ANNUAL REPORT ON FISH SURVEYS ON NECEDAH NATIONAL WILDLIFE REFUGE

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December 2012

This report documents fish surveys on Necedah National Wildlife Refuge (NWR) during calendar year 2012. These surveys included electrofishing and fyke netting at Harvey's Pond, a 7-acre impoundment managed for recreational fishing that has been intermittently restocked during the past two decades. Additional surveys included seining at other refuge locations and fish captures obtained during a concurrent study of invertebrates at refuge inflow sites. Sampling locations are noted in Fig. 1. The inflow sites were selected for sampling during an earlier study (1998) of invertebrates and fish by the USGS Wisconsin Water Science Center and the La Crosse Fish and Wildlife Conservation Office (LFWCO).

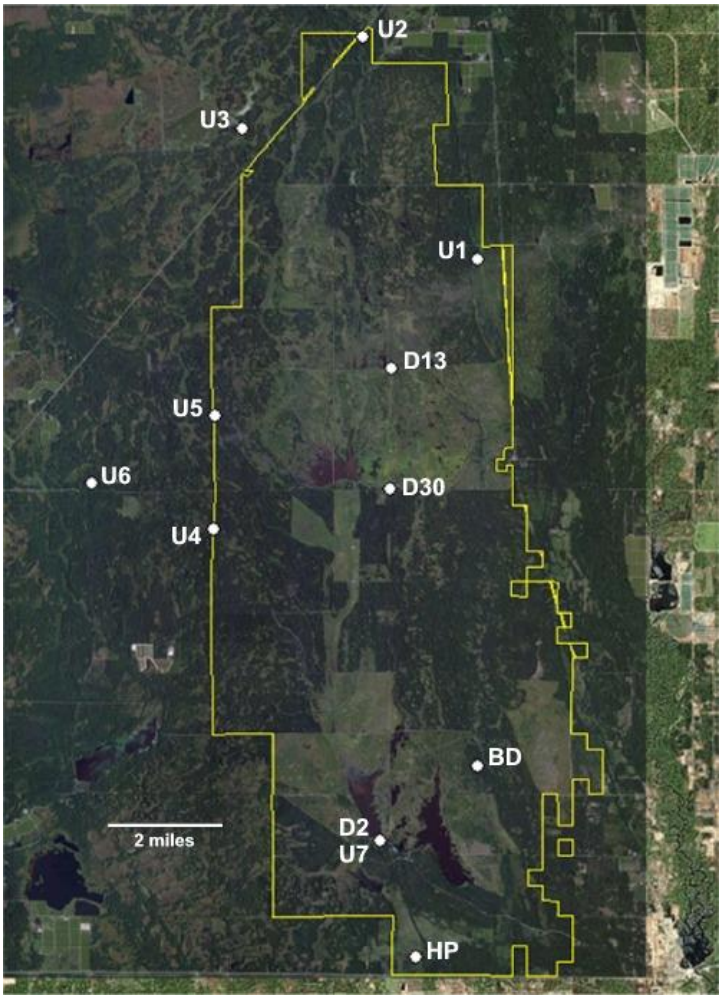

Figure 1. Fish sampling sites on Necedah National Wildlife Refuge, 2012. HP = Harvey's Pond, D2 = Dam 2, BD = Becker Ditch, D30 = Dam 30, D13 = Dam 13, U1-6 = Refuge inflows (see Table 5), U7 =Refuge outflow.

METHODS

Personnel of LFWCO sampled fish populations in Harvey's Pond. They conducted electrofishing with a shocking boat on 6 September. Fyke nets were set on 1 October, run overnight, and then checked on 2 October. N. Bloomfield of that office provided a report on results and recommendations for management (Appendix A).

Refuge staff sampled fish with a 30 x 4-foot 0.25-inch-mesh seine at four ditches or spillways during July and August (Fig. 1). During July Biologist Urbanek sampled invertebrates at two points at each of six refuge inflow and one outflow locations. Specimens were collected for 0.5 hours from approximately 50 m of stream with a 12-inch D-frame 500-micron-mesh net and processed according to USGS National Water-Quality Assessment protocols (Moulton et al. 2002) at each point. A summary of incidentally captured fish are included in this report. Water temperature, pH, dissolved oxygen, and specific conductance were measured with a YSI Professional Plus multimeter.

