



Summary of Fishery Surveys Chequamegon Waters Flowage (Miller Dam), Taylor County, 2010

WDNR's Fisheries Management Team from Park Falls completed fyke netting and electrofishing surveys in spring and fall 2010 to assess the status of important fish populations in Chequamegon Waters Flowage, locally known as Miller Dam. With ice still covering lower portions of the flowage we set 8 fyke nets in the upper third and fished them for two nights on March 29-31, resulting in 15 net-nights of effort. Early spring fyke nets targeted northern pike, but netting also yielded useful information on black crappie, bluegill, and yellow perch populations.

On May 24 two crews completed an electrofishing survey to evaluate abundance and size structure of largemouth bass and bluegill populations. We sampled 5.2 miles of shoreline in 2.7 hours, including 2 miles sub-sampled for panfish in 1.1 hours. We experienced unusual late spring weather conditions on the day of our electrofishing survey. With daytime air temperature exceeding 90°F, water temperature undoubtedly rose suddenly and rapidly, ranging from 72 to 77°F during the survey. Stained, turbid water impaired our ability to see spawning and nesting activities of bass and bluegill deeper than 16 inches. No nests, nest colonies, eggs, spawning pairs, or guarding males were observed.

On October 4-5 we fished six fyke nets at our fall 2006 sites and two nets at new sites for a total of 8 net-nights of effort directed toward black crappie. Quality, preferred, and memorable sizes referenced in this summary are based on standard proportions of world record lengths developed for each species by the American Fisheries Society. "Keeper size" is based on known angler behavior.

Habitat Characteristics

Chequamegon Waters Flowage is a 2714-acre impoundment on the Yellow River and the largest waterbody in Taylor County. Maximum depth is 22 feet, average depth is 5 feet, and 39% of the reservoir is less than 3 feet deep. Bottom materials in the shallow area near shore are mostly muck (80%) with smaller amounts of sand (10%) and gravel (10%). The fine particles underlying extensive portions of the reservoir provide substrate for larval insects (important food for many fish species), wild rice, and 27 other aquatic plant species. Tannins, lignins, and other organic compounds draining from wetlands contribute brown-stained water to the Flowage. Abundant algae can contribute to low water clarity during the open-water season. Low water clarity inhibits light penetration and limits the maximum depth where rooted aquatic plants can grow (6 feet in Miller Dam). The Flowage is classified as highly eutrophic. Eutrophic waters are enriched with nutrients, making them very fertile and productive biologically. Lasting thermal stratification is rare in such a shallow wind-swept reservoir, but during calm periods in summer the lower 6 to 10 feet of the water column often have reduced dissolved oxygen levels.

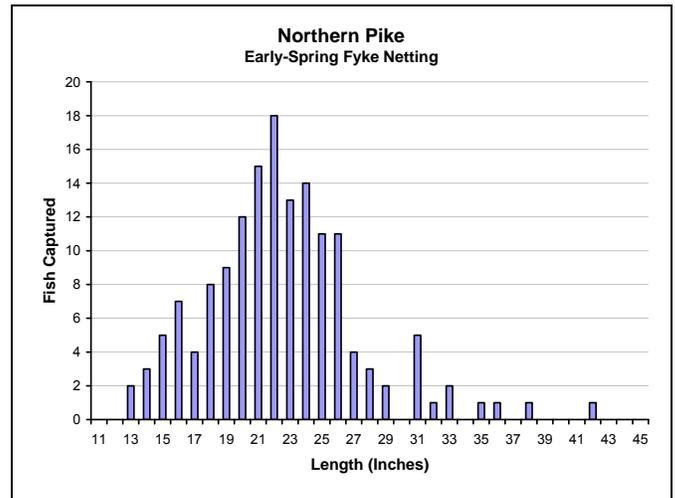
Summary of Results

We did not estimate northern pike density in 2010, so we do not have a measure for comparison with the desired low-moderate population density of 2 to 3 adult northern pike per acre in spring population estimates. At twice the 2009 capture rate in Chippewa Flowage's west basin, our early spring 2010 capture rate of 11 pike ≥ 14 inches per fyke net-night probably reflects moderate to high northern pike abundance in Miller Dam. Our measures of population size structure exceeded Fishery Management Plan objectives. Eleven percent of pike ≥ 14 inches in early spring fyke nets attained preferred size ≥ 28 inches long (Goal: 5 – 10%) and nearly 3% reached memorable size at least 34 inches long (Goal: 1 – 2%). Because the population meets or exceeds the objectives, current management strategies for northern pike under statewide harvest regulations appear to be adequate, and no changes are anticipated at this time.

