

During extended periods of low lake levels; however, plankton abundance is reduced and survival of young paddlefish is limited.

In other parts of its range, habitat quality is generally much poorer. Dam construction, dredging, channelization, and/or excessive water withdrawals for irrigation and municipal and industrial use have significantly changed most large rivers in North America. Few rivers today provide the proper combinations of flow, temperature, and gravel substrates suitable for paddlefish spawning. In many states, paddlefish populations have been greatly reduced or even eliminated because of lost spawning habitat.

Why not just stock more paddlefish?

Stocking efforts to bolster or reestablish populations have yielded mixed results. In 1995 and 1997 paddlefish were stocked in the Williston area; some fish stocked in 1995 have been recovered but naturally recruited fish make up the vast majority of this year class. No fish stocked in 1997 have been recovered yet; this stocking event appears to have not been very successful. The most recent stocking of paddlefish occurred in 2007; this was done in an attempt to bolster recruitment after several years of apparently very poor natural recruitment.

Is the Yellowstone-Sakakawea paddlefish population increasing or decreasing?

The paddlefish population in the Yellowstone and Missouri rivers prior to the construction of Garrison Dam was thought to have been much smaller than the booming population which developed during the years when Lake Sakakawea initially filled. Flooding of the productive uplands released many nutrients into the newly formed reservoir, resulting in excellent rearing conditions for paddlefish. In the years since the reservoir filled in the late 1960s, however, the population has been gradually declined as a result of lower productivity (a natural process in reservoirs) and from harvest and natural mortality of fish produced during the filling period.

Population estimates indicate that the adult population has declined from more than 100,000 fish in the late 1970s to about 50,000 in recent years. Studies have shown that although paddlefish reproduction is occurring, the overall recruitment of young fish to the population hasn't been high enough to offset mortality of adult fish. Fortunately, the 1995 year class has reversed the downward population trend; this robust year class was produced

under ideal conditions of high Yellowstone River flows and rising water levels in Lake Sakakawea. In recent years, drought and water diversions have greatly reduced Yellowstone River flows, which in turn have negatively affected paddlefish spawning. The lower than normal inflows coupled with excessive rates of water discharge by the Corps of Engineers have consequently lowered Lake Sakakawea to a water level far lower than desired for good paddlefish recruitment and growth.

What is the greatest threat to paddlefish?

The greatest threat is the loss of habitat. Successful spawning and recruitment appear to be the primary limiting factors. Paddlefish need natural, free-flowing rivers to reproduce effectively. Without their spawning habitat there's really little that can be done to maintain viable populations over the long run. Water withdrawals from the Missouri and Yellowstone rivers are reducing available habitat; protecting and enhancing habitat and flows in these rivers are critically important for the long-term survival of the stock.

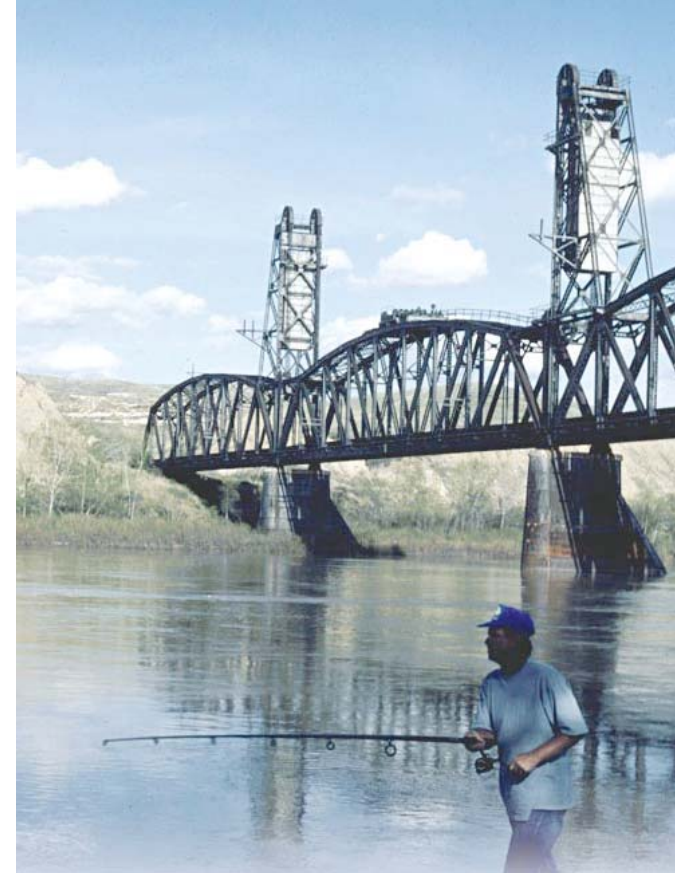
Snag fisheries are regulated to ensure that the Yellowstone-Sakakawea stock is not overharvested. Illegal fishing can be a major threat, however, and has been documented in several states. Any illegal harvest activities are detrimental and should be reported.

