Summary of Fishery Surveys
Upper Flambeau River Flowages, Price County, 2016 – 2017

WDNR's Fisheries Management Team from Park Falls completed three electrofishing surveys in 2016 and 2017 to assess the status of important fish populations in Upper Park Falls Flowage, Lower Park Falls Flowage, Pixley Flowage, and Crowley Flowage, collectively known as the Upper Flambeau River Flowages. Attempting to better characterize spawning fish populations that may move upstream from impounded to free-flowing river segments, we replaced our traditional early spring fyke netting surveys with fall and early spring electrofishing surveys that targeted adult northern pike, walleye, yellow perch, and muskellunge. Our fall electrofishing surveys also evaluated the first-summer survival and growth of naturally-produced walleye and muskellunge. We did not repeat the fyke netting surveys that yielded few black crappies in fall 2010. A late-spring electrofishing survey documented the abundance and size structure of smallmouth bass and bluegill populations, though we dip-netted all panfish in all surveys. 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 our own description applied to bluegill ≥ 7 inches long and black crappie ≥ 9 inches long, based on known angler behavior.

Survey Effort

	Late spring electrofishing May 30 - Jun 8, 2017				Early spring electrofishing Apr 3 - 6, 2017				Fall electrofishing Sep 19 - Oct 4, 2016			
	57.0 - 70.4°F				40.7 - 44.6°F				61.4 - 66.6°F			
	Gamefish		Panfish		Gamefish		Panfish		Gamefish		Panfish	
	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours
Upper Park Falls	3.00	1.42	1.00	0.53	4.00	1.50	4.00	1.50	3.00	1.30	3.00	1.30
Lower Park Falls	3.80	1.70	2.30	1.05	3.74	1.40	3.74	1.40	3.47	1.48	3.47	1.48
Pixley	3.00	1.40	0.50	0.22	2.00	0.93	2.00	0.93	3.00	1.57	2.00	1.10
Crowley	3.00	1.20	0.50	0.20	4.00	1.75	4.00	1.75	3.00	1.47	2.00	1.00
Combined	12.80	5.72	4.30	2.00	13.74	5.58	13.74	5.58	12.47	5.82	10.47	4.88

The shoreline distances sampled in our electrofishing surveys followed the standards we adopted based on lake size. Our fall 2016 survey followed the shoreline routes established in spring 2011. Early spring 2017 electrofishing occurred within several days of ice-out along both shorelines in the upstream-most portion of each impoundment. Beginning near the base of the upstream dam or rapids, we dip-netted gamefish and panfish for two shoreline miles, returned to the starting point, and duplicated the sample on the opposite shore. Our early spring survey in Pixley Flowage was curtailed when our outboard struck a submerged rock on the upstream return. Our electrofishing circuits along Lower Park Falls Flowage's entire shoreline began and ended near its dam in all surveys, and we noticed that our

fish capture efficiency decreased slightly while electrofishing in the upstream versus downstream direction, especially in early spring when discharge was higher than average. For our late spring 2017 surveys in Pixley and Crowley flowages we adjusted the electrofishing routes that were first delineated in spring 2011, so that we could sample targeted populations more effectively and avoid the deep, steeply-sloping shoreline segments where fish were seldom seen, stunned, or captured in earlier surveys.

In most cases, our survey effort occurred within the range of water temperature at which the targeted adult population would be most vulnerable to our capture gear. However, early spring electrofishing ended before muskellunge spawned, so those samples probably do not fully represent adult population status. We delayed the traditional start of our late spring surveys until water temperature approached the optimal range (55-70°F). Bluegills typically do not spawn until water temperature reaches 70°F, but we expect that adult bluegills were staged in shallow water or building nests when we completed our electrofishing surveys. Electrofishing samples should adequately reflect the status of smallmouth bass whose spawning activities can be triggered by variable temperature thresholds.

