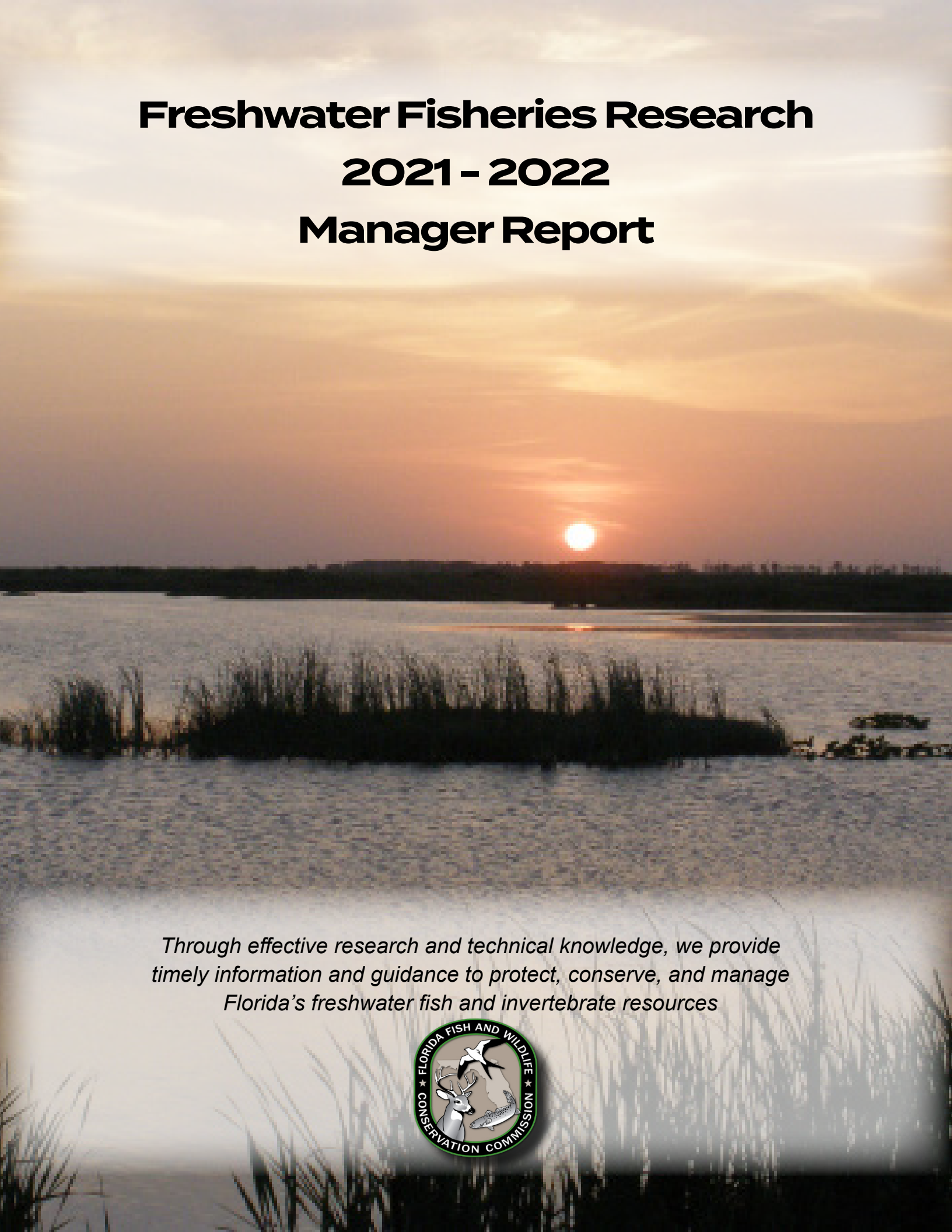
# Freshwater Fisheries Research
# 2021 - 2022
# Manager Report



*Through effective research and technical knowledge, we provide timely information and guidance to protect, conserve, and manage Florida's freshwater fish and invertebrate resources*

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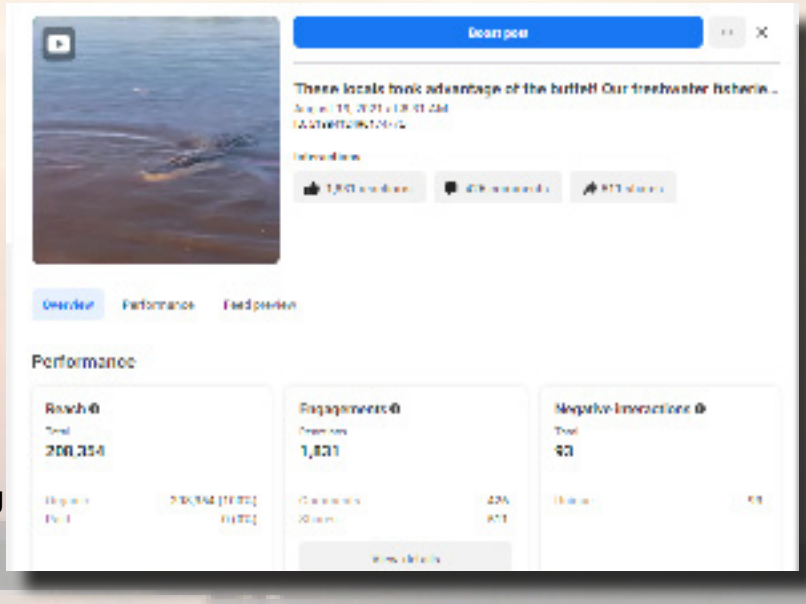
# Analysis of social media performance and practices for Freshwater Fisheries Research

*Justin Hill*

Outreach through social media is an integral part in taking the Florida Fish and Wildlife Conservation Commission's (FWC) collective information and data to the stakeholders. The Florida Fish and Wildlife Research Institute (FWRI) focuses on sharing quality scientific information through various social media platforms with Freshwater Fisheries Research (FFR) being a major contributor. Comparative analysis of yearly production is calculated to monitor the product. Fiscal Year 2021 / 2022 differed little from the past year, as state, national and global events continue to mold FWC behavior and policy.




There was a total of 135 outreach interactions in fiscal year 2021/22.

- → Facebook posts totaled 20
- → YouTube uploads totaled 4
- → Web content totaled 21
- → Instagram posts totaled 19
- → Other 42
- → Internet questions answered 29

Notable posts: A post highlighting alligators taking advantage of a low dissolved oxygen (DO) event in Emeralda Marsh reached over 200,000 accounts on Facebook and 32,000 on Instagram.

## Annual update of FWC's freshwater citizen-science program, TrophyCatch

*Summer Lindelien, Kristen Eser, KP Clements, Drew Dutterer, John Cimbaro, Michelle Kerr, Jason Dotson, and Bill Pouder*

TrophyCatch (TC) has 13,370 approved entries across 395 public waterbodies over 10 seasons (as of June 30th, 2022). These citizen-science data collected for Largemouth Bass ≥8 lbs., surpass data collected from standard electrofishing samples (1,532 bass from 108 waterbodies) and the Trophy Bass Tagging Study (1,637 tagged fish from 164 public waterbodies) since their inception.

Program participation measured by TC approvals was highest during Season 4 (2,268) then decreased during Seasons 5–7. Seasons 8 and 9 showed an increase, which has continued through Season 10 (1,243 through 8 months relative to 1,422 in Season 9.

TrophyCatch has 35,035 registrants as of June 30th, 2022.

Program awareness measured by the Trophy Bass Tagging Study increased (31%→73%) through seasons 1–5 but reached an asymptote (63%–73%) across seasons 3–9. Awareness spiked from 63% in Season 9 to 82% (all-time high) in Season 10.

The Lunker Club (8–9.99 lbs.) surpassed 10,000 approved catches during Season 10.

Out of the total number of FWC-creel surveyed anglers, an average of 24% were TC registered residents of Florida and 21% were TC registered non-residents (see Creel Estimates Reported from TrophyCatch Registered Participants Report).

Based on creel data from 16 waterbodies, TC effort and catch were highest at Lake Harris. Success was highest at L-35B Canal, Garcia, Rodman Reservoir, and Orange Lake (1.07–1.95).

To celebrate ten years of a successful TC program, FWC fisheries scientists tagged ten trophy-size largemouth bass with unusually-high-reward pink dart tags across ten Florida waterbodies this spring (Johns Lake, Lake George, Lake Griffin, Lake Istokpoga, Lake Rousseau, Lake Talquin, Lake Trafford, Lake Weohyakapka [Walk-in-Water], Newnans Lake, and Tenoroc Fish Management Area; termed the 10-Tag Celebration).

Bass Pro Shops will provide $5,000 in gift cards, and American Fishing Tackle Company will provide $1,000 in credit codes to anglers that report and document a 10-Tag bass. Anglers with an approved 10-Tag bass will also be entered into a raffle drawing for $10,000 cash provided by donations from various TC partners at the completion of the Celebration (completion of Season 10).

10-Tag bass at Newnans Lake and Lake Griffin have been caught and reported by anglers

The promotion highlighted waterbodies with considerable FWC investment in fisheries and habitat management actions and sought to increase fishing effort at waterbodies known to have abundant trophy bass through fisheries independent sampling but were under-represented in TC. Increased catches were seen on four waters

## Creel Estimates Reported from TrophyCatch Registered Anglers

*Summer Lindelien and Adrian Stanfill*

Starting in 2019, creel surveys around the state added a question to determine anglers who are registered for TrophyCatch (TC).

These data were collected to evaluate current TC registration rates, residency, targeted species, and TC registered angler effort, catch, and success.

Tracking TC approved bass through the program is helpful, but we have no way to scale approved bass between waterbodies. By capturing state-wide-standardized TC registered angler effort we can better evaluate if TC approvals for a waterbody are higher because there is more TC registered angler effort or if the waterbody produces more TC bass.

To explore the previous bullet, we used TC approved catch data and TC registered angler effort (LMB/day) to calculate catch per unit effort (LMB ≥8 lbs./day) for trophy bass.

We can identify locations where additional TC promotion is needed and assess if TC registered angler effort is increasing to document growth of the program. These data could also help us evaluate changes in TC submissions and participation.

Creel survey data will expand information gained from TC collected data and allow for more scientific and management applications.

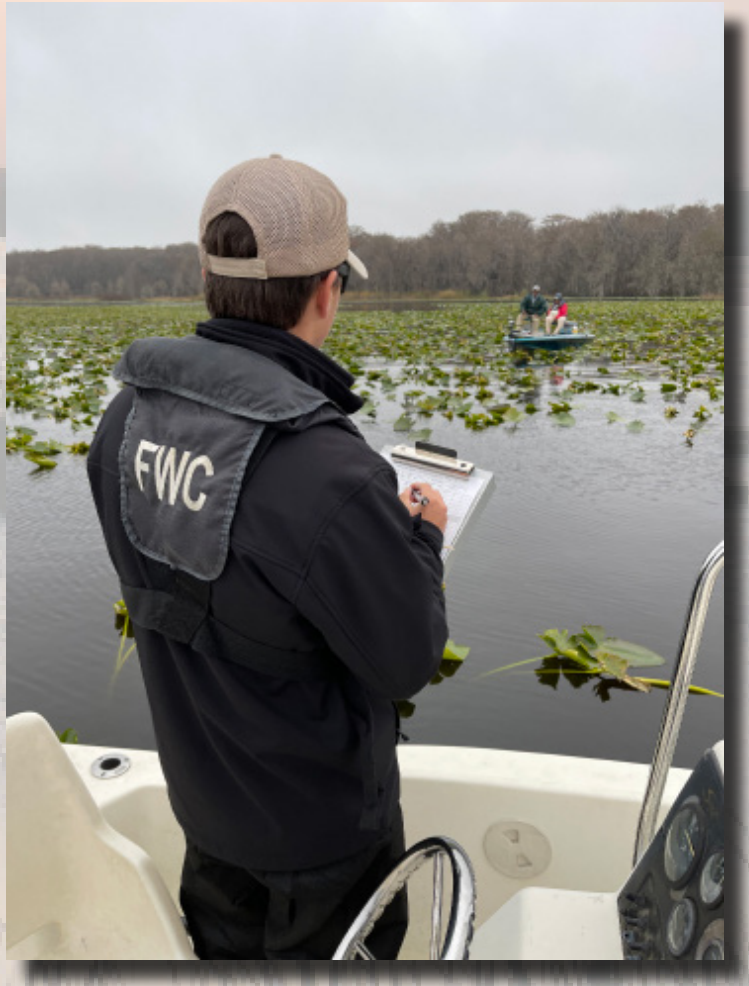
Out of the total number of FWC-creel surveyed anglers (10,454), 15% were registered for TC.

Based on creel data from 17 waterbodies, TC registered angler effort and catch were highest at Lake Harris

TrophyCatch registered angler success was highest at L-35B Canal, Garcia, Rodman Reservoir, and Orange Lake

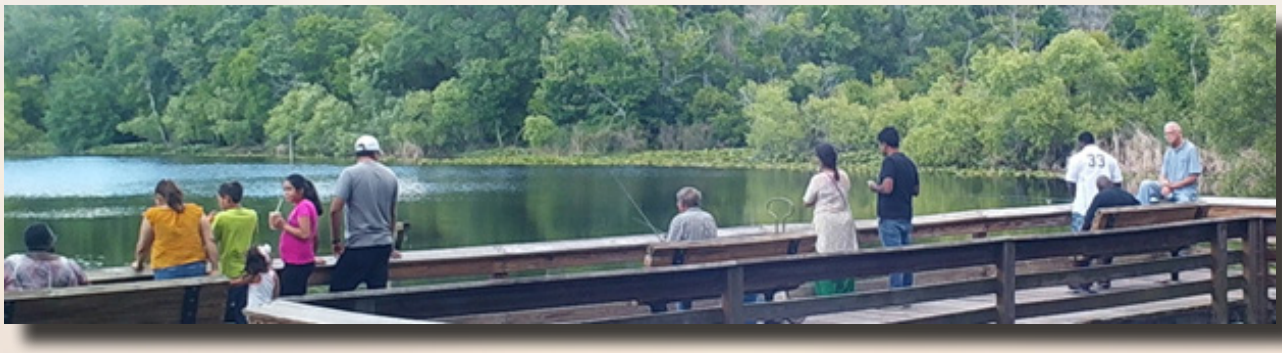
Trophy bass success (bass ≥8 lbs. per day) was highest at Lake Marian, Rodman Reservoir, Orange Lake, and Lake Toho

TrophyCatch registered angler catch increased at Orange Lake, Lake Marian, and Rodman Reservoir from fiscal year 2021-2022 to fiscal year 2020-2021



## Community based fishing project

*Nick Trippel, Ed Camp - UF, Ashton Lyon, Barron Moody, Matt Stevens, Trevor Phillips, Allen Martin, Max Inchausti, Davis Todd*



Southwest and North Central Regions participated in year-three of this study.The Southwest region evaluated marketing advertising and the North Central region evaluated an adult Black Crappie stocking project.

