habitat in strategic locales through landscape protection, watershed enhancement, and conservation guidance.
7. Develop outreach and educational materials to enhance agency, partner, and public to enhance awareness of Mottled Sculpin status and conservation.

## **3. Conservation Actions**

A. Conservation actions. Each action is described along with the associated conservation objective(s) and the stressors/threats/information needs addressed. Resource requirements and years to expected completion are estimated for each action (include funding, staff time, and/or contractual expenses that could be expected to complete the action). Actions shall be ordered according to priority (highest priority first).

1. *Incorporate EO rankings into Natural Heritage database.* EO ranks provide a finer resolution of information than the standard occurrence EOs currently populating the Natural Heritage Database. Incorporating EO ranks developed for the Mottled Sculpin SSA into the Database will allow rapid visualization of EO status and evaluation of population viability. This action will require 7.5 hours of Heritage staff time and 0.5 hours annually thereafter.

2. *Evaluate Mottled Sculpin dispersal patterns.* Although some general information regarding Mottled Sculpin dispersal is available in scientific literature, intra- and inter-watershed dispersal patterns in Illinois have not been evaluated. Elucidation of dispersal patterns and causes of those patterns will facilitate delineation of populations and assist identification of priority populations/locales for conservation. The most cost-effective method for estimating dispersal is to evaluate genetic exchange among locales. This action will require \$15,000 to fund genetic analysis and 45 hours of Heritage staff time to collect tissue samples and synthesize results. This action is currently underway and requires 15 additional staff hours to complete.
3. *Conduct surveys.* Much of the available Mottled Sculpin distribution information comes from IEPA/IDNR Basin Surveys, but new EOs were recorded during surveys conducted for the SSA development indicating the species is more widespread than initial occurrence records revealed. Further, Basin Surveys are conducted at the same locales once every five years limiting the spatiotemporal resolution of these data. Surveys in locales not targeted by Basin Surveys may improve knowledge regarding the range and distribution of Mottled Sculpin in Illinois, while annual surveys at select locales would allow estimates of interannual variability in distribution and abundance. The action would require 45 hours of staff time annually and could be performed by partners and IDNR Fisheries and Heritage staff. Alternatively, annual cost to perform such surveys is approximately \$15,000.
4. *Complete a pilot translocation.* Long-term persistence of Mottled Sculpin in the wild is likely dependent upon creating or maintaining suitable habitat. The McHenry County Conservation District has restored a protected reach of stream and is assessing its suitability for Mottled Sculpin. The District has expressed desire to translocate Mottled Sculpin to the reach and test the feasibility of habitat restoration and translocation as a conservation action. This action would require 7.5 hours of Heritage staff time to review a translocation plan and partner time to conduct and monitor the translocation.
5. *Identify thermal regime associations.* Thermal tolerances of Mottled Sculpin remain unclear. Additional temperature records could elucidate thermal characteristics of suitable habitat. This action would require \$500 of supplies and 30 hours of staff time annually for approximately 3 years, or approximately \$20,000 in contract costs.
6. *Develop habitat suitability models.* Habitat suitability models may provide insights into channel, riparian, and watershed characteristics that correlate with Mottled Sculpin occurrence and may guide selection of reaches for surveys and identify additional conservation actions. State Wildlife Grant T-133 will produce such models. This action will require 7.5 hours of Heritage staff time to interpret model outputs and synthesize patterns.
7. *Compose a Species Guidance Document.* Species Guidance Documents identify avoidance, minimization, and mitigation strategies. Such a document for Mottled Sculpin would have utility for the IDNR ITA program, ITA applicants, and as an educational resource. This action will require \$5,000 or 37.5 hours of staff time.
8. *Identify areas for priority protection.* Occurrence records, EO ranks, and habitat suitability models may be used to identify areas for protection. Protections may include INAI designation (Category II or VI), land purchases, or designation under yet to be developed conservation priority areas. This action would be enhanced by the completion of action #6, develop habitat suitability models. This action will require 22.5 hours of staff time.

