

## Sauger - *Sander canadensis*

Abundance: Common within a limited range

Status: NSS3 (Bb)

NatureServe: G5  
N5B,N5N

Population Status: Population distribution is reduced from historical. Population size is variable with populations in some locales declining (Wind River) while others are stable or increasing (Bighorn River in recent years).

Limiting Factor: Habitat: significant loss of habitat and population connectivity due to water development and diversion. Genetic purity of some Wyoming stocks may be at risk due to coexistence with non-native walleye. Competition with introduced non-native fish and angler exploitation may adversely affect populations in some locales.

Comment: NSS Ranks are reviewed and revised with each SWAP revision. No changes were made for this species in this revision.

### Introduction

Sauger populations have declined across a large part of the Missouri River drainage (McMahon and Gardner 2001; Carufel 1963; Nelson and Walburg 1977; Hesse 1994). In Wyoming, saugers are native in the North Platte, Powder, Tongue, and Bighorn-Wind rivers (Baxter and Stone 1995). Sauger distribution in Wyoming has decreased including extirpation from the North Platte River. The Powder River provides seasonal sauger habitat for fish migrating from the Yellowstone River to spawn (Hubert 1993). A small population of unknown purity exists in the Tongue River. The Bighorn and Wind Rivers each contain populations that were once continuous with one another and those downstream; however, the construction of Boysen and Yellowtail Dams isolated the two. The Bighorn River population was considered to be genetically pure until hybridization with walleye was documented in 2014. The Wind River population is among the last genetically pure sauger populations in the Missouri River drainage (Billington et al. 2006; Bingham et al. 2011). The Bighorn and Wind river populations are currently considered the only viable populations within Wyoming and have high conservation value. Genetic analyses indicate that Bighorn and Wind river sauger are genetically unique from other sauger populations in Montana, and Wind River sauger and Big Horn River sauger are different from one another (Bingham et al. 2011). Sauger from Bighorn and Wind river populations have some of the slowest growth rates throughout the range of the species (Gerrity and Smith 2013). The Wind River population also contains the longest-lived fish (up to age-18) and occupies the highest elevation of any population throughout the species' range (Amadio et al. 2005; Wyoming Game and Fish Department 2016). Spawning occurs in the spring, generally May in Wyoming, and is typically associated with migration of adults to a spawning location (Welker et al. 2001; Kuhn 2005; WGFD 2012 - 2015). Spawning migration distances of up to 235 miles have been observed where barriers to movement do not exist (Collete et al. 1977). Spawning migrations can occur in upstream and downstream directions (Collete et al. 1977; Pegg et al. 1997; Kuhn 2005; Jaeger et al. 2005; Bellgraph et al. 2008).

### Habitat

Sauger have evolved and thrive in free-flowing, turbid river systems and their preferred habitat is deep, low-velocity pools and runs in large, turbid rivers (Hesse 1994; Welker et al. 2002; Amadio et al. 2005, 2006; Kuhn 2005). Sauger also live in reservoirs or systems that contain a combination of large river and reservoir habitat. In rivers the key component of sauger habitat is velocity and depth. In summer and spring they select low velocity areas with fine substrates. Pool habitats are preferred by sauger especially in winter where they tend to select low velocity pools greater than 6 feet deep (Welker et al. 2002; Jaeger et al. 2005; Kuhn 2005). Sauger prefer lower light conditions and may seek turbid areas for cover. Four major spawning aggregations, three in the Little Wind River and one in the Popo Agie River population have been documented in the Wind River population (Kuhn 2005; WGFD 2012 – 2015). Tagged saugers from all four rivers within the Wind River population have been documented spawning at these four aggregations. Spawning occurs over gravel and cobble in 52-59°F water in the Bighorn River and over sand substrate in the Wind River drainage (Roberts et al. 2003; WGFD 2012, 2016). Reservoirs fragment native sauger habitat but also provide abundant deep, low velocity, prey rich habitat that sauger prefer. Additionally, Boysen Reservoir (particularly Poison Creek Bay) and the Wind River upstream from the reservoir provide nursery habitat for juvenile saugers (Lionberger 2006).

