Clear Lake, Steuben County

Supplemental Walleye Evaluation and Management Summary

Dates of Survey: September 18, 22 and October 4, 2009

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Objective: The objectives of this survey were to evaluate survival of June fingerling walleyes stocked in 2009 and look for naturally reproduced age-1 fish in accordance with work plan 300FW1F10D42617.

Methods: Fish collection effort consisted of 5.5 hours of pulsed D.C. nighttime electrofishing. Only walleyes were collected. Fish were measured to the nearest 0.1 in TL and weights were taken to the nearest 0.01 pounds.

Results: During the 2009 survey, 27 walleyes were collected. Sixteen of these were age-0 fish from the 2009 June stocking. These fish were collected at a rate of 2.9 per electrofishing hour. They ranged in length from 6.6 to 9.4 in TL, similar to previous years and other northern Indiana lakes. Two age-1, seven age-2 and two age-3 or older walleyes were also collected. The age-1 fish appears to have been naturally reproduced since walleye were not stocked into Clear Lake in 2008. On the night of September 22, a cold front was moving through the area and may have impacted the catch. However, if you eliminate this night from the composite sample, the 2009 catch of age-0 still falls short of the seven per electrofishing hour criteria for success. The water temperature at the time of this survey ranged from 69°F to 73°F.

During the September 18, 2008 electrofishing survey, no age-1 walleyes were collected from the reduced 2007 stocking. Walleyes were not stocked in 2008 and no naturally reproduced walleyes were collected. The water temperature at the time of this survey was 71° F.

Summary: Walleye stocking in Clear Lake by the Division of Fish and Wildlife (DFW) began in 1974. Initially the lake was one of the most successfully stocked lakes in northeast Indiana (Table 1). Between 1974 and 1979, walleye fry were stocked on four occasions. Based on a 1978 angler creel survey, these fry stockings produced a successful fishery with a harvest of 1.7 walleyes per acre (Appendix 1 & 2). However, this fishery was dominated by young fish that averaged 12.8 in TL and 0.80 pounds. From 1979 through

1987, June fingerlings (1.5 in TL) were stocked at a rate of 200 per acre. Angler creel surveys conducted in 1981 and 1988 documented successful walleye fisheries, with a harvest of 2.9 and 1.4 fish per acre respectively. These walleye fisheries were also dominated by young fish that averaged 13.0 in TL and 0.94 pounds. For the last 20 years, approximately 80,000 (100 per acre) 1.5 in TL June fingerling walleyes have been stocked annually. During the 2001 creel survey, the number of harvested walleyes declined compared to previous creel surveys. However, their average size increased to 16.6 in TL and 1.58 pounds. The minimum walleye size limit of 14 in TL implemented in 1996 and very strong year class of age-3 walleyes were both considered contributing factors in the increase in average size. Based on the criteria for success as outlined in Walleye Management in Indiana, (Andrews 1994) the Clear Lake walleye program has generally been successful.

Clear Lake was used as a walleye brood source from the late 1970's through 1990. Brood fish were captured during 2 to 3 week, labor intensive gill netting operation. Age-4 and age-5 year old walleyes dominated these collections. The average annual egg take during this time period was approximately 2 million eggs with the best egg take occurring in 1983 (4.8 million eggs). By 1990, as the Brookville Reservoir walleye population matured and brood collection effort became more efficient, the operation at Clear Lake could no longer be justified and was discontinued.

Fall nighttime DC electrofishing surveys continue to be the main tool used to evaluate initial survival of stocked walleye, especially for young of the year (age-0) and age-1 fish. Since 1982, fall sampling has been conducted at Clear Lake in 19 seasons. The number of age-0 walleyes collected per electrofishing hour ranged from 0 to 16.3 per hour and average 7.9 per hour. The number of age-1 walleyes collected per electrofishing hour ranged from 0 to 6.7 per hour and averaged 1.9 per hour. Based on fall electrofishing surveys and angler creel surveys, a consistent catch rate of seven age-0 walleyes per hour is considered a successful stocking program that typically develops into a fishable population leading to both angler interest and harvest.

