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April 29, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

**RE: Review of Updated Study Reports filed on March 1, 2016, for FERC project numbers P-1904 (Vernon), P-1855 (Bellows Falls), and P-1892 (Wilder).**

Dear Secretary Bose:

As the agency responsible for protecting fish and wildlife resources in New Hampshire, the New Hampshire Fish and Game Department (NHFGD) monitors and attempts to reduce the impacts of hydroelectric facilities on fish and wildlife species and their habitats. The mission of the New Hampshire Fish and Game Department (NHFGD) is to conserve, manage and protect the state's fish, wildlife and marine resources and their habitats, and to provide the public with opportunities to use and appreciate these resources.

The NHFGD submits the following comments after a review of the Updated Study Reports filed on March 1, 2016, for Vernon (FERC No. 1904), Bellows Falls (FERC No. 1855), and Wilder (FERC No. 1892) projects. We also support any comments received regarding these reports from the Vermont Agency of Natural Resources (VT Fish and Wildlife Department and VT Department of Environmental Conservation: comments to be filed on May 2, 2016), The Nature Conservancy, the USFWS (comments to be filed on May 2, 2016), and the NH Department of Environmental Services (comments to be filed on May 2, 2016).

## Study 10: Fish Assemblage

The goal of this study was to characterize the occurrence, distribution, and relative abundance of fish species present in the project-affected areas.

Please describe what characteristics were used to determine where the project-affected portion of tributaries ended.

The heading to the far right on Table 4.2-2 (Page 25) should be "YOY" and not "Adult."

It should be noted that although the study plan said "scap netters" (plural) would be used while sampling fish via boat electrofishing, the Final Report detailed that only a single scap netter was used. The efficiency of netting fish in a riverine environment can be compromised if flows are high and/or water clarity is poor, and use of a single netter can exacerbate this situation. Lower catches and/or netting efficiency should be addressed in the study report as a result of using a single netter. We would have strongly suggested two netters be utilized if we knew of this study plan deviation.

**Study 11: American eel survey**

The goal of this study was to provide baseline data relative to the presence of American eel in the Wilder, Bellows Falls and Vernon project-affected areas.

Eel abundance was determined to be low as extensive sampling captured only three eels. However, sampling methods (boat electrofishing, eel pots, portable electrofishing) were limited to shallow water habitats (<9 feet). Similarly, number of eels captured during other sampling efforts referenced in the report (Yoder et al. 2009, Study 10, and Vermont Yankee annual sampling) was also low, but sampling methods again were limited to shallow water habitats.

Because sampling efforts were limited to shallow water, it is possible that eel abundance in the project-affected areas is higher than suggested due to the following: 1) Personal angling experience and direct communication with anglers shows eels are present in deep pools above and below the Vernon Dam (in several instances, the number of eels caught by angling in a single day equaled the entire number captured during Study 11); and 2) Pools > 15 feet deep make up 30% of aquatic habitat when averaged among all study reaches (Study 7).

Portable electrofishing sampling (62.5% of all tributary samples and 20.6% of all mainstem samples) were performed during day, as opposed to night, due to safety concerns (this was not discussed with group or included in USR). This deviance could have impacted catch rates, especially if densities are low in shallow water habitats, and should be discussed in the study report.

Accordingly, we request the report acknowledges the limitations of sampling efforts and that results are biased towards shallow water habitats which may result in an underestimate of the abundance of eels within the project-affected areas.

Eel pot surveys appear to be less effective at lower population densities. No eels were captured in an eel pot survey of Lake Winnisquam in August 2013 (NHFGD unpublished data); yet silver eels are consistently found dead in the tailrace of the hydropower plant at the outlet of the lake. Eel pot surveys in the Merrimack River in 2002 captured only 3 eels upstream of the first mainstem dam (Essex Dam; Lawrence, MA), compared to 215 eels captured below the dam

(Sprankle 2002). The actual number of eels in the Merrimack River and its tributaries upstream of the Essex Dam is likely higher than indicated by the survey based on the large number of eels counted at the Amoskeag Dam (Manchester, NH) each year. The same is likely true of the Connecticut River in the project area surveyed in this report.