RESULTS AND DISCUSSION

Environment

Weather.—The year was characterized by a mild winter with record warm temperatures, especially during March (Table 1). A period of below normal rainfall began in June, and by September the refuge was experiencing extreme drought. Impoundment levels decreased below those specified by management objectives, and most refuge marshes and some smaller pools became dry.

Table 1. Temperature (F) and precipitation (inches), Necedah NWR, 2012 (WRCC 2012a, b).

	Mean temp.	Mean min. temp.		Mean max. temp.		Precipitation	
Month	2012	2012	Normal[a]	2012	Normal	2012	Normal
Jan	23.3	12.6	4.7	32.2	25.7	0.84	0.92
Feb	27.8	19.0	8.9	36.0	31.4	1.13	0.90
Mar	49.0	39.6	19.8	57.9	43.0	1.80	1.82
Apr	47.8	36.5	33.0	58.5	59.0	3.07	2.93
May	62.4	50.6	43.9	73.1	71.1	5.28	3.84
Jun	70.2	57.7	53.2	81.0	79.8	2.91	3.95
Jul	76.7	64.5	57.9	88.7	84.0	0.45	4.24
Aug	68.7	56.2	55.6	80.5	81.5	2.74	4.09
Sep	58.0	43.6	47.2	71.3	72.8	1.57	3.77
Oct	46.3	35.8	36.7	56.8	61.1	3.84	2.38
Nov	36.3	26.7	24.6	45.4	44.0	1.27	1.87

[a] Normal = For period 1953-2012.

Water quality. —Water quality was generally unremarkable across the range of sites. Water pH was near neutral, usually slightly acidic, but slightly alkaline in Beaver Creek and Becker Ditch (Table 2).

Table 2. Water quality at sampling points, Necedah NWR and inflows, 2012.

Site[a]	Point[a]	Date	Specific Conductance (uS/cm)	Dissolved O^2 (mg/L)	pH	Temp. (C)
1-Spencer-Robinson Ditch	U	10 Jul	153.7	2.59	6.84	19.9
	D	10 Jul	153.6	1.80	6.81	18.3
2-Remington Ditch/E. Br. Yellow River	U	9 Jul	200.9	2.55	6.72	23.9
	D	9 Jul	199.2	3.37	6.79	25.1
3-Meadow Valley Flowage Outflow	U	11 Jul	153.1	2.67	6.74	26.6
	D	11 Jul	152.9	2.85	6.8	27.9
4-Avery Lateral	U	13 Jul	125.7	0.28	6.98	20.6
	D	13 Jul	190.5	1.00	6.93	27.0
5-Neal Lateral	U	12 Jul	177.8	1.39	6.79	22.2
	D	12 Jul	210.9	0.17	6.71	17.8
6-Beaver Creek tributary	U	18 Jul	165.7	3.85	7.17	23.2
	D	18 Jul	168.3	5.32	7.42	24.2
7-below Dam 2	U	3 Jul	212.4	0.92	6.62	17.5
	D	3 Jul	125.3	3.01	6.65	22.6
Dam 2		3 Aug	163.6	2.39	6.89	18.0
Dam 30 (N of Sprague-Mather Road)		19 Jul	138.9	1.28	6.56	13.2
Dam 30 (S of Sprague-Mather Road)		19 Jul	96.7	1.38	6.6	14.7
Dam 13		19 Jul	92.3	2.72	6.92	24.3
Becker Ditch		3 Aug	355.3	0.05	7.61	21.2

[a] U and D = upstream and downstream points, respectively.

General Observations

During June large numbers of fish, especially small bullheads, accumulated below the spillway of Dam 2. Some species such as channel catfish and walleye, not usually found in refuge pools, were noted, any many of the larger specimens, including northern pike and largemouth bass, were found dead at this site (Fig. 2). Pool 13 was drawn down in spring for fall waterfowl plant production, and by early July the ensuing warm temperatures and low oxygen resulted in a significant fish kill, especially of northern pike, in the remaining water in the borrow ditch (Fig. 3).

