Colorado River-Imperial Division
Fisheries Management Plan
2019-2029

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Approved [X] by Chris Cantrell _____ Date: 9/30/19
Aquatic Wildlife Branch Chief

Location

The Imperial Division of the Colorado River consists of a 38-mile stretch of the river extending from Imperial Dam, upstream to Cibola Lake (Figure 1). The Bureau of Land Management (BLM), Bureau of Reclamation (BOR), Arizona State Land Department (ASLD), and the United States Fish & Wildlife Service (USFWS; Cibola and Imperial National Wildlife Refuge) cooperatively manage resources and recreation on Imperial Division of the Colorado River and the surrounding area.

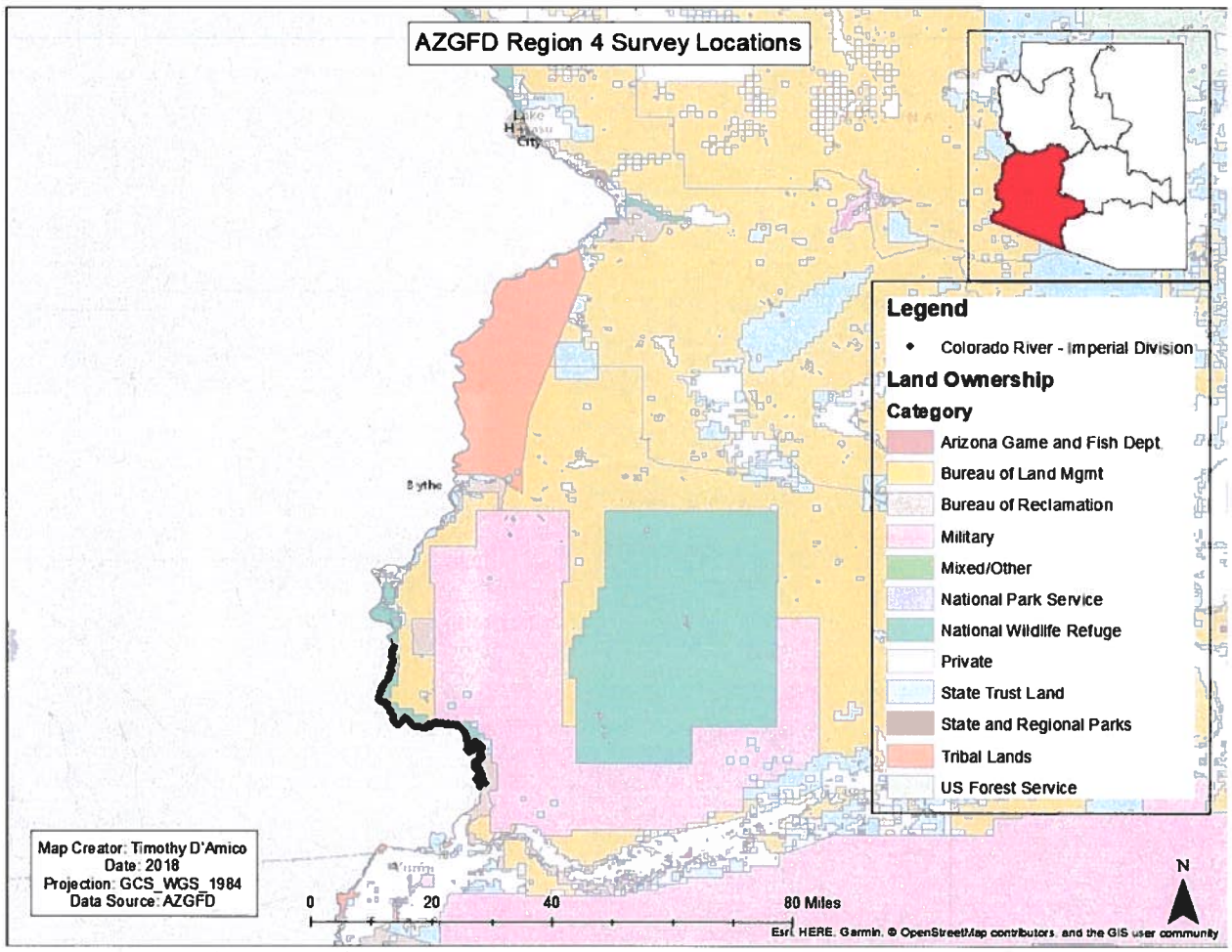

Figure 1. Location map of the Imperial Division of the Colorado River.

Management Prescription

The Arizona Game and Fish Department (AGFD, Department) has developed concepts under a Strategic Vision Document (AGFD 2019) to help guide warmwater fisheries management in Arizona. Using these concepts, fisheries management on the Imperial Division of the Colorado River and the associated backwaters will focus on a high quality Largemouth Bass *Micropterus salmoides* and trophy Flathead Catfish *Pylodictis olivaris* fisheries.

Native fish species management, conservation, and recovery will be in partnership with the USFWS, Lower Colorado River Multi-species Conservation Program (LCRMSCP) and other partners. Actions related to the management, conservation, and recovery of native fish species in the Imperial Division of the Colorado River will be mostly driven by existing conservation and recovery plans and will not be addressed in this plan.

Objective 1: Maintain the Largemouth Bass population to meet or exceed High Quality Concept standards.

Objective 2: Maintain the Flathead Catfish population to meet or exceed Fat Cat Concept standards.

Objective 3: Maintain angler satisfaction at 80%.

Monitoring activities, including community-wide or species-specific electrofishing surveys, angler creel surveys, water quality, and access surveys will be used to determine if aforementioned management objectives are being met. Management strategies to meet objectives are identified in Table 1.

Table 1. Imperial Division Objectives and Adaptive Management Strategies.

Objective 1: Maintain the Largemouth Bass population to meet or exceed High Quality standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Parameters	**Objective Guideline**	**Trigger point to address unmet objectives**	**Strategies if Objectives are not met**
Electrofishing Catch Rates	Spring electrofishing CPUE $\geq$ 100 fish/hour of electrofishing.	Average CPUE drops below 100 for three consecutive samples.	• Reevaluate survey method and/or equipment • Stocking • Regulation Changes
Relative Weight	Mean relative weight 90 < W_r < 105.	Mean relative weight drops below 90 for three consecutive samples.	• Prey Stocking • Regulation Changes

Proportional Size Distribution	PSD between 40-70, PSD-P between 10-40.	Three consecutive sampling events showing population below management guideline.	• Stocking • Regulation Changes
Angler Catch Rates	Largemouth Bass angler CPUE of no less than 1 fish per hour for anglers targeting Largemouth Bass.	Overall CPUE drops below 1 Largemouth Bass per hour for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education

Objective 2: Maintain the Flathead Catfish population to meet or exceed Fat Cat standards as listed in the Warmwater Sportfisheries Strategic Vision Document.			
Electrofishing Catch Rates	Total Electrofishing Catch per Unit Effort: ≥ 10 fish/hour of electrofishing.	Total Electrofishing drops below 10 Flathead Catfish per hour for three consecutive samples.	• Stocking • Regulation Changes • Outreach/Education
Size Structure	Size Structure: ≥ 15% of the total catch ≥ 34 inches for Flathead Catfish	Size Structure: ≤ 15% of the total catch ≥ 34 inches for Flathead Catfish	• Stocking • Regulation Changes • Outreach/Education

Objective 3: Maintain an overall angler satisfaction at 80%.			
Angler Satisfaction	Angler Satisfaction > 80%	Angler satisfaction drops below 80% for two consecutive creel surveys.	• Stocking • Regulation Changes • Outreach/Education

1 CPUE = Catch Per Unit Effort (fish per hour)
2 PSD = Proportional Size Distribution

Background

The Imperial Division of the Colorado River is managed as a Fat Cat concept Flathead Catfish fishery and High Quality Largemouth Bass fishery. Imperial Dam was completed in 1938 to divert water from the Colorado River to California via the All-American Canal and Arizona via the Gila Main Gravity Canal. Land, water, fish, and wildlife resources in and around the river and associated backwaters are managed by multiple authorities. The Department is the primary management agency for fish and wildlife in the state of Arizona. The California Department of Fish and Wildlife (CDFW) manage fish and wildlife for the state of California. Water and dam

operations are managed by the BOR. The USFWS manages threatened and endangered species in the area and two wildlife refuges (the upper 28 miles fall within the boundaries of the Cibola and Imperial National Wildlife Refuges). The lower 10 miles are mostly on land managed by the BLM. Across from the Imperial National Wildlife Refuge is Picacho State Recreation Area, managed by the State of California.

