A FORAY INTO THE WILDS OF MINNESOTA: NORTHERN SUNFISH (*LEPOMIS PELTASTES*) SURVEY IN THE BOUNDARY WATERS

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BACKGROUND

The first Minnesota discovery of Northern Sunfish (*Lepomis peltastes*) was from Hustler Lake (St. Louis County) in 1974. Hustler Lake is six air miles within the Boundary Waters Canoe Area Wilderness (BWCAW) via the shortest canoe route of eight portages. James Underhill (1923–2000; Curator Emeritus at the James Ford Bell Museum [Bell] at the time) considered this an introduced population because of its isolation. Since then, additional *L. peltastes* specimens have been found misidentified in the Bell holdings. Northern Sunfish is currently listed as a species of Special Concern due to the lack of distribution data available for Minnesota. Research funded through State Wildlife Grants focused on genetics and life history but also expanded the known range of the species (Porterfield and Ceas 2008, 2012). One new occurrence found on the edge of BWCAW at Lake One is part of Kawishiwi River system (Hudson Bay watershed), which extends more than 25 miles eastward into the wilderness and encompasses scores of lakes (information provided by Konrad Schmidt.)

Since this discovery at Lake One, Konrad Schmidt has wanted to survey several of the Kawishiwi system lakes for Northern Sunfish, but he lacked a companion to assist him. Then I came along: an Iowa DNR retiree (and NANFA member) who had never been to the BWCAW and who, along with Kon, conducted a previous foray into the wilds of Iowa looking for Northern Sunfish (see *American Currents*, 40[1]:14–18). So I signed on for the excursion. I hope that you enjoy the following travelogue and summary information from our trip.

Photos by the author.

John Olson is retired from the Iowa DNR where he worked for 30 years in the Water Quality Section. He has been involved with stream fish survey work in Iowa since attending Iowa State University where he participated in a statewide survey of Iowa fishes from 1981–1984. He assisted with fish surveys while at the DNR, and continues to pursue his interest in Iowa fishes in retirement. John has co-authored papers on invasive fishes in Iowa and on the occurrence of Chestnut Lamprey (*Ichthyomyzon castaneus*) in a southern Iowa river. He has a degree in Animal Ecology from Iowa State with an emphasis in fisheries biology. His ongoing research into his ancestry has honed skills useful in finding the accounts of Iowa's early ichthyologists.

TUESDAY, SEPTEMBER 4: ANKENY TO ST. PAUL, ST. PAUL TO ELY, ELY TO THE BWCAW

A very long day indeed! I drove for approximately four hours from my home in Ankeny in central Iowa to St. Paul, MN, to meet Kon at his house. After a brief tour of Kon's most excellent landscaping with several fish pools, we got in our vehicles for another four hour drive to Ely, MN (Figure 1).

We arrived in Ely in mid-afternoon and picked up our wilderness entry permit at the US Forest Service office. We then drove 20 miles east of Ely, eventually on a dead end road, to leave my car in the parking lot at the take-out point at Lake One. Returning to Ely, Kon got gas for his vehicle, and I looked in a couple of bait shops for Red Wriggler worms but couldn't find any—only night crawlers. So, I bought a dozen crawlers for $4. If I'd known how poor my hook-and-line success for Northern Sunfish was going to be, I'd have saved the $4.

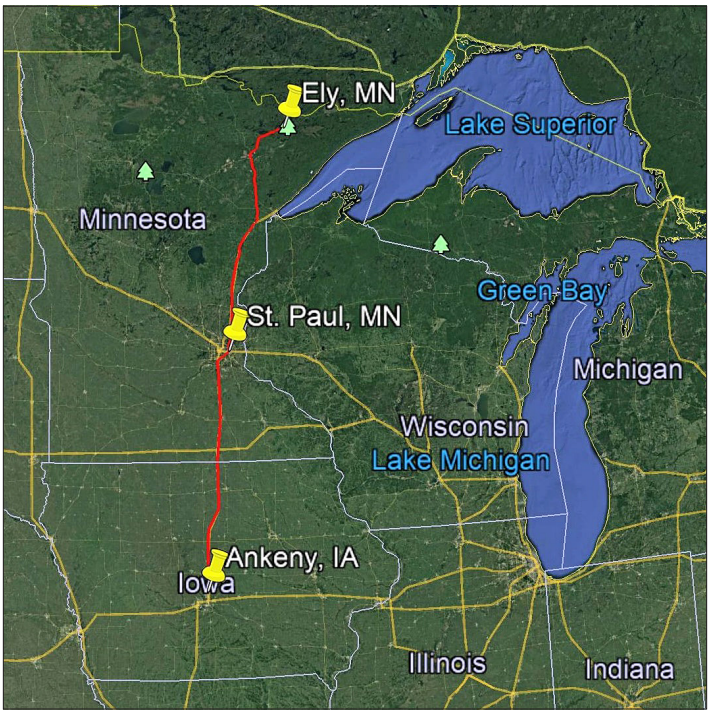

Figure 1. The long drive from Iowa to Ely, MN. (Google Earth image.)

