[[1]](#endnote-1)

**Comments of Ken Cline, Tyler Hebert, Haysie Maurer, and Chloe Meyer**

**on the Ellsworth Water quality Certification**

**DEP Application #L-13256-33-J-N, Ellsworth Hydroelectric Project.**

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| Laura Paye  Maine Department of Environmental Protection  17 State House Station  Augusta, Maine 04333-0017  Dear Ms. Paye:  The below commenters are river advocates who enjoy the ecological and recreational amenities of the Union River. They have spent extensive time in the Union River watershed and have canoed on the main stem of the Union River below Graham Lake Dam, on the West Branch of the Union, and on the East Branch of the Union. Ken Cline has taught college courses on all branches of the Union for over 35 years, taking more than 200 students on the river or into the watershed. The operation of the Ellsworth and Graham Lake dams directly impacts professional and personal parts of our lives. The Union is an incredible recreational and ecological jewel which has suffered from more than 100 years of disruption by dams on the main stem of the river.  The water quality certificate for the Ellsworth Hydroelectric Project must include mandatory conditions which guarantee the ecological integrity of this waterway pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341 *et. Seq.* There are three (3) significant issues that the Maine DEP water quality certificate must address:     1. Without protecting native fish such as American Shad, the proposed discharge violates Maine’s Water Quality classification standards for the Union River. 2. Failure to provide adequate downstream fish passage violates Maine’s Water Quality classification standards for the Union River. 3. The Union River below Graham Lake is impaired because the water quality fails to meet state water quality standards for Class B waters due to the operation of these dams.     In 2020 the Maine Department of Environmental Protection (DEP) denied the water quality certificate for the two dams in Ellsworth. The DEP found that Graham Lake and the Union River below it failed to meet habitat standards for fish and other aquatic life. Leonard Lake, the second impoundment in the system, failed to meet dissolved oxygen standards for Class B waters. On June 18, 2025, Black Bear Hydro Partners LLC submitted an application for a Water Quality Certification (WQC) pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341 *et. seq.* for the federal relicensing and continued operation of the Ellsworth Hydroelectric Project. |

\*\* In addition to the listed commenters several students at College of the Atlantic contributed to these comments. These students include: Sierra Abrams, Ruby DeWilde, River Macrum, Sam Nguyen-Jones , Jay van Pelt, Ira Reinhart-Smith, Kinga Toth-Rohonyi, Andreigha Kramer, and Seven Steiner

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Pursuant to federal regulations, Maine DEP (as the certifying authority) “shall evaluate whether the activity subject to the Federal license or permit will comply with applicable water quality requirements” and “shall include any conditions in a grant of certification necessary to assure that the activity will comply with applicable water quality requirements.” 40 C.F.R.§ 121.3

Under Maine Law the Union River is a Class A stream except from the outlet of Graham Lake to tidewater, tributaries entering below Graham Lake, and the outlet of Green Lake which are Class B waters. 38 MRSA §467. Designated uses in both Class A and Class B streams in Maine include habitat for fish and other aquatic life. State water quality standards also require that “The aquatic life and bacteria content of Class A waters shall be as naturally occurs.” And habitat in Class B streams must be “Natural but can have impoundments.” Any discharges into Class A or Class B streams “shall not cause adverse impact to aquatic life in that the receiving waters” and “shall be of **sufficient quality to support all aquatic species indigenous to the receiving water** without detrimental changes in the resident biological community.” 38 MRSA §465. Therefore, protecting populations of native fish species is essential to protecting and restoring the biological integrity of the Union River. To this end, the water quality certification must guarantee the habitat and fish passage necessary to support American Shad.