Compared to Bass Lake, which is stocked with 4 day old walleye fry and Lake Maxinkuckee which is stocked with June fingerlings, the Clear Lake catch rate of age-0 and age-1 walleyes was relatively low (Table 2). In recent years, several lakes have been stocked with advanced, 6-8 in TL fall fingerling walleyes. The catch rate of age-1 walleyes at these lakes has ranged from 3.4 per electrofishing hour at Big Turkey

Lake, which was stocked with 4.5 fall fingerlings per acre, to 30.7 per electrofishing hour at Pretty Lake, which was only stocked once with 12.4 per acre (Table 3). The catch rate of age-1 walleyes at Clear Lake was 1.1 and 3.0 per electrofishing hour from annual stockings of 100 and 200 June fingerlings per acre respectively.

Since 1977, 466 age-0, 222 age-1 and 49 age-2 walleyes have been collected from Clear Lake during fall gill netting and nighttime DC electrofishing surveys combined. The average length for a fall age-0, age-1 and age-2 walleyes was 7.7 in TL, 11.7 in TL and 15.3 in TL respectively (Table 4). These average lengths are within the range observed at five other northern Indiana natural lakes (Table 5).

Results of length at age determinations for Clear Lake walleye brood fish collected from 1982 through 1989 and fish collected there during an April gill netting survey in 1998 reveled, age-3 fish averaged 16.9 in TL, age-4 averaged 18.4 in TL, age-5 averaged 19.7 in TL, age-6 averaged 21.9 in TL and age-7 walleyes averaged 25.1 in TL (Table 6). There was no significant difference between the average length of age-3 and older walleyes collected from 1982 through 1989 compared to the 1998 sample. However, there was a difference between the average length at age for females and males. As with many species, females grow faster creating size differences which ranged from 0.7 in TL at age-3 to 2.9 in TL at age-7.

Over the years, both fry and June fingerling walleye stockings at Clear Lake have been successful in creating a fishable population. However, survival from these stockings has been sporadic and unpredictable, especially since the mid 1990's. Similar survival patterns of stocked June walleye fingerlings have been seen at other northern Indiana natural lakes. For example, initial walleye stockings at Pretty Lake in LaGrange County were generally successful and developed a fishery. This early success was often followed by 1 to 3 years of poor or failed survival with a successful stocking often occurring in the next year (Ledet 2008). Although less pronounced, this survival pattern has also been seen in advanced fall fingerling stockings at Winona Lake (2003-2005) and to a lesser degree at Crooked Lake. Although stocking advanced walleye fingerlings has been more consistent in establishing strong year classes, it is not surprising to see a weak year class immediately following an extremely successful stocking of advanced fall fingerlings. Even under these circumstances, advance fall fingerlings stocked at rates of 4.5 to 20 per acre provided a 14:1 electrofishing catch rate ratio for age-1 walleye compared to Clear Lake June fingerling stockings. This ratio increased to 18:1 when at least 10 advance fall fingerlings are stocked per acre.

In 1983, in addition to the June fingerling walleye stocking, Clear Lake was stocked with 19,485 fall fingerlings that were fin clipped prior to release. However, 15,850 of these averaged 3.8 in TL. Although the fall stocked walleye only represented 29% of the total 1983 stocking, they comprised 43.5% of the age-1 walleyes collected during the 1984 fall sampling. At that time, it was recommended that the fisheries section continue efforts to address the feasibility of rearing the larger advanced fall fingering walleyes. Shipman (2003) also suggested that if the evaluations of large fingerling stockings continued to be positive, some consideration should be given to including Clear Lake in the large fingerling stocking program.

Walleye recruitment in naturally reproducing populations can be very erratic, influenced by predation (including cannibalism from adult walleye), weather, forage size and abundance, water quality, and harvest. These factors are also capable of influencing the survival of stocked fish, although stocking healthy fish in the fall at large sizes overcomes many of these life history bottlenecks. Managing each walleye lake in Indiana on a lake by lake basis, taking into account the above factors, would be difficult and time consuming. However, the inconsistent success of annual June walleye fingerling stockings compared to the success of advance fall fingerling stockings merits consideration of a change in stocking strategy. Although expensive, advanced fall fingerlings further reduce early life history barriers and provide management options for Indiana's natural lakes where fry and June fingerlings have failed to survive. Establishing a strong year class every two or even three years, as is common in naturally reproducing populations could move the quality of our walleye fisheries to another, more consistent level and should be investigate as a management approach. In addition, while we can't control factors like the weather, forage production or predation, we can influence harvest. The DFW should continue to monitor our walleye populations and explore the impacts of size and bag limits on population structure, survival and growth, especially as it related to stocking density.