Camera creel analysis is still underway, angler counts in photos are still being processed in order to get up to date total angler effort estimates.

Sub-adult bass were not stocked in the South region as planned due to issues with the use of MS-222 to haul fish.  This evaluation is postponed until a sedative is approved for hauling bass.

In May, a Black Crappie tag retention study was completed and a total of 132 mature-size Black Crappie, including 109 tagged fish, were stocked into Bethesda FMA in the North Central Region.

8 tagged and 5 untagged crappie were reported harvested by anglers on Bethesda FMA

These tags were leftover from previous study with no reward or incentive for being turned in so harvest reporting rates are likely very low.

## Virtual population analysis of Black Crappie populations in Florida

*Andrew Marbury, Travis Tuten, Sara Menendez, Reid Hyle, Matt Stevens*

The VPA sampling was largely successful in the fifth year of collection with little to no problems in any of the sampled lakes this year.

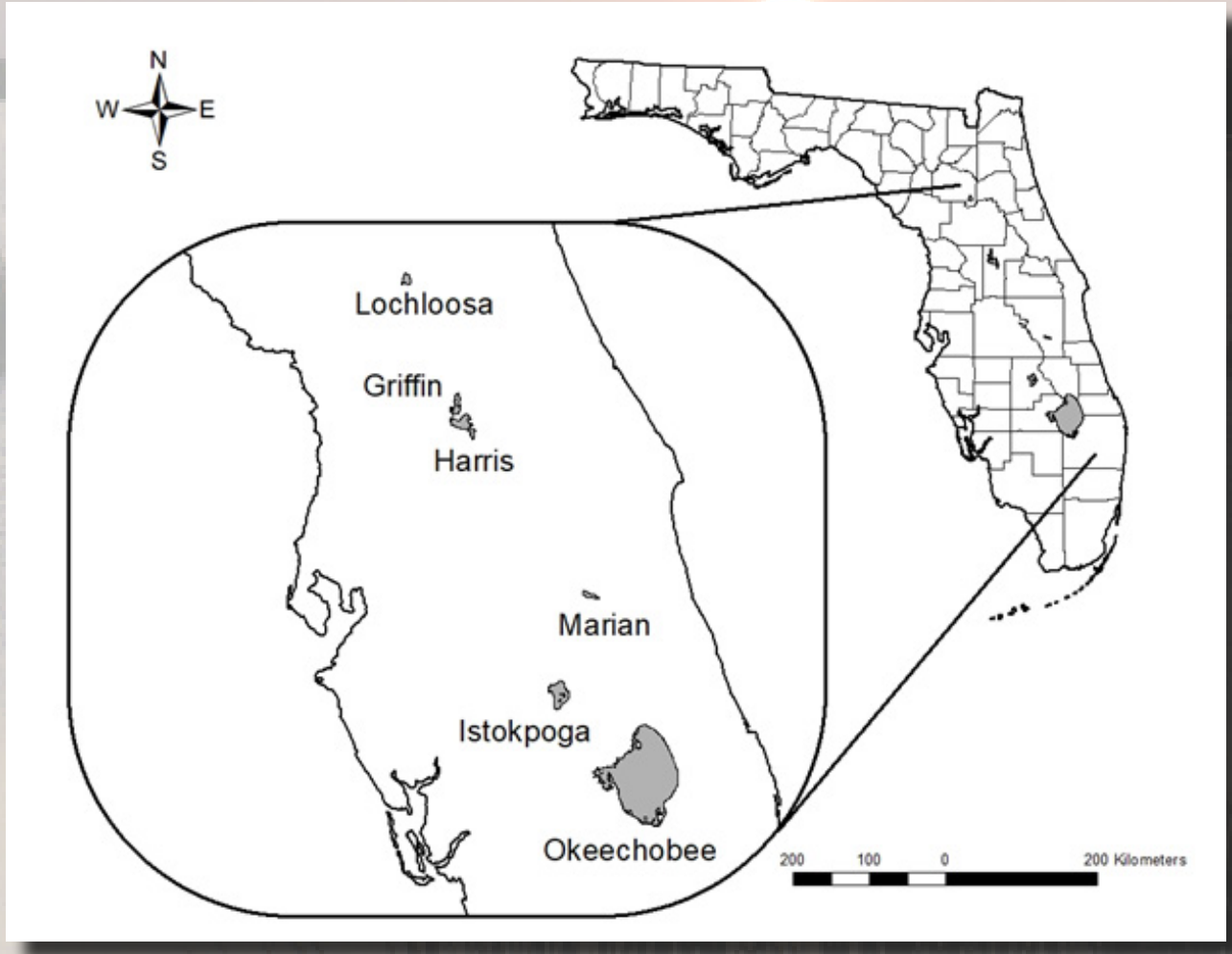
Data has been compiled in a single location that all parties can access.

The key to collecting accurate, sufficient data for this ten-year, statewide, management/research partnership project is communication and collaboration between all biologists involved.

The collaborative effort of management and research biologists continues to improve, even with high position turnover throughout many offices involved.

Gaps in creel data are a continuing problem and creel managers need more support and connection with other creel managers statewide.

With some potential issues already apparent in data collection in past years, it is imperative to maintain the consistency and quality of the data in future years, which the new Black Crappie VPA data coordinator strives to do.




*Lakes selected for Virtual Population Analysis modeling in Florida.*

## Investigating declining black crappie *Pomoxis nigromaculatus* angling trends within phosphate mine pit lakes at Teneroc FMA using hoop nets

*Ryan Howard, Paolo Pecora, Ted Lange, Brandon Thompson, Eric Johnson*

Teneroc FMA lakes are experiencing declines in the number of anglers, angling effort, catch rate, and harvest rates possibly due to decreased crappie abundances.

Abundances are thought to have decreased in only the lakes whose primary productivity decreased (impacted) as a result of a hydrologic manipulations done within the public use area about a decade ago.

Hoop nets were set for both 24- and 48-hour periods from November of 2021 to February 2022 on Lakes B (N = 18), Shop (N = 12), Legs (N = 7), 2 (N = 22), 3 (N = 18), and 5 (N =12).

Total average catch rates in Lakes 3, 5, B, and Shop from the 2021-2022 preliminary study was 0.85 crappie per net day, which was less than that reported in the 1999-2000 study of 3.52 crappie per net day.

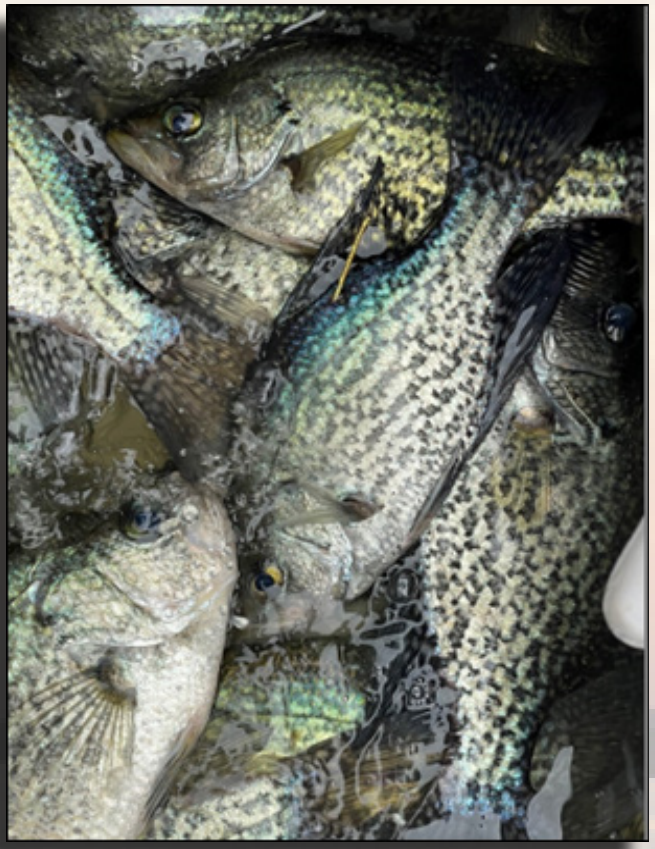
The unimpacted Lakes, B Shop, and Legs were found to have an average catch rate of 1.55 crappie per net day, while the impacted Lakes 2, 3, and 5, had an average catch rate of 0.15 crappie per net day.

Crappie catch rates in 2021-2022 are substantially less than those presented in the 1999-2000 technical report.

The hypothesis that the unimpacted lakes would demonstrate greater catch rates of crappie was supported despite low catch rates occurring in both impacted and unimpacted groups.

# Assessing annual variability in angler exploitation of Black Crappie at Newnans and Lochloosa Lakes

*Travis Tuten, Chris Anderson, Jason O'Connor, Steve Beck, and Allen Martin*



FWC has observed significant relationships between Black Crappie abundance estimated from trawl sample CPUEs and angler effort, catch, and harvest estimated from creel surveys at multiple lakes.

Our objectives are to determine how exploitation in Black Crappie fisheries varies annually and with fish abundance and angler response at lakes Lochloosa and Newnans.

We tagged 202 Black Crappie in Newnans Lake and 202 in Lochloosa Lake with high reward tags ($100) in November 2021.

There were 65 tag returns from Lochloosa Lake, and 59 (90.8%) of those fish were harvested. This resulted in an exploitation estimate of 30.5%.

There were only 49 tag returns from Newnans Lake, and 42 (85.7%) of those fish were harvested. This resulted in an exploitation estimate of 21.6%.

The 2021-2022 exploitation estimate for Newnans Lake (21.6%) was the second highest we've estimated for the lake in seven years of the tagging study (Range: 1.0 – 22.9%).

The 2020-2021 exploitation estimate for Lochloosa Lake (30.5%) is also the second highest we've estimated for the lake in seven years of the tagging study (Range: 12.2 – 37.5%).

There is a strong, positive relationship between Black Crappie exploitation estimates and creel survey estimates of angler catch, harvest, and harvest success at both lakes.

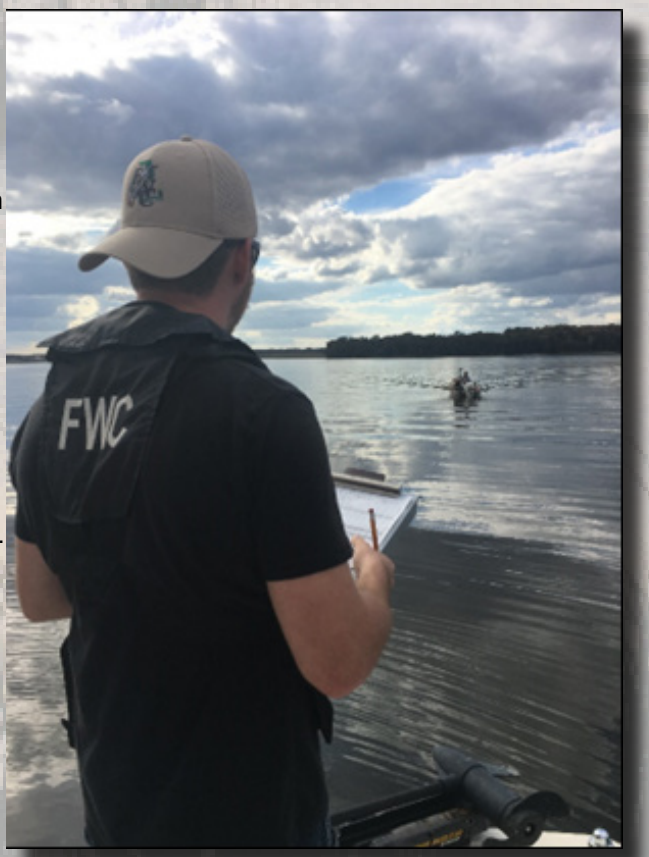
There is a positive relationship between Black Crappie exploitation and angler effort at Newnans Lake, but that relationship is weak at Lochloosa Lake.

Relationships between exploitation and relative abundance of Black Crappie > 203 mm TL based on trawl CPUEs were positive, but weak at both lakes.

Relationships between exploitation and relative abundance of Black Crappie > 229 mm TL based on trawl CPUEs were positive at both lakes, and stronger compared to smaller fish > 203 mm TL.

This was the seventh year of the study. As additional estimates of annual exploitation are available in future years, more detailed relationships between exploitation and fish abundance will be evaluated.

Findings from this study played a key role in the Black Crappie regulation review process completed in 2021.



# Evaluating an out-of-season stocking of fingerling Florida bass *Micropterus floridanus* at Lake Apopka

*Andrew Marbury, Brandon Thompson, and Scott Bisping*

Stocking out-of-season fingerling Florida Bass in the fall at Lake Apopka for two consecutive years was determined to have the best opportunity to augment natural recruitment and increase angler effort.

In fall 2016 and 2017, almost 1.5 million fingerling Florida Bass 30–50 mm TL were stocked across 34 sites and no stocking mortality was observed.

A high-profile media day was organized by Dennis Renfro and the 2016 stocking event was covered by at least 4 news outlets during the evening news, newspapers, and multiple social media posts.

Fin clips were taken during the spring bass sample in 2018 (N = 104), 2019 (N = 300), 2020 (N = 148), and 2021 (N = 221) to determine hatchery contribution to each respective year class.

No hatchery fish were collected in 2018, which primarily assessed the 2016 stocking, due to low catchability of 2017 stocked fish in 2018.

In spring of 2019, three bass from the 2016 stocking and two bass from the 2017 stocking were collected, resulting in 1% contribution to the adult population (> 230 mm TL) and 8% contribution to age-1 population (≤ 230 mm TL).

In spring of 2020, three bass were identified as hatchery-stocked fish. One from 2016, one from 2017, and one that was inconclusive to stocking year—resulting in 2% contribution to the adult population.

In spring of 2021, two bass were identified as having hatchery origins- one from 2016 and one that was inconclusive to stocking year—either 2017 or a small separate stocking event in 2019.

High mortality in the first few months of stocking is likely the reason we did not see higher contribution, although the cause of the mortality is unknown.

