2012 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 2

Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program

By:

John Hunziker, Tyler Haddix, Landon Holte and Ryan Lott

Montana Fish, Wildlife & Parks
PO BOX 165
Fort Peck, MT 59223

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EXECUTIVE SUMMARY

The 2012 sampling year marked the seventh field season for the Pallid Sturgeon Population Assessment Program (Program) crew in Montana. Members of the Program were enthusiastic to see what changes, physically and biologically had occurred in Segment 2 of the Missouri River. Some differences were clear, such as increased pallid sturgeon *Scaphirhynchus albus* catches, migrated channels and newly formed sand bars. However, other changes were not as clear, such as differences determining the effects of the high flows on native cyprinid populations. While some metrics are easily compared among years, such as species distribution, relative condition and size structure, catch-per-unit-effort (CPUE) is difficult to compare between 2012 and 2011. High flows during 2011 likely reduced the efficiencies of the gears and therefore direct comparisons between the two years inappropriate. However, CPUE estimates obtained in 2012 are comparable to years prior to 2011.

A total of twelve randomly selected river bends were sampled in Segment 2 in 2012 during both sturgeon and fish community seasons resulting in 216 otter trawl deployments equaling 55.7 km, 267 trammel net drifts accounting for 65.7 km of sampling, 1,920 trotline hooks baited with nightcrawlers and ninety-six overnight mini-fyke net sets.

Pallid sturgeon captures in Segment 2 in 2012 (N=166) by far eclipsed that of any of the previous years. In fact, more pallid sturgeon were captured in 2012 than the previous six years combined (N=155). Across both seasons, trammel nets reported a catch per unit of effort (CPUE) of 0.046 fish/100m, which was a new record high. When compared amongst seasons, trammel net CPUE was reported to be 0.06 fish/100m and 0.03fish/100m for the sturgeon and fish community seasons, respectively. Although trammel net CPUE continues to be erratic among seasons, an overall trend of increasing CPUE across both seasons remains. The combined otter trawl CPUE for both seasons was recorded at .021 fish/100m. The otter trawl CPUE comparison between seasons demonstrates 0.031 fish/100m for sturgeon season, while a CPUE of 0.01 fish/100m was witnessed for fish community season. Trotlines remain one of the most effective gear to sample pallid sturgeon in Segment 2. The combined CPUE for trotlines in Segment 2 in 2012 was 0.57 fish/20 hooks. A breakdown of both seasons displays a CPUE of 0.54 fish/20 hooks and 0.60 fish/20 hooks for sturgeon and fish community seasons, respectively. Trotline

CPUE across both seasons, as well as among seasons, exhibited substantial increases compared to previous years.

All but five of the pallid sturgeon captured in Segment 2 during 2012 were of known year classes, with nine total year classes represented in sampling. Year class in rank of abundance (Table 3) were; 2009 (N=60), 2006 (N=29), 2008 (N=26), 2010 (N=23), 2005 (N=8), 2007 (N=7), 2001 (N=4), 2004 (N=2), 1999 (N=1) and 1997 (N=1). Of the 166 pallid sturgeon captured in Segment 2 in 2012, 127 were from known stocking locations all originating in RPMA 2, including 12 fish stocked in the Yellowstone River and 115 stocked in the Missouri River. Of those known stocking locations, the largest sample came from Wolf Point site (N=72), followed by Culbertson (N=36), School Trust (N=6), Intake (N=5), Sidney (N=5), and Forsyth, Fairview and the mouth of the Milk River all having one recapture

Pallid sturgeon in Segment 2 during the 2012 field season averaged 391 mm in fork length and averaged 226 g in weight, both of which were higher than any previous year. Average length and weight increases can be attributed to larger, older fish being captured. In 2012 four pallid sturgeon were captured ranging from 655 mm to 1060 mm, all of which were larger than any pallid sturgeon previously recorded in Segment 2 by the Program's crews. Two of these fish were from the 1997 and 2001 year classes, both of which had never been observed in Segment 2 prior to 2012. The relative condition (Wr) of pallid sturgeon in 2012 dropped slightly for both sub-stock (200-329 mm) and stock category pallid sturgeon. This decrease, when compared to 2011, was minimal and Wr for those categories is still higher than that witnessed in 2010.

Shovelnose sturgeon *S. platorynchus* continue to be one of the most abundant species across all of Segment 2. Sampling in 2012 produced 1,264 shovelnose sturgeon, which eclipsed the previous high recorded in 2010 (N=1,085). All gears remain effective at sampling shovelnose sturgeon in Segment 2. During the 2012 sampling year, trammel nets recorded the largest percentage of catch (56%), followed by trotlines (31%), otter trawl (12%) and angling (1%). Trammel net CPUE of quality and larger shovelnose sturgeon for combined seasons in Segment 2 in 2012 (0.95 fish/100m) was very comparable to 2008-2010 (1.03, 0.88 and 0.88 fish/100m, respectively). Trammel net CPUE for the smaller size classes of shovelnose sturgeon remains very low in Segment 2, likely due to the low abundance of those fish. Shovelnose sturgeon otter trawl CPUE of quality and larger shovelnose sturgeon for combined seasons was reported for Segment 2 in 2012 as 0.33 fish/100m, which was essentially unchanged from 2011 (0.33

fish/100m) and 2010 (0.32 fish/100m). The combined season CPUE was equalized by a lower than average catch rate during sturgeon season (0.23 fish/100m) and an above average (0.42 fish/100m) during fish community season. Trotlines remain an effective tool for sampling shovelnose sturgeon in Segment 2. The CPUE across seasons was calculated at 3.19 fish/20 hooks. To break it down by season, sturgeon season exhibited a CPUE of 3.35 fish/20 hooks, while fish community season trotline CPUE was recorded as 3.02 fish/20 hooks.

Shovelnose sturgeon in Segment 2 during 2012 averaged 590 mm in length and 852 g in weight. The population size structure, which is dominated by individuals larger than 400 mm, has remained similar since the inception of the Program in 2006. For example, in 2012, individuals under 400 mm comprised only 0.7% of the shovelnose sturgeon sampled. Although the smallest shovelnose sturgeon to date (239 mm) was sampled in Segment 2 in 2012, young of the year shovelnose sturgeon continue to be absent in sampling. Conversely, smaller shovelnose sturgeon are much more frequently observed in Segment 3 and 4 of the Missouri River.

A total of 48 sturgeon chubs *Macrhybopsis gelida* were sampled in Segment 2 during 2012, which was an increase from 2011 (N=21) and nearly identical to 2010 (N=47). With a reported combined season CPUE of 0.08 fish/100m, catch rates have remained reasonably comparable since 2009. Among seasons, sturgeon chub otter trawl CPUE in Segment 2 in 2012 during the sturgeon season was reported as 0.14 fish/100m. In contrast, the CPUE documented during fish community season was 0.02 fish/100m. Like previous years, elevated CPUE during sturgeon season indicates a likely upstream migration of sturgeon chubs during spawning season. All but the smallest sturgeon chub (30 mm) captured were greater than 70 mm in TL, indicating that Segment 2 continues to be dominated by an adult class of fish.

A total of nine sicklefin chubs *M. meeki* were sampled in Segment 2 in 2012, all of which were captured in the lower 12 miles of the segment. Otter trawl CPUE for each season remains highly variable due to small sample size. As in previous sample years, the majority of sicklefin chubs (78%) captured in Segment 2 in 2012 were observed during sturgeon season, suggesting similar spawning movements exhibited by sturgeon chubs.

A total of nine sand shiners *Notropis stramineus* were captured in Segment 2 in 2012. Mini-fyke nets accounted for all but one sand shiner, which was caught in the otter trawl. This was by far the lowest number of sand shiners sampled since the Program's origination. In response, the lowest ever recorded CPUE for mini-fyke nets was observed (0.1 fish/net night) in

Segment 2 in 2012. The average TL (45.6 mm) for sand shiners in Segment 2 in 2012 did not differ much from previous years, however, unlike previous years, the lack of fish under 30 mm in 2012 would indicate there were no age-0 fish captured while sampling.

Sampling in Segment 2 in 2012 yielded the capture of only four western silvery minnows *Hybognathus argyritis*, which was less than that seen in 2011 (N=14) and remarkably fewer than 2010 (N=270). All four individuals were observed in mini-fyke nets. As a result, the lowest ever CPUE was calculated for *Hybognathus* spp. in Segment 2 with only 0.04 fish/net night. Western silvery minnows sampled in 2012 averaged 93.5 mm TL, with all but one measuring over 90 mm. The length frequency for this very small sample size would indicate that, similar to sand shiners, no age-0 fish were captured in Segment 2 in 2012.

A total of eleven blue suckers *Cycleptus elongates* were captured during Segment 2 sampling in 2012, with trammel nets being responsible for all but one individual. The CPUE calculated for Segment 2 in 2012 was 0.018 fish/100 m, 0.03 fish/100 m and 0.003 fish/100 m for both, sturgeon season and fish community season, respectively. Like other species, the pattern of elevated CPUE during sturgeon season seems to indicate spring spawning movements upstream by adult populations of blue suckers in Segment 2. The average TL of blue suckers in Segment 2 in 2012 was 680 mm, which nearly identical to past years. As indicated by the length frequency, the sampled population of blue suckers in 2012 once again was comprised of mature fish. Only two presumed YOY blue suckers have been captured in Segment 2, one each in 2010 and 2011.

The sampling of Segment 2 in 2012 resulted in the capture of 256 sauger *Sander canadense*, with the majority (79%) being sampled during sturgeon season. All gears remain successful at capturing sauger in Segment 2; with trammel nets recording 201 sauger, the otter trawl sampling 32, followed by mini-fyke nets catching 15 and trotlines accounting for six. Trammel net CPUE in Segment 2 regarding sauger has remained relatively unchanged since the Program's inception in 2006. However, new record highs were observed in both overall (0.27 fish/100 m) and sturgeon season (0.48 fish/100 m) CPUE. Otter trawl CPUE for both seasons (0.06 fish/100 m) in Segment 2 in 2012, like trammel nets, remains comparable to past years. Also, like trammel nets, a record high CPUE was witnessed during sturgeon season with 0.07 fish/100 m. Mini-fyke net CPUE in Segment 2 in 2012 (0.13 fish/net night) reached its highest mark since a record high was set in 2007 (0.14 fish/net night). However, with mini-fyke net

sampling being the most useful tool to monitor YOY sauger production, none were present in the sampling efforts of 2012. Like blue suckers, sauger are more frequently observed during sturgeon season, which coincides with an upstream spawning movement which includes large numbers of individuals entering the Milk River in the spring.

Overall, the increase in pallid sturgeon captures within Segment 2 during 2012 is an important finding and is likely related to the high water of 2011. Data collected in Segment 3 during 2012 indicated that pallid sturgeon had moved upstream from the lower portions of Segment 3 where they have been traditionally captured to areas upstream and adjacent to Segment 2. From the data collected in Segment 2 it is apparent that many of the pallid sturgeon from Segment 3 moved upstream into Segment 2. This is important because during years prior to 2011 a significant portion of the Missouri River downstream of Fort Peck Dam had few to no pallid sturgeon rearing in it. Therefore, to observe that channel forming flows from the Fort Peck Dam Project can change the distribution and habitat use of rearing pallid sturgeon may be critical in the recovery of the species. As hatchery reared pallid sturgeon grow into larger size classes and presumably become more dependent on fish for their diets, expanding the amount of available habitat may become necessary if density dependent mechanisms begin to be observed. It is interesting to note that not only did the flows of 2011 change the behavior and habitat use of hatchery reared juvenile pallid sturgeon, but it also changed the behavior of adult wild pallid sturgeon within RPMA 2. The flows of 2011 triggered approximately 38% (FWP Data) of the radio tagged wild adult pallid sturgeon of RPMA 2 to migrate into areas of Segment 2 during the spawning season. Those observations coupled with the Program's data indicate that modifications from the normal operations of Fort Peck Dam could be critical in recovering this species within RPMA 2.

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Introduction

The U.S. Fish and Wildlife Service (USFWS) listed pallid sturgeon *Scaphirhynchus albus* as endangered in 1990. In response to listing, the USFWS issued a Biological Opinion to the U.S. Army Corps of Engineers (COE), the primary water management entity responsible for the Missouri River mainstem from Fort Peck Dam and Reservoir to its confluence with the Mississippi River. Additionally, an amendment to the 2000 Biological Opinion was issued in 2003. The Amendment listed several Reasonable and Prudent Alternatives (RPA) to address the inability of pallid sturgeon to naturally reproduce and the need to be able to detect changes in their populations and ecosystem trends.

The Pallid Sturgeon Population Assessment Program (program) is guided by the RPA's in the 2003 Amendment to the 2000 Biological Opinion. The program is a comprehensive monitoring plan designed to assess survival, movement, distribution, habitat use, and physical characteristics of these habitats used by wild and hatchery reared juvenile pallid sturgeon (Welker and Drobish 2011). The 2000 Biological Opinion divides the program area into river and reservoir segments and assigns high, moderate, or low priority management action to these segments for pallid sturgeon (Welker and Drobish 2011). The focus of the program is on the high priority management action segments. The Missouri River from Fort Peck Dam downstream to the headwaters of Lake Sakakawea, ND is listed as a high priority action segment.

The program has stratified the Missouri River from Fort Peck Dam to the headwaters of Lake Sakakawea into four study segments based on biological, hydrological and fluvial geomorphological characteristics. The COE contracted Montana Fish, Wildlife & Parks (FWP) to conduct program sampling from Fort Peck Dam downstream to the confluence of the Yellowstone River, which consists of study segments 1 through 3.

The objectives of this program are as follows:

1. Document annual results and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.
2. Document annual results and long-term trends of habitat use of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and life stage.
3. Document population structure and dynamics of pallid sturgeon in the Missouri River System.
4. Evaluate annual results and long-term trends in native target species population

abundance and geographic distribution throughout the Missouri River system.

5. Document annual results and long-term trends of habitat usage of the native target species by season and life stage.
6. Document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than fifty individuals.

Sampling Season and Species

This program has two discrete seasons (sturgeon and fish community), which are primarily segregated by water temperatures. However, the sturgeon season is designed to sample sturgeon with gears that are temperature dependent, such as gill nets. Due to the nature of the majority of habitats in segment 1 through 3, gill nets are not an efficient gear for collecting pallid sturgeon due to debris and swift current and therefore are not used in any segment situated in Montana. Trammel nets and otter trawl are standard gears used in segments 1-4 during sturgeon season, and appear to be an effective method to sample pallid sturgeon.

The fish community season extends from the beginning of July till the end of October and is designed not only to monitor sturgeon, but also monitor other native Missouri River fish populations. Both trammel nets and otter trawls are used during the fish community season, however mini-fyke nets are added as a standard gear to more effectively sample shallow water habitats less than 1.2 m in depth and smaller bodied fishes.

Trotlines were used as an evaluation gear in 2009 to evaluate their effectiveness at capturing pallid sturgeon. Trotlines became a standard gear starting in 2010. All randomly selected river bends were sampled once with trotlines throughout the two seasons.

In addition to pallid sturgeon, the program is designed to monitor nine other native Missouri River species labeled “target” species. These include, shovelnose sturgeon *Scaphirhynchus platorynchus*, blue sucker *Cycleptus elongatus*, sauger *Sander canadense*, sturgeon chub *Macrhybopsis gelida*, sicklefin chub *M. meeki*, speckled chub *M. aestivalis*, plains minnow *Hybognathus placitus*, western silvery minnow *H. argyritis*, and sand shiner *Notropis stramineus*. This suite of species was selected for various reasons. First, some species may have similar habitat requirements as pallid sturgeon and therefore by monitoring their populations we may gain further insight into pallid sturgeon habitat and how anthropomorphic and natural changes to the Missouri River affect native fish assemblages. Secondly, it is hypothesized that

various chub species and other native fishes are an important component of pallid sturgeon diet, and thereby monitoring pallid sturgeon prey will allow us to better describe their habitat. Thirdly, we wouldn't expect to see an immediate response in a long-lived species like pallid sturgeon would be difficult to measure when environmental conditions change from either favorable or detrimental conditions. Thus, by monitoring short-lived native fishes we may be able to correlate environmental conditions to changes in fish populations on a much shorter time interval and make inferences on how pallid sturgeon populations may be affected.

Study Area

Study Segment 2 of the Missouri River Pallid Sturgeon Population Assessment Program begins at the confluence of the Missouri and Milk Rivers and runs downriver 59 river miles to Wolf Point, Montana (Welker and Drobish 2011). This reach of the Missouri River is impacted by the presence and operations of Fort Peck Dam. Fort Peck Dam inhibits the natural spring pulses and distributes that water more evenly throughout the remainder of the year. Fort Peck Dam draws its water for power production from the hypolimnetic regions of Fort Peck reservoir, which are significantly colder during the summer months and warmer during the winter months, when compared to the Missouri River above the reservoir.

Fort Peck Reservoir traps the sediment loads of the Missouri River and therefore releases sediment free water to the Missouri River. This sediment free high-energy water scours the river of fine sediments and has reduced the amount of sand bars within the river.

Segment 2 is a transitional segment, which exhibits both the characteristics of the hypolimnetic water releases from Fort Peck Dam and of the warmer sediment packed waters of the Milk and Redwater Rivers. The water transitions through Segment 2 from very cold and clear in the upper most reaches to warmer and more turbid in the downstream reaches near Wolf Point, MT.

The Milk River is the largest tributary in this segment and its flows can influence water temperature and discharge of the Missouri River (Kapuscinski, 2002). Throughout the spring, the Milk River forms a plume of warm turbid water that mixes with the cold clear waters of the Missouri. When the Milk River is flowing, it results in a warm turbid river on the north side of the channel and a cold clear river on the south side (Gardner and Stewart, 1987). The warm and

cold waters do not generally mix until after moving 15 river miles downstream near Frazer Rapids, where the water remains relatively cold and clear (Kapuscinski, 2002). Water withdrawals for irrigation have reduced the Milk Rivers influence on the Missouri River during low water years.

Geologically, the entire segment is surrounded by the Bearpaw Shale formation, where upstream reaches are comprised of gravelly areas, which transition into sandbar habitats farther downstream near Wolf Point (NRIS, 2007). Fish distribution changes throughout the segment in accordance with turbidity, temperature, and substrate.

Methods

Sampling methods for the Pallid Sturgeon Population Assessment Program were conducted in accordance with the Standard Operating Procedures (Welker and Drobish 2011), which was established by representatives from State and Federal agencies involved with pallid sturgeon recovery on the Missouri River. For a detailed description of methodologies please see Welker and Drobish (2011). A general description of those guidelines follows.

Sampling Site Selection and Habitat Description

Montana Fish Wildlife & Parks (FWP) was contracted to sample Segment 1 from Fort Peck Dam (RM 1771.5) to the mouth of the Milk River (RM 1761), Segment 2 from the mouth of the Milk River (RM 1761) to Wolf Point (RM 1701.5) and Segment 3 from Wolf Point (RM 1701.5) to the Montana/North Dakota border (RM 1586.5). Segment 2 consisted of twelve randomly selected bends. All 12 bends were sampled during both the sturgeon season (April 5 through June 28) and the Fish Community Season (July 12 through October 12) during 2010.

Two gears, trammel net and otter trawl were considered standard gears for both the sturgeon and fish community seasons. Both trammel nets and the otter trawl were used in all 12 randomly selected bends during both seasons. Additionally, mini-fyke nets were also considered

a standard gear for the fish community season and all 12 randomly selected bends were sampled with mini-fyke nets.

Trotlines were switched from an experimental gear, in 2009, to a standard gear for 2010 in Segment 2. Twelve random trotline bends were selected by moving upstream one river bend from the 12 bends that were randomly selected for sampling by standard gears. This was done to the minimize the possibility of an attractant effect of trotlines to our standard gears and to optimize our time spent on any particular bend, since overnight trotlines require an additional trip to each sampled bend. Trotline bends were only sampled once, as opposed to standard bends, which were sampled by standard gears in both sturgeon season and fish community season. Half (N=6) were sampled with trotline in sturgeon season and half (N=6) were sampled during fish community season.

The Population Assessment Team developed a standard set of habitat classifications for the Missouri River (Appendix B) which consists of three distinct macrohabitats found in every bend, a main channel crossover (CHXO), main channel outside bend (OSB), and main channel inside bend (ISB). Each sampling bend was comprised of these three main macrohabitats. Nine additional macrohabitats were identified that may or may not be present in every bend: large tributary mouths (TRML), small tributary mouths (TRMS), confluence areas (CONF), large and small secondary connected channels (SCCL& SCCS), deranged channels (DRNG), braided channels (BRAD), dendritic channels (DEND) and non-connected secondary channel (SCN).

Mesohabitats were established to further define macrohabitats. Mesohabitats include bars (BARS), pools (POOL), channel border (CHNB), thalweg (TLWG) and island tip (ITIP). Channel borders are situated in areas between the deepest portions of the river up to a depth of 1.2 m. Bars are considered shallow areas (< 1.2 m) where terrestrial and aquatic habitats merge. The thalweg is the deepest portion of the river between the two channel borders where the majority of the flow is directed. Pools are directly downstream of any feature that creates scour, thus creating a habitat of deep (> 1.2 m) slower moving water. Island tips are just downstream of bars or islands where two channels meet where the water is > 1.2 m in depth.

For all analysis, the sampling unit was the river bend, where every river bend has a channel crossover, inside and outside bend. The downstream border of a river bend is the beginning of the next downstream bend's channel crossover.

Sampling Gear

For specific information pertaining to the specific habitats gears are utilized in and physical measurements taken in accordance with sampling the various gears described below see Welker and Drobish (2011).

Trammel Net

The standard trammel net has a length of 38.1 m, an inner mesh wall 2.4 m and two outer mesh walls 1.8 m deep. The inner mesh is made of #139 multifilament twine with a bar mesh size of 25.4 mm. The outer walls are constructed of #9 multifilament twine with a bar mesh size of 203.2 mm. The float line is a 12.7 mm diameter foam core with a lead line of 22.7 kg. Trammel nets were drifted from the bow of the boat and orientated perpendicular to the river flow for a minimum of 75 m and a maximum drift distance of 300 m.

Otter Trawl

The standard otter trawl has a length of 7.6 m, a width of 4.9 m and height of 0.9 m. The otter trawl has an inner mesh (6.35mm bar, #18 polyethylene twine) and outer mesh (38mmbar, #9 polyethylene twine) and a cod end opening of 406.4 mm. The trawl doors were made from 19.1 mm marine plywood and measured 762 mm x 381 mm. The trawl doors are used to keep the mouth of the trawl open while deployed on the riverbed. The trawl also has a 7.9 m long tickler chain attached to the bottom of the mouth of the trawl, which aids in keeping it orientated on the riverbed and protecting the mouth when snags are encountered. The otter trawl was deployed from the bow of the boat parallel to the current with two 30.5 m ropes and towed downstream slightly faster than current speed for a minimum of 75 m and a maximum distance of 300 m.

Mini-Fyke Nets

The standard mini-fyke net consists of two rectangular frames 1.2 m wide and 0.6 m high and two 0.6 m tempered steel hoops. A 4.5 m long and 0.6 m high lead is connected to the first frame. The fyke net was made of 3 mm “ace” style mesh. The lead has small floats attached to

the top and lead weights on the bottom. Mini-fyke nets are set with a "T" stake on shore and extend into river as perpendicular to the shoreline as possible or angled slightly downstream where higher velocities existed. Mini-fyke nets were set overnight and checked the following morning.

Trotlines

Trotlines consisted of 32 m nylon rope attached to both upstream and downstream anchors. Octopus style circle hooks were attached to the ropes using 136 kg monofilament line and commercial fishing clips. Twenty 45.7 cm leaders were used on each trotline each with a 3/0 Eagle Claw circle hook. Trotlines were set overnight and checked the next morning.

Data Collection and Analysis

A minimum of eight random subsamples were taken in macrohabitats present at each randomly selected river bend. At least two subsamples (when possible) were taken using each gear in each macro habitat within a bend. More than two subsamples were taken in a macrohabitat for a gear when the number of discrete macrohabitats was less than four or less than four could be effectively sampled. When a pallid sturgeon was captured, we duplicated the sample in a non-random manner. No more than eight duplicates were taken and we would stop taking duplicates whenever two contiguous duplicate subsamples contain no pallid sturgeon. Although this non-random sampling, it gives us a better understanding of relative abundance and identifies habitats that pallid sturgeon may congregate in.

All fish were measured to the nearest mm. Fork length (FL) was used for pallid and shovelnose sturgeon, while other species were measured to TL, except for paddlefish *Polyodon spathula*, which were measured from the eye to the fork in the caudal fin. The first 25 fish of each species in each subsample were measured, after 25 they were counted.

Time was recorded at the beginning of each sample with all gears and an end time was always recorded when pulling mini-fyke net sets. A global positioning satellite (GPS) position was taken at the beginning and end of all otter and beam trawls and trammel net drifts. One GPS

location was taken for mini-fyke net samples (middle of the seine). All GPS locations were taken using a Garmin GPS 76 unit with Wide Area Augmentation System (WAAS) capability.

Sample depth was determined at the beginning, middle and end of each trawl and drift using a Lowrance X136 sonar unit. One depth was taken for mini-fyke nets at the intersection of the frame and floatline using a wading rod.

Water temperature taken near the surface was recorded at every sample using the Lowrance X136 unit for trawls and trammel net drifts and using a hand held thermometer for mini-fyke net and bag seine samples.

Habitat samples were collected randomly for 25% of each mesohabitat within each macrohabitat sampled. Velocities (mps) were taken at three depths in the water column for habitats > 1.2 m in depth (bottom, 0.8 of bottom depth and 0.2 of the bottom depth) using a Marsh-McBirney Flo Mate 2000. Velocities for shallow water habitats (< 1.2 m) were taken at the bottom and 0.6 of the bottom depth using the March-McBirney Flo Mate 2000.

Turbidity was recorded in nephelometeric turbidity units (NTU) using a LaMotte 2020 turbidity meter. Turbidity was taken at the midpoint of all samples, except mini-fyke sets, where it was taken at the convergence of the rectangular frame and float line.

In addition to 25% of all mesohabitats, habitat measurements were taken whenever a pallid sturgeon was captured.

Genetic Verification

Genetic verification for pallid sturgeon or potential hybrids followed the methods outlined in Welker and Drobish (2011). Two fin pectoral fin clips (~ 2 cm^2) are taken from any pallid sturgeon of unknown origin. Fin samples are then preserved in 95% non-denatured alcohol for genetic analysis. All samples are sent to the U.S. Fish and Wildlife Service's Lamar Laboratory for analysis and archiving.

Relative Condition

Relative condition (Kn) for all sampled pallid sturgeon was calculated using the following formula: Kn = W / W', where W is the fork length of the specimen and W' is the length-specific mean weight predicted by the weight-length relationship equation calculated for that population. Since no weight length-relationship exists for the hatchery reared pallid sturgeon population in Segment 2, we used relative condition factor calculated by Shuman et al. (2011).

Size Classes of Pallid and Shovelnose Sturgeon

We used the length categories proposed by Shuman et al. (2006) for pallid sturgeon and Quist et al. (1998) for shovelnose sturgeon when looking at the total proportion of fish captured by length. Additionally, we broke up sub-stock sizes for both pallid and shovelnose into two groups to aid in determining recruitment of young-of-the-year (YOY) sturgeon. Fork length categories for both species of sturgeon are given in all figures and tables pertaining to size classes.

Analyses

The fundamental sampling unit for the Population Assessment Program is the river bend. Therefore, sample size was equal to the number of bends sampled. Accordingly, all catch-per-unit-effort (CPUE) estimates for each species by gear were made on a bend level and the mean bend CPUE's were averaged to obtain the segment CPUE. Catch-per-unit-effort was stratified by season, depending on the analysis. In addition, stratification by macro- and mesohabitats was performed for each species. All CPUE estimates were performed by the Missouri Department of Conservation.