Figure 2. Kon setting up the tent at Kawishiwi Lake Campground.

Figure 3. Sample site on Kawishiwi Lake, the first site where we found Northern Sunfish.

Figure 4. Kon kick-netting at the sample site on Square Lake.

Figure 5. Kon portaging the canoe between Square and Kawasachong lakes.

We left Ely in late afternoon and began our ~60-mile drive to the put-in point at Kawishiwi Lake (Figure 2). Although a 60-mile drive, our put-in point was only about 35 air miles ESE of Ely. The final 15 or 20 miles of our trip was a gravel road, and it was rough. The afternoon remained cloudy, but little or no rain fell. By the time we arrived at the Kawishiwi Lake campground, evening was approaching, and a little light rain fell. It was nearly dark by the time we had set up camp.

I had a rough night. I tried to go to sleep too early, but the ground was like a rock (probably *was* a rock). Yet somehow, I survived until morning!

WEDNESDAY, SEPTEMBER 5: FIRST DAY ON THE WATER

I got up for good about 6:00 AM; I just couldn't take the hard ground any longer. The morning sky was partly cloudy but was clearing; just a light breeze and very nice. We had our breakfast bar breakfast, and we were on the water (Kawishiwi Lake) by about 8:30 AM. This was my first paddling experience in the BWCAW. The scenery was beautiful, and as close to a pristine/pre-settlement landscape as I've seen.

Our first sample site of the trip was a shallow vegetated site on Kawishiwi Lake (Figure 3). We sampled with a seine and with dip/kick-nets. I tried hook-and-line fishing but was unsuccessful. Not being familiar with the Northern Sunfish prior to our trip, I didn't appreciate how small this species is; microfishing would have been a far more appropriate hook-and-line sampling method. In some of our first seine hauls, Kon was confident that we collected, in addition to several other species, some young-of-the-year (YOY) Northern Sunfish. His identification was based on a September 2012 survey when he collected YOY sunfish from the Kawishiwi River downstream of Lake One. Having no experience with this life stage at that time, he brought back several to raise in an aquarium where they grew to maturity and spawned in captivity. To me, however, these "Northern Sunfish" looked like YOY Green Sunfish (*L. cyanellus*). Kon informed me that there are no extant populations of Green Sunfish along our route and only seven records since 1961. I found this hard to believe coming from Iowa where Green Sunfish are common and widespread. For the remainder of the trip, YOY Northern Sunfish were called "those funny looking *Red-eyed Green Sunfish*." Ha ha.

Next was Square Lake. There was no portage between Kawishiwi and Square lakes. We did a brief sampling on Square Lake that also produced YOY Northern Sunfish (Figure 4).

Our first portage of the trip was a mere 26 rods, or about 430 feet (1 rod = 16.5 feet), between Square and Kawasachong lakes. The rod as a unit of measurement is no longer in widespread use but remains the standard for portage distances on recreational maps of the BWCAW. I was impressed that Kon so easily picked up the canoe and headed down the trail between the lakes (Figure 5). Little did I know that I would soon get my chance to carry the canoe.

It was after our portage from Square Lake to Kawasachong Lake that we first entered the portion of the BWCAW impacted by the 2011 Pagami Creek Fire. The landscape differences between the areas impacted by the Pagami Creek fire of 2011 and those spared the fire were striking (Figures 6 and 7).

We seined and dip netted Kawasachong Lake at the portage to Townline Lake (Figure 8) where there was an extensive area

Figure 6. The channel from Square Lake to Kawasachong Lake where the trees and terrestrial vegetation show the impact of the 2011 Pagami Creek fire.