Background and Habitat Characteristics

Four earthen dams, built in the late 1800s and early 1900s to provide mechanical power for sawing and grinding and later converted for hydroelectric generation, form a series of narrow riverine impoundments on the North Fork Flambeau River, near Park Falls, WI. Renewable World Energies, L.L.C., an affiliate of the licensee, Flambeau Hydro, L.L.C., owns and operates the hydroelectric projects under authority granted by the Federal Energy Regulatory Commission. The four hydropower projects produce electricity in a "run-of-river" operational mode, maintaining a near-constant reservoir elevation by closely matching inflow and discharge. WDNR staff completed comprehensive fishery surveys in the Upper Flambeau River Flowages in 1989 – 1992 for the environmental review of the hydroelectric projects' license renewal applications. Searchable information on project features, operational constraints, fishery survey results, and measures for natural resource protection is available on the Commission's e-Library at www.ferc.gov.

	Upper Park Falls	Lower Park Falls	Pixley	Crowley
River mile (upstream from mouth)	93.6	91.6	87.0	81.4
Surface area (acres)	431	71	334	422
Shoreline length (miles)	15.4	4.2	8.1	16.2
Authorized reservoir elevation (feet MSL)	1,487.4 ± 0.25	1,468.0 ± 0.25	1,448.7 ± 0.25	1,428.0 ± 0.25
Maximum depth (feet)	17	16	23	23
Mean depth (feet)	8	8	5	8
Volume (acre-feet)	3,279	571	1,757	3,539
% Surface area < 3 feet deep	24	2.5	15	21

		Upper Park Falls	Lower Park Falls	Pixley	Crowley
Substrate	Rock	45	70	70	15
	Gravel	--	5	5	--
	Sand	50	--	15	--
	Muck	5	25	10	85
Mid-summer Secchi depth (feet)		3.5	--	3	3
Trophic state		eutrophic	eutrophic	eutrophic	eutrophic
Public boat landings		3	1	2	1
Capacity (kilowatts)		900	1,200	960	1,500
FERC Project No.		P-2640	P-2421	P-2395	P-2473

It appears that some lowland forested areas were left intact with standing timber when they were flooded after dam construction, and as a result submerged and partially submerged woody structure is plentiful, especially in shallow bays. Low water clarity indicates high nutrient concentrations and high biological productivity—water quality characteristics that allow us to classify the Upper Flambeau River Flowages as eutrophic. For decades wood fiber and wastewater discharged to the upper reaches of the Flambeau River from paper and lumber manufacturing industries near Park Falls severely degraded water quality, often resulting in extensive fishkills. Though water quality has improved with mandated advances in wastewater treatment in the 1970s and 1980s, evidence of past practices persists in deep deposits of contaminated organic sediments in Lower Park Falls, Pixley, and Crowley flowages. In its publication, *Choose wisely – 2014, A health guide for eating fish in Wisconsin,* WDNR offered specific advice that people of certain age and gender should limit their consumption of fish from these waters.

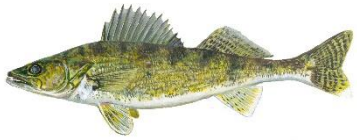
Each impoundment has a canoe portage and at least one public boat landing. The City of Park Falls, Price County, and the hydropower licensee maintain various recreational facilities, including campgrounds, parks, pavilions, trails, and shorefishing piers. Shoreland condition varies considerably with segments developed for seasonal and year-round homes, the paper manufacturing industry, an airport, and a golf course. However, much of the shoreline remains in a near-natural state.

Summary of Results

Spring and fall electrofishing captured 18 fish species in 2016 and 2017. Though not intended to characterize fish community diversity, our samples collectively had most of the species we would expect to find in northern Wisconsin impoundments. Electrofishing captured no golden redhorse and no lake sturgeon that we found in past gillnetting, fyke netting, and electrofishing surveys. Even after adjusting some of our survey protocols and sampling sites from those we last used, our sample sizes were still quite small, despite the favorable timing to intercept most targeted species. Nonetheless, we can cautiously use this information to help anglers catch fish and to guide our fishery management decisions until we can find appropriate methods to efficiently assess sportfish population status in riverine systems. With funding earmarked for fishery investigations in these flowages, extensive netting and electrofishing effort produced larger samples of all fish species in spring, summer, and fall 1989–1992, including estimates of population density for several gamefish. It's unlikely that we could repeat such far-reaching evaluations at 6-year frequency under our normal budget and staffing constraints.

