Environment

Secord Impoundment (Figure 1) is located in central Michigan, approximately 5 miles north of the Village of Wooden Shoe in Gladwin County, T19N, R1E, Sec. 15. The dam location is just below the confluences of the East, West, and Middle Branches of the Tittabawassee. This dam forms the uppermost impoundment of the four large hydroelectric impoundments on the Mainstem Tittabawassee River. The dam has a height of 55 ft and hydraulic head of 46 ft. and impounds 895 acres above it and a 69 mile shoreline at normal pool, in Secord Impoundment. Except during emergencies and winter drawdown, operations of the project may not fluctuate more than 0.4 ft below or 0.3 ft above normal pool elevation (750.8 ft National Geodetic Vertical Datum (NGVD). During winter drawdown, between December 15 and January 15, the level may not fall below 747.8 ft NGVD and may not fluctuate more than 0.7 ft. There are two DNR access sites, #26-9 and #26-11 listed with the Michigan Public Boat Launch Directory. Secord Impoundment is used heavily for recreation including boating, fishing, and hunting.

Secord Impoundment, 895 acres, is classified as a medium size, medium depth impoundment. Medium size lakes are considered between 100 acres to 1000 acres and medium depth lakes are those that usually stratify. The maximum depth of Secord Impoundment is 47 feet, and roughly 25% is less than 15 feet or considered shoal. Since Secord is a fairly narrow impoundment, the river channel occupies much of the area.

The surrounding countryside is mostly level, forested land with some pasture land. Soils are generally sandy loams. The immediate shoreline is mostly level and soils are sandy loams. The shoals are sand, pulpy peat and gravel. The depths are pulpy peat and sand.

Limnological parameters measured in September, 2008 included temperature, oxygen, and pH (Table 1). Thermal stratification occurred at between 12 and 15 feet. No critical oxygen concentrations for fish (< 3 ppm) were observed. Alkalinity measurements were recorded as 133-170 ppm in 1987.

Aquatic vegetation, woody debris, and residential docks were the dominant form of fish cover in Secord Impoundment. Habitat was evaluated during the limnological survey in September 2008. One hundred and eighty three transects were analyzed covering approximately 36 miles of shoreline. This basically was all the navigable shoreline. There were 1,585 submerged trees, 1,593 small docks, 51 large docks, and 1,621 dwellings on the lake. Because of this fairly intense development, approximately 68% of the shoreline has been armored.

History

Secord Impoundment was created in 1925 when Frank Wixom constructed a series of dams on the Tittabawassee River. The dam was built in a high gradient area of the Tittabawassee River and is an earth/gravity dam. Secord project was last licensed under FERC in 1998 and is up for relicensing in 2028. Secord hydroelectric dam is listed as a high hazard dam which means that failure would result in potential loss of life and extensive property damage

The first stocking records recorded in the files indicate that Secord Lake was stocked from 1940 – 1944 with bluegill, from 1942-1944 with bass, in 1941 with perch, and in 1937, 1942 and 1944 with walleye fry. Channel catfish were stocked from 1963 to 1965. Northern pike were stocked annually from 1974 to 1988, and some of this coincided with the operation of a rearing marsh. There was also one record of a stocking of 44 adult white bass in Secord Impoundment in 1988 and most of the more recent fish stockings are tabulated from 1979 to the present (Table 2).

Management emphasis was on utilizing the large amount of suckers and minnows in the impoundment by stocking and enhancing the northern pike population. A pike spawning marsh was operated from 1974 to1988. Production ranged form 865 to 58,000. Pike management was discontinued due to poor growth of pike and the emphasis was shifted toward stocking northern muskellunge. Management for walleyes was also started in the mid 1980s and continues today. Stocking records are listed in Table 2.

The use of the rearing marsh for pike and muskellunge was discontinued because of a change in property ownership resulting in the loss of the downstream flowage easement. The control structure was removed.

Several surveys have been conducted over the years. Fisheries surveys were conducted in 1951, 1967, 1980, 1992 and 1998, and Serns electrofishing in 1992, 2000. Field notes on several surveys indicate that Secord Impoundment is difficult to net and assess because of the sharp drop-offs. Numbers of fish collected in all surveys have been somewhat low.