Why is there a 1,000 fish per state harvest cap?

The harvest cap is intended to keep the adult population from dropping below its current level. Age information is used to estimate how many newly recruited adult fish are entering the population compared to the number of fish being harvested or lost to natural mortality. A 2,000 fish harvest cap, equally split between Montana and North Dakota, is thought appropriate based upon current rates of recruitment.

How do research and monitoring lead to better paddlefish management?

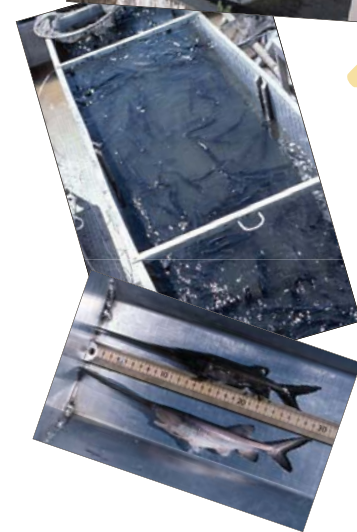
Unique and important fisheries resources such as paddlefish need to be managed carefully and conservatively. Intensive research and monitoring are necessary to properly manage this resource. Because the Yellowstone-Sakakawea stock is a shared resource between North Dakota and Montana, fisheries staff from both states and scientists from the University of Idaho work together to research and manage this stock.



This brochure prepared by Dennis L. Scarnecchia, Professor of Fisheries at the University of Idaho and Fred Ryckman, NW District Fisheries Supervisor for the North Dakota Game and Fish Department. These two individuals jointly conduct research and monitoring activities on paddlefish in the Missouri and Yellowstone rivers and in Lake Sakakawea within North Dakota.

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PADDLEFISH



Questions and Answers

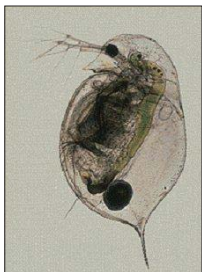
What is a paddlefish, and where are they found?

Paddlefish represent an ancient, mostly cartilaginous lineage of fish most closely related to sturgeons. They have an elongated, paddle-shaped rostrum, smooth skin, small eyes, and a large, toothless (except when very young) mouth. Their overall coloration ranges from light bluish gray to blackish, with a lighter to whitish belly.

There are only two species of paddlefish in the world; an extremely endangered species found only in portions of the Yangtze River drainage in China and the paddlefish found in North America. Paddlefish are found in 22 states throughout the Missouri and Mississippi river basins. In North Dakota, paddlefish are found in the Yellowstone River and throughout the Missouri River mainstem. The population that resides within Lake Sakakawea and the Missouri and Yellowstone rivers upstream (known as the Yellowstone-Sakakawea stock) is the only one which supports a snag fishery. There is a smaller stock of paddlefish which inhabits Lake Oahe and the Missouri River below Garrison Dam. Fossil paddlefish from 60 million years ago have been found in the Missouri River basin near Fort Peck Reservoir.

What do paddlefish eat, and how do they do it?

Paddlefish feed mostly on tiny animals called zooplankton. Very young paddlefish selectively feed on individual zooplankton, which their small teeth help them to capture. After their first year, paddlefish switch to filter feeding zooplankton from the water with filament-like gill rakers. In some studies elsewhere, paddlefish have been documented to also eat aquatic insects and, occasionally, small fish. Because paddlefish won't bite large bait, anglers hoping to harvest a paddlefish must participate in snagging.

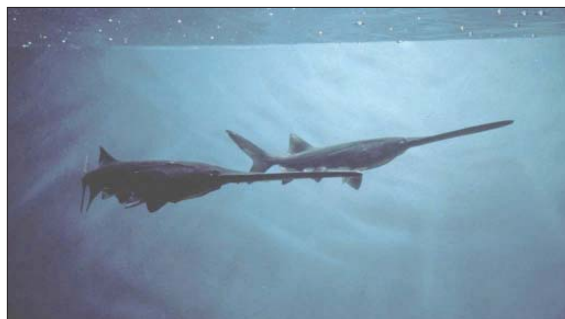


What is the life cycle of paddlefish in the Yellowstone-Sakakawea stock?