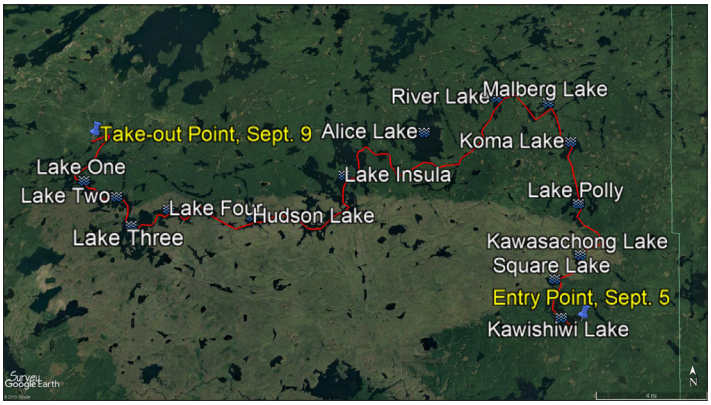

Figure 7. Google Earth satellite image of our September 4–9, 2018, BWCAW trip. This image is approximately 15 miles north to south and 25 miles east to west. The lighter area in the lower half of the photo is the portion of the BWCAW impacted by the Pagami Creek fire of August and September 2011. The fire, which was started by a lightning strike, burned approximately 92,000 acres of the BWCAW.

Figure 8. Our sample site on Kawasachong Lake. This area was also impacted by the Pagami Creek fire.

of submergent vegetation. We again found YOY Northern Sunfish, but also Blacknose Shiners (*Notropis heterolepis*), which was my first ever collection of this species (Figure 9). The Blacknose Shiner once occurred across most of the northern half of Iowa, especially in the shallow glacial lakes and in low-gradient streams. Agricultural and urban development—and the late 19th century introduction of an invasive fish species, the Common Carp (*Cyprinus carpio*)—have altered Iowa's lake and stream systems and their aquatic habitats. One of these alterations was the decline and often elimination of rooted aquatic vegetation in Iowa's streams

Figure 9. Fish of interest from Kawasachong Lake. Top: Northern Sunfish YOY (aka, Red-eyed Green Sunfish); bottom: Blacknose Shiner.

and shallow lakes. As the rooted aquatic vegetation declined in Iowa, so did the Blacknose Shiner. The specimens we collected at Kawasachong Lake were the first I had seen in the field, and I was excited to see them.

The portage from Kawasachong Lake to Townline Lake was long (189 rods, or 3,118 feet). We did not sample Townline Lake (a very small lake). The portage between Townline and Polly lakes was only 90 rods (1,485 feet), but coming so soon after the previous 189-rod portage it seemed much longer.

We found a campsite on Lake Polly and set up camp (Figure 10). Once camp was established, we had our dinners. We were low on water throughout the day. All we had was the water I had brought from home (~2.5 liters), and we had run out of water by late afternoon. So, I used my new water filter that I had purchased a few weeks ago at REI. I filtered about 5 liters before dark, and we re-hydrated.

After dinner (about 6:00 PM), we went out to set minnow traps near our campsite (Figure 11) and then paddled over to the next portage point and did some seining. One haul produced many Common Shiners (*Luxilus cornutus*) along with some YOY *Lepomis peltastes* (aka, Red-eyed Green Sunfish) and a few YOY Rock Bass (*Ambloplites rupestris*). We also saw some Blacknose Shiners here. As per usual, Kon did some kick-net sampling after we had seined, and I continued my unsuccessful attempts to hook and line a Northern Sunfish. Kon collected Iowa Darters (*Etheostoma exile*) and Pumpkinseeds (*L. gibbosus*). We sampled until about 7:00 PM; then called it a day. Felt like it was going to be a chilly night.

THURSDAY, SEPTEMBER 6

I got up a bit before Kon. Beautiful morning with a light fog over the water (Figure 12). A pack of Eastern Timber Wolves (*Canis lupus lycaon*) serenaded us for almost an hour. We had our usual

Figure 10. View of Lake Polly from our campsite on the evening of September 5, 2018. We are now out of the Pagami Creek fire zone.

Figure 11. Kon setting minnow traps on Lake Polly.

Figure 12. Views of Lake Polly from our campsite on the early morning of September 6, 2018.

Figure 13. Left: The bedrock channel between Koma and Malberg lakes. The bedrock cascades between the lakes are the reason for portaging gear and canoes.

breakfast of breakfast bars and coffee (me) or Kool-Aid (Kon), and then were on our way for the day. Not much in the minnow traps.

Lots of portages ahead for us today. We saw a group of canoers on our second portage of the day: old farts (about my age), one of whom noticed my "IOWA" hat and who told me that he did graduate work at Iowa State University. We had lunch at the beginning of the short portage into Malberg Lake (Figure 13). I attempted to filter some more water for the afternoon, but the pumping mechanism on my water filter failed. My brand new water filter was a piece of junk for the remainder of the trip. Thankfully, I did have water purification tablets with me that we used for the rest of the trip along with boiling water in the evenings at our campsites.