The conclusion in this report that eels are present in the project area at low densities is consistent with other studies in the region that show a significant decline in density upstream of dams (Sprankle 2002). Some decline in density is expected as one moves upstream in a larger river system, but American eels are still a major component of the fish community in tributaries of the undammed Delaware River over 300 miles upstream from its mouth (Baldigo et al. 2015). Study Report 11 suggests American eel densities in the project area are lower than one would expect in an undammed river of this size. This makes sense based on the three mainstem dams that eels must ascend to reach the project area in this study. However, the methods used in the report are likely to underrepresent eel populations at low densities.

It should also be noted that there are an estimated 6,398 miles of river and stream habitat in the Connecticut River watershed upstream of the Vernon Dam. Even at low densities, this quantity of habitat could produce a significant number of silver eels, all of which will have to move downstream through the project area to reach their spawning grounds.

**Study 13: Tributary and backwater fish access and habitats:**

The goals of this study were to assess whether water-level fluctuations from project operations impede fish movement into and out of tributaries and backwater areas within the project-affected areas and if operations impact available fish habitat and water quality in the tributaries and backwater areas within the project-affected areas. Specific objectives for this study were to conduct a field study of a subset of tributaries and backwaters in the project-affected areas to assess potential effects of water-level fluctuations on fish access to these areas in the impoundments and riverine reaches below the projects and to examine potential effects of water level fluctuations on available habitat and water quality in a subset of project-affected tributaries and backwaters.

An updated analysis approach for this study was presented at a meeting on March 18, 2016, and more information was emailed to the Agencies on April 4, 2016, from TransCanada. The following comments are related to the new analysis approach.

In general, we agree with the new approach. One aspect of the new approach is "For each study site, flag all spring dates (April 1 – June 30) in each of the 5 annual hydrology's run through the operations model, where < 0.5 ft. of water is present for 12+ hours of that date." As detailed in the email from April 4, 2016, 12 hours was selected simply to create a "breakpoint" and was also considered by TransCanada to be a time period that provided adequate fish access.

We suggest that in addition to the 12+ hours, a complete separate analysis be conducted where all spring dates for each study site are "flagged" when < 0.5 ft. of water is present at any time.

**Study 14 and 15: Resident fish spawning in impoundments and riverine sections**

The goal of these two studies was to assess effects on resident fish spawning from project-related water level fluctuations in the Wilder, Bellows Falls and Vernon impoundments (Study 14) and from project-related flow fluctuations in riverine reaches downstream of these project dams (Study 15). Impoundment target species included Smallmouth Bass, Largemouth Bass, Black Crappie, Pumpkinseed, Bluegill, Chain Pickerel, Northern Pike, Walleye, Yellow Perch, White Sucker, Golden Shiner, Spottail Shiner, and Fallfish. Riverine target species included Smallmouth Bass, White Sucker, Walleye, Fallfish, and Spottail Shiner.

The study report states that spawning surveys focused on shallow water because, in addition to being the preferred spawning location for some species, that is where potential project operation impacts would be greatest. For example, on Page 23 the report states: "Shallow spawning flats were targeted for several reasons: WSE fluctuations in backwaters were typically less than 2 ft., **thus potential impacts would be greatest for the shallowest habitats**; most of the target species are known to prefer relatively shallow water for spawning; and low water clarity prevented visual identification of eggs or nests in deeper water."

Additionally, deeper habitats were purposely excluded from being used as study sites (Page 3, 3.2.1 Impoundment sites: "Prior to the selection of potential study sites, areas were excluded that were not expected to provide significant spawning habitat, e.g. steep banks; silty mid-channel habitat; **depths >5 ft. deep (normal impoundment fluctuations are approximately 1-2 ft.)**; Page 12, 3.2.2 Riverine Sites: "Prior to the selection of potential study sites, areas were excluded that were not expected to provide significant spawning habitat, including areas dominated by sand or silt substrate; **areas >10 ft. deep that would not be vulnerable to normal operational fluctuations in water surface elevations;** ……"[emphasis added]). It should be noted that in some cases shallow water spawning locations were the only areas that could be surveyed due to times of reduced water clarity.

Despite this directed approach of focusing on shallow water spawning areas, the report consistently refers to biases associated with this approach and that the proportion of spawning sites found to be impacted by project operations is likely over-estimated. For example:

1) Page 34: "Water visibility also had an effect on most spawning surveys (excluding egg-block sampling), due to the visual nature of identifying and monitoring observed adult spawners, egg masses, or constructed nests. **This factor necessarily biases the spawning assessment towards shallower habitats that are more vulnerable to dewatering,**

**since deeper and less vulnerable eggs and nests were likely present, but largely undetected due to limitations in visibility. Consequently, estimates of project effects on egg or nest sites are conservative and likely to be over-estimated**."

