2014 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 3

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

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EXECUTIVE SUMMARY

The 2014 season was the ninth consecutive year that the pallid sturgeon population assessment program (Program) has been in place in Segment 3 of the Missouri River. During 2014 a total of 164 pallid sturgeon *Scaphirhynchus albus* were sampled in Segment 3, a significant decrease from the 260 that were captured in 2013. A total of twelve year classes of hatchery reared fish were captured within Segment 3 during 2014. The most abundant year class sampled was the 2009 class, followed by the 2008 and then 2010. These three year classes were also the most abundant during the 2013 and 2012 sampling years. During 2014 the largest hatchery reared pallid sturgeon sampled within Segment 3 measured 955 mm in length and weighed 4,300 g. In addition to the large hatchery reared pallid sturgeon, one wild adult pallid sturgeon was captured within Segment 3 during 2014. This fish measured 1,400 mm in length and weighed 15,500 and was collected on October 3rd at river mile 1,594 in a trammel net.

Sampling within Segment 3 during 2014 occurred from April 28th to June 18th for the sturgeon season, when the otter trawl, trammel nets and trotlines were used. Sampling during the fish community season occurred from July 15th through October 21st, where the same gears were used and mini fyke nets were also added. Twenty-two random river bends were sampled using standard gears during both the sturgeon and fish community season.

While the CPUE of pallid sturgeon using standard gears has not appreciably increased through the past nine years, pallid sturgeon stocked into Segment 3 are surviving and growing. This is indicated by the size distribution of pallids captured using standard gears. Over the past nine years the size distribution has shifted to a higher proportion of larger fish. For instance, during 2006 the average size of hatchery reared pallid sturgeon captured was 249.2 mm and by 2014 the average size has increased to 418.4 mm.

The relative condition of pallid sturgeon sampled within Segment 3 has not noticeably changed over the last nine sampling seasons. However, the smaller sized pallid sturgeon have on average higher relative condition than the larger size classes. In contrast to relative condition, the average age at length of hatchery reared pallid sturgeon has decreased over the last four years. In fact, the average size of several year classes of pallid sturgeon were actually smaller in 2014 when compared to 2013.

The distribution of hatchery reared pallid sturgeon residing in the Missouri River has changed since the high flow year of 2011. Since 2011, more pallid sturgeon are being found

further upstream in the Missouri River. Prior to 2011, the lower portions of Segment 3 were considered "hot spots" for their higher relative densities of pallid sturgeon. However, those "hot spots" have for the most part gone away since 2011. From 2012 to 2014 a greater number of pallid sturgeon are being captured in the upstream sections of Segment 3, when compared to prior to the high flow year. In addition, pallid sturgeon are much more homogeneously distributed throughout the Missouri River from Fort Peck Dam to the confluence of the Missouri and Yellowstone Rivers.

During 2014 a total of 548 shovelnose sturgeon *Scaphirhynchus platorynchus* were sampled within Segment 3 in random and non-random sampling. The catch-per-unit-effort (CPUE) of shovelnose sturgeon for both otter trawls and trammel nets during 2014 was similar to that of 2013. Although the overall CPUE of shovelnose sturgeon has not changed greatly over the years, with the exception of 2011 (low capture efficiency due to high water), data collected have proven valuable in determining recruitment. The 2014 sampling showed relatively good numbers of small shovelnose sturgeon when compared to the majority of sampling years. The 2014 catch of the smallest size category of shovelnose sturgeon was at a nine year high.

The relative abundance of many native cyprinids such as sturgeon chub *Macrhybopsis gelida*, sicklefin chub *M. meeki*, sand shiner *Notropis stramineus* and western silvery minnows *Hypognathus argyritis* have been being monitored by the combination of otter trawls and mini fyke nets over the past nine years. The relative abundance of most of these species have either decreased in recent years or have remained at very low detection levels. The relative abundance of sturgeon chubs during 2014 remained very low when compared to the first three years of the Program. While the sicklefin chub catch was still low in 2014, it had the highest catch-per-unit-effort that we've observed in the otter trawl for the nine year sampling period. Sand shiners were almost non-detectable in 2014, which was similar to 2013. While western silvery minnows were down from 2013, their catch in mini fyke nets was higher than 2009 to 2012. The decrease in many of the native cyprinids over the past few years may be in at least partly explained by the increase in predators such as sauger *Sander canadense* and potentially from the increase in pallid sturgeon of piscivory size.

The presence of blue suckers *Cycleptus elongatus* has been limited within Segment 3 during the nine years of sampling. A total of 11 blue suckers were sampled during 2014, with all

but one being captured in trammel nets. No juvenile or sub-adult blue suckers were captured, which is similar to previous sampling years where most have been adults.

In summary, the data the Program is collecting is invaluable as far as gaining further insight into pallid sturgeon growth, distribution, habitat use and condition. The data collected over the past nine years will provide the baseline for the aquatic ecosystem of the Missouri River and will allow us to monitor both pallid sturgeon and their prey base as hatchery stocked fish reach larger sizes and eventually become sexually mature. Native cyprinid data, coupled with relative condition of both pallid and shovelnose sturgeon will give us insights in to prey availability and whether the carrying capacity of the system has been reached or not. Water seems to be the key to many of the questions that have historically been asked. The flows out of the Fort Peck Project in 2011 greatly influenced adult and juvenile pallid sturgeon behavior and habitat use. Additionally, data collected from the Project is allowing us to understand how important inputs from the lower Missouri Rivers largest tributary, the Milk River is to native fish, including pallid and shovelnose sturgeon. The Milk River's importance is likely heightened due to the hypolimnetic withdrawals and altered hydrograph that occurs do to the normal operations of Fort Peck Dam. Developing a flow regime from Fort Peck Dam that would satisfy the needs of the majority of the users of the Missouri River and the pallid sturgeon is likely imperative if some resemblance of a natural ecosystem is to prevail downstream of Fort Peck Dam.

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Introduction

The 2014 field season was the ninth consecutive year that standardized monitoring occurred in Segment 3 of the Missouri River. Data collected in the Missouri River post 2011 have been important in monitoring the post effects of a large flood. The monitoring program is designed to detect changes in fish populations, growth rates and habitat use following a management action or a significant natural event. Data from the past three years give us insight into how the flooding of 2011 may have influenced fish populations within Segment 3. Direct comparisons between 2011 and any other year should be cautioned due to changing gear efficiencies with changing river flows. However, data collected in 2014 should be comparable to 2012 and 2013 and years prior to 2011.

Sampling in Segment 3 occurred from April 28th to June 18th for the sturgeon season, where the otter trawl, trammel nets and trotlines were used. Sampling during the fish community season occurred from July 15th through October 21st, where the same gears were used and mini fyke nets were added. .

Background

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 North Dakota border, 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 flows and swift current and therefore they 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 < 1.2 m in depth.

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

Montana Fish, Wildlife & Parks samples three segments on the Missouri River below Fort Peck Dam to its confluence with the Yellowstone River in accordance with the Pallid

Sturgeon Population Assessment Program. Study segment 3 of the Missouri River Pallid Sturgeon Population Assessment Program encompasses 119 river miles from Wolf Point, MT to the confluence of the Missouri and Yellowstone Rivers in North Dakota. In this large section, the river has completely transitioned from a cold clear cobble substrate river in segment 2 to a warm turbid prairie river, more similar to its natural characteristics (Galat et al, 2005). The aggrading streambed of segment 3 is flanked by stream deposited sediment of the Fort Union Formation (NRIS, 2007). This stretch of river is slightly less flow regulated than upstream segments due to the tributaries and runoff events. There are five major tributaries that influence this section of river, which include the Milk River, Redwater River, Poplar River, Big Muddy Creek, and Prairie Elk Creek. These sediment packed tributaries flush their warmer turbid waters into the Missouri River increasing flows and suspended sediment, which in turn enables sandbar and island formation. Turbidities in this stretch of river are greater than that of segment 2 and discharge constantly changes with precipitation events and tributary discharge. The species composition of this stretch of river is vastly different from the uppermost segment just below Fort Peck Dam. The non-native fish stocked for recreation are much less prevalent and the prevalence of native, non-sport fish is increased (Gardner and Stewart, 1987). This stretch of ever-changing river is diverse with over 36 species of fish, many of which are benthic specialists, exhibiting streamlined bodies and well-developed chemosensory organs for surviving the sometimes high flows and ever-turbid waters (Galat et al, 2005; Berry et al. 2004). This stretch of river can be highly dynamic and is more reminiscent of what the Missouri River looked like before it became one of the most regulated and impounded rivers in the United States (Galat et al, 2005). However, due to the extremely low spring and summer flows that we've experienced in the past three years due to the operations of Fort Peck Dam, habitat formation is not occurring as it might have during the high runoff years of the 1990's.

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 sampling guidelines follows.

Sampling Site Selection and 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 3 consisted of 22 randomly selected bends.

Two gears, the trammel net and otter trawl are considered standard gears for the sturgeon and fish community seasons. Trammel nets were used in 22 bends during season and 22 during fish community. Otter Trawls were used in 22 bends during sturgeon and 22 during fish community season. Additionally, mini fyke nets are also considered a standard gear for the fish community season and 22 randomly selected bends were sampled with mini fyke nets.

Trotlines were used again in segment 3 during 2012 as a standard gear during both the sturgeon and fish community seasons to monitor changes in relative abundance, size structure, growth, habitat use and potential movements. All 22 randomly chosen river bends were sampled using trotlines, eleven during the sturgeon season and eleven during the fish community season. Random river bends for trotlines were chosen by moving one river bend upstream from the randomly chosen river bends for standard gears. This was done to minimize the influence of trotlines on our standard gears and make logistics easier. Since trotlines are a gear that requires attending a river bend on two consecutive days, it is logistically better to be able to set trotlines on the same day as otter trawling or drifting trammel nets occurs. We also wanted to make sure that one gear wasn't influencing the catch of other gears and by sampling the next river bend upstream we believe we achieved this. No marked pallid sturgeon captured in standard gears or trotlines were subsequently captured in different gear at an adjacent bend within the same

sampling period in 2012. In addition, trotlines were used in wild fashion during September in the lower sections of segment 3 to increase the total catch of hatchery reared pallid sturgeon to further populate survival estimate models.

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, please 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 2/0 Eagle Claw circle hook. Trotlines are 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 either

a Current AA Price Meter and sounding reel or 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 (2009). 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 the weight-length relationship [$\log_{10} W = -6.378 + 3.357 \log_{10} L$ ($r^2 = 0.9740$)] derived by Keenlyne and Evanson (1993) for pallid sturgeon throughout their range.

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.

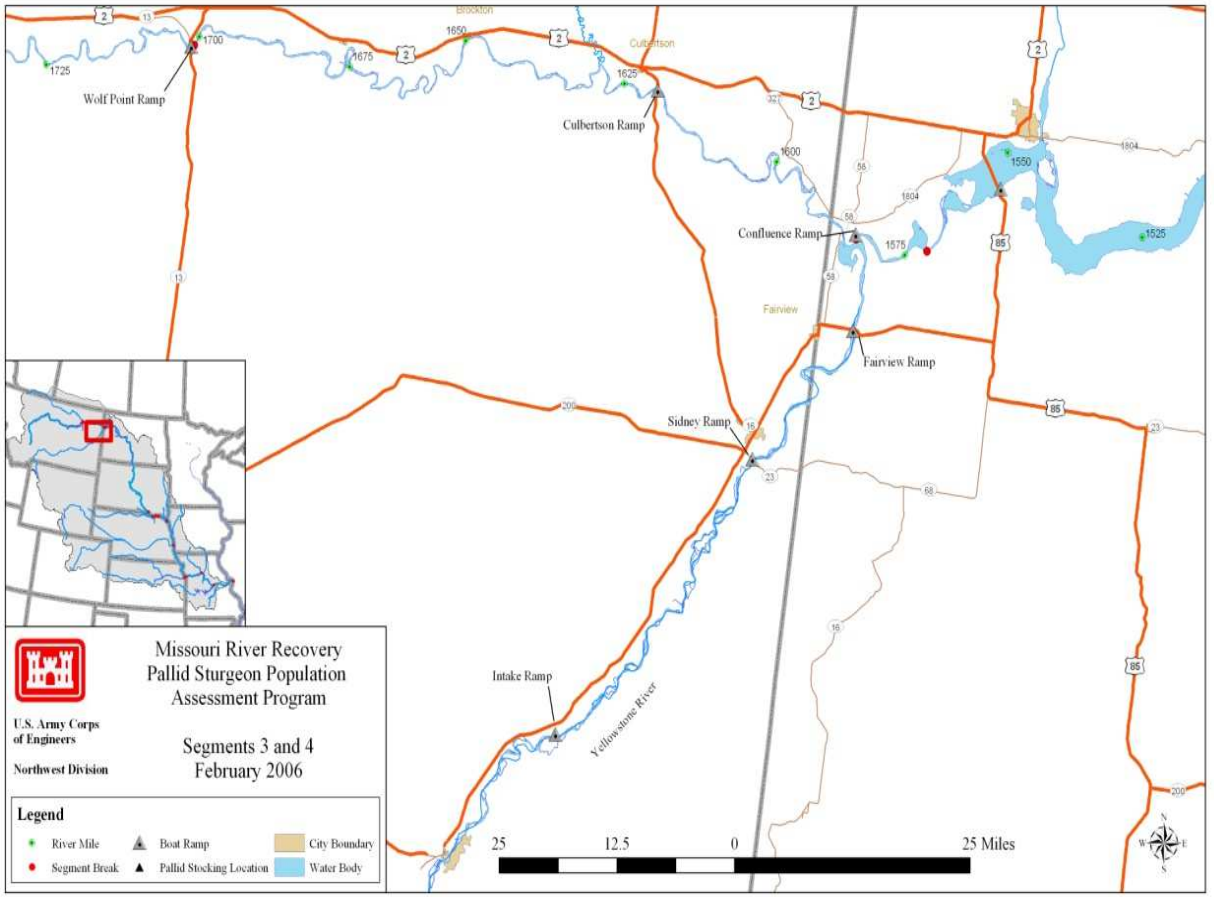

Figure 1. Map of Segment 3 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 3 encompasses the Missouri River from Wolf Point, MT (River Mile 1701.0) to the confluence of the Yellowstone River (River Mile 1582.0).

Results

Effort

A total of 21 individual river bends were sampled within Segment 3 during the sturgeon season and 23 during the fish community season during the 2014 field season. While trammel nets and otter trawls were used in all bends during both seasons, mini fyke nets were only deployed during the fish community season. Trotlines were used during both seasons, but each river bend was only sampled once through the entire field season. All gears had an average of 8.0 deployments per bend, with the exception of trammel nets and trotlines during the fish community season (Table 1).

Pallid Sturgeon

A total of 165 pallid sturgeon were sampled in Segment 3 during 2014 in random and non random sampling (Figure 2), a decrease from the previous five sampling years. One wild adult pallid sturgeon was captured within Segment 3 during 2014. This fish measured 1,400 mm in length and weighed 14,000 and was collected on October 27th at river mile 1,594 in a trammel net. All other pallid sturgeon captured within Segment 3 during 2014 were of hatchery origin.

The longitudinal distribution of pallid sturgeon captures during 2014 was somewhat homogeneous, with catches occurring throughout the Segment (Figure2).

Similar to 2013 and 2014, more pallid sturgeon were sampled in channel crossover habitats during 2013 (n = 60), than inside bends (n = 56), outside bends (n = 46), and secondary connected channels (n = 2) (Table 2). Pallid sturgeon were captured in depths ranging from 0.8 m to 5.0 m and bottom velocities from near zero flow to 1.09 m/second. In general, the proportion of pallid sturgeon captured in the channel crossover was higher than the proportion channel crossovers were sampled with trammel nets (Table 6 and 7).

A total of 12 year classes of hatchery reared pallid sturgeon were sampled in 2014 (Table 3). The most common year class captured during 2014 was the 2009 year class with 53 sampled. The largest pallid sturgeon sample was from the 1997 year class, which measured 955 mm in length and weighed 4,300g. Growth rates of each year class captured are shown in Table 3, which shows that as pallid sturgeon age in the river, growth rates slowly decrease. In addition, relative condition factor also seems to be declining as these fish get larger, although few individuals of the larger size classes have been captured (Table 3 and Figure 4). Although the

larger fish have slightly lower condition factors, they have remained relatively constant throughout the sampling years. This may in part be due to fish being stocked from the hatchery having unnaturally high condition and as they grow in the river condition decreases.

The size structure of pallid sturgeon captured in Segment 3 has been changing in a positive way since beginning the Program in 2006. From 2006 to 2014 the proportion of larger pallid sturgeon in the catch has increased every year (Figure 3). During 2006, a majority of the pallid sturgeon captured during the sturgeon season were of substock size, whereas in 2014 only four substock sized fish were captured during the sturgeon season. This is positive in terms of the hatchery reared pallid sturgeon population growing into larger size classes, but also indicates no natural recruitment has been documented in the river. While the size structure of hatchery reared pallid sturgeon is increasing, there are still relatively few fish of quality or larger size classes present.

To monitor relative abundance of pallid sturgeon within Segment 3, three standard gears have been used, the otter trawl, trammel nets and trotlines. Trammel net CPUE during the sturgeon season was appreciably higher during 2014 when compared to most sampling years. However, trammel net CPUE during the fish community seasonshowed a decrease in 2014 when compared to 2013

Otter trawl CPUE for pallid sturgeon during the overall 2014 sampling season was at a nine year low (Figure 7). Similarly, otter trawl CPUE during both sturgeon and fish community seasons were also at nine year lows. This is likely due to the fact that the most abundant year classes of pallid sturgeon (2009 and 2008) are growing into larger size classes, which are less susceptible to being captured in the otter trawl. Therefore, the trammel net is likely a better way at estimating the relative abundance of the hatchery reared pallid sturgeon currently residing in Segment 3. The otter trawl is likely more effective at documenting natural reproduction, since it tends to catch more YOY sturgeon than trammel nets.

Trotline have only been used as a standard gear for the Program since 2010. Overall trotline CPUE was down in 2014 from 2013 (Figure 8). Both the sturgeon and fish community seasons had similar CPUE during 2014. It is not known why trotline CPUE does not mirror trammel nets. However, since trotlines are a baited gear and trammel nets are passive, trammel nets may have a better chance at mimicking pallid sturgeon abundance. Nevertheless, trotlines

are an effective gear in capturing large numbers of pallid sturgeon at times, which helps populate data for survival rates, growth rates, distribution and size structure.

Table 1. Number of bends sampled, mean number of deployments, and total number of deployments by macrohabitat for Segment 3 on the Missouri River during the sturgeon season and fish community season in 2014.

Gear	Number of Bends	Mean deployments	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRMS	TRML
Sturgeon Season										
1.0" Trammel Net	21	8	63	63	39	2	0	0	0	0
Otter Trawl	22	8	62	59	50	5	0	0	0	0
Fish Community Season										
1.0" Trammel Net	23	7.74	67	58	50	3	0	0	0	0
Mini-Fyke Net	21	8	57	70	5	11	19	6	0	0
Otter Trawl	22	8	71	58	47	0	0	0	0	0
Both Seasons										
Trot Lines	21	8.38	71	61	39	3	0	0	1	1

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

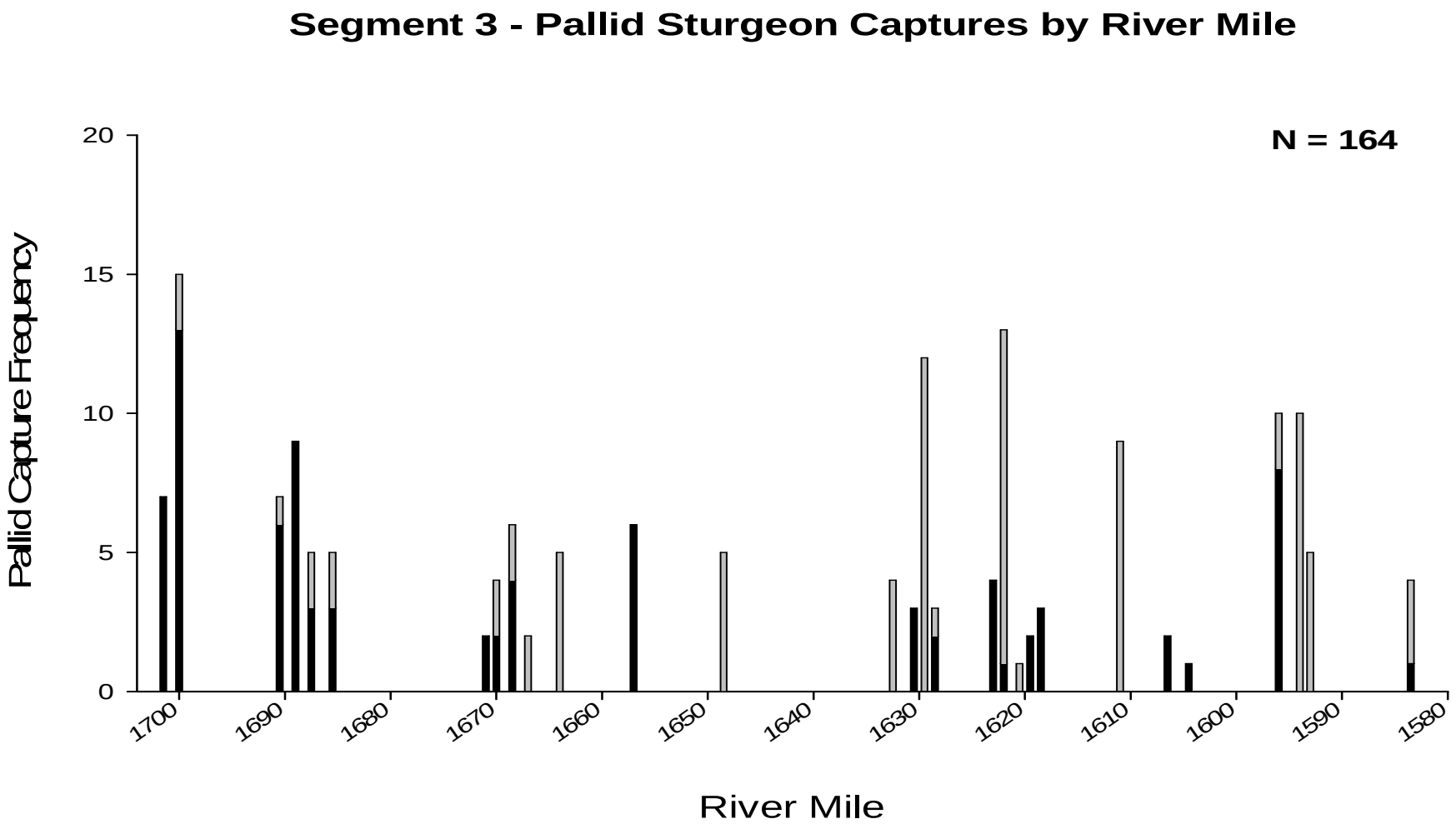

Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 3 of the Missouri River during 2014. Black bars represent pallid captures during the sturgeon season and white bars during the fish community season. Figure includes all pallid captures including non-random and wild samples.