A list of fish species observed or collected during all sampling appears in Appendix B. Based on refuge records, previous surveys by LFWCO, and whooping crane food availability studies (Urbanek 1999, unpublished data 2008), no previously unreported species were discovered in 2012.



Figure 2. Walleye from fish kill in Dam 2 spillway, June 2012.



Figure 3. Northern pike from fish kill on Pool 13, July 2012.

Harvey's Pond

A total of 208 individual fish were captured by electrofishing (163) and in fyke nets (45). Predominant species were pumpkinseed (102), bluegill (37), and largemouth bass (31). The pond is overpopulated with small pumpkinseed and contains no large predators (Table 3). A detailed preliminary report with recommendations to improve this fishery was prepared by N. Bloomfield of LFWCO and appears in Appendix A.

Table 3. Numbers of fish species captured by electrofishing and fyke nets, Harvey's Pond, September-October 2012.

	Size class[a]												
Species	2	3	4	5	6	7	8	9	10	11	12	32	Total
Pumpkinseed		3	60	33	6								102
Bluegill	14		3		12	7	1						37
Largemouth bass		19	2		3	3	3	1					31
Black crappie						4	5	6	1				16
Bullhead						2	1	3	4	1	1		12
Yellow perch				4	2	1							7
Carp												1	1
Green sunfish							1						1
Weed shiner		1											1

[a] 1 = 0-1 inches (0-25 mm), 2 = 1-2 inches (26-50 mm), etc.

Interior Refuge

Available resources and drought limited electrofishing opportunity on the refuge to Harvey's Pond. Seining at four interior sites (three spillways and one isolated ditch, Fig. 1) produced 10 species (Table 4). Priority fishery species included black crappie, bluegill, and yellow perch present in spillways. The ditch site was not associated with an impoundment and contained only forage fish species characteristic of marshes or smaller bodies of shallow water.

Refuge Inflows

By the late 1800's the area that is now Necedah NWR had been extensively ditched for agriculture (Hunt et al. 2000). As a consequence, no natural streams occur on the refuge or in the areas providing inflow to the refuge. The water quality of these inflows depends, of course, on land use practice practices outside the refuge.

The sampling methods used at these sites was specifically for invertebrates, therefore only small fish were collected while larger species potentially present were likely to escape. Seven species were collected (Table 5). Finescale dace, mudminnows, and sticklebacks were collected at four site. Two sites, the outflow of Meadow Valley flowage and Avery Lateral, contained the most fish, with dace predominating.

Table 4. Numbers of fish species collected by seining on Necedah NWR, July-August 2012.

	Size class[a]							
Site/species		2	3	4	5	6	7	8	Total
Dam 2									
Brown bullhead		1	30	7					38
Pumpkinseed			4						4
Bluegill		2	2	1	1				6
Black crappie		2	1			1			4
Dam 30									
Golden shiner				13	1				14
Black crappie				4	1	1			6
Yellow perch					2				2
Dam 13									
Golden shiner		3	1						4
Brown bullhead		1		3					4
Bluegill		17							17
Black crappie		1							1
Yellow perch							2	1	
Iowa darter[b]		2							2
Becker Ditch									
Central mudminnow	1	4	26	3					34
Golden shiner	3	10	19	9	1				42
Fathead minnow		5							5
Brown bullhead		38	2						40
Brook stickleback	1	2							3

[a] 1 = 0-1 inches (0-25 mm), 2 = 1-2 inches (26-50 mm), etc.
[b] Tentative identification pending verification.

RECOMMENDATIONS AND PROSPECTUS

Harvey's Pond is overpopulated with small fish and inadequate numbers of large predatory fish. Appendix A provides several recommendations to correct this imbalance, minimally including additional stocking with largemouth bass and possibly limiting recreational catch of large predator species.

Assessment of the fishery in other refuge pools, especially Sprague-Mather and Goose Pools, which are open to recreational fishing, were beyond the scope of this annual study. Evaluation of the effects of water level management and drought on priority species such as black crappie, bluegill, yellow perch, and northern pike on these pools could be a future topic for research.

The refuge supports a breeding population of whooping cranes. Two primary food items of this endangered species are bullheads and mudminnows (R. Urbanek, personal observations). Like

the sport fishery species, the effects of pool management and drought on populations of these prey species as well as on forage species on which other birds and predatory fish are dependent are potential subjects of further study.