Northern Pike



Captured 11 per net-night ≥ 14 "	
Quality Size ≥ 21 "	68%
Preferred Size ≥ 28 "	11%
Memorable Size ≥ 34 "	2.7%



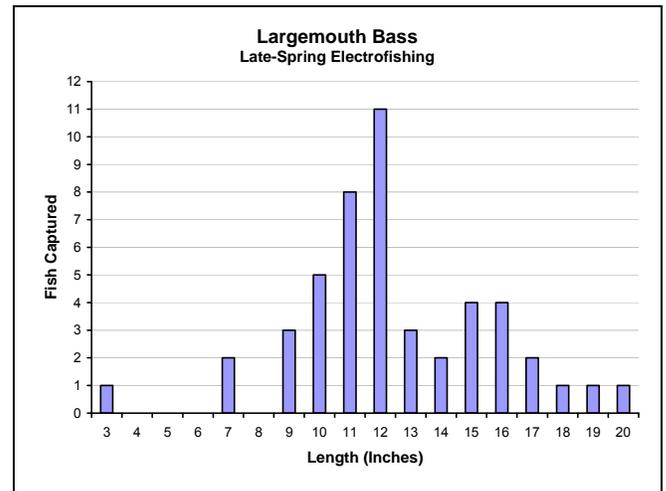
Predation by northern pike is known to influence the structure of fish communities that include largemouth bass and panfish in shallow, productive waters with adequate flooded vegetation for spawning and recruitment—conditions nearly identical to those in Miller Dam. Our surveys suggest that predation by northern pike has affected recruitment in largemouth bass and yellow perch populations, resulting in the low bass abundance (see below) and a nearly collapsed perch population. Despite vegetation and water clarity conditions that should favor their successful reproduction and recruitment, we captured only a handful of perch up to 8.5 inches in early spring fyke nets (1.2 per net-night ≥ 5 inches) and by electrofishing (5 per mile ≥ 5 inches). Yellow perch, the preferred prey of northern pike, may be largely responsible for favorable proportions of preferred- and memorable-size pike in Miller Dam.

In turn, northern pike, which eat more perch and possibly larger perch in relation to their own increasing size, are the probable cause of poor recruitment, very low abundance, and poor size structure of the yellow perch population. Young perch are important food for other fishes, and their scarcity may partially account for slower-than-average growth of largemouth bass and black crappies. Predation by northern pike apparently did not reduce the abundance or the size structure of the bluegill population, probably because pike strongly prefer long, slender prey and avoid eating fish shaped like bluegills and crappies.

Largemouth Bass



Captured 8.6 per mile or 17 per hour $\geq 8''$	
Quality Size $\geq 12''$	64%
Preferred Size $\geq 15''$	29%
Memorable Size $\geq 20''$	2.2%



Stakeholder-driven objectives in our 2006 Fishery Management Plan reflect a desire for a largemouth bass population at moderate density with some fish available in the memorable size range (20 inches and longer). Our electrofishing capture rate of 17 largemouth bass ≥ 8 inches per hour was lower than expected and below the range of 40 – 60 bass/hour selected to represent moderate abundance.