Game cameras have tracked peak season angler effort since 2012 and while effort substantially increased from 2020-2022, this was not attributed to our stocking efforts.

Roving creels conducted in 2013 and 2022 showed bass-targeted effort flipped from 15% to 96% of total effort on Lake Apopka.

Increase in effort was likely caused by improved natural recruitment due to the rapidly expanding hydrilla along with the heavily-promoted 2021 Lake Apopka Fishing Tag challenge.

Although stocking did not meet our intended goals, managers should continue to try to utilize other forms of promotion, such as kiosks or other positive promotion techniques, to promote the existing bass fishery.

This stocking highlights the ability of the Florida Bass Conservation Center to produce large numbers of out-of-season fingerling bass, which may be a useful technique for increasing annual hatchery production.

# Evaluating biological and social effects of the new statewide Largemouth Bass regulation

*Daniel Nelson, Brandon Thompson, and Matt Cleary*

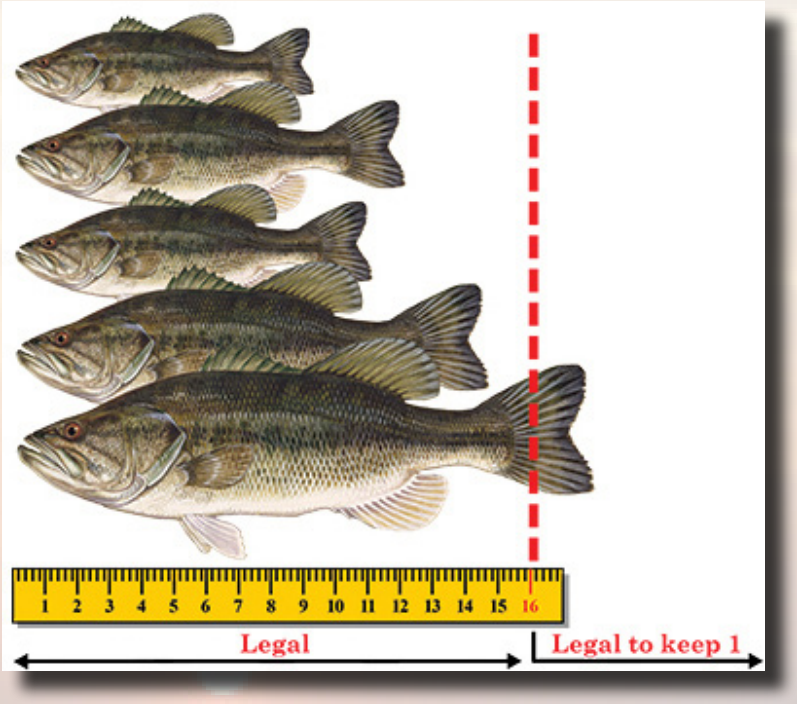
July 1, 2016, the statewide Largemouth Bass regulation was changed to a five-fish bag, of which only one fish can be 16” or larger.

A set of waterbodies was selected to assess biological changes as an effect of the Largemouth Bass regulation change.

Creel surveys were conducted on a subset of lakes to assess changes in directed effort, catch, and harvest of Largemouth Bass, as well as social changes like regulation satisfaction and awareness.

Five years (of ten) of the evaluation have been completed.

Electrofishing samples have shown no trends in catch rates, size structure, or condition of bass that can be related to the regulation change.




Regulation awareness has reached a new peak during the creels of 2021-22 (65%) and satisfaction remains high (4.47/5).

Age-at-length growth rates show no trends since the regulation change.

577 Largemouth Bass were tagged in fall 2021 to assess changes in size selective harvest post-regulation change.

Harvest rates remain higher in the Panhandle than Peninsular waterbodies, yet exploitation remains low statewide (2.9%; lowest since the beginning of the evaluation).

Although no positive biological impacts are occurring, the new regulation has not had any negative impacts.

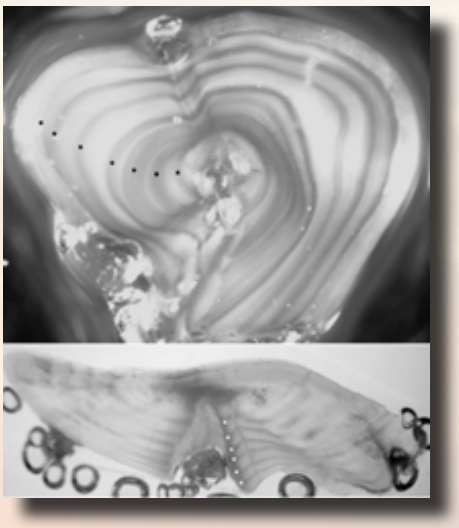
The new regulation is meeting the objectives of protecting mature female fish and allowing maximum harvest potential for a five-fish bag.

Positive social impacts have been documented in continual high angler satisfaction.

Continued evaluations at the variety of waterbodies through multiple sample types will allow biologists to detect any changes to bass populations and angler dynamics.

## Developing a nonlethal ageing method using Largemouth Bass dorsal spines collected in Florida

*Summer Lindelien, Drew Dutterer, Paul Schueller, Chris Anderson, and Jason O'Connor*



Genotypes can be collected from the skin and distal section of dorsal spines using several storage methods that mimic scenarios an angler might easily use if collecting a dorsal spine while fishing.

Differences in LMB dorsal spine and otolith age estimates varied across Lake Griffin, Stick Marsh/Farm 13, Fellsmere Reservoir, L-67A Canal, Escambia River Marsh, and the Apalachicola River.

Ages derived from LMB dorsal spines across six Florida water bodies agreed with otolith ages 42% of the time but had greater agreement within one year (mean PA±1yr = 80%).

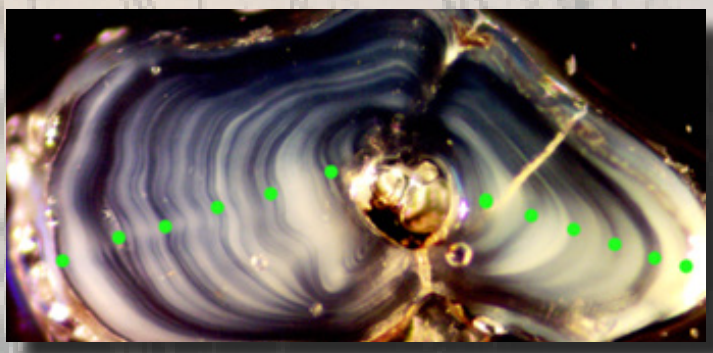
Reference sets improved precision and bias for both readers and some water bodies.

Dorsal spines can provide viable and uncommon age information about trophy-size LMB without sacrificing this socially and biologically important segment of the population.

Incorporating a nonlethal ageing method in fishery-dependent activities (e.g., tournaments, TrophyCatch) would expand age data sources and possibly foster increased angler interest and participation, generating a valuable new tool for bass research, management, conservation, and stakeholder engagement.

We simulated the effects of errors associated with dorsal spine age estimates on population-level estimates of total annual mortality (A), relative to using otoliths which are generally the most accurate LMB body part for estimating age but are lethal to collect.

The best ageing method was a hybrid approach of using both otoliths and dorsal spines. This included using otoliths to age LMB <56 cm TL and using dorsal spines to age LMB ≥56 cm TL. Using this method, estimates of A fell within 1–2% of estimates of A using just otolith ages (current FWC method).



# Statewide evaluation of angler catch and exploitation rates of trophy Florida Bass (The Trophy Bass Tagging Study)

*Drew Dutterer*

The trophy bass tagging study was designed to evaluate components of Florida's statewide trophy-bass fishery during the operation of TrophyCatch, an angler-recognition, citizen-science, trophy-bass conservation program because it promotes catch and release for trophy-size bass (≥ 8 lbs).

Bass ≥ 8 lbs have been tagged with high-reward ($100) external dart tags during routine annual sampling across the state since 2011, and tagging efforts remain ongoing.

Tag returns have been monitored to meet the objectives of measuring mean annual statewide catch, exploitation, and release rates of trophy-size bass and to measure awareness and participation rates of TrophyCatch.

Cumulatively through 11 years of operating the tagging study, FWC biologists have tagged 1,637 trophy-size bass (104–194 per year; this year: 104) from 164 public waterbodies (33–56 per year; this year: 39) within Florida.

Throughout the study, estimates of mean annual catch of trophy-size bass have varied 12%–27% (this year: 17%), and annual exploitation varied 1%–6% (this year: 1%).

Low annual exploitation rates were due to high release rates (77%–95%; this year: 94%), which were largely voluntary.

Long-term trends of release rate showed a significant increase through time, and harvest for taxidermy has shown a statistically significant decrease.

TrophyCatch awareness increased through its first five seasons (31%→73%). However, in Seasons 3–5, increases in awareness slowed (67%→73%). Over the last seven seasons (3–9) awareness has only varied within 63%–73%, suggesting it has reached an asymptote. However, during Season 10 awareness has spiked to an all-time high of 82%

TrophyCatch participation rate showed an increasing trend through the first five seasons (6%→42%), but during Seasons 6–9 participation rate has decreased somewhat, varying between 16%–30%. Season 10 participation rate increased markedly, jumping from 16% in Season 9 to 40% in Season 10.

## Largemouth Bass regulation evaluation in the Escambia River Marsh

*Matthew G. Wegener and Amanda E. Mattair*

Largemouth Bass from the Escambia River Marsh rarely attain a size greater than 406-mm TL, thus the entire population is susceptible to harvest because of the new statewide Largemouth Bass regulation.

Excessive exploitation occurred on the Escambia River when the entire population was susceptible to harvest during the 1980's; however, there is uncertainty whether significant Largemouth Bass harvest still occurs on the Escambia River.

Research is needed to re-evaluate the fishery from the Escambia River Marsh not only from a biological perspective, but also a human dimensions perspective.

Catch rates from day-time electrofishing samples have not significantly decreased before-and-after implementation of the new regulation.

Otolith analysis indicated an increase in total mortality after implementation of the new regulation.

Largemouth Bass harvest has increased to >30% after statewide regulation was implemented.

Total fishing effort has been increasing slightly each year since 2017 but is still substantially lower than when surveys began in 1981.Continued monitoring is needed to determine whether angler attitudes have shifted away from catch-and-release to harvest.

## Newnans Lake Largemouth Bass stock enhancement evaluation

*Steve Beck, Chris Anderson, and Steve Hooley*

Newnans Lake is one of three major lakes in the Orange Creek Basin (OCB) in north central Florida.

The bass fishery on Newnans Lake is characterized by low catch rates in electrofishing surveys, and low angler effort and catch success rates in creel surveys, especially when compared to the other major OCB lakes (i.e., Orange and Lochloosa) over the last decade.

Three high density stocking events occurred at Newnans Lake during the spring from 2019–2021 when nearly 1 million pellet-reared, fingerling bass were released across all three years combined (112 bass/ha).

Creel estimates for angler catch success rates of bass increased from 0.04 ± 0.02 in 2020-21 to 0.09 ± 0.02 fish/hour in 2021-22.

From 2020-21 to 2021-22, effort for bass also increased from 2,022 ± 398 to 3,936 ± 527 angler hours; however, the percent of trips where anglers targeting bass successfully caught at least 1 bass decreased from 46% to 18%.

Electrofishing catch rates from bass targeted sampling in the Spring decreased from 0.15 bass/min in 2021 to 0.03 bass/minute in 2022; however, the water level in Newnans was 1.86 feet NGVD88 higher in 2022 than 2021, which likely had a substantial, negative impact on our catch rates in 2022.

Hatchery contributions of bass sampled during bass-targeted electrofishing in the Spring from the 2019-2021 stocking events were 4% in 2020, 0% in 2021, and 8% in 2022.

The largest bass collected from the 2019-2021 stocking events was a 448 mm TL individual from the 2019 stocking that was caught and weighed in during the Spring 2022 UF Bass Club Tournament.

The majority of hatchery fish collected from during bass targeted electrofishing in Spring 2020–2022 came from a previous stocking event in 2017, so we expect our hatchery contributions to increase as the fish from the 2019-2021 stocking events grow larger.

The percentage of anglers surveyed that were aware of the high density stocking events that took place from 2019–2021 increased from 11% in 2020-21 to 28% in 2021-22.

## Evaluating stocked, hatchery-reared Rainbow Trout as potential forage for trophy Largemouth Bass in Florida

*Drew Dutterer, Shalyn Zappulla, Summer Lindelien and Allen Martin*

We released 10 trout with internal acoustic depredation tags. Nine of those tags indicated predation within 1–4 days post release. One tag was never detected in Magnolia Lake and was likely removed by an avian or terrestrial predator.

We released 40 trout with internal radio tags with activity sensors that indicated the binary status of active or inactive. Thirty of these tags transitioned from active to inactive during the first four weeks post release. Four tags transitioned to inactive between weeks 5-14 post stocking. Based on the high depredation rate observed in the acoustic tags, these 34 tags were most likely eaten by other fish.

Four radio tags were never detected in the lake. Two were routinely detected as active before disappearing. We assumed these were removed by avian predators. In addition to acoustic tag ascribed to avian predaton, the overall estimated avian predation rate was 14%.

To evaluate trout survival in the absence of predation, we stocked 41 trout evenly (13,14,14) into three holding pens deployed in Magnolia Lake. This began on February 1st, 2022, and we checked pens for dead trout weekly or bi-weekly until May 9, 2022, when the last trout had died. Mortality of trout in the holding pens began in mid-March, after several consecutive days of water temperatures exceeding 70°F. Fifty percent of the trout died by mid-April, after sustained water temperatures exceeding 70°F. No trout remained alive after sustained water temperatures exceeding 75°F.

Depending on initial stocking date, Rainbow Trout could survive in North Florida waters as forage for a 4–5-month window during winter and spring.

## Kissimmee River fish study

*Reid Hyle, Rachel Grey, Jason O'Connor, Brittany Bankovich, Chuck Hanlon, Steve Bousquin, Brad Fontaine, Arthur Bernhardt, and Tanner Beagell*

FWRI partnered with the South Florida Water Management District in a two-year study to investigate the population dynamics of Largemouth Bass in response to wet season oxygen depression in the Phase-I and Phase-IV restoration areas of the Kissimmee River. Telemetry concluded on December 16, 2021.

The primary study was designed to detect immigration, emigration, and mortality of Largemouth Bass in the restored area and between upstream water bodies.