**The life history of American Shad directly conflicts with the hydropower operations on the Union River.**

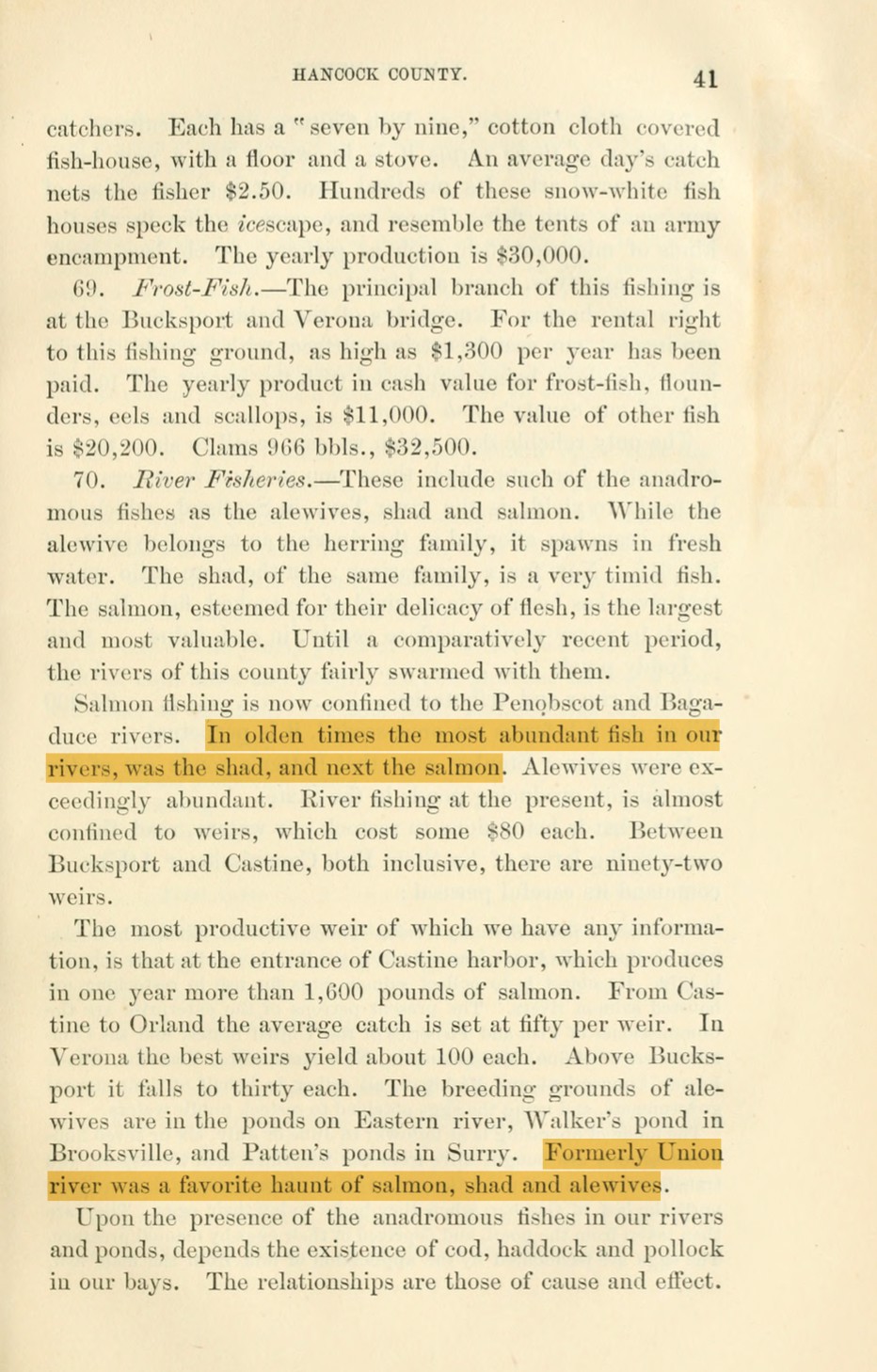
American Shad *(Alosa sapidissima)* have a historical habitat that “extends from southeastern Canada in Newfoundland, Nova Scotia and the St. Lawrence River south to central Florida in the U.S” (USFWS 2023). Shad are anadromous and spend most of their lives in the ocean and return to the freshwater rivers where they hatched during spawning. (Alosa Sapidissima | U.S. Fish & Wildlife Service n.d.) Young shad fry feed on aquatic plankton and insects, growing rapidly (Delaware River Basin Commission 2022). Larval survival improves in water temperatures greater than 20°C, pH above 7.0, prey levels higher than 50 individuals per liter (Limburg et al. 2003). As water temperatures begin to decrease in the late summer and early fall, movement of immature shad is triggered, and mass migration downriver occurs (Delaware River Basin Commission 2022).

After the young shad leave their natal river they school in high densities with shad from other regions, feeding on small fish, plankton and crustaceans in the Atlantic ocean, until they reach reproductive age around 3-4 yrs old and are ready to spawn (Atlantic States Marine Fisheries Commission, 2025). Primary summer feeding grounds for American Shad from Florida to Maine are located in the Bay of Fundy (Atlantic States Marine Fisheries Commission 2025; Delaware River Basin Commission 2022; Limburg et al. 2003).

Once the shad has reached sexual maturity, they will make the journey to their natal river, a journey that can span distances of hundreds of miles (Hollis 1948; Atlantic States Marine Fisheries Commission 2025). American Shad have strong homing tendencies (Hollis 1948) finding their way back to their natal river using olfaction (Limburg et al. 2003; North Carolina Museum of Natural Sciences 2021). During this migration, adult shad do not eat (Limburg et al. 2003; Delaware River Basin Commission , 2022), except for occasional opportunistic capture of prey (Grote et al. 2014). American Shad can only spawn in freshwater and are not capable of rearing young in saltwater conditions (Grote et al. 2014). Illustrating the importance of free-flowing riverways that allow for shad spawning.