We sampled a shallow vegetated area on Malberg Lake and had an approximately 8-pound (Kon said 10-pound) Northern Pike (*Esox lucius*) in the seine momentarily. Seining produced the usual species but included one Blacknose Shiner. Kon, however, captured a very nice adult Northern Sunfish by kick-netting in near-shore aquatic vegetation (Figures 14 and 15). I took several photos of this fish which I did very cautiously because Kon threatened to leave me behind in the BWCAW if I accidentally dropped the fish into water before photographing. Beautiful fish! We also captured a few Iowa Darters here as well as Yellow Perch (*Perca flavescens*).

We continued our paddling and portaged from Malberg Lake to River Lake (so-named on Google Earth but "Kawishiwi River" on other maps). The portage was a rough one (in my opinion) of about 60 rods (990 feet). We arrived at our campsite on "River Lake" at about 5:00 PM (Figure 16).

We both were dehydrated and tired. So, I used the purification tablets to prepare drinking water for the evening for Kon and me. We had a difficult time finding a tree suitable for hanging our food bags to keep them out of reach of raiding Black Bears (*Ursus americanus*). Kon eventually found a limb about 7 or 8 feet off the ground that would support the bags. After setting up camp, we went out in the canoe, and Kon set three minnow traps. We returned to camp and had our evening meal. We were both exhausted and turned in before dark (~7:30 PM).

FRIDAY, SEPTEMBER 7

I slept reasonably well. I seemed to be getting used to sleeping on the ground. It was another beautiful morning, calm, with just enough clouds to catch the sunrise, and a light fog on the water (Figure 17).

We had no bear problems overnight, but a Red Squirrel (*Tamiasciurus hudsonicus*) had chewed a hole in my food bag that was hanging from the tree limb (Figure 18). I had noticed the squirrel running through our campsite when we set up camp the afternoon before. Like squirrels at Grand Canyon campgrounds, I figured the critter might be trouble, but I was too tired to care the evening before. I didn't notice the hole until I took a bag of GORP out of my food bag in the morning, and peanuts and raisins started falling on the ground. The brazen little varmint continued to hang around our camp that morning—he seemed very accustomed to raiding BWCAW campers—but he didn't do any further damage to our food items (at least that we knew of).

We had our typical breakfast of breakfast bars, and I had my coffee. I was a little tired and sore but otherwise felt good. I figured that this day, our third on the water, would tell the story as to how I was going to hold up to the physical demands of the trip.

Figure 14. Adult Northern Sunfish captured from Malberg Lake.

Figure 15. Near-shore vegetated habitat where the adult Northern Sunfish was captured by Kon with his kick net.

Figure 16. Our campsite on River Lake.

Figure 17. Early morning view of River Lake from camp.

Figure 18. Varmint that chewed a hole in my food bag overnight at our River Lake campsite; probably feasting on my GORP.

Figure 19. Konrad at our fish sampling site at River Lake; checking maps.

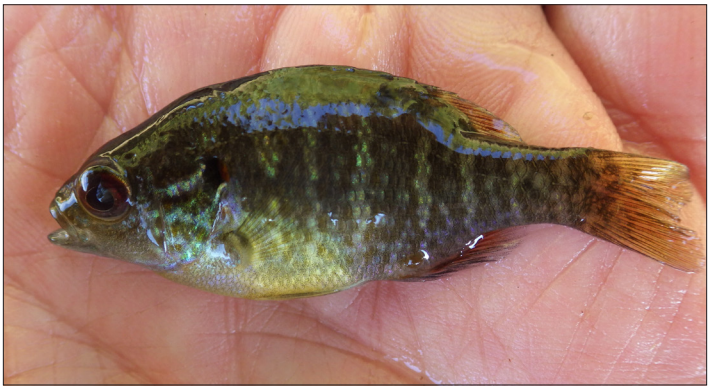

Figure 20. Northern Sunfish juvenile from River Lake.

Figure 21. Common Loon on Alice Lake.

We picked up the minnow traps; again, not much in them and nothing of interest. We seined the area where the minnow traps were set (Figure 19) and did find some YOY and one juvenile Northern Sunfish (Figure 20). I also caught my only hook-and-line fish of the week: an adult Bluegill (*L. macrochirus*). Oh boy, how exciting.

We did the short (18-rod [297-foot]) but tricky (uneven) portage from River Lake to Fishdance Lake. We paddled through Fishdance Lake with our only sampling done at the portage to Alice Lake. We didn't see anything of interest there except one Johnny Darter (*E. nigrum*) which is rather uncommon in the BWCAW.