A secondary objective was to analyze fish community data to evaluate fish community-based benchmarks/targets for tracking restoration progress.

Stationary receiver/logger stations were placed downstream of S65, S65-A, at PC-33 gage, and at Riverwood Research to detect movement between areas.

Across years, 15 of the 40 fish tagged in Pool A + Lake Kissimmee were captured by anglers at least once whereas only 2 of the 60 fish tagging in Phases I and IV were captured by anglers.

Fish migration occurred between adjacent waters, e.g. between Pool A and Lake Kissimmee or Pool A and Phase IV but the amount of fish migrating in each year did not exceed 20% of study animals and emigration and immigration offset each other.

All 30 fish died or vacated the restoration area in summer 2020 during periods of critically low dissolved oxygen. Only four survived and those returned in the late fall when oxygen recovered. Total annual mortality of fish tracked in the restoration areas was 88.9%.

The total annual mortality for 2021 was 31.6% with 24 of 33 study animals that started the year surviving the entire year. Water level increases in 2021 were gradual and modest compared to 2020 and fish were able to move and adapt to survive the brief period of critically low dissolved oxygen below 1 mg/L.

Fish preferred still water sloughs and side channels during the dry season when river stage permitted access.

The species composition of SFWMD electrofishing data was consistent with a waterbody impaired by chronic low dissolved oxygen in spite of improved average dissolved oxygen conditions since fill of C-38 and restoration of flow in the natural river channel.

Exotic fish such as Blue Tilapia, Sailfin Catfish, and Mayan Cichlids made up a small fraction of the total catch but were visually very abundant, just hard to capture. Their CPUE increased 10-fold from 2014 through 2020 in spite of gear bias against capture of these species.

# Shoal Bass population monitoring in the Chipola River, FL

*Ryan Henry, Brandon Barthel, Andy Strickland, Stephen Stang, and Bryan Winston*

A mark-recapture population estimate was conducted to compare current Shoal Bass abundance to previous estimates done in 2009-2011.

Fin clips were collected for genetic analysis to estimate the effective population size of the Shoal Bass population and to assess the current state of hybridization between Shoal Bass and non-native black bass species within the Chipola River.

A total of 372 Shoal Bass were collected via boat electrofishing, marked with a fin clip, and released in October-November 2021 during 9 sampling events. A total of 55 Shoal Bass were recaptured throughout the study.

The estimated population of Shoal Bass from Spring Creek to Johnny Boy Landing in was 1,039 (95% CI 660-1,814) in fall 2021.

This population estimate suggests a 52% loss in the Chipola River Shoal Bass population compared to the 2009 population estimate conducted in the same section of the river.

The estimated population from Peacock Landing to Johnny Boy Landing was 80% lower than the 2009 estimate.

After a 91% decrease in relative abundance following Hurricane Michael, a large year class of Shoal Bass was observed in 2019 and likely contributes nearly 70% of the current population.

Ninety-eight percent of fish were non-hybrid Shoal Bass. This is the highest level documented in years.

The effective population size is estimated to be below 50. The population is at risk to inbreeding, which could lead to loss of genetic fitness and adaptive potential. Estimates of effective population size prior to this study (2009-2017) were greater than 100.

The Chipola River Shoal Bass population has lost genetic diversity and could be impacted by inbreeding depression in the future. This loss in genetic diversity is likely due to a reduction in adult abundance following Hurricane Michael.

Satellite imagery with comparison of Chipola River section between Peacock Landing and Johnny Boy Landing before (May 2017) and after (October 2018) Hurricane Michael landfall. Image courtesy of Google Earth.

## Development of a comprehensive Florida freshwater fisheries strategic stocking plan

*Ed Camp and Diana Perry*

The FWC contracted University of Florida (UF) to develop a comprehensive freshwater fisheries strategic stocking plan over a four-year period. The third year of the overall project involved finalizing a freshwater angler survey, developing a stocking simulator tool, and hosting a workshop with FWC to present results of the angler survey and describe the Stocking Simulator tool.

The final version of the survey was disseminated to approximately 230,000 freshwater fishing license holders with a response rate of 4.3%.

Survey respondents fell into 3 broad types of anglers – committed (type 1), active (type 2), and casual (type 3).

About 75% of type 1 anglers indicate that stocking has a positive impact on their fishing experience, whereas only about 60% of type 3 anglers felt that way.

Anglers broadly support stocking of largemouth bass.

There is little support for stocking of catfish.

Survey results indicate that maintenance and improvement of fish habitat and facilities have the greatest positive impact on anglers' decisions on how often they fish and whether they choose to buy a license.

The Stocking Simulator provides managers the opportunity to explore existing and novel stocking strategies and compare alternative stocking strategies.

The stocking Simulator has many different variables that managers can change to investigate particular stocking strategies with a single lake or across a landscape.

UF hosted a workshop that included key staff from FWC's Division of Freshwater Fisheries Management and the Fish and Wildlife Research Institute to present angler survey results and walk through all of the tools that have been developed throughout the project and are continuing to be refined through discussions with managers.

## St. Johns River *Morone spp.* stocking program assessment

*Susanna Harrison, Jay Holder, and Earl Lundy*

Directed electrofishing efforts and snorkeling surveys throughout the SJR system have indicated that Silver Glen Springs (SGS), a first magnitude spring discharging into Lake George via a one-kilometer run, holds one of the largest summer aggregations of *Morone spp*.

From early July 2021 through June 2022, we made visual snorkel/video observations on at least a monthly basis of Striped Bass (*Morone saxatilis*) and Sunshine Bass (*Morone chrysops* x *M. saxatilis*) at SGS. *Morone spp*. were found in all surveys with numbers peaking (~1,170) in the summer, but with small numbers remaining throughout the winter.

Sunshine Bass stockings far surpass Striped Bass stockings in recent years and continue to dominate observations (~90%) in SGS. However, in 2022, Striped Bass stockings more than doubled those of Sunshine Bass, which may cause the proportion of observations to change in future surveys, depending on the survival of the stocked fish.

We collected 67 Morone spp. from the headsprings at SGS to assess stomach contents and determine whether fish leave thermal refuge to feed when water temperatures exceed their thermal tolerance (>25°C).

Nine of 67 fish (~13%) had nutritionally valuable food (i.e., fish remains) in their stomachs. Of these, only two had stomach contents weighing more than one g.

Results indicated that some Morone spp. were reluctant to leave thermal refuge to feed, even when water temperatures were within their tolerance range.

Over 25% of the fish we collected had parasitic infections, suggesting that physiological stress due to crowding, confinement, and starvation may depress immune function.

## Summer habitat, explotation, connectedness, and age structure of Striped Bass in the Ochlockonee River Drainage

*Stephen Stang, Andy Strickland, Mike Allen, Ryan Henry*

Lake Talquin currently offers marginal summer habitat for adult (>age-2) Striped Bass with the best summer refuge habitat for adults found in Hammock Creek, Ocklawaha Creek, Rocky Comfort Creek, Little River.

201 Striped Bass were tagged and 80 of those were recaptured with 47 reported as harvested (59% harvest rate). The harvest rate was 56% for fish less than 24" TL and 67% for fish greater than 24" TL.

Annual exploitation was estimated at 25% with most exploitation occurring below the Talquin dam during the winter and spring and on 2 cohorts of fish (age-2 and age-3).

There were 8 recaptured Striped Bass reported form Lake Talquin and 72 from the Lower Ochlockonee River. 23 of those 72 fish recaptured from the lower Ochlockonee were originally tagged in Lake Talquin, which suggests high rates of dam escapement and connectivity between Lake Talquin and the lower Ochlockonee River.

An age sample was collected from Lake Talquin during winter of 2021-2022. Ages included age-2, age-3, and only a few age-4 fish. This suggests a fast growing population to age-3 and then high mortality.

Historically fish as old as 6 were sampled in Lake Talquin. The combination of high dam escapement, climate change, and thermal refuge areas filling with aquatic plants/muck could be contributing to lack of older age classes

Some possible management options include an increase in annual stocking numbers in Lake Talquin and discontinued stocking below Jackson Bluff Dam to account for high level of dam escapement, and a proposed regulation change for lower Ochlockonee River (3 fish bag with one over 24" to reduce harvest of mature fish required by hatchery for spawning).

Aquatic habitat management partners (AHRES) are also overseeing shredding projects in thermal refuge areas to remove matts of aquatic vegetation to help restore flow of cool water.

## Florida's statewide freshwater mussel conservation program

*Lauren N. Patterson, Amber N. Olson, Jacob S. Lanning, Susan R. Geda*

The program has conducted 1,104 discrete surveys and recorded 133,386 individual mussels. During this fiscal year 38 surveys were performed in six basins where 3,872 individual mussels were collected representing 34 species. The total number of federally listed mussels was 975, representing nine of the 16 listed species in the state.

Outreach efforts were significantly bolstered by participation in several educational events for the public and by the creation of a "Florida's Freshwater Mussels" poster.

Program biologists assisted with a fish community composition assessment in the Apalachicola drainage prior to dredging of sand plugs from the mouths of sloughs in order to restore floodplain connectivity.

In December, Lake Trafford mussel restoration efforts were supported by program biologists collecting broodstock for propagation at the FBCC. Newnan's Lake was also evaluated to determine its eligibility as a target for mussel stocking.

Three host trials were conducted during this fiscal year. One trial to identify host fish species for *Strophitus williamsi* (Flatwoods Creekshell) was conducted over 39 days utilizing 38 fish representing 22 species. Among 13 fish species, 119 mussel larvae were rejected (did not attach to the fish's gills or fins), and no juvenile mussels were observed.

One host trial for *Obovaria choctawensis* (Choctaw Bean) was conducted over 44 days involving 72 fish from 38 species. From 29 fish species, 835 mussel larvae were rejected, and only one non-viable juvenile was observed in the Blacktail Redhorse aquatic habitat.

A second trial for *O. choctawensis* was conducted over 47 days using 20 fish from 11 species. A total of 632 mussel larvae were rejected from 10 fish species. Two new host fish species were identified, Speckled Darters and Florida Sand Darters. The Speckled Darters produced three juveniles with a metamorphosis success of 20.8%. The Florida Sand Darters produced 13 non-viable juveniles and 69 viable juveniles!

# Alligator Gar research in Pensacola Bay

*Amanda E. Mattair and Matthew G. Wegener*

The population status of Alligator Gar in Florida is currently unknown, but is thought to be declining throughout its historical range.

Large-mesh gill nets were used to sample for Alligator Gar.

Captured Alligator Gar were surgically implanted with a ultrasonic-telemetry tags and externally implanted with PIT tags.

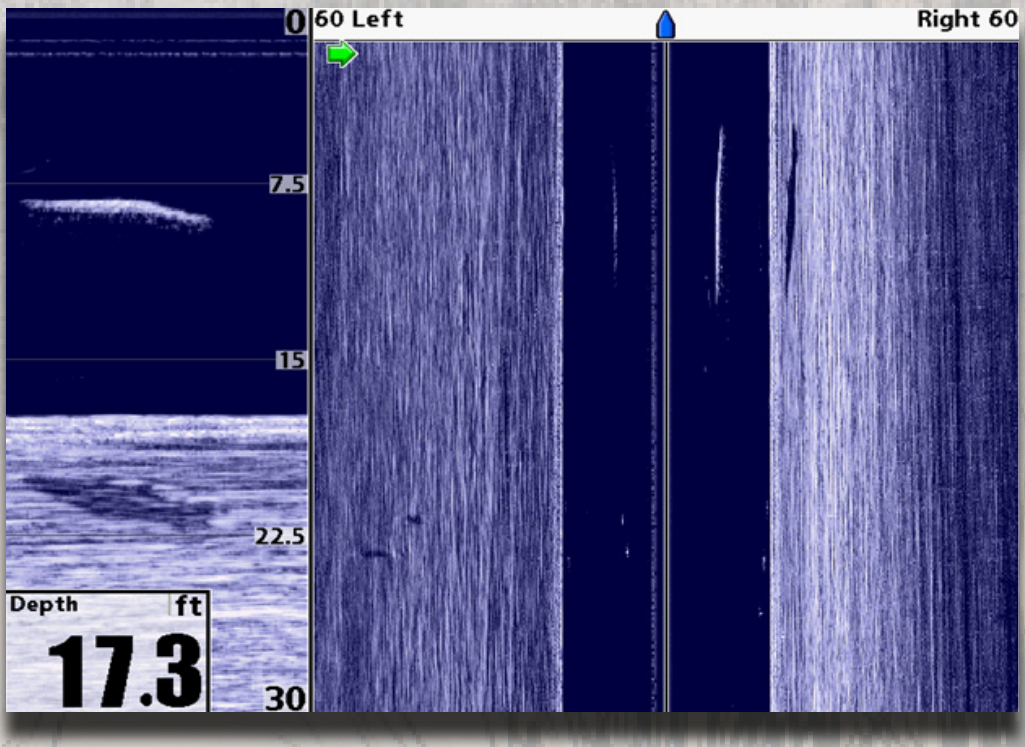
Active and passive tracking were used to estimate movement and habitat use of Alligator Gar.

One fish was captured in Blackwater Bay after manually tracking an aggregation of tagged fish.

Majority of detections occurred in bay habitats, followed by Escambia River.

Most of the river detections occurred during the warmer months (May-September).

All tagged fish were detected on Escambia River SR's during the study.




Long-range movement coincided with rising river levels and could have been related to a spawning event.

Telemetry results suggest Alligator Gar in Pensacola Bay are panmictic, likely traveling to a single tributary of Pensacola Bay to spawn.

Telemetry and genetic analysis combined suggest a mark/recapture estimate in the Escambia River during the spring could be representative of the entire Pensacola Bay population.

**Age and growth of American Eel in the lower St. Johns River, Florida**

*Kimberly Bonvechio, Jay Holder, Trevor Knight, Allen Martin, Jessica Carroll, and Noretta Perry*


The American Eel *Anguilla rostrata* stock is considered to be in a state of decline by the Atlantic States Marine Fisheries Commission.

Little is known about populations in much of its range, including Florida.

This study focuses on American Eel life history and population dynamics in the lower St. Johns River.

Year 1 sampling included 24 sampling events over a 12-week period from August to November 2021.

A total of 128 eels were collected ranging from 150 to 626 mm total length, but a modal peak was observed for the 32-33.99 cm size group.

Eel catches were low but varied by section of river and through time; however, no differences were observed in the length-weight relationship or size structure among river sections.