### Historical Accounts document the presence of American Shad in the Union River

Looking at archived newspapers, reports, and writings, there are several compelling historical mentions of American Shad in the Union River and the Union River watershed. During a survey of Hancock County, Maine, in the late 19th century by Samuel Wasson, the surveyor made note that “In olden times [referencing previous years in the early-to-mid 19th century] the most abundant fish in our rivers was the shad, and next the salmon” (Samuel Wasson 1878). Samuel Wasson is also quoted (see below) in the survey report discussing the relationship between the Union River and the American Shad: “Formerly Union river was a favorite haunt of salmon, shad and alewives” (Samuel Wasson 1878).



In 1926 Walter P. Pio was looking through old Ellsworth records. He found an account that wrote about the shad population before the Ellsworth and Graham Lake dams were constructed. In an Ellsworth American newspaper article, Walter noted that: “In 1835, below the dam … a large number of shad [were caught]” (Ellsworth American 1926). Over 100 years prior to this Ellsworth American article, the Bangor Registry published a newspaper article outlining a proposed law that would, in part, protect the shad population in the Union River. The law was introduced by state legislators in both the state House and Senate chambers. The 1823 law read:

Be it enacted… that if any person shall make or continue any dam or other obstruction, in or across Union river, … through or into which salmon, shad or alewives have been accustomed to pass, for the purpose of casting their spawn, without providing and keeping constantly open and clear

… a sufficient passage or sluice way for such salmon, shad and alewives… shall forfeit and pay a fine not exceeding two hundred dollars, not less than fifty dollars” (Bangor Register 1823).

The existence of American Shad on the Union River can be highlighted by 19th century to early 20th century archived documents and accounts ranging between both eras: before the early 20th century damming of the Union and afterwards. Historical accounts of American Shad in the Union River, as well as other fish like Atlantic Salmon and Alewives began to decrease as the dams threatened the species survival.

An article from D. Stitch (et al. 2019), focused on the Penobscot River, addresses the lack of quantitative standards for evaluating fish passage at dams, focusing on American Shad. The authors developed a stochastic, life-history-based simulation model to study how dam passage and migratory delays impact shad populations in the Penobscot. The Union River needs a thorough assessment of the existence of American Shad in order to accurately understand the harms the shad population faces.

Archival research and early state legislation dating back to the 1800’s acknowledges shad’s existence, and these documents are the next best supplemental resources for determining the historical existence of the shad population in the Union River. Despite the historical records of shad in the Union, and early 1800’s state legislation aiming to protect species such as shad in the river, Brookfield denies the existence of shad in the Union in their section 401 water quality certificate application.

### Shad have specific habitat and Fishways requirements to ensure safe upstream passage

Shad as a species are sensitive to stress. If they are handled too much or are put through high-intensity passage situations, they will often die. Fish passages are typically designed for salmonid fish. Weaver (1965) reported observations of American Shad during a rate of flow experiment through a passage built for salmon. Flow varied between 11.4 and 13.5 feet per second, and the passage was 85 feet long. During this experiment, no fish were seen to pass successfully, and a reverse relationship between flow and distance fish gained in the passage was observed (Weaver 1965). Weaver et al. ([1972](https://onlinelibrary.wiley.com/doi/10.1080/19425120.2012.675975#CIT0066)) also examined passage through a fishway at the John Day dam, a run-of-the-river hydroelectric dam on the Columbia River. This dam sports a unique low-slope fishway (overall grade of 6.7%) and had shad passage of over 70%. The two ladders on this dam are vertical slot systems that reduce air entrapment and eddying in the waterflow, a design that has proven preferable for shad passage (Weaver et al. 1972). According to Haro and [Castro-Santos](https://onlinelibrary.wiley.com/authored-by/Castro%E2%80%90Santos/Theodore) (2012), American Shad may be more affected by turbulence and air entrapment than by water velocity. They are also reluctant to leave passages with large eddies or rest areas, likely in part because of the schooling behavior of shad. Passages such as pool-and-weir systems unnaturally separate schools and may disrupt migratory behavior. American Shad are diurnal in their migratory patterns, avoiding high-velocity areas at night; this extends to darkened areas of fishways. They prefer passages with free-flowing surface water (no submerged entrances) and continuous flow–unlike salmonids, they do not leap to ascend high velocity zones (Haro and [Castro-Santos](https://onlinelibrary.wiley.com/authored-by/Castro%E2%80%90Santos/Theodore) 2012).