There were two portages between Fishdance Lake and Lake Alice. The first portage was a long one of 92 rods (1,518 feet). After we finished this portage, we ate lunch. The second portage was much shorter (18 rods [297 feet]), and Kon decided to slide the canoe down the short rapids between the lakes to avoid unpacking the canoe. This worked quite well.

Alice is a big lake (~1,500 acres). We saw Common Loons (*Gavia immer*) on the lake and were able to get remarkably close to them. I tried some photos, but the canoe and I were still too far away to get a decent photo with my camera (Figure 21). We seined at a couple of locations but didn't find much of interest. One location we seined was a long-abandoned beaver pond just off the outlet channel of Alice Lake. The pond looked promising, but the silt was very deep, and sampling was difficult such that we saw very few fish. Kon did better with his kick-net and found Central Mudminnows (*Umbra limi*) and Tadpole Madtoms (*Noturus gyrinus*). We also collected Iowa Darters in the shallows of the channel that runs from Lake Alice to Lake Insula (Figure 22).

There was a short 10-rod (165-foot) portage from Alice to Lake Insula, and Kon decided to slide the canoe down the rapids as we had done between Fishdance and Alice lakes. This time, however, I slipped under the canoe and took some water into my waders. Other than that slight mishap, we navigated the rapids well enough. Insula is another big lake (~3,200 acres). It was getting toward late afternoon and once on the lake, our objective was to find a campsite. After passing a couple of occupied campsites, we found one that, as opposed to the usual bedrock shoreline, had a sand beach which, based on what I've read, is relatively rare in the BWCAW (Figureş 23–24).

We set up camp, and I used the water purification tablets to get us drinking water. I also boiled water for the evening meals and for additional drinking water (and for my evening coffee).

Kon went for a swim and I did the same. The water was certainly cool but not uncomfortably cold. It felt good to rinse off a bit. Clouds had moved in during the late afternoon and evening, and it looked like rain was a possibility.

SATURDAY, SEPTEMBER 8

Another beautiful sunrise in the BWCAW. About sunrise, I saw what I believe was a Gray Fox (*Urocyon cinereoargenteus*) about 100 yards from our camp. For the better part of a minute, I looked at the fox and the fox looked at me. I thought the fox might pay us a visit in camp, but no. Just as well.

We were on the water by about 8:30 AM. We sampled two sites on Lake Insula (Figure 25). The first site was not very productive, but we did find some colorful Iowa Darters (Figure 26).

Figure 22. Iowa Darter collected by kick-netting near the abandoned beaver dam in the channel leading from Alice Lake to Lake Insula.

Figure 23. The landing for our campsite on Lake Insula. This sand beach landing almost looks manmade but probably isn't.

Figure 24. Our campsite on Lake Insula. The campsite was at an elevation approximately 15 feet above the surface of the lake.

As we left the first sample site on Lake Insula, we paddled by a landmark of sorts called "The Rock" (Figure 27). I'm not sure of its significance—even the Web doesn't have much to say about it other than providing links to YouTube videos of guys jumping from it into the lake—but "The Rock" is noted on many maps of the BWCAW.

Our second sample site on Lake Insula was back in the area affected by the 2011 Pagami Creek fire (Figure 28). We would be in the burn area of that fire for most of the rest of our trip. Again, deep mucky silts made seining difficult. An interesting find here was a Mottled Sculpin (*Cottus bairdii*) (Figure 29).

We had a little difficulty finding the portage out of Lake Insula to Hudson Lake (Figure 30): so many islands and so many opportunities to take a wrong turn. We encountered a group of four fishermen from Buford, Missouri, at the beginning of our 95-rod

Figure 25. Kon at our first sample site on Lake Insula, kick-netting and checking the seine.

Figure 26. Iowa Darters from our first sample site on Lake Insula.

Figure 27. Lake Insula landmark: The Rock.

Figure 28. Lake Insula in the area affected by the 2011 Pagami Creek Fire.

Figure 29. Mottled Sculpin from the second Lake Insula site.

Figure 30. The non-navigable cascade from Lake Insula to Lake Hudson necessitates a 95-rod portage. As we canoed downstream on the Kawishiwi River, the flow in cascades between lakes increased considerably.

Figure 31. Sample site on Lake Hudson.

Figure 32. Central Mudminnow from Lake Hudson site.

Figure 33. Our campsite on Lake Four, our final campsite of the trip. These photos are from the next (Sunday) morning, as I was too tired to care about taking photos when we arrived late Saturday afternoon.

Figure 34. The Olson Water Supply Co.