2) Page 23: "Because backwater, tributary mouth, and island/bar surveys were all based on visual observations of spawning sites, periods of limited water visibility restricted the identification and monitoring of deeper egg or nest sites, and consequently **the estimated proportion of spawning sites impacted by project operations is likely to be over-estimated in this report."**

3) Executive summary: "Although deeper, less vulnerable nests were seen during periods of clear water and lower flows, these nests are likely under-represented in this spawning assessment."

4) Page 26: "Most backwater surveys conducted throughout May allowed confident visual identification of eggs or nests down to 3 ft., with some days of over 4 ft. visibility. Water clarity was generally less throughout June due to high water conditions and many days provided visibility conditions <2 ft., which were judged insufficient to adequately identify new spawning activities or to re-locate existing nests or eggs. In some cases water clarity was sufficient but WSEs were so high that previously identified nests were too deep to relocate. Because of these limitations, it should be clearly evident that **all visually-based spawning observations in backwaters (as well as tributaries and riverine islands) are biased towards shallow spawning, as deeper nests or eggs were less likely to be detected."**

**5)** Page 109 6.0: "High flows and water clarity significantly limited the depth at which egg or nest observations could be made or repeated. **This would affect the true representation of project effects as the more vulnerable sites were also the sites most commonly observed; whereas deeper and more protected nesting sites were more infrequently detected."** [Emphasis added].

We assume these references to bias and over-estimation imply there were additional nests/spawning events/eggs occurring in deeper water that were too deep to be impacted by project operations and/or were not surveyed due to the study approach. While these biases and/or over-estimation were assumed to occur in this study, they were not quantified.

References to bias and over-estimation should be removed from the report and clarifying language added. For example, rather than stating that "an average of 23% of sunfish nests may have been subject to depths less than 0.5 ft.", report that "an average of 23% of surveyed sunfish nests that were located in shallow habitats most vulnerable to project effects may have been subject to depths less than 0.5 ft. There were likely sunfish nests in deeper water that were not surveyed and/or not vulnerable to project effects."

In addition to data presented (proportion by site, range, mean etc.), data on nest abandonment and/or dewatering due to project impacts should be explicitly presented for yellow perch and sunfish as a proportion of the total number of nests/egg masses examined (similar to how data were presented for smallmouth bass and fallfish). For example, in addition to stating "an average of 20-25% of yellow perch egg masses may have been dewatered at some point in their development", also report the proportion of the 838 yellow perch egg masses examined that may have been dewatered at some point in their development. Our interest here is to be able to examine total project impacts for all nests/egg masses examined of a particular species, in addition to the data already presented in the report.

Page 2, 2.0- The report is missing the original first objective for Study 15- "locate and map nesting locations and spawning sites in riverine sections."

The study report states on Page 113 that "In general, project operations did not appear to exert significant negative impacts to spawning within project impoundments for the observed species and identified spawning locations." We believe the word "significant" is not appropriate in this context as no statistical analyses were conducted. Regardless of terminology, we feel that results presented do show a cause for concern in regards to project impacts (yellow perch: up to 25% of eggs may have been dewatered due to project operations; sunfish: mean of 23% of observed sunfish nests could be subject to loss due to dewatering or abandonment of the adult guardian; fallfish: 36% of nests in riverine reaches dewatered or impacted; smallmouth bass: 13% of nests in tributaries had minimum depths <1 foot and 34% of nests in riverine sections were potentially vulnerable to dewatering or nest abandonment by adult guardian)

The NHFGD recognizes the exceptional effort that went into these studies and that environmental conditions (high flows, poor water clarity) crews contended with made it difficult to reach study goals for all species. However, there is limited data (walleye- 1 egg, white sucker- 62 eggs from two sites, and largemouth bass- 5 nests) or no data (black crappie, northern pike, chain pickerel, spottail shiner, golden shiner) for 62% (8/13) of species that were investigated. We request that these studies be repeated in 2017 for walleye, white sucker, largemouth bass, black crappie, northern pike, chain pickerel, spottail shiner and golden shiner. Without additional studies, we cannot assess potential project-related effects on these species.