Current Status

Secord Impoundment was surveyed using a variety of gear types set forth in the Status and Trends protocol. Efforts included seining, boomshocking, trap netting, fyke netting, gill netting and limnology. The netting and boomshocking were conducted on 6/2/2008 and 6/17/2008 respectively, and the limnological survey was conducted on 08/29/2008. Water temperatures were around 70º F during netting, and the air temperatures were around 75 ºF. Each gear type is subject to certain biases and these must be considered when reviewing the survey catch. Trap and fyke nets were used to sample fish moving through the littoral zone. Experimental gill nets are designed to net fish in the deeper areas. Seine hauls are designed to net fish in the shallows and nursery areas and target young fish and some minnow species. Night electrofishing is designed to catch fish moving into the shallows at night, and typically samples both small and large fish. Collectively, the catch from all these gears allows for reasonable interpretation of the fish community.

A total of 2,283fish representing 18 species were collected from the survey efforts. Bluegill were the most abundant comprising 79 % of the total catch by number and 59% by weight (Table 3). Other fish species collected included brown and yellow bullhead, black crappie, largemouth bass, northern pike, pumpkinseed, rock bass, walleye, carp, white sucker, redhorse, bluntnose minnow, logperch, Iowa darter, golden shiner, and yellow perch.

A total of 1,793 bluegill averaging 6.2 inches comprised 59% of the total survey catch (Table 3). Bluegill ranged from 1 to 9 inches with 65 % of the fish meeting or exceeding the acceptable harvest size of 6 inches. Age-growth data indicates bluegills are growing 0.4 inches below State average (Table 4). Age distribution indicates sufficient recruitment with good representation of bluegill aged 2 through 9. Age 0 and 1 are under-represented in the survey catch and were not aged.

Only 14 black crappie averaging 6.9 inches comprised 0.6 % of the total survey catch (Table 3). Black crappie ranged from 4 to 12 inches with 29% of the fish meeting or exceeding the acceptable harvest size of 7 inches. Age-growth data indicates black crappie are growing slightly below State average having a mean growth index of -0.2 (Table 4). Age distribution indicates sufficient recruitment to the fishery with good representation of ages 1 to 5 fish. The timing of the survey may have influenced the number caught in the survey. Black crappie may have been in the deeper water and less vulnerable to the netting.

Pumpkinseed sunfish were relatively abundant in the survey catch, representing 2.8% by number (Table 3). Pumpkinseed ranged from 3 to 8 inches and averaged 6.1 inches. Sixty-two percent of the pumpkinseed caught would meet or exceed the acceptable harvest size of 6 inches. Age distribution indicates sufficient recruitment to the fishery and good representation of ages 2 to 9 fish. Pumpkinseed sunfish are growing 0.8 inches above state average.

Rock bass and yellow perch were also caught fair numbers. They appear to be present in large enough numbers and lengths acceptable to anglers. The 78 rock bass represented 3.4% of the survey catch. Seventy-one percent of the rock bass met or exceeded the acceptable harvest size of 6 inches. Rock bass are growing 0.8 inches below state average even though they are reaching desirable sizes.

Yellow perch were represented by 4 year classes and were growing 0.9 inches below State average.

Only 19 largemouth bass averaging 12.9 inches comprised 0.8 % of the total catch (Table 3). Largemouth bass ranged from 3 to 20 inches with 47% meeting or exceeding the minimum harvest size of 14 inches. Age-growth analysis indicates largemouth bass are growing above State average having a mean growth index of +0.9 inches (Table 4). Age distribution indicates multiple year classes make up the harvestable sport fishery with representation of fish up to 12 years of age.

Only 16 northern pike were captured representing 0.7% of the survey catch (Table 3). Northern pike ranged from 12 to 33 inches and averaged 21.4 inches. Twenty-five percent of the northern pike meet or exceed the minimum harvest size of 24 inches. Northern pike were represented by age classes 1-6. Inadequate numbers of pike were captured to calculate a growth index.

Yellow and brown bullhead were the most abundant non-sportfish species collected. A total of 107 bullhead comprised 4.7% of the total catch (Table 3). Bullhead average between 10 and 11 inches in length, and almost all are of acceptable angling size. Other non-sportfish species collected in low abundance included white sucker, carp, and golden shiner.

No white bass or white crappie were captured in the survey. White bass were stocked in 1988 and none have ever been captured in subsequent surveys. White crappie were captured in fish surveys in both 1992 and 1995.