Figure 35. Kon with his magic kicknet at our late afternoon sample site on Lake Four.

portage to Hudson Lake. The older guys in the group were very friendly, the younger ones not so much. One in this group seemed interested in how our survey was being funded. During this portage, we encountered another group portaging in the opposite direction: from Lake Hudson to Lake Insula. Again, they were a friendly group, and one older gent even carried our seine and kick nets for us on the portage trail.

We sampled one site on Hudson Lake (Figure 31). Other than the old/abandoned beaver pond between Alice Lake and Lake Insula, this site—in my opinion—presented the most difficult seining of the trip: super deep muck here. We didn't do particularly well for fish at this site. We saw the usual suspects (Yellow Perch, Bluegill, and Iowa Darter), and Kon did collect Central Mudminnows (Figure 32), but no Northern Sunfish.

We had a couple of portages between Hudson Lake and Lake Four, but these were short. Our last site of the day was in the upper portion of Lake Four. Again, no Northern Sunfish seen, just the usual species plus one White Sucker (*Catostomus commersonii*).

We had just a few YOY Northern Sunfish for the day, all from Lake Insula. Seining conditions were unusually difficult due to the very deep and soft silts, especially compared to conditions at our sample sites during the first two days. Was this a lasting mark of the Pagami Creek Fire? Kon pondered that maybe we were seining in peat beds. Whatever the case, it was as difficult as any seining I've done in the famously deep silts of Iowa's streams and lakes.

The BWCAW had been getting busier with canoers as we got closer to the weekend and, now on late Saturday afternoon, the first two campsites we saw on Lake Four were already taken. It had been a busy day. We both were tired, and I was anxious to find a campsite. Thankfully, on our third (or fourth?) try, we found a campsite. The site wasn't particularly scenic—kind of open and windswept—but it turned out to be a very comfortable and easily managed campsite (Figure 33).

We continued to use the water purification tablets and boiling to have drinking water and water for (my) coffee and (Kon's) Kool-Aid. So far, we had avoided any water-related gastrointestinal problems, although Kon kept mentioning the time he had Giardiasis. I suppose he did this to make sure that I (the water provider) didn't slack off on my water purification duties (Figure 34). After dinner, we went out and sampled a site on Lake Four but found very few species and no Northern Sunfish. Again, very mucky deep silts made seining difficult (Figure 35). Kon also set three minnow traps near woody debris.

Figure 36. Views of Lake Four from our campsite at sunrise on Sunday, September 9, 2018, the last day of our trip.

An east wind blew during the day. I kept expecting rain to fall but none did. Tomorrow would be our last day on the water.

SUNDAY, SEPTEMBER 9: THE LAST DAY

I got up at 6:00 AM, about 15 minutes before sunrise. Yet another beautiful Boundary Waters sunrise! The lake was calm (Figure 36). I heard and saw Common Loons; one flew by our campsite. A Canada Goose (*Branta canadensis*) also flew by and honked. For some reason, the Canada geese in the BWCAW seem much less annoying than the stormwater detention basin strain of this species (*B. c. suburbiensis* (Olson)) that lives in central Iowa.

When Kon awoke, he mentioned that he had been up several times during the night to get rid of the large amount of Kool-Aid that he had consumed the afternoon and evening before. In honor of his getting up to pee more times than me, I dubbed this campsite "Camp Kool-Aid."

After the east wind all day yesterday, I figured on rain today (it did sprinkle overnight), but during my 5:00 AM pee break, the stars were shining brilliantly. It might be obvious—after all, it is a wilderness area—but the stargazing is spectacular in the BWCAW. Based on my admittedly limited experience, only the night sky on North Rim of the Grand Canyon can compare.

In the morning, I boiled water for coffee and for additional drinking water. We wanted to finish our BWCAW trip in good time today to get back to Kon's vehicle at the Kawishiwi Lake Campground where we started our trip. Our plan was to then travel in the afternoon to Grand Marais on the North Shore of Lake Superior and maybe get a motel room (a thought which very much appealed to me). Because this was my first trip to this area, Kon offered to give me a guided tour of the North Shore following our BWCAW trip.

Figure 37. Our sample site on Lake Two. An abandoned Bald Eagle nest was just to the right of this site.

Figure 38. Kon, me, and the *SS Darter* at our Lake Two sample site, the last sample site of the trip.

Figure 39. Common Mergansers on Lake Two.

Figure 40. Lake One, getting close to our take-out point.

Figure 41. The landing at Lake One, the end of the trip.

