



**Spring 2021**

**Introduction:**

The past five years, JadEco, LLC has been contacted to collect data on the fishery for Willow Lake located in Freeport, IL. This data collection is used to determine if the fishery is improving over time. DC Electroshocking was conducted throughout the lake on May 8, 2021 during the day. Air temperature was 59°F and water temperature was 63.7°F. Water clarity was 14 inches. Fish population data was collected for a total of 50 minutes utilizing DC electrofishing equipment. A total of 559 fish were collected with 8 species being represented. Data analysis consisted of catch per unit effort per species and total catch per unit effort. This provides information on the fish population density, and potential trends in the fishery. PSD's (proportional stock density) were also calculated on important game species to assist with understanding the size structure within the lake. The last metric analyzed was the relative weight (Wr). This metric provides information on length to weight relationships to better understand if your game fish are relatively fat, or relatively thin and potential changes in the predator / prey relationships and available forage. The data was then compared to the previous collections in 2016 and 2019.

**Summary of Fisheries Data:**

A total of 559 fish were collected during the 2021 survey. There were 8 different species represented with only 3 of them representing undesirable species (carp, buffalo, and green sunfish). Game fish present consisted of largemouth bass, bluegill, black crappie, channel catfish, and even one white bass. Common carp were well represented in the survey with 55 fish collected. The largemouth bass population continues to do well since the 2016 survey with good distribution among year classes, with the exception of the bass in the 8" to 11" range. Younger year classes were observed and should recruit into the missing size class in the next 2 years. Bluegill continue to be represented by a smaller, possibly stunted, population.

Black crappie were collected again in 2021, with a broader range of sizes ranging from 2.4" to 11.1" in length. Their relative weights also improved since 2019.

The collection of carp was lower in 2021 than 2019 with carp representing 9.8% of the total collection at a rate of 1.1 fish per minute. Carp recruitment is occurring with one carp being recorded at 4.6" in length. The range for carp was 4.6" to 22.6" with an average size of 19". Even though the CPUE was lower, this catch rate is substantially higher than the recommended goals at .25 fish per minute. Along with the carp, we also collected two big buffalo between 34" and 35" in length.

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The 2021 survey provided the highest CPUE for largemouth bass of the past three surveys at 1.3 fish per minute. This was the first time since 2006 that bass were within our objective goal range of 1-2.5 fish per minute. This indicates the bass fishery is improving, which will also benefit the rest of the fishery.

When comparing the condition of the bass, they were consistent with average relative weights at 100 in 2016 and 102 in 2006 and dropped to 95 in 2019, but it has increased to 98 in 2021.

### **Largemouth Bass:**

When evaluating the fish population, we utilize a metric known as proportional stock density or "PSD". This metric analyzes the size structure within the population. The proportion of fish greater than quality size (12") divided by the number of fish greater than stock size (8") provides the PSD value. A desired PSD range for Largemouth bass is a value from 40 to 70. The PSD for largemouth bass collected at Willow Lake is above our objective at 80. Along with this, the RSD14 value (the proportion of fish greater than 14 inches divided by the number of fish greater than 8 inches) was at 48. A desired RSD14 range for Largemouth bass is 10 to 20. The larger bass are well represented in the survey, and we're missing the bass between 8" and 12", causing the higher PSD / RSD values.

We collected largemouth bass from 2.4" to 19.9" during the survey, with an average size of 12". The average relative weights ( $W_r$ ) for largemouth bass fell within the objective range at 98 (Range 90-110).

The CPUE is within our objective range for the first time since 2006, relative weights are good, and the population distribution is good, with the exception of the missing 8" to 12" fish. These all indicate the bass fishery is improving.

### **Bluegill:**

The CPUE for bluegill was at 7.56 fish per minute (up from 4.47 fish per minute in 2019). This falls well above our objective range of 2 to 4.5 fish per minute. Bluegills ranging from 1.8" to 6.3" were collected with the average size at 4". Less than 1% of the bluegill collected were over 6" and there were no bluegill collected over 7" in length.

The PSD for bluegill at Willow Lake was at 1, which is lower than the objective between 20 and 60. The RSD7 value for bluegill (the number of fish larger than 7" divided by the number of fish 3" and larger) is at 0, since no bluegill over 7" were collected. The desirable range for RSD7 would be between 5 to 20. The majority of bluegill collected were in the 4.1"-4.9" range (43%). The average relative weight

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for bluegill was at 93 (down from 102 in 2019). The Wr at 93 is within our objective range, but on the lower end of the spectrum.

