

A Fatal Blockage (?): A Look at the St. Croix Falls Dam

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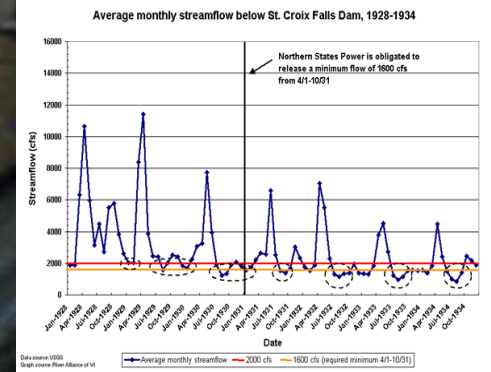


Overview:

The St. Croix River is one of the most diverse riverine ecosystems in the Upper-Midwest. It is home to 68 fish species, 39 mussel species, and 497 macroinvertebrate taxa (Fago and Hatch 1993). Unfortunately, many of these species have been classified as threatened or endangered on both a federal and state level. There are a total of thirty-nine at risk species including the crystal darter, the St. Croix snaketail dragonfly, and the winged mapleleaf mussel (see below). One of the major threats to all of these species is the St. Croix Falls hydroelectric project. The dam has eight turbines each with a hydraulic capacity of 800 cfs and it generates 119.6 million kilowatt-hours of energy annually. It is operated by Xcel Energy as a peaking facility which means that in the winter the flow is regulated based on power demand. During periods of low demand, the company stifles the flow and when demand increases they release the water that has collected. This peaking behavior along with other ecological hazards associated with the dam have detrimental effects on many of the taxa residing within the river system. Over the past 3 years there has been an average



HISTORY - The section of the river that is impounded is located just north of Hudson, Wisconsin. This area was originally blocked by the Nevers Dam in 1890 as a means of controlling the log jams that plagued the river. By 1902 the timber had been depleted and so the dam was to be abandoned, but Northern States Power stepped in and bought it in order to control flow while they constructed the hydroelectric plant at St. Croix Falls, just down river. The plant was completed in 1907 but the Nevers Dam was not removed until 1954 when it was deemed unsafe and a nuisance to recreational activities. Since it was built before the Federal Power Act of 1920 the Federal Energy Regulatory Commission does not oversee its use, instead it falls under the Federal War Powers Act of 1903. Under this Act, Xcel is required to maintain a flow of 1600 cfs from April 1 through October 31. Since 1989, Xcel has voluntarily released at least 800 cfs during the remainder of the year.



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Table 1. State and federally listed riverine species, St. Croix River, from St. Croix Falls Dam downstream to Lake St. Croix, David Heath, October, 2000.