Table 2. Pallid sturgeon capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2014. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B.

Macro	Meso	Depth(m) (Effort)	Depth(m) (catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (catch)	Temp. (Effort)	Temp. (catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (catch)	Total Pallids caught
CHXO	BARS	0.4 (0.1-1.0)		0.05 (0.00-0.16)		15.7 (10.0-22.4)		47 (22-98)		
	CHNB	1.7 (0.5-6.0)	1.7 (0.8-3.0)	0.64 (0.00-0.97)	0.54 (0.00-0.80)	14.4 (6.5-21.8)	12.5 (6.5-20.5)	81 (17-1200)	61 (22-181)	60
ISB	CHNB	1.8 (0.4-4.6)	1.8 (1.0-3.1)	0.62 (0.00-1.29)	0.54 (0.00-0.97)	14.6 (3.7-22.0)	13.8 (6.5-21.7)	84 (17-1200)	58 (26-150)	56
	BARS	0.4 (0.1-0.6)		0.02 (0.00-0.09)		16.2 (1.3-22.5)		100 (21-1000)		.
OSB	CHNB	2.5 (0.6-6.7)	2.6 (1.0-5.0)	0.64 (0.00-1.09)	0.33 (0.00-1.09)	14.8 (6.5-22.4)	13.2 (6.5-21.8)	71 (20-470)	55 (24-98)	46
	BARS	0.4 (0.3-0.6)		0.12 (0.09-0.14)		17.7 (12.9-21.0)		54 (45-62)		.
SCCL	CHNB	1.3 (0.8-2.4)	1.0 (0.8-1.1)	. (.-.)	. (.-.)	16.8 (6.5-21.5)	18.6 (18.5-18.7)	41 (25-66)	25 (25-25)	2
	BARS	0.4 (0.2-0.6)		0.08 (0.00-0.24)		16.3 (11.5-22.3)		288 (24-1000)		.
SCCS	BARS	0.5 (0.3-0.6)		0.07 (0.00-0.20)		17.6 (11.0-21.3)		57 (22-79)		.
SCN	BARS	0.5 (0.3-0.6)		0.00 (0.00-0.00)		17.2 (12.7-21.0)		58 (55-60)		.
TRML	CHNB	1.2 (1.2-1.2)		. (.-.)		21.0 (21.021.0)		. (.-.)		.

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 2014 from Segment 3 of the Missouri River. Relative condition factor was calculated using the equation in Shuman et al. (2010).

Year Class	N	Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
1997	2	.	.	.	948	3950	1.121	.	.
.	.	.	.	.	15	700	0.14	.	.
2001	4	280	.	.	671	1013.25	0.88	0.078	.
.	.	.	.	.	95	361.83	0.1	.	.
2002	2	194	20	1.054	736	1501	0.935	0.116	0.237
.	.	.	.	.	177	1108	0.02	.	.
2004	2	.	.	.	452	318.5	1.04	.	.
.	.	.	.	.	13	21	0.03	.	.
2005	13	245	58	1.418	450	287.77	0.905	0.046	0.041
.	.	.	.	.	29	73.56	0.053	.	.
2006	19	262	73	1.36	448	272.68	0.899	0.073	0.083
.	.	31	38.28	0.183	15	32.51	0.051	0.024	0.044
2007	7	222	32	1.079	409	224.86	1.003	0.085	0.082
.	.	14	6	0.021	29	45.7	0.079	0.012	0.027
2008	33	266	61.86	1.154	401	192.76	0.928	0.073	0.082
.	.	19	10.69	0.122	6	13.86	0.049	0.015	0.027
2009	53	249	57	1.169	372	157.85	0.968	0.086	0.067
.	.	30	22.37	0.063	7	9.65	0.032	0.01	0.009
2010	17	240	49.33	1.015	358	141	0.981	0.102	0.075
.	.	47	43.13	0.086	16	14.84	0.052	0.023	0.027
2012	7	341	150.14	1.216	398	181.71	0.889	0.114	0.063
.	.	15	28.01	0.057	24	30.14	0.037	0.019	0.011
2013	4	268	80.13	1.386	307	86.25	0.994	0.358	-0.056
.	.	39	32.73	0.092	37	28.58	0.2	0.03	0.469

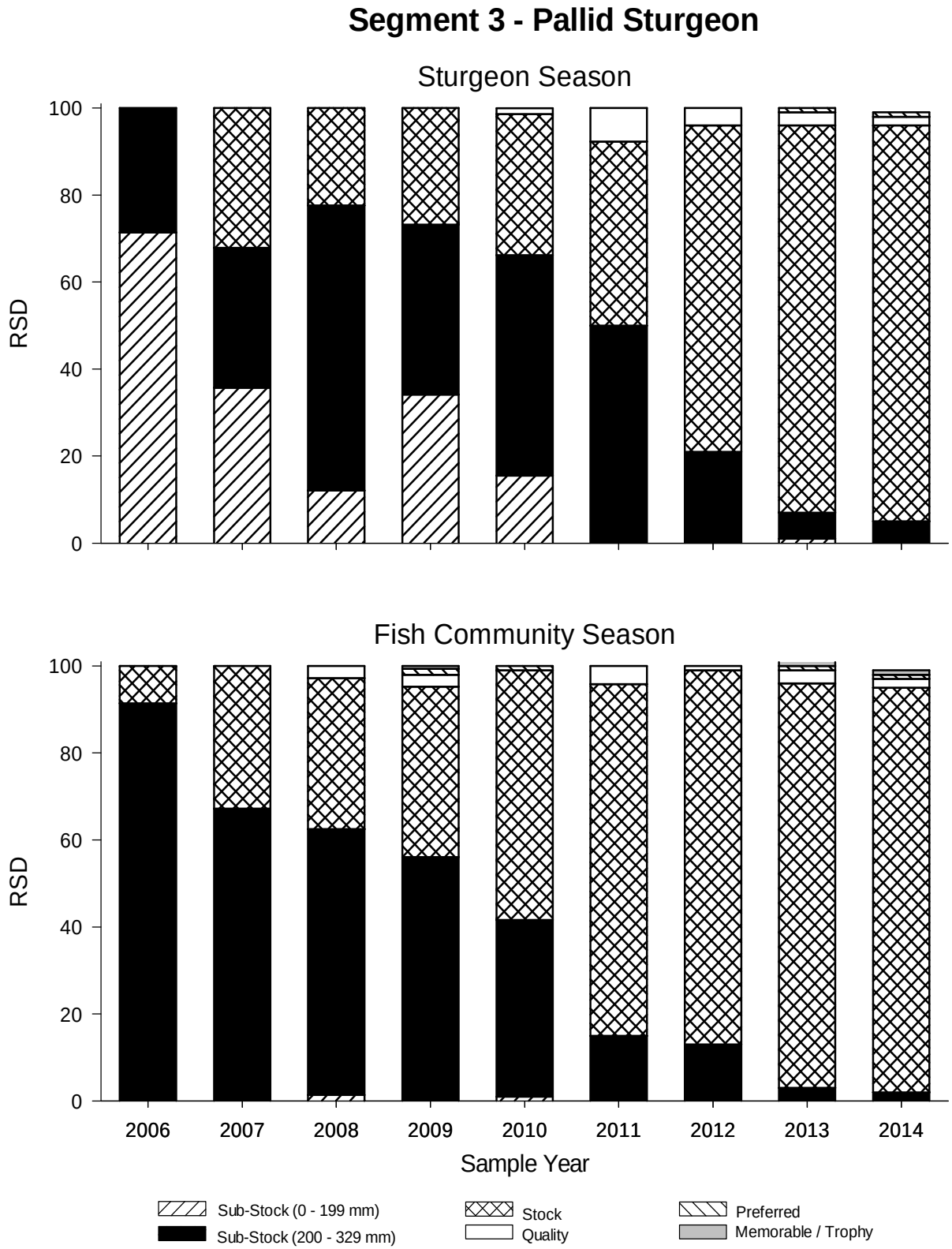

Figure 3. Proportion of total catch by length group for all pallid sturgeon captured with all gear by length category from 2006-2014 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

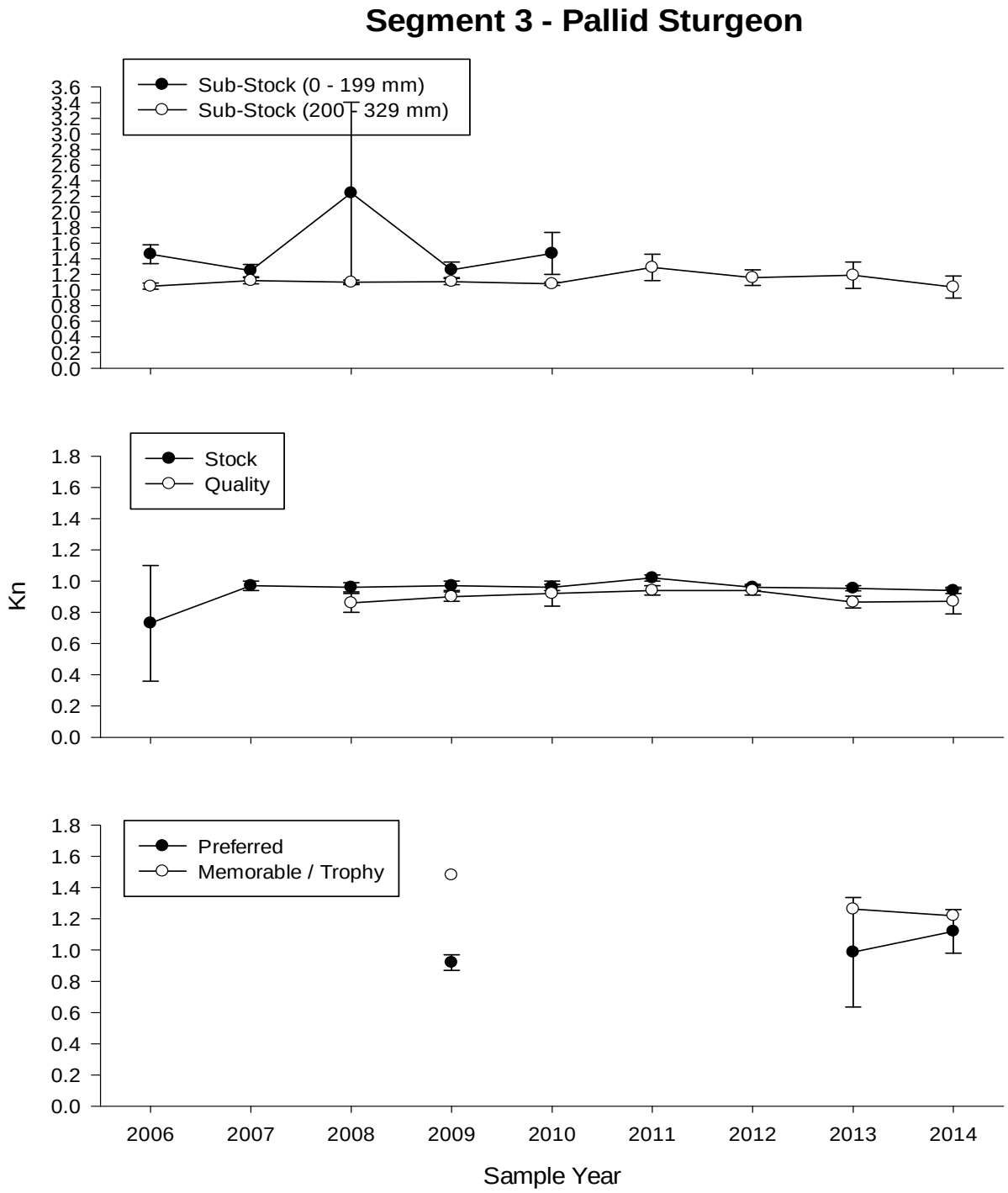

Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2014 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (2011).

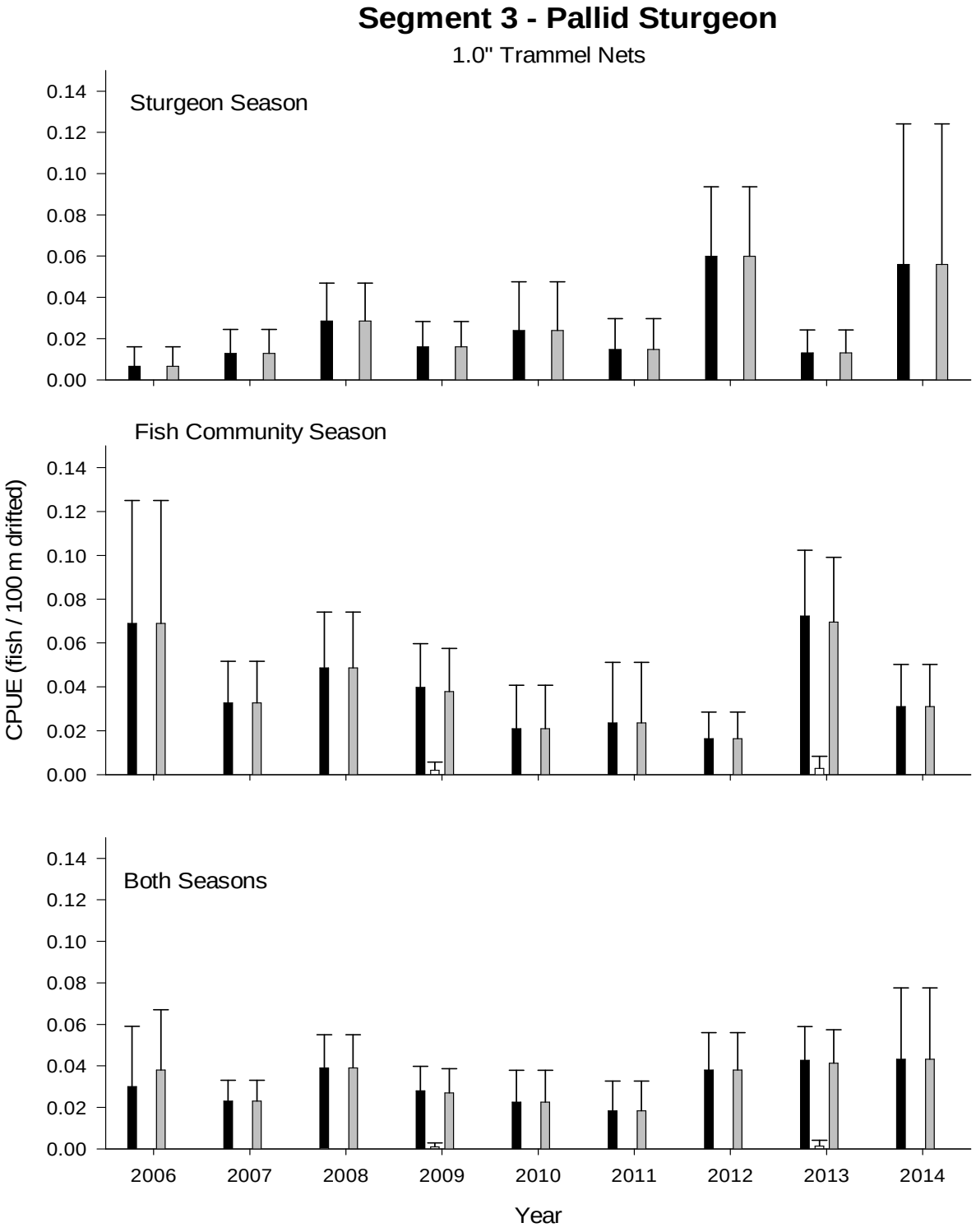

Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 3 of the Missouri River from 2006-2014. Pallid sturgeon of unknown origin are awaiting genetic verification.

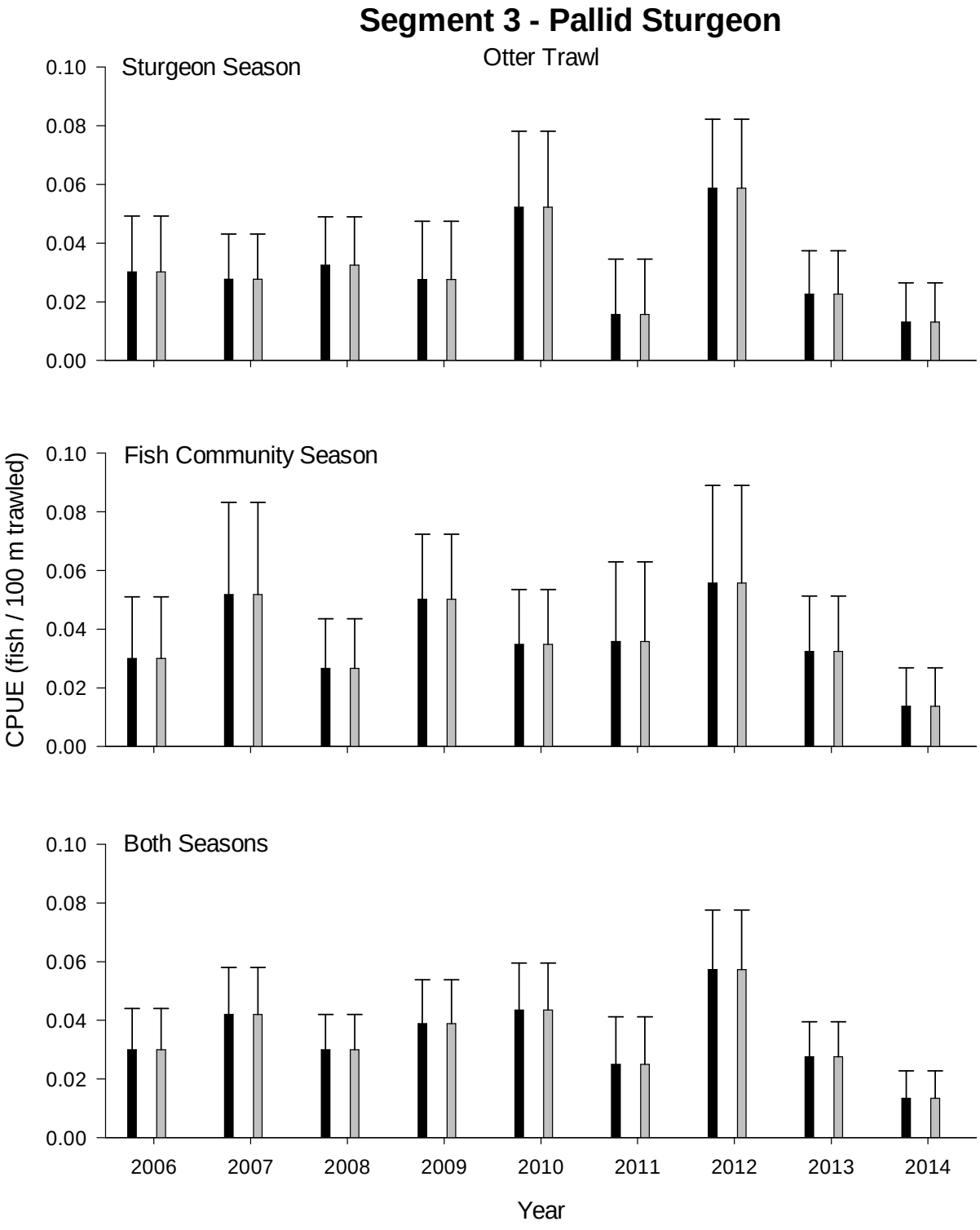

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 3 of the Missouri River from 2006-2014. Pallid sturgeon of unknown origin are awaiting genetic verification.