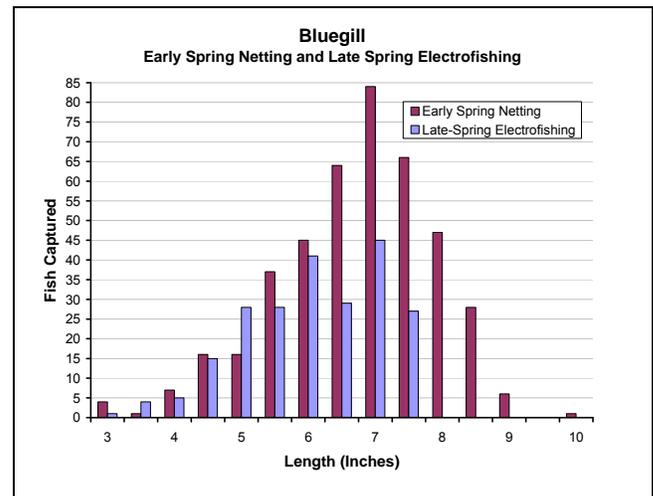
Nighttime electrofishing in early fall is considered a legitimate method to sample bass of all sizes in shallow reservoirs, like Miller Dam, with reduced water clarity, ample cover near shore, and little or no deep-water structure. Electrofishing capture rates for largemouth bass ≥ 8 inches long were 36 and 38 per hour in September 1998 and 2002, respectively. Miller Dam's shallow, gradually-sloping reservoir basin may have influenced our springtime measure of abundance if bass were broadly distributed over expansive areas of equally suitable spawning habitat, rather than concentrated near shore where more would be vulnerable to our electrofishing gear as they are in steeper-sloping basins. However, in light of northern pike's population status and their known influence in structuring bass populations by predation, we believe our late spring 2010 electrofishing sample reasonably represents a low largemouth bass population density. Another indirect indicator of low bass density was our high capture rate of yellow bullheads (130 per net-night) in fall fyke nets, most of which were 9 – 12 inches long. In lakes with even moderate densities of largemouth bass, bullheads (a preferred prey of bass) are scarce. We may need to revise the Management Plan's objective to a more realistic level of largemouth bass abundance if northern pike remain predominant in the fish community.

Consistent with the findings of published studies, predation by northern pike apparently reduced largemouth bass recruitment and abundance without decreasing population size structure. Nearly 29% of the largemouth bass 8 inches and longer were at least 15 inches long in late spring 2011, and the proportion of memorable-size bass ≥ 20 inches long (2.2%) lies just within the desired range (2 – 4%). Unlike many other waters with low abundance of largemouth bass (and less within-species competition for food), bass growth rate in Miller Dam was slow. Age analysis using scales shows that on average bass grew to 11.9 inches in 5 years, almost attaining the minimum harvestable length (14 inches) in 6 years. At ages 5 and 6 largemouth bass in Miller Dam were 1.1 inches shorter than those in other northwestern Wisconsin populations. Slow growth at Miller Dam may be due to intense competition for the most preferred prey (perch) between bass and pike, fewer crayfish than exist in lakes with rockier substrate, disruption of feeding behavior by a high-pressure catch-and-release fishery, and greater energy expenditure to find food and evade predation in a lake basin with relatively little structural habitat diversity.

Bluegill



Fyke netting—March 29-31, 2010	
Captured 96 per net-night $\geq 3''$	
Quality Size $\geq 6''$	81%
Keeper Size $\geq 7''$	55%
Preferred Size $\geq 8''$	19%
Electrofishing—May 24, 2010	
Captured 109 per mile or 206 per hour $\geq 3''$	
Quality Size $\geq 6''$	64%
Keeper Size $\geq 7''$	32%
Preferred Size $\geq 8''$	0%



Bluegills were abundant along 2 miles of sub-sampled shoreline. Our electrofishing capture rate of 206 bluegills ≥ 3 inches per hour was above the range (75 – 150) considered to be somewhat indicative of the desired moderate density. Despite their abundance bluegill grew to 8 inches in 7 years—a half inch longer than the regional average length at age 7. Satisfactory growth is probably attributable to abundant food, mainly insect larvae like midges and phantom midges, produced in the reservoir's vast shallow mud flats. Northern pike in general and largemouth bass at low density in large, relatively turbid reservoirs like Miller Dam are ineffective in controlling bluegill abundance by predation. Therefore, we believe it is exceptionally high food production that has allowed even large numbers of bluegills to grow quickly to angler-preferred sizes.