Table 5. Numbers of fish species collected during invertebrate sampling of USGS refuge inflow sites, 2012. No fish were collected at outflow site 7-below Dam 2.

Site/species	Size class 1	2	3	Total
1-Spencer-Robinson Ditch				
Central mudminnow		2		2
Finescale dace	1			1
Brook stickleback		1		1
2-Remington Ditch/E. Branch Yellow River				
Golden shiner		1		1
Finescale dace		1		1
Bullhead		1		1
Brook stickleback		1		1
3-Meadow Valley Flowage Outflow				
Central mudminnow		13		13
Golden shiner			1	1
Finescale dace	18	136		154
Fathead minnow			2	2
Brook stickleback	1	32		33
4-Avery Lateral				
Central mudminnow	15	22		37
Finescale dace	51	12		63
Bullhead	1			1
Brook stickleback	17	19		36
5-Neal Lateral				
Central mudminnow	1	3	5	9
Johnny darter	5	5		10
6-Beaver Creek tributary[a]				
Johnny darter	2	4		6

[a] Sampling of the Beaver Creek tributary was moved 200 m upstream from the original (1998) USGS site because the latter streambed was dry due to the drought.

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LITERATURE CITED

Hunt, R. J., D. J. Graczyk, and W. J. Rose. 2000. Water flows in the Necedah National Wildlife Refuge. U.S. Geological Survey Fact Sheet FS-068-00.

Moulton, S. R., II, J. G. Kennen, R. M. Goldstein, and J. A. Hambrook. 2002. Revised protocols for sampling algal, invertebrate, and fish communities as part of the National Water-Quality Assessment program. U.S. Geological Survey OFR 02-150.

Urbanek, R. P. 1999. Food abundance at three candidate whooping crane reintroduction sites in Wisconsin. Appendix 3 in J. R. Cannon. Wisconsin whooping crane breeding site assessment. Final Report to the Canadian-United States Whooping Crane Recovery Team. Front Royal, Virginia.

Western Regional Climate Center [WRCC]. 2012a. Station monthly summary. Western Regional Climate Center, Reno, Nevada.
Available: http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?idRNEC

Western Regional Climate Center [WRCC]. 2012b. Monthly climate summary, 5/ 1/1953 to 7/27/2012. Western Regional Climate Center, Reno, Nevada.
Available: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wi5786

Appendix A

Preliminary Management Recommendations for Harvey's Pond at Necedah National Wildlife Refuge

prepared by
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December 2012

Results

A total of 208 fish were captured representing 10 species from four families (Table 1). Pumpkinseed (49.2%), bluegill (17.9%) and largemouth bass (14.9%) were the most common species sampled. Other sportfish collected include black crappie (7.7%) and yellow perch (3.4%). 163 fish were captured electrofishing and 45 were collected with fyke nets. Pumpkinseed dominated the electrofishing sample with a catch per unit effort (CPUE) of 97.6 fish/hour, followed by bluegill (46.1 fish/hour) and largemouth bass (42.0 fish/hour). Pumpkinseed also dominated the fyke net CPUE at 15 fish/net night, followed by yellow bullhead (4.5 fish/net night) and bluegill (1.5 fish/net night). Tadpoles were also collected in the fyke nets in large numbers. It should be noted that the fykes were fished improperly with the rear throat tied shut, which likely impacted the number of fish caught.