**Black Crappie:**

We collected 13 black crappie in 2021, and the numbers seem to be more consistent now, compared to the very high collection of 112 crappie in 2016. Crappie collected in 2021 ranged from 2.4" to over 11" with an average at 4.9". The small size collected in 2021 indicate that another successful spawn has occurred at Willow Lake. Crappie are known to over populate and stunt in small reservoirs and ponds. Close monitoring of the crappie fishery should continue. The catch per unit effort for crappie was at 0.26 fish per minute and was within our objective range.

The crappie collected in 2021 had much better relative weights, and were within our objective range at 92. The crappie collected in 2019 had relative weights averaging at 80 and under our objective.

The size breakdown of the crappie collected indicated several year classes of successful spawn and recruitment. While the upcoming crappie fishing at Willow Lake should be very good, it is important to control the crappie fishery through harvest. The harvesting of crappie should continue to be allowed.

**Other Species:**

Other species collected were channel catfish (11), green sunfish (34), buffalo (2), common carp (55), and White bass (1). The common carp comprise nearly 9.8% of the total collection at Willow Lake with a catch per unit effort of 1.11 fish per minute. This is much higher than the objective goals of less than 0.25 fish per minute. Carp are a non-native invasive species for Willow Lake, and by all indications, have been an issue for quite some time (collection rates for 2006 and 2016 remained consistent, but were much higher in 2019). The concern for carp and your fishery is that they root up native vegetation, create turbidity with suspended solids in the water due to the bottom feeding behavior of the species, they predate on game fish nests, and can limit reproduction of important game species, and they compete for food and space with preferred game species. These issues, along with the catch rate observed, indicate the need for Willow Lake to perform carp removal efforts. This high carp density may be impacting largemouth spawning. Carp collected were between 4.6" and 22.6" with an average size at 18.6". The three buffalo captured were between 28.1" and 31.9" with an average length of 19". The small fish collected, and lower average size are a concern that the carp fishery is going to increase.

An unexpected catch of one 11.1" white bass was observed. This is the first time this species has been observed in any reports since 2006. At this time, I do not believe they pose a threat to the fishery.

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### **Recommendations:**

The following is a list of recommendations on how to improve the fishery at Willow Lake. The recommendations are in a priority order.

### **Creel Limits**

- Continue to maintain creel limits to allow unlimited harvest of crappie at any size
- ~~REMOVE bluegill from this limit. Bluegill should not be catch and keep.~~
- Allow bluegill harvest at 15 per day with only 5 of them over 8" allowed.
- Largemouth bass should be catch and release only until the population indicates an increase in size.
- Carp should be catch and remove, never release.

### **Carp Removal**

Carp removal (and other rough fish like buffalo) should be a big effort by the community annually; either through angling, bowfishing, tournaments, etc, or removal by electrofishing or commercial netting. Willow Lake has a limited biomass of fish it can carry. This is called 'carrying capacity' and currently a large portion of the biomass is in common carp. By removing the carp, you improve spawning and recruitment success of your game fish, improve water clarity, and improve fish habitat. This should be a priority for Willow Lake until electrofishing surveys indicate a catch rate closer to 0.25 fish per minute. The 2021 survey was over 4 times above this objective. And recruitment has been observed.

### **Black Crappie**

As previously said in 2019, even with the lower collection of crappie, I feel the black crappie fishery needs to be controlled through angling pressure. Due to the low relative weight of the fish collected, I anticipate biomass and competition to be high. The high biomass of crappie create competition for limited food and space by other desired game species as well. By removing the crappie, you will observe larger crappie being caught while fishing as well as improvements in recruitment and growth by other important game species like bass and bluegill. If angling pressure isn't enough to reduce the population, commercial netting may provide the needed results.

### **Habitat Enhancement:**

The number one thing that can improve the bass fishery is improving habitat for young of the year survival and ambush for larger bass hunting grounds. The less energy a largemouth bass has to use to catch forage, and the bigger the forage base (or 'food packet') the more the bass can put into growth and less energy into hunting. On the same lines, young fish need to have a place they can evade predation and feed and grow as well. Strategic placement of quality structure

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throughout the lake will improve the fishery. Care should be taken to ensure any structures placed are placed safely for any other uses such as swimming.

Many fishing clubs do collections for Christmas trees in the winter to be placed with concrete blocks. While these are a good effort, small structures like this are not going to greatly impact the fishery as a whole. Placement of larger cribs, and brush are the best option. Other artificial materials can also be used to build fish structures for both shallow and deep water. I can assist you with this design and placement if needed. With plans in place to work on dredging Willow Lake, structure placement should be documented.