Analysis and Discussion

In lower Michigan warmwater lakes, bluegill are often one of the more abundant fish species present and play a key role in community structure and overall sportfishing quality (Schneider 1981). Schneider (1990) suggests indices of bluegill characteristics can be used to classify populations. The "Schneider Index" uses size scores of length frequency and growth data and relates them to an adjective ranking system ranging from "very poor" to "superior". Using the Schneider Index for classifying bluegill populations, Secord Impoundment scored 4.25 or “satisfactory-plus” (Table 5). This is good size structure in comparison to lakes in the area.

Black crappie appear to be a lesser component of the sport fishery in Secord Impoundment, but the timing may be under-representing their abundance. Size structure and average length indicate an acceptable size but abundance appears low. The absence of white crappie in the survey catch is not different from what we have found in other surveys of large impoundments that are clarifying as a result of zebra mussels. It appears that the conditions in the impoundments are currently favoring black crappie. Numbers of crappie were lower overall, but this may be due to survey timing as anglers are not complaining.

Northern pike were only captured in low numbers. There appears to be adequate spawning habitat available. The late timing of the survey definitely influenced the survey catch as pike are most vulnerable immediately following ice out and then become increasingly difficult to catch as the water gets warmer.

Catches of walleye and muskellunge in netting and shocking surveys has been consistently low. Much of this is probably due to the timing of the surveys and the morphometry of the lake. If the surveys were conducted immediately after ice-out, then more muskellunge would be expected in the catch. Due to the steep drop-offs, setting nets and electrofishing is even difficult. Angler reports do indicate regular catches of walleye and occasional catches of muskellunge. If a more targeted survey can be conducted, perhaps a more accurate evaluation can be made.

Largemouth bass appear very healthy and are growing well in Secord Impoundment. Bass are growing above State average and their population is well represented by 8 year classes. Bass abundance appears low but this may be due to timing. No smallmouth bass were captured.

Management Direction

Presently, Secord Impoundment is in good condition in terms of its overall fishery. The Impoundment offers very good angling opportunities for several species including bluegill, pumpkinseed sunfish, black crappie, largemouth bass, and northern pike, walleye, and the occasional trophy muskellunge. Additional opportunities are available for yellow perch, the occasional rock bass, and non-game species.

Fisheries management of Secord Impoundment should continue to focus on warm and coolwater species. Sustainable populations of largemouth bass, northern pike, and bullheads as top predators will help maintain an improved bluegill size structure. Presently, these species occur in sufficient numbers and size and no management actions are directed toward them.

Secord Impoundment has a fairly long history of stocking northern muskellunge and walleye but survival has been difficult to assess. The impoundment has very steep drop-offs. Netting and electrofishing have not yielded high catches of either walleye or muskellunge. Angler reports do document catches of both species. Future management should focus on documenting these fisheries. If these species fail to become established and can not be documented by surveys, then serious consideration should be given to eliminating the stocking programs.

At present time walleyes should continue to be stocked at 45 per acre or 40,000 spring fingerlings triennially. Likewise, northern muskellunge should be stocked at roughly 2 per acre or 1600 fall fingerlings triennially.

References

MDNR (Michigan Department of Natural Resources). 1996. Michigan Boat Launch Directory, 1996. Michigan Department of Natural Resources, Lansing.

Schneider, J.C. 1981. Fish communities in warmwater lakes. Michigan Department of Natural Resources, Fisheries Division, Fisheries Research Report 1890, Ann Arbor, Michigan.

Schneider, J.C. 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Division, Fisheries Technical Report No. 90-10, Ann Arbor, Michigan.