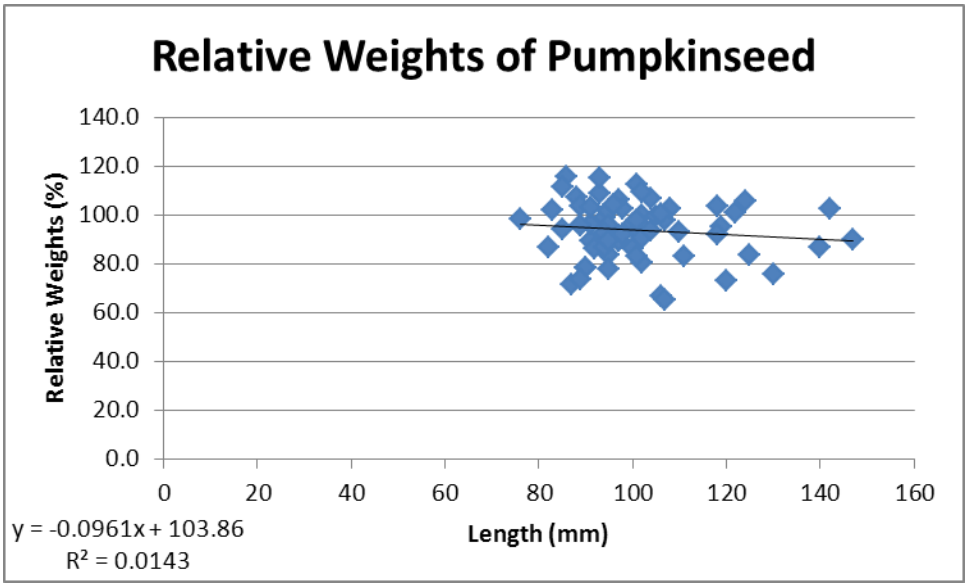
Table 1. Tabulation of all fish captured at Harvey's Pond

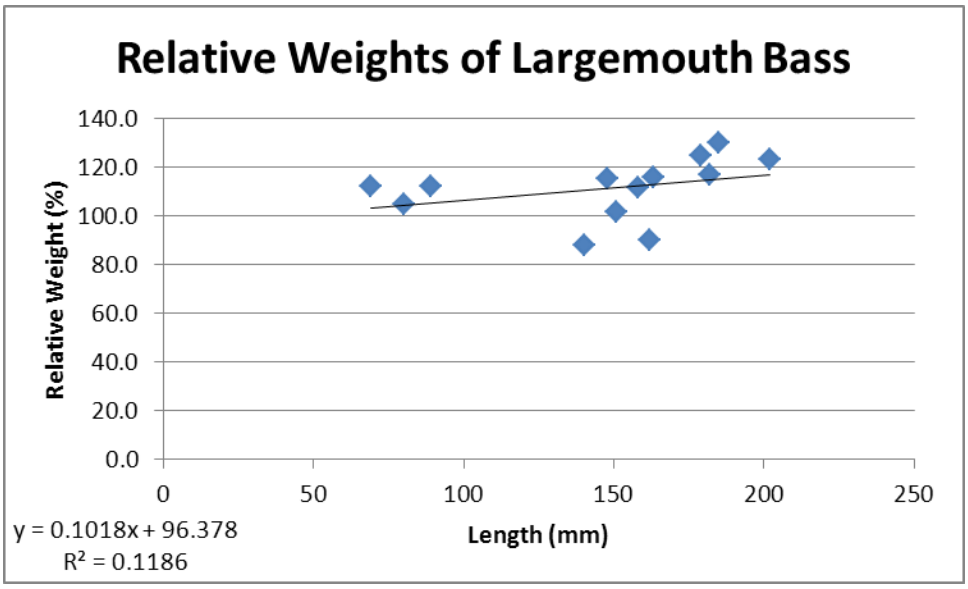
Species	Count	Length Range (mm)	Average Length (mm)	Electrofishing CPUE	Fyke CPUE
Black Bullhead	2	157-186	172	1.4	0.5
Black Crappie	16	159-232	192	21.7	
Bluegill	37	38-178	107	46.1	1.5
Common Carp	1	790	790	1.4	
Green Sunfish	1	192	192		0.5
Largemouth Bass	31	63-202	102	42.0	
Pumpkinseed	102	53-147	100	97.6	15.0
Weed Shiner	1	60	60	1.4	
Yellow Bullhead	10	171-289	224		5.0
Yellow Perch	7	107-176	132	9.5	
Grand Total	208				