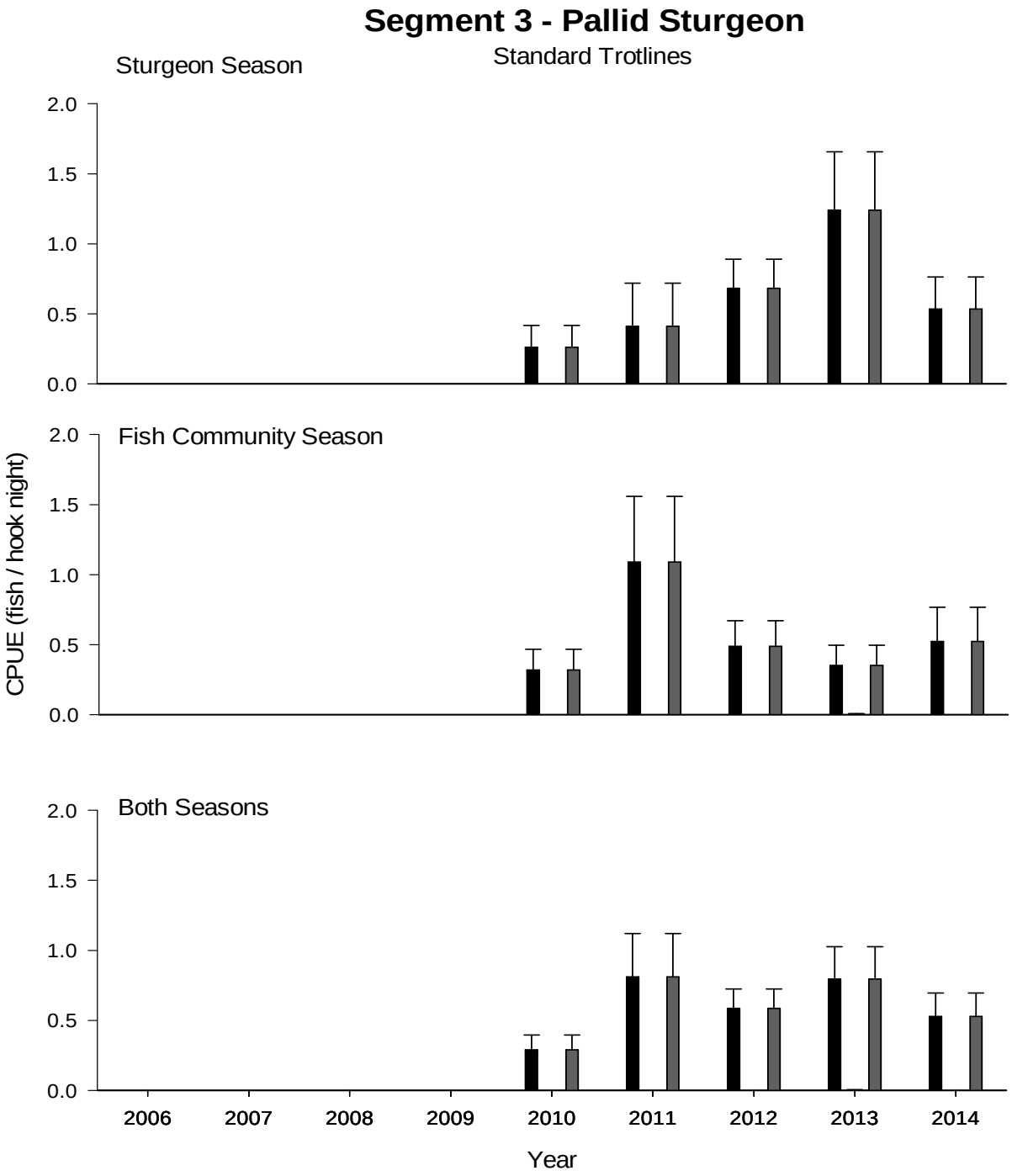

Figure 8. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using trot lines in Segment 3 of the Missouri River from 2010-2014. Pallid sturgeon of unknown origin are awaiting genetic 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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		41	32	26	1	0	0	0	0
				Both Seasons					
Trot Lines	0	0	0	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	1	0	0	100	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	1	0	0	100	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	2	0	0	0	0	0	0	0	0
		41	32	26	0	0	0	0	0
				Both Seasons					
Trot Lines	1	0	0	100	0	0	0	0	0
		40	35	22	2	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	CONF	TRML	TRMS
				Sturgeon Season						
1.0" Trammel Net	19	21	21	58	0	0	0	0	0	0
		42	34	23	1	0	0	0	0	0
Otter Trawl	5	20	20	60	0	0	0	0	0	0
		36	33	28	3	0	0	0	0	0
				Fish Community Season						
1.0" Trammel Net	12	17	42	33	8	0	0	0	0	0
		39	33	26	2	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0	0
Otter Trawl	4	50	50	0	0	0	0	0	0	0
		41	32	26	0	0	0	0	0	0
				Both Seasons						
Trot Lines	90	43	34	22	0	0	0	0	0	0
		40	35	22	2	0	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	CONF	TRML	TRMS
				Sturgeon Season						
1.0" Trammel Net	1	0	100	0	0	0	0	0	0	0
		42	34	23	1	0	0	0	0	0
Otter Trawl	1	0	0	100	0	0	0	0	0	0
		36	33	28	3	0	0	0	0	0
				Fish Community Season						
1.0" Trammel Net	1	0	100	0	0	0	0	0	0	0
		39	33	26	2	0	0	0	0	
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		41	32	26	0	0	0	0	0	0
				Both Seasons						
Trot Lines	2	100	0	0	0	0	0	0	0	0
		40	35	22	2	0	0	0	1	1

Table 8. Total number of pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	CONF	TRML	TRMS
				Sturgeon Season						
1.0" Trammel Net	21	19	24	57	0	0	0	0	0	0
		42	34	23	1	0	0	0	0	0
Otter Trawl	7	14	14	71	0	0	0	0	0	0
		36	33	28	3	0	0	0	0	0
				Fish Community Season						
1.0" Trammel Net	13	15	46	31	8	0	0	0	0	0
		39	33	26	2	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0	0
Otter Trawl	6	33	50	17	0	0	0	0	0	0
		41	32	26	0	0	0	0	0	0
				Both Seasons						
Trot Lines	93	44	33	23	0	0	0	0	0	0
		40	35	22	2	0	0	0	1	1

Segment 3 - Pallid Sturgeon

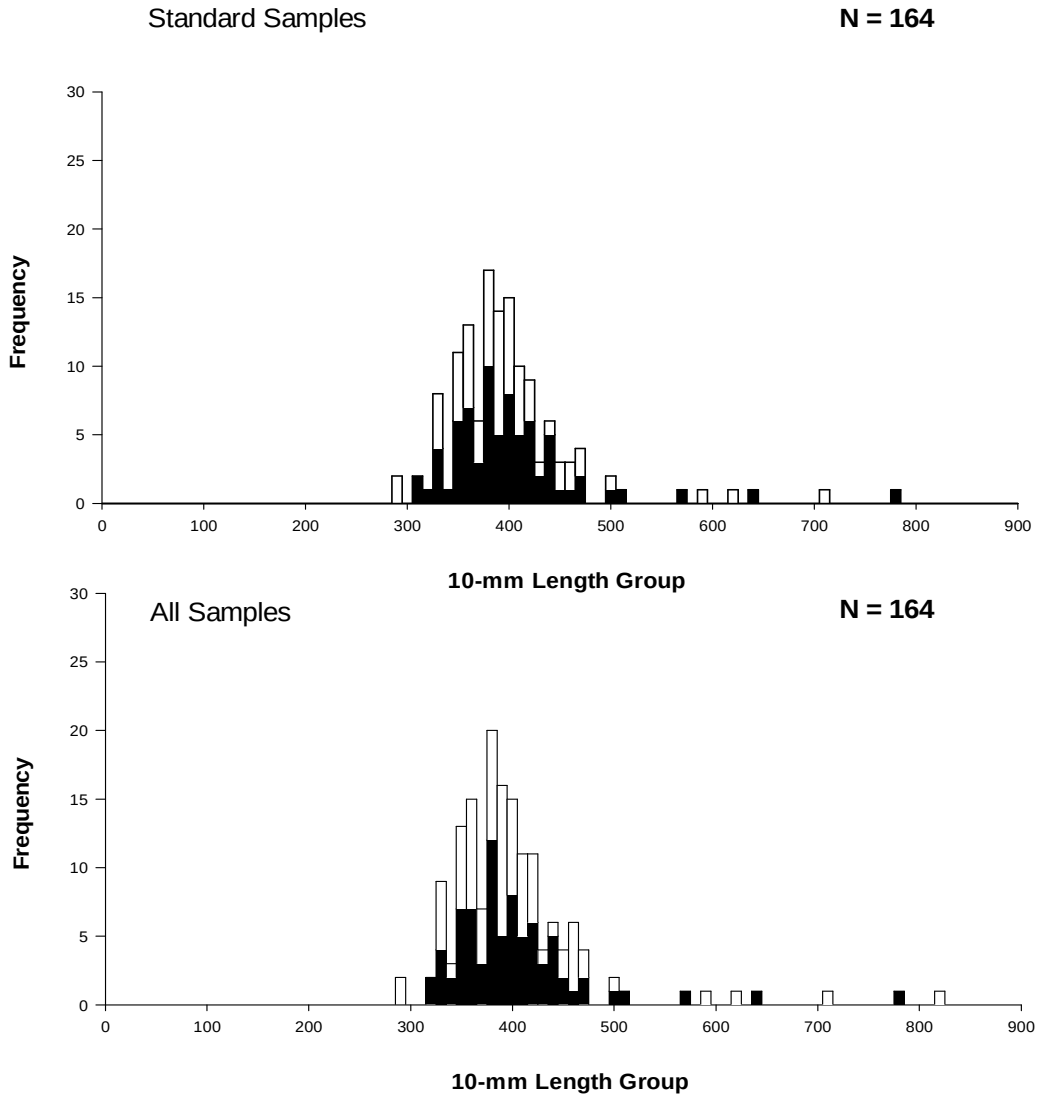

Figure 9. Length frequency of pallid sturgeon captured during the sturgeon season (black bars) and fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014. Pallid sturgeon of unknown origin are awaiting genetic verification.

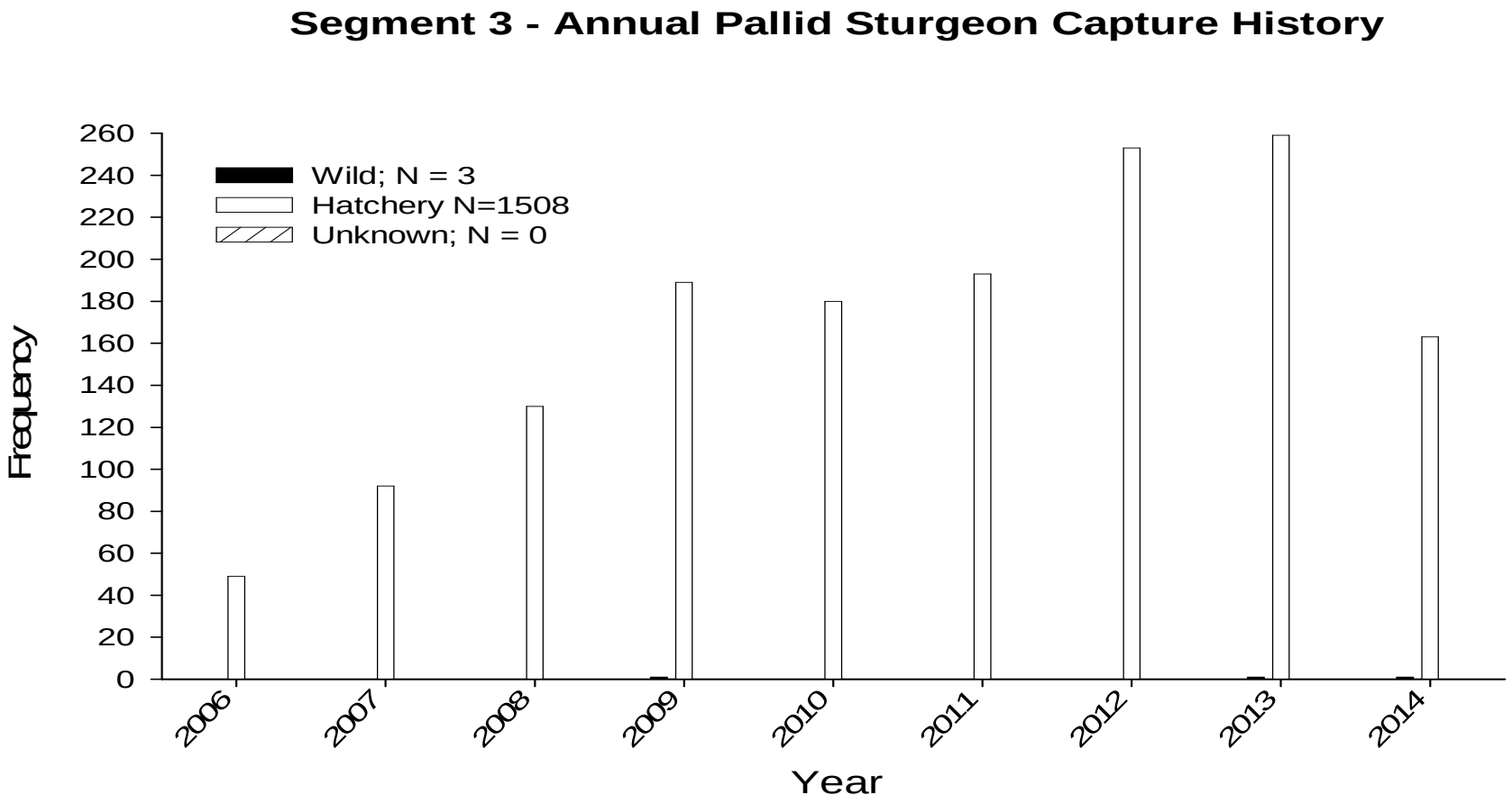

Figure 10. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 3 of the Missouri River from 2006-2014. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose x pallid sturgeon hybrids were collected in Segment 3 during 2014 or during the previous eight years of sampling.

Targeted Native River Species

Shovelnose Sturgeon

A total of 548 shovelnose sturgeon were captured within Segment 3 during 2014, 165 and 383 during the sturgeon and fish community seasons, respectively. Shovelnose sturgeon averaged 518.2 mm in length and 649.0 g in weight.

Combined trammel net CPUE was slightly lower in 2014 than compared to 2013, but was the second highest of all nine sampling years (Figure 11). Overall, no discernible pattern can be drawn about the overall relative abundance of shovelnose sturgeon over the nine sampling years by the trammel net catch.

Similarly to trammel nets, combined otter trawl CPUE was slightly lower in 2014 when compared to 2013. The relative abundance of substock sized shovelnose sturgeon was at a nine year high in 2014. Also similar to trammel nets, otter trawls give little evidence of large population fluctuations between years. However, the ability to detect YOY shovelnose is the true strength of the otter trawl.

While trotlines have only been deployed as a standard gear since 2010, CPUE for shovelnose sturgeon has remained extremely constant. The only appreciable difference between the five years of trotline data exists in the catches of fish smaller than quality sized fish and since those numbers are so low, no inferences can be made either (Figure 13).

Although it is hard to compare overall CPUE between years due to highly variable catches, difference in the sizes of shovelnose sturgeon captured does shed light on shovelnose recruitment. The 2014 sampling year had one of the highest proportions of small shovelnose captured of all sampling years (Figure 15). In addition, it is only the second year where substock fish in the 0-149 mm range were captured. The other year where 0-149 mm shovelnose were captured was 2010 and the following year a relatively large proportion of 150-249 mm fish were sampled, showing that they had the 2010 year class had recruited to age-1. It will be interesting to see if fish in the 150-250 mm range are captured during the 2015 field season.

The majority of shovelnose sturgeon catches over the nine years of sampling are of fish in the preferred and memorable/trophy categories (Figure 15). These fish are likely older than seven years old, at which time it becomes increasingly difficult to age them.

The relative weights of shovelnose sturgeon within Segment 3 have not changed greatly over the past nine years of sampling (Figure 16). However, after the good water years of 2010 and 2011 stock, quality and preferred sized fish showed slight increases in relative condition. The average relative condition of those fish decreased during 2013 and continued to decrease into the 2014 season. The change in relative weights of these size classes of shovelnose sturgeon is contrary to pallid sturgeon relative condition (Figures 4 and 16). In other words, we did not observe an appreciable increase in condition of pallid sturgeon after the water years of 2010 and 2011.

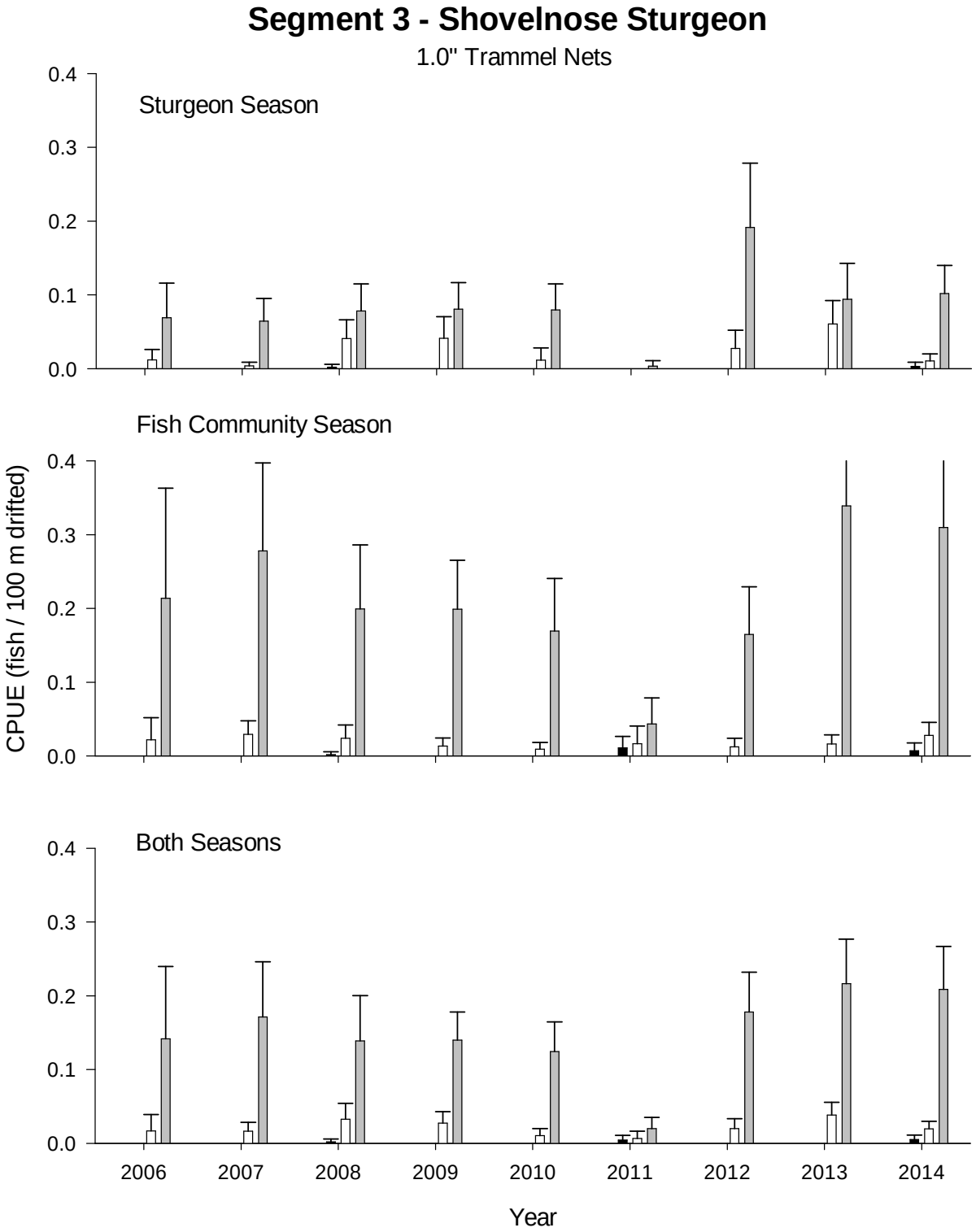

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0” trammel nets in Segment 3 of the Missouri River from 2006-2014.

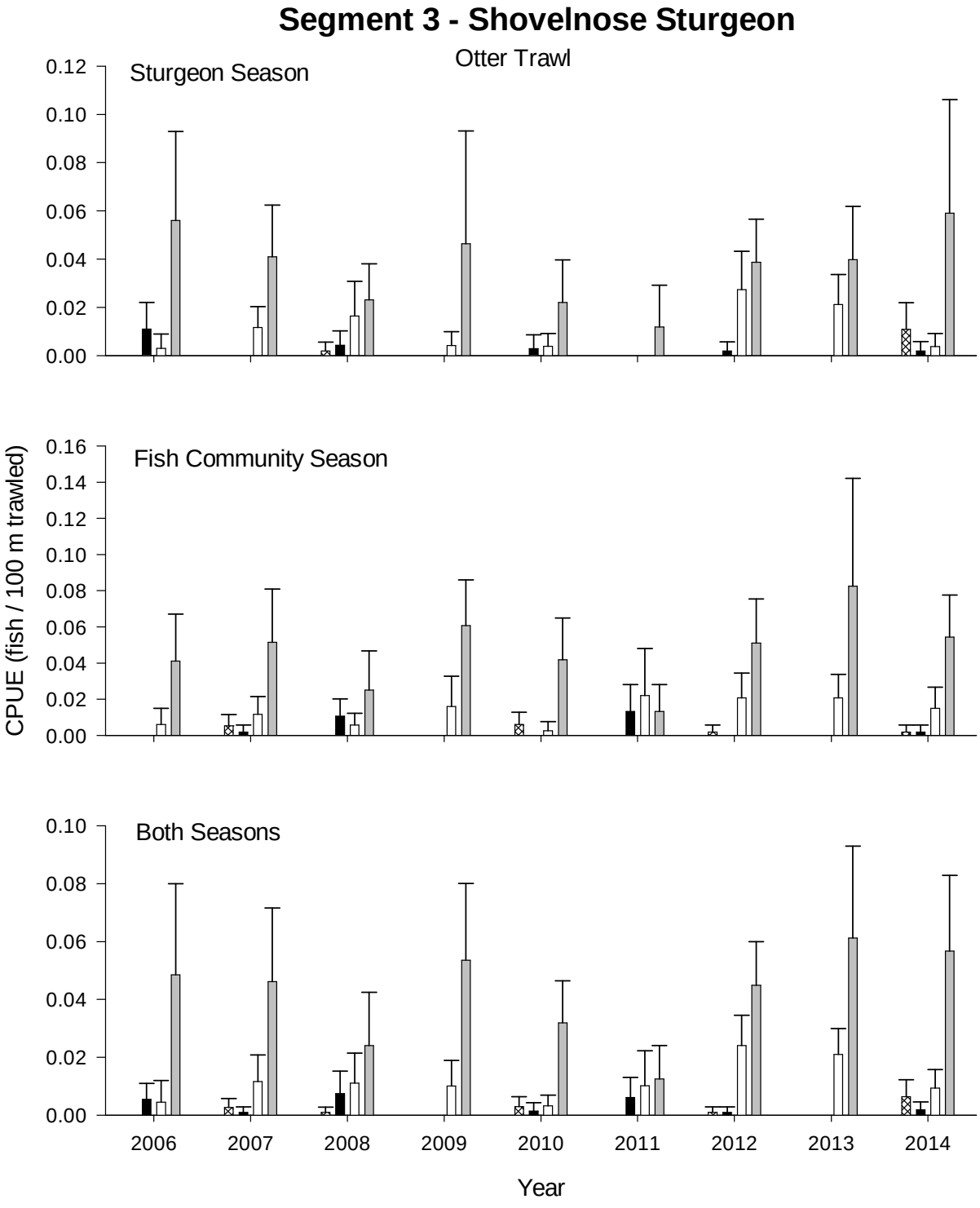

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 3 of the Missouri River from 2006-2014.