**Please see below for species specific comments:**

Black Crappie:

The study report details no spawning observations were made for black crappie. The report implies they are rare in the study areas due to a lack of angling catches (n = 2) and that they are a minor component of the fish community as they represented only 0.3% of the total fish catch in Study 10. Additionally, it is stated that black crappie are known to construct nests in aquatic vegetation, potentially making them more difficult to detect by visual means.

This species is not rare in these sections of the Connecticut River. In fact, angling catches during winter and spring at Study Site 14-VB-039 and 14-VB-050 are quite high, based on personal and professional observations. In the winter of 2014/2015, schools of hundreds of black crappie were present at Study Site 14-VB-050. It is not surprising that angling efforts during Study 14 caught a number of largemouth bass and chain pickerel, but only two black crappie, as lures that consistently capture bass and pickerel are typically not suitable for catching crappie. It is also not surprising that more black crappie were not collected during Study 10 boat electrofishing surveys as in the experience of the NHFGD, boat electrofishing is not an efficient or effective method to capture black crappie. Finally, in a number of NH water bodies black crappie have been observed to spawn on open flats and not in aquatic vegetation.

Yellow Perch:

On Page 29 it is stated that, "Because Yellow Perch eggs are encapsulated within a moist, gelatinous mass, brief periods of exposure did not appear to affect viability," and "Consequently, perch egg masses were not classified as "dewatered" unless they were exposed to air for an extended period of time (e.g., several hours)." Additionally, on Page 56 it is stated that "As noted earlier, the gelatinous mass that surrounded the Yellow Perch egg masses undoubtedly afforded some protection against short-term dewatering events, but the relationship between exposure duration and egg viability is unknown."

According to Normandeau staff at a meeting on March 18, 2016, no scientific study was found examining how long yellow perch eggs remain viable while dewatered and that references to dewatered time periods above were kept ambiguous because a critical time period was not known. Due to this, we strongly suggest the above language is removed from the report and that yellow perch eggs are considered dewatered as soon as they are exposed to air.

On Page 23 and 24 of the report it is reported that in instances the highest and lowest elevation was measured for a mass of yellow perch eggs instead of a single elevation measurement. In cases where the highest and lowest elevations were measured, the mean elevation was calculated for comparison with WSE data. These eggs masses were then considered dewatered if the WSE dropped below the mean calculated elevation of the egg mass.

We disagree with this mean elevation calculation and suggest that the highest egg mass elevation be used for comparison with the WSE as it is unknown if eggs will be viable, and for how long, if only a portion of an egg mass is in water. Additionally, the highest egg mass elevation should also be used so methods are consistent and results comparable among sites.

On Page 110 it is reported that up to 25% of perch eggs may have been dewatered due to project operations. It should be noted that estimated percent mortality of yellow perch egg masses was as high as 83% in some backwaters (WB-051; Zebedee Brook).

On Page 110 it is stated, "Although the 2015 data suggested that up to 25% of perch eggs may have been dewatered due to project operations, large numbers of perch eggs remained wetted throughout the incubation period and this estimate of mortality would likely change significantly under different flow conditions (e.g., higher mortality with more frequent uncontrolled high flow events, lower mortality under more stable and controlled conditions)." A similar statement could be made for any of the species for which data were collected and while likely true, it is somewhat irrelevant unless future studies are to be conducted under different flow regimes in future years.

Also on Page 110, there is a discussion about what spring WSE levels would be most beneficial to spawning yellow perch. We request that similar discussions be added for other species where appropriate.

As noted earlier, data on impacts to eggs masses due to project operations should also be presented as a proportion of the total number of egg masses examined.

<u>Northern Pike and Chain Pickerel:</u>

No northern pike or chain pickerel spawning activity was observed. Although extensive effort was made to survey the literature to document spawning temperature ranges, the resulting combination of these studies makes for a very wide spawning temperature range which may not be applicable to the Connecticut River. For example, northern pike are known to spawn under the ice at times and large pike are caught at both Study Site 14-VB-039 and 14-VB-050 soon after ice out each spring. Given correspondence filed with FERC by the Vermont Fish and Wildlife Department concerning this study, we agree it is likely pike spawning occurred prior to the start of the Study 14 surveys.