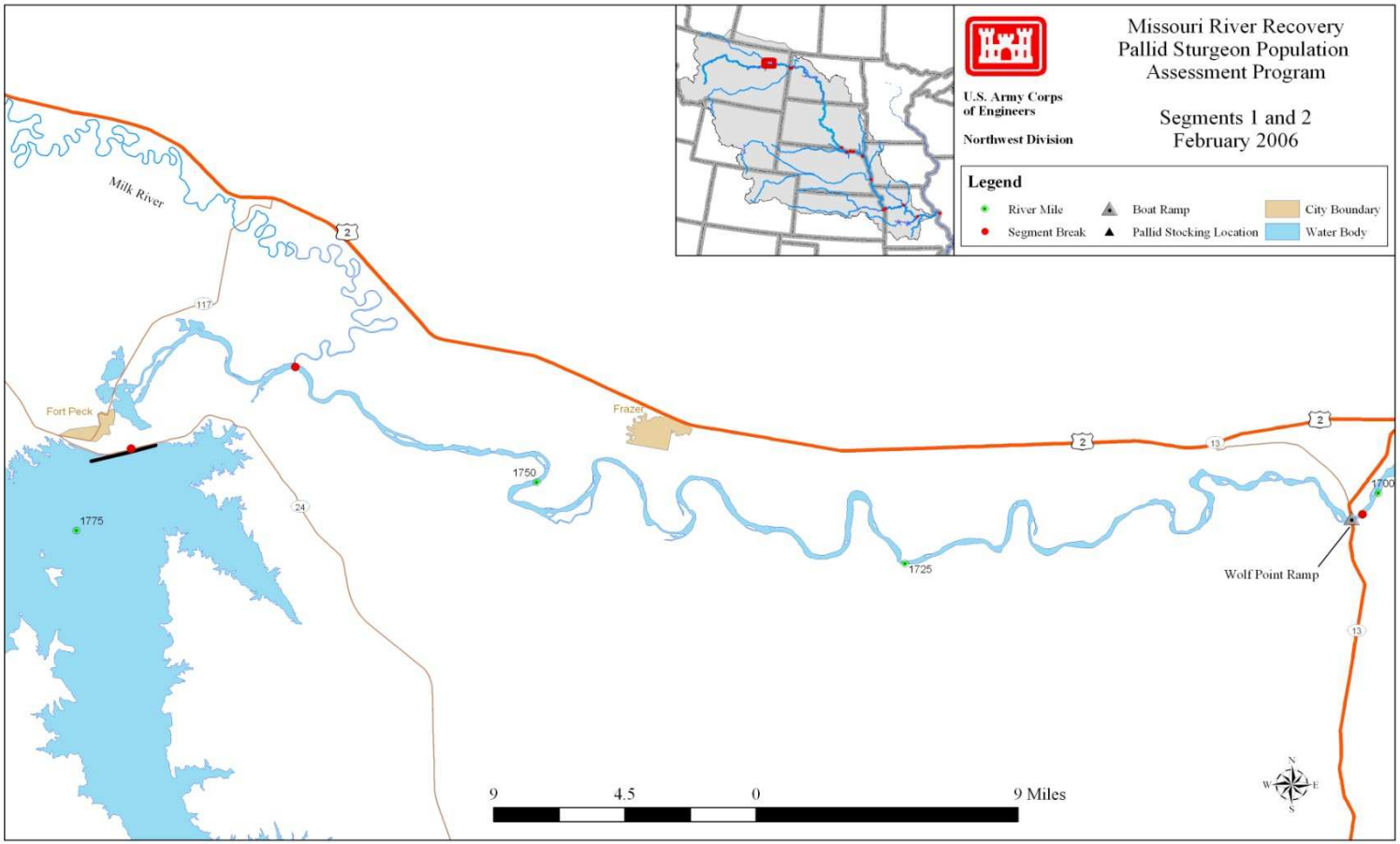

Figure 1. Map of Segment 2 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 2 encompasses the Missouri River from the mouth of the Milk River (River Mile 1761.5) to Wolf Point, MT (River Mile 1701.5).

Results

Effort

A total of twelve randomly selected river bends were sampled in Segment 2 in 2012 during both sturgeon and fish community seasons (Table 1). Otter trawl and trammel nets exhibited equal deployment averages (8) per bend for both sturgeon and fish community seasons. While mini-fyke nets averaged 7.92 deployments per bend during fish community season (the only season they are used). Trotline deployment averaged eight per bend across both seasons. As opposed to other gears, which sample each bend once during sturgeon season and once during fish community season, trotlines are used to sample each bend once throughout both seasons. Trotline bends are selected by sampling the next immediate upstream river bend from the randomly selected bend.

Otter trawl deployments (N=216) resulted in a total distance 57.7 km of sampling in Segment 2 across both seasons in 2012. Trawling consisted of 51.2 km sampled during randomly selected deployments, while 6.5 km were sampled during non-random duplicate sampling.

Trammel net deployments (N=267) resulted in a total distance of 65.7 km of sampling, which consisted of 45.4 km of random deployments in addition to 20.1 km of non-random duplicate sampling across both seasons in Segment 2.

A total of twelve randomly selected trotline bends were sampled in Segment 2 in 2012. Six were set during sturgeon season, while six were set during fish community season. Each bend sampled consisted of eight trotlines equipped with 20 hooks per trotline, or a total of 160 hooks per bend. Two additional 20-hook trotlines were deployed in the same bend during fish community season as part of a non-random sampling effort.

Pallid Sturgeon

Pallid sturgeon captures in Segment 2 in 2012 (N=166) by far eclipsed that of any of the previous years. In fact, more pallid sturgeon were captured in 2012 than the previous six years combined. The previous single year high was recorded in 2010 when forty-three hatchery-reared pallid sturgeon were sampled. Among seasons, 101 pallid sturgeon were observed during sturgeon season, while sixty-five were captured during fish community season. Sampling 2012

marked the first year in the seven year history of the Program that more pallid sturgeon were sampled in Segment 2 during sturgeon season than fish community season. To date, no wild pallid sturgeon have been captured by population assessment crews in Segment 2 (Figure 9).

The trammel net accounted for the largest portion (54.8%) of pallid sturgeon observations in Segment 2 in 2012, followed by trotlines (36.1%) and the otter trawl (9.1%). Across both seasons, trammel nets reported a catch per unit of effort (CPUE) of 0.05 fish/100m, which was a new record high (Figure 5). When compared amongst seasons, trammel net CPUE was reported to be 0.06 fish/100m and 0.03 fish/100m for the sturgeon and fish community seasons, respectively. Although trammel net CPUE continues to be erratic among seasons, an overall trend of increasing CPUE across both seasons remains.

The combined otter trawl CPUE for both seasons was recorded at .021 fish/100m (Figure 6). The otter trawl CPUE comparison between seasons demonstrates 0.031 fish/100m for sturgeon season, while a CPUE of 0.01 fish/100m was witnessed for fish community season. In relation, record highs were recorded in 2010 for both combined otter trawl CPUE (0.04 fish/100m) as well as fish community otter trawl CPUE (0.04 fish/100m). The record high for sturgeon season was recorded in 2011 with 0.05 fish/100m. Although differences remain, comparisons are based on very small increases or decreases of CPUE.

Trotlines, standardized in 2010, remain one of the most effective gears to sample pallid sturgeon in Segment 2. The combined CPUE for trotlines in Segment 2 in 2012 was 0.57 fish/20 hooks (Figure 7). A breakdown of both seasons displays a CPUE of 0.54 fish/20 hooks and 0.60 fish/20 hooks for sturgeon and fish community seasons, respectively. Trotline CPUE across both seasons, as well as among seasons, exhibited a substantial increase, nearly tripling that of 2010 or 2011.

Pallid sturgeon in Segment 2 during the 2012 field season averaged 391 mm in fork length and averaged 226 g in weight. Both average length and weight continue to increase as older year classes of hatchery-reared pallid sturgeon continue to be present in Segment 2. Sampling in 2012 marked the first year that either a quality or a memorable pallid sturgeon has been observed in Segment 2 (Figure 8).

The relative condition (Kn) for pallid sturgeon in Segment 2 is shown in Fig. 4. When compared to the high-water year of 2011, when both sub-stock (200-329 mm) and stock category pallid sturgeon exhibited increases in relative condition, Kn in 2012 dropped slightly among both

of those groups. However, observed relative condition was still higher than that of 2010. Kn for the sub-stock (200-329 mm) continues to be higher when compared to the stock category. Relative condition for the larger size category pallid sturgeon cannot be compared, as fish in those size categories have previously not been sampled in Segment 2.

Pallid sturgeon were distributed widely though out Segment 2 (Figure 2), including four captures at the furthest upstream point of Segment 2; at the mouth of the Milk River (RM 1761). However, the majority of pallid sturgeon sampled (84%) continue to come from the lower two-thirds of Segment 2 (RM 1724-RM1700). The other 16% of pallid captures were spread throughout the upper section of the segment, with the largest sample coming from RM 1753 (N=14).

All but five of the pallid sturgeon captured in Segment 2 in 2012 were of known year class (Table 3), with nine total year classes represented in sampling. Year class in rank of abundance (Table 3) were; 2009 (N=60), 2006 (N=29), 2008 (N=26), 2010 (N=23), 2005 (N=8), 2007 (N=7), 2001 (N=4), 2004 (N=2), 1999 (N=1) and 1997 (N=1). Sampling in 2012 marked the first year that Population Assessment crews captured any pallid sturgeon older than 2001 year class

Of the 166 pallid sturgeon captured in Segment 2 in 2012, one hundred twenty-seven were from known stocking locations; all originating in RPMA 2, including twelve fish stocked in the Yellowstone River and 115 stocked in the Missouri River. Of those known stocking locations, the largest sample came from Wolf Point (N=72), followed by Culbertson (N=36), School Trust (N=6), Intake (N=5), Sidney (N=5), and Forsyth, Fairview and the mouth of the Milk all having one recapture. The largest net movement recorded was from a pallid sturgeon released in Forsyth in 2009 that navigated 253.2 miles downstream through the Yellowstone River, then traveled 135.5 miles upstream through the Missouri River and was captured at RM 1717.5. The smallest net movement was from a pallid sturgeon that was stocked at the School Trust site in 2010 and traveled downstream 3 miles to the mouth of the Milk River.

The specific habitat measurements for pallid sturgeon captured in random deployments by macro and meso habitat is displayed in Table 2. Additionally, Table 4 through 7 shows the number of pallid sturgeon captured by random deployments by gear and macro habitat, as well as effort expended in those macro habitats.

Table 1. Number of bends sampled, mean number of deployments, and total number of deployments by macrohabitat for Segment 2 on the Missouri River during the sturgeon season and fish community season in 2012. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean deploy-ments	Macrohabitat[a]							
			CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season										
1.0” Trammel Net	12	8	31	3	32	26	4	0	0	0
Otter Trawl	12	8	33	2	31	26	4	0	0	0
Fish Community Season										
1.0” Trammel Net	12	8	37	2	33	22	2	0	0	0
Mini-Fyke Net	12	7.92	32	2	36	3	4	14	4	0
Otter Trawl	12	8	33	2	30	27	4	0	0	0
Both Seasons										
Trot Lines	12	8	29	2	37	22	4	0	0	2

[a] Habitat abbreviations and definitions presented in Appendix B.

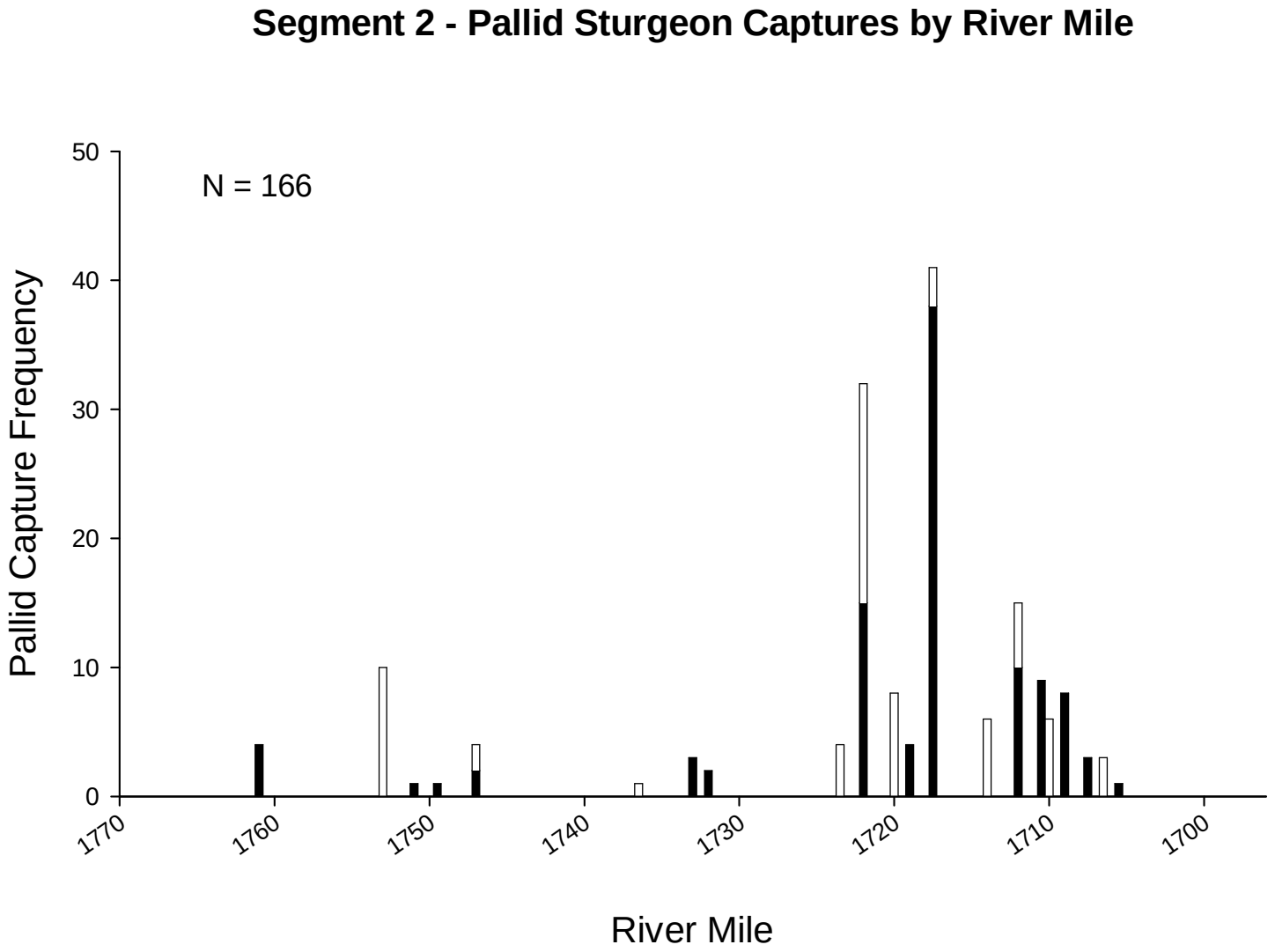

Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 2 of the Missouri River during 2012. Black bars represent pallid sturgeon captures during sturgeon season and white bars during fish community season. Figure includes all pallid captures including non-random and wild samples.

Table 2. Pallid sturgeon capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2012. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. Table includes all pallid sturgeon captures including non-random samples.

Habitat		Depth (m)		Bottom Velocity (m/s)		Temperature (^{o}C)		Turbidity (ntu)		Total pallids caught
Macro-	Meso-	Effort	Catch	Effort	Catch	Effort	Catch	Effort	Catch	
CHXO	BARS	0.4 (0.2-0.6)		0.09 (0.00-0.30)		14.8 (8.6-18.9)		14 (6-32)		
	CHNB	1.9 (0.4-5.3)	1.7 (0.9-3.2)	0.75 (0.12-1.13)	0.74 (0.48-0.98)	12.8 (6.1-18.2)	11.4 (7.3-17.5)	19 (4-60)	19 (7-60)	42
CONF	BARS	0.3 (0.2-0.3)		0.08 (0.08-0.08)		14.0 (14.0-14.0)		7 (7-7)		
	CHNB	1.8 (1.1-2.9)	1.9 (1.7-2.0)	0.50 (0.00-0.70)	0.67 (0.67-0.67)	10.9 (8.6-16.2)	10.0 (9.5-10.5)	37 (5-69)	5 (5-5)	2
ISB	BARS	0.4 (0.2-0.6)		0.03 (0.00-0.12)		14.3 (8.6-19.4)		15 (6-22)		
	CHNB	1.8 (0.5-2.9)	1.9 (1.1-2.8)	0.70 (0.15-0.98)	0.67 (0.15-0.89)	13.4 (6.1-18.4)	12.8 (8.6-18.1)	21 (5-152)	27 (6-152)	75
OSB	BARS	0.5 (0.5-0.5)				13.3 (13.3-13.3)				
	CHNB	2.6 (0.3-6.8)	2.3 (1.0-4.1)	0.75 (0.00-1.08)	0.72 (0.44-0.96)	13.5 (6.1-21.0)	11.8 (8.6-17.0)	29 (5-165)	28 (10-60)	39
SCCL	BARS	0.5 (0.4-0.6)		0.01 (0.00-0.02)		17.0 (16.1-17.8)		21 (20-22)		
	CHNB	1.2 (1.0-1.8)	1.1 (1.0-1.6)	0.69 (0.47-0.88)	0.63 (0.47-0.83)	11.2 (6.0-16.8)	10.9 (6.1-12.9)	40 (14-146)	25 (14-51)	8
SCCS	BARS	0.4 (0.2-0.6)		0.04 (0.00-0.15)		15.4 (8.6-19.5)		17 (11-22)		
	CHNB									
SCN	BARS	0.6 (0.6-0.6)		0.00 (0.00-0.00)		17.9 (13.3-22.0)		20 (9-28)		
	CHNB									
TRML	BARS									
	CHNB	2.2 (2.1-2.2)				14.0 (14.0-14.0)				

Table 3. Mean fork length, weight, relative condition factor (Kn) and absolute growth rates for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2012 from Segment 2 of the Missouri River. Relative condition factor was calculated using the equation in Shuman et al. (2011). Table includes all hatchery-reared pallid sturgeon captures including non-random and wild samples.

Year Class	N	Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
1997	1	.	.	.	1060	4500.0	0.884	.	.
.	.	.	.	.	.	.	.	.	.
1999	1	350	.	.	693	1087.0	0.865	0.080	.
.	.	.	.	.	.	.	.	.	.
2001	4	320	.	.	601	940.5	0.974	0.101	.
.	.	.	.	.	190	590.6	0.039	.	.
2004	2	.	.	.	418	217.0	0.906	.	.
.	.	.	.	.	28	60.0	0.052	.	.
2005	8	265	58.0	1.418	410	232.4	1.039	0.063	0.049
.	.	40	.	.	13	25.8	0.061	0.004	.
2006	29	226	41.5	1.238	408	211.7	0.960	0.096	0.088
.	.	24	14.7	0.066	9	13.9	0.030	0.017	0.017
2007	7	.	.	.	383	209.0	1.205	.	.
.	.	.	.	.	41	53.5	0.325	.	.
2008	26	230	47.5	1.422	384	178.3	0.980	0.117	0.106
.	.	22	13.0	0.057	12	18.2	0.035	0.026	0.007
2009	60	264	73.1	1.194	353	146.2	1.030	0.152	0.141
.	.	24	19.1	0.035	12	16.6	0.042	0.016	0.021
2010	23	320	120.3	1.158	392	171.9	0.887	0.166	0.122
.	.	15	18.4	0.056	14	17.0	0.037	0.012	0.016

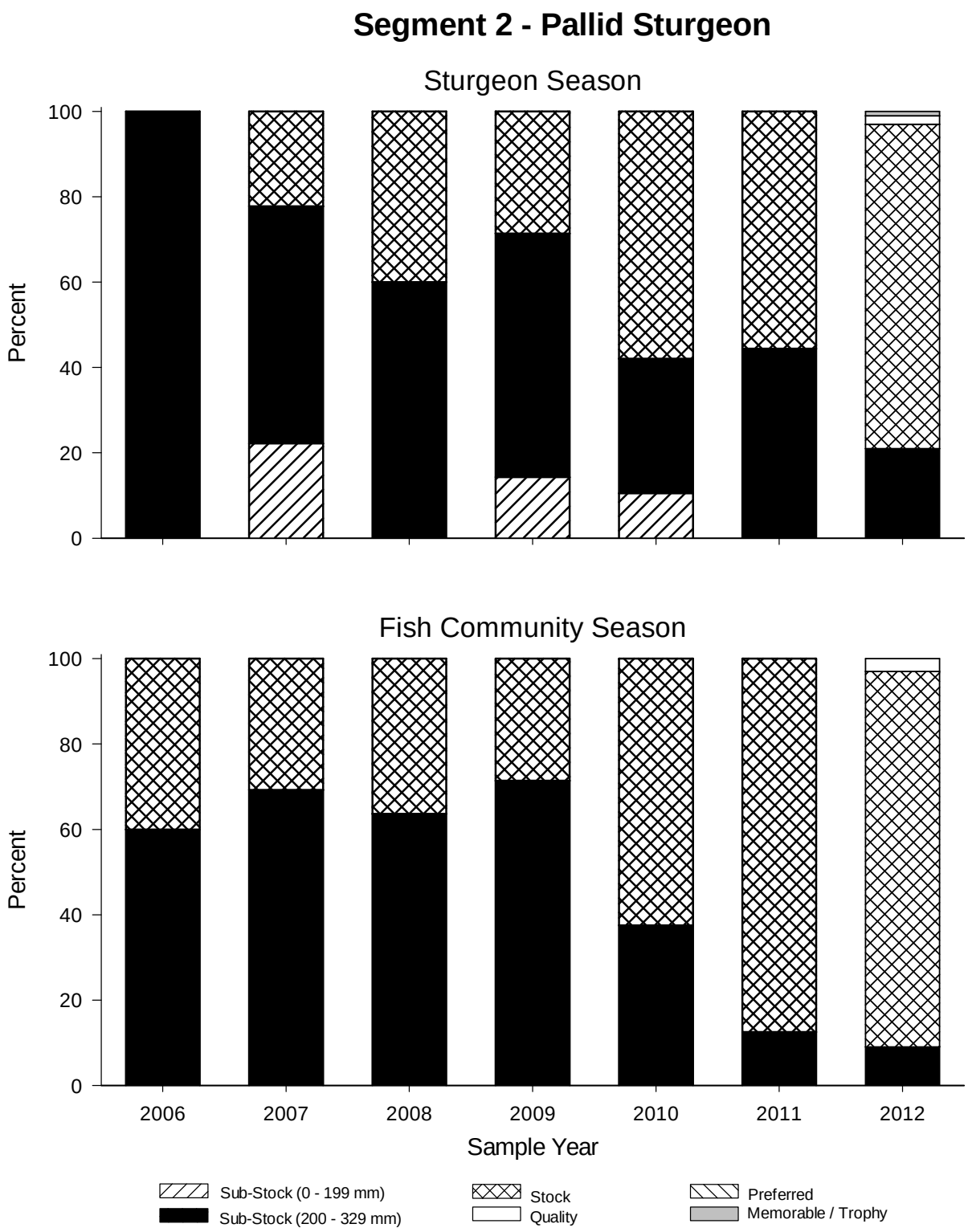

Figure 3. Proportion of fish sampled for all pallid sturgeon captured with all gear by length category from 2006-2012 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

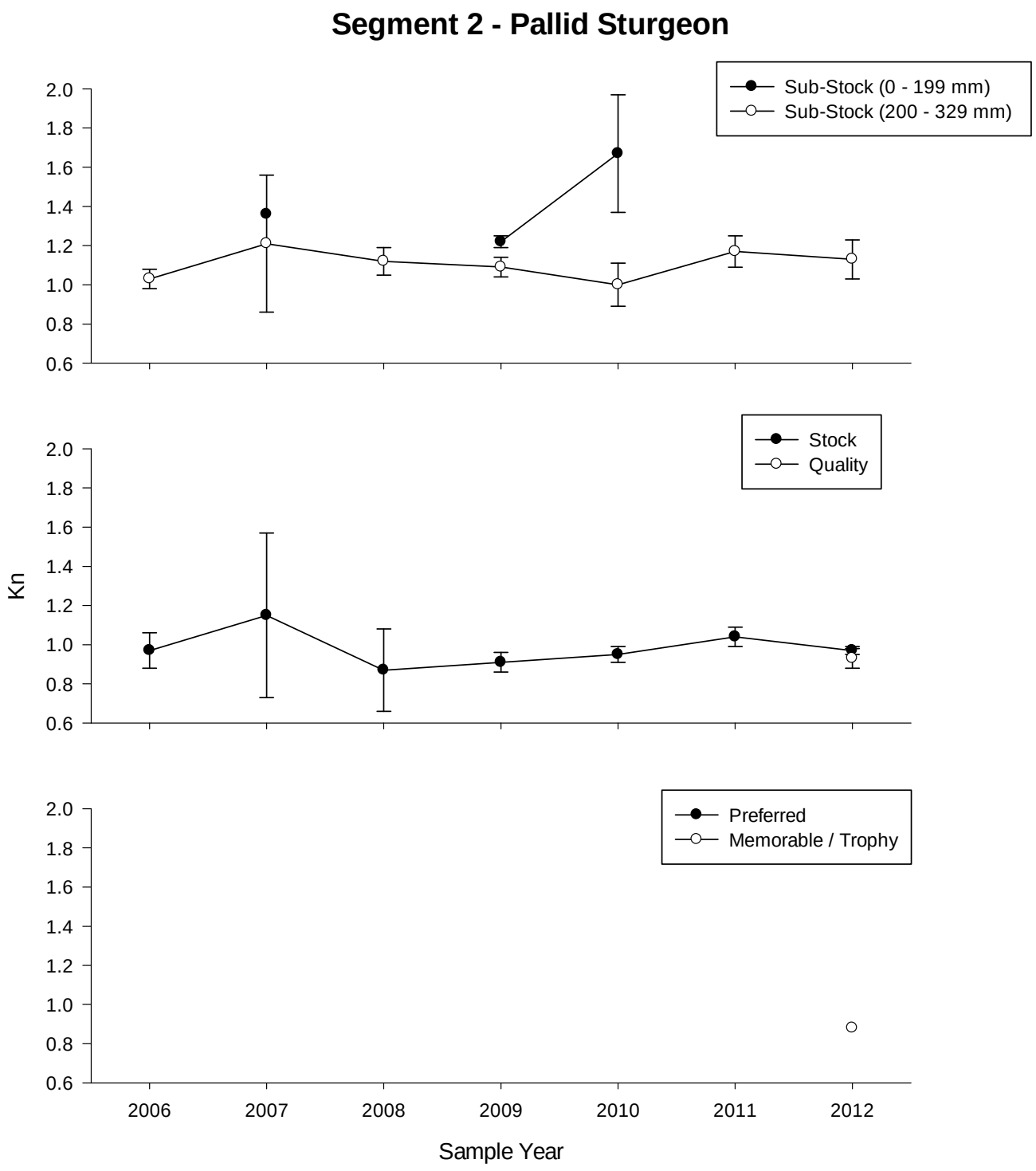

Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2012 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (2011).