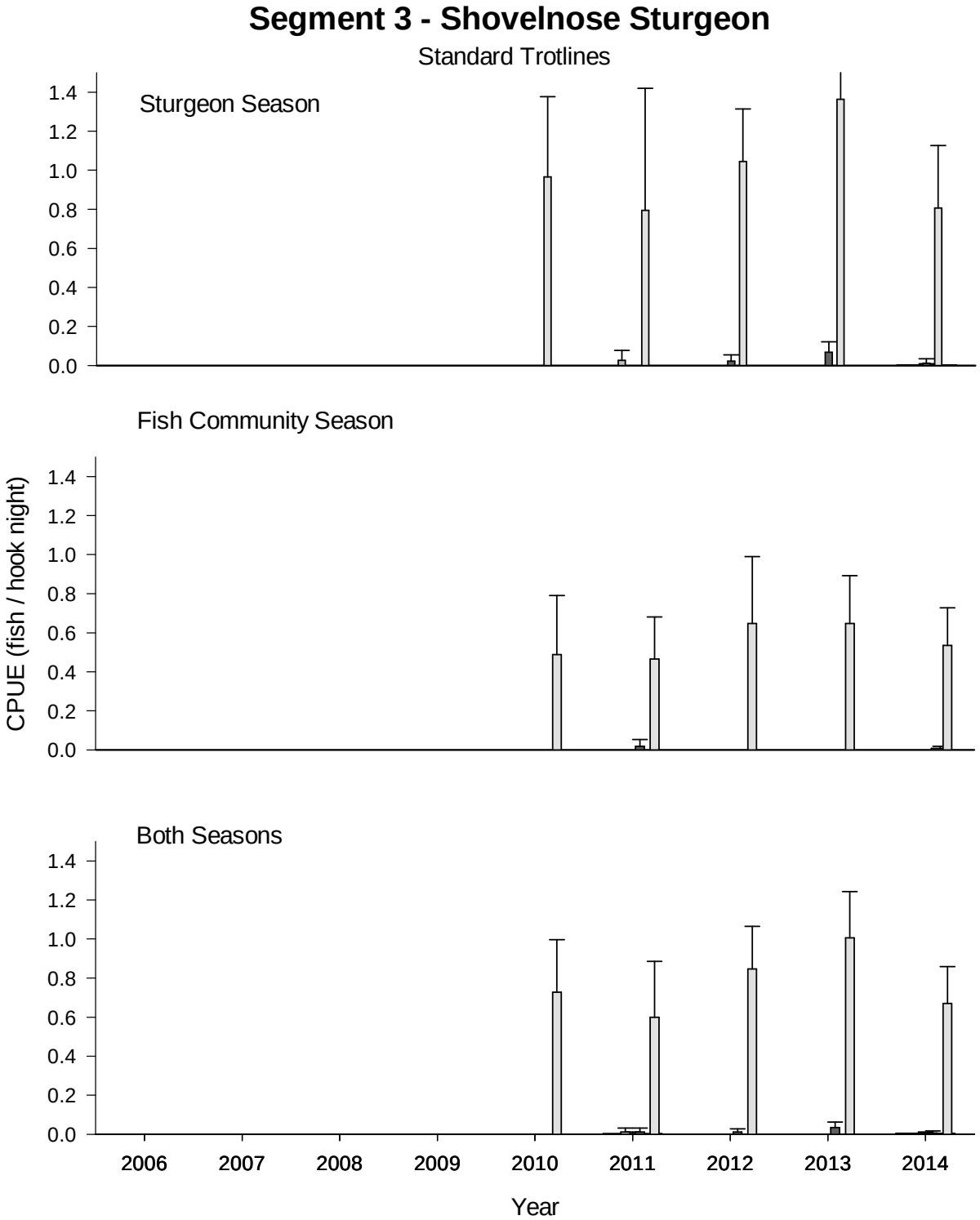

Figure 13. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using trotlines in Segment 3 of the Missouri River from 2010-2014. Note that trotlines were not used as a standard gear from 2006 to 2009.

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	5	0	80	20	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	1	100	0	0	0	0	0	0	0
		41	32	26	1	0	0	0	0
				Both Seasons					
Trot Lines	0	0	0	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	1	0	100	0	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	1	0	100	0	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	2	0	100	0	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	1	0	100	0	0	0	0	0	0
		0	41	32	26	0	0	0	0
				Both Seasons					
Trot Lines	0	0	0	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	5	60	20	20	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	2	0	50	50	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	13	23	54	23	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	7	43	29	29	0	0	0	0	0
		41	32	26	0	0	0	0	0
				Both Seasons					
Trot Lines	1	0	100	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

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 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	41	51	22	24	2	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	2	32	50	18	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	124	31	39	29	1	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	28	43	25	32	0	0	0	0	0
		41	32	26	0	0	0	0	0
				Both Seasons					
Trot Lines	118	42	41	15	2	0	0	0	0
		40	35	22	2	0	0	1	1

Table 13. Total number of shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	47	51	23	23	2	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	30	23	57	20	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	139	30	41	28	1	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	37	46	24	30	0	0	0	0	0
		41	32	26	0	0	0	0	0
				Both Seasons					
Trot Lines	119	42	41	15	2	0	0	0	0
		40	35	22	2	0	0	1	1

Segment 3 - Shovelnose Sturgeon

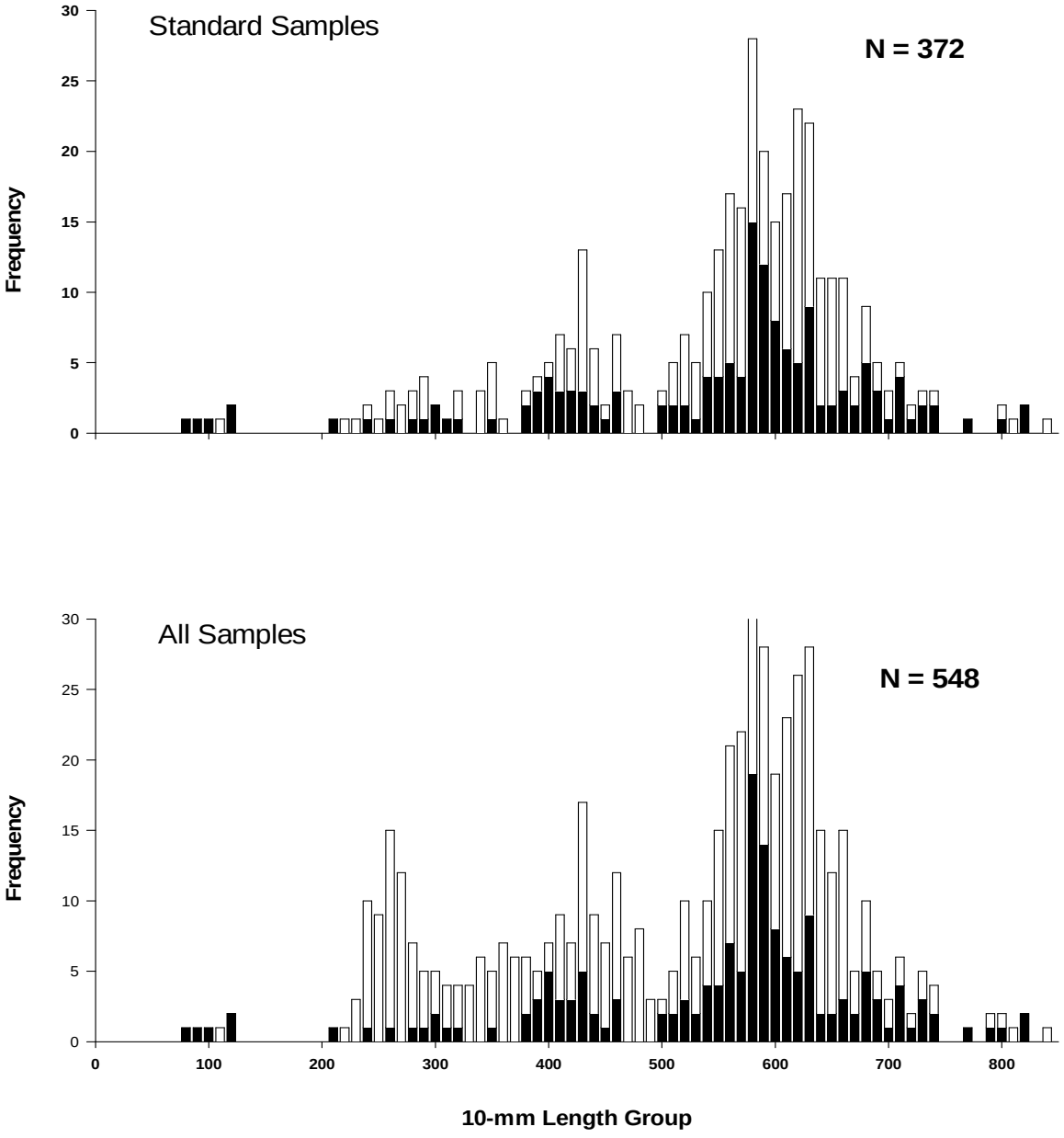

Figure 14. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

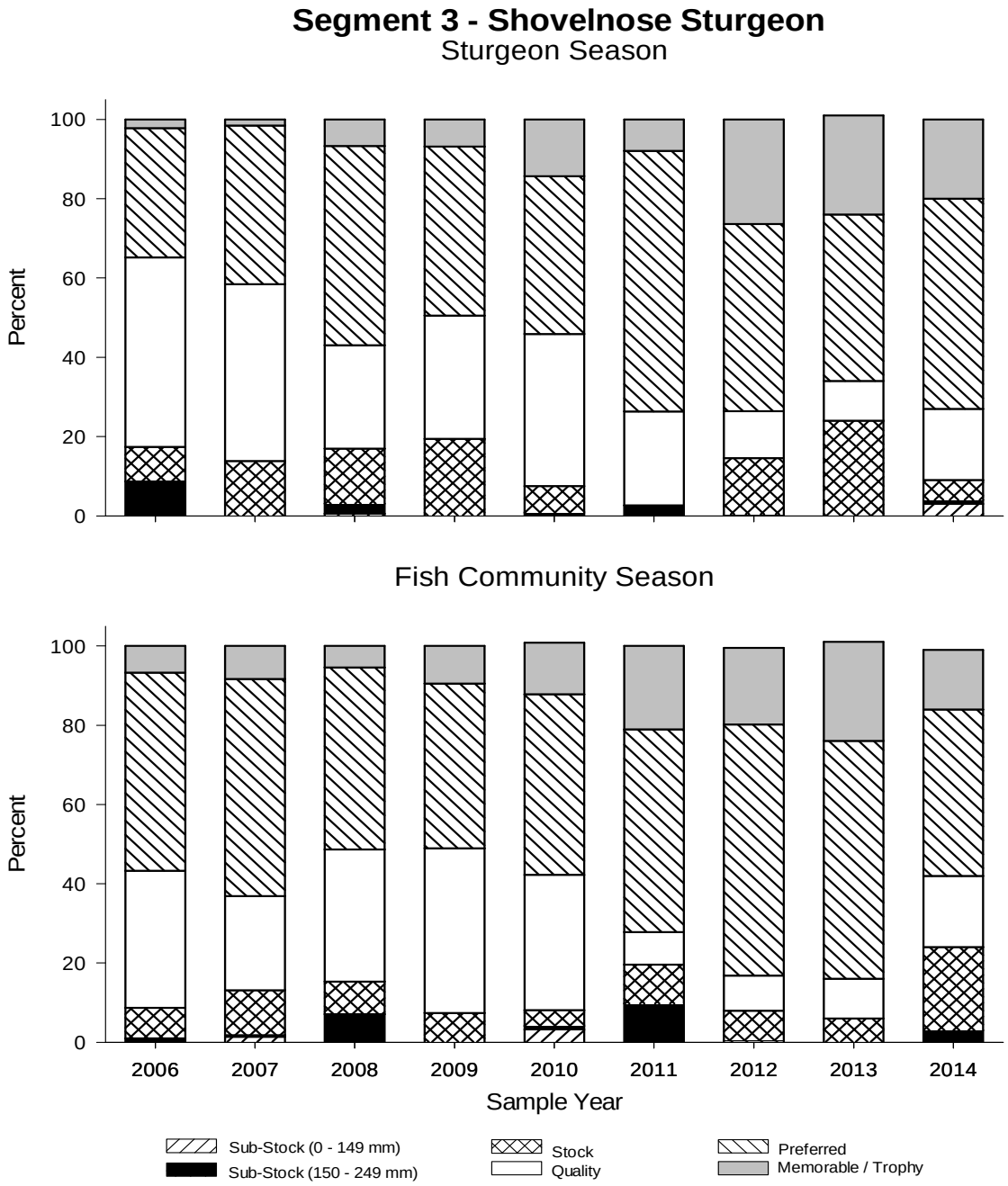

Figure 15. Proportion by length group for all shovelnose sturgeon captured with all gear by length category from 2006 to 2014 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

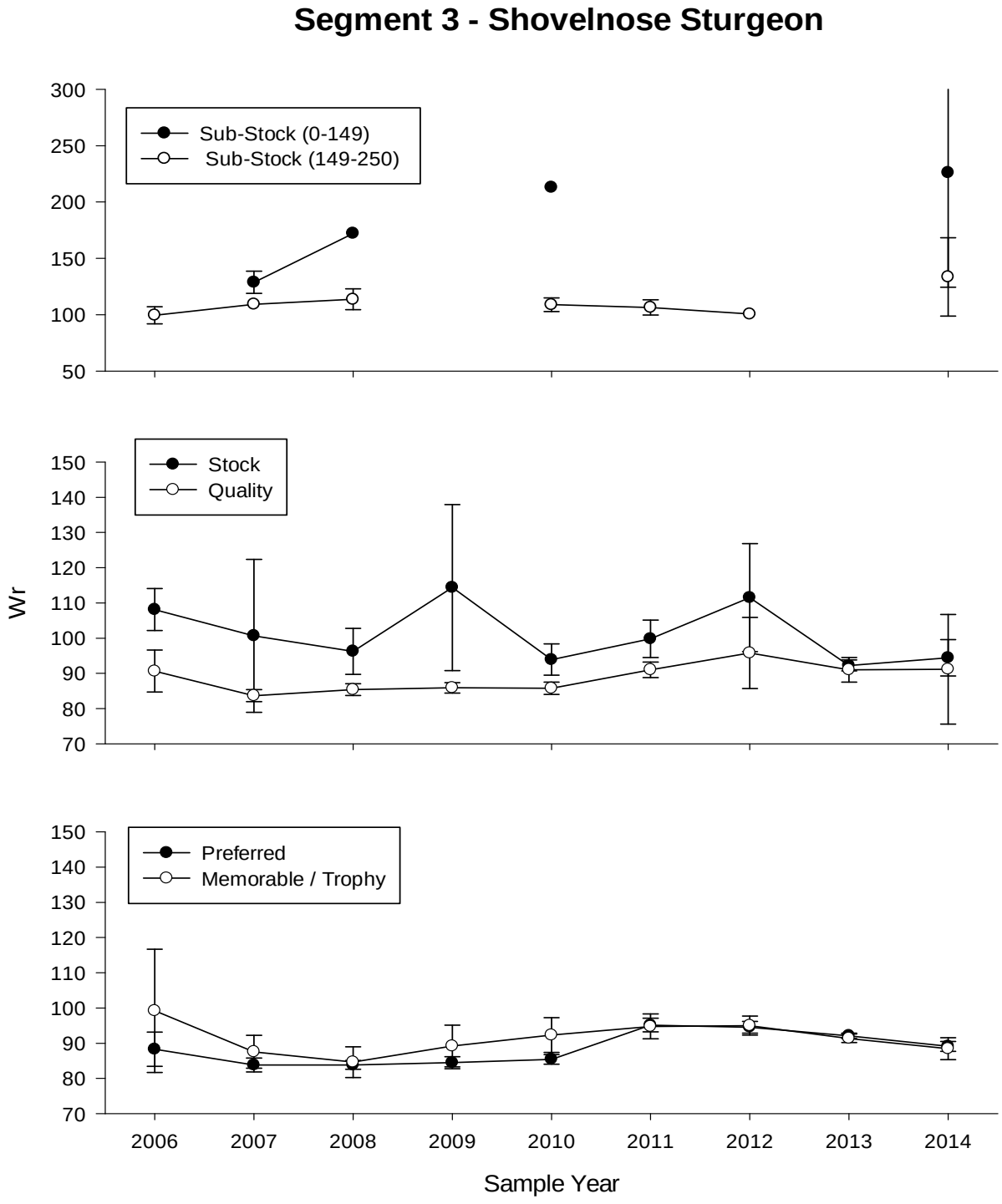

Figure 16. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2014 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

Sturgeon Chub

A total of 178 sturgeon chubs were sampled within Segment 3 during 2014, all of which were caught using the otter trawl. Random subsamples accounted for 171 sturgeon chubs, while non-random duplicate trawls accounted for the remaining 7. More sturgeon chubs were sampled during the sturgeon season (n = 135), when compared to the fish community season (n = 43). The total number of sturgeon chubs sampled in 2014 was similar to that sampled in 2013 (n = 173)

Although the total number of sturgeon chubs captured in 2014 was similar to 2013, there was a slight increase in overall CPUE during 2014 when compared to the previous sampling year. However, during the fish community season, a decline in otter trawl CPUE was observed. This decrease was offset by the larger CUPE for sturgeon chubs during the sturgeon season in 2014 (Figure 17). Since 2009 CPUE of sturgeon chubs has declined and stayed relatively low when compared to 2006 through 2008. The highest overall CPUE was observed in 2006, which had 0.67 fish/100m, more than triple that of 2014.

Sturgeon chubs sampled in Segment 3 during 2014 averaged 57.0 mm in length. Sturgeon chubs collected in 2014 were mainly comprised of one and two year old fish, with some YOY and three years old fish collected (Herman et al. 2008).

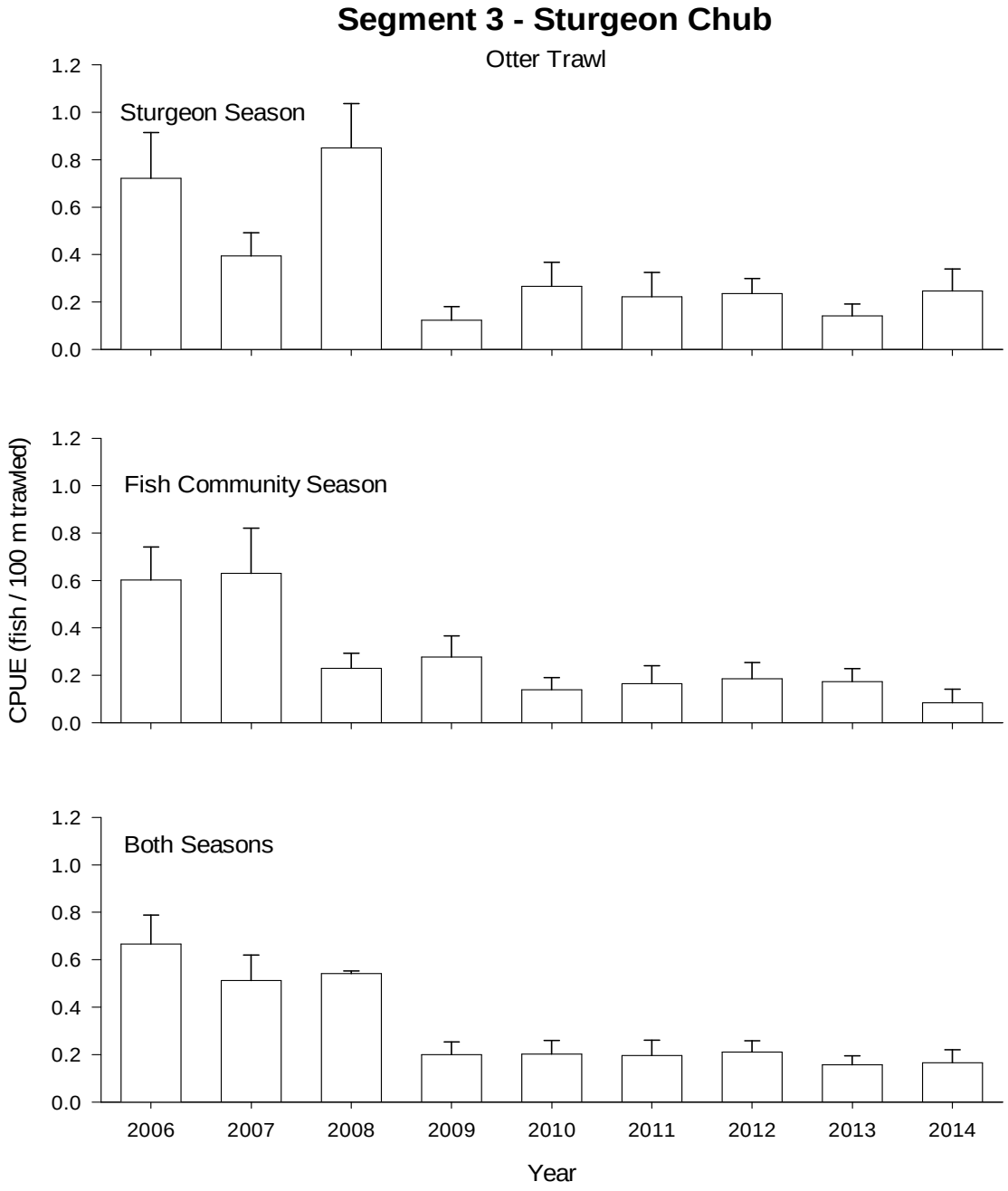

Figure 17. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 3 of the Missouri River from 2006-2014.