The lack of channelized riverine habitat makes the Imperial Division section of the Colorado River unique. The Imperial Division section includes numerous backwaters on both sides of the river channel. The total surface area of the backwaters is approximately 1,325 acres. Within the Imperial Division, backwaters greater than 20 acres comprise approximately 85% of the total (Brown and Engel 2011). The substrate of the main river channel is primarily sand and silt. The shoreline is lined with Salt Cedar (*Tamarix spp.*) and thick stands of various hydrophilic plants (*Phragmites spp.*, *Typha spp.* and *Scirpus spp.*).

Development of the southwest, particularly the constructions of dams, has significantly impacted almost every feature of the lower Colorado River basin. When combined with the stocking of non-native fishes, the construction of the dams and the associated changes to flow regime caused the fish community of the Lower Colorado River to change considerably over the last century. Historically, three primary native fish species were present, including the Razorback Sucker *Xyrauchen texanus*, Bonytail Chub *Gila elegans* and Colorado Pikeminnow *Ptychocheilus lucius*. These large-bodied cyprinids were adapted to the harsh environment found on the Colorado River where large fluctuations in river flows and high turbidity often existed. Another native fish, the Striped Mullet *Mugil cephalus,* may be present in low densities, although no fish have been documented in the Colorado River recently. Currently, most native fishes have been extirpated, replaced by introduced sportfish from the eastern United States that are more adapted to the slow and steady flow regime of the present-day lower Colorado River and its chain of reservoirs. Fisheries management today on the Imperial Division focuses on a few introduced sportfish species most sought after by anglers.

Productivity & Water Quality

The Department takes basic water quality measurement prior to annual surveys in May and November. There is no indication of severe or chronic water quality issues in this stretch of the river at this time. Water temperature in the main channel of the river in May is approximately 70°F and water temperature in the backwaters in November is approximately 60°F. Dissolved oxygen varies between 6 and 10 parts per million, pH varies between 7.5 and 8.5, and conductivity varies between 1,000 and 1,300 microsiemens per centimeter.

Very little is known about nutrient levels in the Imperial Division of the Colorado River or its associated backwaters. A better understanding of nutrient inputs, specifically phosphorus and nitrogen, under different conditions and the corresponding changes in primary productivity of the Imperial Division of the Colorado River or its associated backwaters could help managers understand trophic connections and the associated effect on sportfish populations. The Department will continue coordination with partner agencies to get this information. If the information does not exist, the Department will attempt to begin this sampling in house as personnel time allows or

contract out the sampling to an outside vendor.

Water quality and adequate flow in and out of backwaters in the division are very important if the Department wishes to reach the Objectives listed in Table 1. Poor water quality negatively impacts health of fish populations or causes fish kills possibly causing negative impacts to bass and catfish. These off-channel backwaters provide habitats required for spawning and rearing for fishes, as well as increased angling opportunities. These nursery habitats are critical, and large disturbances in water or habitat quality could negatively impact populations. The Department will work with BOR and other entities to maintain or enhance channels from river to backwaters to increase flow that should alleviate any water quality issues that could exist in the future.

Forage/Prey

Management of forage fishes in the Imperial Division of the Colorado River is currently focused on maintaining a diverse prey base to support healthy predatory fish populations. Bluegill Sunfish *Lepomis macrochirus*, Redear Sunfish *Lepomis microlophus*, Threadfin Shad *Dorosoma petenense*, and Gizzard Shad *Dorosoma cepedianum* contribute the most to the prey base in the Imperial Division backwaters.

Surveys conducted prior to 2014 were species-specific surveys primarily targeting Largemouth Bass. Community-wide surveys have been conducted since 2014 to collect data on species-specific abundance and species composition, which will help to better quantify abundance of forage fishes. Forage fishes have comprised at least 50% of the total catch during fall electrofishing since 2014. During a 2018 fall electrofishing survey they comprised 63% of the total catch (Figure 6).

In 2018, the Region 4 Aquatic Wildlife Program began to measure total length (mm) and wet weight (g) of Threadfin and Gizzard Shad sampled to gain a better understanding of the population. With additional community-wide surveys, managers hope to better understand the connection between the abundance of shad and other forage fish, as well as lake conditions, both biotic and abiotic. If after several years of community-wide surveys, biologists are still unable to understand the connections between lake conditions and forage abundance, alternative survey methods may be required.

The Department is unaware of any data collected on non-fish forage sources (i.e. plankton, macrophytes, crayfish, invertebrates, etc.) on the Imperial Division of the Colorado River. An increased understanding of the links between aforementioned forage sources could help better inform fisheries management on the Imperial Division of the Colorado River.

Habitat

The Imperial Division is unique relative to other reaches of the lower Colorado River. The Imperial Division includes numerous backwaters on both sides of the river channel, and the banks are lined with vegetation, whereas upstream reaches are highly channelized and lined with large rocky substrate (riprap). The total surface area of backwaters in this division is approximately 1,325 acres. Within the Imperial Division, backwaters greater than 20 acres comprise approximately 85% of the total backwater area (Brown and Engel 2011).

Fish habitat is abundant in the mainstem of the lower Colorado River Imperial Division reach. The substrate of the main channel is primarily sand and the banks are lined with dense stands of *Phragmites*, cattails and bulrush providing overhanging cover. The Imperial Division backwaters and associated channels have diverse substrates ranging from silt and sand to rock, and many of the backwaters also have organic habitat inputs, including inundated tree stumps, submerged and emergent vegetation.

Species

Sportfish species

Fishes known to occur in the Imperial Division include Largemouth Bass, Smallmouth Bass *Micropterus dolomieu*, Striped Bass *Morone saxatillis*, Bluegill Sunfish, Redear Sunfish, Green Sunfish *Lepomis cyanellus*, Warmouth Sunfish *Lepomis gulosus*, Channel Catfish *Ictalurus punctatus*, Flathead Catfish, Black Crappie *Pomoxis nigromaculatus*, tilapia *Oreochromis spp.*, Common Carp *Cyprinus carpio*, Goldfish *Carassius auratus*, Yellow Bullhead *Ameiurus natalis*, Threadfin Shad, and Gizzard Shad.

Annual electrofishing surveys have been conducted for many years by AGFD in cooperation with CDFW. The national standard for assessing Largemouth Bass populations call for spring nighttime sampling however, so future population sampling will switch over to the spring months. Fall sampling is still valuable and spot check type surveys to assess relative reproductive success of centrarchids may still be done in the fall.

Largemouth Bass:

The Imperial Division of the Colorado River and associated backwaters are managed as a high quality Largemouth Bass fishery, which has metrics for spring electrofishing CPUE, W_r, PSD and angler CPUE. Average Largemouth Bass CPUE during Imperial Division electrofishing surveys and associated backwaters from 2014 to 2018 was 53.9 fish per hour. Average CPUE for each year is shown in Figure 3. This is below the management objective for a High Quality fishery (CPUE > 100 fish per hour of electrofishing). Since surveys are completed in the fall, electrofishing CPUE cannot be compared with spring electrofishing CPUE due to seasonal biases in fisheries data (Pope and Willis 1996). Additionally, centrarchids (e.g. Largemouth Bass) spawn in the spring by building and guarding nests in shallow water (Page and Burr 2011) where they are more susceptible to shoreline electrofishing, thus further seasonally biasing their estimated CPUE. Furthermore, aquatic vegetation varies seasonally, with increased growth throughout the summer, and stem density is well known to decrease capture probability (Chick et al. 1999). Finally, water conductivity in the Imperial Division and associated backwaters is at the upper limits of the current sampling gear (Coffelt VVP-15) available to AGFD Region IV staff, which likely further limits capture probability.