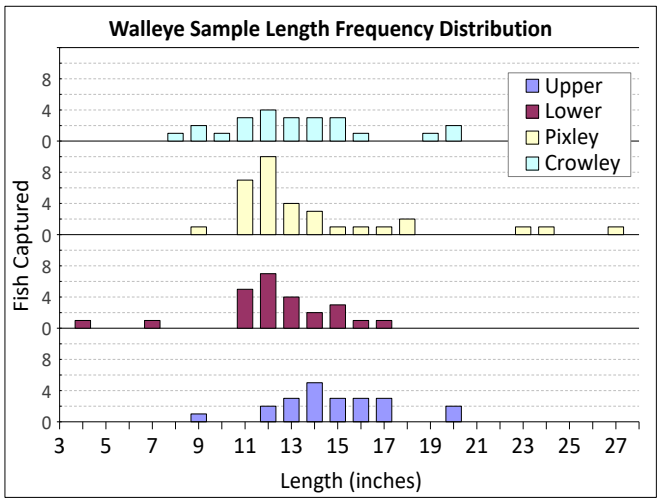
Illustrations by Virgil Beck

Walleye



Early Spring Electrofishing

	Number per mile ≥ 10"	Number per hour ≥ 10"	Quality Size ≥ 15"	Preferred Size ≥ 20"	Memorable Size ≥ 25"
Upper Park Falls	5.3	14	52%	10%	0%
Lower Park Falls	6.1	16	22%	0%	0%
Pixley	16	34	25%	9%	3%
Crowley	5.3	12	33%	10%	0%
Combined	7.1	17	32%	7%	1%

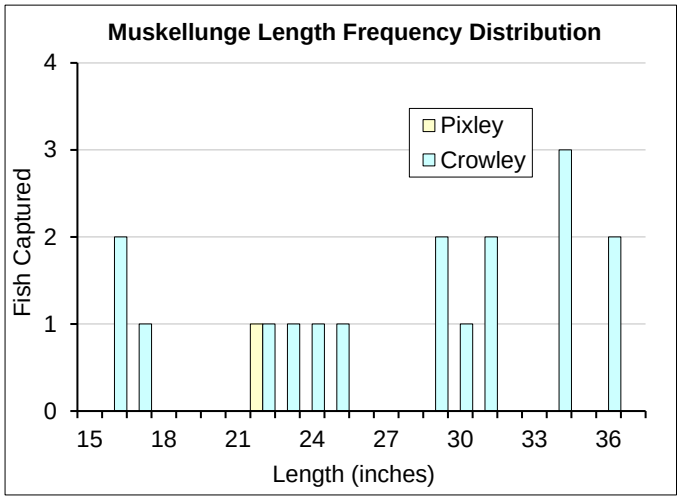


Our capture rates of walleye in early spring electrofishing surveys suggest that population abundance was similar in Upper, Lower, and Crowley flowages and highest in Pixley Flowage. Pixley Flowage also had the largest walleye, but we doubt that our small samples properly represent the abundance and size structure of the entire adult population because many spawning fish probably moved upstream to free-flowing river reaches or to the immediate tailwaters of the next upstream dam where they were inaccessible with our electrofishing gear. Fall electrofishing catch rates of 15 and 7.7 fingerlings per mile revealed that walleye produced 2016 year classes in Pixley and Crowley flowages. Catch rates of 2.0 and 0.9 fingerlings/mile in Upper and Lower flowages indicated barely detectable levels of recruitment to those walleye populations. Catch rates ranged 1.5–9.7 age-0 walleyes/mile in seven fall electrofishing surveys on these four impoundments in 1996, 2004, and 2005. Though our records from fall electrofishing surveys are scarce for these waters, the current harvest regulation may not be the best fit for walleye populations with modest recruitment. Anglers may keep 3 walleyes of any length, but only one can be over 14". Additional fall electrofishing evaluations, along with age-growth analysis, could identify the need for a fishing rule change to protect young walleye, provided that they can grow fast enough to contribute to the fishery.