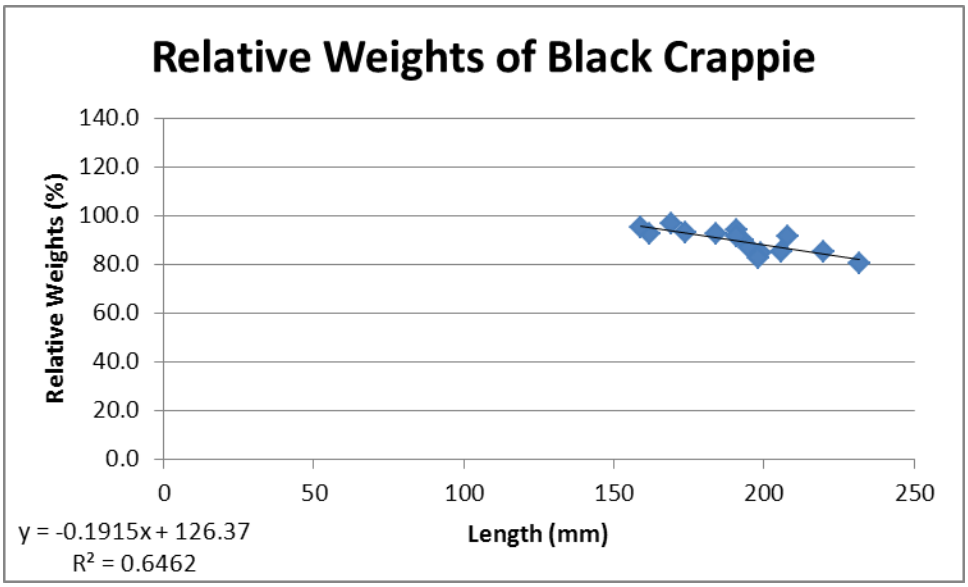
A proportional stock density (PSD) index was calculated for the *Lepomis* species (bluegill, green sunfish, and pumpkinseed) and black crappie using fish caught with both gears. PSD values can help determine balance in a system. PSD's values were 25 and 10 for black crappie and *Lepomis* species, respectively. Generally for prey species such as *Lepomis* species, a value of 20-40 indicates a balanced population. The value of 10 shows the population consists mainly of small fish. There were 31 largemouth bass collected. Of these, only one was greater than stock size (>200 mm) and there were zero quality fish (>300 mm).

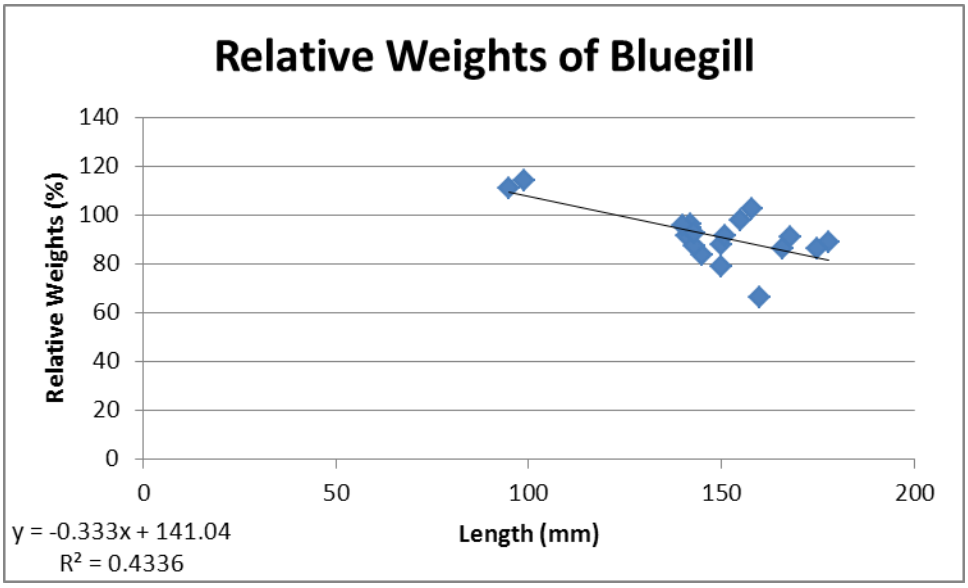
Relative weights were calculated for pumpkinseed, largemouth bass, black crappie, and bluegill (Figures 1-4). Relative weights provide a measure of condition as a percentage based upon what a healthy fish at that size should weigh. Pumpkinseed, bluegill, and black crappie show a slight decline in body condition with increased size, while largemouth bass show a slight increase in condition with size. Most fish of all species were within a healthy range (>80%).