The mean estimated relative weight of Largemouth Bass caught during electrofishing surveys from 2014 to 2018 was 89 and is below management guidelines (Figure 4). The Department's Warmwater Sportfisheries Strategic Vision objectives for a High Quality fishery are estimated mean relative weights between 90 and 105.

The length frequency distribution for Largemouth Bass in 2018 is similar to 2014 - 2017 and indicates multiple size classes in Largemouth Bass sampled from the Imperial Division backwaters (Figure 5). The proportional size distribution (PSD) for Largemouth Bass caught during the 2018 survey was 81 and is above management guidelines (Table 2). This is higher than PSDs seen over the last few years and indicates a population of Largemouth Bass that is shifted toward larger, adult fish. Gablehouse (1984) indicated that PSD values of 40-70 for Largemouth Bass generally indicate a balanced population.

Flathead Catfish:

The Imperial Division of the Colorado River is also managed as a Fat Cat concept Flathead Catfish fishery, which has metrics for spring electrofishing CPUE and proportional length frequency. Annual spring electrofishing surveys targeting Flathead Catfish in the main river channel are conducted in May. Mean annual CPUE and W_r for Imperial Division Flathead Catfish (2014-2018) are shown in Figures 7 and 8, respectively. There was not a survey conducted in 2016 due to personnel limitations. Average Flathead Catfish CPUE during Imperial Dam electrofishing surveys from 2014 to 2018 was 19.9 fish per hour and mean annual CPUE has been at or above management objective from 2014 – 2018 (Figure 7).

The 2018 Flathead Catfish length-frequency distribution is similar to 2014 - 2017 and indicates multiple size classes of Flathead Catfish sampled from the Imperial Division of the Colorado River (Figure 9). Proportional length frequency from 2014 – 2018 is below the management objective of 15% or greater of the sampled population greater than 34" (~863mm). The current Flathead Catfish population is not meeting the management objective of 15% or greater of the sampled population greater than 34" (~863mm) is due to the large number of young of year fish rather than a lack of large fish. The Imperial Division of the Colorado River regularly produces Flathead Catfish in excess of 40 pounds (~18,144 g) in both electrofishing surveys and angler catches so there is no concern from fisheries managers at this time about a lack of large fish. In the future, surveys or management objectives may need to be altered to accurately represent the Imperial Division Flathead Catfish population.

Invasive/undesirable species

Quagga Mussels *Dreissena bugensis*, Bullfrogs *Lithobates catesbeiana*, Northern Crayfish *Orconectes virilis*, Gizzard Shad *Dorosoma cepedianum,* Giant Salvinia *Salvinia molesta*, Water Lettuce *Pistia stratiotes,* and Water Hyacinth *Eichhornia crassipes* have all been documented in the Imperial Division and Apple Snails *Pomocea* spp. occur in the vicinity. Currently, Giant Salvinia is the greatest concern and as such has required significant resources to control. Gizzard Shad are one of the most recent fish species to invade the Imperial Division of the Colorado River and the full impacts to the fishery are not yet known. The Department will continue to work with partner agencies to maintain and enhance monitoring and participate in control efforts when needed.

Access

Vehicular access to the Imperial Division section of the river is mainly from Highway 95 north of Yuma. The two main paved access roads are Imperial Dam Road and Martinez Lake Road. Concrete boat ramps are located at Hidden Shores Village, Fisher's Landing Resort, Martinez Lake Resort, and Meers Point on the Arizona side of the river and at Squaw Lake Campground, and Picacho State Recreation Area on the California side of the river. Shoreline access for angling and camping is limited by dense vegetation on the banks.

Currently, the 38 miles of river and most of the backwaters are accessible by boat. However, with population growth and long-term drought conditions affecting the desert southwest, future management of the lower Colorado River will be faced with decreased water resources. State and federal agencies are addressing drought contingency plans, and as such this document will not delve into details. However, the Department should advocate for the importance of fisheries to the local economy should conversations about modifying the current flow regime be discussed.

The Department should strive to maintain or increase access to backwaters on the Imperial Division of the Colorado River for the fish population and anglers. These off-channel backwaters provide habitats required for spawning and rearing for fishes, as well as increased angling opportunities. These nursery habitats are critical, and large disturbances in water or habitat quality could negatively impact populations. These backwaters are also very important to anglers as the majority of angling for sunfish and bass in this division of the Colorado River occurs inside the backwaters for most of the year. Any large scale changes in the ability of fish or anglers to access these backwater habitats could lead to declines in the overall fish population or angling experience. The Department will work with BOR and other entities to maintain or enhance channels from river to backwaters to increase access for fish and anglers.

Catch & Satisfaction

Catch, harvest, and angler satisfaction rates on the Imperial Division are not known because creel surveys have not been conducted recently due to a lack of funding and resources. It is recommended that creel surveys be conducted approximately every five years on the Imperial Division. However, limited resources, access and personnel may restrict the Department's ability to conduct a creel survey on the Imperial Division. Other practices (i.e. tagging) may be implemented in lieu of creel to more accurately assess angler pressure and harvest of fishes in the Imperial Division.

Literature Cited

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Tables and Figures

Table 2. Proportional stock densities (PSD) of Largemouth Bass sampled during fall Imperial Division of the Colorado River backwater electrofishing surveys (2014-2018).

Year	n	No. Stock Size Fish[a]	PSD[b]	PSD S-Q[c]	PSD Q-P[c]	PSD P-M[c]	PSD M-T[c]	PSD T[c]
2018	304	256	81	19	34	43	4	0
2017	242	154	65	35	28	35	2	0
2016	206	111	83	17	41	39	4	0
2015	176	139	68	32	38	27	2	1
2014	206	140	71	29	29	38	4	0

[a] Stock-size Fish = Largemouth Bass >199 mm.
[b] PSD = Percent of stock-size fish: Largemouth Bass >299 mm.
[c] PSD = Proportional size distribution: S-Q=Stock to Quality, Q-P=Quality to Preferred, P-M=Preferred to Memorable, M-T=Memorable to Trophy.