The fisheries section should also review our walleye sampling protocol. While fall nighttime electrofishing has proven to be a reliable sampling tool to evaluate survival of age-0, age-1 and to a lesser degree age-2 walleyes including valuable length at age information, it is less effective in collecting older walleyes in lakes like Clear. Many of these lakes have shallow, sandy flats with little cover. While some adult walleyes will use these sandy flats in the fall months, the time they spend there appears short, especially when near shore vegetation is lacking which reduces their vulnerability to electrofishing. Considering sample size and the

variability in growth between male and female walleyes, spring gill or trap netting could be more appropriate for sampling adult walleyes if growth rates, size structure and mortality of older fish are needed.

Recommendations: It is recommended that walleye stockings at Clear Lake shift from June fingerling to advanced fall fingerlings. These fish should be stocked at 10 per acre with a minimum size of 7 inches. As this shift occurs, fall electrofishing surveys will be conducted to monitor recruitment, growth and initial survival.

Literature cited:

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Table 1. Clear Lake walleye stocking and number of age-0 through age-3 or older walleyes collected per fall nighttime DC electrofishing hour, 1974 – 2008.

Month/Year	Number Stocked	Size Stocked	Effort hrs.	Number Age-0 /hr	Number Age-1 /hr	Number Age-2 /hr	Number ≥ Age-3 /hr
May 1974	82,000	Fry					
May 1975	4,000,000	Fry					
1976	None						
May 1977	2,400,000	Fry					
1978	None						
May 1979	396,000	Fry					
June 1979	167,553	1.8					
1980	None						
June 1981	131,999	1.6					
May 1982	2,200,000	Fry	2.00	0	6.5	0	4.0
June 1983	18,873	1.5	1.75	1.3	0	8.3	6.9
July 1983	28,562	1.7					
Sept.1983	3,420	5.6					
Oct. 1983	15,850	3.8					
Oct. 1983	215	8.4					
June 1984	162,415	1.4	2.00	2.0	3.5	0	0
Sept. 1984	613	3.9					
June 1985	165,238	1.4	4.00	10.3	0.5	0	1.0
June 1986	165,156	1.8	6.00	7.7	6.7	0	0.7
Oct. 1986	1,035	7.5					
June 1987	161,365	1.6	4.00	15.3	3.3	0.5	1.5
June 1988	80,495	1.8	4.00	9.3	0.5	0.8	0.3
June 1989	82,155	1.4	4.00	9.8	0.5	0.3	0.5
June 1990	84,922	1.4	4.00	3.8	0.3	0	0.3
June 1991	87,764	1.6	4.00	16.3	0	0.8	1.5
June 1992	82,629	1.8					
June 1993	83,910	1.7					
June 1994	84,465	1.6					
June 1995	83,200	1.5	4.00	8.8	1.8	0.8	0.3
June 1996	80,030	1.2	4.00	3.8	2.0	0.8	0.3
June 1997	121,395	0.9	2.25	0	0	0	0
June 1998	90,000	1.5	4.00	14.5	0	0	0.8
June 1999	91,830	1.5	6.00	4.0	5.3	0.2	0.5
June 2000	89,850	1.4	4.00	9.5	0.5	1.5	0.8
June 2001	81,285	1.6	4.00	3.3	1.5	1.0	0.5
June 2002	82,030	1.2					
June 2003	81,500	1.2					
June 2004	82,062	1.7					
June 2005	49,788	1.3					
June 2006	67,850	1.5					

(Table 1 continued)

Month/Year	Number Stocked	Size Stocked	Effort hrs.	Number Age-0 /hr	Number Age-1 /h	Number Age-2 /hr	Number ≥ Age-3 /hr
June 2007	35,050	1.4					
June 2008	None		2.0	0	0	0	0
June 2009	94,260	1.6	5.5	2.9	0.4	1.3	1.0
Oct 2009 *	1,240	4.7					
Oct 2009**	1,849	6.7					
Average				7.6	1.9	0.9	1.0

* Forage reared

** Pellet reared

Average does not include the fry stocking in 1982, the partial fingerling stocking in 2007 or the advanced walleyes stocked after the 2009 survey.