<u>Sunfish:</u>

Page 111 of the report states an estimated 23% of sunfish nests were potentially impacted by fluctuations in WSE. It should be noted that this represents a mean of 23% as up to 50% of observed sunfish nests were subject to loss due to dewatering or abandonment of the adult guardian.

As noted earlier, data on impacts to nest due to project operations should also be presented as a proportion of the total number of nests examined.

Smallmouth Bass:

Please show estimates of percent of nests vulnerable to dewatering similar to Figure 5.3-4.

Fallfish:

Please describe the rationale, as was done for other species, for selecting 10 days prior to nest observations and 5 days following an observation for the fallfish egg incubation period.

Please show estimates of percent of nests vulnerable to dewatering similar to Figure 5.3-4.

We concur and support the Vermont Fish and Wildlife Department's comments related to measuring fallfish nest elevation at the top of the nest mound instead of at the base.

**Study 16: Sea lamprey spawning**

The goals of this study were to assess the level of spawning activity by sea lamprey in the project-affected areas and to determine whether project operations are affecting the success (i.e., survival to emergence) of lamprey spawning.

The second goal of this study related to whether project operations affected success (i.e., survival to emergence) was not met. Therefore, it must be assumed that any dewatering of a nest results in the failure of that nest.

The study report states 26% (6 of 23) of sites experienced dewatering due to project impacts (including 6 sites at which no nests were identified). Also stated is that 44% (7 of 16) of sites at which nests were found were shown to be potentially exposed to dewatering. The value that should be reported is the percentage of dewatered sites where lamprey actually nested (i.e. 44%).

Sample sites were distributed evenly throughout the project area, but potential project effects vary widely depending on the location of the site. Eleven of the 23 sites were located in impounded habitat (6 sites in the Bellows Falls Dam impoundment and 5 sites in the Vernon Dam impoundment) and 12 sites were located in riverine habitat. All sites where nests were documented in impounded areas were associated with tributaries, with one exception at the very upper end of the Bellows Falls Dam impoundment. The focus of this report was on nest exposure due to project related water level fluctuations, yet nest exposure is not the only a suitable metric for assessing project impacts in impounded areas. The primary project impacts in impounded areas include inundation of spawning habitat, fine sediment deposition in lower tributary mouths, and tributary accessibility. These effects were not evaluated in this report.

There are 52 miles of impounded habitat and approximately 25 miles of riverine habitat in the project area studied. Of the 12 sites located within riverine sections, 7 were located in the 18-mile riverine reach below the Wilder Dam, 3 were in the 6-mile reach below the Bellows Falls Dam, and 2 were located less than 1 mile below the Vernon Dam. Of the sites located in the Wilder riverine reach, 2 did not contain nests, leaving a total of 10 sites within riverine reaches where sea lamprey nests were documented. Six out of these 10 sites (60%) contained nests that showed signs of dewatering. A clear distinction should be made in the report between riverine sites, where the majority of spawning in the mainstem river occurs, and impounded sites, where the majority of habitat has been flooded and suitable habitat is dependent on tributaries. These two habitat types should not be grouped in the Study Conclusion section and the percent of nests and sites (containing nests) dewatered should also be examined by habitat type.

A more extensive sampling effort focused on mainstem riverine reaches would be necessary to evaluate the extent of nest exposure in habitat that is most vulnerable to water level fluctuation. The sampling design in this report does not provide information on the relative importance of spawning habitat in different riverine reaches or on the relative importance of tributary vs. riverine spawning sites. Without the ability to compare the importance of spawning habitat at the reach, site, or nest level, all nests must be considered equally important.

The water surface elevations depicted at sites in Figure C-14 and C-15 in Appendix C. are very different from that depicted in Figure C-13, which represents a site just upstream. These three sites were all in the Bellows Falls riverine reach. The report mentions the Wilder and Vernon riverine reaches have a higher risk of nest exposure because flows there are the most dynamic, but does not explain why flows in the Bellows Falls riverine reach are less dynamic.

The captions below each figure should explain why some of the graphs do not represent the same pattern of flow fluctuations that is shown for the other riverine sites.

Site WL-005 is listed as no project impact in Table 6.1-2, but is reported as having one nest exposed for 16.3% of logger records in Table 5.2-3. Please correct or clarify.