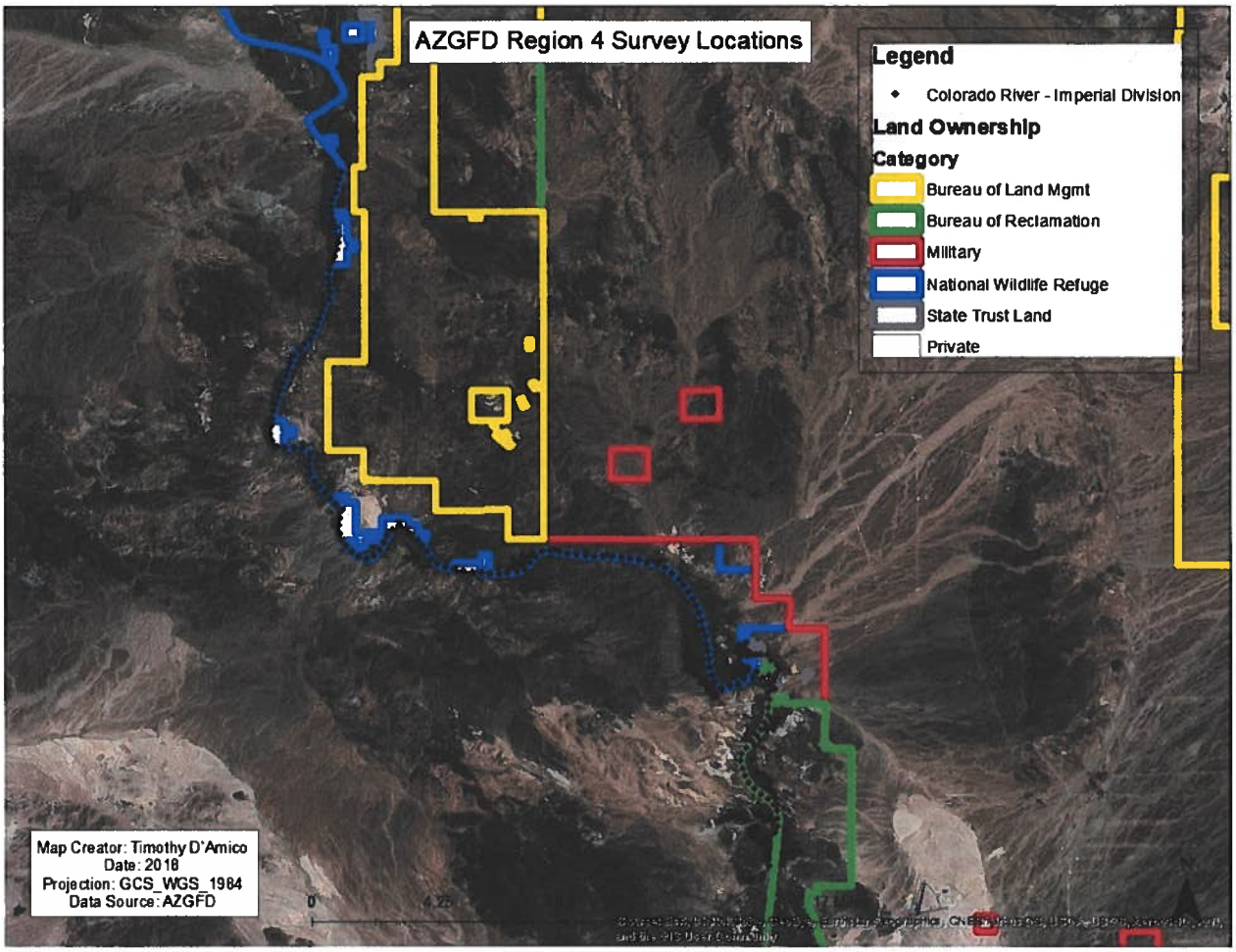


Figure 2. Land ownership of the Imperial Division of the Colorado River.

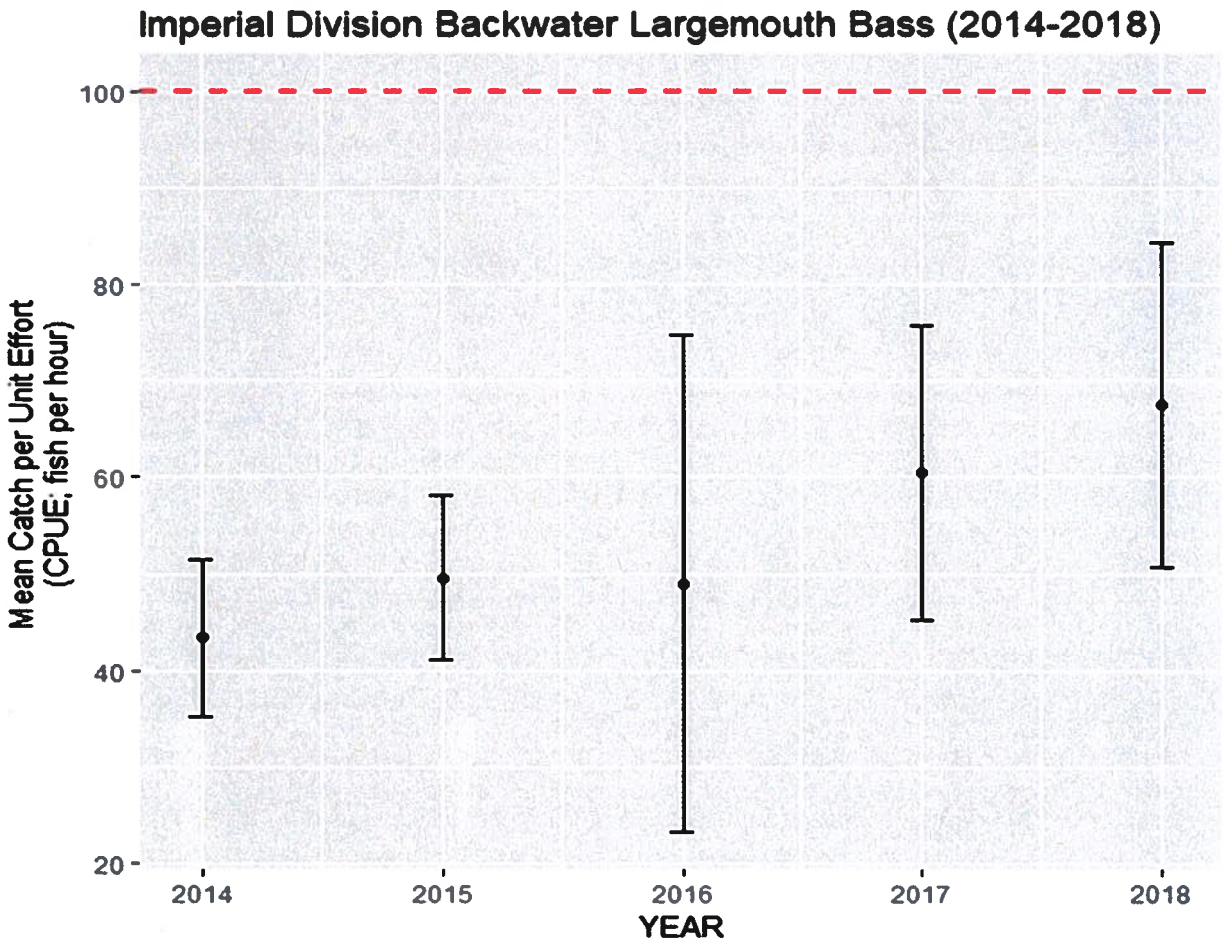


Figure 3. Annual mean catch per unit effort (CPUE) and associated 95% confidence intervals for Largemouth Bass captured during Imperial Division Backwater electrofishing surveys (2014-2018). AGFD Warmwater Vision objectives are shown with dashed red line.