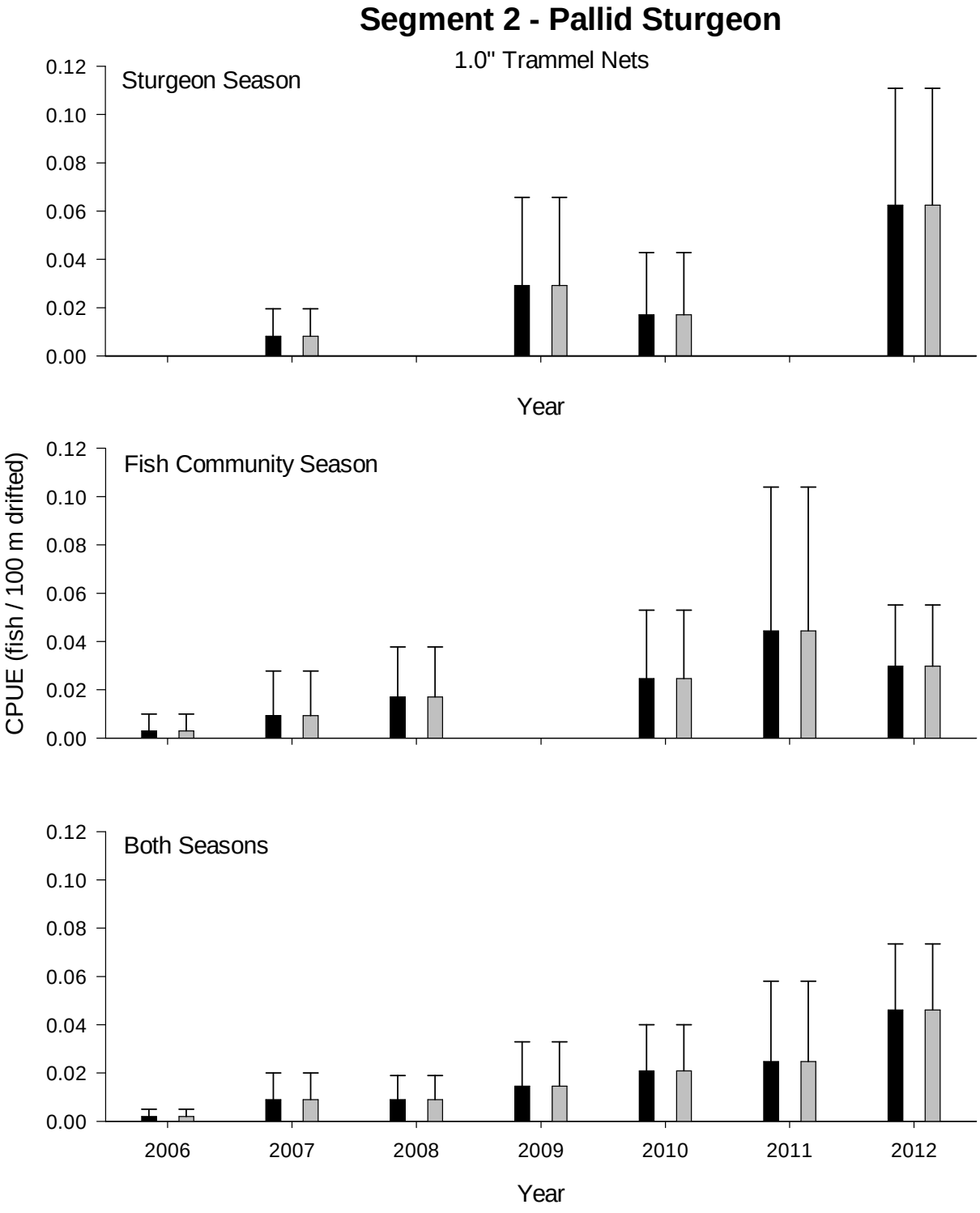

Figure 5. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2012. Pallid sturgeon of unknown origin are awaiting genetic verification.

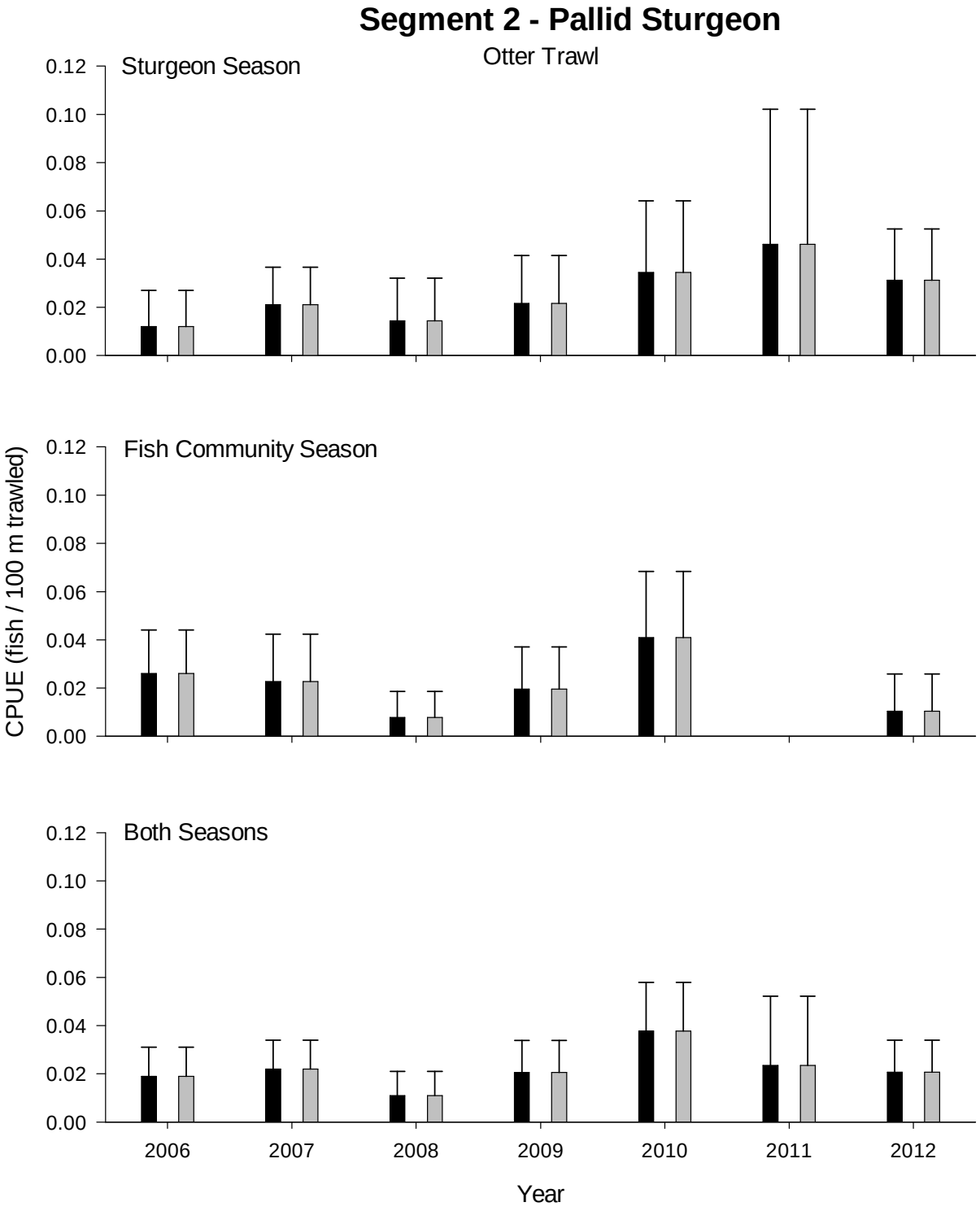

Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2012. Pallid sturgeon of unknown origin are awaiting genetic verification.

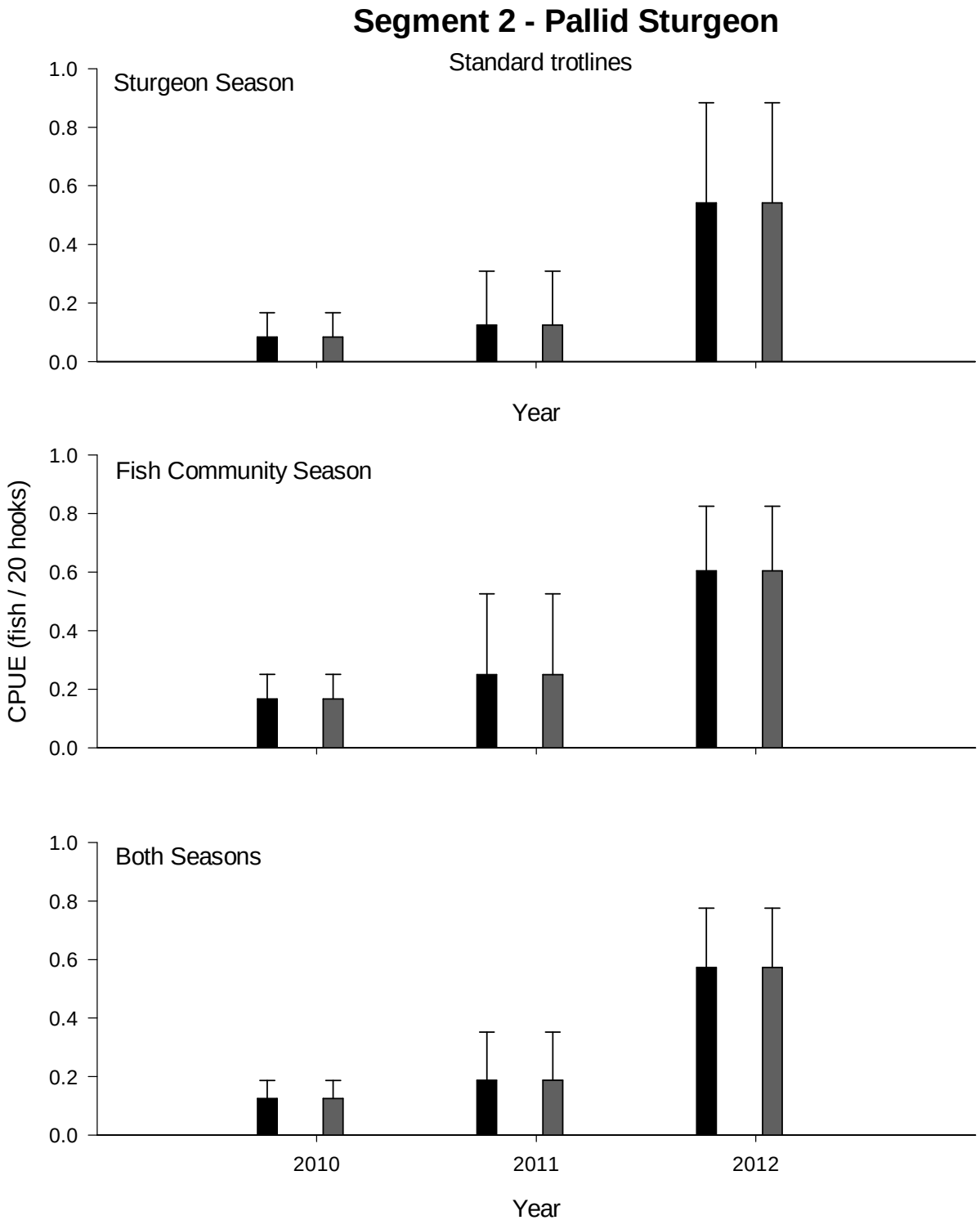

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2012. Pallid sturgeon of unknown origin are awaiting genetic verification.

Table 4. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
				Sturgeon Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
				Fish Community Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	25	4	0	0	0
				Both Seasons					
Trot Lines	0	0	0	0	0	0	0	0	0
		30	2	39	23	4	0	0	2

Table 5. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
				Sturgeon Season					
1.0” Trammel Net	5	40	0	20	40	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	1	100	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
				Fish Community Season					
1.0” Trammel Net	2	100	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	1	0	0	100	0	0	0	0	0
		37	2	32	25	4	0	0	0
				Both Seasons					
Trot Lines	3	0	0	67	0	33	0	0	0
		30	2	39	23	4	0	0	2

Table 6. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	11	27	9	36	18	9	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	7	29	0	43	14	14	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	6	67	0	33	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	2	50	0	50	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	48	27	0	44	19	10	0	0	0
		30	2	39	23	4	0	0	2

Table 7. Total number of quality size and greater (≥630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	4	25	0	50	25	0	0	0	0
		30	2	39	23	4	0	0	2

Table 8. Total number of pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	16	31	6	31	25	6	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	8	38	0	38	13	13	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	8	75	0	25	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	3	33	0	67	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	55	25	0	45	18	11	0	0	0
		30	2	39	23	4	0	0	2

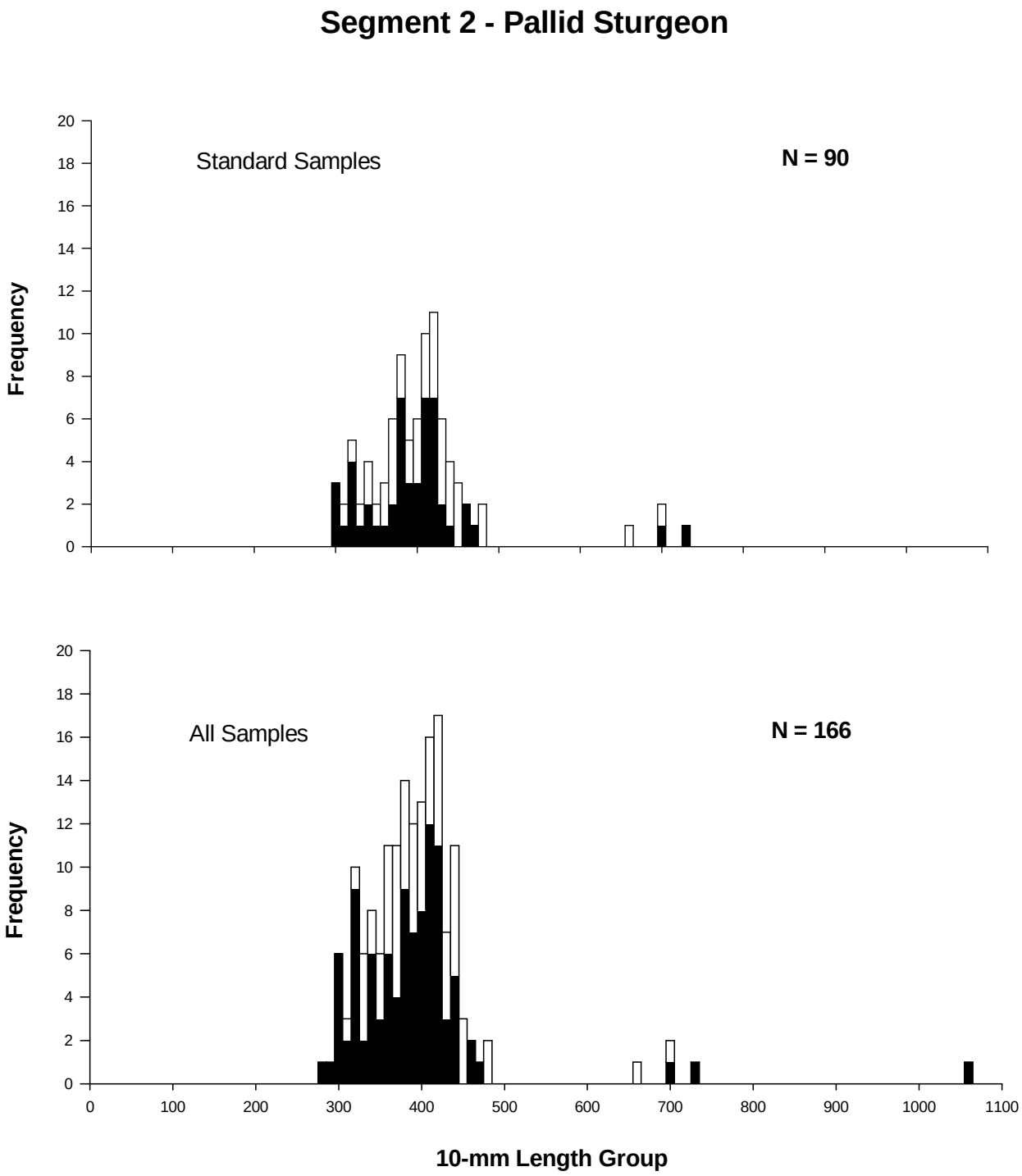

Figure 8. Length frequency of pallid sturgeon captured in Segment 2 of the Missouri River during 2012. White bars represent wild pallid sturgeon captures, gray bars represent hatchery-reared pallid sturgeon and cross-hatched bars represent unknown pallid sturgeon. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012. Pallid sturgeon of unknown origin are awaiting genetic verification.

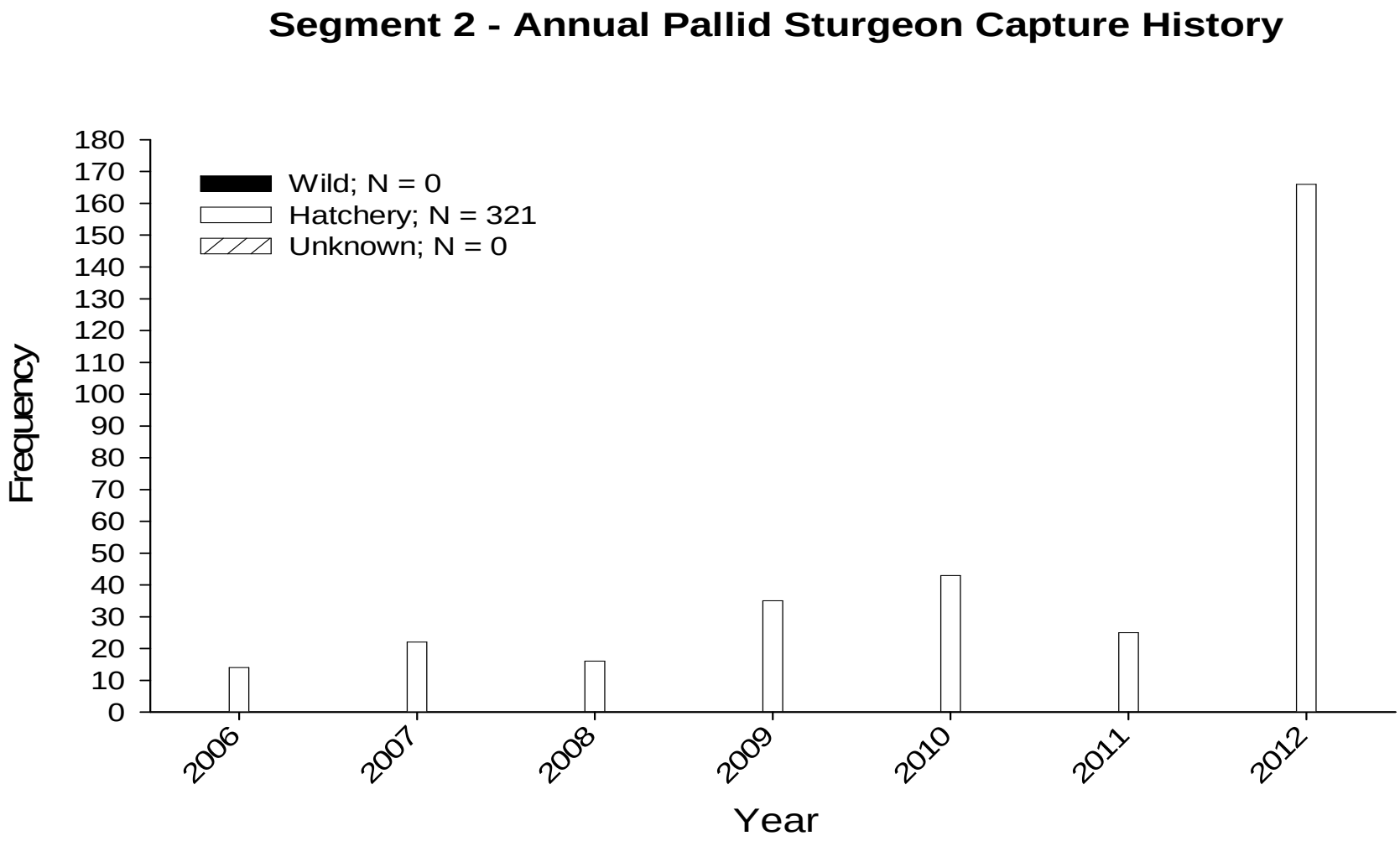

Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 2 of the Missouri River from 2006-2012. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose sturgeon x pallid sturgeon hybrids have been collected in Segment 2 of the Missouri River from 2006-2012.

Targeted Native River Species

Shovelnose Sturgeon

Shovelnose sturgeon continue to be one of the most abundant species across all of Segment 2 of the Missouri River. Sampling in 2012 produced 1,264 shovelnose sturgeon, which eclipsed the previous high recorded in 2010 (N=1,085). Among seasons, 44% of shovelnose sturgeon captures occurred during sturgeon season, while the remaining 56% were sampled during fish community season. All gears remain effective at sampling shovelnose sturgeon in Segment 2. During the 2012 sampling year, trammel nets recorded the largest percentage of catch (56%), followed by trotlines (31%), otter trawl (12%) and angling (1%). It is important to note that while the highest proportion of catch was related to the trammel net, trotlines are only set in each bend once per year, as opposed to the other standard gears, which are deployed once in each season.

Trammel net CPUE of quality and larger shovelnose sturgeon for combined seasons in Segment 2 in 2012 (0.95 fish/100m) was very comparable to 2008-2010 (1.03, 0.88 and 0.88 fish/100m, respectively) (Figure 10). As with combined seasons, comparisons between seasons continue to exhibit very small differences in CPUE, with the exception of the high-water year of 2011, which created sampling issues across the entire segment. Trammel net CPUE in Segment 2 for shovelnose sturgeon of stock and sub-stock categories remains very low.

Shovelnose sturgeon otter trawl CPUE of quality and larger shovelnose sturgeon (Figure 11) for combined seasons was reported for Segment 2 in 2012 as 0.33 fish/100m, which was essentially unchanged from 2011 (0.33 fish/100m) and 2010 (0.32 fish/100m). The combined season CPUE was equalized by a lower than average catch rate during sturgeon season (0.23 fish/100m) and an above average (0.42 fish/100m) during fish community season. To compare those CPUEs, the long-term average (2006-2011) for sturgeon season is 0.30 fish/100m and 0.20 fish/100m for fish community season. As with trammel nets, otter trawl CPUE for stock and sub-stock category shovelnose sturgeons remains very low in Segment 2 of the Missouri River.

Trotlines remain an effective tool for sampling shovelnose sturgeon in Segment 2. The CPUE (Figure 12) across seasons was calculated at 3.19 fish/20 hooks. Comparing that catch rate, it was slightly higher than 2011 (2.75 fish/20 hooks) but below that of 2010 (5.0 fish/2

hooks). To break it down by season, sturgeon season exhibited a CPUE of 3.35 fish/20 hooks which was also higher than 2011 (2.04 fish/20 hooks) and lower than 2010 (6.5 fish/20 hooks). For fish community season trotline CPUE was recorded as 3.02 fish/20 hooks, which is much more comparable to both 2011 (3.46 fish/20 hooks) and 2010 (3.5 fish/20 hooks). Sampling of Segment 2 in 2012 also marks the first year a shovelnose sturgeon falling into the sub-stock (150-249 mm) category was captured in Segment 2 using trotlines.

Shovelnose sturgeon in Segment 2 in 2012 averaged 590 mm and 852 g. The population size structure, which is dominated by individuals larger than 400 mm (Figure 13), has remained similar since the inception of the Program in 2006. For example, in 2012, individuals under 400 mm comprised only 0.7% of the shovelnose sturgeon sampled. Although the smallest shovelnose sturgeon to date (239 mm) was sampled in Segment 2 in 2012, young of the year shovelnose sturgeon continue to be absent in sampling. In contrast, smaller shovelnose sturgeon are captured more frequently in segment 3, indicating that the habitats in lower stretches of the Missouri River in Montana are much more suitable for rearing.

The relative weights (Wr) for shovelnose sturgeon in Segment 2 are displayed in Figure 15. The Wr for stock size category shovelnose sturgeon in Segment 2 rose slightly in 2010 and held steady in 2011. However, in 2012, the relative weight for those same fish decreased measurably, but remained highly comparable to 2006-2009. The Wr for the quality size category has remained relatively comparable across all years of sampling. Similarly, the preferred and memorable/trophy size categories of shovelnose sturgeon in Segment 2 have shown little to no significant change in seven years of sampling. The only pattern that remains constant is that, on average, as shovelnose sturgeon recruit into larger size classes their relative weights decrease.

The specific macro habitats where shovelnose sturgeon were sampled by gear and size class is depicted in Tables 9-12. Table 13 shows the total number of shovelnose sturgeon sampled by gear and macro habitat.

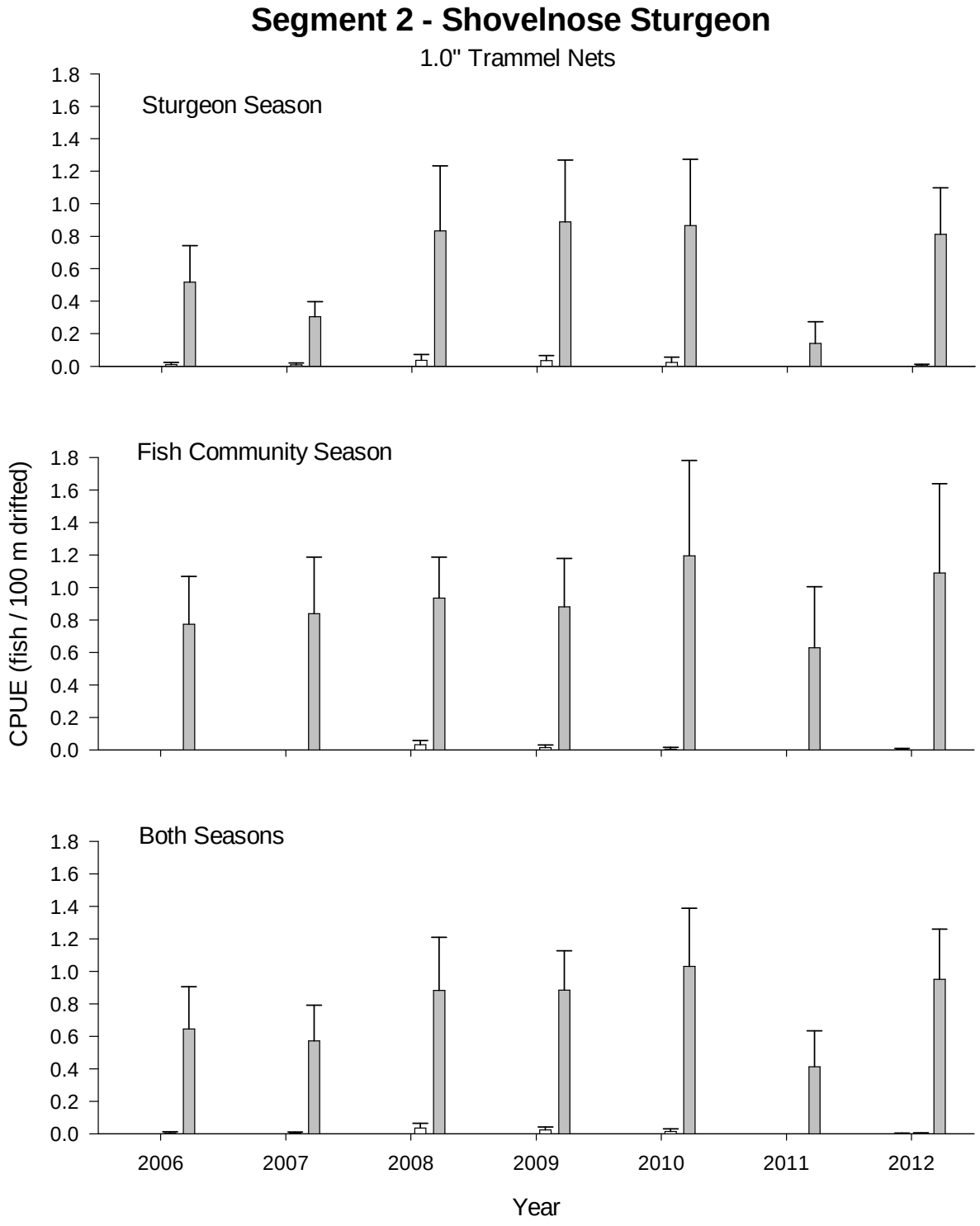

Figure 10. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2012.