Table 2. Average historical fall nighttime DC electrofishing catch rates of age-0 through age-2 walleyes collected from Bass Lake, Clear Lake, Pretty Lake and Lake Maxinkuckee.

Lake	Number of age-0 collected per hour	Number of age-1 collected per hour	Number of age-2 collected per hour
Bass Lake	29.6	5.6	4.1
Clear Lake	7.8	1.9	0.9
Lake Maxinkuckee	13.6	3.7	1.5
Pretty Lake	4.9	2.5	1.4

Note: Bass Lake is stocked with fry while the other lakes are stocked with June fingerlings.

Table 3. Average fall nighttime DC electrofishing catch rates for age-1 walleyes collected from Big Turkey, Clear, Crooked, Pretty, Simonton, Sylvan, Wall and Winona lakes. Number of years sampled in ( ).

Lake	Average Number of advanced fingerlings stocked per acre	Average Number of age-1 fish collected per electrofishing hour
Big Turkey (5)	4.5	3.4
Crooked (6)	10.0	11.5
Pretty (1)	12.4	30.7
Simonton (7)	6.2	5.6
Sylvan (6)	20.0	22.0
Wall (3)	10.0	15.1
Winona (6)	20.0	11.6
*Clear (12 / 4)	100 / 200	1.1 / 3.0

* June fingerlings

Table 4. Number, length range and average length in inches of age-0 through age-2 walleyes collected during fall gill netting and or nighttime DC electrofishing surveys from Clear Lake, 1977 through 2008.

	Age-0			Age-1			Age-2		
Year	Number Collected	Length Range	Average Length	Number Collected	Length Range	Average Length	Number Collected	Length Range	Average Length
1977	0			16	9.0 – 11.5	10.6	2	15.5	15.5
1979	6	7.0 – 7.5	7.3	3	12.0 – 13.5	13.0			
1980	1	9.0	9.0	21	11.5 – 13.5	12.6	0		
1982	0			24	9.5 – 12.5	11.6	0		
1984	4	7.0 – 9.2	8.5	23	9.0 – 13.7	11.3	0		
1985	47	6.1 – 8.4	7.0	20	10.0 – 15.0	13.5	17	13.8 – 15.8	15.1
1986	46	6.5 – 9.0	7.8	48	9.0 – 12.5	11.0	0		
1987	6	7.0 – 9.0	7.8	13	10.5 – 13.0	11.8	2	14.0 – 15.0	14.5
1988	37	7.0 – 9.0	8.2	2	11.5	11.5	3	13.5 – 16.0	14.8
1989	39	6.7 – 8.7	8.1	2	12.0 – 12.5	12.3	1	17.0	17.0
1990	15	8.3 – 9.6	8.1	1	12.8	12.8	0		
1991	65	6.8 – 9.2	8.2	0			3	14.5 – 16.5	15.3
1995	35	5.8 – 7.8	6.9	3	11.6 – 14.1	12.6	1	15.3	15.3
1996	15	6.3 – 9.0	7.8	8	10.1 – 13.5	11.9	3	13.5 – 15.9	14.7
1998	58	6.4 – 8.7	7.5	0			0		
1999	24	6.3 – 9.2	7.0	28	9.3 – 13.6	11.4	1	16.2	16.2
2000	38	6.7 – 8.5	7.8	2	13.0 – 14.1	13.6	5	14.8 – 16.5	16.0
2001	14	6.4 – 7.3	6.7	6	11.3 – 13.6	12.3	4	15.2 – 16.6	16.0
2008	0			0			0		
2009	16	6.6 – 9.4	7.4	2	11.5 – 13.0	12.3	7	13.5 – 16.4	15.5
Total	466		7.7	222		11.7	49		15.3

Table 5. Number and average length in inches of age-0 through age-2 walleyes collected during fall gill netting and or nighttime DC electrofishing surveys from six northern Indiana natural lakes, 1977 through 2008.