9. *Evaluate presence of subspecies.* Willink (2017) suggested Mottled Sculpin in the Rock River watershed are the Great Lakes subspecies (*Cottus bairdii kumlieni*) while other watersheds contain the Northern subspecies (*Cottus bairdii bairdii*). Confirming this spatial arrangement of subspecies requires a more robust evaluation. This action will require 7.5 hours of Heritage staff time to synthesize findings from an ongoing study of Mottled Sculpin genetic patterns.
10. *Evaluate potential impacts of chloride pollution.* Chloride pollution is an emerging threat, but the extent of that threat is unknown. Patterns between Mottled Sculpin EO ranks or other metrics of local population condition and chloride concentrations should be evaluated. Where chloride concentrations are not recorded partners may be used to fill data gaps. This action will require 15 hours of Heritage staff time and an unknown amount of funds to support partners (\$100s - \$1,000s for supplies).
11. *Review IDNR regulatory and management actions to identify conflicts with the Mottled Sculpin conservation framework.* IDNR administrative rules, policies, and management plans should be reviewed to ensure they do not cause or enhance stressors and that they facilitate conservation objectives. Some examples include updating the Approved Species List to remove Mottled Sculpin, reviewing the Trout in the Classroom guidance to ensure trout are not stocked where Mottled Sculpin occur, and updating site management plans to incorporate Mottled Sculpin conservation actions. This action will require 15-37.5 hours of ORC or INPC staff time.
12. *Identify additional conservation partners.* The Mottled Sculpin recovery team will identify partners that may identify additional conservation actions, facilitate conservation actions, or benefit from products of conservation actions. This action will require 15-30 ORC staff hours.
13. *Inventory and characterize threats.* An attributed inventory of threats shall be compiled to identify locales and stressors associated with threats and identify conservation actions to alleviate those threats. This action will require 15-30 Heritage staff hours.

B. Synthesis table of conservation actions. Table columns include: Action, Objective Addressed, Purpose of Action (what associated stressor, threat, and/or information need is addressed), Estimated Resources Required (staff hours, dollars, and/or contractual), and Years to Complete.

| Action   | Objective(s) | Purpose   | Resources Required   | Years to Complete     |
|--|--------------|---|--|-----------------------|
| 1. Incorporate EO rankings into Natural Heritage database. | 2, 4, 6      | Information Need: Evaluate population viability and provide context for other conservation actions. | 7.5 staff hours (initial)<br>0.5 staff hours annually            | Ongoing annual effort |
| 2. Evaluate Mottled Sculpin dispersal patterns.            | 3, 4, 6      | Information Need: Evaluate realized dispersal and delineate populations.                            | 15 staff hours (\$15,000 and 30 staff hours previously expended) | 1                     |

|  |            |   |   |   |
|--|------------|---|---|---|
| 3. Conduct surveys.  | 1, 2, 4, 5 | Information Need:<br>Improve resolution of monitoring.                        | 45 staff hours annually or \$15,000   | 3                                       |
| 4. Complete a pilot translocation.   | 1, 6       | Threat:<br>Fragmentation/dispersal limitation, identify conservation actions. | 7.5 staff hours, and unknown partner hours                                    | 1 (and periodic monitoring by partners) |
| 5. Identify thermal regime associations.   | 5, 6       | Information Need:<br>Habitat associations.                                    | 30 staff hours annually, or \$20,000  | 3                                       |
| 6. Develop habitat suitability models  | 4, 5, 6    | Information Need:<br>Habitat associations.                                    | 7.5 staff hours (in addition to resources expended for T-133)                 | 1                                       |
| 7. Compose a Species Guidance Document   | 6, 7       | Information Need:<br>Potentially all  | \$5,000, or 37.5 staff hours  | 1                                       |
| 8. Identify areas for priority protection  | 1, 6       | Information Need:<br>Identification of conservation actions.                  | 22.5 staff hours  | 1                                       |
| 9. Evaluate presence of subspecies   | 3          | Information Need:<br>Evaluation of population viability.                      | 7.5 staff hours (in addition to resources expended for sculpin genetic study) | 1                                       |
| 10. Evaluate potential impacts of chloride pollution.  | 5, 6       | Information Need:<br>Emerging threats.  | 15 staff hours -and- Funds to support partners                                | 1 -or- Ongoing annual effort            |
| 11. Review IDNR regulatory and management actions to identify conflicts with the Mottled Sculpin conservation framework. | 1, 6, 7    | Threats: Harvest  | 15-37.5 staff hours   | 1                                       |
| 12. Identify additional conservation partners.   | 7          | Information Needs:<br>Identification of conservation actions.                 | 15-30 staff hours -and- Unknown partner hours                                 | 1                                       |
| 13. Inventory and characterize threats.  | 1, 5, 6    | Information Needs:<br>Possibly all.   | 15-30 staff hours   | 1                                       |

#### **4. Citations**

Hinz, Jr., L.C., B.A. Metzke, and A.M. Holtrop. 2012. Evaluating water temperature, habitat, and fish communities in candidate coolwater streams in Illinois. Illinois Natural History Survey technical report 2011(21).

Willink, P.W. 2017. Assessing the status of potential Illinois endangered and threatened fish species. Final project report for Illinois State Wildlife Grant T-106-R-1.