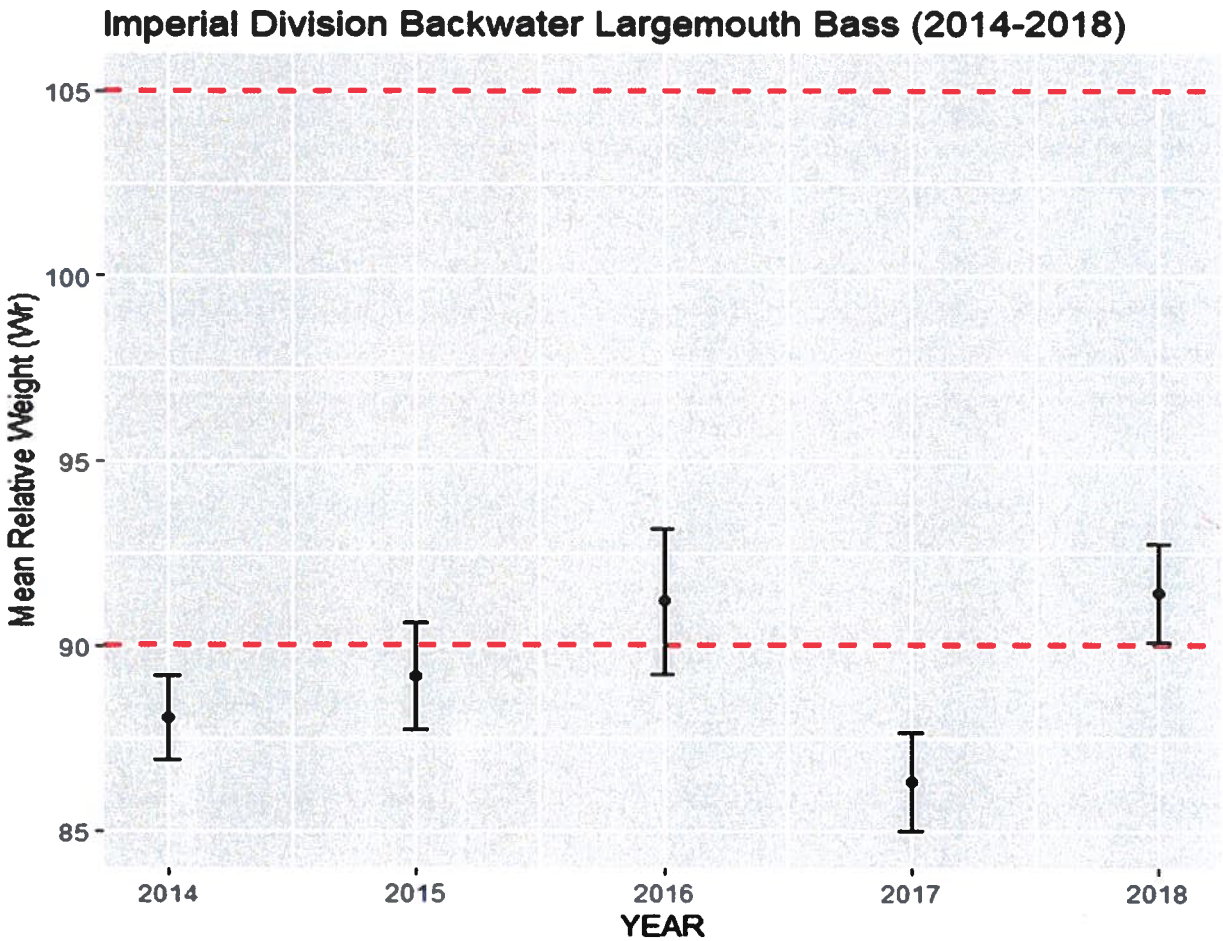


Figure 4. Annual mean relative weight (Wr) and associated 95% confidence intervals for Largemouth Bass captured during Imperial Division Backwater electrofishing surveys (2014-2018). AGFD Warmwater Vision objectives are shown with dashed red line.

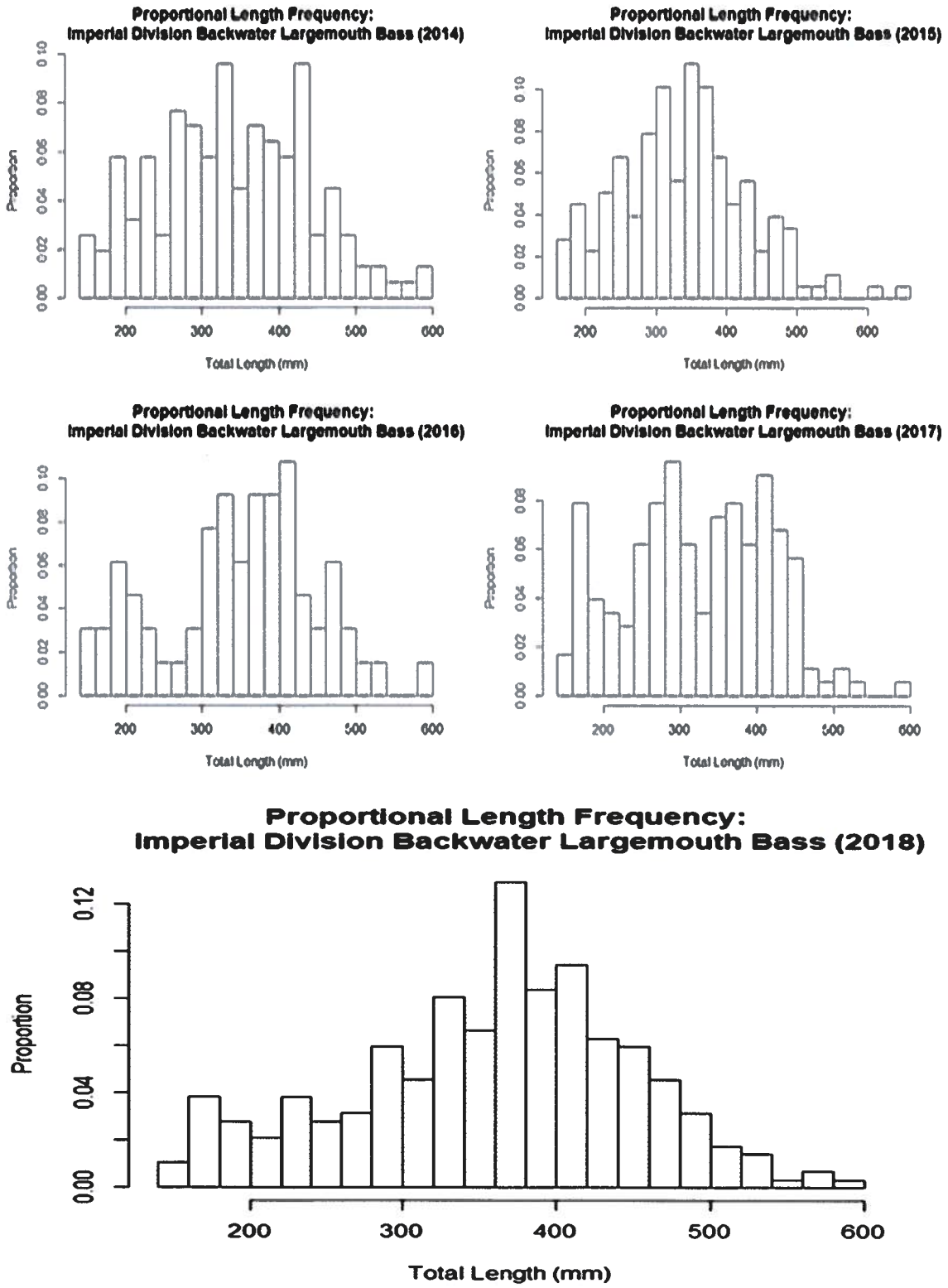


Figure 5. Length-frequency distribution of Largemouth Bass sampled during fall electrofishing survey in the Imperial Division backwaters (2014-2018).