	Age-0		Age-1		Age-2	
Lake	Number Collected	Average Length	Number Collected	Average Length	Number Collected	Average Length
Bass		6.5		11.3		
B. Turkey	0		68	12.8	27	15.9
Clear	466	7.7	222	11.7	49	15.3
Max	660	7.7	190	11.9	73	14.7
Pretty*	141	8.7	113	12.6	61	15.2
Wall	0		68	11.6	33	14.5

*Average was 16.1 in TL prior to the 2009 sample of 28 age-2 fish.

Table 6. Average length by age in inches of April collected walleyes at Clear Lake, 1982-1989 and 1998.

		Average Length (Number Averaged)				
Year Collected	Sex	Age-3	Age-4	Age-5	Age-6	Age-7
1982	Female	18.1 (7)		23.2 (17)		
	Male	16.6 (43)		19.8 (42)		
1983	Female		19.5 (96)		24.2 (6)	
	Male		17.7 (147)		20.9 (22)	
1984	Female	16.5 (3)		19.8 (56)		25.4 (7)
	Male	15.3 (2)		19.0 (109)		
1985	Female		17.5 (12)		22.3 (8)	
	Male		17.7 (102)			
1986	Female	17.8 (3)		20.1 (15)		
	Male	16.9 (36)		18.9 (87)		
1987	Female		18.3 (5)	19.1 (1)	23.2 (7)	
	Male	16.9 (18)	18.8 (96)	20.5 (4)	21.0 (6)	
1988	Female	17.5 (1)	18.6 (11)	20.8 (18)	25.0 (2)	25.3 (2)
	Male	17.0 (15)	19.1 (86)	20.4 (32)	21.5 (1)	22.5 (1)
1989	Female		19.1 (1)			
	Male	16.4 (1)	18.3 (9)			
1998	Female	17.0 (4)	17.9 (5)	21.1 (1)		
	Male	16.6 (12)	17.8 (16)	19.3 (17)		
Average	Female	17.5 (18)	19.1 (130)	20.6 (108)	23.3 (23)	25.4 (9)
	Male	16.8 (127)	18.2 (456)	19.3 (291)	20.9 (29)	22.5 (1)
	Length Differential	0.7	0.9	1.3	2.4	2.9

Appendix 1. Fish harvest and yield from 1978, 1981, 1988 and 2001 creel surveys of Clear Lake.

	1978		1981		1988		2001	
Species	Number Harvested	Total Weight (lbs.)	Number Harvested	Total Weight (lbs.)	Number Harvested	Total Weight (lbs.)	Number Harvested	Total Weight (lbs.)
Yellow perch	6,687	1,192.88	5,204	1,145.01	3,771	1,026.80	2,169	822.85
Bluegill	4,903	1,406.05	1,334	398.38	1,956	625.94	1,040	595.37
Largemouth bass	1,398	1,198.41	1,390	1,481.56	608	761.35	445	868.77
Walleye	1,347	1,102.00	2,296	2,223.00	914	820.94	613	967.89
Rock bass	897	304.95	973	332.64	1,839	626.03	750	485.17
Smallmouth bass	498	363.12	424	336.59	485	541.97	127	245.68
Rainbow trout	96	133.60	109	235.15	679	915.69	439	502.39
Brown trout	78	191.69	437	288.25	7	7.03	0	0
Others*	1,896	286.09	612	336.27	353	107.89	958	634.66
Total	17,800	6,178.79	12,779	6,776.85	10,612	5,433.64	6,541	5,122.78
Angler hours	21,589.00		32,753.90		21,719.73		19,996.96	
Hours per acre	26.98		40.94		27.15		25.00	
Fish per hour	0.79		0.39		0.49		0.33	

*Includes: pumpkinseeds, black crappies, warmouth, bullheads, bowfin, redear, suckers and northern pike.

Appendix 2. Catch and release of selected species from 1978, 1981, 1988 and 2001 creel surveys of Clear Lake.

Species	1978	1981	1988	2001	Total
Walleye	NR	353	252	781	1,386
Largemouth bass	NR	244	512	4,391	5,147
Smallmouth bass	NR	NR	266	3,556	3,822
Total		597	1,030	8,728	10,355

NR – not recorded