We observed adult Anguillicoloides crassus in 45% of swimbladders, while over 70% exhibited some level of swimbladder damage

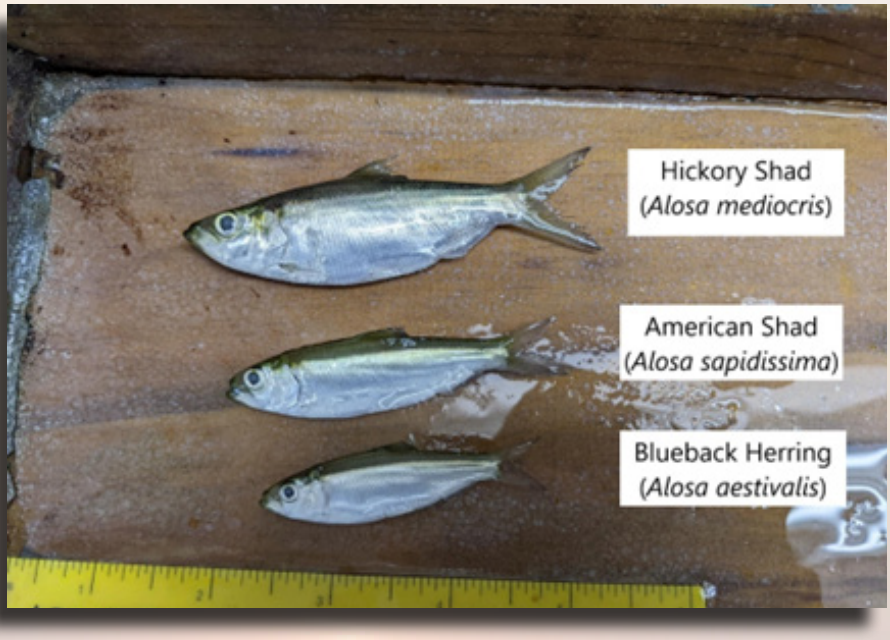
Fish samples are currently being processed for age determination, but histological examination of gonads from 87 eels revealed most were immature females or undifferentiated.

To increase sampling size, another round of sampling is scheduled for fall 2022 and will include several adjustments to improve sampling efficiency and data collection.

# St. Johns River shad and River Herring long term monitoring

*Reid Hyle, Jay Holder, Earl Lundy, Susanna Harrison, and Andrew Marbury*

American Shad and Blueback Herring are anadromous herring that range along the Atlantic Coast of North America from Florida to Canada. Each river has a unique spawning stock. Most stocks are at historically low abundance. Florida's populations are low, and the commercial fishery is closed but American Shad can be popular among recreational anglers when abundance is higher.




Our primary objectives were to monitor the spawning stock abundance, size structure, sex ratio, and age composition of the spawning stock of American Shad in the St. Johns River, monitor annual juvenile production of American Shad in the St. Johns River, and monitor effort, catch rate, total catch, and total harvest of American Shad from the recreational fishery on the St. Johns River.

Data were collected about the Blueback Herring spawning stock and juvenile relative abundance from the American Shad surveys to satisfy federal FMP requirements.

We conducted standardized electrofishing (84 samples) for the spawning stock survey, standardized pushnetting (a modified trawl pushed ahead of the boat just below the surface) for the juvenile survey (156 samples), and an access point creel (22 samples) for the fishery monitoring.

The 2022 index of the American Shad spawning run tied the 2021 index for the lowest since sampling began in 2003. Three consecutive years of a low spawning stock index triggered a management review, which was completed in 2021.

The American Shad juvenile abundance index (JAI) for 2021 was the highest on record for the 13-year time series.

Recreational fishing effort 1,431 hours was the lowest since the current access point creel survey began in 2011.

Recreational CPUE of American Shad was also the lowest since 2011 at 0.24 fish per angler-hour in both strata.

The JAI of both American Shad and Blueback Herring in the 2021 pushnet survey was the highest in that time series. For Blueback Herring, this continues a trend of above average indices for the last several years.

Florida submitted an updated American Shad Sustainable Fishing Plan for the St. Johns River System, Florida to the Atlantic States Marine Fisheries Commission. The plan was updated to include the Econlockhatchee River, Wekiva River, Ocklawaha River, and Black Creek.

Florida submitted the ASMFC Alternative Management Plan for Shad and River Herring in Florida to the Atlantic States Marine Fisheries Commission. This plan stipulates that, for Blueback Herring statewide and for American Shad outside of the St. Johns River system, Florida will either implement a monitoring and management program or harvest moratorium if harvest is documented to be occurring.

## Development and evaluation of habitat suitability indices

*Eric Nagid and Kym Rouse Holzwart - SWFWMD*

The purpose of this study is to evaluate the comprehensive list of habitat suitability indices (HSIs) presently being used by the FL water management districts (WMDs) to determine if they are representative of the functional and structural characteristics of streams within Florida, and reflective of the habitat affinities of Florida fish populations.

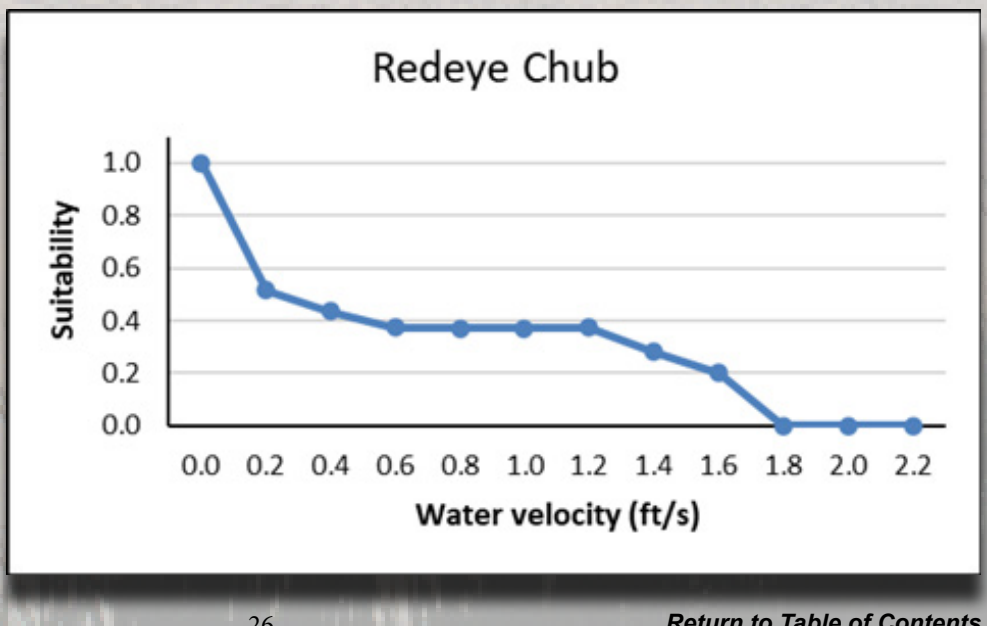
Refinements to HSIs will be made through best professional judgement or empirical data collection.

The HSI library currently consists of 57 sets of indices representing 24 species and life stages of fish, which have been used for MFL evaluations at 17 river drainages to date.

HSIs were developed using empirical data for Redeye Chub (Notropis harperi) and Pirate Perch (Aphredoderus sayanus) from the Rainbow River and Withlacoochee River (south), respectively.

HSIs were also developed for Hogchoker (Trinectes maculatus), Speckled Madtom (Noturus leptacanthus), and Ironcolor Shiner (Notropis chalybaeus) using the Delphi technique, which involves HSI development through blind surveys of subject matter experts.

The final product will be a living document of HSIs that the WMDs will use to protect the habitat and life history requirements of lotic fish species throughout Florida.



## Population dynamics and habitat use juvenile Gulf Sturgeon – Pensacola Bay Fl

*John R. Knight, Kirsten Humphries, and Bradford Warland*

The Garcon Point Aquatic Research Laboratory recently completed the sixth year of juvenile Gulf Sturgeon monitoring from the Pensacola Bay watershed (Escambia and Yellow Rivers).

Currently the monitoring program is working on a multi-state agreement with Louisiana State University, University of Southern Mississippi, University of Georgia, University of Florida, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey to assess population dynamics of juvenile sturgeon range wide.

During FY 02-22, a total of 1,262 nets hours were dedicated to sampling the Yellow River and 445 net hours were exerted to sampling the Escambia River

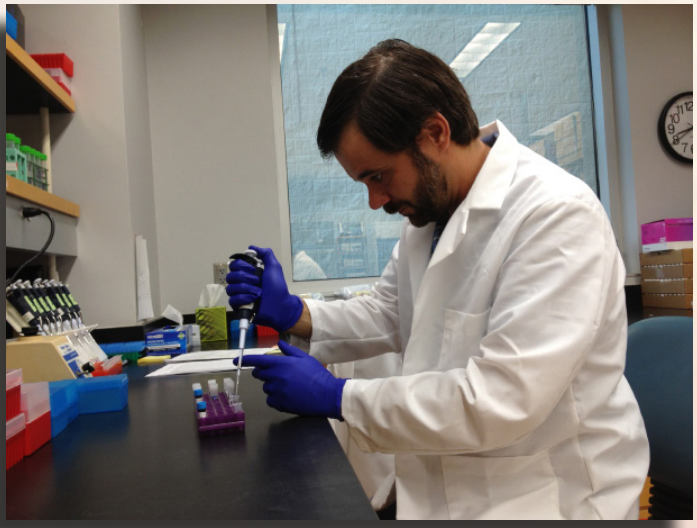
Thirty-six juvenile sturgeon were acoustically tagged from the Yellow River and Three fish were tagged from the Escambia River to monitor Juvenile habitat use from both the rivers and estuary habitats.

Genetic samples were collected to determine parentage analysis from 104 sturgeon from the Yellow river and 46 fish from the Escambia River.

Results from this research will aid in guiding future management and conservation of this federally Threatened species in order to recover decimated Gulf Sturgeon populations.

## Population genetics of freshwater fish for management and stock enhancement hatchery related projects

*Brandon Barthel, Bryan Winston, Mike Tringali*



The FWRI freshwater genetics program completed a number of projects that involved identifying the ancestry of new hatchery brood fish and post-release assessments of hatchery reared Florida Bass.

Genetic screening analyses were conducted on three sets of fish to confirm they were Florida Bass before they were added to the brood stock and allowed to spawn at the Florida Bass Conservation Center.

Two of 224 bass collected from Lake Apopka in 2021 were identified as hatchery releases.

None of the 15 bass collected from Lake Trafford in fall 2020 were hatchery releases.

Six of 81 bass collected from Lake Trafford in spring 2021 were hatchery releases.

None of the 7 bass collected during the Newnans Lake Crappie Exploitation study in November 2021 were identified as hatchery releases.

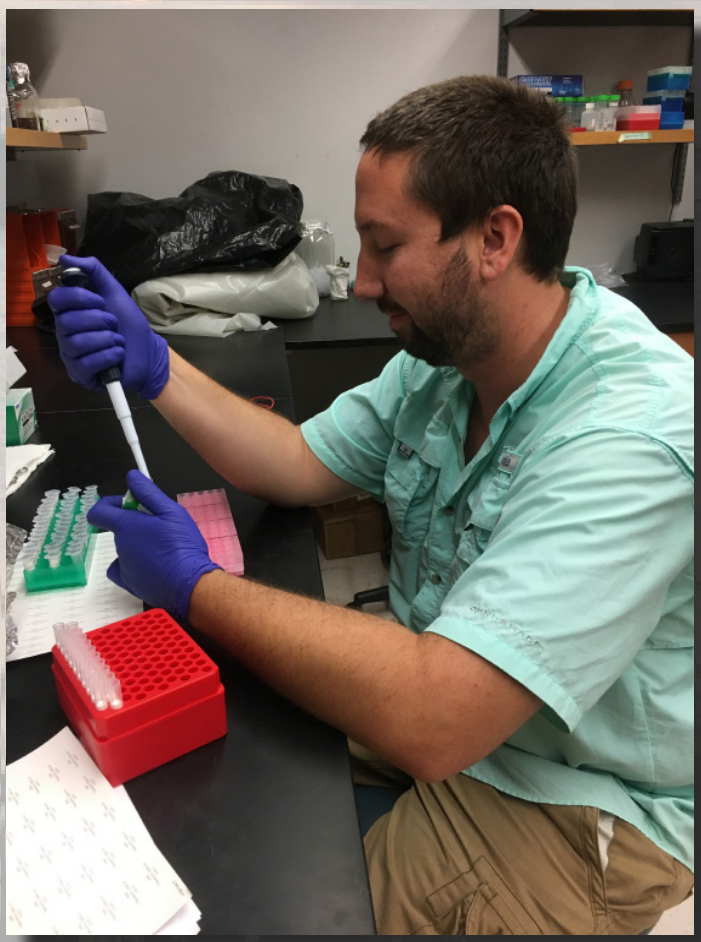
Two of the bass collected during community sampling on Newnans Lake in fall 2021 were identified as hatchery releases.

Four of 12 bass collected during targeted bass sampling on Newnans Lake in March 2022 had been released from the hatchery.

None of the 3 fish collected from Newnans lake during trophy bass sampling in January and February were hatchery releases.

Two of the 17 fish sampled at the University of Florida Bass Tournament held at Newnans Lake had been released from the hatchery.

Five juvenile bass exhibiting lordosis at the Florida Bass Conservation Center were determined to have been produced by 3 matings between a total of five hatchery brood fish.



## Implementing a statewide protocol for monitoring abnormalities in freshwater fish

*Daniel Nelson, Jason O'Connor, Shalyn Zappulla, Taylor Dluzniewski, Marcus Zokan, Josh Wilsey,Jennifer Moran, and Ted Lange*

Fish abnormalities have been sampled for two concurrent years.

Largemouth bass abnormalities were noted in spring of 2021 and spring of 2022.

Additionally, largemouth bass, black crappie, redear sunfish, and bluegill abnormalities were documented in fall 2021.

Fish abnormalities continued to be documented with the 'FLOPS' notations.

During spring 2022 targeted samples, 299 of 5,789 (5.2%) largemouth bass were displayed an abnormality at LTM systems.

Lesion 'L' was the most common abnormality coded and made up 126 of 299 documented abnormalities.

Community sampling revealed a lower abnormality rate for largemouth bass (2.8%; 86 of 3,090) and 'L' again was the most common abnormality coded (36 of 86).

Bluegill (N = 16,918), Redear sunfish (N = 1,433), and black crappie (N = 230) had documented lower abnormalities rates, 0.27%, 1.5% and 2.2% respectively, than largemouth bass.