Mature paddlefish migrate upstream out of Lake Sakakawea into the Yellowstone and Missouri rivers to spawn. Most fish make this migration in early spring, but some start migrating the previous fall. They spawn during high runoff events in late spring or early summer. Most fish deposit their

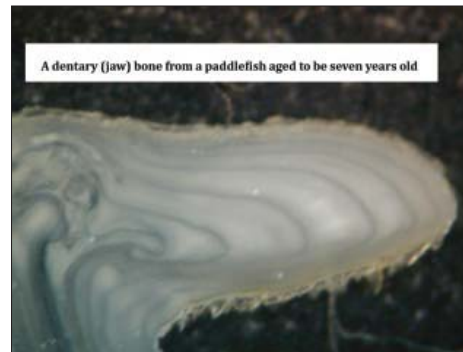
eggs and milt on flooded gravel bars in the lower Yellowstone River, but some fish migrate up the Missouri River into Montana to spawn. Soon after spawning, post spawn adults typically move back downstream into Lake Sakakawea.

The eggs are fertilized by milt as they are released from the females. When exposed to water, the eggs become very sticky and adhere to the gravel and cobble substrate. Incubation time varies depending upon water temperature; eggs hatch in about 7 days in 60° F water. After hatching, young (larval) fish drift downstream with the current, eventually reaching the headwaters of Lake Sakakawea where they spend their first few months of life. Because of greater zooplankton abundance, older juvenile and adult fish also heavily utilize the upper portions of Lake Sakakawea. With the exception of spawning migrations, paddlefish remain within Lake Sakakawea. Paddlefish typically mature at about age 9 or 10 for males, age 16 to 18 for females. Tagging studies have shown that males spawn more frequently than females. Males spawn every year or every other year, while females typically spawn every second or third year.



What do we know about young paddlefish in Lake Sakakawea?

Larval paddlefish grow very rapidly. By late July they're typically 5-6 inches, by late September 10-12, in total length. From mid July through September they're found in the headwaters of Lake Sakakawea. The young paddlefish swim in loose groups, selectively feeding mainly on a large zooplankton call Leptodora. The rapid first year growth of paddlefish is an important survival tactic, since they're comparatively weak swimmers and vulnerable to being eaten by predaceous fish and birds. Studies have shown that young paddlefish grow faster when Sakakawea's water elevations are high and rising, since zooplankton is more abundant under these conditions.



How can you tell how old a paddlefish is, and how long do they live?

The best way to determine age is to use the lower jaw bone, called a dentary. Dentaries are removed from the majority of harvested fish, then cleaned and cross-sectioned. Annual rings are counted on the cross sections (much like aging a tree using tree rings).

Paddlefish can live to age 50 or older, with females typically living longer than males. Most of the larger fish (over 50 pounds) are females that range from 15 to 40 years of age and average about 27 years, while most of the smaller fish (less than 40 pounds) are males that range from 9 to 40 years old and average about 20 years. The presence of a wide range of ages in the population is thought important to its overall health.

How big do paddlefish get, and why are females typically larger than males?

The largest paddlefish on record was speared in Lake Okoboji, Iowa in 1916. It was 85 inches in total length and weighed an estimated 198 pounds. Modern records are a 144 pound fish snagged in 2004 in Kansas and a 142.5 pound fish snagged in 1973 in Montana. The North Dakota record is a 120 pound fish snagged in 1993. Fish living in lakes and reservoirs often grow faster and larger than those living solely in rivers, because reservoirs usually contain more zooplankton.

Male and female paddlefish have evolved different strategies for passing their genes on to the next generation. For a female, the larger she grows the more eggs she can develop and the more young paddlefish she can potentially produce. A male gains less by becoming larger, because even a small male produces millions of sperm which is more than enough to fertilize all of the eggs from the

largest female. Males mature at a younger age than females so that they may reproduce more often.

What is the purpose of the rostrum?

The rostrum serves as a framework to support an electrosensory system that functions as an antenna to detect weak electrical fields. The rostrum, as well as the head and gill flaps, is covered with tiny sensory pores that detect the weak electrical field generated by food items.

The rostrum is not even present on very young fish. But by the time a fish reaches 8 inches in total length, the rostrum may be nearly half its total length. As fish get older and larger, the rostrum becomes comparatively shorter in terms of its proportion to the total length of the fish. Adult paddlefish can function and survive without a rostrum, but it appears that those fish which have lost all or part of their rostrum feed less efficiently and are thus thinner than those with intact rostrums.

Why are paddlefish relatively common in the Williston area when they're so rare or no longer present in other areas within their range?

Simply because in comparison to other areas, the overall habitat quality for paddlefish is generally much better for all life stages in Lake Sakakawea and in the Yellowstone and Missouri rivers. Paddlefish are finicky spawners, requiring a combination of high flows, the right water temperature, and a good substrate of clean gravel and cobble. The Yellowstone River is still a free flowing, naturally fluctuating river that provides adequate spawning habitat for them in most years. When Lake Sakakawea has a high water level, paddlefish generally find abundant food for growth and maturation.