Shad passage through typical fishways has typically been low, possibly due to their design favoring salmonids rather than other anadromous fishes. Passage systems for shad do exist. Important fishway designs characteristics for passing shad include: low-slope, decreased flow, and continuity of flow within the passage. Natural-type fishways are the most effective for passing shad, but technical fishways can also be effective, as long as they are low-slope, low-flow, and straightforward in their flow pattern (Weaver et al. 1972). Free-flowing surface water is important in passing shad, as they do not typically ascend through submerged or darkened passageways (Haro and [Castro-Santos](https://onlinelibrary.wiley.com/authored-by/Castro%E2%80%90Santos/Theodore) 2012).

Shad tend to swim in the upper layer of the water column, which means a fishway placed in the upper layer water column is ideal for their passage. They move in shoals or groups. The passage would have to be wide, allowing the fish to stay together. If they are separated, they will die from stress. In order to not confuse and stress the shad, resting places, in calmer, less turbulent water are required. Streaming deep pool passes seem to be the best for shad. Shad do not leap or jump, they only pass by swimming. They are also easily trapped in corners and sensitive to light changes (Larinier 2002).

### 1. Current American Shad Passage on the Union River is inadequate and violates Maine’s Water Quality Standards

The only means of fish passage the Ellsworth Dam has is by “trap and truck.” A method of collecting the fish at the bottom of the dam, loading them into a truck and bringing them to Graham Lake. Federal officials have recommended that the dam needs to improve fish passage or fish will continue to suffer from high mortality rates (Trotter 2018).

Currently, the Leonard Lake Dam blocks most of the historic fish spawning habitat for shad in the Union. Shad spawn in the lower section of the river, this is where their population is maintained. In order to support the indigenous population of shad to the Union, shad need access to spawning areas located just above the dam. The Graham Lake Dam severs the connectivity of the river and requires additional fish passage installed. Nature-like fishways are effective for shad, an example of this is the rock ramp on the Narraguagus river. Vertical slot fishways and Dennil Ladders have also been successful for shad and may be more easily implemented into the existing dam.

**2. The Water Quality certificate must require adequate downstream fish passage on the Ellsworth Dam.**

Brookfield’s Ellsworth dam is the site of consistent and documented fish kills of native aquatic species. Again, this directly violates Maine’s Water Quality classification standards for the Union River. Each year countless adult and juvenile American eels, river herring, and an assortment of other native species, die at the base or side of the dam during upstream movements or while trying to pass downstream over the spillway and onto rocks at the toe of the dam, through its penstocks and turbines, or the very limited bypass tube. Fish mortality at the site is well-documented. Turbines at the dam cause high downstream mortality rates for migratory fish, including shad. Brookfield does not plan on changing any operations until they “see at least ten dead fish a minute, which is about 14,000 dead fish a day” (Rogers 2021).

Immediate upgrades to downstream passage for fish in the Union River must be a condition of DEP certification of this project. This should include a downstream plunge pool for fish that fall over the dam, screening over the penstock intakes from April to November, the installation of deep gate to provide safe passage for American eels, and funding for Maine DMR staff to provide 3rd party monitoring of the river below the dam to assure that fish kills are stopped by these measures.

**3. Brookfield has violated Maine Water Quality Standards for dissolved oxygen in Leonard Lake for decades.**

Since the inception of citizen monitoring in the early 2000’s, the operators of the hydropower dams on the Union have failed to meet state dissolved oxygen requirements for Leonard Lake and the stretch of the Union River below Graham Lake dam. Although in their new application for a WQC Brookfield made minor modifications to their operating regime for Graham Lake and limited water quality enhancements for Leonard Lake, Brookfield has provided no new data or modeling on how these efforts will remedy the violations. The DEP should require state of the art aeration systems accompanied by weekly monitoring that assures that Brookfield’s systems bring the river into attainment with state water quality standards. If issues remain after the first two years, additional measures—including changed operation of the dams or more aeration systems should be required.

**Conclusion.**

The Union River is a public trust resource that the state of Maine holds in trust for all of its citizens. This weighty responsibility falls on the shoulders of the DEP to protect that trust resource through this water quality certification process. The Union River is an ecological and recreational gem that has long been tarnished by the operations of this hydroelectric project. Hydropower can be part of a smart energy future for Maine, but only if it is designed well and operated to ensure that the river complies with all applicable water quality standards. The current dams do not comply with the existing water quality standards applicable to the Union River and any water quality certificate must ensure that any new license includes mandatory conditions that ensure that they do.

Sincerely,

Ken Cline

Haysie Maurer

Tyler Hebert

Chloe Meyer

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