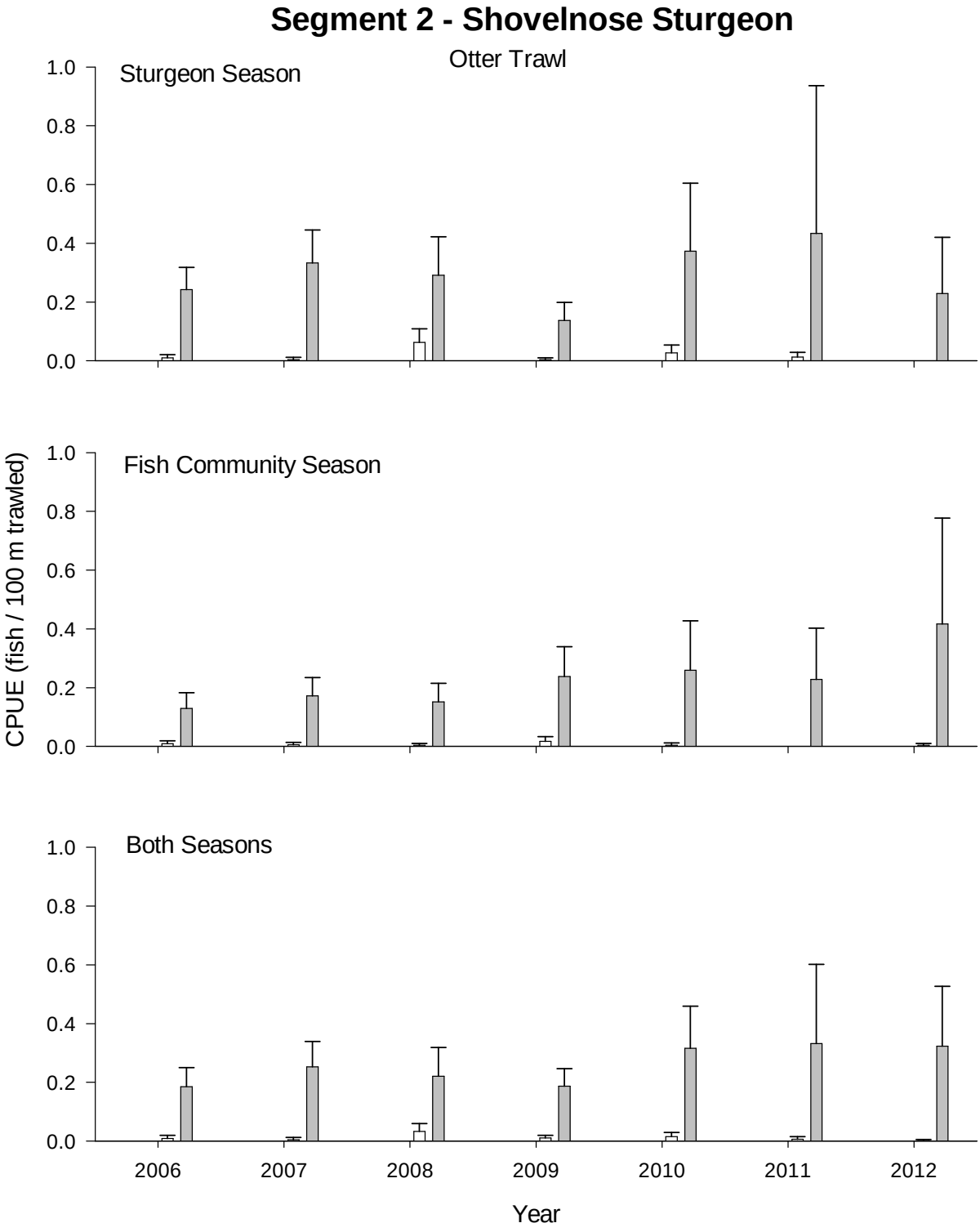

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2012.

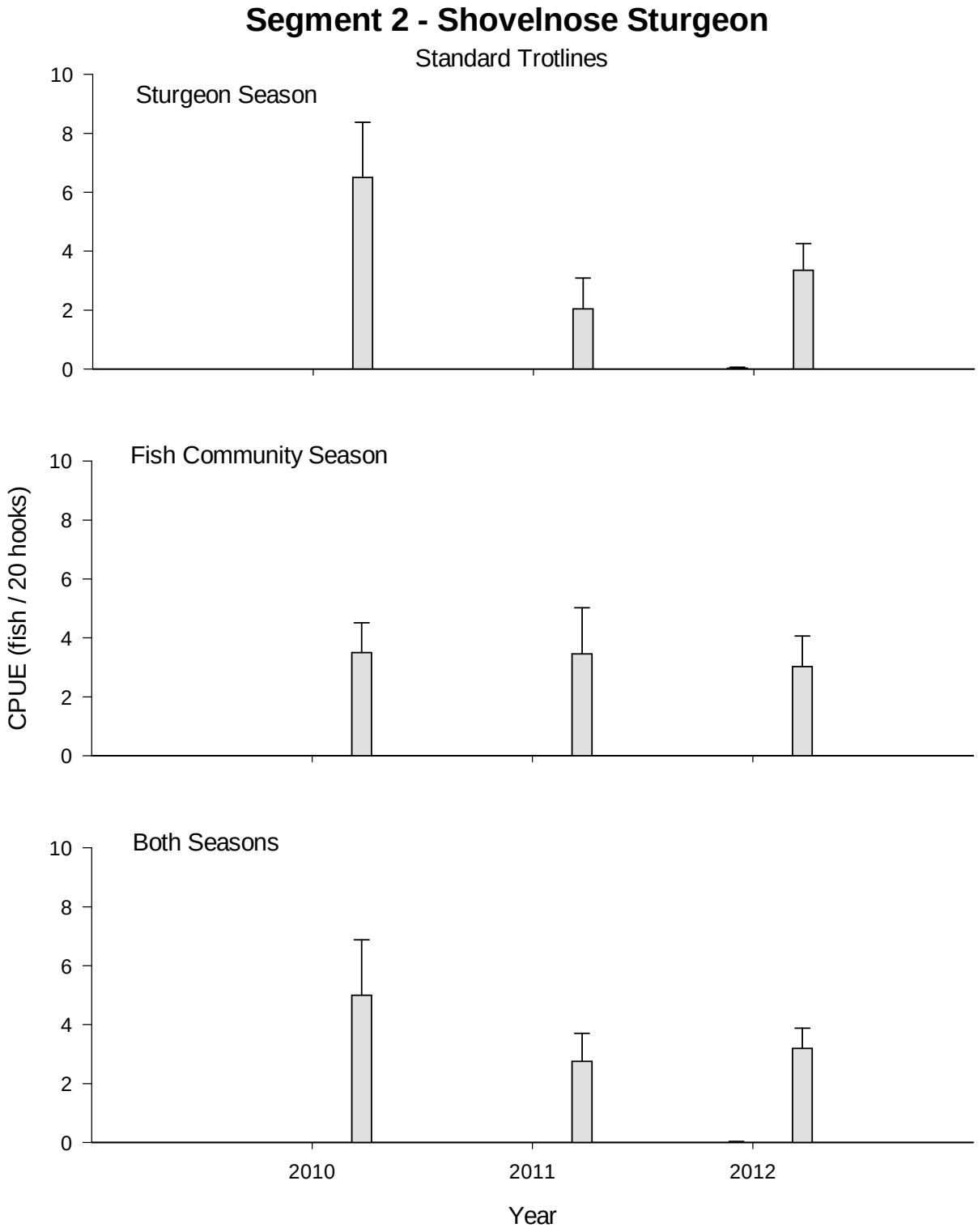

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2012.

Table 9. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		30	2	39	23	4	0	0	2

Table 10. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	1	100	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	1	0	0	100	0	0	0	0	0
		30	2	39	23	4	0	0	2

Table 11. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
				Sturgeon Season					
1.0” Trammel Net	1	100	0	0	0	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
				Fish Community Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	1	0	0	100	0	0	0	0	0
		37	2	32	25	4	0	0	0
				Both Seasons					
Trot Lines	0	0	0	0	0	0	0	0	0
		30	2	39	23	4	0	0	2

Table 12. Total number of quality size and greater (≥380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	178	40	6	36	17	1	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	62	24	40	16	18	2	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	210	39	1	29	30	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	77	34	0	34	30	3	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	306	35	6	34	23	2	0	0	1
		30	2	39	23	4	0	0	2

Table 13. Total number of shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	179	41	6	36	17	1	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	62	24	40	16	18	2	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	211	39	1	29	30	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	78	33	0	35	29	3	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	307	35	6	34	22	2	0	0	1
		30	2	39	23	4	0	0	2

Segment 2 - Shovelnose Sturgeon

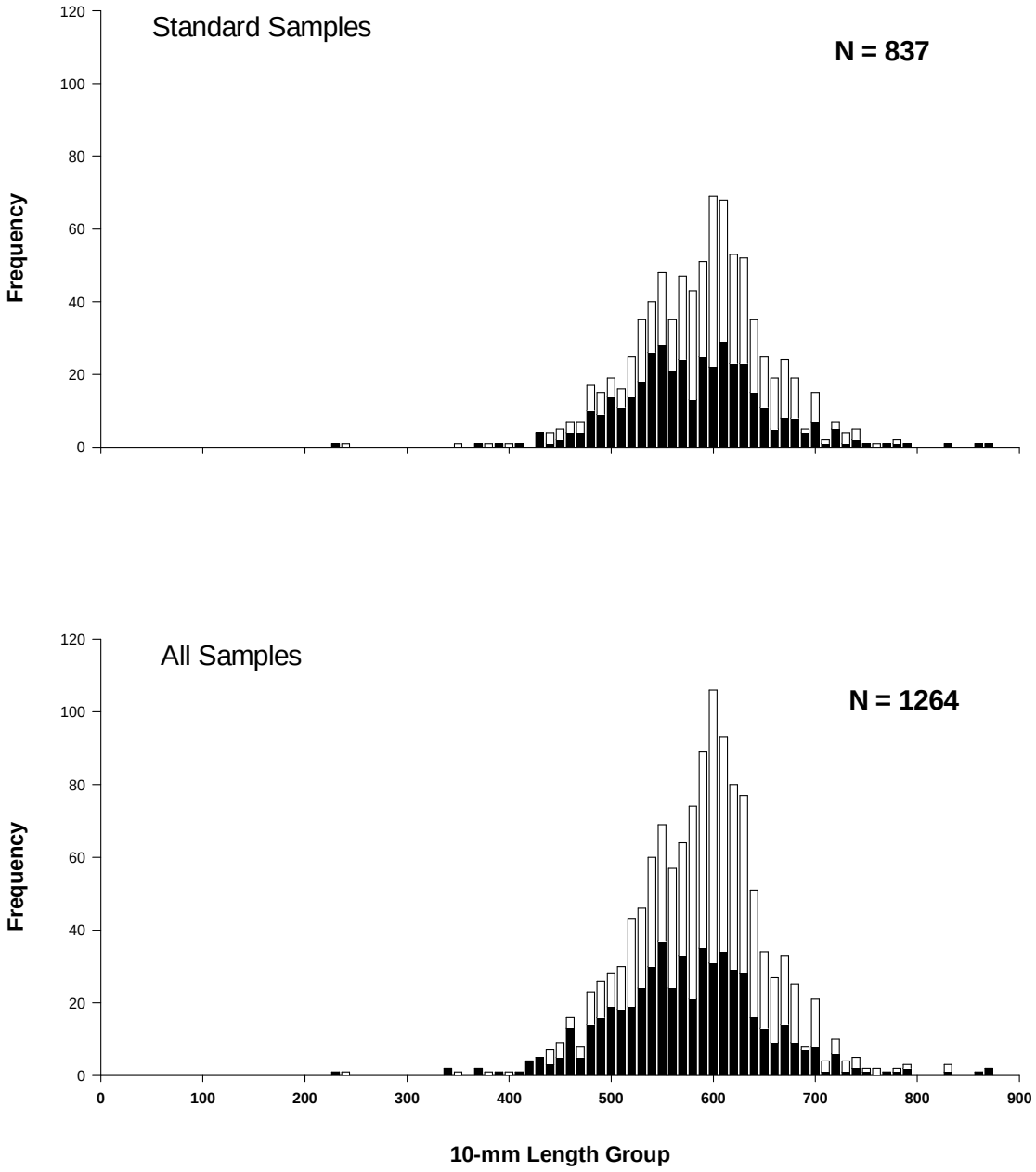

Figure 13. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

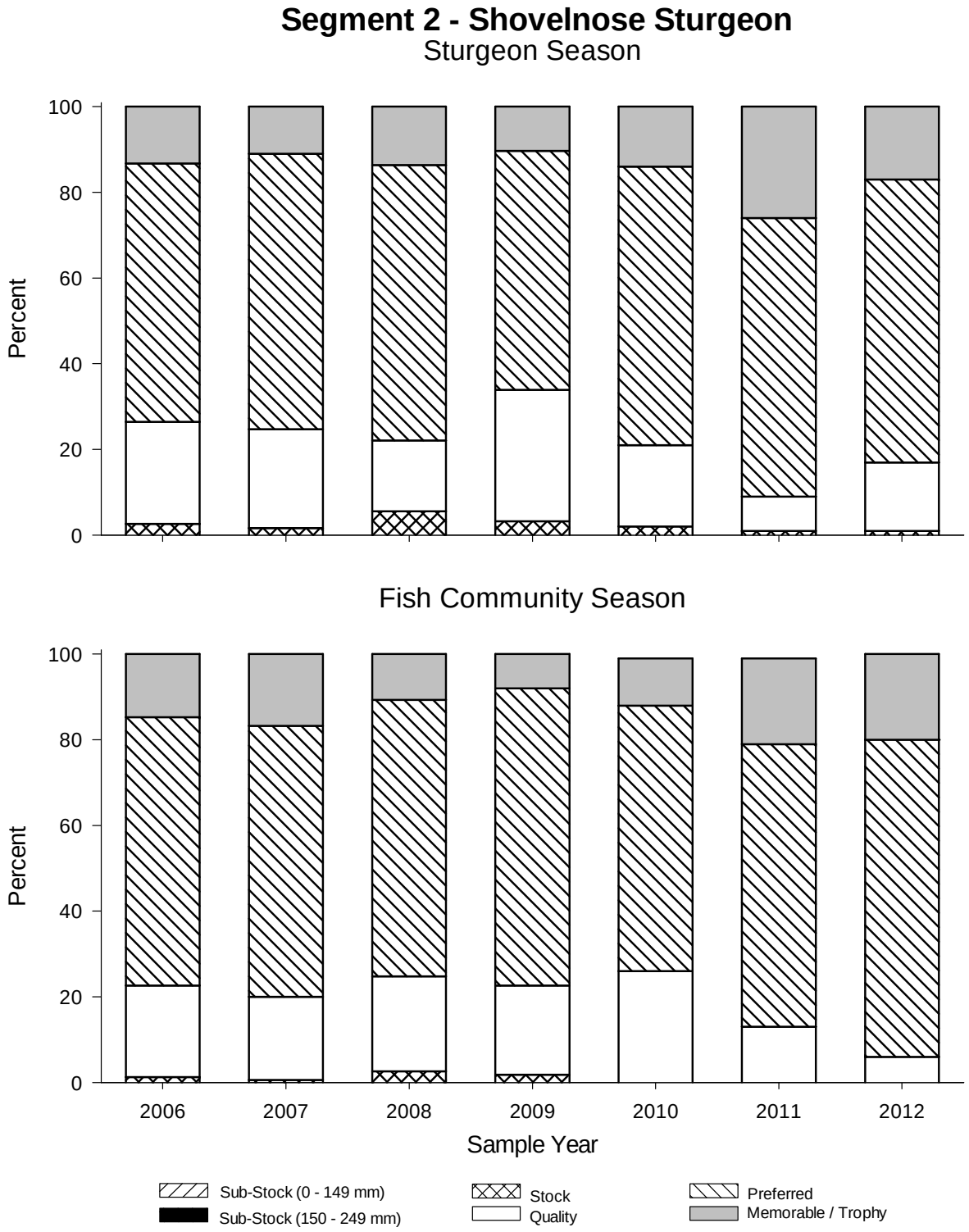

Figure 14. Proportion of total catch for all shovelnose sturgeon captured with all gears by length category from 2006 to 2009 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

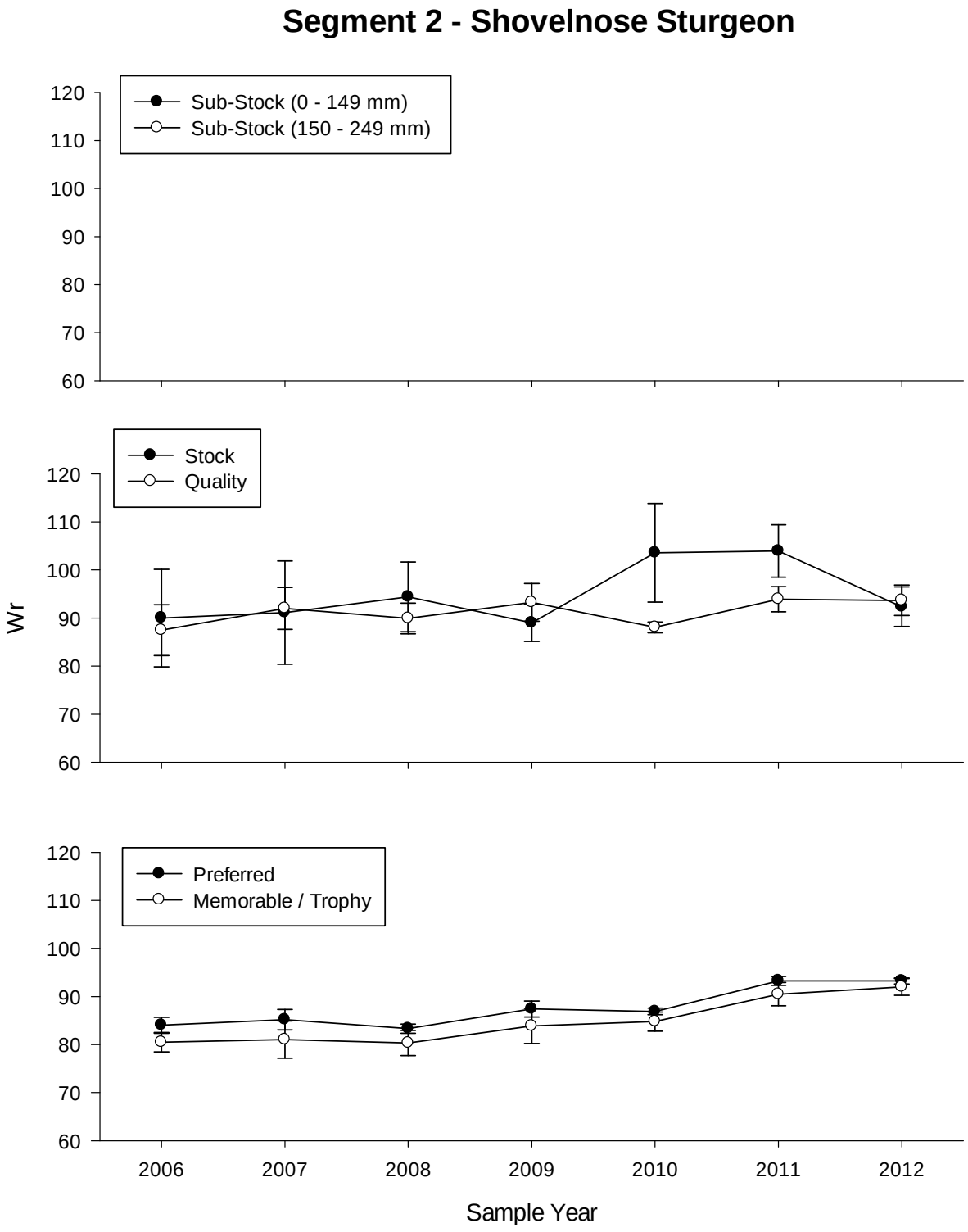

Figure 15. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2012 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

Sturgeon Chub

A total of forty-eight sturgeon chubs were sampled in Segment 2 in 2012, which was an increase from 2011 (N=21) and nearly identical to 2010 (N=47). A much larger proportion of sturgeon chubs (83%) were captured during sturgeon season than fish community season (17%).

With a reported combined season CPUE of 0.078 fish/100m (Figure 16), catch rates have remained reasonably comparable since 2009. To collate the sturgeon chub catch rates in 2012, the lowest recorded CPUE was in 2011 with 0.065 fish/100m, while the highest recorded CPUE in Segment 2 occurred in 2007 with 0.217 fish/100m. Among seasons, sturgeon chub otter trawl CPUE in Segment 2 in 2012 during the sturgeon season was reported as 0.139 fish/100m, which was again comparable to those numbers recorded since 2009. In contrast, the CPUE documented during fish community season was 0.015 fish/100m. To compare fish community catch rates, the lowest observed CPUE was in 2011 with 0.006 fish/100m, while the highest observed CPUE was in 2006 with 0.085 fish/100m. Aside from comparing CPUE between years, another important observation is the contrast between seasons. In all years of sampling a higher CPUE has been calculated during sturgeon season than fish community season, suggesting upstream movements by sturgeon chubs during spawning season.

The average TL for sturgeon chubs in Segment 2 in 2012 was 84.9 mm, with the largest specimen being 102 mm, while the smallest individual measured 30 mm (Figure 17). All but the smallest sturgeon chub captured were greater than 70 mm in TL, indicating that Segment 2 continues to be dominated by an adult class of fish (Herman et al. 2008a).

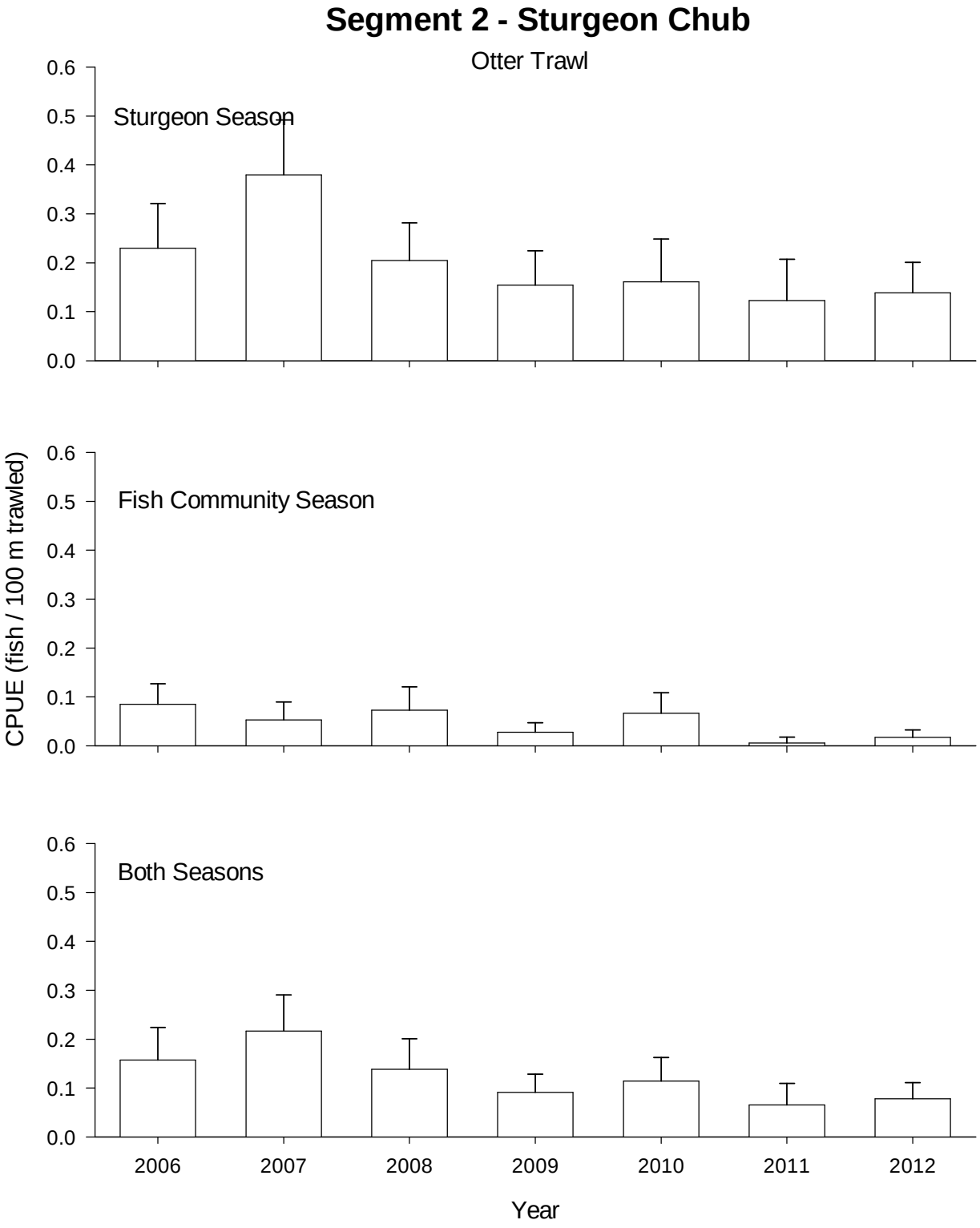

Figure 16. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 2 of the Missouri River from 2006-2012.

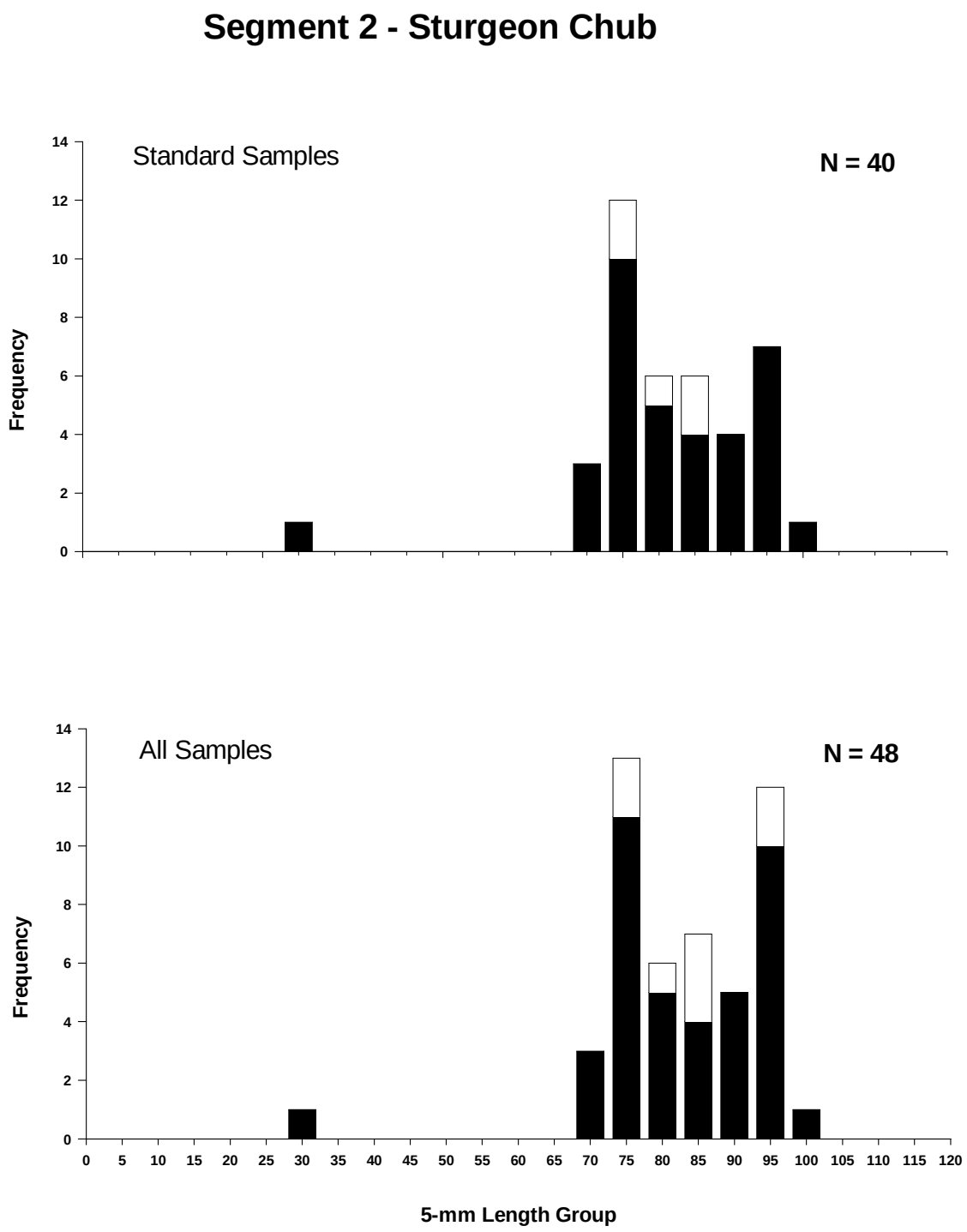

Figure 17. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Sicklefin Chub

A total of nine sicklefin chubs were sampled in Segment 2 in 2012, all of which were captured in the lower twelve miles of the segment. Otter trawl CPUE for both seasons (Figure 18) in Segment 2 (0.013 fish/100 m) was highly comparable to that observed in 2011 (0.013 fish/100 m), as well as 2010 (0.011 fish/100 m). Otter trawl CPUE for each season remains highly variable due to small sample size. As in previous sample years, the majority of sicklefin chubs (78%) captured in Segment 2 in 2012 were observed during sturgeon season, suggesting similar spawning movements exhibited by sturgeon chubs.