Fin rot or erosion 'F' was the most common abnormality for both bluegill and redear sunfish, 37% and 43% of documented abnormalities.

The current hypothesis for largemouth bass is that spawning around spring samples is more stressful than the extended warmer water temperatures in fall samples, relating to a higher prevalence of abnormalities.

Abnormalities will continue to be noted on largemouth bass during both targeted and community samples, while other species will be optional.

Presentations on current data were given at the Florida Aquatic Plant Management Society meeting and Aquatic Plant Management Technical Assistance Group meeting.

## Estimating tournament release mortality for Largemouth Bass

*Ryan Howard, Brandon Thompson, Ted Lange, and Scott Bisping*

Evidence from a previous study supports that the holding pens provide unbiased estimates of delayed mortality (FWC, unpublished data).

Average total mortality of tournament caught largemouth bass was greatest in the summer months at 41% (N = 5 tournaments, range 26% to 74%) compared to 7% (N = 2 tournaments, range 3% to 11%) during the winter months.

Reference fish collected via electrofishing I experienced lower mortality than tournament caught fish with 6% dying during the summer, and zero during the winter.

On average, delayed mortality contributed 86% of total mortality.

The majority of the delayed mortality (71%) occurred between days 3-7

Bass 10-19'' and bass greater than 20'' in total length experienced similar mortality rates, 38% and 32% respectively.

More data will be collected across a wider variety of waterbodies and clubs throughout the state, which will help to validate our initial findings as we proceed with tournament angler outreach and education.

*Backpack electrofishing was used to collect remaining individuals on the last holding day post-tournament. All fish were then categorized as expired or alive, measured, checked for a marking, then released.*

## Statewide mercury (Hg) investigations

*Ted Lange, Doug Richard, Rick Clark, and David Tyler (FL DEP)*

Most fish advisories in freshwater fish are due to Hg contamination but advisories exist for organochlorine pesticides (e.g. DDT, Dieldrin), Dioxins and PCBs.

Management partners use contaminant specific criteria for the protection of human health to issue fish consumption advisories (FLDOH) and to identify waters as impaired for designated use under the federal Clean Water Act (FLDEP) where fish consumption, recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife are maintained.

For Hg risk assessments, 727 fish were collected from 30 locations including 4 newly sampled fisheries and 26 where sampling was repeated (data were > 7 years old) or new species were collected.

Currently 446 locations have Hg advisories in both fresh and marine waters. Pesticides, dioxin, and arsenic each have one location under advisory in fresh water.

Long-term monitoring to assess spatial and temporal trends in Hg levels in fish included collections of Largemouth Bass from 17 established locations across the state.

Trends data indicate FL is higher in Hg and unchanged since 2000.

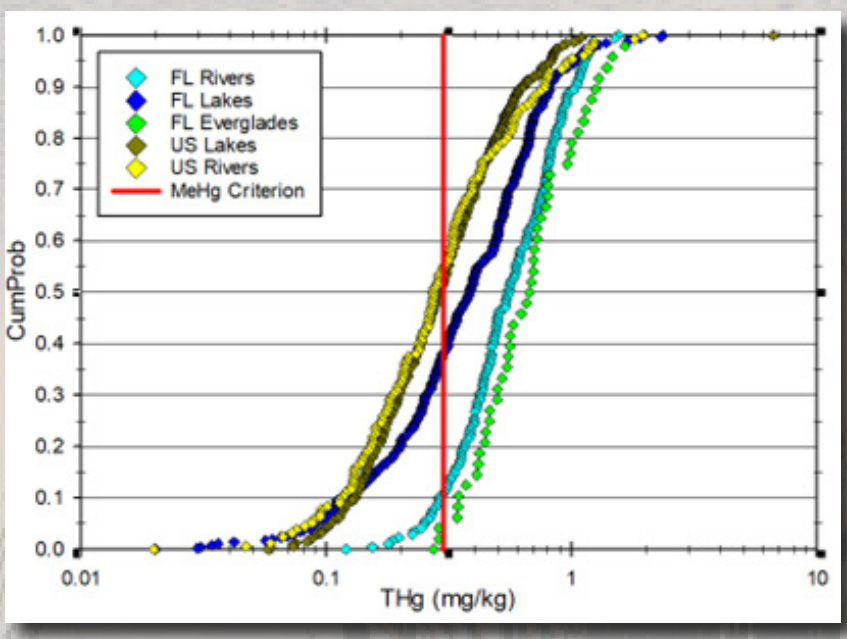
From samples collected in 2008, Lake Apopka is currently listed as impaired for designated use due to fish consumption advisories from pesticides for Black Crappie, Blue Tilapia, Bluegill, Brown Bullhead and Largemouth Bass.

During the fall of 2021, Lakes Apopka and Beauclair were sampled to update existing data for legacy pesticides in sport fish. Largemouth Bass and 9 other species were tested for 27 compounds in individual fish fillets.

For 108 fish tested, Hg was detected in all fish while two breakdown compounds from DDT, 4,4”-DDD and 4,4”DDE, were detected in 7 and 68 fish, respectively.

Fewer pesticides were detected in fish tissue and lower concentrations were found for those that were detected.

FLDOH is reviewing the updated results and fewer advisories for pesticides are anticipated.




*In US Lakes and Rivers, about 50% of mean Hg in Largemouth bass > the US EPA MeHg Criterion for protection of human health; 60% of FL Lakes and 90% of FL Rivers exceed the criterion and nearly 100% of Everglades exceed the criterion.*

## Long-term monitoring of lakes – statewide summary

*Kim Bonvechio*


Standardized fish community electrofishing samples were collected from 29 waterbodies in late summer and fall (August to December 2021).

Inverse Simpson diversity index varied from 1.31 to 7.41 and averaged 4.06 for all systems combined.

A total of 69 identified species of freshwater and marine taxa were collected during community sampling.

Bluegill, Eastern Mosquitofish, and Threadfin Shad were the most abundant numerically, whereas Florida Gar, Bowfin, and Largemouth Bass dominated the catch by weight.

Targeted sampling for Largemouth Bass were collected during spring 2022 on 29 waterbodies.

Largemouth Bass electrofishing catch rates were variable and averaged (± 1 SE) between 0.03 ± 0.01 fish/min at Newnans Lake to 1.85 ± 0.17 fish/min at Lake Harris.

Largemouth Bass age and growth information was collected on lakes Apopka and Kissimmee.

Black Crappie were collected with a standard otter trawl at seven lakes from September to December 2021. Mean catch rate (+ 1 SE) ranged from 3.20 ± 0.61 fish/min at Lake Griffin to 9.18 ± 1.40 fish/min at Lake Harris.

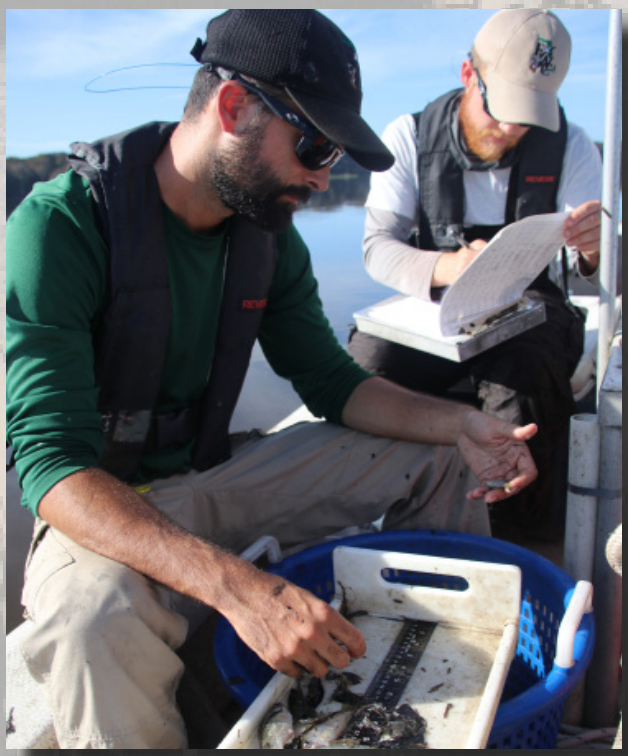
A subsample of Black Crappie was collected for age and growth (N=794). Overall age ranged from 0 to 8 yrs.

Roving creel surveys were conducted on 17 waterbodies during 2021-22. All surveys were conducted during the “peak” sportfishing season(s) for each system.

Mean species directed effort (number of angler-hours/hectare/100 days) ± 1 SE was greatest for Largemouth Bass and Black Crappie (2.81 ± 0.63 and 2.26 ± 0.85, respectively), followed by sunfishes Lepomis spp. (0.83 ± 0.28) and Ictalurid catfishes (0.17 ± 0.09).

Mean catch and catch rate ± 1 SE for Largemouth Bass were estimated as 1.66 ± 0.40 fish/ha/100 d and 0.55 ± 0.06 fish/h, but harvest and harvest rate for Largemouth Bass were approximately 1/10th of those values.

Bluegill, Florida Gar, Largemouth Bass, and Redear Sunfish were the most ubiquitous species; being collected in every lake sampled



## Long-term monitoring of rivers - statewide summary

*Eric Nagid*

Fish community samples were collected by standard electrofishing protocols from eight rivers between the fall of 2021 and spring of 2022 to assess and track trends in lotic fish communities.

Diversity as represented by the modified Simpson's diversity ranged from 1.3 in the upper St. Johns River to 14.9 in Holmes Creek.

Species richness ranged from 29 in the Middle St. Johns River to 51 in the Escambia River.

Visual fish health inspections were made on individual fish species for abnormalities with fin erosion, lesions, parasitic infections, and skeletal malformations. Abnormalities were only present in 0.6% of all fish examined across all rivers.

Habitat and chemical parameters were collected with each electrofishing transect. Chemical parameters included water temperature, conductivity and dissolved oxygen. Habitat parameters included the percent area covered of shore type, percent area covered of shore type canopy, percent area covered by instream habitat, the minimum, maximum and average depth encountered along the transect, water clarity (or turbidity), and substrate type.

## Long-term aquatic habitat monitoring of Florida lakes

*Kevin Johnson, Jennifer Moran, Kirk Dunn, Kyle Miller, Chelsea Buescher, and John Saxton*

Submersed vegetation and point-intercept mapping was completed March 2021 through November 2021 at 55 Florida lakes, 19 of which were LTM core lakes.

Mapping provided estimates of submersed vegetation percent area covered (PAC) and percent volume infested (PVI), and point-intercept vegetation speciation data including submersed vegetation species distribution, density, and a PAC (i.e., frequency of occurrence estimates); point-intercept data generated maps of individual vegetation species distribution and density with frequency of occurrence estimates; and species richness.

We teamed with the Florida Fish and Wildlife Conservation Commission's (FWC) Invasive Plant Management Section, Aquatic Habitat Restoration and Enhancement Subsection, Division of Freshwater Fisheries Management, Freshwater Fisheries Research Section, and several external partnering universities and agencies to map vegetation at 36 out of the 55 lakes that were considered important for management and research needs in 2021.

Vegetation maps and point-intercept data for the 19 LTM core lakes mapped in 2021 were stored on FWC's internal freshwater fisheries LTM program SharePoint website.

We have begun to reassess the list of lakes that we map for a given mapping season. This reassessment process has and will include for future years, rotating the mapping of certain lakes, selection of lakes for mapping in particular mapping season that are most important for management and research needs, and the inclusion of some lakes within a mapping season that have never been mapped before to create a baseline of habitat conditions. This process will include creating the upcoming season's mapping lake list further in advance to allow for a more rigorous assessment and prioritization of the lake list, starting at the section leader level.

# Harris Chain of Lakes management report

*Andrew Marbury, Brandon Thompson, KristieRae Ellis, and Logan Masterson*

Extensive monitoring occurs at the Harris Chain of Lakes (HCOL) as it is one of the premier freshwater fisheries in Florida and numerous research studies and evaluations utilize this data.

In general, most lakes have shown a trend of improved water quality, water clarity, and expansion of SAV; resulting in an improved bass fishery but a declining crappie fishery.

Bass effort and angler catch rates have increased on nearly all lakes and the number of exempted tournaments has shown an increasing trend over the past 5 years (359 tournament days this year).

PAC increased at all lakes except Lake Dora (declined from 22 to 12%) and Lake Harris (declined from 16 to 10 %). The SAV at lakes Dora, Beauclair, and Griffin is primarily natives whereas hydrilla is the primary SAV at Apopka and Harris.

As the population of bass has increased with expanding vegetation, there has been a noticeable decrease in bass relative weights at all lakes.

For the first time in over 50 years, Lake Apopka has considerable levels of SAV (i.e., hydrilla), with over 11,000 acres estimated in early 2022. Angling effort at Apopka increased by 44% this year (from camera effort data) and bass catch rates (electrofishing and creel) were record highs this year.

Spring electrofishing catch rates of age-1 bass in Lake Harris have shown a decreasing trend since 2016. However, age-1 bass have notoriously low/variable electrofishing vulnerability to begin with and the adult population has increased over the same period. In fact, angler effort and catch rates this year were the highest recorded in 30 years at Lake Harris. Black Crappie effort also was the highest recorded since 2008, and catch was a record for Lake Harris. Trawl surveys also indicated a great year for crappie at Lake Harris.

At Lake Griffin, bass effort and catch rates declined in 2021-2022, potentially due to anglers leaving the fishery in favor of Lake Apopka. The crappie fishery continues to have a lower level of effort, but the harvest rate is relatively high (1.09 fish/hr) with a 10” minimum size limit. Trawl surveys recorded the second-highest catch of adult crappie since standardized sampling began.

Lakes Dora and Beauclair have the highest electrofishing catch rates of quality sized bass on the chain for the past several years and expanding SAV has corresponded with four consecutive years of high age1 catch rates. Two recent creel surveys show that Lakes Dora/Beauclair have a similar pattern to Griffin where bass has replaced crappie as the primary targeted species.

TrophyCatch submissions for season 8 (Oct 2020-Sept 2021- last full season) were the second-highest recorded, with notable increases coming from lakes Apopka and Griffin.

While additional exotic species have been encountered in recent years on the HCOL, numbers have not substantially increased after initially falling off in the 2010 cold kill.