Species Name	Common Name	Wisconsin	Federal ESA	Minnesota ESA	Group Name
<i>Neurocordulia amabilis</i>	blue damselfly	SC	none	none	dragonfly
<i>Neurocordulia modesta</i>	smoky damselfly	SC	none	none	dragonfly
<i>Neurocordulia</i>					
<i>Odynerophanes borealis</i>	Pygmy damselfly	THR	none	none	dragonfly
<i>Odynerophanes subvelutis</i>	rusty damselfly	END	none	SC	dragonfly
<i>Polyura maia</i>	maia damselfly	SC	none	none	dragonfly
<i>Argemone fulvicornis</i>	lake dragon	SC	none	SC	fish
<i>Argulus mucronatus</i>	American slug	SC	none	none	fish
<i>Cryselasma agrippa</i>	Crysel damselfly	END	none	SC	fish
<i>Cyprinus tangana</i>	blue nacker	THR	none	SC	fish
<i>Etheostoma dani</i>	Warblers and darter	SC	none	none	fish
<i>Etheostoma applegatei</i>	mad darter	SC	none	none	fish
<i>Hiodon alosoides</i>	Goldeye	END	none	none	fish
<i>Hypentelus nigricauda</i>	Speckled shub	THR	none	none	fish
<i>Hypentelus nigricauda</i>	silver shub	SC	none	none	fish
<i>Lepomis gibbosus</i>	black chub	THR	none	none	fish
<i>Moxostoma valenciennianum</i>	rose milkfish	THR	none	none	fish
<i>Moxostoma valenciennianum</i>	Orange milkfish	THR	none	none	fish
<i>Nocomis biguttatus</i>	wood darter	SC	none	none	fish
<i>Opiostedion emarginatum</i>	spotted darter	SC	none	none	fish
<i>Percina variegata</i>	gill darter	THR	none	SC	fish
<i>Alopiichthys regalis</i>	fluke	SC	none	SC	mussel
<i>Cambarlandia modesta</i>	Speckled case	END	none	SC	mussel
<i>Cyclanassa tuberculata</i>	purple wartyback	END	none	SC	mussel
<i>Elliptica lineolata</i>	Rocky	END	none	SC	mussel
<i>Elliptica erasmodonta</i>	Elephant ear	END	none	end	mussel
<i>Leptodonta hypoleuca</i>	leopard	END	none	SC	mussel
<i>Langella langella</i>	Hoggin eye	END	LE	end	mussel
<i>Parthenoclema striatella</i>	round pigtoe	SC	none	SC	mussel
<i>Quacella fagosa</i>	Winged mussel	END	LE	end	mussel
<i>Quacella munitaria</i>	Monkeyface	THR	none	SC	mussel
<i>Symphonura arbutus</i>	Salamander mussel	THR	none	SC	mussel
<i>Symphonura variegata</i>	Rockfish	THR	none	SC	mussel
<i>Acutanassa ligamentosa</i>	Mucket	none	none	SC	mussel
<i>Elgiva dilatata</i>	lytle	none	none	SC	mussel
<i>Lamingtona corporea</i>	crinkled hogmillet	none	none	SC	mussel
<i>Lamingtona costata</i>	flatfish shell	none	none	SC	mussel
<i>Ligumia recta</i>	black sandshell	none	none	SC	mussel
<i>Ligumia olivacea</i>	Hickorynut	none	none	SC	mussel

SC = state special concern species
 THR = state threatened species
 END = state endangered species
 LE = federally endangered species
 None = no listing status

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ECOLOGICAL PROBLEMS

The literature documenting the ecological damage caused by aquatic impoundments is vast; there are a number of problems that dams can cause to an aquatic ecosystem. First, they interfere with migration patterns, particularly fishes' spawning patterns by preventing movement upstream. Next, they can create excessive mixing below the blockage, leading to a saturation of oxygen and may cause blood-oxygen disease. The disturbances they create in the tailwaters can change the substrate as well as the thermal environment. Above the blockage, there is extreme sediment deposition and significant changes in the nutrient content. These changes can be classified as both habitat alterations and sporadic disturbances, both of which lead to shifts in biodiversity and overall population concentrations around the impoundment.



Of particular concern to conservationists are the winged maple leaf mussels, which reside in the tailwaters beneath the dam. This is the last known population of this species of mussels and so their preservation is considered a very high priority. Historically, they were found in large to medium sized clear-water streams but most of these have been lost to channelization. The mapleleafs are also threatened by agriculture and modified land use (Eldridge, 1991). Hornbach et al. (1996) showed that winged mapleleaf mussels require roughly the same habitat as other mussel populations. The construction of dams is inherently bad for mussel populations; benthic diversity generally declines both above and below impoundments (Yeager, 1993) and several dozen mussel species have been driven to extinction wholly or in large part through the construction of dams (Watters, 1999). Mussels need a very specific depth, temperature, and substrate to survive and reproduce and dams modify all three of those characteristics.

Efforts to Mitigate the Problems

In order to help mitigate the damages to endangered species living near the St. Croix Falls dam, Xcel Energy signed a memorandum of understanding (MOU) in which they agree to switch from peaking to run-of-river management. Under the new management system, the flow into the dam should always equal the flow out of the dam. While there would be no net power loss, Xcel Energy would stand to sustain some economic losses given that they would be generating less high-demand peak power. The Minnesota DNR found that the dam must release 1,980 cfs to adequately protect the riverbed from dewatering. Presumably, under run-of-river management this level would be sustained. Unfortunately the MOU is nonbinding and as you can see from the graphs above, the flow still drops to dangerously low levels.