## Problems

- h Infrastructure that creates physical barriers or changes water quality by making water cooler and less turbid can negatively affect the distribution, abundance, recruitment, growth, and survival of the species.
- h Lack of connectivity resulting from low flows or other physical barriers (natural and man made) may significantly limit access to upstream habitats.
- h Genetic purity of Wyoming sauger stocks may be at risk due to coexistence with non-native walleye.
- h Predation by introduced piscivores (especially in reservoirs) may limit recruitment.
- h Stocking of walleye in Big Horn Lake by the State of Montana poses a risk to the genetic purity of the Bighorn River population.
- h Flow alteration from cumulative irrigation withdrawals has altered the physical habitat in the Wind River below Diversion Dam, negatively impacting sauger habitat by reducing side-channel habitat, reducing woody debris recruitment, and altering sediment regimes.
- h Habitat degradation (e.g., dewatering, loss of connectivity) and introduced species pose the most serious threats to this species' persistence.
- h Habitat degradation due to impoundments in major river drainages is likely contributing to declines in distribution and population size.
- h Entrainment of sauger in water diversion structures may impact populations (Jaeger et al. 2005)

## Conservation Actions

- h A collaborative process is needed to develop a management plan for saugers in the Wind River watershed.
- h Continue efforts to reduce land and water uses which exacerbate stream channel drying.
- h Conduct wild egg takes and stock progeny as needed to supplement natural reproduction
- h Continue to collaborate with Shoshone and Arapaho tribes and the USFWS to gain better understanding of factors influencing native fish populations within the Wind River drainage.
- h A better understanding of juvenile habitat requirements is needed.
- h Management actions that favor the production of walleye or other exotic piscivores would be contrary to the best interests of native sauger populations.
- h A better understanding of the habitat and flow requirements of this species is needed to assess the impacts of water and land use activities.
- h A more robust evaluation of the extent of walleye/sauger hybridization need to be conducted in the Bighorn River/Big Horn Lake system
- h Entrainment in canals needs evaluation

## Monitoring/Research

Continue established trend monitoring programs for Bighorn, Little Wind and Popo Agie rivers, as well as Boysen Reservoir and Big Horn Lake.

Create new monitoring programs and research habitat types used and available for juvenile saugers in the Bighorn and Wind river populations

Research the types of habitat used by juveniles and their availability in Big Horn Lake, Boysen Reservoir, and the Wind River upstream from Boysen Reservoir.

Use stable isotopes and genetics to determine if saugers stocked during the 2013 - 2017 Wind River drainage spawning operations are surviving and reproducing.

Continue tagging saugers within the Bighorn and Wind river populations to obtain mortality estimates and learn more about migration tendencies

Work with Colorado State University to determine the effects of water temperature on the early life history of sauger

Monitor larval sauger in the Bighorn River in an effort to identify factors driving recruitment variability

Conduct study of sauger population in the Tongue River above Tongue River Reservoir to determine genetic purity and population viability

Recent Developments

Since the initiation of sauger research in the Wind River watershed by graduate students at the University of Wyoming, several major questions have been answered concerning sauger ecology. Sauger distributions and habitat associations (Amadio 2003; Amadio et al. 2005 and 2006), seasonal movements and spawning locations (Kuhn 2005), and nursery areas and movement of saugers in the Wind River watershed (Lionberger 2006) have been identified.

An annual monitoring program has been established within the core area of the Wind River drainage sauger population.

In 2006 the statewide creel limit for sauger was reduced from six fish to two fish.

The WGFD contracted with Montana Fish, Wildlife and Parks to conduct microsatellite genetic analysis of sauger from Boysen Reservoir and the Wind River upstream. Analyses determined that Bighorn and Wind river sauger are genetically unique from other sauger populations in Montana, and Wind River sauger and Big Horn River sauger are different from one another. Analyses also determined that genetic diversity (i.e., heterozygosity and allelic richness) are adequate in both populations.

Completed construction of the Kendrick Diversion dam bypass channel on Clear Creek, a tributary to the Powder River, to allow fish passage for spawning migrations. A project to determine which species are utilizing the bypass channel will be initiated in 2011.

An age and growth study revealed that Wind River drainage sauger are the slowest growing and longest lived throughout the range of the species (Gerrity and Smith 2013)

Wild egg takes were conducted and the resulting progeny were stocked in the Wind river population to supplement low natural recruitment from 2013 - 2017.

Research at the University of Wyoming determined that endocrine disrupting compounds were not the cause of low natural reproduction in the Wind River population (Johnson 2014).

Montana terminated diploid walleye stocking in Big Horn Lake in 2008 to reduce the hybridization potential between walleye and sauger in the Bighorn River. To maintain angling opportunity, sauger from wild egg takes in the Bighorn River were stocked from 2011 – 2014, and triploid walleye stocking began in 2015

Sauger hybridization with walleye in the Bighorn population was documented for the first time in 2014.

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SOURCE: Digital maps of ranges for Wyoming Species of Greatest Conservation Need: February 2016. Wyoming Game and Fish Department. Note that brown indicates the current known range of the species.