In 2012 sicklefin chubs in Segment 2 averaged 101.8 mm in TL, with all fish measuring between 94 and 114 mm (Figure 19). The population size structure indicates sicklefin chubs in Segment 2 continue to consist solely of adult fish (Herman et al. 2008b). Relative density of sickelfin chubs remains very low in Segment 2, most likely due to the highly altered habitat associated with downstream of Fort Peck Dam. In contrast, sicklefin chubs are much more common in the lower stretches of segment 3 of the Missouri River.

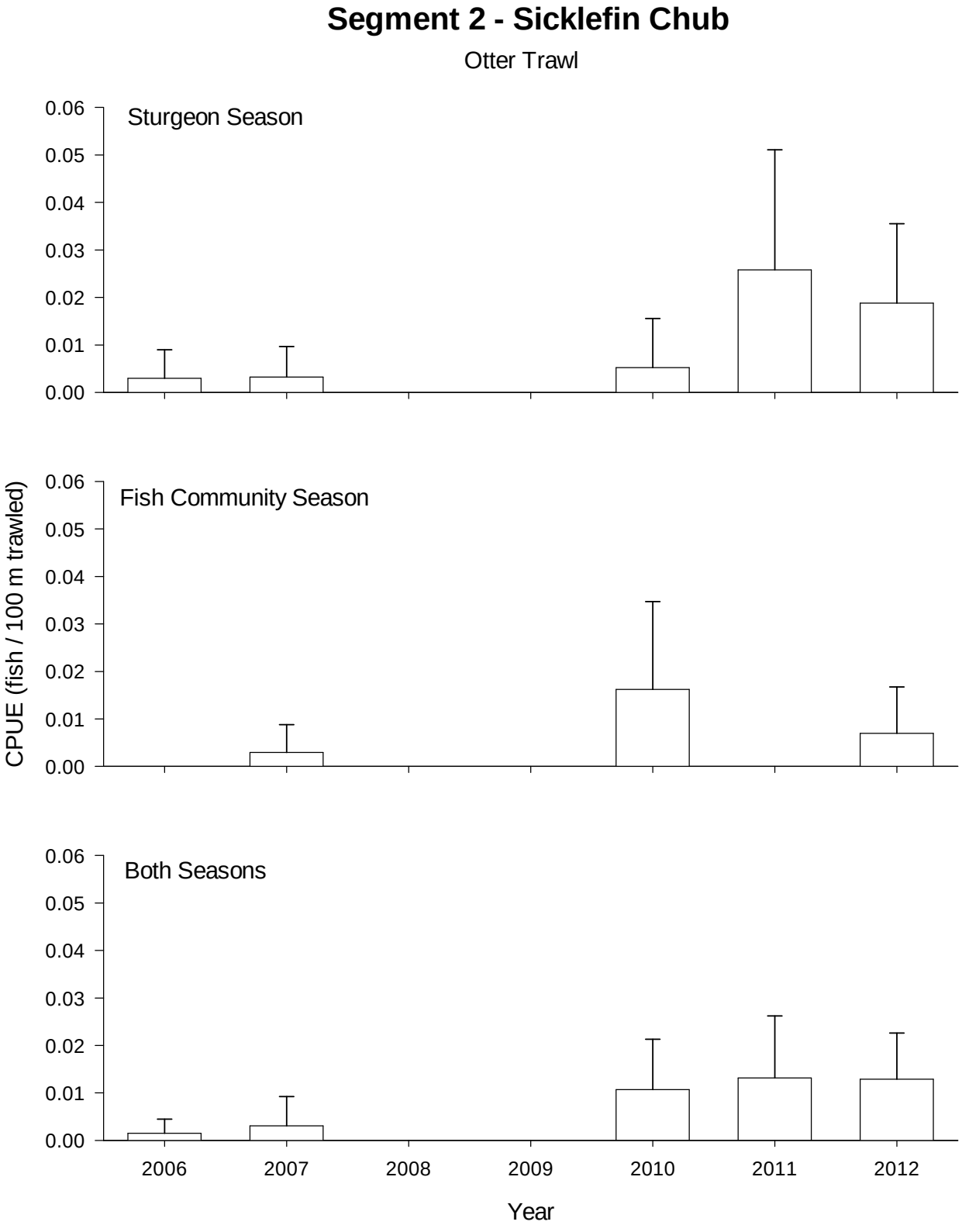

Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 2 of the Missouri River from 2006-2012.

Segment 2 - Sicklefin Chub

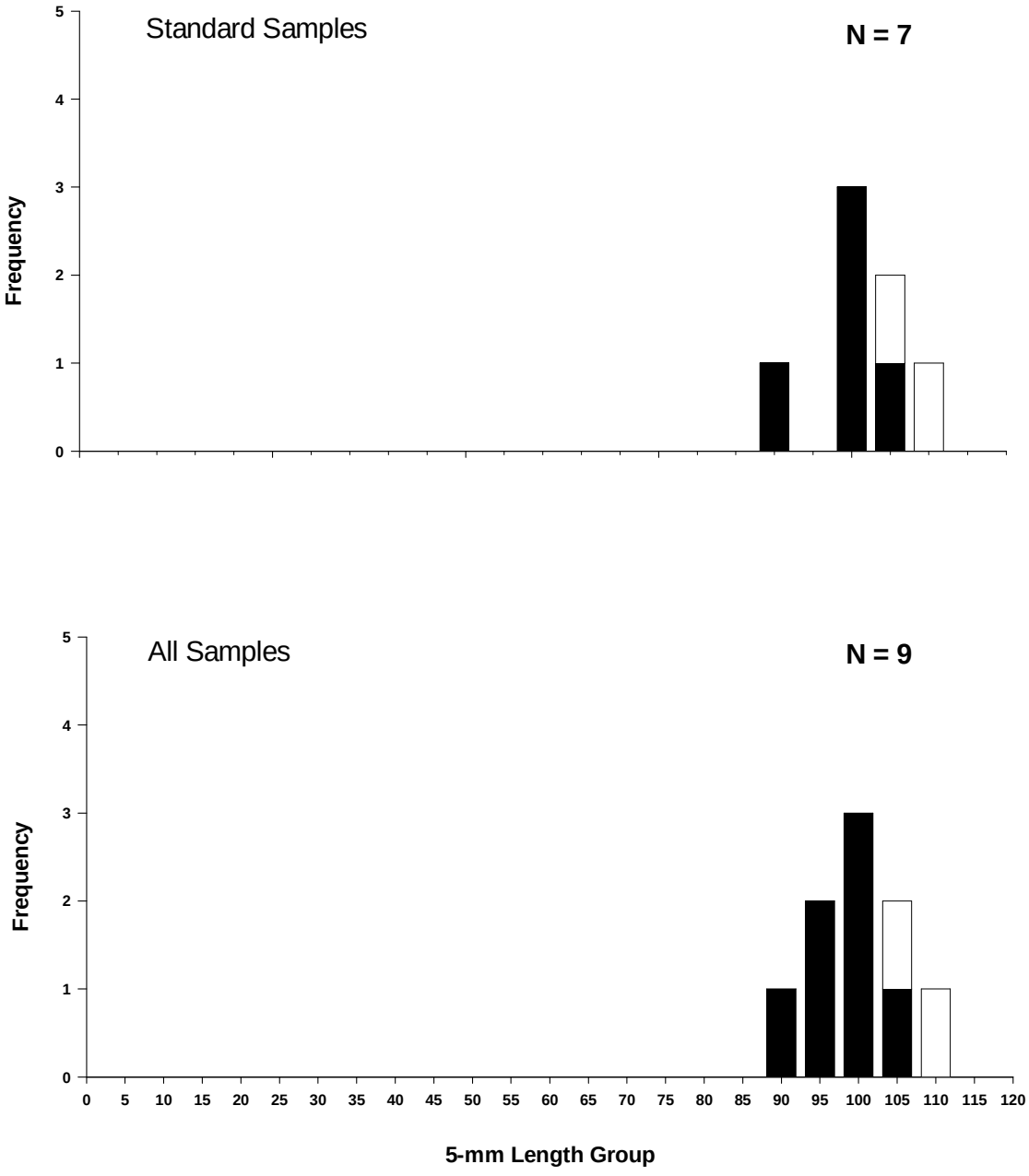

Figure 19. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Sand Shiner

A total of nine sand shiners were captured in Segment 2 in 2012 with mini-fyke nets accounted for all but one sand shiner, which was caught in the otter trawl. This was by far the lowest number of sand shiners sampled since the Program's origination, with the previous low mark set in 2011 with 41 individuals. In response, the lowest ever recorded CPUE for mini-fyke nets was observed (0.095 fish/net night) in Segment 2 in 2012 (Figure 20). In comparison, the highest CPUE recorded for sand shiners in Segment 2 occurred in 2007 (8.543 fish/net night).

The average TL (45.6 mm) for sand shiners in Segment 2 in 2012 did not differ much from previous years; 43.3 mm in 2011 and 42.7 mm in 2010. However, unlike past years, smaller fish (<30 mm) were not represented in Segment 2 sampling (Figure 21), indicating a lack of age-0 fish (Datillo et al. 2008a).

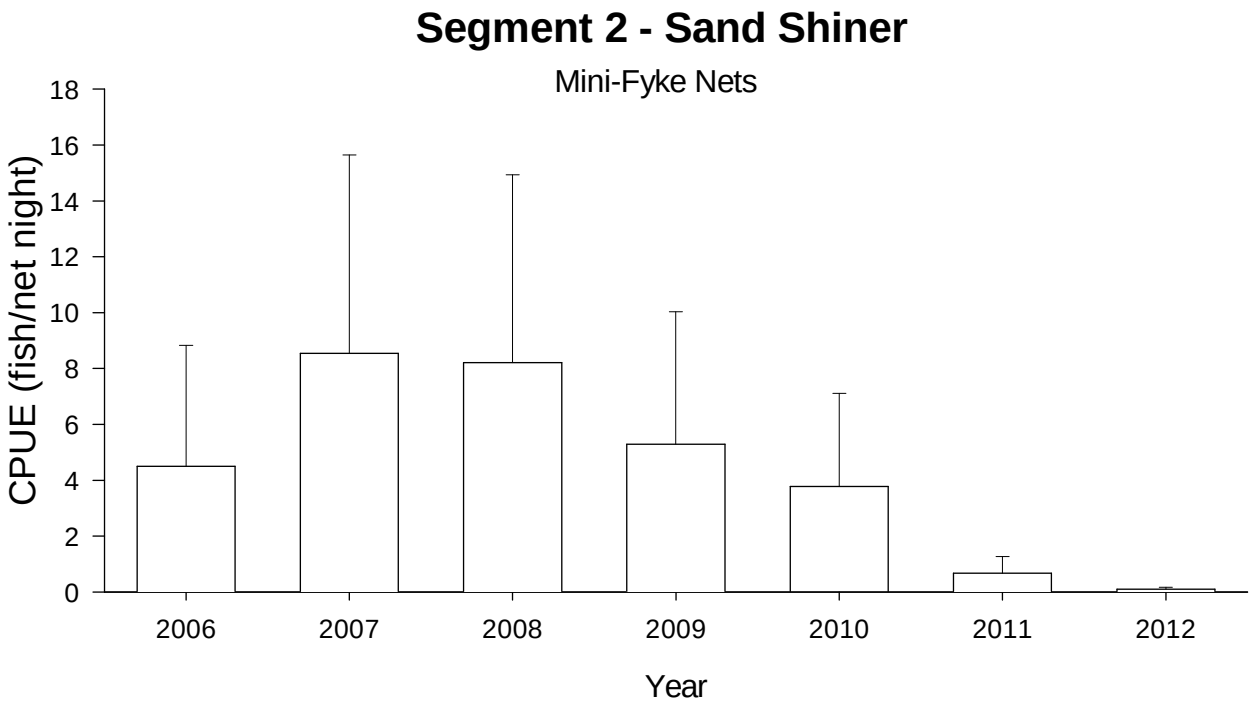

Figure 20. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2012.

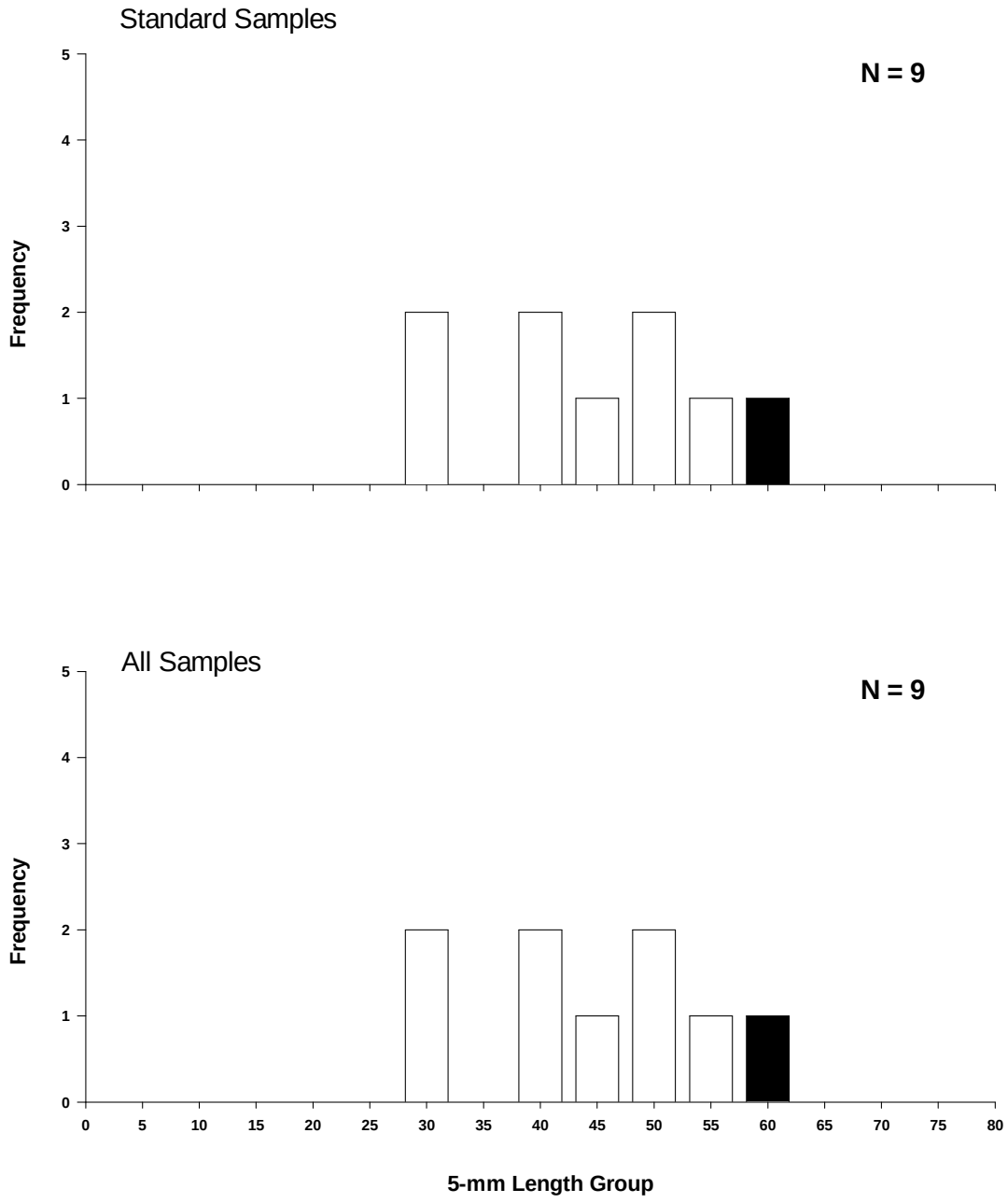

Figure 21. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Hybognathus spp.

Sampling in Segment 2 in 2012 resulted in the capture of only four western silvery minnows, which was less than that seen in 2011 (N=14) and remarkably fewer than 2010 (N=270). All four individuals were observed in mini-fyke nets. As a result, the lowest ever CPUE was calculated for *Hybognathus* spp. in Segment 2 with only 0.042 fish/net night (Figure 22).

Western silvery minnows sampled Segment 2 in 2012 averaged 93.5 mm TL, with all but one (61 mm) measuring over 90 mm. The length frequency in Figure 23 for this very small sample size would indicate that unlike previous years, no age-0 fish (Datillo et al. 2008b) were captured in Segment 2 in 2012.

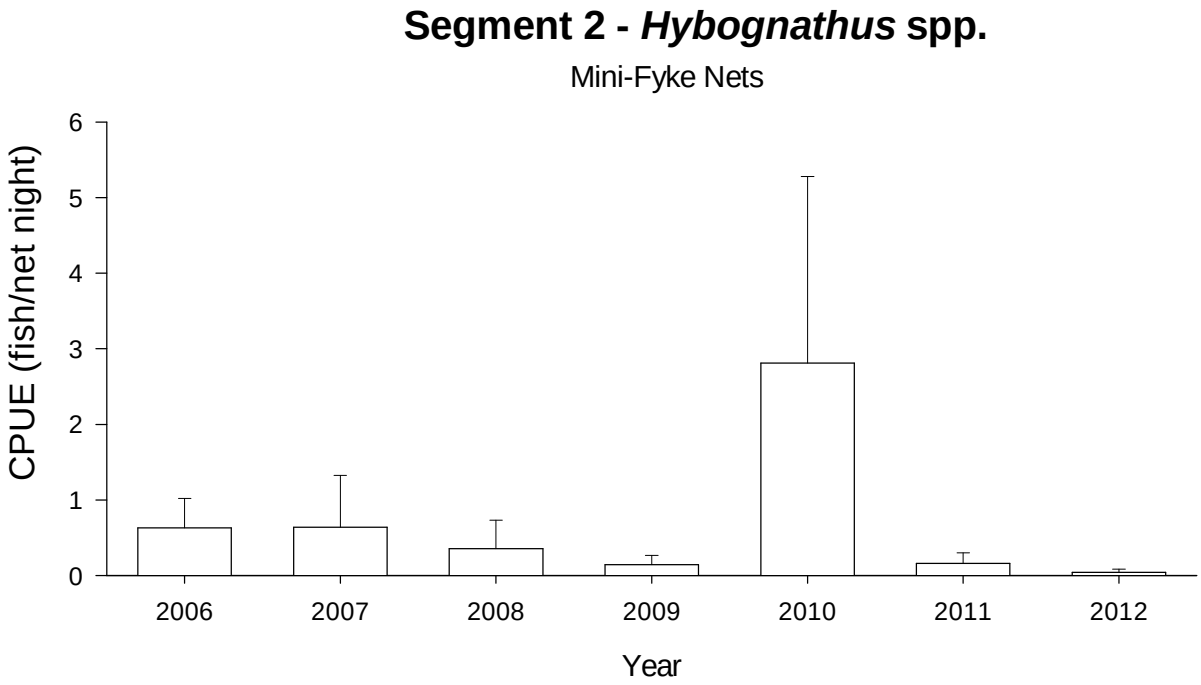

Figure 22. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2012.

Segment 2 - *Hybognathus* spp.

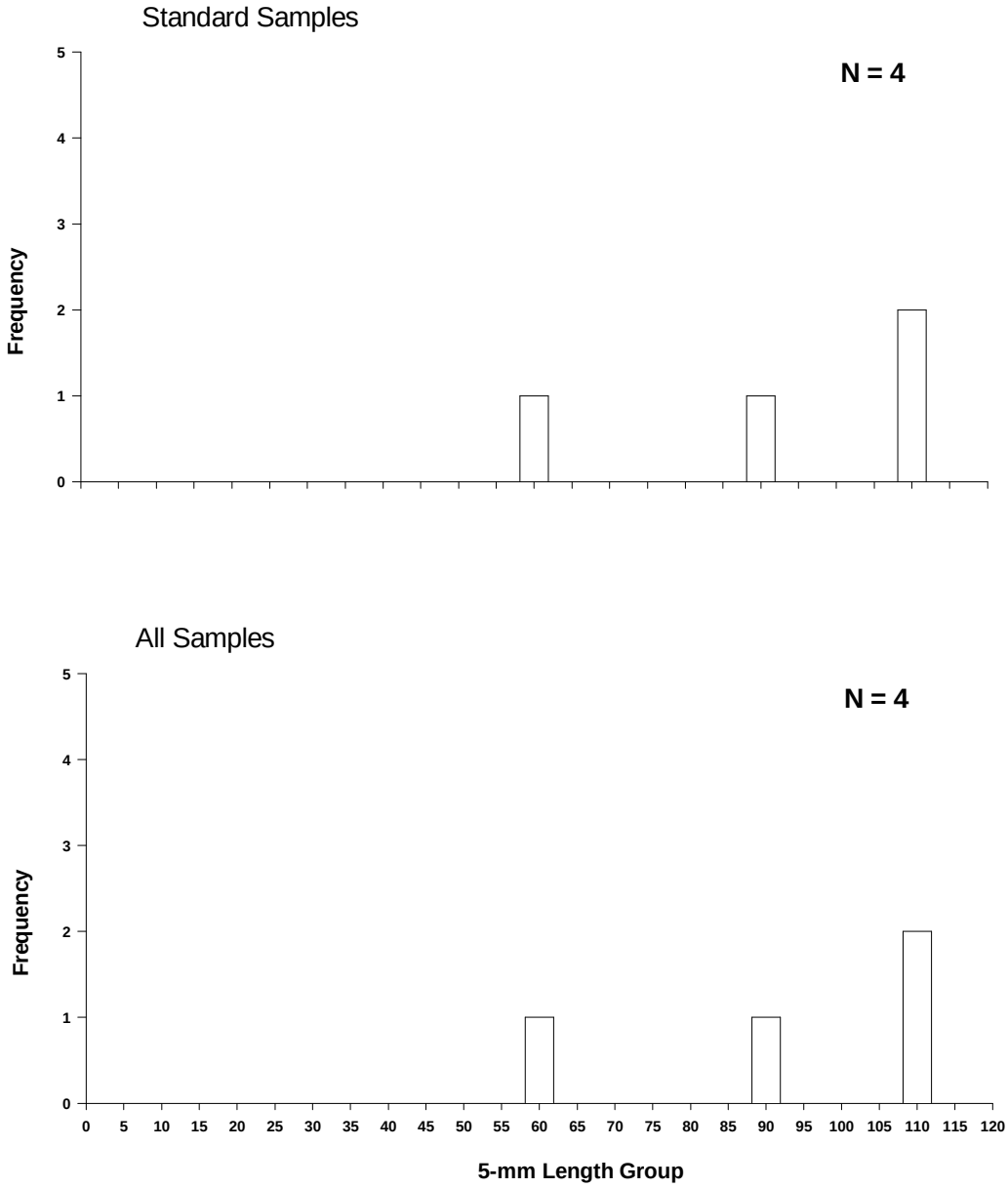

Figure 23. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Blue Sucker

A total of eleven blue suckers were captured during Segment 2 sampling in 2012. To compare, a record low was reported in 2010 (N=4), while the highest total was observed in 2007 (N=36). Trammel nets were responsible for all but one blue sucker, which was captured with the otter trawl. Among seasons, nine blue suckers were observed during sturgeon season, while two were sampled during fish community season.

Trammel net CPUE calculated for Segment 2 in 2012 can be seen in Figure 24. The CPUE for both seasons was 0.02 fish/100 m, which was similar to both 2011 (0.02 fish/100 m) and 2010 (0.01 fish/100 m) but far less than the highest recorded CPUE in 2007 (0.06 fish/100 m). Among seasons, with 2011 being the exception, CPUE during sturgeon season remains higher than that of fish community season. As a result a CPUE of 0.03 fish/100 m was recorded for sturgeon season, while a CPUE of 0.003 fish/100 m was reported for fish community season. The pattern of elevated CPUE during sturgeon season seems to indicate spring spawning movements upstream by adult populations of blue suckers in Segment 2.

Otter trawl captures, and subsequently CPUE (Figure 25), remains sporadic for blue suckers in Segment 2. In 2012 no blue suckers were captured in the otter trawl during sturgeon season, while two were caught during fish community season. As a result a CPUE for combined seasons was noted as 0.005 fish/100 m. Because they are so irregularly captured, it is unlikely to draw any advantageous comparisons using otter trawl data for blue suckers in Segment 2.

The average TL of blue suckers in Segment 2 in 2012 was 680 mm, which nearly identical to past years. As indicated by the length frequency in Figure 26, the sampled population of blue suckers in 2012 once again was comprised of mature fish. Only two presumed YOY blue suckers have been captured in Segment 2, one each in 2010 and 2011.

The total number of blue suckers captured by gear in the specific macro habitats is displayed in Table 14.

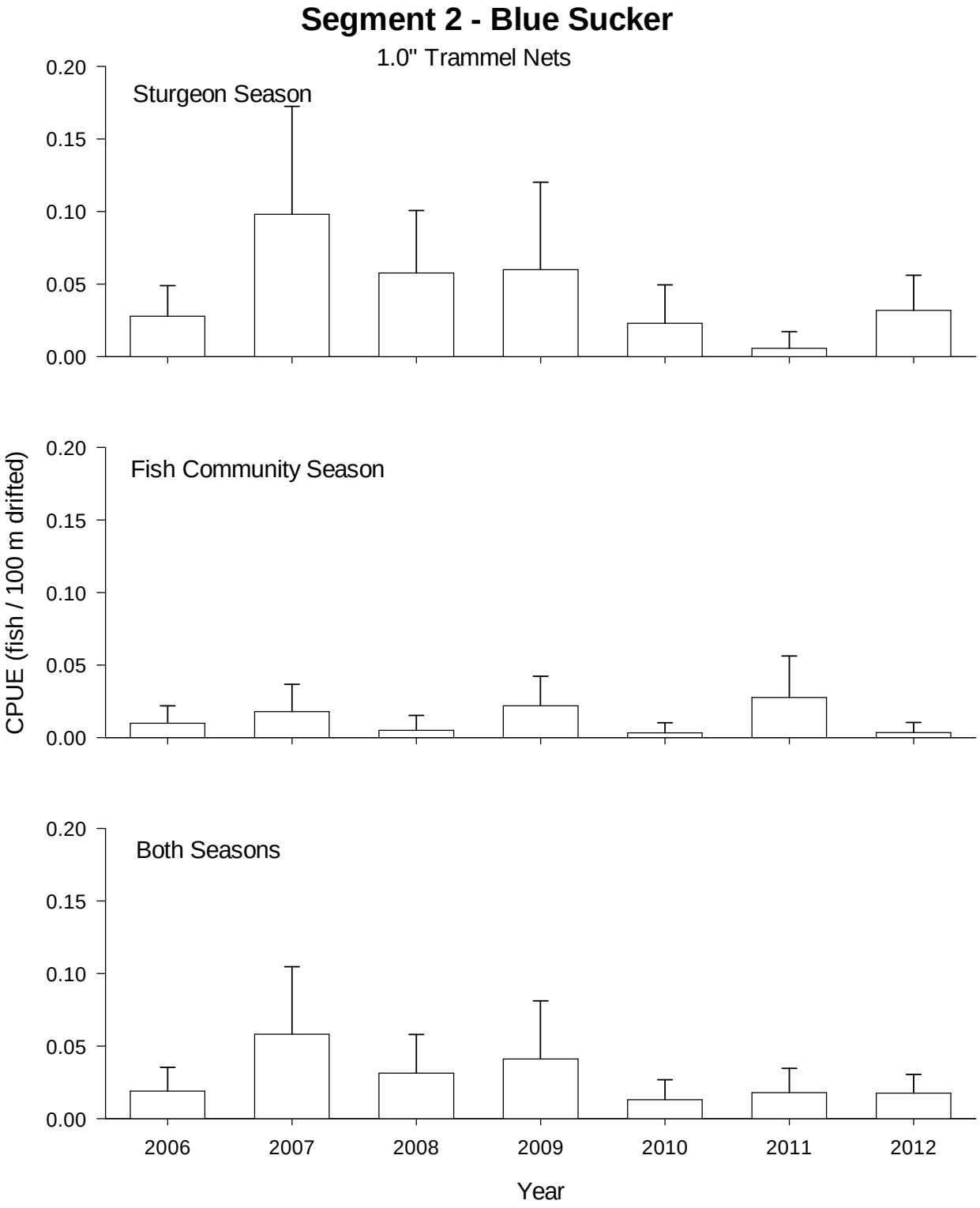

Figure 24. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2012.

