# Rocky Mountain Sculpin (*Cottus bondi*)
# Conservation Status Rank Summary

March 6, 2024

For details on assessment and ranking methodology, see: *Conservation Status Assessment Definitions, Process, Rank Factors, and Calculation of State Ranks for Montana Species*

## Rarity and Trends

| Rank Factor | Date Assessed | Value | Score | Data Source | Comments |
|---|---|---|---|---|---|
| **Rarity** | | | | | |
| **Range Extent** | 2024-02-20 | Y: 203475.5 km² | 4.710 | MTNHP Range Maps | None |
| **Area of Occupancy** | 2024-03-06 | 19143 \| 1km² cells | 4.810 | MTFWP Fish Distribution Layer | Km for Mottled Sculpin in MT Fish Distribution Layer |
| Number of Occurrences | | | - | | **Factor not used in ranking.** |
| Population Size | | | - | | **Factor not used in ranking.** |
| # of Occurrences in Good Condition | | | - | | **Factor not used in ranking.** |
| % of Area Occupied in Good Condition | | | - | | **Factor not used in ranking.** |
| Environmental Specificity | | | - | | **Factor not used in ranking.** |
| Rarity is calculated by averaging weighted factor scores: **( (4.71 × 1) + (4.81 × 2) ) / 3 = 4.78** | | | | | |
| **Trends** | | | | | |
| **Short-term Trend** | 2024-02-20 | [-3.0, 28.0%] | 0.000 | FWP Survey Data 2024; Data from FWP Survey data (2013-2023) | FWP Survey Data 2024; Data from FWP Survey data (2013-2023). I calculated the geometric mean of annual population rates for all sections that had conducted long-term monitoring surveys in consecutive years at any point from 2013-2023 (n=39). From those data I calculated the mean population trend for Montana (seen here as estimated trend) and the standard errors (95% confidence intervals). HOWEVER, because I did not have data on effort for these surveys, these are based solely on count data and therefore should be interpreted with caution (perhaps not use at all). If I can get the effort data on these surveys I can redo these estimates with perhaps slightly more confidence. |
| Long-term Trend | 2024-02-20 | | - | Fisheries and Oceans Canada | **Factor not used in ranking.** I was unable to find any papers or technical reports that gave an estimate of historic Rocky Mountain sculpin abundance or population trends. There was a |

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| | | | | 2020; McCleave (1964) | population estimate for 'mottled sculpin' (likely still Rocky Mountain sculpin) done in one section of Trout Creek (a tributary of the Gallatin River in MT) by McCleave (1964), but there didn't seem to be any consistent quantitative studies of abundance that I could find. One report of the 'westslope' Rocky Mountain sculpins in Canada suggested their population is stable despite this lack of information, but didn't comment on historic abundance of Rocky Mountain sculpin (Fisheries and Oceans Canada 2020). |
| Trends score is calculated by summing weighted short and long-term trend scores:<br>**( (0.00 × 2) ) = 0.00** | | | | | |

# Threats

| Rank Factor | Date Assessed | Value | Score | Data Source | Comments |
|---|---|---|---|---|---|
| **Threats** | | | | | |
| **Overall Threat Impact** | | High | 1.830 | | None |
| Intrinsic Vulnerability | | | - | | Factor not used in ranking. |
| Threat score is calculated from Overall Threat Impact when available or Intrinsic Vulnerability if not: **( 1.83 ) = 1.83** | | | | | |

### Individual Threats Data

| Threat Category | Date Assessed | Impact Score | Scope | Severity | Immediacy | Comments |
|---|---|---|---|---|---|---|
| **Climate Change & Severe Weather** | 2024-02-20 | High | Pervasive | Serious | High | Clancy, N.G., P.E. Budy, and A.W. Walters. In review. High climate vulnerability of glacial-relict fishes. |
| Threat Tally: 0 - Very High, 1 - High, 0 - Medium, 0 - Low<br>Overall Threat Impact* = High | | | | | | |

*See Conservation Status Assessment Definitions, Process, Rank Factors, and Calculation of State Ranks for Montana Species for calculation of Overall Threat Impact based on the number and impact of individual threats.

## Conservation Status Rank Calculation

**Raw score**

Rarity: (4.78 × 70%) + Threats: (1.83 × 30%) + Trends: (0.00) = 3.89

Calculated Rank: S4

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|---|---|
| **Accepted Rank** | S4 |
| **Date Approved** | 2025-02-03 |
| **Approval Authority** | Montana Natural Heritage Program Staff |
| **Rank Justification** | Species is widely distributed and appears stable, but faces significant threats from warming water temperatures |

## Supplementary Information

Montana Natural Heritage Program. 2021. Conservation Status Assessment Definitions, Process, Rank Factors, and Calculation of State Ranks for Montana Species. 18 p.
https://mtnhp.mt.gov/docs/Montana_State_Rank_Criteria_20211201.pdf

Montana Field Guide Species Account:
https://fieldguide.mt.gov/speciesDetail.aspx?elcode=AFC4E02440

Predicted Suitable Habitat Model:
https://mtnhp.mt.gov/resources/models/?elcode=AFC4E02440

# Information Needs

Information needs are assessed by considering the availability of factors used to assess species status as well as the quality of these assessments. Current information availability and quality to inform Conservation Status Rank for this species are highlighted.