Muskellunge

Early Spring Electrofishing

	Number per mile ≥ 20"	Number per hour ≥ 20"	Preferred Size ≥ 38"	Legal Size ≥ 40"	Memorable Size ≥ 42"
Upper Park Falls					
Lower Park Falls					
Pixley	0.5	1.1	0%	0%	0%
Crowley	3.5	8.0	0%	0%	0%
Combined	1.1	2.7	0%	0%	0%



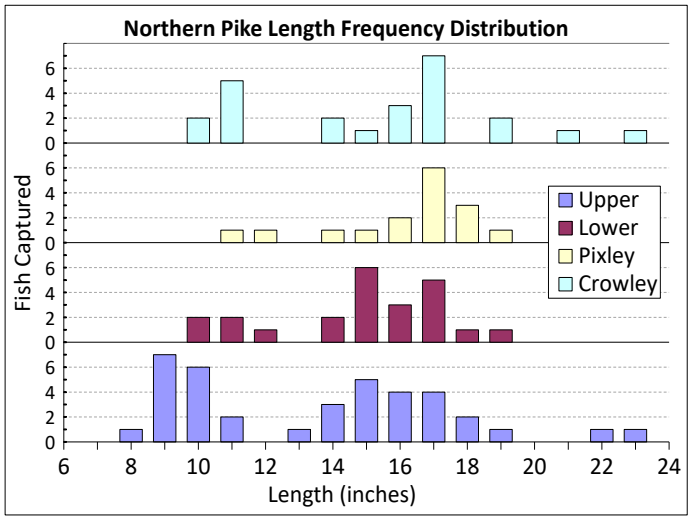
Illustrations by Virgil Beck

Of our three recent surveys, early spring electrofishing captured the most muskellunge, but nearly all were in Crowley Flowage. Fall electrofishing captured seven muskies in Crowley Flowage (range 12.8–31.7") and three in Pixley Flowage (21.3–32.9"). In our late spring electrofishing survey we caught four muskies 10.8–35.2" in Crowley, three 21.8–32.4" in Pixley, and most notably one 51.3" musky in Upper Park Falls Flowage. None of our samples was particularly useful to describe adult population status because our surveys occurred outside the optimal water temperature range when muskies use shallow habitat near shore and because large muskies are difficult to catch by electrofishing. Natural recruitment sustains these populations—WDNR suspended stocking muskies into Upper Park Falls Flowage in 2000. In a 1990–1992 study of fish movements radio-tagged muskies moved downstream through the open spillways at 1–4 of these dams and upstream about 15 miles from Upper Flowage toward the Turtle-Flambeau Dam. Anglers often target muskellunge in all four flowages, including competitors in a local musky fishing league. While fishing gillnets for lake sturgeon in summer, crew members caught 4 muskies 30–35" in Crowley and 2 more 23.3 and 27.1" in Pixley Flowage.

Northern Pike

Early Spring Electrofishing

	Number per mile ≥ 14"	Number per hour ≥ 14"	Quality Size ≥ 21"	Preferred Size ≥ 28"	Memorable Size ≥ 34"
Upper Park Falls	5.3	14	10%	0%	0%
Lower Park Falls	4.8	13	0%	0%	0%
Pixley	7.0	15	0%	0%	0%
Crowley	4.3	9.7	12%	0%	0%
Combined	5.1	13	6%	0%	0%

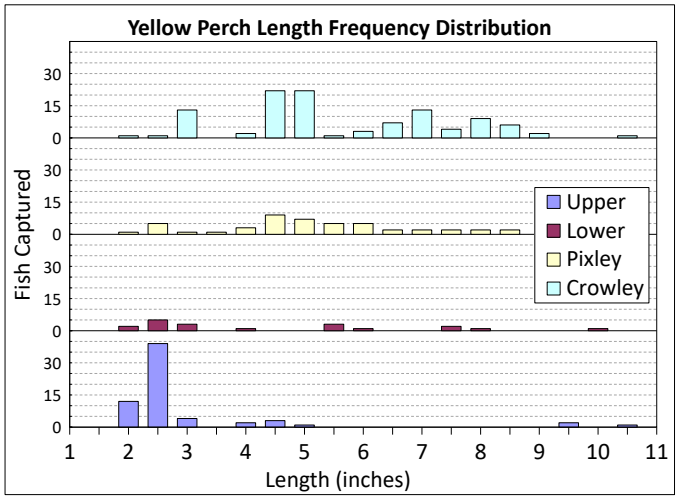


Our early spring electrofishing capture rates suggest that northern pike occur at similar population abundance in each of these flowages. Their size structure was disappointing in each flowage, too. Among the 186 pike captured in our twelve electrofishing surveys in these four flowages combined, only three fish were 24" or longer. Our Fish Team members caught 28 northern pike 12.7–34.1" by angling, but only 15% of those pike ≥ 14" were at least 21" long.