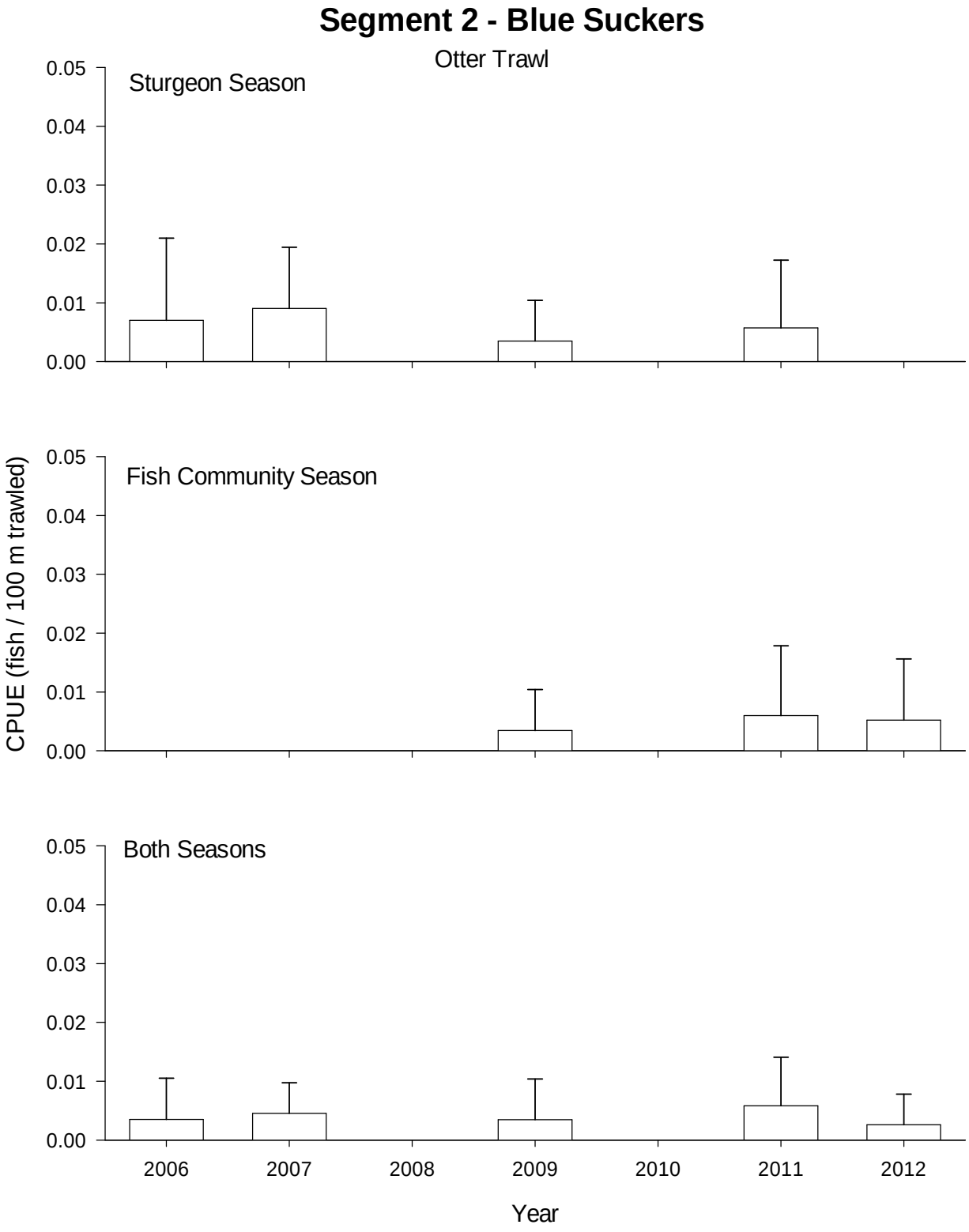

Figure 25. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 2 of the Missouri River from 2006-2012.

Table 14. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0" Trammel Net	7	14	0	57	29	0	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0" Trammel Net	1	100	0	0	0	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	2	38	3	4	15	4	0
Otter Trawl	1	0	100	0	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		30	2	39	23	4	0	0	2

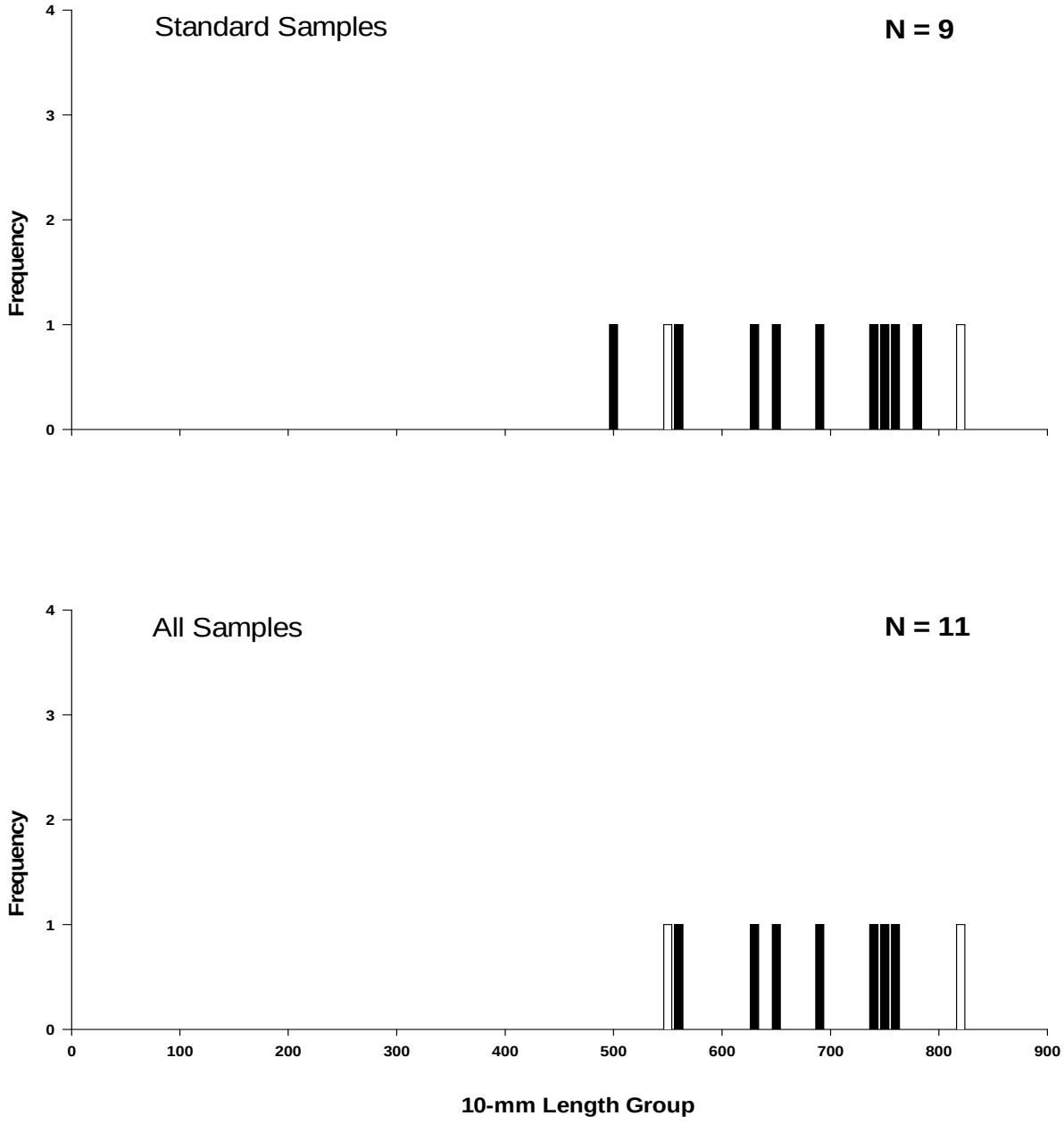

Figure 26. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Sauger

Sampling of Segment 2 in 2012 resulted in the capture of 256 sauger, with the majority (79%) being sampled during sturgeon season, while the remaining 21% were handled during fish community season. The most effective gear for sampling sauger was trammel nets, recording 201 sauger captures in Segment 2 in 2012. The next highest capture rate was otter trawl (N=32), followed by mini-fyke nets (N=15) and trotlines (N=6).

Trammel net CPUE in Segment 2 regarding sauger has remained relatively unchanged since the Program's inception in 2006 (Figure 28). However, new record highs were observed in both overall (0.273 fish/100 m) and sturgeon season (0.479 fish/100 m) CPUE. In comparison, the long term average for trammel net CPUE in Segment 2 for both seasons is 0.187 fish/100 m, while the long term average for sturgeon season is 0.29 fish/100 m. Trammel net CPUE in Segment 2 during fish community season remains, on average, lower than that of sturgeon season. Trammel net CPUE during fish community in 2012 was 0.07 fish/100 m. That calculated CPUE was relatively lower than that of 2011 (0.17 fish/100 m), which was an all time high for fish community season. However, the catch rate during fish community season was not much different that the long term average of 0.09 fish/100 m.

Otter trawl CPUE for both seasons in Segment 2 in 2012, like trammel nets, remains comparable to past years (Figure 29). To compare catch rates, the CPUE for both seasons was 0.056 fish/100 m, which nearly matched the record high recorded in 2007 of 0.059 fish/100 m. Also, like trammel nets, a record high CPUE was witnessed during sturgeon season with 0.072 fish/100 m. Even with these record or near record highs, otter trawl CPUE has not differed drastically from the long term average; 0.044 fish/100 m, 0.052 fish/100 m and 0.035 fish/100 m for combined seasons, sturgeon season and fish community season, respectively.

Mini-fyke net CPUE, in Figure 27, for Segment 2 in 2012 (0.13 fish/net night) reached its highest mark since a record was set in 2007 (0.14 fish/net night). However, with mini-fyke net sampling being the most useful tool to monitor YOY sauger production, none were present in the sampling efforts of 2012.

Sauger TL for Segment 2 in 2012 averaged 374 mm, with a range from 202 mm to 569 mm. The average size of sauger was comparable to previous years. Like previous years, the

largest sauger sampled in Segment 2 in 2012 were captured on trotlines (388 mm). The smallest size class of fish were observed in mini-fyke nets.

The total number of sauger sampled by gear in specific macro habitats is depicted in Table 15.

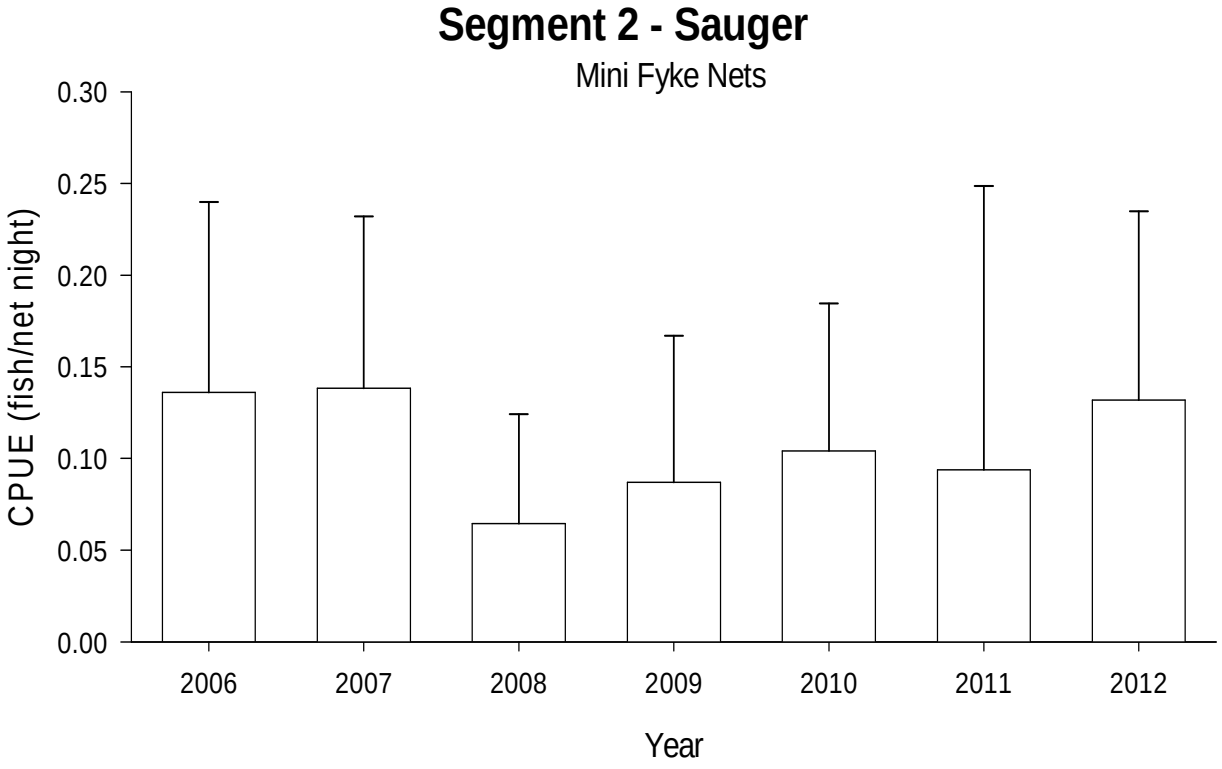

Figure 27. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini-fyke nets in Segment 2 of the Missouri River from 2006-2012.

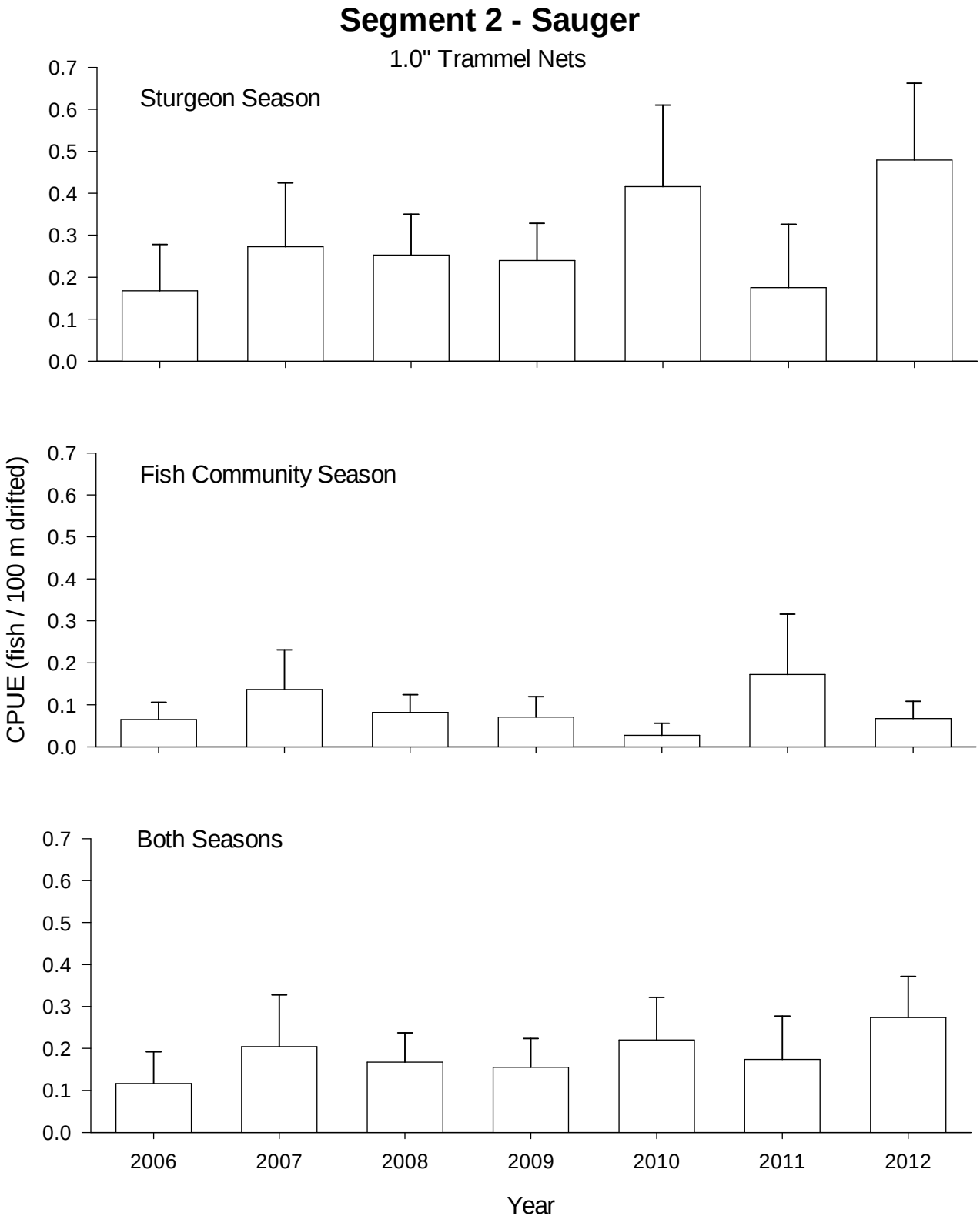

Figure 28. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2012.

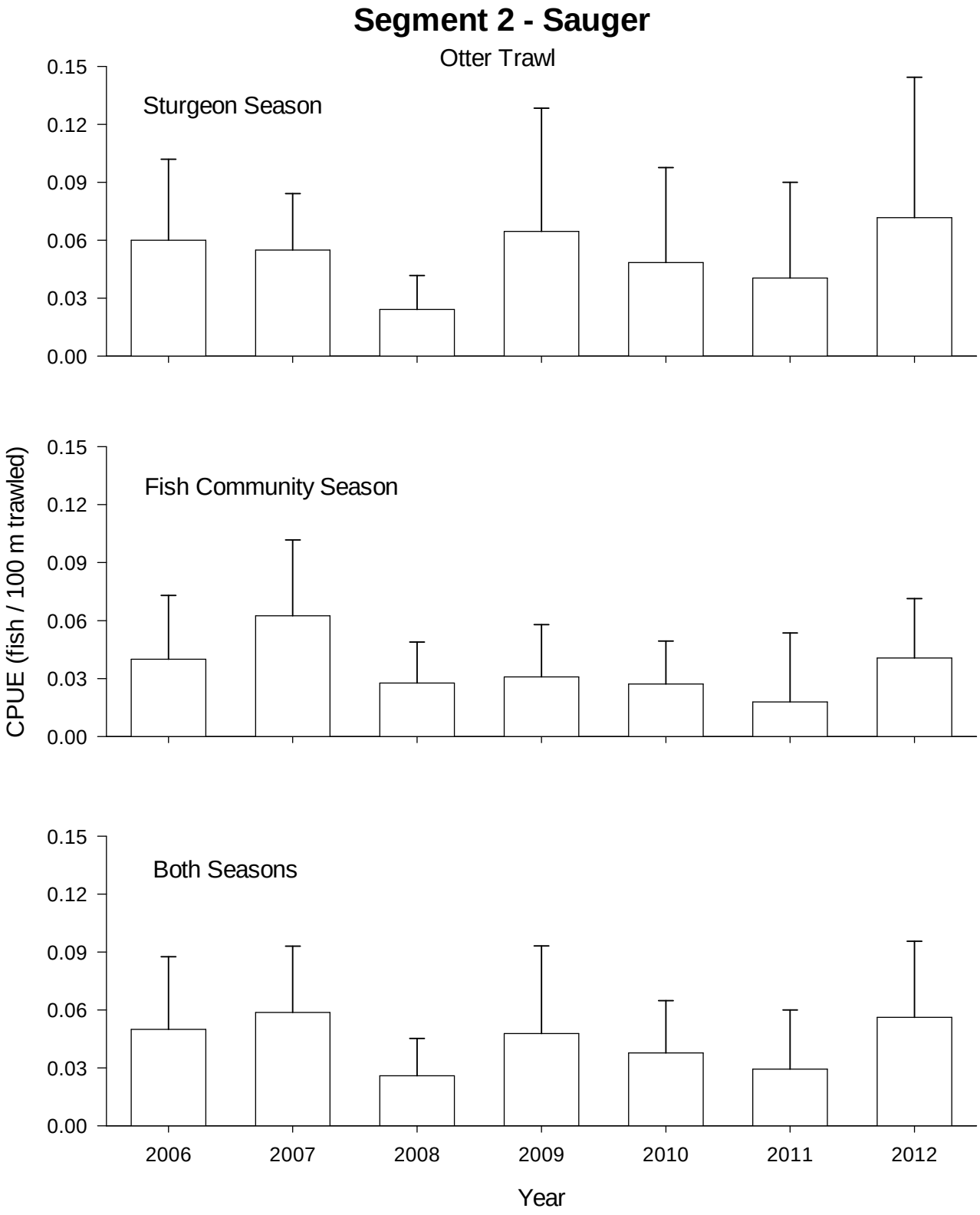

Figure 29. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 2 of the Missouri River from 2006-2012.

Table 15. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2012. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]							
Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	116	21	0	48	25	6	0	0	0
		34	3	33	25	4	0	0	0
Otter Trawl	17	18	71	12	0	0	0	0	0
		37	2	32	24	5	0	0	0
Fish Community Season									
1.0” Trammel Net	15	53	0	27	20	0	0	0	0
		43	1	32	21	3	0	0	0
Mini-Fyke Net	15	27	7	20	33	0	0	13	0
		34	2	38	3	4	15	4	0
Otter Trawl	11	9	9	82	0	0	0	0	0
		37	2	32	25	4	0	0	0
Both Seasons									
Trot Lines	6	0	0	50	17	17	0	0	17
		30	2	39	23	4	0	0	2

Segment 2 - Sauger

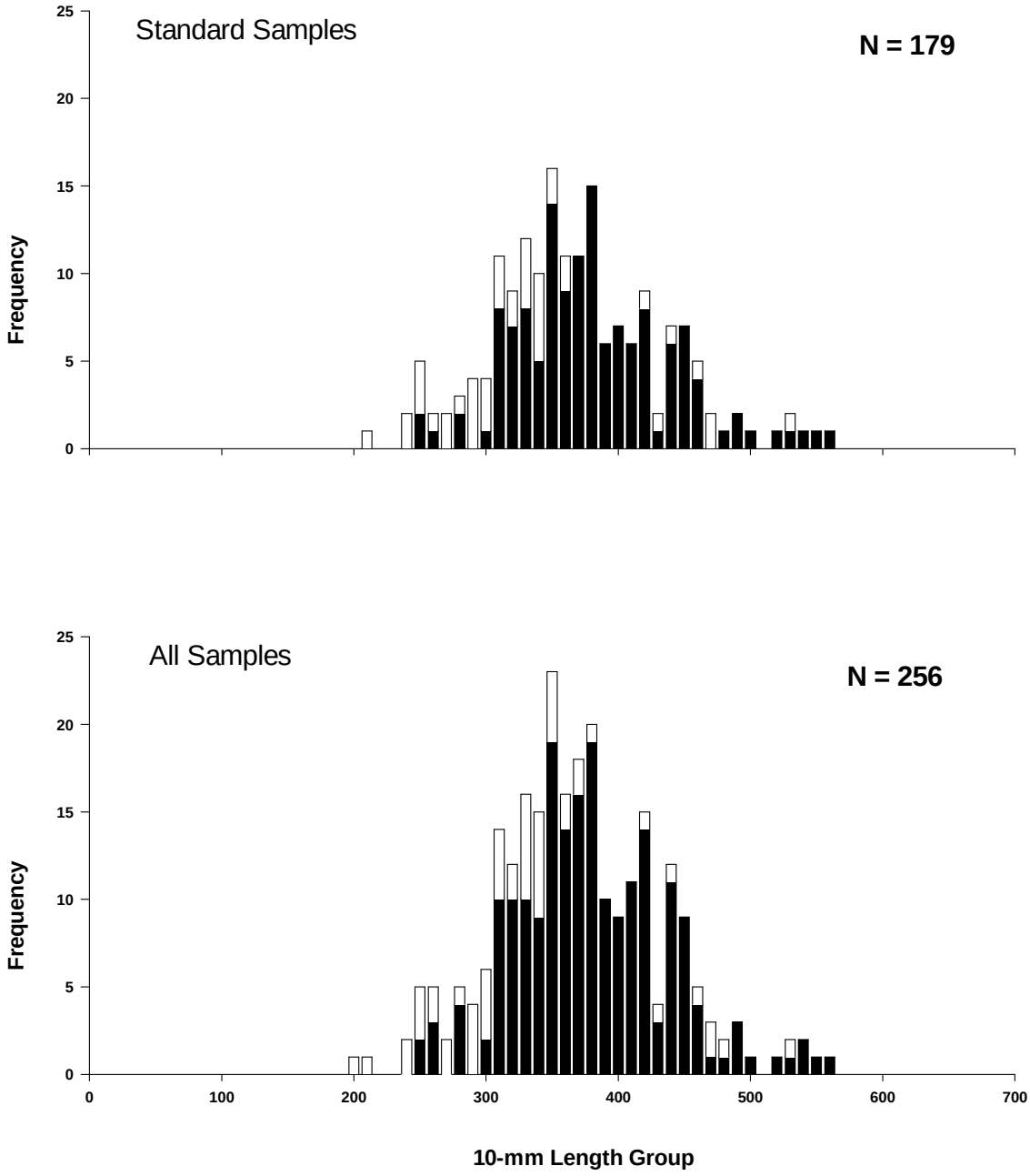

Figure 30. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2012. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2012.

Missouri River Fish Community

The 2012 sampling events in Segment 2 of the Missouri River in Montana produced a total of 9,141 fish consisting of thirty-five species. White suckers *Catostomus commersoni* were the most abundant species observed (N=4,391), with the majority being YOY captures resulting from mini-fyke net deployments. In Segment 2 it seems to be a reoccurring event to have large numbers of YOY *Catostomus spp.* present during mini-fyke net sampling. The next most abundant species, with 1,268 observations, was fathead minnows *Pimephales promelas,* which were also primarily sampled in min-fyke nets. Shovelnose sturgeon, which were the thirds most captured species, remain abundant in Segment 2. As a result 1,264 shovelnose sturgeon were captured in 2012, and unlike the aforementioned species, none were observed in min-fyke nets. This was consequently the highest recorded total of shovelnose sturgeon captures ever recorded in Segment 2.

As was the case in past years, river carpsuckers *Carpiodes carpio* continued to be a common species observed in Segment 2 in 2012. A total of 636 individuals were captured, with mini-fyke nets accounting for 90% of the total catch. Like white sucker captures, river carpsucker numbers can be inflated by YOY fish that are frequently observed in the fyke nets.

A total of 245 flathead chubs *Platygobio gracilis* were handled in Segment 2 in 2012. While total captures were not drastically different from the record high in 2007 (N=355) or the record low in 2009 (N=66), what was notable was the abundance of larger flathead chubs captured in trammel nets. In 2012 49% of the flathead chubs observed were sampled in trammel net deployments, in comparison; the next highest percentage was witnessed in 2009 when 18% of flathead chubs were captured using the same gear. As a result, the highest average TL for flathead chubs (201 mm) in Segment 2 was recorded in 2012. In contrast, the next highest average TL was observed in 2010, which was 118 mm.