Figure 1. Map of Secord Impoundment, Gladwin County

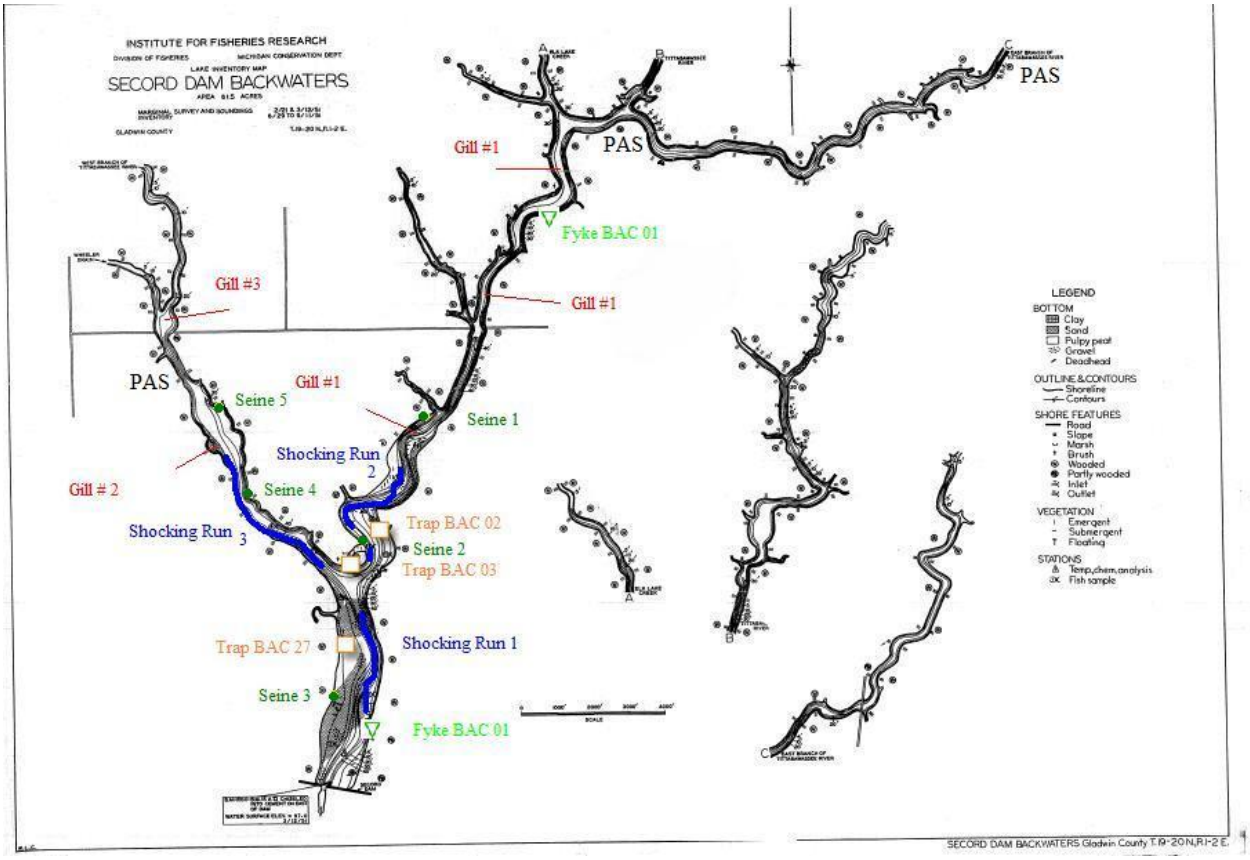

Table 1. Limnological Parameters of Bass Lake, August 28, 2008

Temp	SpCond	DO Conc	Depth	pH
F	uS/cm	mg/L	ft	
73.33	355	12.07	0.025	7.8
72.99	355	12.13	3.192	7.77
72.86	356	12.05	6.084	7.72
72.63	356	11.82	9.086	7.67
72.29	356	11.37	12.06	7.63
69.67	362	11.31	15.039	7.49
66.74	352	8.97	18.126	7.33
63	340	7.1	21.105	7.22
59.6	348	5.1	24.039	7.13
55.95	355	4.23	27.035	7.09
52.59	341	3.43	30.163	7.03
50.57	332	2.8	33.09	6.97
49.34	329	2.52	36.1	6.93
47.95	325	2.35	39.064	6.89
47.45	325	2.26	42.15	6.87
46.44	329	2.13	45.154	6.82
46.49	343	1.93	47.108	6.83

Table 2. Stocking records for Secord Impoundment, 1979 to 2008.

Species ***Strain***	**Date**	**Number**	**Avg. Length (in.)**	**Operation**
Northern pike	5/31/1979	30,000	0	Marsh & Rearing Pond Release
Northern pike	6/5/1980	12,000	0	Marsh & Rearing Pond Release
Northern pike	6/24/1981	1,500	5.84	Marsh & Rearing Pond Release
Northern pike	6/10/1982	25,000	3.4	Marsh & Rearing Pond Release
Northern pike	6/8/1983	10,000	3.76	Marsh & Rearing Pond Release
Northern pike	6/4/1984	4,080	3.8	Marsh & Rearing Pond Release
Walleye	7/3/1984	13,185	2	Marsh & Rearing Pond Release
Walleye	7/5/1984	5,337	2.32	Marsh & Rearing Pond Release