We first checked the minnow traps, but they had nothing in them. There were no portages between Lake Four and Lake Three or between Lake Three and Lake Two. The day was a bit windy, and we had to contend with a crosswind for most of the morning and encountered some good rollers on Lake Three that bobbed us up and down like a cork in the ocean.

We saw an abandoned Bald Eagle (*Haliaeetus leucocephalus*) nest at our sample site on Lake Two. We did moderately well: the usual species but no Northern Sunfish (Figure 37).

Being nearly done with our BWCAW journey, I finally got a photo of Kon and me by the canoe. The photo turned out OK. I look much taller than Kon in the photo (which I am not) because he had sunk in the muck while I was setting up the camera (Figure 38).

We saw a group of Common Mergansers (*Mergus merganser*) swimming at the first of two short portages between Lake Two and Lake One. The birds seemed incredibly tame and allowed us to almost canoe through them (Figure 39). We did our last two portages and began our paddle through Lake One to our take-out point(Figure 40).

We exited at the Lake One landing (Figure 41). I got my car from the parking lot, and we loaded up Kon's canoe for the ~80-mile drive back to his vehicle at the Kawishiwi Lake campground where we had started five days ago. First, however, we stopped in Ely to get gas for my car and to have lunch at Dairy Queen: back to civilization! Then, we continued to the Kawishiwi Lake campground and reached Kon's vehicle at approximately mid-afternoon. We then caravanned to Grand Marais where we would begin a two day tour of the North Shore.

EPILOGUE

Overall, we had a great trip with just one significant glitch: the failure of my new water filter. Our five day, 35 mile canoe trip included 14 lakes and 19 portages. The weather was exceptionally good: no rain, generally light winds, and moderate temperatures. Only one or two nights were even close to chilly. I was impressed by the clear water and the lack of sediment anywhere except in those small bays we sampled where aquatic vegetation had grown. Basically, all the campsites were on bedrock.

Portaging was a new experience for me, but I did get used to it and, by the end of the trip, even preferred carrying the canoe to carrying the seine and kick nets. We encountered very few other canoers until the weekend (Friday, Saturday, and Sunday) when the lakes got busier. But several times, and most of the time earlier in the week, we were the only canoe on the lake; no one else in sight.

The fish sampling seemed to be better (and seining easier) in the upper lakes in the Kawishiwi River system earlier in the week than in the downriver lakes we sampled later in the week. The deeper silts (or peat beds?) in the lower lakes, along with the heavier growths of aquatic vegetation combined to make seining much less effective than in the upper lakes. It was great to find Northern Sunfish, even if most were YOY and to me looked like Green Sunfish. The adult Northern Sunfish that Kon captured with his kick net in Malberg Lake was beautiful. Seeing my first Blacknose Shiners was exciting to me although not so much to Kon.

PRELIMINARY DATA SUMMARY

The following summary is based on Kon's Excel file of fish species sampled during our trip (collections KPS18-65 through KPS18-78). Altogether, we collected 17 fish species from 14 shallow, vegetated sample sites on 13 BWCAW lakes (Tables 1 and 2; Figure 7). The three most common species were Bluegill, Tadpole Madtom, and Yellow Perch (all three occurred in 9 of the 13 lakes) followed by Iowa Darter and Northern Sunfish (both occurred in 8 of 13 lakes). Central Mudminnow occurred in 6 of the 13 lakes. The remaining species occurred in less than half the lakes with single occurrences of White Sucker, Mottled Sculpin, Pumpkinseed, and Johnny Darter (Figure 42).

The number of species collected in each of the 13 lakes sampled is summarized in Figure 43. In general, the Northern Sunfish seemed to occur in lakes with a higher number of fish species, al-

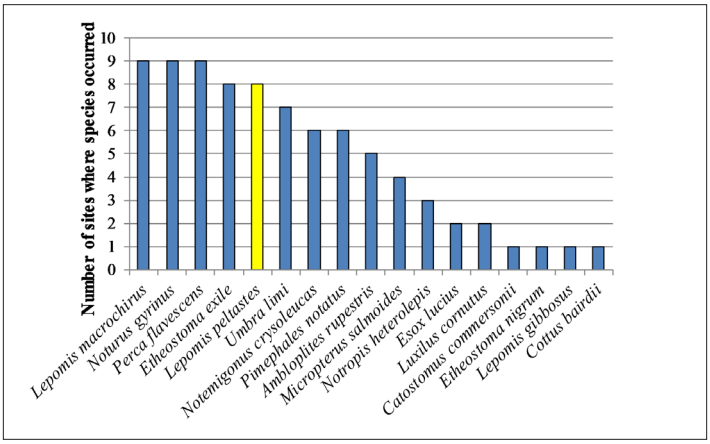

Figure 42. Summary of species occurrence at the 14 sites in 13 lakes sampled in the BWCAW, Sep. 5–9, 2018.