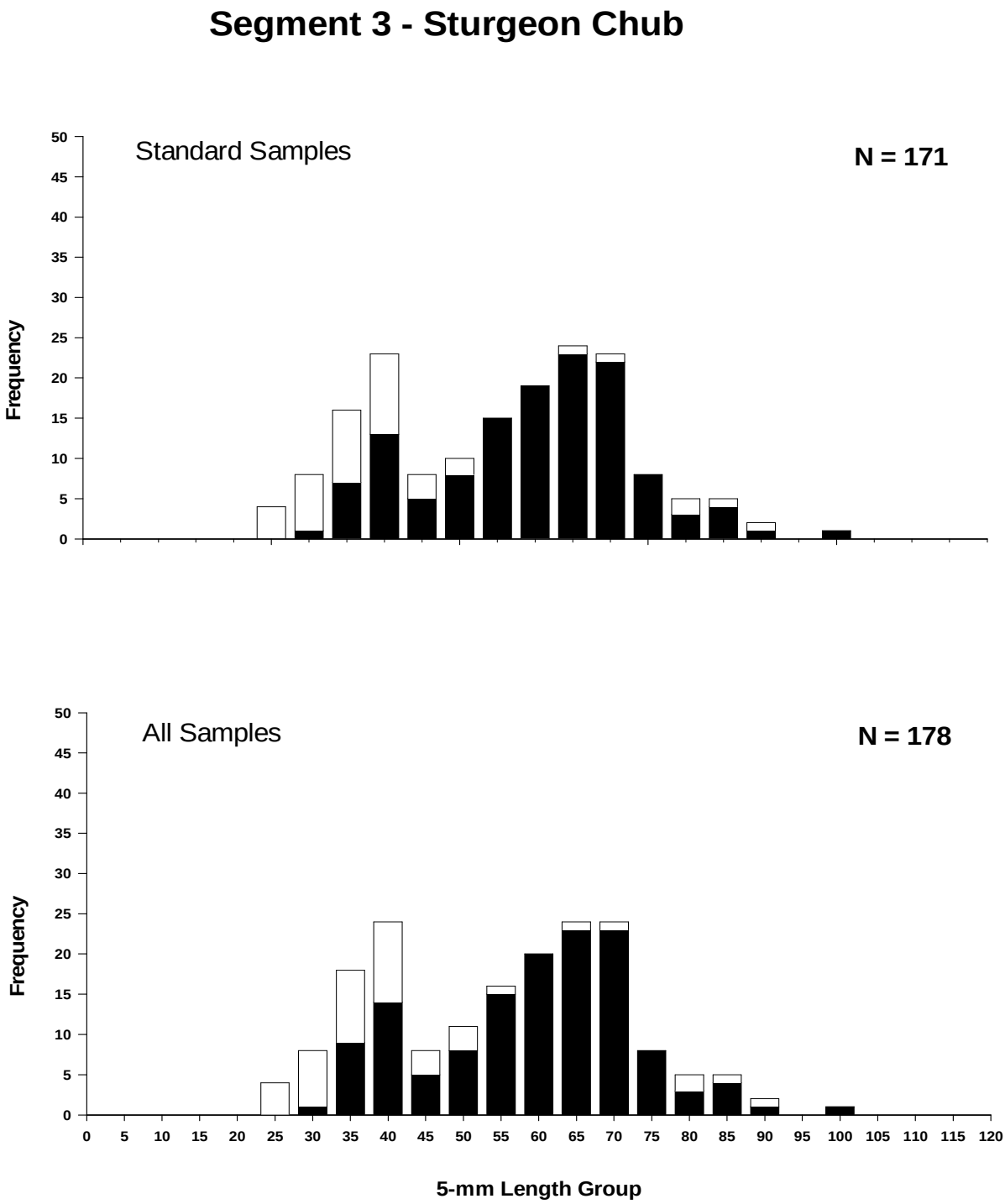

Figure 18. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

Sicklefin Chub

During 2014 a total of 162 sicklefin chubs were collected within Segment 3, which was an increase from the 77 captured during 2013. During 2014, more sicklefin chubs were collected during the fish community season (n = 131), when compared to the sturgeon season (n = 31), this was a similar pattern to what was observed in 2013. All sicklefin chubs collected in 2014 were captured in the otter trawl. The higher total catches of sicklefin chub in 2014 can be seen in an increase of otter trawl CPUE. For both seasons combined, 2014 had the highest CPUE of sicklefin when compared to the previous 8 years of sampling.

The length frequency histogram of sicklefin chubs indicate a strong cohort of fish in the 75 to 90 mm range. However, during 2014 a small proportion was made up of younger smaller fish in the 40 to 50 mm range.

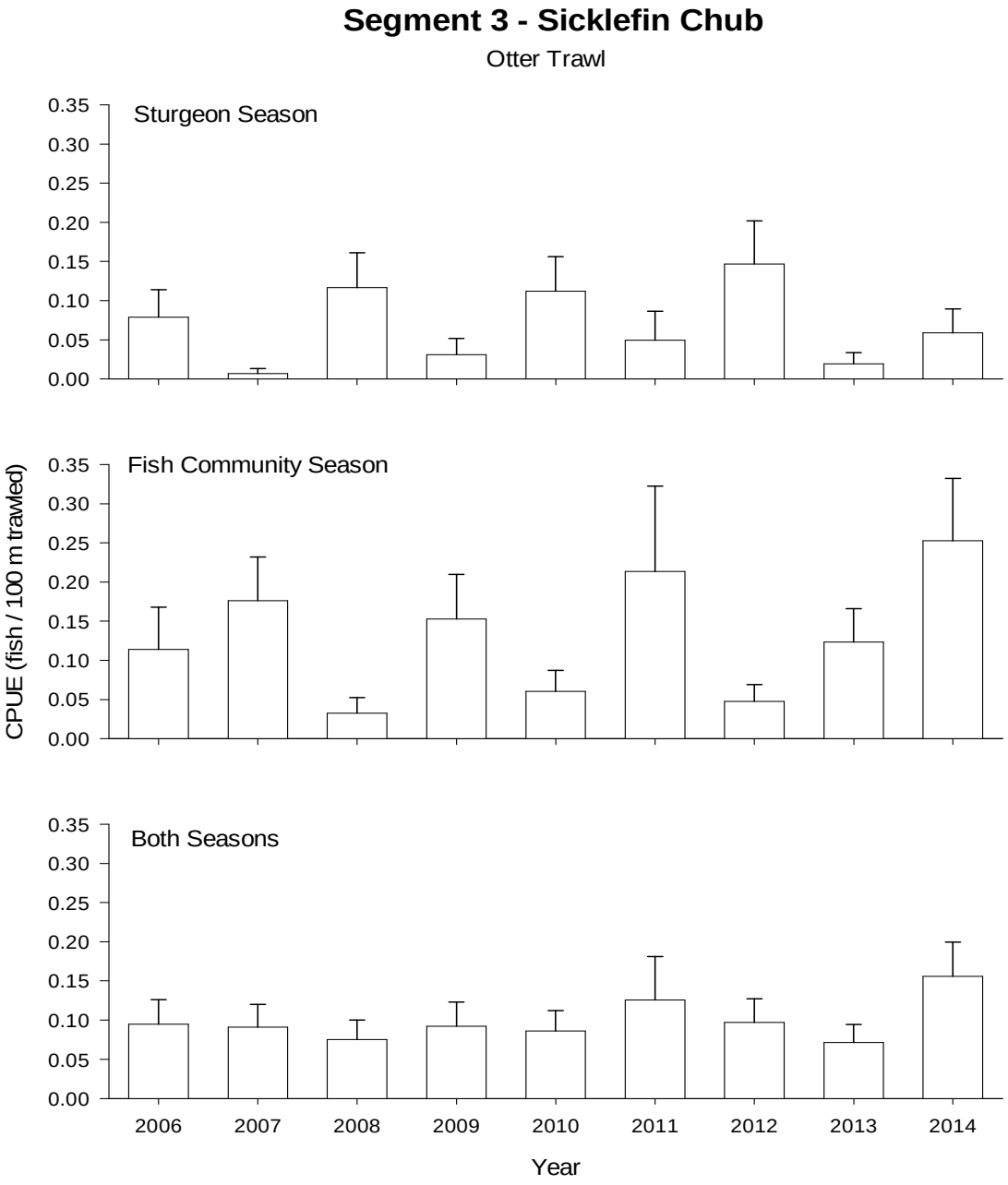

Figure 19. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 3 of the Missouri River from 2006-2014.

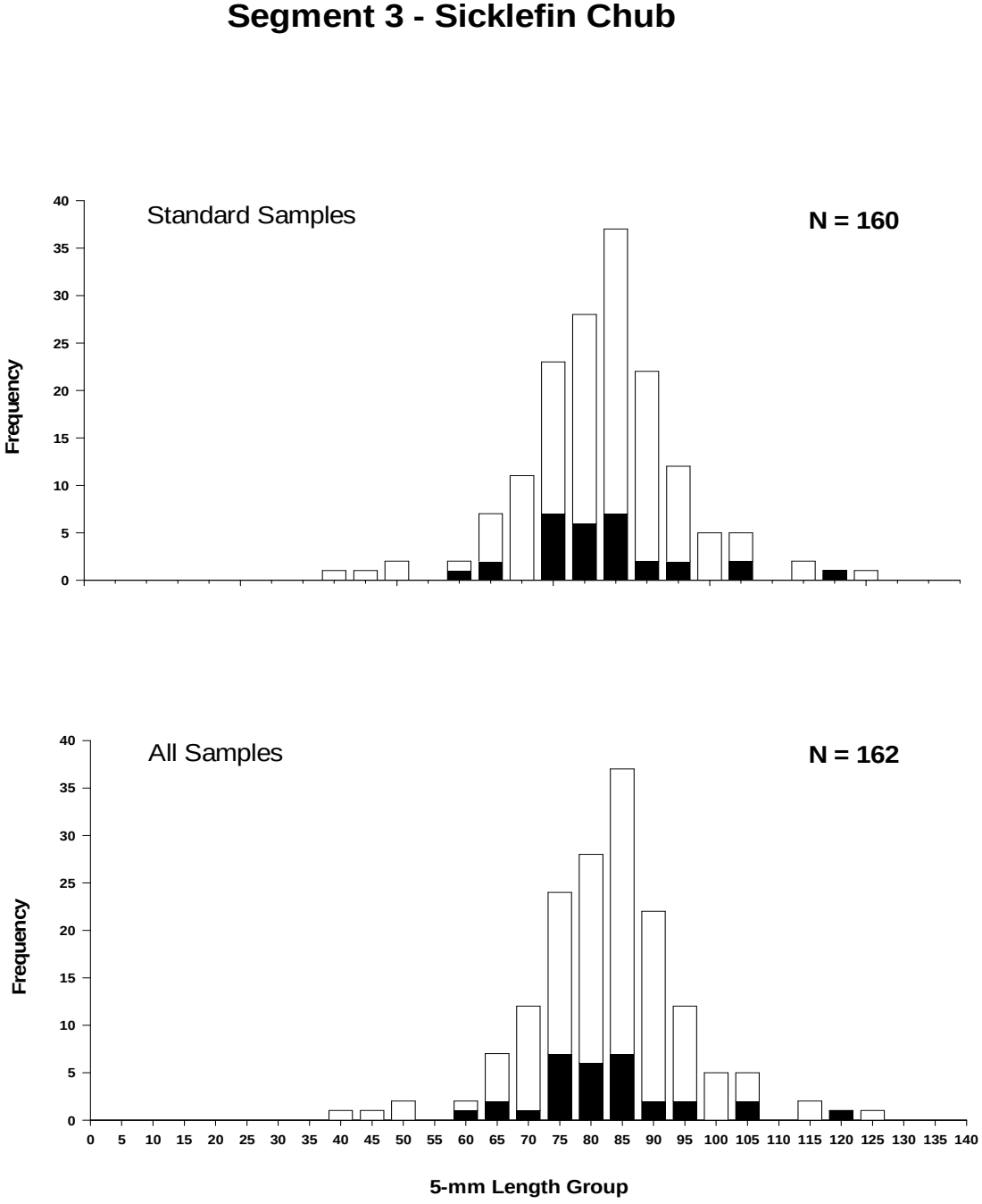

Figure 20. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

Sand Shiner

A total of 58 sand shiners were sampled in Segment 3 during 2014, which was more than double the total catch of 2013. All but two of the sand shiners captured in 2014 were sampled using mini fyke nets during the fish community season. While the total catch of sand shiners was up from 2013, their relative abundance as measured by mini fyke net CPUE was again very low when compared to the early years of the Program. Sand shiner CPUE was 0.33 fish/net night in 2014, a significant decrease from the nine year high of 13.7 fish/net night observed in 2006 (Figure 21).

Based on Datillo et al. (2008) the majority of sand shiners collected in 2014 were YOY, with a few age-1 fish sampled (Figure 22). Sand shiners averaged 38.0 mm in length in 2014. It is not known why CPUE of sand shiners has decreased over the past nine years of sampling.

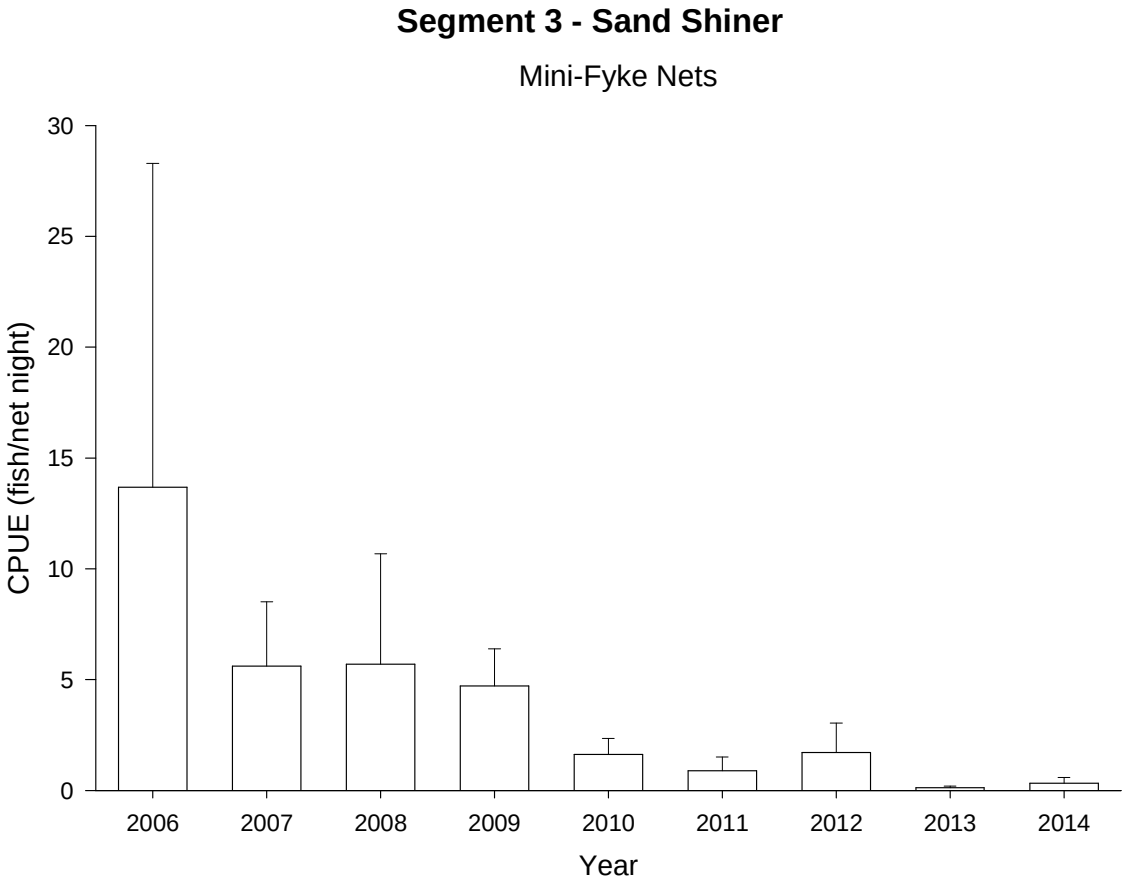

Figure 21. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2014.

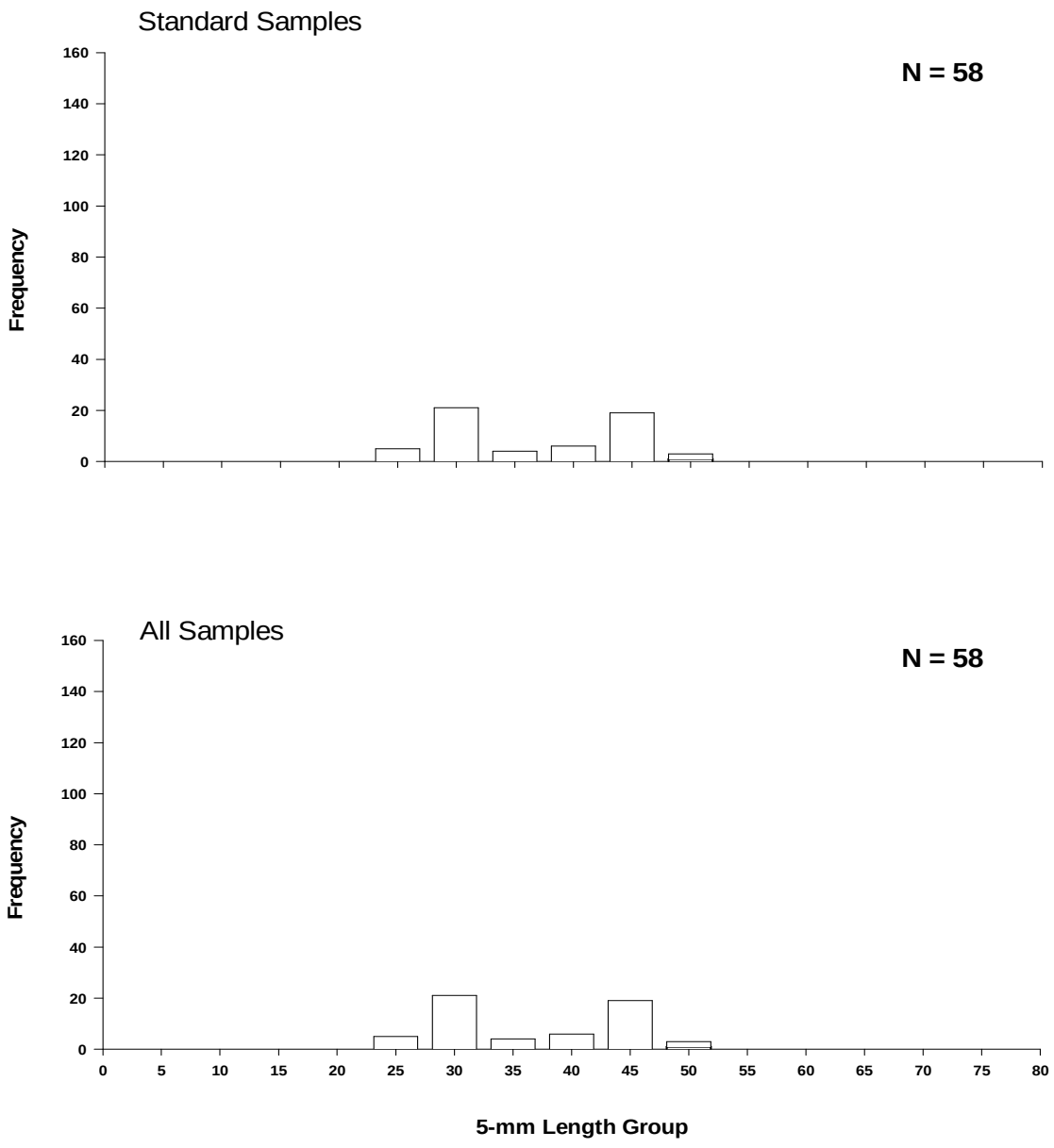

Figure 22. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

***Hybognathus* spp**.

Al l *Hybognathus spp.* that were collected within Segment 3 during 2014 were identified as western silvery minnows. In all, 220 western silvery minnows were collected, 211 in standard mini fyke net sets and 9 in standard otter trawls. The relative abundance of western silvery minnows was estimated at 1.26 fish/net night for mini fyke nets during 2014. This was lower than 2013, but significantly up from the years 2009 to 2012 (Figure 23).