Walleye	7/5/1984	12,917	2.84	Marsh & Rearing Pond Release
Northern pike	6/4/1985	5,820	3.32	Marsh & Rearing Pond Release
Northern pike	6/5/1986	7,500	3.36	Marsh & Rearing Pond Release
Northern pike	5/28/1987	865	2.68	Marsh & Rearing Pond Release
White bass	5/23/1988	44	12.24	Transplant of Wild Fish
Northern pike	6/6/1988	8,085	4.56	Marsh & Rearing Pond Release
Walleye *Bay De Noc*	6/23/1992	24,816	2	Marsh & Rearing Pond Release
Muskellunge *Northern*	6/1/1994	2,000	2.04	Marsh & Rearing Pond Release
Walleye *Muskegon*	6/22/1994	24,992	1.76	Marsh & Rearing Pond Release
Muskellunge *Northern*	5/11/1995	86,000	0.56	State Plant
Muskellunge *Northern*	6/6/1995	100	3.04	Marsh & Rearing Pond Release
Walleye *Muskegon*	6/17/1995	49,600	1.84	Marsh & Rearing Pond Release
Muskellunge *Northern*	6/29/1996	100	3.04	Marsh & Rearing Pond Release
Muskellunge *Northern*	6/23/1997	2,000	3.2	Marsh & Rearing Pond Release
Muskellunge *Northern*	9/23/1997	1,567	11.4	State Plant
Walleye *Muskegon*	6/6/1998	39,187	1.44	Marsh & Rearing Pond Release
Walleye *Tittabawassee*	5/31/2000	98,505	1.28	Marsh & Rearing Pond Release
Muskellunge *Northern*	6/13/2000	6,300	0.96	State Plant
Muskellunge *Northern*	6/22/2001	1,752	3.24	Marsh & Rearing Pond Release
Muskellunge *Northern*	10/16/2001	1,600	12.2	State Plant
Walleye *Tittabawassee*	6/19/2002	21,735	1.36	Marsh & Rearing Pond Release
Muskellunge *Northern*	7/3/2003 11:43:00 AM	858	3.048	Marsh & Rearing Pond Release
Muskellunge *Iowa*	11/18/2003 11:24:00 AM	2,558	9.832	State Plant

Walleye *Tittabawassee*	6/16/2004 1:33:00 PM	35,040	1.452	Marsh & Rearing Pond Release
Muskellunge *Northern*	10/18/2005 11:24:00 PM	1,600	10.16	State Plant
Walleye *Tittabawassee*	6/9/2006 11:10:00 AM	43,130	1.676	Marsh & Rearing Pond Release
Muskellunge *Northern*	11/6/2008 11:59:00 AM	1,600	11.04	State Plant

Table 3. Secord Impoundment number length and weight by species.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)*	Average length (in.)	Percent legal size**
Black crappie	14	0.6	3.2	0.6	4-12	6.9	29
Bluegill	1,793	78.5	330.4	59.3	1-9	6.2	65
Bluntnose minnow	12	0.5	0.1	0	2-3	2.6	--
Brown bullhead	29	1.3	23.9	4.3	8-14	11.9	100
Common carp	3	0.1	25.6	4.6	24-27	26.5	100
White sucker	4	0.2	3.1	0.6	11-13	12.5	100
Golden redhorse	2	0.1	4.6	0.8	16-20	18.5	100
Golden shiner	5	0.2	0.2	0	3-6	4.9	--
Iowa darter	3	0.1	0	0	2	2	--
Johnny darter	11	0.5	0.1	0	2	2	--
Largemouth bass	19	0.8	26.9	4.8	3-20	12.9	47
Logperch	3	0.1	0	0	3	3	--
Northern pike	16	0.7	43.4	7.8	12-33	21.4	25
Pumpkinseed	63	2.8	13.7	2.5	3-8	6.1	62
Rock bass	78	3.4	19.3	3.5	2-9	6.5	71
Walleye	2	0.1	10.3	1.8	24-25	25	100
Yellow Perch	148	6.5	3.1	0.6	2-9	3.6	1
Yellow bullhead	78	3.4	49	8.8	7-13	10.8	100
All species totals:	**2,283**		**556.8**				

**Legal or acceptable size to anglers

Table 4. Weighted Mean Length and Age Composition, Secord Impoundment Survey 2008.