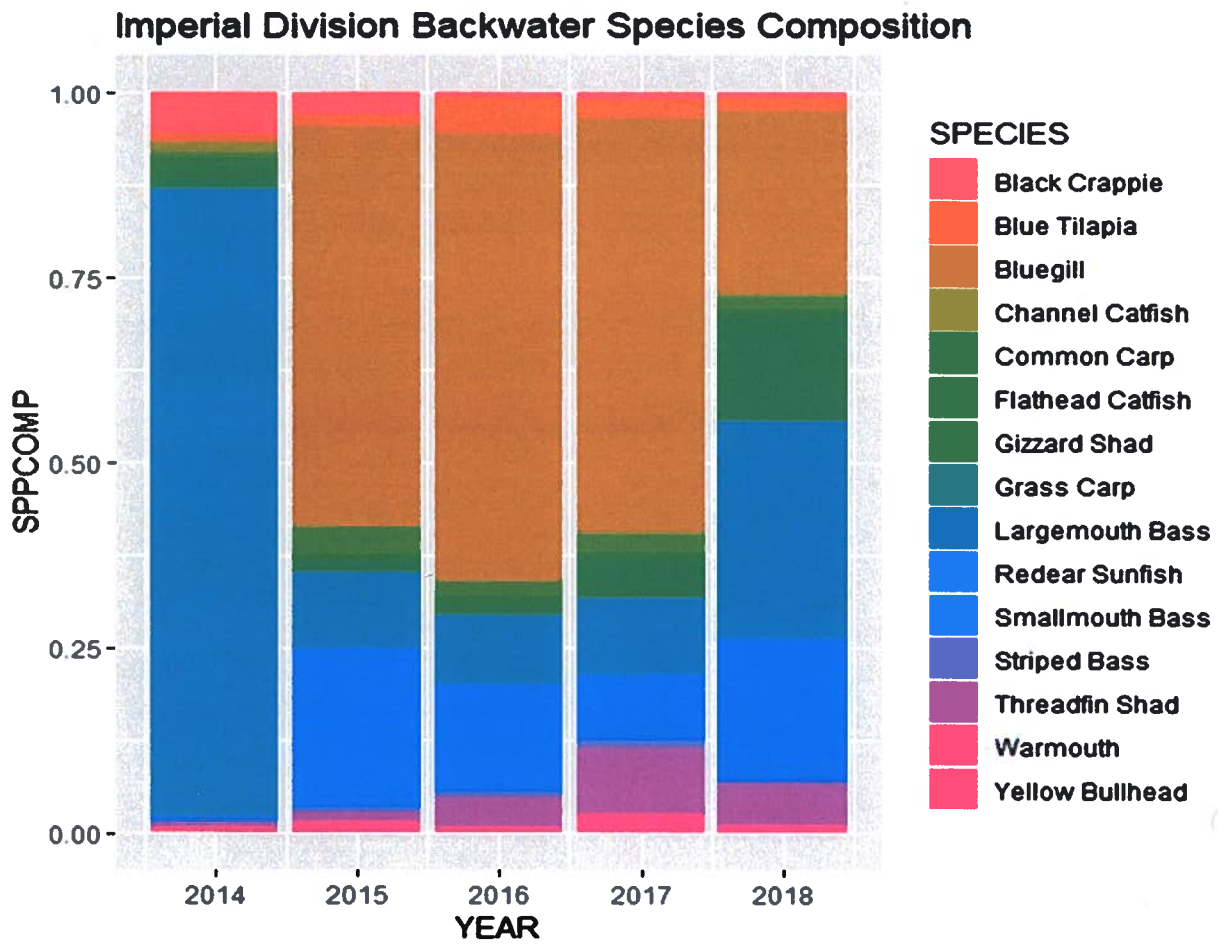
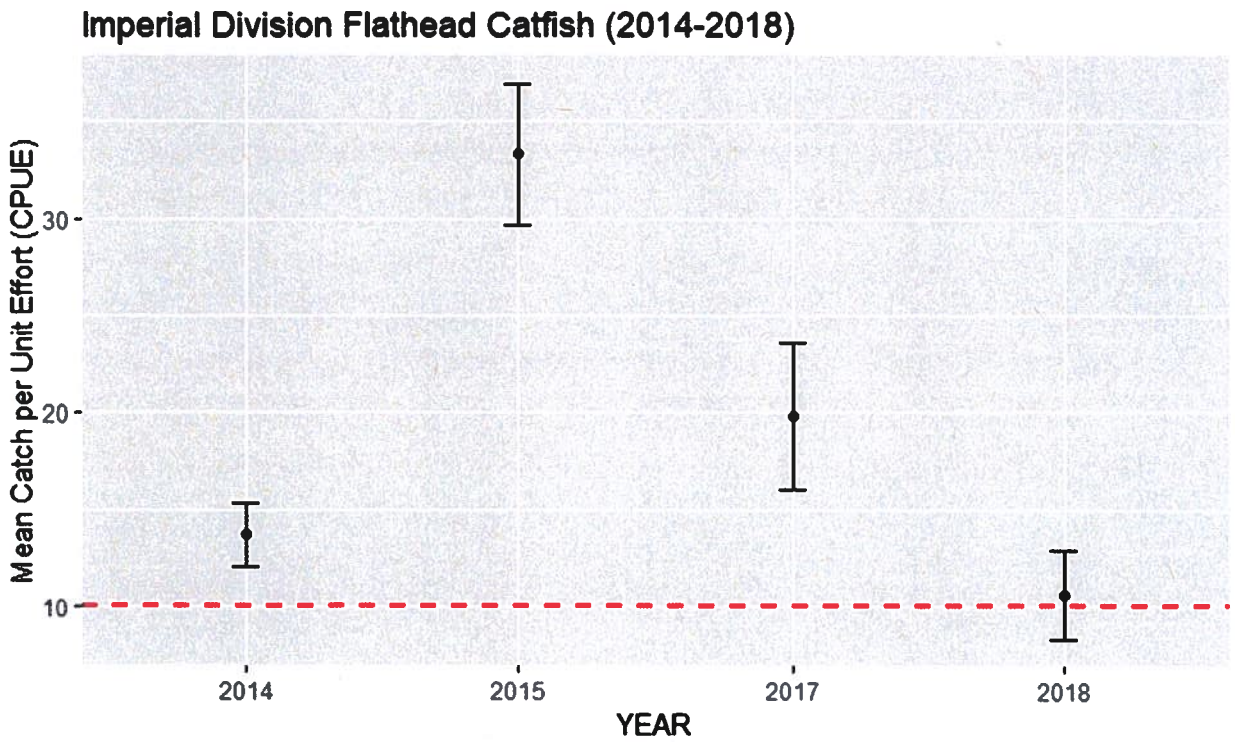


Figure 6. Relative species composition of fish caught in Imperial Division backwaters during a fall electrofishing surveys (2014-2018).