There were likely three age classes of western silver minnows collected in 2014, YOY, age-1 and age-2 (Figure 24). Fish in the 20 to 45 mm size were likely YOY, whereas fish in the 55 to 75 mm range were likely age-1 and fish of 90 mm were likely age-2 (Dattilo et al. 2008b).

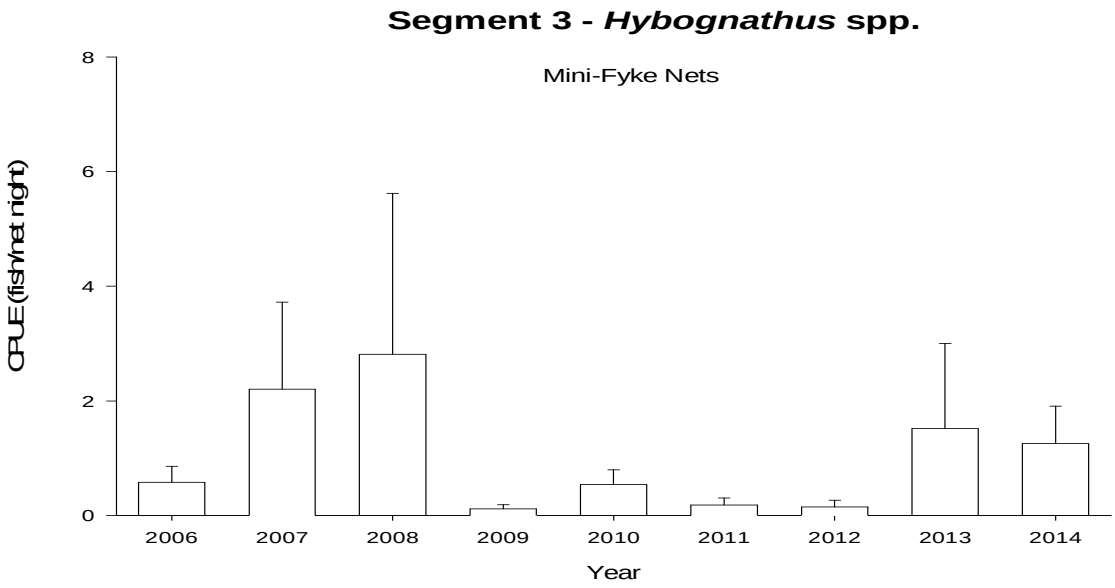

Figure 23. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 3 of the Missouri River during fish community season 2006-2014.

Segment 3 - *Hybognathus* spp.

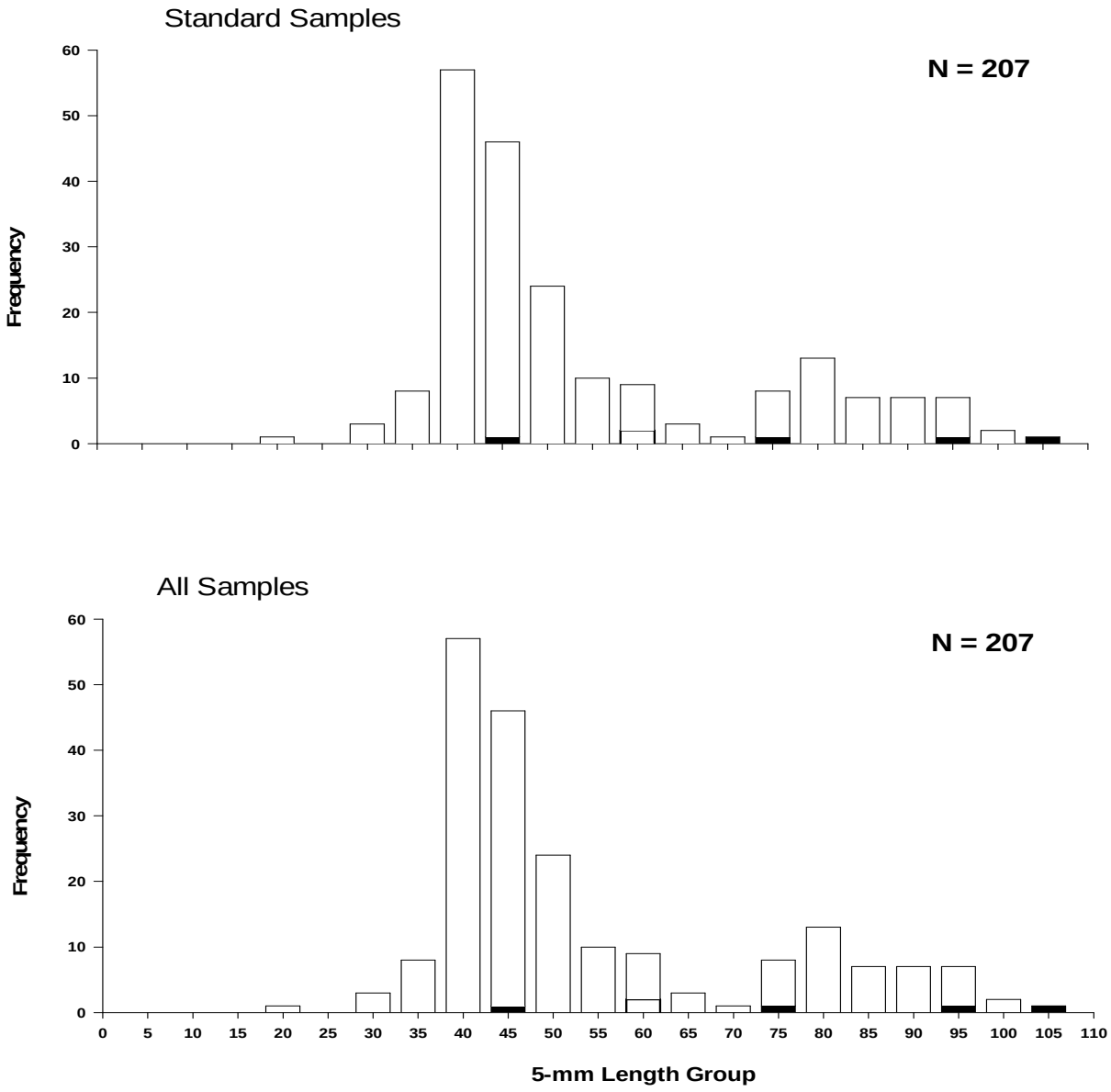

Figure 24. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

Blue Sucker

During 2014 a total of 11 blue suckers were collected within Segment 3, 10 with trammel nets and one on a trotline. Over the nine years of the Program, relatively few blue suckers have been collected in Segment 3. Trammel net CPUE has remained relatively constant and low (Figure 25). During 2014 trammel net CPUE was estimated at 0.014 fish/100m for both seasons combined. Whereas in 2009, which was had the highest CPUE was only at 0.024 fish/100m.

The otter trawl is an inefficient gear at collecting adult blue suckers, therefore no comparisons between years should be made. However, the otter trawl may collect YOY or juvenile blue suckers if present, but since very little recruitment seems to be occurring in Segment 3 the gear has captured very few fish.

All but one blue sucker captured in 2014 was over 600 mm in length (Figure 27). The largest specimen collected was 742 mm and the smallest was 564 mm in length.

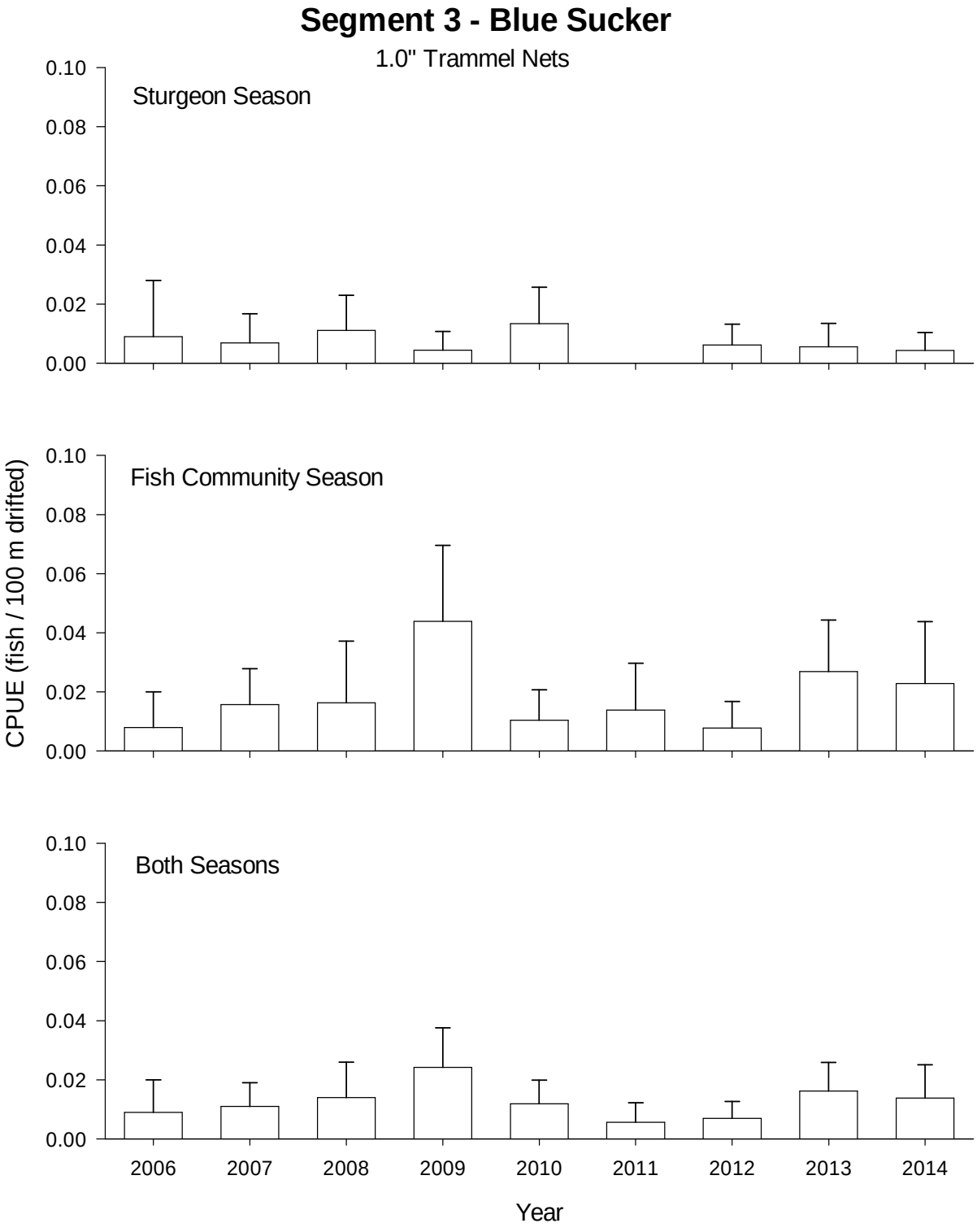

Figure 25. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0" trammel nets in Segment 3 of the Missouri River from 2006-2014.

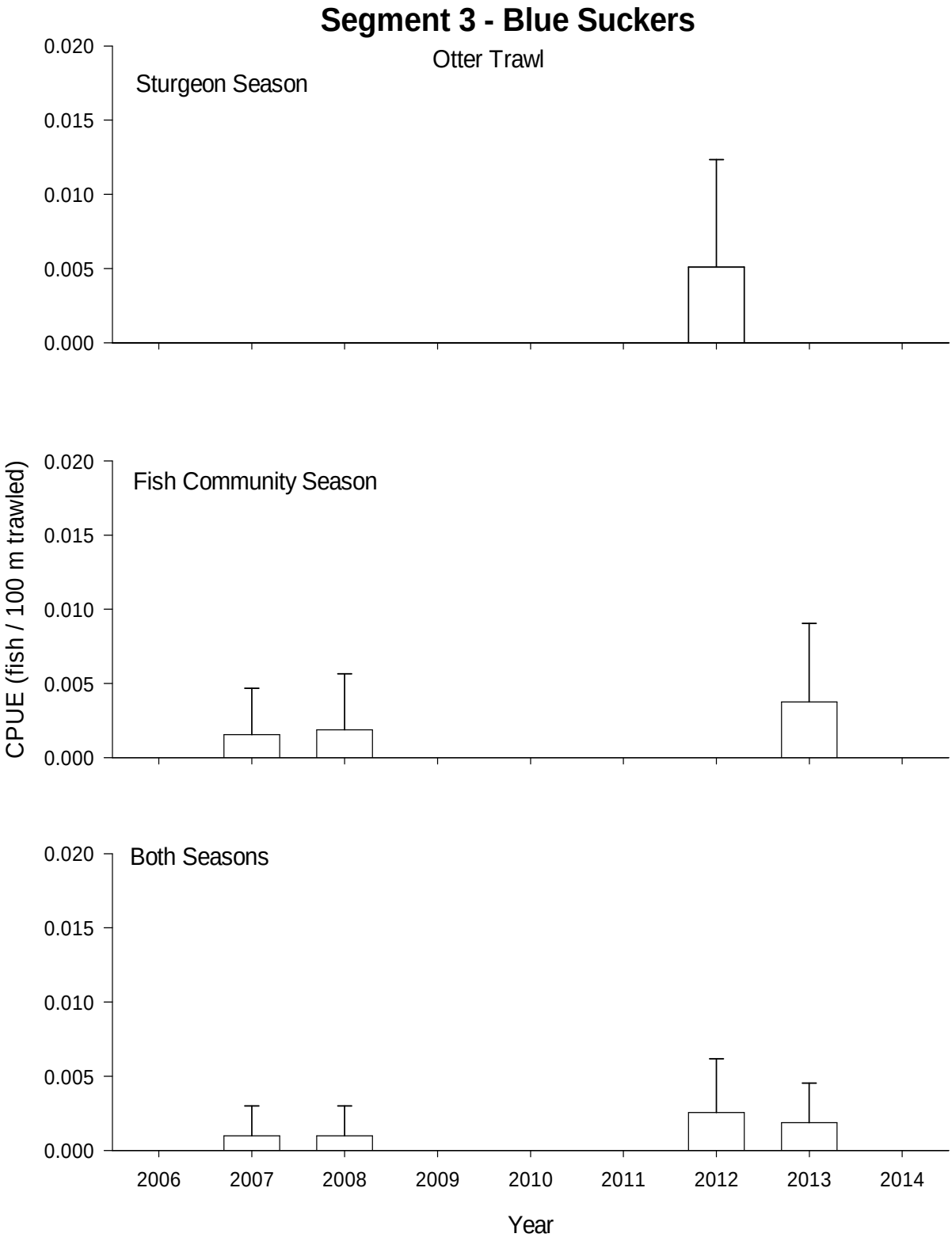

Figure 26. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 3 of the Missouri River from 2006-2014.

Table 14. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRMS	TRML
				Sturgeon Season					
1.0" Trammel Net	2	50	50	100	0	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	6	50	17	33	0	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	0	0	50	50	0	0	0	0	0
		41	32	26	1	0	0	0	0
				Both Seasons					
Trot Lines	1	100	0	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

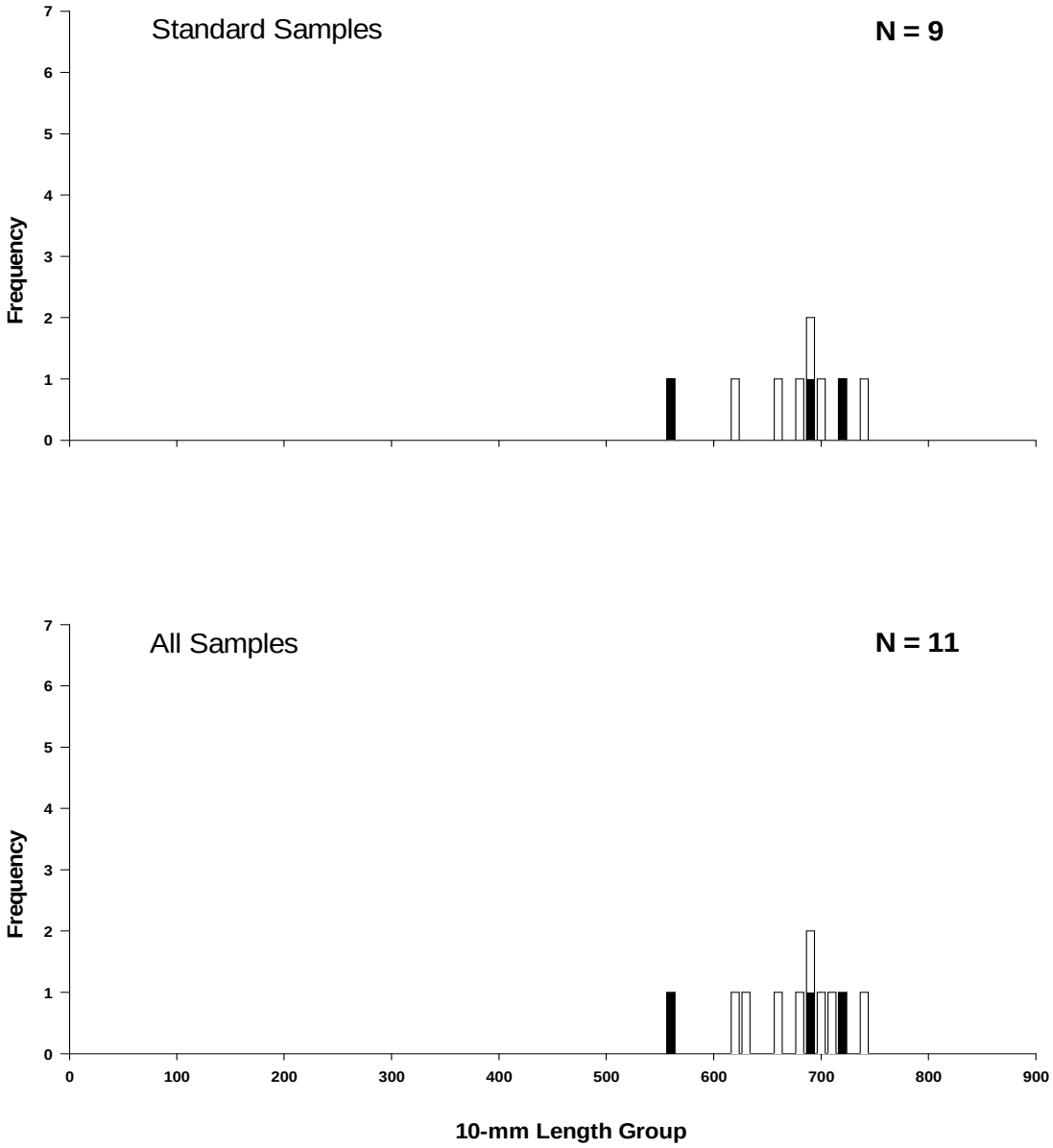

Figure 27. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

Sauger

A total of 290 sauger were collected within Segment 3 during 2014. Sauger were caught in all types of gears that were deployed, but were most commonly caught in trammel nets. Trammel nets captured 205 sauger, followed by otter trawl with 52, mini fyke nets captured 31 and trotlines 2.

Trammel nets have been the best gear to estimate relative abundance of adult sauger through the past seven seasons. Total sauger CPUE for trammel nets was slightly down when compared to the previous 2 years (Figure 29). However, trammel net CPUE during the Fish Community Season was at a nine year high of 0.19 fish/100 m drifted (Figure 29).

Mini fyke nets have been the best gear at assessing YOY sauger, although numbers have been relatively low during each year (Figure 28). During 2014 only three sauger less than 100 mm in length were captured using mini fykes. These fish likely represent YOY sauger.

Even though few YOY sauger have been captured in the multitude of gears used by the Program, the overall size distribution of sauger captured indicates that recruitment is occurring (Figure 31). The length frequency histogram in Figure 31 indicates that the sauger population of Segment 3 consists of fish from age-0 to approximately fish of age-7 or older (Dattilo et al. 2008). Relatively large year classes of age-1 and age-2 fish are present. When compared to drought year conditions, a much larger proportion of the sauger population has been comprised of younger year classes of fish since 2011.

In all, sauger caught in trammel nets averaged 334.3 mm in length and weighed 301.2 g. Sauger sampled in the otter trawl were on average smaller, measuring 300.9 mm and weighing 213.1g. Sauger sampled in mini fyke nets were on average the smallest sauger sampled, averaging 250.3 mm and weighing 164.3 g.

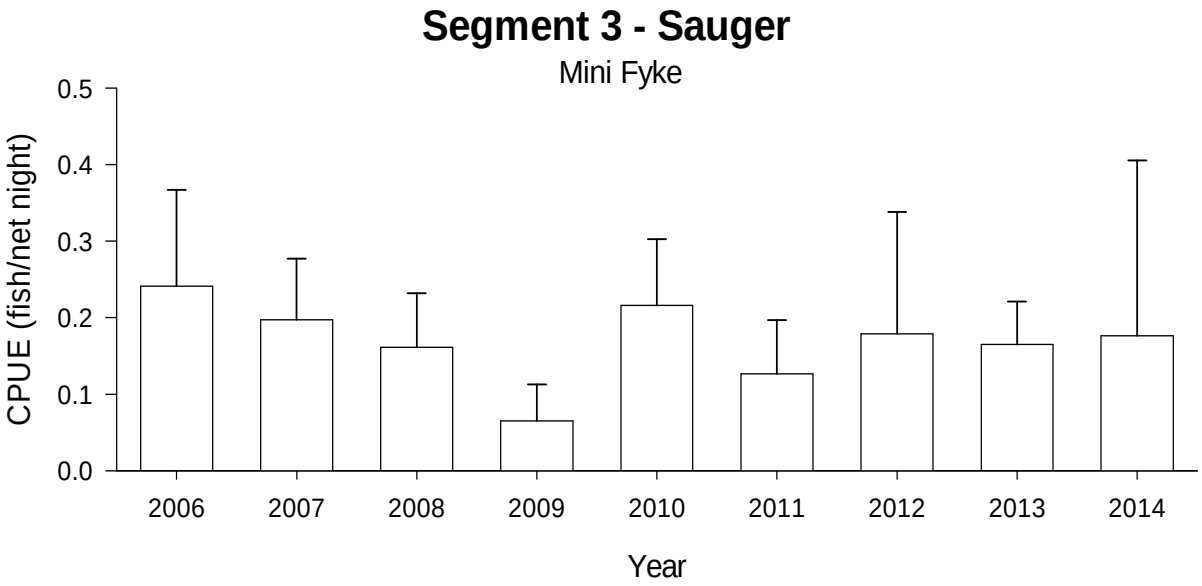

Figure 28. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini-fyke nets in Segment 3 of the Missouri River from 2006-2014.

