Sauger (*Sander canadensis*)
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: 67793.9 km²	3.930	MTNHP Range Maps	None
Area of Occupancy	2024-03-06	7461 | 1km² cells	4.130	MTFWP Fish Layer	From MT Fish Distribution Layer
Number of Occurrences	2025-01-31	5	0.000	MTNHP Databases	Approximately 5 waterbodies with presence
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: **((3.93 × 1) + (4.13 × 2) + (0.00 × 1)) / 4 = 3.05**					
Trends					
Short-term Trend	2024-02-20		[-0.070, 0.000]	Expert opinion	Trend data from FWP biologists suggests the 10 year trend in sauger abundance in some area is stable while other areas appear to be in decline. In general there seems to be consistency in both Missouri and Yellowstone River trend data that sauger abundance is better following good water years and low following drought periods.
Long-term Trend	2024-02-20	-53.0%	-0.220		McMahon and Gardner 2001, report by the 1990's sauger had declined 53% from their historic range
Trends score is calculated by summing weighted short and long-term trend scores: **(([-0.07, 0.00] × 2) + (-0.22 × 1)) = [-0.36, -0.22]**					

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
Agriculture & Aquaculture	2024-02-20	Medium	Pervasive	Moderate	High	Jaeger et al 2005, Hiebert et al 2000, Horn and Bark 2019, Hiebert et al estimated roughly 1/2 million fish entrained into Intake Canal annually with sauger being the most frequently encountered species. Jaeger points to substantial entrainment of sauger into Intake Canal (accounted for more than 1/2 of non-fishing mortality), this headworks was rebuilt incorporating fish screens in 2012. Horn and Bark reported the effectiveness of fish screens estimating that screened intakes entrain ~4% of the fish entrained by unscreened intakes. Talking to Demi By the impact of entrainment and changing climates affect on in stream flow makes loss of sauger into irrigation infrastructure a concern for the population in her area of the middle Yellowstone. This is a shared concern on the Lower Yellowstone in Mat Rugg and I's areas as a result of the diversions that lack adequate screening to avoid entraining sauger.
Invasive & Other Problematic Species, Genes & Diseases	2024-02-20	High	Large	Extreme	High	Bellgraph et al 2008, Paper describing potential competition between sauger and walleye. This diet overlap and direct competition was also observed in stable isotope analysis of samples collected by Jaeger on the Yellowstone River and recorded in an FWP technical report covering 2001-2010 authored by J. Rhoten. This concern for competition between native sauger and introduced walleye and smallmouth bass continues today especially for upstream reaches of

						historic range than have been made cooler and clearer by the influence of upstream and tributary dams (e.g., Holmquist on the Upper Missouri, Bollman on the Yellowstone);Bingham et al 2011, Papers addressing level of risk from hybridization of sauger and walleye. Hybridization with walleye is one of the main concerns for Demi By the MT FWP biologist for the Yellowstone River and Big Horn River. Both the YSR in her area from Billings to the Big Horn confluence and Big Horn Lake above Yellowtail dam are home to sauger populations with distinct genetics as reported by Bingham et al. 2011. Jared Krebs found genetics samples from sauger collected below Fort Peck Dam on the Missouri River to have much higher rates of introgression than observed by Bigham et al for this reach of river 10 years ago.
Threat Tally: 0 - Very High, 1 - High, 1 - Medium, 0 - Low 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: (3.05 × 70%) + Threats: (1.83 × 30%) + Trends: ([-0.36, -0.22]) = [2.32, 2.46]

Calculated Rank: S2

Accepted Rank	S2
Date Approved	2001-08-01
Approval Authority	Montana Species of Concern Committee
Rank Justification	Species is widely distributed but faces significant threats due to hybridization with Walleye and hydrologic changes

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=AFCQC05010

Predicted Suitable Habitat Model:
https://mtnhp.mt.gov/resources/models/?elcode=AFCQC05010

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

Information is available but trend is uncertain

Summary of Information Needs

Continued monitoring to determine more precise trend

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
Agriculture & Aquaculture - 2.1 - Annual & Perennial Non-Timber Crops	2024-02-20	Caleb Bollman	Jaeger et al 2005, Hiebert et al 2000, Horn and Bark 2019	Pervasive	Moderate	High	Jaeger et al 2005, Hiebert et al 2000, Horn and Bark 2019, Hiebert et al estimated roughly 1/2 million fish entrained into Intake Canal annually with sauger being the most frequently encountered species. Jaeger points to substantial entrainment of sauger into Intake Canal (accounted for more than 1/2 of non-fishing mortality), this headworks was rebuilt incorporating fish screens in 2012. Horn and Bark reported the effectiveness of fish screens estimating that screened intakes entrain ~4% of the fish entrained by unscreened intakes. Talking to Demi By the impact of entrainment and changing climates affect on in stream flow makes loss of sauger into irrigation infrastructure a concern for the population in her area of the middle Yellowstone. This is a shared concern on the Lower Yellowstone in Mat Rugg and I's areas as a result of the diversions that lack adequate screening to avoid entraining sauger.
Natural System Modifications - 7.2 - Dams & Water Management/Use	2024-02-20	Caleb Bollman	McMahon and Gardner 2001; Jaeger et al 2005	Pervasive	Serious	Insignific ant	Damming and dewatering impacts migration
Invasive & Other Problematic Species, Genes & Diseases - 8.1 - Invasive Non-Native/Alien Species/Diseases	2024-02-20	Caleb Bollman	Bellgraph et al 2008;Bellg raph et al 2008	Large	Extreme	High	Bellgraph et al 2008, Paper describing potential competition between sauger and walleye. This diet overlap and direct competition was also observed in stable isotope analysis of samples collected by Jaeger on the Yellowstone River and recorded in an FWP technical report covering 2001-2010 authored by J. Rhoten. This concern for competition between native sauger and introduced walleye and smallmouth bass continues today especially for upstream reaches of historic range than have been made cooler and clearer by the influence of upstream and tributary dams (e.g., Holmquist on the Upper Missouri, Bollman on the Yellowstone);Bingham et al 2011, Papers addressing level of risk from hybridization of sauger and walleye. Hybridization with walleye is one of the main concerns for Demi By the MT FWP biologist for the Yellowstone River and Big Horn River. Both the YSR in her area from

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