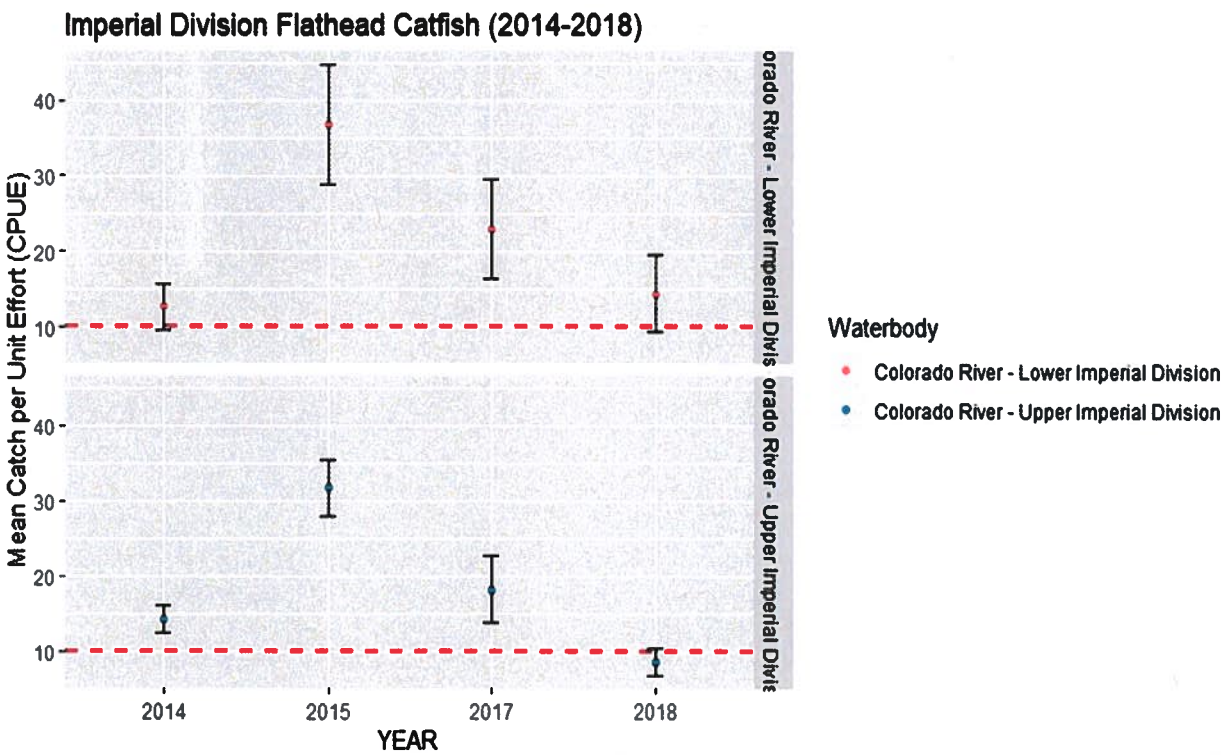
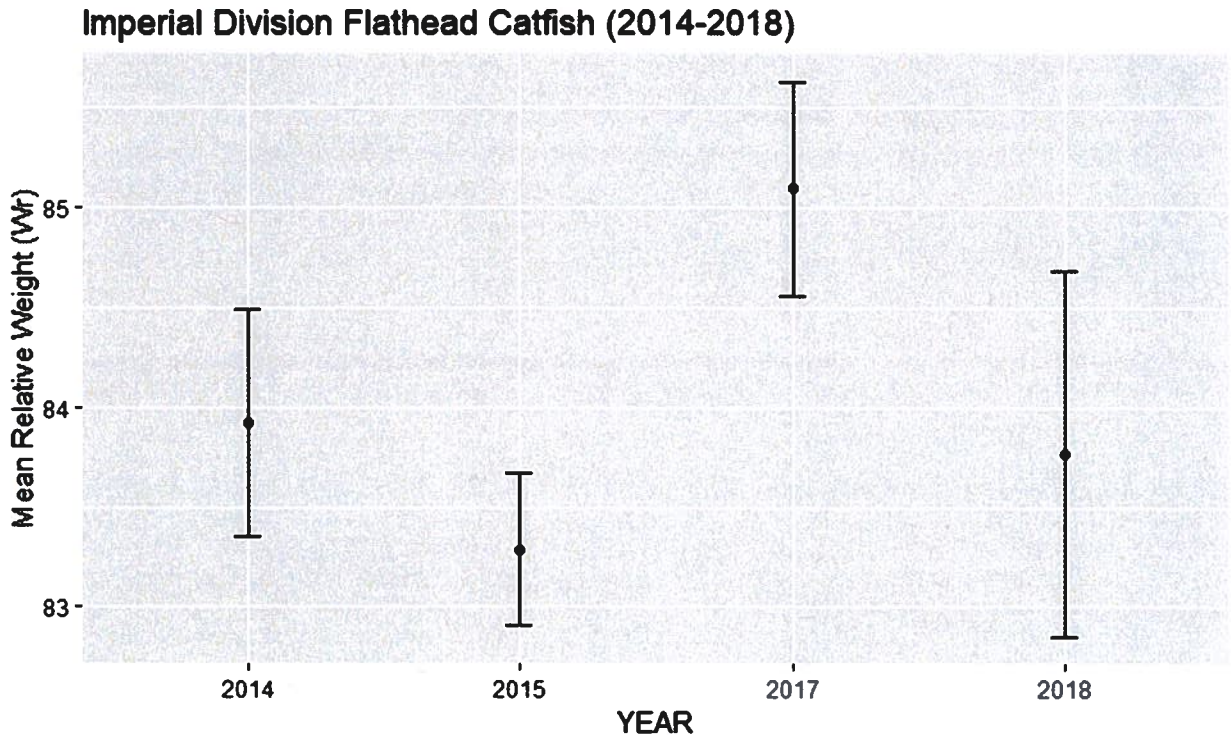


Figure 7. Annual mean catch per unit effort (CPUE) and associated 95% confidence intervals for Flathead Catfish captured during Imperial Division electrofishing surveys (2014-2018). AGFD Warmwater Vision objectives are shown with dashed red line.



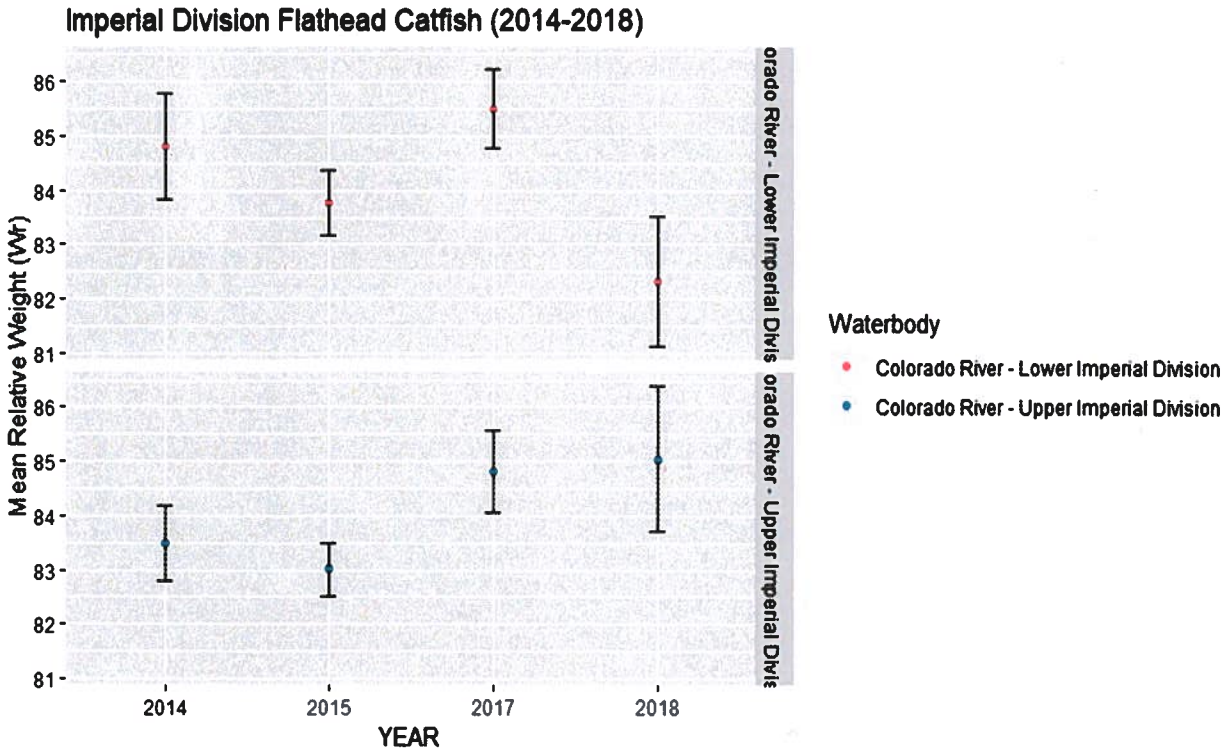


Figure 8. Annual mean relative weight (Wr) and associated 95% confidence intervals for Flathead Catfish captured during Imperial Division electrofishing surveys (2014-2018).