Sampling events in Segment 2 in 2012 resulted in the capture of 235 long nosesuckers *C. catostomus*, which was more than witnessed in 2011 (N=126) but far fewer than observed in 2010 (N=530). Like years past, the majority (84%) of longnose sucker captures in Segment 2 in 2012 were represented by YOY fish being captured in mini-fyke nets.

Goldeye *Hiodon alosoides* observations in Segment 2 in 2012 (N=184) were comparable to those witnessed in 2011 (N=143), but less than those observed in 2010 (N=285). However,

unlike 2010 and 2011, the prevalence of YOY goldeyes was nearly nonexistent. Only two goldeyes under 50 mm TL were observed in Segment 2 in 2012.

Channel catfish *Ictalurus punctatus* were the tenth most abundant species captured in Segment 2 of the Missouri River in 2012, with a total of ninety-eight individuals. Channel catfish averaged 325 mm TL in 2012, which was nearly identical to both 2011 and 2010. They ranged in size from 31 mm to 579 mm, and similarly to other years, the majority of the larger fish (>400 mm) were captured using trotlines.

It was anticipated that we could see some intermediate sized smallmouth *Ictiobus bubalus* and bigmouth buffalo *I. cyprinellus* in segement 2 in 2012, given that more YOY buffalo were sampled in Segment 2 in 2011 than any previous year. However, results in 2012 were comparable to previous years, with only ten larger individuals (>450 mm) and numerous YOY (<80 mm) *Ictiobus spp.* being sampled.

Other species present in the 2012 sampling year throughout Segment 2 in rank of abundance were; emerald shiner *Notropis atherinoides* (N=50), shorthead readhorse *Moxostoma macrolepidotum* (N=47), common carp *Cyrpinus carpio* (N=44), bluegill *Lempomis macrochirus* (N=21), spottail shiner *Notropis hudsonius* (N=20), longnose dace *Rhinichthys cataractae* (N=20), walleye *Sander vitreus* (N=14), rainbow trout *Onchorhynchus mykiss* (N=6), burbot *Lota lota* (N=6), freshwater drum *Aplodinotus grunniens* (N=4) and northern pike *Esox lucius* (N=3).

Discussion

The 2012 sampling season resulted in extremely interesting data on pallid sturgeon. More pallid sturgeon were captured within Segment 2 during 2012 than the previous six sampling years combined. This increase in abundance was likely due to the high flows observed in 2011 and the resulting changes in habitat condition. Before 2011, relatively few pallid sturgeon were captured within Segment 2, when compared to downstream Segments 3 and 4. However, during 2011 and 2012 our data indicate a mass migration of juvenile pallid sturgeon in an upstream manner. Within the adjacent and downstream Segment 3, more pallid sturgeon were captured in upstream portions during 2012 than any prior sampling year. Prior to 2012 the majority of Segment 3 captures and especially the capture of larger pallid sturgeon occurred in the lower most sections of the Segment. Data collected indicate that changes in flow management of the Fort Peck Dam Project could increase the amount of suitable habitat for pallid sturgeon within RMPA 2/

Standardized trammel net data indicate that the relative abundance of pallid sturgeon within Segment 2 is on an increasing trajectory. During 2012, the highest trammel net CPUE was recorded with an estimate of 0.05 fish/100 m. However, unlike trammel nets, overall otter trawl CPUE fort the past seven seasons does not seem to be increasing appreciably. While the CPUE for 2012 (0.02 fish/100 m) was comparable to that of 2011 (0.02 fish/100 m) it was nearly half that of 2010 (0.04 fish/100 m). Although it appeared a possible pattern of increasing CPUE for otter trawl during sturgeon season has been emerging since 2009, CPUE in 2012 fell from a record high in 2011 (0.05 fish/100 m) to 0.031 fish/100 m. Otter trawl CPUE for fish community season in Segment 2 remains highly stochastic. Trotlines remain, possibly, the most effective gear for sampling pallid sturgeon in Segment 2. Since trotlines were implemented as a standard gear in 2010, CPUE has steadily risen. New record highs were set for both seasons, as well as sturgeon and fish community seasons with 0.57 fish/20 hooks, 0.54 fish/20 hooks and 0.60 fish/20 hooks, respectively.

The possible explanation for the increasing trammel net CPUE (for both seasons) and the increasing CPUE for trotlines for both seasons, as well as individual seasons, is the increasing size structure of the pallid sturgeon population in Segment 2. Trotlines and trammel nets regularly catch larger sized fish compared to otter trawls. Pallid sturgeon in Segment 2 during

2012 averaged 391 mm in fork length, which was an increase from 369 mm in 2011. The increase can also be partially attributed to four pallid sturgeon ranging from 655 mm to 1060 mm, all of which were larger than any pallid sturgeon previously captured in Segment 2 by Population Assessment crews.

It is likely that the increase in average size came from older and larger fish migrating from downstream locations. These fish were most likely draw upstream in 2011 by prolonged flows from both the Milk River and Fort Peck Spillway releases, and in turn remained there into the 2012 field season. During "normal" years, when cold, clear releases dominate the majority of Segment 2, older age classes of pallid sturgeon are found more frequently downstream in the more naturalized portions of Segment 3.

Despite the fact that relative condition for the two most frequently captured size classes (sub-stock 200-329 mm and stock) decreased from the levels observed in 2011, Wr was still higher in 2012 than it was in 2010. The sub-stock (200-329 mm) size class continues to exhibit the highest Wr of any other size class of pallid sturgeon in Segment 2.

Nine year classes were represented in Segment 2 sampling in 2012; the most ever sampled by the Program. Year class in rank of abundance were; 2009 (N=60), 2006 (N=29), 2008 (N=26), 2010 (N=23), 2005 (N=8), 2007 (N=7), 2001 (N=4), 2004 (N=2), 1999 (N=1) and 1997 (N=1). Previously to the 2012 field season, pallid sturgeon older than 2001 had never been observed in Segment 2 of the Missouri River.

Sampling in 2012 produced 1,264 shovelnose sturgeon, which eclipsed the previous high recorded in 2010 (N=1,085). Despite the fact that shovelnose sturgeon captures were at previously unseen levels, there were no considerable increases in CPUE for any gear during any particular season, with the exception of otter trawl CPUE during fish community season which was recorded at 0.42 fish/100 m. In comparison, the previous high was 0.26 fish/100 m observed in 2010. The shovelnose sturgeon population in Segment 2 continues to be dominated by adult fish over 400 mm in FL, despite sampling the smallest individual ever (239 mm) captured by the Program. Conversely, shovelnose sturgeon under <400 mm FL are much more common in segment 3, representing 11.7% of the total catch, compared to less than one percent of the total catch in Segment 2. All indications are that the majority of habitat available within Segment 2 of the Missouri River is not conducive to shovelnose sturgeon rearing.

Although major changes occurred to the morphology of the Missouri River in Segment 2 in 2011, it is not yet clear what these changes mean to the overall diversity and relative

abundance to the fish species. While certain species in 2012 such as shovelnose sturgeon were observed at record high levels, other species, such as sand shiners, were captured at all time lows. Further monitoring will also indicate if the larger, older age classes of pallid sturgeon observed in 2012, thought to be drawn upstream by elevated discharge, continue to inhabit areas of Segment 2, or if those fish will migrate downstream into segment 3 where older age classes are more frequently observed.

Findings from the 2012 field season give further relevance to changing the normal operations of Fort Peck Dam. The fact that more pallid sturgeon were found in upstream sections of Segment 2 and Segment 3 during both years lends evidence that pallid sturgeon rearing habitat may be increased with more naturalized flows. These data coupled with FWP's observations of mass wild adult movements and spawning within Segment 2 during 2011 support the need for future manipulations of flows at the Fort Peck Dam Project to test if these type of results can be duplicated. Some resemblance of flow restoration on the Missouri River downstream of Fort Peck Dam will likely be necessary to recover this imperiled species.

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Appendices

Appendix A. Phylogenetic list of Missouri River fishes with corresponding letter codes used in the long-term pallid sturgeon and associated fish community sampling program. The phylogeny follows that used by the American Fisheries Society, Common and Scientific Names of Fishes from the United States and Canada, 5th edition. Asterisks and bold type denote targeted native Missouri River species.

Scientific name	Common name	Letter Code
	CLASS CEPHALASPIDOMORPHI-LAMPREYS	
	ORDER PETROMYZONTIFORMES	
	Petromyzontidae – lampreys	
Ichthyomyzon castaneus	Chestnut lamprey	CNLP
Ichthyomyzon fossor	Northern brook lamprey	NBLP
Ichthyomyzon unicuspis	Silver lamprey	SVLP
Ichthyomyzon gagei	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
	CLASS OSTEICHTHYES – BONY FISHES	
	ORDER ACIPENSERIFORMES	
	Acipenseridae – sturgeons	
Acipenser fulvescens	Lake sturgeon	LKSG
Scaphirhynchus spp.	Unidentified Scaphirhynchus	USG
Scaphirhynchus albus	**Pallid sturgeon**	**PDSG***
Scaphirhynchus platorynchus	**Shovelnose sturgeon**	**SNSG***
S. albus X S. platorynchus	Pallid-shovelnose hybrid	SNPD
	Polyodontidae – paddlefishes	
Polyodon spathula	Paddlefish	PDFH
	ORDER LEPISOSTEIFORMES	
	Lepisosteidae – gars	
Lepisosteus oculatus	Spotted gar	STGR
Lepisosteus osseus	Longnose gar	LNGR
Lepisosteus platostomus	Shortnose gar	SNGR
	ORDER AMMIFORMES	
	Amiidae – bowfins	
Amia calva	Bowfin	BWFN
	ORDER OSTEOGLOSSIFORMES	
	Hiodontidae – mooneyes	
Hiodon alosoides	Goldeye	GDEY
Hiodon tergisus	Mooneye	MNEY
	ORDER ANGUILLIFORMES	
	Anguillidae – freshwater eels	
Anguilla rostrata	American eel	AMEL
	ORDER CLUPEIFORMES	
	Clupeidae – herrings	
Alosa alabame	Alabama shad	ALSD
Alosa chrysochloris	Skipjack herring	SJHR
Alosa pseudoharengus	Alewife	ALWF
Dorosoma cepedianum	Gizzard shad	GZSD
Dorosoma petenense	Threadfin shad	TFSD

Appendix A. (continued).

Scientific name	Common name	Lettter Code
D. cepedianum X D. petenense	Gizzard-threadfin shad hybrid	GSTS
	ORDER CYPRINIFORMES	
	Cyprinidae – carps and minnows	
Campostoma anomalum	Central stoneroller	CLSR
Campostoma oligolepis	Largescale stoneroller	LSSR
Carassius auratus	Goldfish	GDFH
Carassus auratus X Cyprinius carpio	Goldfish-Common carp hybrid	GFCC
Couesius plumbens	Lake chub	LKCB
Ctenopharyngodon idella	Grass carp	GSCP
Cyprinella lutrensis	Red shiner	RDSN
Cyprinella spiloptera	Spotfin shiner	SFSN
Cyprinus carpio	Common carp	CARP
Erimystax x-punctatus	Gravel chub	GVCB
Hybognathus argyritis	**Western slivery minnow**	**WSMN***
Hybognathus hankinsoni	Brassy minnow	BSMN
Hybognathus nuchalis	Mississippi silvery minnow	SVMW
Hybognathus placitus	**Plains minnow**	**PNMW***
Hybognathus spp.	Unidentified Hybognathus	HBNS
Hypophthalmichthys molitrix	Silver carp	SVCP
Hypophthalmichthys nobilis	Bighead carp	BHCP
Luxilus chrysocephalus	Striped shiner	SPSN
Luxilus cornutus	Common shiner	CMSN
Luxilus zonatus	Bleeding shiner	BDSN
Lythrurus unbratilis	Western redfin shiner	WRFS
Macrhybopsis aestivalis	**Shoal chub**	**SKCB***
Macrhybopsis gelida	**Sturgeon chub**	**SGCB***
Macrhybopsis meeki	**Sicklefin chub**	**SFCB***
Macrhybopsis storeriana	Silver chub	SVCB
M. aestivalis X M. gelida	Shoal-Sturgeon chub hybrid	SPST
M. gelida X M. meeki	Sturgeon-Sicklefin chub hybrid	SCSC
Macrhybopsis spp.	Unidentified chub	UHY
Margariscus margarita	Pearl dace	PLDC
Mylocheilus caurinus	Peamouth	PEMT
Nocomis biguttatus	Hornyhead chub	HHCB
Notemigonus crysoleucas	Golden shiner	GDSN
Notropis atherinoides	Emerald shiner	ERSN
Notropis blennius	River shiner	RVSN
Notropis boops	Bigeye shiner	BESN
Notropis buchanani	Ghost shiner	GTSN
Notropis dorsalis	Bigmouth shiner	BMSN
Notropis greenei	Wedgespot shiner	WSSN
	Cyprinidae – carps and minnows	
Notropis heterolepsis	Blacknose shiner	BNSN
Notropis hudsonius	Spottail shiner	STSN
Notropis nubilus	Ozark minnow	OZMW
Notropis rubellus	Rosyface shiner	RYSN
Notropis shumardi	Silverband shiner	SBSN
Notropis stilbius	Silverstripe shiner	SSPS
Notropis stramineus	**Sand shiner**	**SNSN***
Notropis topeka	Topeka shiner	TPSN
Notropis volucellus	Mimic shiner	MMSN

Appendix A. (continued).

Scientific name	Common name	Letter Code
Notropis wickliffi	Channel shiner	CNSN
Notropis spp.	Unidentified shiner	UNO
Opsopoeodus emiliae	Pugnose minnow	PNMW
Phenacobius mirabilis	Suckermouth minnow	SMMW
Phoxinus eos	Northern redbelly dace	NRBD
Phoxinus erythrogaster	Southern redbelly dace	SRBD
Phoxinus neogaeus	Finescale dace	FSDC
Pimephales notatus	Bluntnose minnow	BNMW
Pimephales promelas	Fathead minnow	FHMW
Pimephales vigilax	Bullhead minnow	BHMW
Platygobio gracilis	Flathead chub	FHCB
P. gracilis X M. meeki	Flathead-sicklefin chub hybrid	FCSC
Rhinichthys atratulus	Blacknose dace	BNDC
Rhinichthys cataractae	Longnose dace	LNDC
Richardsonius balteatus	Redside shiner	RDSS
Scardinius erythrophthalmus	Rudd	RUDD
Semotilus atromaculatus	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	Unidentified Asian Carp	UAC
	Catostomidae - suckers	
Carpiodes carpio	River carpsucker	RVCS
Carpiodes cyprinus	Quillback	QLBK
Carpiodes velifer	Highfin carpsucker	HFCS
Carpiodes spp.	Unidentified Carpiodes	UCS
Catostomus catostomus	Longnose sucker	LNSK
Catostomus commersonii	White sucker	WTSK
Catostomus platyrhynchus	Mountain sucker	MTSK
Catostomus spp.	Unidentified *Catostomus* spp.	UCA
Cycleptus elongatus	**Blue sucker**	**BUSK***
Hypentelium nigricans	Northern hog sucker	NHSK
Ictiobus bubalus	Smallmouth buffalo	SMBF
Ictiobus cyprinellus	Bigmouth buffalo	BMBF
Ictiobus niger	Black buffalo	BKBF
Ictiobus spp.	Unidentified buffalo	UBF
Minytrema melanops	Spotted sucker	SPSK
Moxostoma anisurum	Silver redhorse	SVRH
Moxostoma carinatum	River redhorse	RVRH
Moxostoma duquesnei	Black redhorse	BKRH
Moxostoma erythrurum	Golden redhorse	GDRH
Moxostoma macrolepidotum	Shorthead redhorse	SHRH
Moxostoma spp.	Unidentified redhorse	URH
Catostomidae - suckers	Unidentified Catostomidae	UCT
	ORDER SILURIFORMES	
	Ictaluridae – bullhead catfishes	
Ameiurus melas	Black bullhead	BKBH
Ameiurus natalis	Yellow bullhead	YLBH
Ameiurus nebulosus	Brown bullhead	BRBH
Ameiurus spp.	Unidentified bullhead	UBH
Ictalurus furcatus	Blue catfish	BLCF

Appendix A. (continued).

Scientific name	Common name	Letter Code
Ictalurus punctatus	Channel catfish	CNCF
I. furcatus X I. punctatus	Blue-channel catfish hybrid	BCCC
Ictalurus spp.	Unidentified *Ictalurus* spp.	UCF
Noturus exilis	Slender madtom	SDMT
Noturus flavus	Stonecat	STCT
Noturus gyrinus	Tadpole madtom	TPMT
Noturus nocturnus	Freckled madtom	FKMT
Pylodictis olivaris	Flathead catfish	FHCF
	ORDER SALMONIFORMES	
	Esocidae - pikes	
Esox americanus vermiculatus	Grass pickerel	GSPK
Esox lucius	Northern pike	NTPK
Esox masquinongy	Muskellunge	MSKG
E. lucius X E. masquinongy	Tiger Muskellunge	TGMG
	Umbridae - mudminnows	
Umbra limi	Central mudminnow	MDMN
	Osmeridae - smelts	
Osmerus mordax	Rainbow smelt	RBST
	Salmonidae - trouts	
Coregonus artedi	Lake herring or cisco	CSCO
Coregonus clupeaformis	Lake whitefish	LKWF
Oncorhynchus aguabonita	Golden trout	GDTT
Oncorhynchus clarkii	Cutthroat trout	CTTT
Oncorhynchus kisutch	Coho salmon	CHSM
Oncorhynchus mykiss	Rainbow trout	RBTT
Oncorhynchus nerka	Sockeye salmon	SESM
Oncorhynchus tshawytscha	Chinook salmon	CNSM
Prosopium cylindraceum	Bonneville cisco	BVSC
Prosopium williamsoni	Mountain whitefish	MTWF
Salmo trutta	Brown trout	BNTT
Salvelinus fontinalis	Brook trout	BKTT
Salvelinus namaycush	Lake trout	LKTT
Thymallus arcticus	Arctic grayling	AMGL
	ORDER PERCOPSIFORMES	
	Percopsidae – trout-perches	
Percopsis omiscomaycus	Trout-perch	TTPH
	ORDER GADIFORMES	
	Gadidae - cods	
Lota lota	Burbot	BRBT
	ORDER ATHERINIFORMES	
	Cyprinodontidae - killifishes	
Fundulus catenatus	Northern studfish	NTSF
Fundulus diaphanus	Banded killifish	BDKF
Fundulus notatus	Blackstripe topminnow	BSTM
Fundulus olivaceus	Blackspotted topminnow	BPTM
Fundulus sciadicus	Plains topminnow	PTMW

Appendix A. (continued).

Scientific name	Common name	Letter Code
Fundulus zebrinus	Plains killifish	PKLF
	Poeciliidae - livebearers	
Gambusia affinis	Western mosquitofish	MQTF
	Atherinidae - silversides	
Labidesthes sicculus	Brook silverside	BKSS
	ORDER GASTEROSTEIFORMES	
	Gasterosteidae - sticklebacks	
Culaea inconstans	Brook stickleback	BKSB
	ORDER SCORPAENIFORMES	
	Cottidae - sculpins	
Cottus bairdi	Mottled sculpin	MDSP
Cottus carolinae	Banded sculpin	BDSP
	ORDER PERCIFORMES	
	Percichthyidae – temperate basses	
Morone Americana	White perch	WTPH
Morone chrysops	White bass	WTBS
Morone mississippiensis	Yellow bass	YWBS
Morone saxatilis	Striped bass	SDBS
M. saxatilis X M. chrysops	Striped-white bass hybrid	SBWB
	Centrarchidae - sunfishes	
Ambloplites rupestris	Rock bass	RKBS
Archoplites interruptus	Sacramento perch	SOPH
Lepomis cyanellus	Green sunfish	GNSF
Lepomis gibbosus	Pumpkinseed	PNSD
Lepomis gulosus	Warmouth	WRMH
Lepomis humilis	Orangespotted sunfish	OSSF
Lepomis macrochirus	Bluegill	BLGL
Lepomis megalotis	Longear sunfish	LESF
Lepomis microlophus	Redear sunfish	RESF
L. cyanellus X L. macrochirus	Green sunfish-bluegill hybrid	GSBG
	Centrarchidae - sunfishes	
L. cyanellus X L. humilis	Green-orangespotted sunfish hybrid	GSOS
L. macrochirus X L. microlophus	Bluegill-redear sunfish hybrid	BGRE
Lepomis spp.	Unidentified *Lepomis*	ULP
Micropterus dolomieu	Smallmouth bass	SMBS
Micropterus punctulatus	Spotted sunfish	STBS
Micropterus salmoides	Largemouth bass	LMBS
Micropterus spp.	Unidentified *Micropterus* spp.	UMC
Pomoxis annularis	White crappie	WTCP
Pomoxis nigromaculatus	Black crappie	BKCP
Pomoxis spp.	Unidentified crappie	UCP
P. annularis X P. nigromaculatus	White-black crappie hybrid	WCBC
Centrarchidae	Unidentified Centrarchidae	UCN
	Percidae - perches	
Ammocrypta asprella	Crystal darter	CLDR

Appendix A. (continued).

Scientific name	Common name	Letter Code
Etheostoma blennioides	Greenside darter	GSDR
Etheostoma caeruleum	Rainbow darter	RBDR
Etheostoma exile	Iowa darter	IODR
Etheostoma flabellare	Fantail darter	FTDR
Etheostoma gracile	Slough darter	SLDR
Etheostoma microperca	Least darter	LTDR
Etheostoma nigrum	Johnny darter	JYDR
Etheostoma punctulatum	Stippled darter	STPD
Etheostoma spectabile	Orange throated darter	OTDR
Etheostoma tetrazonum	Missouri saddled darter	MSDR
Etheostoma zonale	Banded darter	BDDR
Etheostoma spp.	Unidentified Etheostoma spp.	UET
Perca flavescens	Yellow perch	YWPH
Percina caprodes	Logperch	LGPH
Percina cymatotaenia	Bluestripe darter	BTDR
Percina evides	Gilt darter	GLDR
Percina maculata	Blackside darter	BSDR
Percina phoxocephala	Slenderhead darter	SHDR
Percina shumardi	River darter	RRDR
Percina spp.	Unidentified Percina spp.	UPN
	Unidentified darter	UDR
Sander canadense	**Sauger**	**SGER***
Sander vitreus	Walleye	WLEY
S. canadense X S. vitreus	Sauger-walleye hybrid/Saugeye	SGWE
Sander spp.	Unidentified *Sander* (formerly *Stizostedion*) spp.	UST
	Unidentified Percidae	UPC
	Sciaenidae - drums	
Aplodinotus grunniens	Freshwater drum	FWDM
	NON-TAXONOMIC CATEGORIES	
	Age-0/Young-of-year fish	YOYF
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF
	Turtles	
Chelydra serpentine	Common Snapping Turtle	SNPT
Chrysemys picta bellii	Western Painted Turtle	PATT
Emydoidea blandingii	Blanding's Turtle	BLDT
Graptemys pseudogeographica	False Map Turtle	FSMT
Trachemys scripta	Red-Eared Slider Turtle	REST
Apalone mutica	Smooth Softshell Turtle	SMST
Apalone spinifera	Spiny Softshell Turtle	SYST
Terrapene ornata ornata	Ornate Box Turtle	ORBT
Sternotherus odoratus	Stinkpot Turtle	SPOT
Graptemys geographica	Map Turtle	MAPT
Graptemys kohnii	Mississippi Map Turtle	MRMT
Graptemys ouachitensis	Ouachita Map Turtle	OUMT
Pseudemys concinna metteri	Missouri River Cooter Turtle	MRCT
Terrapene carolina triunguis	Three-toed Box Turtle	TTBT

Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendritic	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Main channel inside bend	Macro	The convex side of a river bend	ISB
Main channel outside bend	Macro	The concave side of a river bend	OSB
Secondary channel-connected large	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, large indicates this habitat can be sampled with trammel nets and trawls based on width and/or depths > 1.2 m	SCCL
Secondary channel-connected small	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, small indicates this habitat cannot be sampled with trammel nets and trawls based on width and/or on depths < 1.2 m	SCCS
Secondary channel-non-connected	Macro	A side channel that is blocked at one end	SCCN
Tributary	Macro	Any river or stream flowing in the Missouri River	TRIB
Tributary large mouth	Macro	Mouth of entering tributary whose mean annual discharge is > 20 m^3/s, and the sample area extends 300 m into the tributary	TRML
Tributary small mouth	Macro	Mouth of entering tributary whose mean annual discharge is < 20 m^3/s, mouth width is > 6 m wide and the sample area extends 300 m into the tributary	TRMS
Wild	Macro	All habitats not covered in the previous habitat descriptions	WILD
Bars	Meso	Sandbar or shallow bank-line areas with depth < 1.2 m	BARS
Pools	Meso	Areas immediately downstream from sandbars, dikes, snags, or other obstructions with a formed scour hole > 1.2 m	POOL
Channel border	Meso	Area in the channelized river between the toe and the thalweg, area in the unchannelized river between the toe and the maximum depth	CHNB
Thalweg	Meso	Main channel between the channel borders conveying the majority of the flow	TLWG
Island tip	Meso	Area immediately downstream of a bar or island where two channels converge with water depths > 1.2 m	ITIP

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed, years used, and catch per unit effort units for collection of Missouri River fishes in Segment 2 for the long-term pallid sturgeon and associated fish community sampling program.

Gear	Code	Type	Season	Years	CPUE units
Gill Net – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	Fish / net night
Trammel Net – 1.0”inner mesh	TN	Standard	Sturgeon	2003 - Present	Fish / 100 m drift
		Standard	Fish Comm.	2003 - 2009	Fish / 100 m drift
Otter Trawl – 16 ft head rope	OT16	Standard	Both Seasons	2003 - Present	Fish / 100 m trawled
Mini-Fyke Net	MF	Standard	Fish Comm.	2003 - Present	Fish / net night
Beam Trawl	BT	Standard	Both Seasons	2003 - 2004	Fish / 100 m trawled
Hoop Net – 4 ft.	HN	Standard	Both Seasons	2003 - 2004	Fish / net night
Trammel Net – 2.5” inner mesh	TN25	Standard	Sturgeon	2005 – 2006	Fish / 100 m drift
Bag Seine – quarter arc method pulled upstream	BSQU	Standard	Fish Comm.	2003 – 2005	Fish / 100 m^2
Bag Seine – quarter arc method pulled downstream	BSQD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag Seine – half arc method pulled upstream	BSHU	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag seine – rectangular method pulled upstream	BSRU	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag seine – rectangular method pulled downstream	BSRD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR	OT01	Evaluation	Fish Comm.	2006	Fish / 100 m trawled
Push Trawl – 8 ft 4mm x 4mm	POT02	Evaluation	Fish Comm.	2007	Fish / m trawled
Trot Line	TL	Evaluation	Both Season	2009	Fish / hook night
		Standard	Both Seasons	2010 - Present	Fish / hook night

Appendix D. Stocking locations and codes for pallid sturgeon by Recovery Priority Management Area (RPMA) in the Missouri River Basin.

State(s)	RPMA	Site Name	Code	River	R.M.
MT	2	Forsyth	FOR	Yellowstone	253.2
MT	2	Cartersville	CAR	Yellowstone	235.3
MT	2	Miles City	MIC	Yellowstone	181.8
MT	2	Fallon	FAL	Yellowstone	124.0
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Grand Champs	GRC	Missouri	1741.0
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	3	Running Water	RNW	Missouri	840.1
SD/NE	4	St. Helena	STH	Missouri	799.0
SD/NE	4	Mullberry Bend	MUL	Missouri	775.0
NE/IA	4	Ponca State Park	PSP	Missouri	753.0
NE/IA	4	Sioux City	SIO	Missouri	732.6
NE/IA	4	Sloan	SLN	Missouri	709.0
NE/IA	4	Decatur	DCT	Missouri	691.0
NE/IA	4	Boyer Chute	BYC	Missouri	637.4
NE/IA	4	Bellevue	BEL	Missouri	601.4
NE/IA	4	Rulo	RLO	Missouri	497.9
MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
KS/MO	4	Leavenworth	LVW	Missouri	397.0
MO	4	Parkville	PKV	Missouri	377.5
MO	4	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for Segment 2 of the Missouri River (RPMA 4).