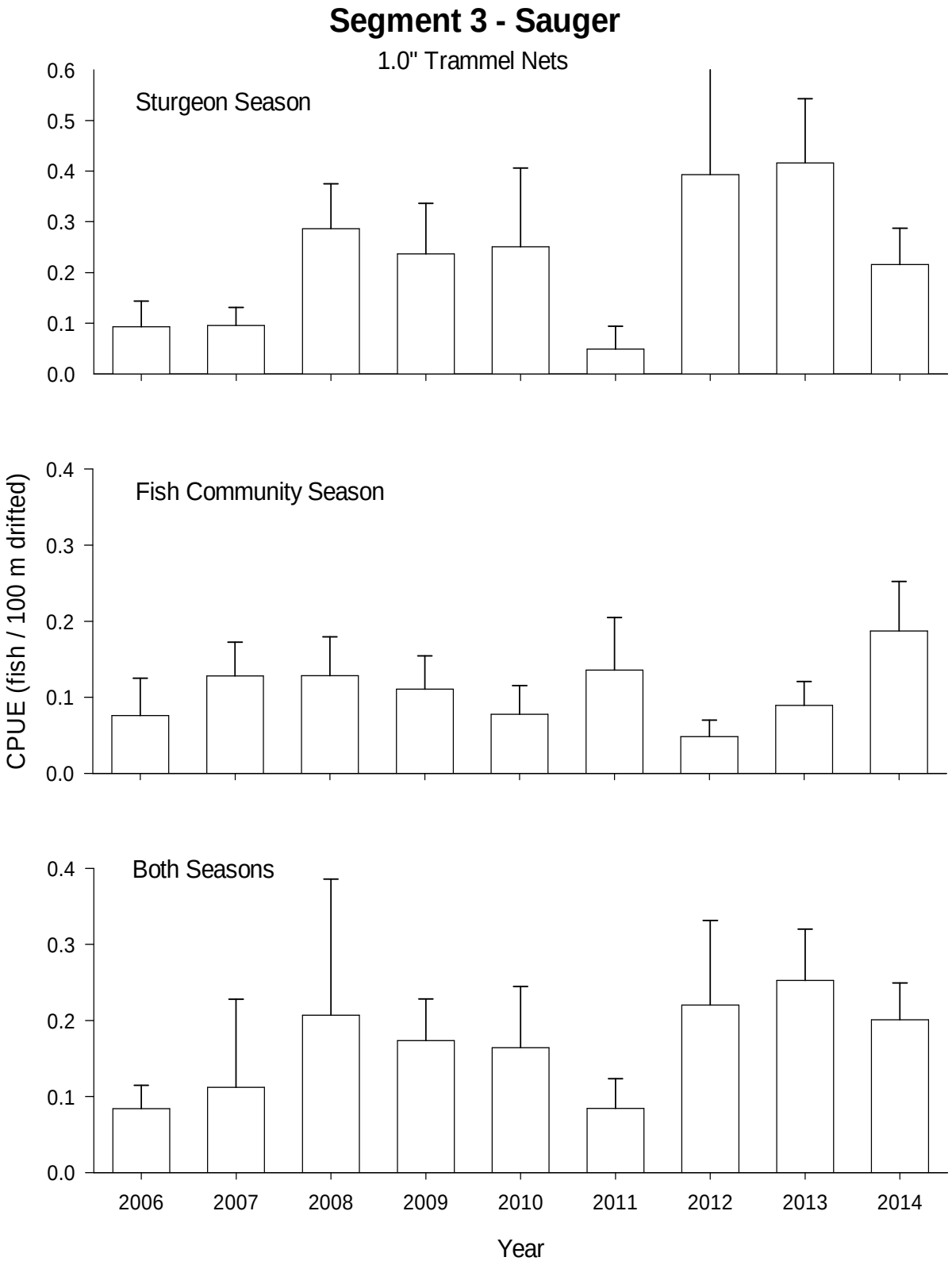

Figure 29. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0" trammel nets in Segment 3 of the Missouri River from 2006-2014.

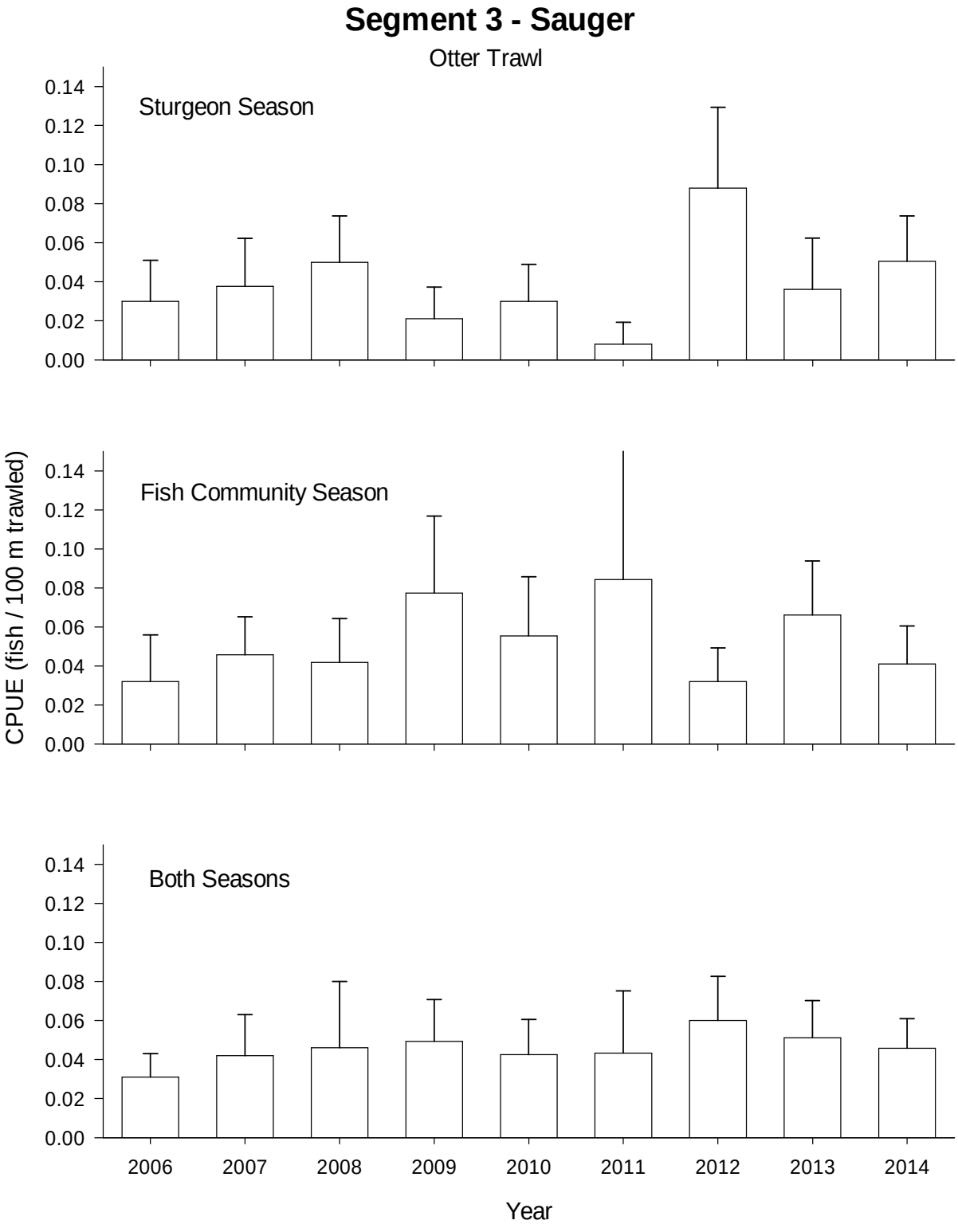

Figure 30. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 3 of the Missouri River from 2006-2014.

Table 15. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2014. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
				Sturgeon Season					
1.0" Trammel Net	87	38	38	23	1	0	0	0	0
		42	34	23	1	0	0	0	0
Otter Trawl	25	32	40	24	4	0	0	0	0
		36	33	28	3	0	0	0	0
				Fish Community Season					
1.0" Trammel Net	78	38	46	13	3	0	0	0	0
		39	33	26	2	0	0	0	0
Mini-Fyke Net	31	32	19	6	13	3	26	0	0
		34	42	3	7	11	4	0	0
Otter Trawl	20	35	40	25	0	0	0	0	0
		41	32	26	0	0	0	0	0
				Both Seasons					
Trot Lines	2	50	50	0	0	0	0	0	0
		40	35	22	2	0	0	1	1

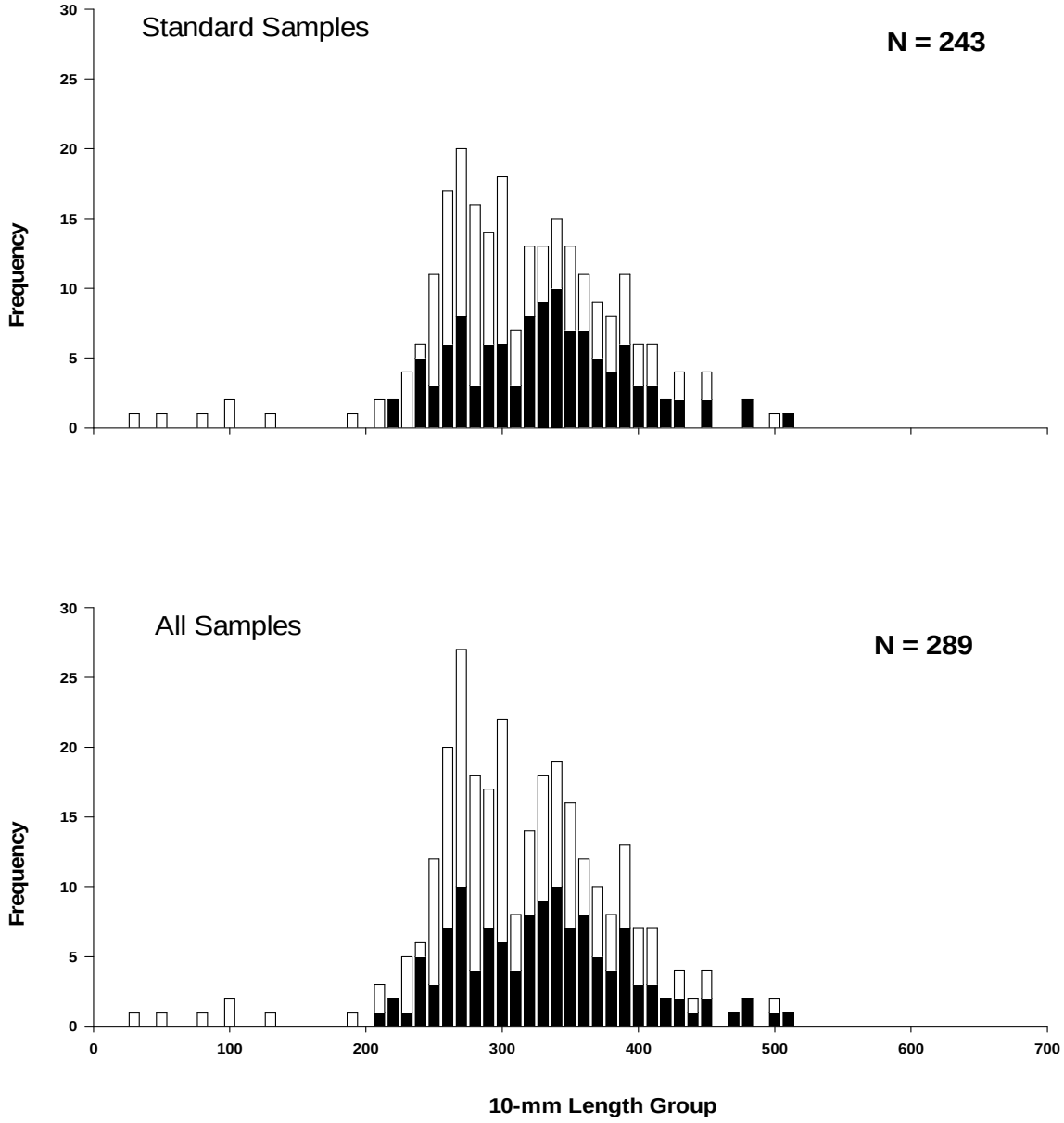

Figure 31. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2014.

Missouri River Fish Community

This section describes the total catch of fishes that are not target species and had more than 50 individuals captured during 2014. The most common fish sampled in all of 2014 was the emerald shiner *Notropis atherinoides*, with a total of 23,648 sampled. The vast majority (n = 23,586) were captured in mini fyke nets, while only 62 were sampled using the otter trawl. Emerald shiners averaged 65.9 mm in length.

The second most abundant species sampled was the channel catfish *Ictalurus punctatus*, with a total of 629 sampled. Channel catfish were sampled using trotlines, trammel nets, otter trawls and mini fyke nets. The otter trawl was the most effective gear in collecting large numbers of channel catfish, with a total of 384 sampled. While the average sized catfish caught in the otter trawl measured 243.0 mm, 16 channel catfish under 100 mm and 67 between the sizes of 100 and 200 mm in length were caught. On average, standard trotlines caught the largest channel catfish, with an average size of 368.4 mm.

The fourth most abundant species captured during 2014 was the river carpsucker *Carpiodes carpio* with 479 sampled. Mini fyke nets captured 437 river carpsuckers, most of which were YOY. River carpsuckers caught in the mini fyke net had an average length of 29.7 mm. The otter trawl caught a total of seven river carpsuckers averaging 401.7 mm in length, while trammel nets caught 35, but on average were the larger than other gears with an average length of 477.3 mm.

A total of 303 flathead chubs *Platygobio gracilis* were sampled within Segment 3 during 2014, 113 using otter trawls, 63 using mini fykes, 96 using trammel nets and 31 using trotlines. Several age classes of flathead chubs were caught, with the smallest fish being caught in mini fyke nets, which had an average length of 76.8 mm in length. On average, the largest flathead chubs were captured using trammel nets, which had an average length of 239.6 mm.

Goldeye *Hiodon alosoides* were sampled in all standard gears, although the majority of the catch was sampled using trammel nets, which caught 196. All other gears combined to catch 101 goldeye. Few YOY goldeye were sampled during 2014 some of the sampling years.

Other species that totaled over 50 specimens included fathead minnows *Pimephales promelas*, shorthead redhorse *Moxostoma macrolepidotum*, common carp *Cyprinus carpio* and white sucker *Catostomus commersonii*.

Discussion

The total number of pallid sturgeon captured in 2014 was the smallest since the 2008 sampling season. However, due to pallids captured during standardized random samples, the overall CPUE of pallid sturgeon using trammel nets was at an all time high with 0.043 fish/100 m drifted. Conversely, the overall CPUE using otter trawls was at a nine year low, with approximately 0.013 fish/100 m trawled. This difference is likely due to smaller pallid sturgeon making up less of the overall catch during 2014, when compared to earlier years of the Program. Trammel nets are likely more efficient in capturing the at-large hatchery fish that are currently residing in RPMA 2 of the Missouri River.

The size structure of at-large hatchery pallid sturgeon within Segment 3 has changed appreciably since the inception of the Program in 2006 (Figure 3). During the 2006 sampling season, the majority of pallid sturgeon sampled were smaller than 330 mm in length. Conversely, during 2014 the majority of pallid sturgeon captured were larger than 330 mm, with many over 400 mm. This is likely a factor of two things, first the pallid sturgeon stocked in the mid 2000's have grown. Secondly, since 2011 we have greatly reduced the number of pallid sturgeon stocked into RPMA 2.

Data on age at length over time has indicated that growth rates for all year classes have begun slowing down over the last four years. The worst case scenario of this could indicate that carrying capacity of pallid sturgeon in the system is getting close to being reached. However, it appears that once pallid sturgeon get to a size that they are able to primarily consume fish, their growth once again increases. But since relatively few fish have made it to this size (> 500 mm) data are slightly lacking. It will be interesting to see how the growth rates of larger hatchery reared fish are affected once the majority of at-large hatchery fish reach sizes where they primarily consume fish. Contradicting any theories of the current carrying capacity being met is the fact that the condition of at-large pallid sturgeon have remained a relatively over the past several years. These data indicate that even while fish growth may be slowing, the overall robustness of the individuals has not greatly diminished.

The capture locations of pallid sturgeon within Segment 3 during 2014 were relatively evenly distributed throughout the Segment. The old "hot spots" that were once found in the lower portions of Segment 3 have not been identified since 2011. We believe that the channel

forming flows of 2011 both created better habitat and created habitat for pallid sturgeon throughout the Missouri River. This was supported by the reduced number of high density "hot spots" in the lower river. In addition, since 2011 the total number of pallid sturgeon captures in Segment 2 significantly increased. Before 2011, very few pallid sturgeon were being captured upstream of the Wolf Point stocking location. Following the high flow year, pallid sturgeon migrated upstream and became more uniformly distributed within the Missouri River within RMPA 2.

Currently, hatchery reared pallid sturgeon are thriving in the Missouri River within RMPA 2. Nevertheless, the amount of quality habitat for pallid sturgeon and in particular pallid sturgeon of larger sizes and older age classes seems to be significantly limited by the effects of Fort Peck Dam. Most larger hatchery reared pallid sturgeon captured within RPMA 2 are captured at the downstream most areas, where tributary influences and natural solar warming have somewhat naturalized the river. This is similar to the behavior of adult pallid sturgeon residing within RPMA 2. Those fish spend the majority of the year in the lower sections of the river downstream of the confluence of the Missouri and Yellowstone Rivers. As hatchery reared pallid sturgeon grow, there may be more competition among themselves and other predatory fish for the resources of the lower Missouri River. Trawling and mini fyke net data indicate a significantly reduced population of native cyprinids in the upper portion of the Missouri River downstream of Fort Peck Dam. Thus, as pallid sturgeon grow in size and become obligate piscivores, they will likely need to reside in the lower portion of the river where food is more available. Continuing to monitor this population for indications of density dependent growth and survival will be critical for clearly understanding the long-term viability of this population, especially in the very altered habitat that which they reside in.

Acknowledgments

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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. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

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 3 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2006 for Segment 3.