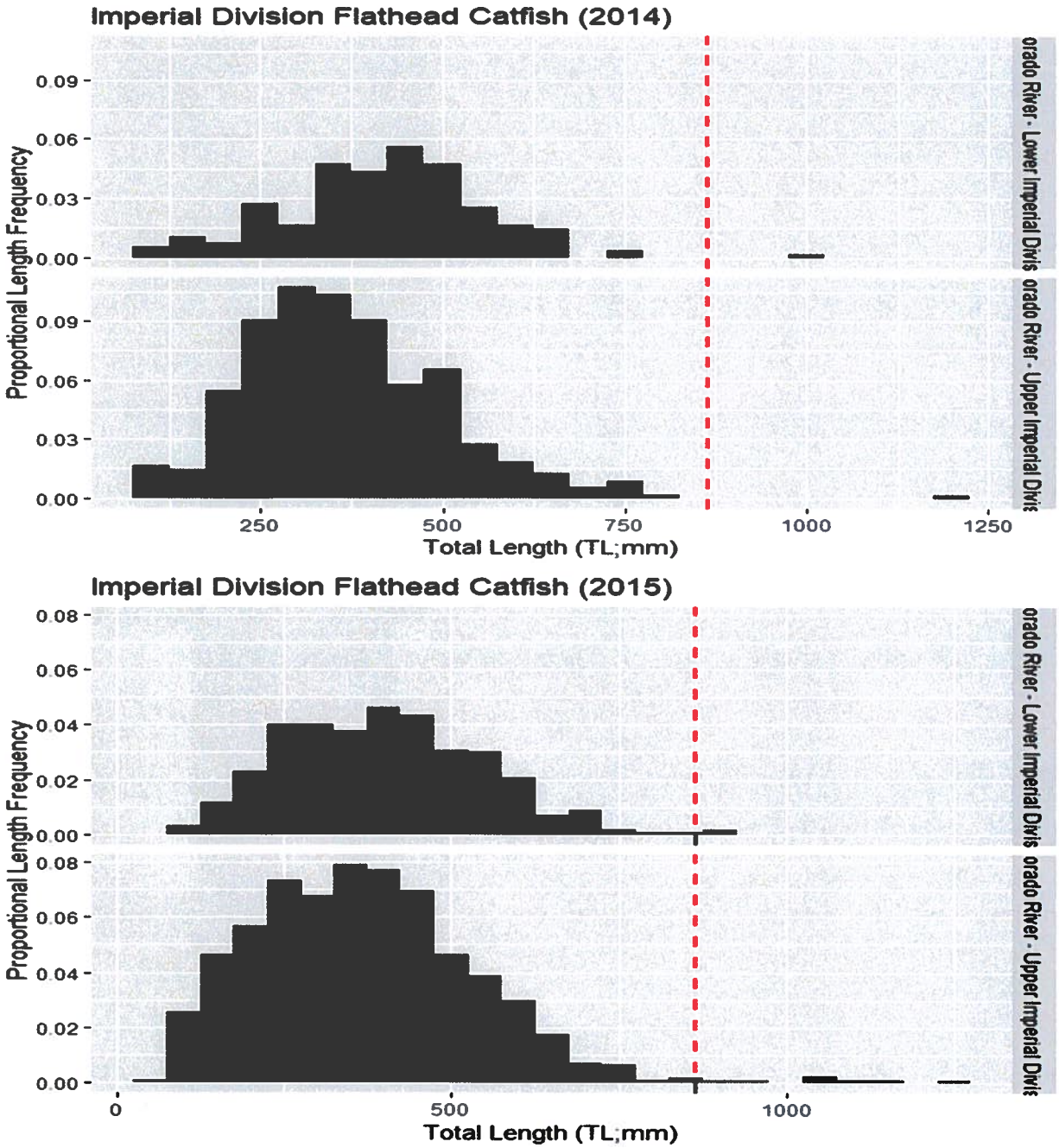
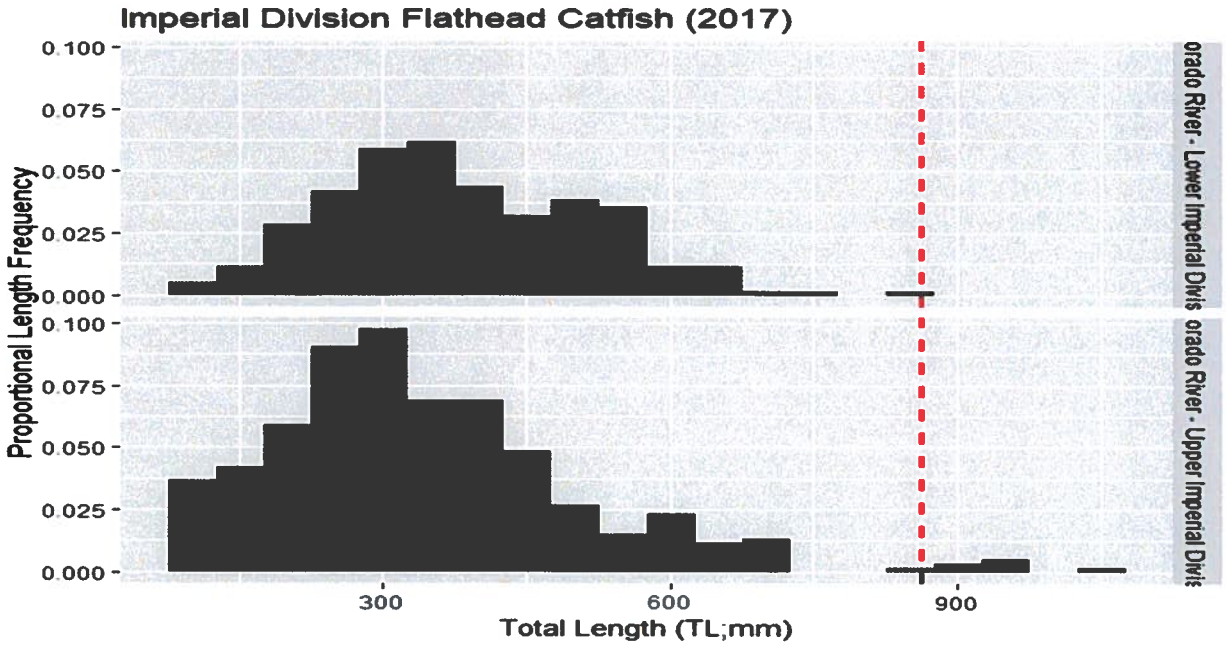


Figure 9. Annual proportional length frequency for Flathead Catfish captured during Imperial Division electrofishing surveys (2014-2018). AGFD Warmwater Vision objectives are shown with dashed red line.



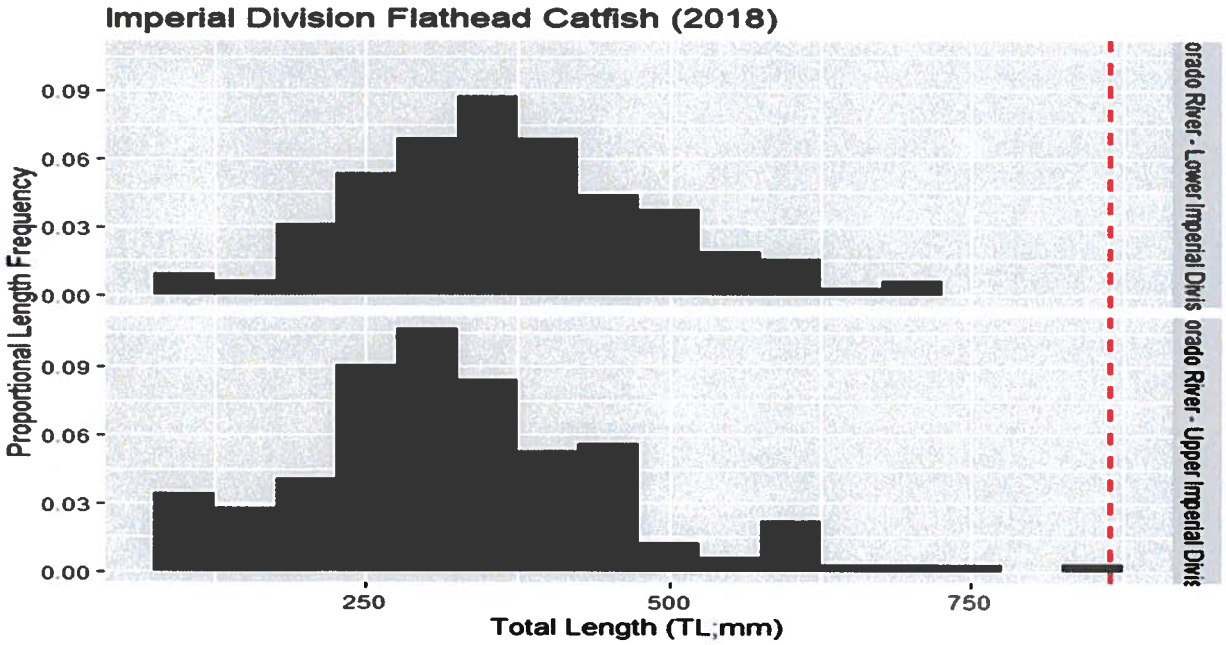


Figure 9 continued. Annual proportional length frequency for Flathead Catfish captured during Imperial Division electrofishing surveys (2014-2018). AGFD Warmwater Vision objectives are shown with dashed red line.