The percentage of time that sea lamprey nests were exposed (Table 5.2-3) over the entire length of the study period (May 15 to July 15) does not capture the true nature of exposure in some nests, which were rapidly dewatered and inundated multiple times during periods of project influenced flow. The total number of exposures, average length of exposure, and the min/max length of exposure should be presented for each nest. In addition, percent exposure should be calculated based on periods when flows are within project generating capacity. The length of time that flows exceed project generating capacity will vary each spring. Focusing only on percent exposure during periods of project influenced flow will aid in comparisons of nest exposure.

The extent of flow fluctuation at each site was not well documented in the report. From the graph in Figure C-1 (Appendix C.), water level appears to have fluctuated by up to 6 feet in a 24-hour period. This rapid fluctuation in water level may influence spawning behavior and impact the total number of nests available for study. The difference between maximum and minimum water level elevation, average daily (24-hr) water level fluctuation, and the average rate of change in water level elevation (ft. /hr.) should be reported for each site during periods of project influenced flow.

In addition to reporting the percentage of sites (with nests) that were dewatered, the percentage of nests that were dewatered should be reported (nests at all sites combined).

The study report states "Exposure was not necessarily relative to mortality, however, because the assignation of risk assumes that exposed nests were occupied during periods of project-controlled discharge" and "Finally, dewatered nests do not necessarily represent negative effects since the nests may not be occupied during exposed periods, or the duration of exposure may not be detrimental to early life stages." Regardless of the validity of these statements, they are not relevant because nest occupation during periods of project-controlled discharge and/or during exposed periods, and whether the duration of exposure was detrimental to early life stages, were not quantified. These statements should be removed from the report.

Liedtke et al. (2015) was cited as evidence that "exposure may not be detrimental to early life stages". While some Pacific lamprey ammocoetes in that study were able to survive exposure, smaller ammocoetes were significantly more vulnerable to dying during exposure periods than larger ammocoetes. Nest exposure would impact ammocoetes in their first few weeks of life, when they are at their most vulnerable. Liedtke et al. (2015) did not study the effects of exposure on sea lamprey eggs. Impacts to older year-classes of sea lamprey larvae were not evaluated in Study 16. The above statement in quotes should be removed from the report.

Several mitigating factors are detailed in the report on Page 76 and 77: One mitigating factor given was: "It is not clear that spawning occurs in all nests. As noted in Section 5.1, radio telemetry tracking suggested the potential for serial spawning or, alternatively, exploratory nest construction. Nests that may be abandoned or unoccupied due to non-operational flows are inconsequential in terms of project affects." Regardless of the validity of this statement, it is not relevant to this study because nests that were abandoned or unoccupied due to non-operational flows were not quantified. This statement should be removed from the report.

In addition, the effect of project influenced flows on nest placement, nest construction, spawning behavior, and nest abandonment was not evaluated in this report. Without a better understanding of the influence of flow on spawning behavior, it is difficult to assess the relative importance of each nest.

Another mitigating factor given was: "The spawning season included periods when high river discharges exceeded project generating capacity, conditions that typically occur during the spring spawning season. Vulnerable nest elevations were therefore most accessible to spawning lamprey in flow periods beyond project operations. Spawning and gestation could occur entirely or mostly during extended periods of continuous submergence." The statement assumes that periods of nonoperational flows will reliably occur each spring and that these flows are beneficial to sea lamprey spawning. The timing and duration of non-operational flows vary each year. Spawning success during periods of non-operational flow vs. project influenced flow was not evaluated in this study. Any reference to the occurrence of non-operational flows during the spawning season as a mitigating factor to potential project impacts should be deleted.

Another mitigating factor given was: "Ammocoetes are adapted to survive some dewatering. In a laboratory study that evaluated the effects of dewatering on larval Pacific lamprey movement and survival (Liedtke et al., 2015), about one-half of ammocoetes emerged from the sand following exposure to dewatering conditions and about one-half stayed burrowed. Those that emerged tended to do so only after substrate exposure, increasing the potential for stranding, and those that remained burrowed were more than four times more likely to survive. Mortality was less than 7 percent for exposure periods of less than 24 hours. For nests that experienced exposure, the average period of exposure was always less than 10 hours (Table 6.1-2). In this study, specific nests at only three sites were exposed for longer than 24 hours, and then for a limited number of events (site 16-WL-001, 2 events; 16-WL-002, 1 event; 16-VL-001, 1 event)."