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
1998	Big Sky Bend	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Confluence	40	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Nohly Bridge	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Sidney	230	1997	8/11/1998	Yearling	PIT Tag	Elastomer
2000	Culbertson	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Fairview	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Sidney	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Wolf Point	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Culbertson	89	1999	10/17/2000	Yearling	PIT Tag	
2000	Fairview	150	1999	10/17/2000	Yearling	PIT Tag	
2000	Sidney	149	1999	10/17/2000	Yearling	PIT Tag	
2000	Wolf Point	90	1999	10/17/2000	Yearling	PIT Tag	
2002	Culbertson	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Fairview	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Intake	199	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Sidney	271	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Wolf Point	269	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Culbertson	317	2001	7/26/2002	Yearling	PIT Tag	
2002	Fairview	360	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	97	2001	7/26/2002	Yearling	PIT Tag	
2002	Sidney	427	2001	7/26/2002	Yearling	PIT Tag	
2002	Wolf Point	425	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	155	2001	9/18/2002	Yearling	PIT Tag	
2003	Culbertson	1033	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Fairview	887	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Intake	1040	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Wolf Point	926	2002	8/7/2003	Yearling	PIT Tag	Elastomer

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2004	Milk River	821	2003	4/13/2004	Yearling	Elastomer	
2004	Culbertson	523	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Intake	347	2003	8/9/2004	Yearling	PIT Tag	Elasomer
2004	Sidney	397	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Wolf Point	379	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Larval Drift	30000	2004	7/2/2004	Fry		
2004	Larval Drift	50000	2004	7/8/2004	Fry		
2004	Larval Drift	25000	2004	7/20/2004	Fry		
2004	Larval Drift	25000	2004	7/23/2004	Fry		
2004	Larval Drift	25000	2004	7/27/2004	Fry		
2004	Culbertson	3819	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Sidney	2991	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Wolf Point	4040	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Mouth of Milk	3482	2004	10/15/2004	Advanced Fingerling	CWT	Elastomer
2004	Intake	2477	2004	11/18/2004	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	288	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	309	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Wolf Point	271	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	175	2004	8/19/2005	Yearling	PIT Tag	Elastomer
2005	Brockton	229	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	226	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	456	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	232	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	122	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	611	2005	10/12/2005	Advanced Fingerling	CWT	Elastomer
2005	Brockton	371	2005	10/13/2005	Advanced		
2005	Culbertson	1736	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	182	2005	10/13/2005	Advanced Fingerling		
2005	Intake	313	2005	10/13/2005	Advanced Fingerling		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2005	Milk River	845	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Mouth of Milk	371	2005	10/13/2005	Advanced Fingerling		
2005	Sidney	105	2005	10/13/2005	Advanced Fingerling		
2005	Wolf Point	1521	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	371	2005	10/13/2005	Advanced Fingerling		
2005	Culbertson	651	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	2120	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	485	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	882	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	650	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2006	Culbertson	235	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	327	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Mouth of Milk	134	2005	3/28/2006	Advanced fingerling	Elastomer	
2006	Sidney	113	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	232	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	970	2005	4/3/2006	Yearling	PIT Tag	Elastomer
2006	Sidney	314	2005	4/3/2006	Yearling	PIT Tag	Elastomer
2006	Culbertson	844	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Mouth of Milk	1007	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Wolf Point	866	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Culbertson	669	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Intake	765	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Mouth of Milk	650	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Sidney	228	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Wolf Point	653	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006		1355	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Culbertson	1544	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Intake	1680	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Mouth Milk	1117	2006	10/24/2006	Advanced Fingerling	Elastomer	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2006	Sidney	586	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	1553	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	School Trust	436	2006	11/8/2006	Advanced Fingerling	Elastomer	
2007	Culbertson	651	2006	4/5/2007	Yearling	PIT Tag	Scute Removed
2007	Fallon	491	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	Forsyth	492	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	Sidney	983	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	School Trust	639	2006	4/5/2007	Yearling	PIT Tag	Scute Removed
2007	Wolf Point	651	2006	4/5/2007	Yearling	PIT Tag	Scute Removed
2007	Wolf Point	428285	2007	7/9/2007	Fry		
2007	Grand Champs	5558	2007	7/13/2007	Fry		
2007	Miles City	13125	2007	7/18/2007	Fry		
2007	Intake	20763	2007	8/9/2007	Fry		
2007	Miles City	13675	2007	8/9/2007	Fry		
2007	Intake	336	2007	8/27/2007	Fingerling		
2007	Miles City	336	2007	8/27/2007	Fingerling		
2007	Wolf Point	672	2007	8/27/2007	Fingerling		
2007	Forsyth	690	2007	8/31/2007	Fingerling	CWT	
2007	Intake	615	2007	8/31/2007	Fingerling	CWT	
2007	School Trust	1160	2007	9/6/2007	Fingerling	CWT	
2007	Intake	293	2007	9/12/2007	Fingerling		
2007	Miles City	293	2007	9/12/2007	Fingerling		
2007	Wolf Point	586	2007	9/12/2007	Fingerling		
2007	Culbertson	6455	2007	9/14/2007	Fingerling	Elastomer	
2007	Fallon	4827	2007	9/14/2007	Fingerling	Elastomer	
2007	Forsyth	5370	2007	9/14/2007	Fingerling	Elastomer	
2007	Intake	7812	2007	9/14/2007	Fingerling	Elastomer	
2007	School Trust	6096	2007	9/14/2007	Fingerling	Elastomer	
2007	Sidney	1934	2007	9/14/2007	Fingerling	Elastomer	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2007	Wolf Point	6455	2007	9/14/2007	Fingerling	Elastomer	
2008	Culbertson	1384	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Culbertson	643	2007	3/26/2008	Yearling	Elastomer	
2008	Fallon	1307	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Forsyth	1384	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Forsyth	106	2007	3/26/2008	Yearling	Elastomer	
2008	Intake	2395	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Intake	103	2007	3/26/2008	Yearling	Elastomer	
2008	School Trust	1325	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	School Trust	654	2007	3/26/2008	Yearling	Elastomer	
2008	Sidney	149	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Sidney	67	2007	3/26/2008	Yearling	Elastomer	
2008	Wolf Point	1328	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Wolf Point	416	2007	3/26/2008	Yearling	Elastomer	
2008	Miles City	4797	2008	7/30/2008	Fry		
2008	Grand Champs	24395	2008	7/30/2008	Fry		
2008	Culbertson	15630	2008	9/24/2008	Fingerling	Elastomer	
2008	Fallon	7930	2008	9/29/2008	Fingerling	Elastomer	
2008	Forsyth	7723	2008	9/29/2008	Fingerling	Elastomer	
2008	Intake	12642	2008	9/29/2008	Fingerling	Elastomer	
2008	Sidney	3186	2008	9/29/2008	Fingerling	Elastomer	
2008	Wolf Point	11717	2008	9/24/2008	Fingerling	Elastomer	
2009	Culbertson	1387	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Fallon	1155	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Forsyth	1166	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Intake	2181	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Sidney	710	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Wolf Point	2162	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Miles City	46260	2009	7/31/2009	Fry		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2009	Wolf Point	26175	2009	7/22/2009	Fry		
2009	Culbertson	10238	2009	9/24/2009	Fingerling	Elastomer	
2009	Fallon	5133	2009	9/23/2009	Fingerling	Elastomer	
2009	Forsyth	5386	2009	9/23/2009	Fingerling	Elastomer	
2009	Intake	8374	2009	9/23/2009	Fingerling	Elastomer	
2009	Sidney	1865	2009	9/23/2009	Fingerling	Elastomer	
2009	Wolf Point	9946	2009	9/23/2009	Fingerling	Elastomer	
2009	Intake	8374	2009	9/23/2009	Fingerling	Elastomer	
2009	Sidney	1865	2009	9/23/2009	Fingerling	Elastomer	
2009	Wolf Point	9946	2009	9/23/2009	Fingerling	Elastomer	
2010	Fallon	721	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Fallon	268	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Fallon	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Forsyth	1402	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Forsyth	268	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	1890	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	816	2009	6/4/2010	Yearling	Elastomer	
2010	Intake	541	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Sidney	331	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Wolf Point	1309	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute
2010	Wolf Point	858	2009	6/4/2010	Yearling	Elastomer	
2010	Wolf Point	425	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Wolf Point	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Culbertson	65	2004	9/21/2010	6 Yr Old	PIT Tag	
2010	Culbertson	1337	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute
2010	Culbertson	384	2009	6/4/2009	Yearling	PIT Tag	Scute Removed
2010	Culbertson	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	School Trust	1766	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2011	Culbertson	795	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Wolf Point	797	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Fallon	531	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Forsyth	545	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Intake	510	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Culbertson	262	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Fallon	131	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Forsyth	174	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Intake	132	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Wolf Point	262	2010	8/22/2011	Yearling	PIT Tag	Scute Removed

Appendix F

Appendix F. Total catch, overall mean catch per unit effort (± 2 SE), and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for Segment 2 of the Missouri River during 2012. Species captured are listed alphabetically and their codes are presented in Appendix A. Asterisks with bold type indicate targeted native Missouri River species and habitat abbreviations are presented in Appendix B. Standard Error was not calculated when N < 2.

Appendix F1. 1.0” trammel net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BKSB	0	0	0	0	0	0	0
		0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	1	0.002	0	0	0.005	0	0
		0.003	0	0	0.01	0	0
BRBT	1	0.002	0.006	0	0	0	0
		0.004	0.011	0	0	0	0
BUSK	**8**	**0.018**	**0.01**	**0**	**0.027**	**0.02**	**0**
		0.013	**0.014**	**0**	**0.027**	**0.029**	**0**
CARP	2	0.004	0	0	0.007	0	0.06
		0.006	0	0	0.014	0	0.119
CNCF	14	0.028	0.03	0	0.018	0.046	0
		0.018	0.027	0	0.021	0.054	0
CSCO	1	0.002	0.007	0	0	0	0
		0.005	0.014	0	0	0	0
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	82	0.16	0.216	0	0.139	0.118	0.222
		0.049	0.09	0	0.09	0.073	0.33
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	79	0.173	0.122	0	0.324	0.08	0
		0.06	0.063	0	0.154	0.054	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
LKWF	1	0.005	0	0	0.014	0	0
		0.009	0	0	0.027	0	0
LNDC	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNSK	11	0.024	0.042	0.133	0.01	0	0.079
		0.016	0.034	0.267	0.021	0	0.159
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	1	0.007	0	0	0	0.028	0
		0.014	0	0	0	0.056	0
PDFH	1	0.003	0	0	0	0.01	0
		0.005	0	0	0	0.021	0
PDSG	**24**	**0.046**	**0.056**	**0.066**	**0.042**	**0.032**	**0.069**
		0.027	**0.04**	**0.131**	**0.049**	**0.064**	**0.139**
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0
RVCS	37	0.104	0.079	0.133	0.129	0.104	0.079
		0.066	0.059	0.267	0.136	0.168	0.159
SFCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
SGER	**131**	**0.273**	**0.168**	**0**	**0.358**	**0.313**	**0.46**
		0.098	**0.096**	**0**	**0.235**	**0.166**	**0.583**
SHRH	17	0.043	0.032	0	0.029	0.08	0.056
		0.034	0.026	0	0.044	0.118	0.111
SMBF	3	0.006	0	0	0.005	0.019	0
		0.007	0	0	0.01	0.026	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
SNSG	390	**0.955**	**0.84**	**1.621**	**0.856**	**1.277**	**0.181**
		0.31	**0.256**	**1.298**	**0.422**	**1.03**	**0.163**
SNSN	0	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
STCT	0	0	0	0	0	0	0
		0	0	0	0	0	0
STSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
UBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
UCA	0	0	0	0	0	0	0
		0	0	0	0	0	0
WLYE	6	0.012	0.018	0	0.017	0	0
		0.01	0.02	0	0.02	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
WTSK	14	0.041	0.019	0.52	0.039	0.024	0.056
		0.025	0.023	0.637	0.035	0.033	0.111
YWPH	0	0	0	0	0	0	0
		0	0	0	0	0	0

Appendix F2. Otter trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BKSB	0	0	0	0	0	0	0
		0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0
		0	0	0	0	0	0
BUSK	**1**	**0.003**	**0**	**0.125**	**0**	**0**	**0**
		0.005	**0**	**0.25**	**0**	**0**	**0**
CARP	4	0.007	0.01	0	0.011	0	0
		0.007	0.014	0	0.015	0	0
CNCF	17	0.031	0.032	0	0.028	0.019	0.136
		0.017	0.025	0	0.025	0.038	0.184
CSCO	0	0	0	0	0	0	0
		0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	77	0.147	0.26	0	0.141	0.032	0.083
		0.057	0.148	0	0.065	0.033	0.108
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	2	0.003	0.005	0	0.005	0	0
		0.005	0.01	0	0.011	0	0
LKWF	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNDC	5	0.009	0.015	0	0.005	0	0.041
		0.008	0.017	0	0.011	0	0.082
LNSK	18	0.036	0.03	0.738	0.012	0.024	0
		0.022	0.028	0.276	0.017	0.037	0
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDSG	**11**	**0.021**	**0.022**	**0**	**0.029**	**0.008**	**0.042**
		0.013	**0.022**	**0**	**0.03**	**0.015**	**0.084**
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0
RVCS	7	0.014	0.005	0.292	0.02	0	0
		0.012	0.01	0.344	0.023	0	0
SFCB	**7**	**0.013**	**0.017**	**0**	**0.016**	**0.006**	**0**
		0.01	**0.02**	**0**	**0.019**	**0.013**	**0**

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
SGCB	**41**	**0.078**	**0.106**	**0**	**0.075**	**0.051**	**0.084**
		0.033	**0.06**	**0**	**0.054**	**0.068**	**0.109**
SGER	**28**	**0.056**	**0.022**	**1.333**	**0.065**	**0**	**0**
		0.039	**0.022**	**1.269**	**0.048**	**0**	**0**
SHRH	15	0.033	0.02	0.738	0.022	0.012	0
		0.026	0.02	0.954	0.026	0.025	0
SMBF	1	0.002	0.005	0	0	0	0
		0.003	0.01	0	0	0	0
SNSG	**140**	**0.325**	**0.206**	**2.083**	**0.373**	**0.311**	**0.141**
		0.204	**0.089**	**4.167**	**0.503**	**0.331**	**0.138**
SNSN	**1**	**0.003**	**0**	**0**	**0.011**	**0**	**0**
		0.007	**0**	**0**	**0.022**	**0**	**0**
STCT	1	0.002	0.005	0	0	0	0
		0.004	0.01	0	0	0	0
STSN	1	0.002	0	0	0.005	0	0
		0.003	0	0	0.011	0	0
UBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
UCA	0	0	0	0	0	0	0
		0	0	0	0	0	0
WLYE	3	0.005	0.005	0	0.011	0	0
		0.006	0.01	0	0.015	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**

	Total	Overall	CHXO	CONF	ISB	OSB	SCCL
Species	Catch	CPUE	CHNB	CHNB	CHNB	CHNB	CHNB
WTSK	26	0.059	0.024	1.446	0.059	0	0.042
		0.051	0.024	2.021	0.056	0	0.084
YWPH	0	0	0	0	0	0	0
		0	0	0	0	0	0

Appendix F3. Mini-fyke net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
BKSB	1	0.011	0.032	0	0	0	0	0	0
		0.021	0.065	0	0	0	0	0	0
BLGL	21	0.221	0.032	0	0.559	0	0	0.071	0
		0.38	0.065	0	1.059	0	0	0.143	0
BMBF	3	0.032	0	0	0	0.5	0.25	0	0
		0.036	0	0	0	1	0.5	0	0
BRBT	5	0.053	0.065	0	0.088	0	0	0	0
		0.046	0.09	0	0.099	0	0	0	0
BUSK	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CARP	30	0.316	0.161	0	0.059	0.5	0	0.929	2.25
		0.319	0.163	0	0.082	1	0	1.709	4.5
CNCF	15	0.158	0.29	0	0.176	0	0	0	0
		0.151	0.406	0	0.197	0	0	0	0
CSCO	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
ERSN	50	0.526	0.613	0	0.588	0	0.25	0.714	0
		0.351	0.606	0	0.573	0	0.5	1.429	0
FHCB	16	0.168	0.129	0	0.176	0	0	0.357	0
		0.126	0.154	0	0.215	0	0	0.578	0
FHMW	1268	13.347	0.839	0	1.206	1	0.75	1.857	292.5
		24.614	0.395	0	0.608	0	1.5	2.676	585
FWDM	1	0.011	0	0	0.029	0	0	0	0
		0.021	0	0	0.059	0	0	0	0
GDEY	2	0.021	0	0	0	0	0	0.143	0
		0.042	0	0	0	0	0	0.286	0

Species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
LKWF	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
LNDC	12	0.126	0.065	0	0.176	0	0.75	0.071	0
		0.091	0.09	0	0.197	0	0.957	0.143	0
LNSK	196	2.063	0.194	0	4.971	0	4	0.286	0.25
		2.188	0.327	0	5.96	0	8	0.327	0.5
NTPK	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
PDSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
RBTT	6	0.063	0.032	0.5	0.029	0	0	0	0
		0.058	0.065	1	0.059	0	0	0	0
RVCS	571	6.011	5.355	0	3.471	0	0.25	18.786	5.75
		4.247	4.139	0	2.988	0	0.5	25.865	11.5
SFCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
SGER	**15**	**0.158**	**0.129**	**0.5**	**0.088**	**2.5**	**0**	**0**	**0.5**
		0.109	**0.154**	**1**	**0.099**	**3**	**0**	**0**	**0.577**
SHRH	1	0.011	0	0	0.029	0	0	0	0
		0.021	0	0	0.059	0	0	0	0
SMBF	20	0.211	0.226	0	0.235	0	0	0.357	0
		0.127	0.24	0	0.19	0	0	0.496	0
SNSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
SNSN	**9**	**0.095**	**0.097**	**0**	**0.088**	**0**	**0.25**	**0**	**0.5**
		0.074	**0.108**	**0**	**0.13**	**0**	**0.5**	**0**	**1**
STCT	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
STSN	19	0.2	0.065	0.5	0.147	0.5	0	0.071	2.25
		0.2	0.09	1	0.149	1	0	0.143	4.5
UBF	23	0.242	0.065	0	0	0	0	0	5.25
		0.444	0.129	0	0	0	0	0	10.5
UCA	16	0.168	0	0	0.029	0	0	1.071	0
		0.296	0	0	0.059	0	0	1.994	0
WLYE	1	0.011	0	0	0.029	0	0	0	0
		0.021	0	0	0.059	0	0	0	0
WSMW	**4**	**0.042**	**0**	**0**	**0.088**	**0**	**0**	**0**	**0.25**
		0.041	**0**	**0**	**0.099**	**0**	**0**	**0**	**0.5**
WTSK	4327	45.547	44.419	4	76.294	5	31.75	3.143	39
		48.434	38.844	6	130.635	8	56.406	3.708	74.686
YWPH	1	0.011	0	0	0.029	0	0	0	0
		0.021	0	0	0.059	0	0	0	0

Appendix F4. Trot lines: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
BKSB	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BUSK	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
CARP	5	0.052	0.034	0	0.108	0	0	0
		0.046	0.069	0	0.104	0	0	0
CNCF	39	0.406	0.172	0	0.378	0.455	0.5	4
		0.174	0.174	0	0.21	0.315	0.577	4
CSCO	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FHCB	24	0.25	0.31	0	0.216	0.227	0.5	0
		0.111	0.224	0	0.158	0.261	0.577	0
FHMW	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FWDM	1	0.01	0	0	0.027	0	0	0
		0.021	0	0	0.054	0	0	0
GDEY	47	0.49	0.345	1	0.486	0.455	1	1.5
		0.154	0.268	0	0.214	0.341	1.414	1

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNSC	5	0.052	0.034	0	0.081	0.045	0	0
		0.046	0.069	0	0.091	0.091	0	0
NTPK	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDSG	**55**	**0.573**	**0.483**	0	**0.676**	**0.455**	**1.5**	**0**
		0.202	**0.274**	**0**	**0.356**	**0.469**	**1.291**	**0**
RBTT	0	0	0	**0**	0	0	0	0
		0	0	0	0	0	0	0
RVCS	1	0.01	0	0	0.027	0	0	0
		0.021	0	0	0.054	0	0	0
SFCB	0	**0**	**0**	0	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGER	**6**	**0.063**	**0**	**0**	**0.081**	**0.045**	**0.25**	**0.5**
		0.05	**0**	**0**	**0.091**	**0.091**	**0.5**	**1**
SHRH	**5**	0.052	0	**0**	0.135	0	0	0
		0.046	0	0	0.114	0	0	0
SMBF	1	0.01	0	0	0	0	0	0
		0.021	0	0	0	0	0	0
SNSG	**307**	**3.198**	**3.655**	**9.5**	**2.838**	**3.136**	**1.25**	**1.5**
		0.685	**1.463**	**3**	**0.868**	**1.502**	**0.957**	**3**

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
SNSN	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
STCT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
STSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UCA	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WLYE	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
WTSK	21	0.219	0.034	1.5	0.351	0.091	0.5	0
		0.112	0.069	1	0.235	0.125	0.577	0

Appendix G. Hatchery names, locations and abbreviations.

Hatchery	State	Abbreviation
Blind Pony State Fish Hatchery	MO	BYP
Neosho National Fish Hatchery	MO	NEO
Gavins Point National Fish Hatchery	SD	GAV
Garrison Dam National Fish Hatchery	ND	GAR
Miles City State Fish Hatchery	MT	MCH
Blue Water State Fish Hatchery	MT	BLU
Bozeman Fish Technology Center	MT	BFT
Fort Peck State Fish Hatchery	MT	FPH

Appendix H. Alphabetic list of Missouri River fishes with total catch per unit effort by gear type for the sturgeon season and the fish community season during 2012 for Segment 2 of the Missouri River.

Species Code	Sturgeon Season		Fish Community Season			Both Seasons
	1.0" Trammel Net	Otter Trawl	1.0" Trammel Net	Mini-Fyke Net	Otter Trawl	Trot Lines
BKSB	0	0	0	0.011	0	0
BLGL	0	0	0	0.221	0	0
BMBF	0.003	0	0	0.032	0	0
BRBT	0.004	0	0	0.053	0	0
BUSK	**0.032**	**0**	**0.003**	**0**	**0.005**	**0**
CARP	0.008	0.003	0	0.316	0.010	0.052
CNCF	0.026	0.044	0.030	0.158	0.017	0.406
CSCO	0	0	0.005	0	0	0
ERSN	0	0	0	0.526	0	0
FHCB	0.187	0.151	0.133	0.168	0.142	0.250
FHMW	0	0	0	13.347	0	0
FWDM	0	0	0	0.011	0	0.010
GDEY	0.113	0.003	0.233	0.021	0.003	0.490
LKWF	0	0	0.009	0	0	0
LNDC	0	0.007	0	0.126	0.010	0
LNSK	0.012	0.023	0.037	2.063	0.050	0.052
NTPK	0.014	0	0	0	0	0
PDFH	0.005	0	0	0	0	0
PDSG	**0.062**	**0.031**	**0.030**	**0**	**0.010**	**0.573**
RBTT	0	0	0	0.063	0	0
RVCS	0.175	0.028	0.032	6.011	0	0.010
SFCB	**0**	**0.019**	**0**	**0**	**0.007**	**0**
SGCB	**0**	**0.139**	**0**	**0**	**0.017**	**0**
SGER	**0.479**	**0.072**	**0.067**	**0.158**	**0.041**	**0.063**
SHRH	0.081	0.007	0.005	0.011	0.058	0.052
SMBF	0.008	0	0.005	0.211	0.003	0.010
SNSG	**0.816**	**0.229**	**1.093**	**0**	**0.420**	**3.198**
SNSN	0	0.007	0	0.095	0	0
STCT	0	0	0	0	0.004	0
STSN	0	0	0	0.200	0.003	0
UBF	0	0	0	0.242	0	0
UCA	0	0	0	0.168	0	0

Species Code	Sturgeon Season		Fish Community Season			Both Seasons
	1.0” Trammel Net	Otter Trawl	1.0” Trammel Net	Mini-Fyke Net	Otter Trawl	Trot Lines
WLYE	0.016	0.003	0.008	0.011	0.007	0
WSMW	**0**	**0**	**0**	**0.042**	**0**	**0**
WTSK	0.056	0.023	0.027	45.547	0.095	0.219
YWPH	0	0	0	0.011	0	0

Appendix I. Comprehensive list of bend numbers and bend river miles for Segment 2 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FCS) between years from 2003 - 2012.

Bend Number	Bend River Mile	Coordinates		2006	2007	2008	2009	2010	2011	2012
		Lattidude	Longitude							
1	1761	48.05581	106.32055	ST, FC					ST, FC, HW	ST, FC
2	1760									
3	1759	48.04416	106.28819		ST, FC				HW	
4	1757.5	48.03696	106.25307						HW	
5	1756	48.03379	106.24998					ST, FC	FC	
6	1754.5	48.02680	106.19850			ST, FC		ST, FC	FC, HW	
7	1753	48.02938	106.16258		ST, FC	ST, FC			ST, FC	FC
8	1751	48.03120	106.13605			ST, FC	ST, FC		ST, FC, HW	ST, FC
9	1749.5	48.02872	106.12263	ST, FC					ST, FC, HW	ST
10	1747	48.00566	106.10929					ST, FC	ST, FC, HW	ST, FC
11	1745	48.02677	106.08480				ST, FC	ST, FC	ST, FC	
12	1744	48.03534	106.08521	ST, FC	ST, FC	ST, FC	ST, FC		FC	
13	1741.5	48.00999	106.04510				ST, FC	ST, FC		
14	1740	48.00255	106.02716		ST, FC					
15	1738									
16	1736.5	48.03137	106.00100		ST, FC		ST, FC			FC
17	1735	48.02545	105.98821			ST, FC				ST, FC
18	1733	48.01287	105.95323	ST, FC						ST
19	1732	48.01149	105.93182	ST, FC	ST, FC					ST, FC
20	1730.5									
21	1728.5	48.03616	105.89557			ST, FC				
22	1727.5	48.03228	105.88458						FC	

Bend Number	Bend River Mile	Coordinates Lattidude	Longitude	2006	2007	2008	2009	2010	2011	2012
23	1726.5	48.01900	105.87228	ST, FC	ST, FC		ST, FC	ST, FC		
24	1725.5	48.00855	105.85176			ST, FC				
25	1723.5	48.01666	105.82971			ST, FC		ST, FC		FC
26	1722	48.02402	105.79479		ST, FC				FC, HW	ST, FC
27	1720	48.04621	105.77785				ST, FC	ST, FC	HW	FC
28	1719	48.04468	105.76749	ST, FC	ST, FC				HW	ST
29	1717.5	48.02643	105.74791					ST, FC	FC, HW	ST, FC
30	1716	48.03228	105.71736				ST, FC		FC, HW	FC
31	1714	48.05327	105.69457				ST, FC	ST, FC	HW	FC
32	1712	48.05313	105.66531		ST, FC	ST, FC				ST, FC
33	1710.5	48.04739	105.66245	ST, FC		ST, FC				ST, FC
34	1710	48.05159	105.64158	ST, FC			ST, FC			FC
35	1709	48.06960	105.64798	ST, FC					HW	ST, FC
36	1707.5	48.07648	105.64107			ST, FC				ST, FC
37	1706.5	48.07407	105.62061	ST, FC	ST, FC		ST, FC	ST, FC	HW	FC
38	1705.5	48.07725	105.60690					ST, FC		ST, FC
39	1704.5	48.08012	105.58631	ST, FC	ST, FC	ST, FC			ST, FC	
40	1703	48.07828	105.56033				ST, FC		ST, FC, HW	