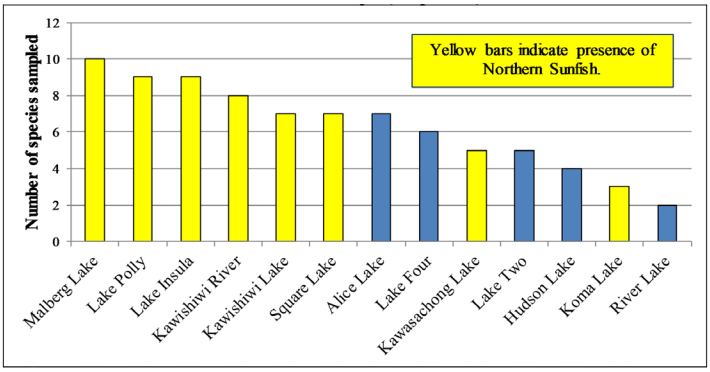

Figure 43. Number of fish species sampled in each of the 13 BWCAW lakes surveyed, Sep. 5–9, 2018.

though two lakes with comparatively low numbers of fish species (Kawasachong and Koma) also had Northern Sunfish.

Based on the results of our sampling, the lakes in the upper portion of the Kawishiwi River system (e.g., Kawishiwi, Square, Kawasachong, and Malberg) were more likely to have Northern Sunfish than lakes farther downriver such as Hudson Lake, Lake Four, and Lake Two (Figure 7). Avoidance of the area impacted by the Pagami Creek fire is a possibility although Northern Sunfish were collected at two lakes (Square and Kawasachong) in the burn area. Although the less species-rich sample sites in the lower portion of the Kawishiwi River system tended not to have Northern Sunfish, seining and sampling was considerably more difficult in these lakes than in the upper lakes (i.e., above Lake Insula), and the species may have been missed in our samples.

ACKNOWLEDGEMENT

My thanks to Kon for inviting me along on the BWCAW trip. The scenery was outstanding. With his prior experience in the BWCAW and knowledge of native fishes, Kon was the perfect guide for this trip. Thus, I learned a great deal during this foray, including the meaning of the word "portage" as used in the BWCAW. I'm still working, however, on perfecting my kick-net sampling technique. Thanks also to Kon for providing the background information on the distribution history of the Northern Sunfish in the BWCAW.

Table 1. The 13 BWCAW lakes sampled for fish, Sep. 5–9, 2018.

Lake	Surface Acres*
Kawishiwi	420
Square	135
Kawasachong	200
Polly	541
Koma	263
Malberg	133
Kawishiwi River	2,160
River	52
Alice	1,520
Insula (two sample sites)	3,188
Hudson	382
Four	578
Two	538

*Acreage data from PaddlePlanner Lake Database (http://www.paddleplanner.com/tools/lakedatabase.aspx?area=1)

Table 2. Fish species sampled in the Kawishiwi River system in the BWCAW, Sep. 5–9, 2018.

Common Name	Scientific Name
Common Shiner	*Luxilus cornutus*
Golden Shiner	*Notemigonus crysoleucas*
Blacknose Shiner	*Notropis heterolepis*
Bluntnose Minnow	*Pimephales notatus*
White Sucker	*Catostomus commersonii*
Tadpole Madtom	*Noturus gyrinus*
Northern Pike	*Esox lucius*
Central Mudminnow	*Umbra limi*
Mottled Sculpin	*Cottus bairdii*
Rock Bass	*Ambloplites rupestris*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Northern Sunfish	*Lepomis peltastes*
Largemouth Bass	*Micropterus salmoides*
Iowa Darter	*Etheostoma exile*
Johnny Darter	*Etheostoma nigrum*
Yellow Perch	*Perca flavescens*

References:

Porterfield, J., and P. Ceas. 2008. Distribution, abundance and genetic diversity of the longear sunfish (*Lepomis megalotis*) in Minnesota, with determination of important populations. Final report: Minnesota State Wildlife Grants Program. 25 pp. plus appendices.

Porterfield, J., and P. Ceas. 2012. Life histories of the northern longear sunfish (*Lepomis megalotis peltastes*) and pugnose shiner (*Notropis anogenus*) in Minnesota, with examination of other rare non-game fishes. Final report: Minnesota State Wildlife Grants Program, T-32-R-1, F10AF00108. 27 pp plus figures.