Along with structure, native aquatic plants greatly benefit your lake. Not only the fishery through cover and foraging but also water quality. Native plants utilize nutrients, stabilize soils, and provide oxygen needed by living organisms. By reducing the carp population, native plants have a better opportunity to establish. If they don't establish on their own, selective plantings would be important. If or when plants begin to establish, be prepared to develop a plant management plan as you may begin receiving complaints by the membership. Educational efforts will be needed to inform your members of the many benefits of aquatic plants, and how to coexist with them.

**Stocking:**

Largemouth bass stocking can be temporarily suspended until the next survey.

Bluegill need to be stocked, and I would recommend stocking 5" to 7" bluegill at 20 / acre as your budget allows. That size bluegill can be found at both Gollon's in Dodgeville, WI and Keystone Hatchery Richmond, IL.

Consistent with the 2016 report, if catfish have not been stocked in the past couple of years, you may be getting natural recruitment from catfish spawning. With the low density of bass, this may be happening. However, if you are stocking, you will need to continue periodic stocking to ensure no gaps in age class. Channel catfish grow quickly, and they are relatively inexpensive to stock and should be stocked at a minimum size of 8"-10". This size range has better survival because the bass will not be foraging on them. A density of about 10 fish per acre stocked annually (or every two years) should provide angling opportunities. Generally, catfish can be purchased for about .90 cents per fish.

Stocking is always subjective to budgetary constraints, and all recommendations may not be able to be met. Stocking recommendations should always be re-evaluated based on subsequent fish population sampling. If budgetary constraints are a problem, stocking every other year may be an option, keeping in mind limited year-class strength and size gaps in the fish that anglers are catching.

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For stocking assistance, you can contact the following hatcheries for pricing and availability:

**Andry's Fish Farm at 812-389-2448 or 812-630-5536 (cell).**

**Keystone Hatcheries at 815-678-2537**

**Gollon's Bait and Fish Farm at 608-935-2098**

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Table 1: Catch Per Unit Effort (CPUE) by species

Species:	Number:			Fish / Minute			Obj. (fish/min)
	20s	19s	16s	20s	19s	16s	
Largemouth Bass:	65	27	25	1.3	0.9	0.33	1.0-2.5
Bluegill:	378	134	172	7.56	4.47	2.29	2.0-4.5
Black Crappie:	13	4	112	0.26	0.13	2.24	0.2-0.8
Channel Catfish:	11	12	8	0.22	0.4	0.11	-----
Muskie:	----	2	----	----	0.07	----	-----
Carp:	55	86	47	1.1	2.87	0.63	Below 0.25
Buffalo:	2	3	----	0.04	0.1	----	-----
Green Sunfish:	34	54	10	0.68	1.8	0.13	-----
Grass Carp:	----	1	----	----	0.03	----	-----
White Bass:	1	----	----	0.02	----	----	-----
Total CPUE:	559	323	374	11.18	10.77	5.73	6.00 plus

Table 2: Proportional Stock Density (PSD)

Species:	20s	19s	16s	Objective
Largemouth	80	71	80	40-70
Bluegill:	1	4	1	30-60

Table 3: Relative Weight (Wr)

Species:	Wr (Ave)			Range:			Objective
	20s	19s	16s	20s	19s	16s	
Largemouth Bass:	98	95	101	85-121	80-108	81-118	90-110
Bluegill:	93	102	88	65-111	73-159	65-105	90-110
Black Crappie:	92	80	93	88-99	62-93	72-121	90-110
Channel Catfish:	97	88	94	82-107	76-97	86-123	90-110

Table 4: Length Ranges by Species

Species:	Length:			Average:		
	20s	19s	16s	20s	19s	16s
Largemouth Bass:	2.4"-19.9"	6"-19.4"	2.9"-19.9"	10.6"	14.8"	12.6"
Bluegill:	1.8"-6.3"	2.2"-8.3"	2.6"-6.1"	4"	3.9"	4.3"
Black Crappie:	2.4"-11.1"	5.7"-9"	5.3"-8.9"	4.9"	6.7"	6.2"
Channel Catfish:	14.4"-20.2"	13.6"-26.1"	9.1"-18.9"	17.2"	16.2"	14.1"
Muskie:	----	107"-12.4"	----	--	11.5"	--
Carp:	4.6"-22.6"	15.8"-24.8"	15.9"-22.6"	19"	8.6"	18.8"
Buffalo:	34.8"-35"	28.1"-31.9"	----	34.9"	29.4"	--
Green Sunfish:	0.9"-6.9"	1.9"-4.2"	2.8"-6.5"	3.8"	2.9"	4.9"
Grass Carp:	----	38"	----	--	38"	--
White Bass:	11.1"	----	----	11.1"	--	--

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