Species / Age	No. aged	Length range (in.)	State avg.length (in.)	Weighted mean length (in.)	Weighted age frequency	Mean growth index
Black crappie						-0.2
Age I:	2	4.9-5.7	4.8	5.17	21.43%	
Age II:	6	6-6.6	6.5	6.27	42.86%	
Age III:	3	6.6-7.5	7.9	7.17	21.43%	
Age IV:	1	9.2-9.2	8.9	9.2	7.14%	
Age V:	1	12.2-12.2	9.7	12.2	7.14%	
Bluegill						-0.4
Age II:	10	3.2-3.9	4.2	3.53	3.90%	
Age III:	7	4.7-5.5	5.3	5.11	5.42%	
Age IV:	14	4.6-6.5	6.2	5.88	31.74%	
Age V:	9	5.4-7.8	6.9	6.54	28.44%	
Age VI:	9	6.3-8.2	7.4	6.83	22.03%	
Age VII:	6	7.9-8.3	8	7.94	5.38%	
Age VIII:	2	7.5-8.5	8.4	7.57	2.51%	
Age IX:	4	8.1-9.2	8.7	8.3	0.58%	
Largemouth bass						+0.9
Age I:	1	3.3-3.3	5.4	3.3	5.26%	
Age II:	2	8.7-9.1	8.7	8.86	13.16%	
Age III:	1	8.3-8.3	10.6	8.3	7.89%	
Age IV:	5	11.2-14.7	12	12.94	26.32%	
Age V:	4	12.5-16	13.7	14.43	21.05%	
Age VI:	3	14.8-15.2	15	15.03	15.79%	
Age VII:	2	17.2-17.5	16.7	17.35	5.26%	
Age XII:	1	20.8-20.8		20.8	5.26%	
Northern pike						--
Age I:	4	12.7-14.8	14.5	13.38	25.00%	
Age II:	2	19.2-23.5	19	20.92	10.42%	
Age III:	4	18.3-23.6	21.8	20.71	22.92%	
Age IV:	2	23-24	24.2	23.6	10.42%	
Age V:	1	33.1-33.1	26.1	33.1	6.25%	
Age VI:	4	21.9-30.4	27.8	25.93	25.00%	
Pumpkinseed						+0.8
Age II:	15	3.6-5.3	4.2	4.21	22.38%	
Age III:	12	5.1-6.4	5.2	5.77	23.94%	
Age IV:	6	6-6.7	5.8	6.4	16.45%	
Age V:	9	6.4-8.2	6.3	7.36	21.36%	
Age VI:	5	7.5-8	6.8	7.61	12.46%	
Age VII:	1	7.9-7.9	7.2	7.9	3.02%	
Age IX:	1	8.2-8.2		8.2	0.40%	
Rock bass						-0.8

Age II:	4	3.5-3.8	4.3	3.63	5.48%	
Age III:	10	4-5.3	5.4	4.74	13.70%	
Age IV:	4	4.9-5.8	6.4	5.33	5.48%	
Age V:	7	6.1-7.7	7.2	6.9	20.00%	
Age VI:	12	6-8.7	8.1	7.03	30.41%	
Age VII:	7	7.2-8.8	8.8	7.91	13.84%	
Age VIII:	3	7.8-10.3	9.4	8.46	4.79%	
Age IX:	4	8.7-9.4		8.94	5.21%	
Age X:	1	9.7-9.7		9.7	1.10%	
Walleye						--
Age VIII:	1	24.5-24.5	21.7	24.5	50.00%	
Age X:	1	25.2-25.2	23.1	25.2	50.00%	
Yellow Perch						-0.9
Age I:	13	3-4.3	4	3.43	85.27%	
Age II:	9	4.1-5.1	5.7	4.55	11.68%	
Age III:	3	5-5.6	6.8	5.3	2.29%	
Age IV:	1	9.5-9.5	7.8	9.5	0.76%	

Table 5.-Secord Impoundment bluegill classification using trap net data and the Schneider Index (Schneider 1990). Size score is given in parentheses

Sample date	6/02/2008
Sample size	1360
Average length (inches)	6.4 (4)
% $\geq$ 6 inches	69 (4)
% $\geq$ 7 inches	27.4 (4)
% $\geq$ 8 inches	2.0 (5)
Schneider Index	4.25
Rank[1]	Satisfactory