Yellow Perch

Fall Electrofishing

	Number per mile ≥ 5"	Number per hour ≥ 5"	Quality Size ≥ 8"	Preferred Size ≥ 10"
Upper Park Falls	1.3	3.1	75%	25%
Lower Park Falls	2.3	5.4	25%	13%
Pixley	14	25	15%	0%
Crowley	34	68	26%	1%
Combined	10	22	25%	3%



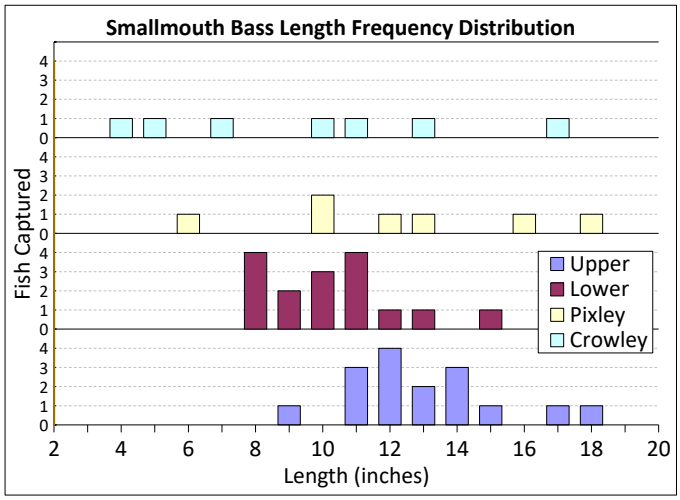
Illustrations by Virgil Beck

Yellow perch were relatively scarce in our early spring (n=34) and late spring (n=48) electrofishing samples in all four flowages, but fall electrofishing captured 237 perch that ranged 2–10.8" and averaged 4.9" long. Crowley and Pixley flowages seemed to offer the best prospects for anglers to catch a meal of yellow perch.

Smallmouth Bass

Late Spring Electrofishing

	Number per mile ≥ 7"	Number per hour ≥ 7"	Quality Size ≥ 11"	Preferred Size ≥ 14"	Memorable Size ≥ 17"
Upper Park Falls	5.3	11	94%	38%	13%
Lower Park Falls	4.2	9.4	44%	6%	0%
Pixley	2.0	4.3	67%	33%	17%
Crowley	1.7	4.2	60%	20%	20%
Combined	3.4	7.5	67%	23%	9%



Our catch rates of smallmouth bass ≥ 7" in late spring electrofishing surveys were highest in Upper and Lower flowages, perhaps because those impoundments had more rock substrate to harbor crayfish, the favorite food of smallmouth bass. We found memorable-size smallmouth bass ≥ 17" in three of the four flowages. In our four fall electrofishing surveys combined we captured 24 smallmouth bass, most from Upper and Pixley flowages, that ranged 2.6–17.3" and averaged 10.0". Angling captured 14 additional smallmouth bass 8.7–17.4" long in summer. The smallmouth bass in our samples appeared plump for their length. Largemouth bass were virtually absent in our twelve electrofishing surveys—we caught two 3.7 and 9.9" in Crowley Flowage in fall 2016.

Although we collected all panfish in every survey, we captured only 14 crappies (1.7–8.2") and 46 bluegills (1–6.3") in our 12 electrofishing samples combined.

Survey data collected and analyzed by: Matt Anchor, Chad Leanna, Kendal Patrie, Evan Sniadajewski, and Jeff Scheirer—WDNR Fishery Team, Park Falls.

Written by: Jeff Scheirer—Fishery Biologist, January 27, 2020.

Reviewed by: Steve Gilbert—Woodruff Field Unit Supervisor, November 2020.

Approved for web posting by: Mike Vogelsang—Northern Administrative District Supervisor, July 2020.

Illustrations by Virgil Beck