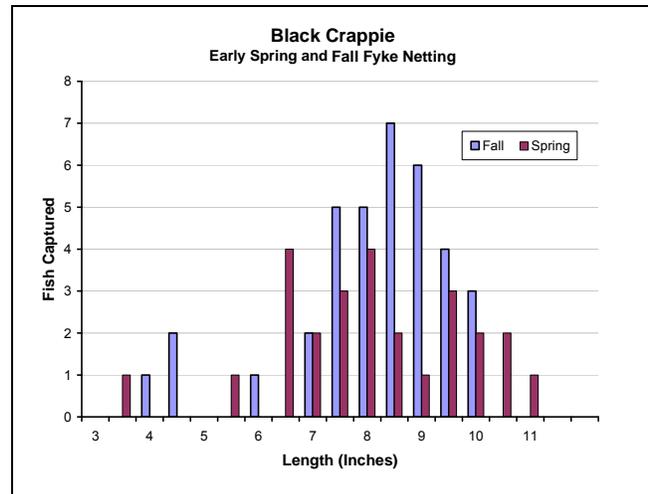
For reasons unclear to us, early spring fyke nets captured substantial numbers of bluegills ≥ 8 inches that were not represented in our May 24 electrofishing sample. Most of these preferred-size fish were probably males that were not yet ready to begin building nests in shallow water on May 24; but mature males usually roam the shallows and feed alongside smaller bluegills during this pre-spawn period. (Could Miller Dam be different because of the rich food supply over mid-lake mud flats?) Regardless of unexplained sampling bias, our fyke net sample demonstrates that Miller Dam Flowage has a relatively high proportion of bluegills large enough to attract considerable angling interest.

To attain our 2006 Management Plan objectives, 15 – 20% of bluegills ≥ 3 inches should be 8 inches or longer (true only in fyke nets), and 1 – 2% should be at least 10 inches long (not true of either gear type). Under moderate to heavy fishing pressure for panfish year round, anglers are probably selectively harvesting the largest bluegill in the population. Sustaining quality fishing may eventually require more restrictive harvest regulations to decrease exploitation of preferred- and memorable-size bluegill.

Black Crappie



March 29-31, 2010	
Captured 3.8 per net-night $\geq 5''$	
Quality Size $\geq 8''$	60%
Preferred Size $\geq 10''$	20%
October 4-5, 2010	
Captured 4.1 per net-night $\geq 5''$	
Quality Size $\geq 8''$	76%
Preferred Size $\geq 10''$	9%



Similar capture rates for black crappie ≥ 5 inches in spring and fall 2010 nets (3.8 and 4.1 per net-night) were three times lower than the same measure in fall 2006 and well below the Fishery Management Plan's objective of 10 – 20 per net-night. Early spring and fall 2010 fyke nets included crappie from all expected size and age classes, suggesting crappie fishing opportunities should be uninterrupted at various levels of abundance for several years. The proportion of preferred-size crappie ≥ 10 inches in fall 2010 nets (9%) declined from 15% in fall 2006 and fell short of the performance standard for population size structure (30 – 50%). Age analysis using scales taken in fall 2010 revealed that crappies grew to 8 inches long in 4 years and 10 inches in 7 years—0.1 and 0.6 inch less than the regional average length at those ages. Crappie starting the year 8 – 10 inches long grew on average only 0.7 inch (range = 0.4 – 1.2) by the end of the growing season, an annual gain considered insufficient to sustain the desired proportion of preferred-size fish before the oldest crappie succumb to angling or natural causes of mortality. It is unclear why mid-size crappies are growing slower than average in a lake where bluegills are growing faster than average, considering these species often share the same food resources.

Our results reflect the cyclic nature of crappie populations whose abundance can vary with reproductive success and decline abruptly when anglers selectively harvest a high percentage of the largest adults. Fluctuations in crappie abundance related to harvest will probably continue under moderately heavy fishing pressure at Miller Dam, but more restrictive harvest regulations could help to improve population size structure and distribute the harvest more equitably among anglers and years.

A single 15-inch walleye in fall nets and reports from anglers who have been catching young walleye serve as early indicators of the lake association's recent investment in stocking large fingerlings annually since 2008 to establish and maintain a bonus walleye fishery. Scheduled surveys in 2013 and 2014 should provide a fair evaluation of the walleye stocking strategy after several year classes mature and become vulnerable to capture in early spring fyke nets.

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