| Rank Factor | Assessment Category | Value | Criteria |
|---|---|---|---|
| **General Status** | Status Quality | Adequate | Calculated rank has low uncertainty and is represented by a single rank (e.g. S3); accepted rank may be adjusted to a range rank (e.g. S2S3) |
| | | Poor | Rank assessed as SU or calculated rank has notable uncertainty and corresponds to a range rank with 2 or more values (e.g. S2?, S1S3, or S4S5) |
| **Rarity** | Range Quality | Adequate | Range polygon adequately represents area of probable occupancy and does not include substantial unoccupied areas; range may be adequately defined and still include areas of unsuitable habitat (e.g. mountain ranges for plains species) |
| | | Marginal | Range polygon defined, but may include or exclude notable areas where the species may or may not occur on the landscape |
| | | Poor | Range polygon not defined |
| | Habitat Quality | Adequate | Species-habitat relationship is well-defined (e.g. relevant literature or robust habitat model available) |
| | | Marginal | Understanding of species-habitat relationship is adequate among some but not all habitats (e.g. literature covers similar habitats outside of Montana or habitat model performance is only somewhat adequate) |
| | | Poor | Species-habitat relationship is not well understood |
| **Threats** | Threat Quality | Adequate | Threat Impact is a single value (including "Unthreatened") |
| | | Marginal | Threat Impact assessed at more than one value (e.g. "High - Medium") |
| | | Poor | Threat Impact is Unknown but Intrinsic Vulnerability is assessed |
| | | Unknown | Threat Impact is Unknown and Intrinsic Vulnerability is not assessed |
| **Trends** | Recency | Current | Short-term Trend assessment date less than 10 years old |
| | | Out of Date but Adequate | Short-term Trend assessment date is more than 10 years old or Unknown, but species is Unthreatened |
| | | Out of Date | Short-term Trend assessment date more than 10 years old |
| | | Not Available | Short-term Trend data are not available |
| | Trend Quality | Sufficient | Short-term Trend assessed at a single value or multiple values with a minimum trend greater than -10% (stable or increasing) |
| | | Unknown but Sufficient | Short-term Trend is Unknown, but species is Unthreatened |
| | | Poor | Short-term Trend is less than -10% (in decline) with two or more values selected |
| | | Unknown | Short-term Trend is Unknown |

Summary of Information Availability

None

Summary of Information Needs

None

# Additional Threat Details

The table below contains the complete threats assessment for this species. While the Conservation Status Rank Calculation is based on cumulative, broadly categorized (Level 1) threats data, threats are assessed and tracked for more specifically categorized (Level 2) threats when available.

| Threat Category | Date Assessed | Assessed By | Data Source | Scope | Severity | Imme-diacy | Comments |
|---|---|---|---|---|---|---|---|
| **Transportation & Service Corridors - 4.1 - Roads & Railroads** | 2024-02-20 | Kadie Heinle | FWP Survey Data 2024; Fisheries and Oceans Canada 2020 | Large | Unknown | High | FWP Survey Data 2024; Fisheries and Oceans Canada 2020: I based this estimate off of a visual assessment of how close the sites Rocky Mountain sculpin have been surveyed at are near major roads, the proportion near forest service roads could be higher. In the DFO (2020) management plan for westslope populations of Rocky Mountain sculpin, it suggests siltation from roads (especially road construction) represent one of the biggest threats to Rocky Mountain sculpin as they are a very sedentary species and Mebane (2001) suggested sculpin in Idaho are negatively affected by higher percentages of fine sediments. |
| **Invasive & Other Problematic Species, Genes & Diseases - 8.1 - Invasive Non-Native/Alien Species/Diseases** | 2024-02-20 | Kadie Heinle | Ruetz III et al. 2003; Zimmerman and Vondracek 2007; Fisheries and Oceans Canada 2012; | Pervasive | Unknown | High | Ruetz III et al. 2003; Zimmerman and Vondracek 2007; Fisheries and Oceans Canada 2012: In the DFO recovery plan for 'eastslope' Rocky Mountain sculpin, they outline introduced non-native species (e.g., brown trout, brook trout) as potential threats to these sculpin, primarily in the form of competition, but also possibly predation. Both Ruetz III et al. (2003) and Zimmerman and Vondracek (2007) document asymmetrical competition between slimy sculpin and brown trout (but no negative effects of brook trout which evolved with slimy sculpin in their Minnesotan study area). It is likely that brown trout and potentially brook trout could compete with Rocky Mountain sculpin in a similar manner, but I didn't find any studies that specifically address this. I would consider any area where Rocky Mountain Sculpin coincide with non-native species (I coarsely estimated this to be 90% of their range, but I am not as well versed in the range of Rocky Mountain sculpin, so this could be a ways off) are at risk of negative effects of competition, but it is yet to be determined what the extent of those negative effects could be. I also did not find any papers that specifically mentioned.<br><br>McNeely et al. 1990; Voss et al. 2022: Smallmouth bass predate on mottled sculpin where both species co-occur (e.g., in Kentucky; McNeely et al. 1990). Therefore as smallmouth bass encroachment up |

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| | | | | | | | the Yellowstone River increases (Voss et al. 2022), predation effects on Rocky Mountain sculpin could occur and possibly increase into the future. My only knowledge of smallmouth bass encroachment on waterbodies with Rocky Mountain Sculpin is in the Yellowstone River, so I estimated the proportion of population impacted to be small (~0.1?), but if there is more overlap in this range, then perhaps the proportion should be increased. |
| **Climate Change & Severe Weather - 11.1 - Habitat Shifting & Alteration** | 2024-02-20 | Kadie Heinle | Clancy, N.G., P.E. Budy, and A.W. Walters. In review. | Pervasive | Serious | High | Clancy, N.G., P.E. Budy, and A.W. Walters. In review. High climate vulnerability of glacial-relict fishes. |