## Lower St. Johns River long-term lake monitoring

*Earl Lundy, Jay Holder, and Susanna Harrison*

We conducted both community and single-species (Largemouth Bass) electrofishing surveys in all three LTM study lakes in FY 2021-2022. A Largemouth Bass survey was also conducted on Lake Harney. Community data were collected from October – December 2021, and Largemouth Bass data from February – March 2022. Creels were performed on lakes George and Monroe to determine angler preference, utilization, and harvest.

Community abundance indices and species composition for our LTM lakes were within historical ranges but were all on the lower end of historical data. Lake George and Lake Monroe community metrics were the lowest recorded in terms of numbers and biomass, and Lake Monroe biomass catch showed a significant decrease using Kendall's Tau analysis.

All three lakes' community samples were dominated numerically by Bluegill. Crescent Lake and Lake George biomass was dominated by Florida Gar, while Lake Monroe biomass was dominated by Largemouth Bass.

Abundance for Largemouth Bass populations in lakes Crescent, Monroe, and George were among the lowest recorded since monitoring began, likely due to continuing Hurricane Irma-induced vegetation loss. Kendall's Tau analysis indicates a strong decrease in catch rates for lakes George and Monroe. Four Largemouth Bass were collected on Lake Harney, with ten sites sampled.

The Lake George creel survey indicated total effort was greatly reduced over the previous year. Anglers still primarily target Largemouth Bass on Lake George. Black Crappie effort on Lake George showed a 56% increase over the previous year and success was the highest documented since 2008. Lake Monroe creel data indicated Black Crappie as the dominant sportfish.

Submersed vegetation was largely absent on all lakes, and emergent vegetation could at best be described as "sparse." This continues a trend first seen after Hurricane Irma impacted the state in 2017, and seems to be driving low catch rates on all lakes.

The percentage of standardized bass transects on Lake George with zero catch has continued to rise since 2018, and currently accounts for 41% of all sampled sites.

## Lower St. Johns River long-term monitoring

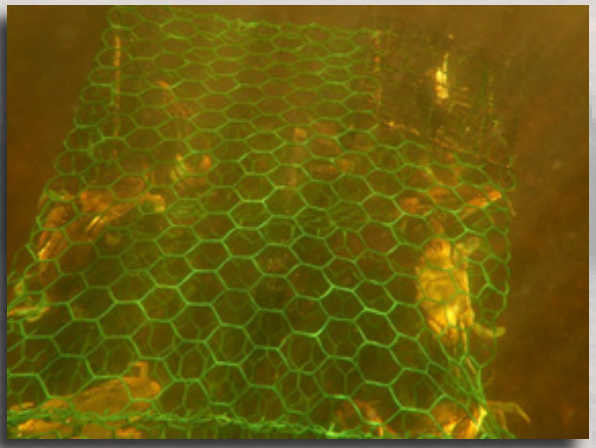
*Earl Lundy, Susanna Harrison, and Jay Holder*

We conducted community electrofishing surveys on the St. Johns River from December 15, 2020 – January 22, 2021.

All metrics for the St. Johns River were within historical ranges, albeit on the low end of the range. Only biomass collections on S4 showed an increase over the previous year.

After 9 years of data collection, a strong positive correlation was noted between Secchi depth and two indices—total biomass and average biomass (g/Km).

*A Channel Catfish weighing more than 10 lbs. that was collected during river sampling.*



*A crab trap in Juniper run filled with blue crabs. In previous years, this crab trap would have been in a dense bed of eelgrass.*

**Juniper Springs Run**

We conducted community electrofishing surveys on Juniper Springs Run from May 4 through May 5, 2022.

Bluegill were the most numerically dominant species on Juniper Springs Run, while Largemouth Bass dominated biomass. Chain Pickerel and Florida Gar were absent.

No submersed vegetation other than scant filamentous algae was present in Juniper Springs Run. Limited emergent vegetation was observed.

# Upper St. Johns River fishery resource assessment

*Arthur Bernhardt and Reid Hyle*

Electrofishing surveys of fish communities were conducted on the Upper St. Johns River and Lakes, and Blue Cypress Lake as part of the long-term monitoring program in Fall/ Winter 2021.

Largemouth Bass populations were also sampled on Lake Washington, Lake Poinsett, and Blue Cypress Lake during Spring 2022.

Eastern Mosquitofish were numerically dominant in the St. Johns River samples with a CPUE of 74/minute.

Florida Gar was the dominant biomass in the river samples at 301 grams/minute in electrofishing samples.

Community summary statistics and diversity indices for 2021 were consistent with long-term average values.

Fish communities appear stable and most shifts in CPUEs among common species were likely attributable to interannual differences in water level during sampling.

Exotic species such as Mayan Cichlid continue to be found in more waters of the region with more recent reports and photos of others, such as African Jewelfish and Black Pacu.

FWC collaborated with SJRWMD in an experimental haul seine fishery at Lake Winder.

Commercial fishers pulled a seine three times in early summer 2022 with and average of 50 acres covered per haul.

FWC subsampled the catch to measure the size of fish captured and estimate bycatch of native species.

58% of the haul seine catch was *Oreochromis* and 22% was *Pterygoplichthys.*

An estimated 23,204 lbs of tilapia was landed and sold at $0.58 per pound.

An estimated 2,835 lbs of gamefish were released alive with condition of released Largemouth Bass and Bluegill observed to be excellent since these species rise to the top of the pocket and are quickly released early in the process of fishing up.

SJRWMD estimated that the combined removal of the dominant exotic species *Oreochromis, Pterygoplichthys*, and *Hoplosternum* resulted in a removal of 144 lbs of phosphorus from the system.


# Long-term monitoring of selected rivers and streams in Northwest Florida

*Chelsea Myles-McBurney*

Monitoring efforts are important in freshwater ecosystems due to their sensitivity to anthropogenic change, invasive species, climate change, sedimentation, and other environmental factors (Reid et al. 2019).

Escambia River, Yellow River, and Holmes Creek were sampled to assess their sport fish populations and species compositions during FY 21-22.

Sampling of large rivers were conducted in the fall for the Escambia and Yellow River, and Holmes Creek was sampled in the spring.

All sport fish collected were sorted by species, individually measured (mm, TL), and weighed (g). Non-sport fish were sorted by species and individually measured (mm, TL) and weighed (g), or sorted by species, counted, and batch weighed (usually by cm size).

Thirty-three sites were sampled on the Escambia River between 22 October 2021 and 4 November 2021.

Sampling on the Escambia resulted in the collection of 50 species of fish, and 1,829 individuals. Percent composition was numerically dominated by Cyprinid fishes (>36% of total catch) and sport fish accounted for 36% of total fish caught.

Thirty-one sites were sampled on the Yellow River between 12 October 2021 and 19 October 2021.

Sampling on the Yellow River resulted in the collection of 49 species of fish and 1,374 individuals.
Percent composition was numerically dominated by Cyprinid fishes (>35% of total catch) and sport fish accounted for 36% of total fish caught.

Twenty-five sites were sampled on Holmes Creek between 18 April 2022 and 21 April 2022.

Sampling on Holmes Creek resulted in the collection of 42 species of fish, and 714 individuals. Percent composition was numerically dominated by sport fish (>48% of total catch) and percent composition for Cyprinid fishes was significantly lower than other rivers sampled (<16% of total catch).

# Fishery resource assessment of water management impoundments of the upper St. Johns River basin

*Arthur Bernhardt and Reid Hyle*

The impoundments (Farm 13/Stick Marsh, Lake Garcia, Kenansville Lake, Fellsmere Reservoir) of the Upper St. Johns River Project are unique water bodies and widely considered among the best fisheries in the area.

We collected 1,783 Largemouth Bass in 90 transects using boat-mounted electrofishing.

Peak season access creels were executed on Garcia and Stick Marsh while an annual access creel continues on Fellsmere.

Largemouth Bass e-fish CPUE in 2022 is consistent across years (2007-2022) on Garcia, Stickmarsh, and Kenansville above 1 fish/min . Fellsmere CPUE for LMB was 1.20 fish/min, similar to the other impoundments.

Juvenile bass (< 21cm) were abundant in all lakes, indicating successful recruitment into the fishery.

Lake Garcia was very clear with abundant SAV. This is a continuation of the last two year's vegetation coverage and clarity. Kenansville Lake SAV (mostly Hydrilla) has recovered from Hurricane Irma and covers most of the lake. Farm 13/ Stick Marsh remains turbid and SAV growth stagnant. Farm 13/ Stick Marsh could benefit greatly from wind breaks. Bulrush planting on the internal berms is planned in the coming year. Fellsmere WMA is a heavily vegetated marsh and will require maintenance vegetation control. In the past year, much of the cattail has been removed and has been replaced by SAV.

Relative weights have declined at Farm 13/Stick Marsh, Kenansville Lake, Lake Garcia, and Fellsmere for the past few years.

Largemouth Bass Angling Success was high on all creeled waters: Lake Garcia, Farm 13/Stick Marsh, and Fellsmere (1.10 fish/hr ,1.31 fish/hr, and 1.32 fish/hr).

Largemouth Bass angling effort on Fellsmere was identical between years with the exception of the first four months after the boat ramp opened in year-1. Peak season effort was ~20,000 angler hours in a 28 day period in both years.

The angler CPUE of Largemouth bass >24" TL increased from 0.004 fish/hr in year 1 to 0.108 fish/hr in year 2 in Fellsmere Reservoir. We think this increase is a possible combination of more large fish being available to the fishery as the fish population matures and a greater rate of anglers reporting their larger fish to the creel clerk. We estimated a total angler catch of ~1,200 bass over 24" in year-2.


*Fellsmere angler effort for Largemouth Bass*

*Fellsmere Water Management Area is opened to the public in August 2020. Creel survey data shows excellent catch rates. Prior FWC management actions on FWMA have led to an incredible fishery. Continued monitoring of angler-use and success is recommended*

## Investigating impacts to the Lake Apopka fishery from the expansion of hydrilla

*Brandon Thompson, Scott Bisping, and Andrew Marbury*


Lake Apopka was once named Florida's most polluted lake and has prompted large-scale restoration projects over the past four decades. Although there have been improvements to the water quality and habitat, total vegetative coverage prior to 2019 has been less than 2%—resulting in low densities of bass and very few bass anglers.

Beginning in 2019, hydrilla began to rapidly expand and by the summer of 2021, hydrilla coverage was estimated at approximately 11,000 acres.

With the first substantial coverage (>5%) of SAV at Lake Apopka in over 50 years, managers were interested in documenting how multiple years of high SAV coverage would impact the fish community, bass recruitment, adult bass abundance, and angling effort.

Long term monitoring data from fall electrofishing, spring electrofishing, summer plant mapping is being used to track trends for fish and plants species.

An access camera creel has documented total angler effort since 2012 and this past season a roving creel survey was also conducted to capture supplementary angling information along with asking anglers a specific question regarding hydrilla management.

Researchers initiated a high reward tagging study in combination with the catch estimated from the creel to estimate the total abundance of bass for Lake Apopka.

From 2021-22 electrofishing data, there were marked increases in the catch rates of bluegill and age-1 bass.

Creel survey results showed a second consecutive year on increased angler catch rates and an estimated 96% of anglers were targeting bass.

Additionally, interviewed anglers indicated they were not supportive of managing hydrilla with the goal of having the lowest amount possible (i.e., lowest feasible level).

The creel survey documented that 95% of recreational vessels using Lake Apopka were either fishing or duck hunting with only 5% pleasure boating.

We estimated that the total abundance of adult bass (>10") was 102,598 (3.33 bass/acre) with 33,779 (1.10 bass/acre) over 16".

We plan to conduct an additional population estimate in 2027-28 assuming we have 3-5 years of substantial (PAC >15%) hydrilla coverage to assess the magnitude of change to the bass abundance.

# Assessing the effects of the East Lake Tohopekaliga habitat restoration on the shallow water fish community

*Chris Anderson, Ted Lange, Doug Richard, Travis Tuten, Jason O'Connor, Jen Moran, Arthur Bernhardt, Steve Beck, Brad Fontaine, John Saxton, Kirk Dunn, Kyle Miller, Chelsea Buescher, Kyle Olivencia, Sam Burke, Rachel Liebman, Jamie Casteel, Steve Hooley, Ryan Howard, Tim Coughlin, and Marty Mann*


Water level stabilization and excessive growth of invasive aquatic plants have all contributed to the accelerated rate of lake succession in East Lake Tohopekaliga (ELT).

A lake drawdown began on October 1, 2019 when water levels were lowered from 56.41 ft (NGVD) to 52.31 ft (NGVD) on May 24, 2020 (> 1,133 ha of lakebed exposed).

Littoral habitat restoration was conducted by AHRES in spring/summer 2020 by controlling/removing monocultures of invasive emergent vegetation via herbicide treatment and prescribed burning as well as the mechanical removal of woody vegetation, tussocks, and associated organic material from the littoral zone

Our study will evaluate impacts to shallow water fish communities, site-specific water quality (e.g., diel dissolved oxygen regimes) and habitat structure/composition (e.g., aquatic vegetation density and depth of organic sediment) across a range of habitat restoration and enhancement actions (i.e., pre- vs post-treatment).

Mini-fyke nets and dissolved oxygen sondes were used to sample the fish community and DO regimes, respectively in September 2016, 2018, 2019 (i.e., pre-treatment), and 2020 and 2021 (i.e., post-treatment).

Qualitative habitat assesments of aquatic vegetation and sediment cores were also completed at each site.

A total of 21,438 fish, comprising 28 species (excludes Pterygoplichthys sp.) were captured using MFNs in 2021 (n = 87 of 90 MFNs fished successfully).

Compared to 2020, the total number of fish caught decreased by 10% (23,809 fish in 2020), but species richness remained the same (28 species).

Although significant differences in fish community composition were detected between some treatment areas, most test statisitics were close to 0, indicating that these differences are not ecologically significant.