Figures 4-4. Length vs. relative weight for selected species in Harvey's Pond.









Discussion and Recommendations

In its current state, Harvey's pond provides little fishing opportunity. Largemouth Bass are low in density and small. Bluegill and pumpkinseed are present in high densities and may provide a lot of action for new or young anglers, but are not a desirable size. There is a desirable sized black crappie population present that could provide some quality fishing.

The pond currently lacks large predators. This allows overpopulation of the prey species (primarily pumpkinseed and bluegill) and stunting. Low PSD values from these two species confirm stunting is occurring. Decreases in relative weights with increases in size for these species would also indicate intraspecific competition depleting food sources for larger fish. The presence of large numbers of tadpoles also indicates a lack of predators. The lack of large predators is often attributable to

overfishing. It's also a potential indicator of a partial fish kill. Larger fish require more oxygen and will be lost whereas smaller fish may survive a low oxygen event that is not too severe. Heavy ice cover in recent years and low water due to drought may have contributed to a partial fish kill in recent years.

Several actions can be taken alone or in conjunction with others to improve the fishery at Harvey's Pond:

- A rotenone treatment to remove the entire fish population would be the most desirable control. Bullheads and common carp are present and very difficult to control in a pond setting. If it is likely that the pond will establish connection to nearby ditches, immigration of common carp and bullheads back into the pond is probable. This option may only provide short term control of these species and is not recommended if this is the case.
- Install an aeration system to prevent future fish kills. Windmill systems are available that do not require power on site and can adequately aerate small impoundments.
- Maintain water levels, if feasible.
- Stock predators to reestablish balance in the system. Fingerling largemouth bass can be provided from Genoa National Fish Hatchery. If desired, other species can be purchased from private entities. At a minimum, largemouth bass should be added to the system. Stocking rates for recommended species include:
    - Largemouth bass: 100 fingerlings/acre. This number should be decreased to 25-50 fish/acre for yearlings or 6-8 fish/acre for adults. Using adults or yearlings will have a more immediate impact but will need to be purchased from a private hatchery and are more costly.
    - Channel Catfish: 100 fingerlings/acre. Channel catfish can provide another angling option without impacting largemouth bass or panfish populations. These will not likely spawn successfully and will need to be replenished periodically.
    - Northern Pike/Walleye: Not recommended. These predators will compete with largemouth bass and likely prey on young largemouth bass.
- Establish regulations to protect predators from angling and encourage liberal harvest of panfish.
- Remove up to 80% of the total weight of bluegills and pumpkinseeds, along with any other undesirable species. Predators alone often are not enough to control a stunted panfish population and will not have a noticeable effect until fish reach the 16 inch range (for largemouth bass). Gearing the removal towards pumpkinseeds may help shift the balance towards bluegills, which are preferred due to their ability to grow larger and quicker. The remaining fish will have less competition and grow to a more desirable size. This can be accomplished by trap netting or electrofishing with assistance from the La Crosse Fish and Wildlife Conservation Office.
- Survey the pond again in three years.

*These results are preliminary. A full report will be completed in early 2013.

Appendix B. Scientific names of fish species collected during surveys or observed on Necedah NWR, 2012.

Common Name	Scientific Name
Central mudminnow	*Umbra limi*
Northern pike	*Esox lucius*
Common carp	*Cyprinus carpio*
Golden shiner	*Notemigonus crysoleucas*
Finescale dace	*Phoxinus neogaeus*
Weed shiner	*Notropis texanus*
Fathead minnow	*Pimephales promelas*
Black bullhead	*Ictalurus melas*
Brown bullhead	*Ictalurus nebulosus*
Yellow bullhead	*Ictalurus natalis*
Channel catfish	*Ictalurus punctatus*
Brook stickleback	*Culaea inconstans*
Largemouth bass	*Micropterus salmoides*
Green sunfish	*Lepomis cyanellus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Black crappie	*Pomoxis nigromaculatus*
Walleye	*Stizostedion vitreum*
Yellow perch	*Perca flavescens*
Johnny darter	*Etheostoma nigrum*
Iowa darter[a]	*Etheostoma exile*

[a] Tentative identification pending verification.