Gear	Code	Type	Season	Years	CPUE units
Trammel Net – 1.0”inner mesh	TN	Standard	Both Seasons	2006 - Present	Fish / 100 m drift
Otter Trawl – 16 ft head rope	OT16	Standard	Both Seasons	2006 - Present	Fish / 100 m trawled
Mini-Fyke Net	MF	Standard	Fish Comm.	2006 - Present	Fish / net night
Beam Trawl	BT	Standard	Both Seasons	2003 - 2004	Fish / 100 m trawled
Bag Seine – half arc method pulled upstream	BSHU	Standard	Fish Comm.	2006	Fish / 100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Standard	Fish Comm.	2006	Fish / 100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Wild	Fish Comm.	2007-Present	Fish / 100 m^2
Push Trawl – 8 ft 4mm x 4mm	POT02	Evaluation	Fish Comm.	2007	Fish / m trawled
Trot Line	TL	Evaluation	Both Seasons	2009	Fish / hook night
Trot Line	TL	Standard	Both Seasons	2010-Present	Fish / hook night
Electrofishing	EF	Wild	Both Seasons	2010-Present	Fish/hour

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 3of the Missouri River (RPMA 2)

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 Fingerling		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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		
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

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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	
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

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark 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	
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	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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		
2009	Wolf Point	26175	2009	7/22/2009	Fry		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stockinga	Primary Mark	Secondary Mark
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

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stockinga	Primary Mark	Secondary Mark
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
2011	Culbertson	795	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Wolf Point	797	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Fallon	531	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Forsyth	545	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Intake	510	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Culbertson	262	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Fallon	131	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Forsyth	174	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Intake	132	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Wolf Point	262	2010	8/22/2011	Yearling	PIT Tag	Scute
2013	Wolf Point	187	2012	4/22/2013	Yearling	PIT Tag	Scute
2013	Culbertson	187	2012	4/23/2013	Yearling	PIT Tag	Scute
2013	Intake	118	2012	4/24/2013	Yearling	PIT Tag	Scute
2013	Fallon	185	2012	4/25/2013	Yearling	PIT Tag	Scute
2014	Culbertson	212	2013	4/15/2014	Yearling	PIT Tag	Scute
2014	Kinsey Bridge	214	2013	4/15/2014	Yearling	PIT Tag	Scute
2014	Powder River Depot	210	2013	4/15/2014	Yearling	PIT Tag	Scute
2014	Wolf Point	211	2013	4/15/2014	Yearling	PIT Tag	Scute

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 3 of the Missouri River during 2014. 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 BARS	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BLGL	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
BMBF	13	0.018	0	0.013	0.023	0.019	0
	.	0.01	.	0.014	0.022	0.02	0
BRBT	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
BUSK	8	0.014	0	0.018	0.01	0.015	0
	.	0.011	.	0.021	0.014	0.024	0
CARP	17	0.02	0	0.018	0.013	0.03	0.082
	.	0.012	.	0.019	0.015	0.028	0.165
CNCF	70	0.087	0	0.065	0.071	0.144	0.066
	.	0.033	.	0.042	0.044	0.094	0.132
CSCO	1	0.001	0	0	0	0.006	0
	.	0.003	.	0	0	0.011	0
ERSN	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
FHCB	73	0.093	0	0.076	0.094	0.121	0.073
	.	0.033	.	0.03	0.061	0.087	0.145
FHMW	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
GDEY	161	0.181	0	0.196	0.174	0.168	0.282
	.	0.041	.	0.07	0.074	0.067	0.393
LKWF	4	0.004	0	0.01	0	0	0
	.	0.005	.	0.012	0	0	0

LNDC	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
LNSK	1	0.001	0	0	0	0.004	0
	.	0.002	.	0	0	0.008	0
NFSH	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
NTPK	3	0.003	0	0.003	0.003	0.004	0
	.	0.004	.	0.005	0.007	0.008	0
PDSG	34	0.043	0	0.016	0.039	0.087	0.082
	.	0.034	.	0.013	0.028	0.127	0.165
RVCS	29	0.037	0	0.029	0.051	0.034	0
	.	0.023	.	0.023	0.057	0.035	0
SFCB	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
SGER	165	0.201	0	0.185	0.257	0.145	0.348
	.	0.048	.	0.085	0.089	0.071	0.367
SHRH	52	0.068	0	0.061	0.103	0.031	0.108
	.	0.032	.	0.046	0.071	0.034	0.216
SMBF	17	0.022	0	0.013	0.018	0.042	0
	.	0.012	.	0.012	0.016	0.038	0
SNSG	186	0.233	0	0.181	0.248	0.291	0.266
	.	0.06	.	0.067	0.097	0.164	0.389
SNSN	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
STSN	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
WLYE	17	0.018	0	0.022	0.025	0	0.073
	.	0.01	.	0.017	0.02	0	0.145
WSMW	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
WTBS	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
WTCP	0	0	0	0	0	0	0
	.	0	.	0	0	0	0
WTSK	3	0.004	0	0.003	0.004	0.006	0
	.	0.004	.	0.005	0.008	0.011	0
YWPH	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	ISB CHNB	OSB CHNB	SCCL CHNB
BLGL	0	0	0	0	0	0
	.	0	0	0	0	0
BMBF	3	0.003	0	0.003	0.008	0
	.	0.004	0	0.006	0.012	0
BRBT	2	0.002	0	0.006	0	0
	.	0.003	0	0.008	0	0
BUSK	0	0	0	0	0	0
	.	0	0	0	0	0
CARP	13	0.013	0.008	0.023	0	0.198
	.	0.008	0.009	0.019	0	0.264
CNCF	358	0.345	0.182	0.543	0.343	0.066
	.	0.262	0.071	0.769	0.182	0.133
CSCO	1	0.001	0.003	0	0	0
	.	0.002	0.005	0	0	0
ERSN	62	0.06	0.11	0.054	0	0
	.	0.061	0.155	0.055	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
FHCB	107	0.107	0.091	0.146	0.081	0.132
	.	0.031	0.038	0.069	0.054	0.162
FHMW	0	0	0	0	0	0
	.	0	0	0	0	0
FWDM	8	0.009	0.008	0.014	0.004	0
	.	0.007	0.009	0.019	0.008	0
GDEY	8	0.008	0.012	0.009	0.003	0
	.	0.009	0.016	0.017	0.007	0
LKWF	0	0	0	0	0	0
	.	0	0	0	0	0
LNDC	0	0	0	0	0	0
	.	0	0	0	0	0
LNSK	2	0.002	0	0.003	0.003	0
	.	0.003	0	0.006	0.007	0
NFSH	0	0	0	0	0	0
	.	0	0	0	0	0
NTPK	0	0	0	0	0	0
	.	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
PDSG	13	0.013	0.008	0.013	0.022	0
	.	0.009	0.009	0.017	0.024	0
RVCS	5	0.005	0.009	0.006	0	0
	.	0.005	0.01	0.008	0	0
SFCB	160	0.156	0.162	0.121	0.198	0
	.	0.044	0.059	0.052	0.121	0
SGCB	171	0.165	0.163	0.223	0.108	0
	.	0.055	0.082	0.128	0.056	0
SGER	45	0.046	0.038	0.057	0.042	0.067
	.	0.015	0.021	0.029	0.03	0.133
SHRH	15	0.015	0.018	0.021	0	0.066
	.	0.008	0.015	0.018	0	0.132
SMBF	3	0.003	0.002	0.004	0.003	0
	.	0.004	0.005	0.009	0.007	0
SNSG	67	0.074	0.084	0.077	0.061	0
	.	0.028	0.062	0.042	0.029	0
SNSN	2	0.002	0.003	0	0.003	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
	.	0.003	0.005	0	0.007	0
STCT	12	0.014	0.018	0.006	0.017	0
	.	0.009	0.015	0.012	0.018	0
STSN	0	0	0	0	0	0
	.	0	0	0	0	0
UCA	0	0	0	0	0	0
	.	0	0	0	0	0
WLYE	8	0.01	0.015	0.006	0.009	0
	.	0.009	0.02	0.008	0.011	0
WSMW	9	0.01	0.005	0.009	0.021	0
	.	0.01	0.007	0.013	0.031	0
WTBS	0	0	0	0	0	0
	.	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
WTCP	0	0	0	0	0	0
	.	0	0	0	0	0
WTSK	1	0.001	0	0.004	0	0
	.	0.003	0	0.009	0	0
YWPH	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	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
BLGL	1	0.006	0	0	0	0	0.053	0
	.	0.012	0	0	0	0	0.105	0
BMBF	2	0.012	0.018	0.014	0	0	0	0
	.	0.017	0.035	0.029	0	0	0	0
BRBT	7	0.042	0.053	0.029	0	0.182	0	0
	.	0.035	0.078	0.04	0	0.244	0	0
BUSK	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
CARP	18	0.107	0.053	0.043	0	0	0.053	1.833
	.	0.094	0.078	0.049	0	0	0.105	2.155
CNCF	3	0.018	0	0	0.2	0	0	0.333
	.	0.027	0	0	0.4	0	0	0.667
CSCO	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
ERSN	23586	140.393	72.509	255.871	275.2	3.545	1.211	17.333
	.	112.698	61.936	262.171	462.643	3.958	0.832	21.724

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
FHCB	63	0.375	0.228	0.314	0.4	0.273	1.211	0
	.	0.214	0.255	0.184	0.49	0.282	1.564	0
FHMW	210	1.25	0.719	2.014	0.8	0.091	0.632	1.833
	.	0.891	0.35	2.103	1.6	0.182	0.411	1.585
FWDM	1	0.006	0	0	0	0	0	0.167
	.	0.012	0	0	0	0	0	0.333
GDEY	20	0.119	0.053	0.129	0	0	0	1.333
	.	0.087	0.06	0.152	0	0	0	1.333
LKWF	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
LNDC	2	0.012	0.035	0	0	0	0	0
	.	0.017	0.049	0	0	0	0	0
LNSK	5	0.03	0.035	0.043	0	0	0	0
	.	0.036	0.07	0.064	0	0	0	0
NFSH	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
NTPK	5	0.03	0	0.014	0	0.182	0	0.333
	.	0.026	0	0.029	0	0.244	0	0.422

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
PDSG	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
RVCS	437	2.601	2.158	2.643	0	1.727	0.105	18
	.	2.005	2.343	4.024	0	2.616	0.211	18.206
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	31	0.185	0.175	0.086	0.4	0.364	0.053	1.333
	.	0.093	0.195	0.067	0.8	0.407	0.105	0.989
SHRH	1	0.006	0.018	0	0	0	0	0
	.	0.012	0.035	0	0	0	0	0
SMBF	5	0.03	0.018	0.014	0	0	0.053	0.333
	.	0.026	0.035	0.029	0	0	0.105	0.422
SNSG	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
SNSN	56	0.333	0.07	0.657	0	0	0.316	0

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
	.	0.253	0.085	0.588	0	0	0.344	0
STCT	7	0.042	0	0.086	0	0	0	0.167
	.	0.054	0	0.127	0	0	0	0.333
STSN	16	0.095	0.035	0.143	0	0.364	0	0
	.	0.083	0.07	0.154	0	0.727	0	0
UCA	1	0.006	0	0.014	0	0	0	0
	.	0.012	0	0.029	0	0	0	0
WLYE	3	0.018	0	0.014	0	0	0	0.333
	.	0.02	0	0.029	0	0	0	0.422
WSMW	211	1.256	1.526	1.586	1.8	0.091	0	0.5
	.	0.655	1.562	0.894	2.4	0.182	0	1
WTBS	2	0.012	0	0.029	0	0	0	0
	.	0.017	0	0.04	0	0	0	0
WTCP	16	0.095	0.053	0.043	0	0.091	0.053	1.333

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
	.	0.066	0.078	0.064	0	0.182	0.105	1.116
WTSK	60	0.357	0.368	0.3	0.2	0.182	0.263	1.667
	.	0.203	0.427	0.277	0.4	0.244	0.3	1.978
YWPH	1	0.006	0	0.014	0	0	0	0
	.	0.012	0	0.029	0	0	0	0

Appendix F4. Trotlines: overall season and segment summary. Lists CPUE (fish/20 hooks) and 2 standard errors on second line.

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB	TRMS CHNB
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	1	0.006	0	0	0.026	0	0	0
	.	0.011	0	0	0.051	0	.	.
BUSK	1	0.006	0.014	0	0	0	0	0
	.	0.011	0.028	0	0	0	.	.
CARP	9	0.051	0.014	0.049	0.103	0	1	0
	.	0.033	0.028	0.056	0.098	0	.	.
CNCF	131	0.744	0.648	0.689	0.897	0.333	6	1
	.	0.182	0.257	0.232	0.503	0.667	.	.
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	31	0.176	0.141	0.18	0.256	0	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB	TRMS CHNB
	.	0.073	0.108	0.119	0.19	0	.	.
FHMW	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
FWDM	7	0.04	0.056	0.016	0.026	0.333	0	0
	.	0.034	0.068	0.033	0.051	0.667	.	.
GDEY	73	0.415	0.479	0.426	0.333	0	0	0
	.	0.128	0.204	0.236	0.247	0	.	.
LKWF	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	.	.
LNSK	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
NFSH	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
NTPK	2	0.011	0	0.033	0	0	0	0
	.	0.016	0	0.046	0	0	.	.
PDSG	93	0.528	0.577	0.508	0.538	0	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB	TRMS CHNB
	.	0.167	0.288	0.302	0.263	0	.	.
RVCS	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
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	2	0.011	0.014	0.016	0	0	0	0
	.	0.016	0.028	0.033	0	0	.	.
SHRH	21	0.119	0.211	0.066	0.051	0	0	0
	.	0.061	0.133	0.064	0.072	0	.	.
SMBF	1	0.006	0.014	0	0	0	0	0
	.	0.011	0.028	0	0	0	.	.
SNSG	119	0.676	0.704	0.803	0.462	0.667	0	0
	.	0.188	0.355	0.316	0.219	1.333	.	.
SNSN	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB	TRMS CHNB
STCT	15	0.085	0.056	0.033	0.231	0	0	0
	.	0.056	0.055	0.046	0.214	0	.	.
STSN	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	2	0.011	0	0.016	0.026	0	0	0
	.	0.016	0	0.033	0.051	0	.	.
WSMW	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.

species	Total Catch	Overall CPUE	CHXO CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB	TRMS CHNB
WTBS	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
WTCP	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
WTSK	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	.	.
YWPH	0	0	0	0	0	0	0	0
	.	0	0	0	0	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 2014 for Segment 3 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

species	ST 1 Inch Trammel Net	ST Otter Trawl	FC 1 Inch Trammel Net	FC Mini Fyke	FC Otter Trawl	Trot_Line_BOTH
BLGL	0.000	0.000	0.000	0.006	0.000	0.000
BMBF	0.033	0.004	0.004	0.012	0.003	0.000
BRBT	0.000	0.000	0.000	0.042	0.004	0.006
BUSK	0.004	0.000	0.023	0.000	0.000	0.006
CARP	0.016	0.010	0.024	0.107	0.017	0.051
CNCF	0.067	0.439	0.106	0.018	0.250	0.744
CSCO	0.003	0.000	0.000	0.000	0.002	0.000
ERSN	0.000	0.000	0.000	140.393	0.119	0.000
FHCB	0.100	0.061	0.087	0.375	0.153	0.176
FHMW	0.000	0.000	0.000	1.250	0.000	0.000
FWDM	0.000	0.002	0.000	0.006	0.015	0.040
GDEY	0.171	0.006	0.191	0.119	0.011	0.415
LKWF	0.000	0.000	0.007	0.000	0.000	0.000
LNDC	0.000	0.000	0.000	0.012	0.000	0.000
LNSK	0.002	0.000	0.000	0.030	0.004	0.000
NFSH	0.000	0.000	0.000	0.000	0.000	0.000

species	ST 1 Inch Trammel Net	ST Otter Trawl	FC 1 Inch Trammel Net	FC Mini Fyke	FC Otter Trawl	Trot_Line_BOTH
NTPK	0.000	0.000	0.006	0.030	0.000	0.011
PDSG	0.056	0.013	0.031	0.000	0.014	0.528
RVCS	0.045	0.004	0.030	2.601	0.007	0.000
SFCB	0.000	0.059	0.000	0.000	0.253	0.000
SGCB	0.000	0.246	0.000	0.000	0.084	0.000
SGER	0.216	0.051	0.187	0.185	0.041	0.011
SHRH	0.031	0.012	0.104	0.006	0.018	0.119
SMBF	0.043	0.005	0.002	0.030	0.002	0.006
SNSG	0.115	0.076	0.345	0.000	0.073	0.676
SNSN	0.000	0.002	0.000	0.333	0.002	0.000
STCT	0.000	0.017	0.000	0.042	0.010	0.085
STSN	0.000	0.000	0.000	0.095	0.000	0.000
UCA	0.000	0.000	0.000	0.006	0.000	0.000
WLYE	0.025	0.009	0.011	0.018	0.011	0.011
WSMW	0.000	0.015	0.000	1.256	0.006	0.000
WTBS	0.000	0.000	0.000	0.012	0.000	0.000

species	ST 1 Inch Trammel Net	ST Otter Trawl	FC 1 Inch Trammel Net	FC Mini Fyke	FC Otter Trawl	Trot_Line_BOTH
WTCP	0.000	0.000	0.000	0.095	0.000	0.000
WTSK	0.008	0.000	0.000	0.357	0.003	0.000
YWPH	0.000	0.000	0.000	0.006	0.000	0.000

Appendix I. Comprehensive list of bend numbers and bend river miles for Segment 3 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FC) between years from 2006 - 2014.

Bend Number	Bend River Mile	Coordinates* Latitude	Longitude	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	1701.5	48.06744	105.53246						ST, FC			
2	1700	48.07314	105.52296							ST,FC	ST,FC	ST,FC
3	1698.5	48.09253	105.50295									
4	1697.5	48.0919	105.49388							ST,FC		
5	1696	48.09072	105.45751					ST, FC			ST,FC	
6	1695	48.08947	105.43861		ST, FC		ST, FC	ST, FC			ST,FC	
7	1693.5	48.09039	105.36333									
8	1692	48.09134	105.3734		ST, FC	ST, FC						
9	1690.5	48.0929	105.33356							ST,FC	ST,FC	ST,FC
10	1689	48.08243	105.324		ST, FC							
11	1687.5	48.0797	105.30329						ST, FC	ST,FC		ST,FC
12	1685.5	48.08757	105.257			ST, FC		ST, FC				ST,FC
13	1684.5	48.0912	105.24746		ST, FC		ST, FC	ST, FC				
14	1683	48.08517	105.22466	ST, FC			ST, FC		ST, FC			
15	1681.5	48.06341	105.21178				ST, FC			ST,FC		
16	1680	48.06636	105.19965	ST, FC								
17	1678.5	48.09023	105.18363		ST, FC							
18	1677	48.10268	105.17349		ST, FC						ST,FC	
19	1675.5	48.09255	105.17268			ST,						

Bend Number	Bend River Mile	Coordinates* Latitude	Longitude	2006	2007	2008	2009	2010	2011	2012	2013	2014
						FC						
20	1674	48.07865	105.16694			ST, FC			ST, FC			
21	1672.5	48.07616	105.12389					ST, FC				
22	1671	48.07116	105.10641							ST,FC		
23	1670	48.06138	105.10345									ST,FC
24	1668.5	48.06103	105.09673							ST,FC		ST,FC
25	1667	48.07748	105.06696				ST, FC					ST,FC
26	1666	48.06939	105.04797			ST, FC	ST, FC	ST, FC	ST, FC			
27	1665	48.05456	105.05145							ST,FC		
28	1664	48.05832	105.04102				ST, FC					
29	1663	48.08657	105.0019									ST,FC
30	1661.5	48.08338	105.00873					ST, FC	ST, FC		ST,FC	
31	1660	48.07323	104.99768				ST, FC		ST, FC		ST,FC	
32	1659	48.06867	104.99927	ST, FC								
33	1657	48.09531	104.98125	ST, FC						ST,FC		
34	1656	48.09737	104.98157				ST, FC					ST,FC
35	1655	48.10115	104.96768			ST, FC	ST, FC			ST,FC		
36	1654	48.09348	104.94374							ST,FC		
37	1653	48.09515	104.93953		ST, FC	ST, FC		ST, FC				
38	1651	48.12806	104.92393		ST, FC	ST, FC			ST, FC			

Bend Number	Bend River Mile	Coordinates* Latitude	Longitude	2006	2007	2008	2009	2010	2011	2012	2013	2014
39	1650	48.13711	104.92179						ST, FC		ST,FC	
40	1648.5	48.14876	104.89821		ST, FC		ST, FC					
41	1647	48.14244	104.8712						ST, FC	ST,FC		ST,FC
42	1646	48.12876	104.85751				ST, FC	ST, FC		ST,FC		
43	1644.5	48.1204	104.83851				ST, FC		ST, FC	ST,FC		
44	1643	48.12765	104.79225				ST, FC					
45	1641.5	48.12736	104.76171					ST, FC				
46	1640.5	48.1135	104.74879				ST, FC					
47	1639.5	48.11303	104.73495		ST, FC	ST, FC					ST,FC	
48	1638.5	48.11906	104.71559		ST, FC	ST, FC						
49	1637.5	48.12048	104.70437					ST, FC				ST,FC
50	1636.5	48.10395	104.68213	ST, FC				ST, FC	ST, FC		ST,FC	
51	1635.5	48.10472	104.68209						ST, FC			
52	1634.5	48.10719	104.65868		ST, FC					ST,FC		
53	1633.5	48.11139	104.6321			ST, FC	ST, FC	ST, FC	ST, FC			
54	1632.5	48.11786	104.62228					ST, FC				
55	1631.5	48.13085	104.61791				ST, FC					ST,FC
56	1630.5	48.13984	104.6045	ST, FC				ST, FC	ST, FC			
57	1629.5	48.13993	104.60433			ST, FC					ST,FC	ST,FC

Bend Number	Bend River Mile	Coordinates* Latitude	Longitude	2006	2007	2008	2009	2010	2011	2012	2013	2014
58	1628.5	48.12988	104.58845						ST, FC	ST,FC		ST,FC
59	1627	48.11385	104.59247						ST, FC			
60	1625.5	48.11823	104.56667		ST, FC		ST, FC	ST, FC		ST,FC		
61	1624	48.12555	104.53561						ST, FC			
62	1623	48.11155	104.51026	ST, FC								
63	1622	48.11476	104.49685									ST,FC
64	1620.5	48.12325	104.4721		ST, FC	ST, FC						ST,FC
65	1619.5	48.11113	104.45372						ST, FC		ST,FC	
66	1618.5	48.09912	104.44811				ST, FC					ST,FC
67	1617.5	48.09658	104.4437		ST, FC	ST, FC		ST, FC			ST,FC	
68	1616.5	48.08134	104.41538	ST, FC								
69	1615	48.07642	104.3929		ST, FC					ST,FC		
70	1613.5	48.07464	104.37304			ST, FC						
71	1612	48.04856	104.34785								ST,FC	
72	1611	48.04604	104.33904			ST, FC			ST, FC			
73	1610	48.04465	104.32111					ST, FC				ST,FC
74	1608.5	48.04829	104.28288		ST, FC	ST, FC	ST, FC				ST,FC	
75	1606.5	48.035	104.25092	ST, FC		ST, FC				ST,FC	ST,FC	
76	1604.5	48.03568	104.20708	ST, FC			ST, FC	ST, FC				ST,FC
77	1603	48.0441	104.19778			ST,					ST,FC	

Bend Number	Bend River Mile	Coordinates* Latitude Longitude		2006	2007	2008	2009	2010	2011	2012	2013	2014
						FC						
78	1598.5	48.04596	104.18368	ST, FC		ST, FC					ST,FC	
79	1597.5	48.03868	104.16394			ST, FC			ST, FC		ST,FC	
80	1596	48.04502	104.15459				ST, FC					
81	1595	48.05317	104.14133		ST, FC	ST, FC		ST, FC				ST,FC
82	1594	48.0378	104.12411		ST, FC					ST,FC	ST,FC	
83	1593	48.02956	104.10265		FC	ST, FC						ST,FC
84	1592	48.02939	104.1001						ST, FC			
85	1591	48.02138	104.09813			ST, FC						
86	1590.5	48.02015	104.10017		ST, FC			ST, FC				
87	1589.5	48.0052	104.10172		ST, FC					ST,FC		
88	1588.5											
89	1587	47.99909	104.05392								ST,FC	
90	1585.5	47.98677	104.01939							ST,FC		
91	1583.5	47.96973	104.01037								ST,FC	ST,FC