## Emeralda Marsh Conservation Area DO studies

*Ted Lange, Brandon Thompson, Scott Bisping, Dan Kolterman*

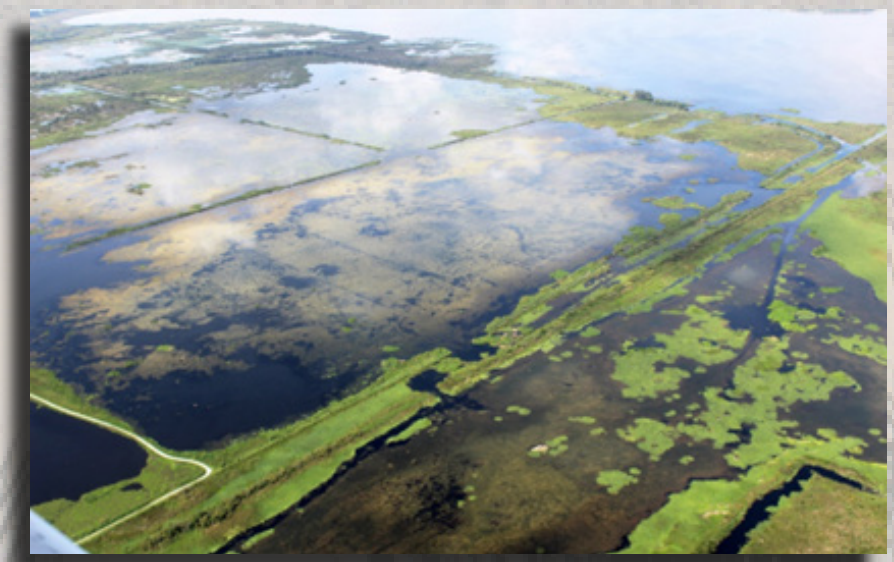
We monitored dissolved oxygen (DO) concentrations and other water quality (WQ) in a restored wetland where submerged aquatic vegetation (SAV) is dominated by aggressive growth of Hydrilla, Hydrilla verticillata. EMCA consists of historic wetlands, farmed for 50 years, and restored starting in 1994. Farms remained flooded until 2016 when connections to Lake Griffin, Yale Canal, and Haines creek were established in EMCA2, 3, and 4 but not EMCA 7. Connected marshes contribute to the Lake Griffin fishery during much of the year by providing habitat for feeding and spawning. Tagging studies have documented Griffin fish utilizing the marsh. Marshes support excellent duck hunting and bird watching opportunities.

Our main study area, EMCA3 is divided by interior levees with breaches into 3 cells with EMCA3-Q having the most connectivity to Lake Griffin, EMCA3-T less, and EMCA3-Z no connections to the lake except through the other cells.

WQ was monitored at permanent sites throughout the year and at sites randomly selected based on acoustic (BioBase) and drone video mapping to include low PVI (<80%, called open water “holes”) and high PVI (>80%) sites.

Hypoxic conditions (DO<2 mg/l) dominated year-round in EMCA7, during the months of July-August in EMCA3, and never in Lake Griffin. Duration of hypoxic conditions was longest in EMCA3-Z which had the highest summer average PVI of 78% across the cell. Hypoxic conditions started in June in EMCA3-Z and in July in EMCA3-T and EMCA3-Q. Increases in levee breaches and open water areas resulted in shorter periods of hypoxia in EMCA3 cells.

Data support the hypothesis that increased size of open water areas result in improved DO concentrations that better support aquatic life. Open water promotes wind and wave action to oxygenate the water column and supports phytoplankton photosynthesis.



Diel DO cycles indicate self-shading by hydrilla depletes DO concentrations at depth through respiration and creating of a physical barrier to DO migration.

Continued monitoring is planned to further evaluate open water size requirements to maintain DO concentrations that could better support a sport fishery through the summer.

An AHRES project to increase lake connections with EMCA3-Z has been approved.

# Assessing anthropogenic impacts on submerged aquatic vegetation (SAV) in central Florida springs

*Susanna Harrison, Jay Holder, Earl Lundy*

In recent years, submerged aquatic vegetation (SAV) has substantially declined in many of the spring headwaters and runs of the middle St. Johns River Basin.

SAV is a critical component in the SJR basin ecosystem, functioning as habitat, nursery grounds, and cover for sportfish and other aquatic taxa.

Because Alexander and Juniper Springs are home to the last large expanses of American eelgrass remaining in the middle SJR, the protection of these SAV beds may be crucial to any future aquatic habitat restoration efforts in the area.

In January 2022, we installed game cameras around the swim areas at Alexander and Juniper Springs to monitor recreational use.

Beginning in February 2022, we conducted monthly visual/photographic SAV surveys in the headsprings using underwater cameras.

To date, over 7000 game camera images, 198 still vegetation photos, and 6 videos have been captured using the methods described above.

Our goal is to produce a quantitative estimate of spring usage while simultaneously quantifying changes in the health and coverage of SAV in springs, allowing us to identify any potential correlations between human use and SAV degradation.

By examining the impacts of human springs use on SAV health, we can provide the USFS and other management partners with valuable data to inform and support recreational management decisions.

# Investigating the survival and behavior of Grass Carp in large Florida lakes

*Logan Masterson, Brandon Thompson, Andrew Marbury and Scott Bisping*

Hydrilla control has become more challenging with a limited available budget along with stakeholder contention surrounding herbicide treatments.

This has encouraged further discussion regarding the utilization of triploid Grass Carp as a cost-effective biological control to potentially be used for integrated management at large open waterbodies.

To provide more information about Grass Carp stocked in large open systems, we designed a multi-year radio telemetry study that would assess their survival and behavior.

Objectives included investigating survival rates for stocked Grass Carp, how they dispersed through the available habitat after stocking and the rate that they emigrated from the stocked lake.

In the first year of the study, we surgically implanted radio transmitters in 40 juvenile Grass Carp at Lake Yale and at Lake Apopka, we stocked 20 juvenile and 30 adult Grass Carp.

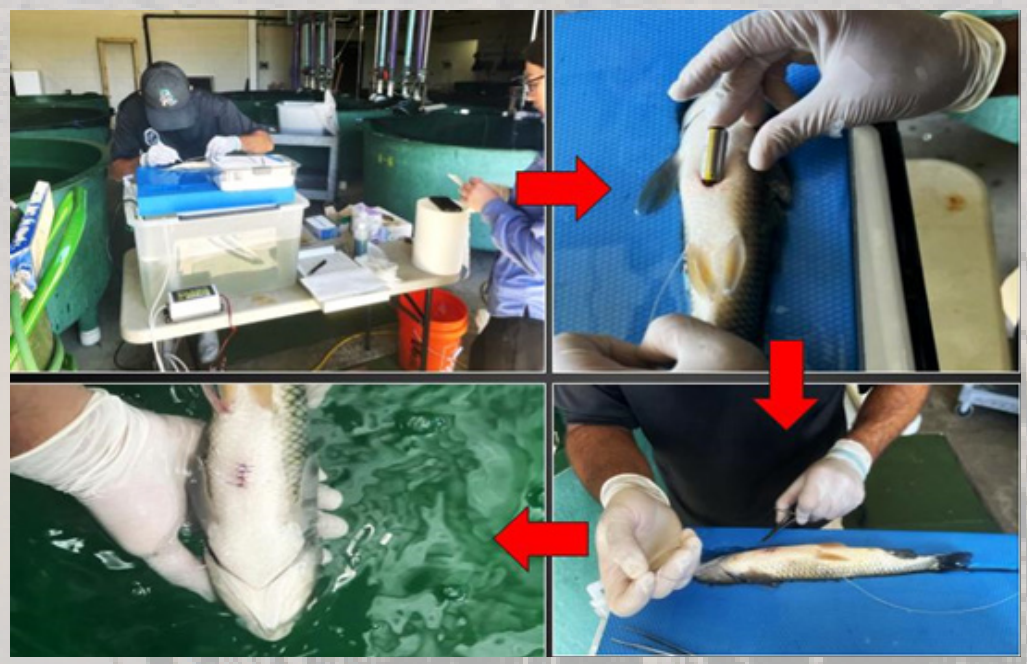
Biologists manually tracked both lakes weekly to locate tagged fish and recorded their location, depth, vegetation, and if the tag was active.

Tracking locations from the first three weeks showed Grass Carp quickly dispersing all around both lakes and distributed throughout the primary hydrilla infestations.

Passive datalogging receivers were positioned at water control structures to assess emigration from Lake Apopka and we documented two adult grass carp move through the structure during a period of high-water flow.

Although initial stocking mortality of tagged fish was low (0% in the first two weeks), many juvenile tagged Grass Carp began going inactive within the first two months which were likely influenced by the timing of tagging and tag size relative to their body cavity.

In the second year of the study, we plan to optimize the timing of tagging and tag size prior to tagging/stocking both juvenile and adult Grass Carp at Lake Apopka and Lake Parker.



# Investigating fish attractor materials and locations in CMI lakes

*Matthew G. Wegener, Calvin L. Beech, Kimberly I. Bonvechio, Colin Shea*


Commission Managed Impoundments (CMI's) are naturally low in productivity but receive immense fishing effort.

Previous fertilization programs are no longer feasible due to environmental concerns.

Managers are looking for alternative management strategies on the CMI's.

Addition of firm substrate is a strategy for improving productivity without fertilizing.

Firm substrate increases habitat for spawning and macroinvertebrates.

More research on firm substrate in the form of gravel beds needs to be done.

No research has been done on where to place gravel beds in a lake.

Gravel beds added in 2019.

Mossback fish attractors added in 2021.

Total catch for all species combined was significantly higher on gravel sites than reference sites.

Total catch for all species combined was significantly higher on gravel/Mossback sites than reference sites.

Total catch for all species combined between gravel sites and gravel/Mossback sites was not significantly different.

Although not significant, catch rate for all species combined was greater on onshore gravel sites than offshore.

Although not significant, catch rate for all species combined was greater on onshore gravel/Mossback than offshore.

Spawning beds of Largemouth Bass, Bluegill and Redear Sunfish observed on gravel sites and gravel/Mossback sites.

Final phase of this project will compare catch from Mossback only sites to gravel/Mossback sites.

# Assessing movement and diet overlap of Bullseye Snakehead, Largemouth Bass, and Peacock Bass in Lake Ida

*Brian Hutchinson, Kelly Gestring, Barron Moody, Max Inchausti, Brad Fontaine,Dan Nelson, Kristin Rogers, and Nick Trippel*

25 each of Bullseye Snakeheads, Butterfly Peacock Bass, and Largemouth bass were tagged with radio tags and external dart tags on Lake Ida in spring of 2021Fish are tracked manually once a month and passively with three stationary receiversBatteries should last approximately 600 days so fish will continue to be tagged until tags die

Anglers have caught and released 14 of the 25 tagged Largemouth Bass, 12 of the 25 tagged Butterfly Peacock Bass, and two of the Bullseye Snakeheads. All of these fish were released.

All three species have been sampled monthly using electrofishing to collect diet samples with a gastric lavage.

A total of 477 Largemouth Bass, 529 Butterfly Peacock Bass, and 288 Bullseye Snakehead were collected and lavaged.

By weight, fish comprised the highest percentage of diets for all three species although it was much higher for Largemouth Bass (87%), Butterfly Peacock Bass (99%), than for Bullseye Snakeheads (32%).Largemouth Bass commonly preyed upon fish such as juvenile Largemouth Bass, Brook Silversides, African Jewelfish, grass shrimp, and crayfish.

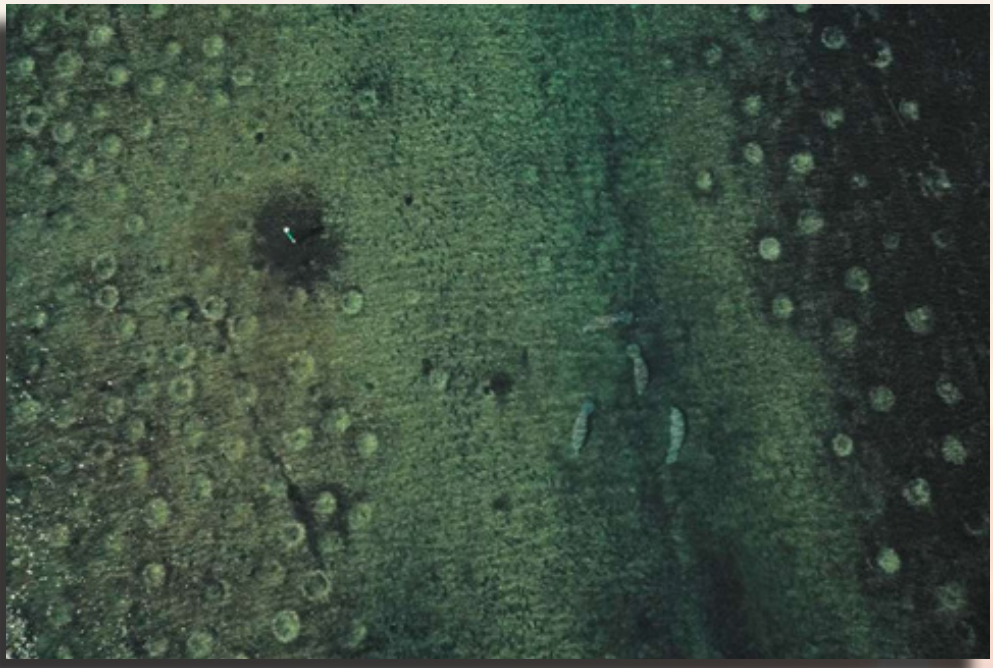
Butterfly Peacock Bass commonly preyed upon juvenile Largemouth and Butterfly Peacock Bass, and grass shrimp

Bullseye Snakeheads had a more diverse diet with prey items consisting of Cane Toad tadpoles, a two-toed amphiuma, crayfish, grass shrimp, swamp darters, and mosquito fish.

More detailed telemetry and diet analysis will be completed in the future.

# Seasonal movements and residence time of Sailfin Catfish and Oreochromis Tilapia in Silver Glen Springs and Salt Springs, FL

*Nick Trippel, Andrew Marbury, Jay Holder, Earl Lundy, Trevor Knight, Clay Coates, John Galvez - USFWS*



In February 2021 acoustic tags were placed in 15 Blue Tilapia and 15 Sailfin Catfish each at Salt Springs and Silver Glen Springs for a total of 60 tagged fish.

Fish were collected using boat electrofishing, using large mesh gill nets as seines, and by snorkelers hand-grabbing Sailfin Catfish.

All tagged fish appeared uninjured and were able to successfully swim away

Sailfin Catfish had a low rate of tag retention regardless of tagging technique

Bowfisherman harvested five (14%) tilapia and ten (33%) Sailfin Catfish

Two shed acoustic tags were recovered by snorkelers and five acoustic tags were turned in by bowfisherman. Those tags were placed back out again in more tilapia in April 2021 as Sailfin Catfish could not be tagged effectively.

Because tags were deployed in spring of 2021, movement data is still currently being collected and will be analyzed once batteries have died on all active tags.

Tags should last through September or October of 2022

Data will help determine if future removal projects may be feasible and best timing for these projects.


FLORIDA FISH AND WILDLIFE
CONSERVATION COMMISSION