The study cited (Liedtke et al., 2015) focused on impacts to larval Pacific lamprey in a laboratory setting with a sandy burrowing substrate. It did not examine effects on nest construction, egg survival, or larval emergence, and therefore should not be used to speculate on the effects of dewatering on sea lamprey nesting success in Study 16. The study cited also did not examine the effects of multiple dewatering events. Nests at higher elevations in Study 16 were exposed up to 53 times during the study period on the Connecticut River. Additional factors that would occur in a natural setting (predation, variable substrate and topography, desiccation) were also not evaluated (Liedtke et al. 2015).

Another mitigating factor given was: "At all sites except one (16-BT-004) where identified nests were exposed in low or minimum flow periods, there were other nests identified that were always submerged. Additionally, suitable habitat was often available in channel areas adjacent to island / bar assessment sites. It is possible that spawning occurred in those deeper habitats as well. Radio telemetry tracking indicated that adult lamprey were frequently located in areas of suitable substrate, but that were >10 ft. deep. Those areas were generally out of the scope of this study because they were not vulnerable." While this observation is likely true, it was not quantified (either actual spawning or spawning success) and therefore should not be used as a mitigating factor as spawning success of these deeper nests was also unknown.

Please provide a table showing the distance between each study site and the logger used to determine WSE. We are concerned that some loggers were located far away from study sites and might not be representative of actual water level conditions experienced at the study site.

Pending future revisions of the Study 16 report and additional analyses requested in our comments, an additional year of study may be required in order to be able to assess potential project impacts on sea lamprey spawning.

**Study 18: American eel upstream passage**

The goal of this study was to provide baseline data on the presence and areas of concentration of American eels attempting to move upstream of the Vernon, Bellows Falls and Wilder dams. Visual surveys were conducted weekly in areas of likely concentration below each of the dams. In addition, 10 baited eel pots per project were set overnight once per week. If/when locations of eel aggregations were identified through either visual surveys or eel pot collections, eel trap passes would be deployed. Due to low catch rates and lack of identification of aggregation areas, no eel trap passes were deployed.

Based on study results, TC stated that no concentrations of eels staging below or trying to ascend the dams were identified. However, TC noted that, based on the numbers of eels observed using the Vernon ladder during the course of Study 17, eels were more attracted to the fish ladder than other wetted areas across the dam and raised the question whether higher numbers of eels would have been detected at other locations had the ladder shut down as it normally does after the anadromous fish passage season.

TC did not draw the same inferences at Wilder and Bellows Falls with respect to attraction to the ladders as it did for Vernon, apparently based on the relatively lower ladder passage numbers (52 at Wilder, 60 at Bellows Falls versus 1,545 at Vernon). While eel passage rates in the ladders were lower at the upstream two projects, they still suggest (particularly in the context of the very low numbers of eels observed or caught as part of Study 18 at those facilities) that the ladders likely attract eels. The fact that two of the three eels observed at Bellows Falls were at the fish ladder underscores this hypothesis.

As noted above, TC questioned whether more eels would have been observed at other wetted locations if the fish ladders had not been operating. We share this inquiry, which leads us to request that TC conduct a supplementary study (only at Vernon) to determine if there are discernible areas of eel concentrations during periods when the ladder is not operating for riverine or anadromous fish passage. Collecting additional data will also help identify if alternate ladder operations result in higher passage rates for eels than what was seen during Study 17.

Therefore, we recommend that TC repeat Study 18 in 2016, using visual observations at wetted locations along the dam and an eel trap pass within a lower portion of the Vernon fish ladder. TC should determine the location, design, and operation and attraction flows of the fish ladder eel trap pass in consultation with the agencies and Dr. Alex Haro of the USGS Conte Anadromous Fish Research Center. A similar study using an eel trap located in the lower part of a fish ladder was successfully conducted in 2015 at the Turners Falls Project (FERC No. 1889) as part of a FERC approved study plan for that project. Additionally, similar to methods in Study 18, temporary eel trap passes should be installed, with consultation with the aquatic working group, if adequate concentrations of eels are found during visual observation surveys.

By requesting this study, TC should not infer that we will not seek expanded ladder operation as part of any new license issued for the Vernon Project, as that cannot be determined until after review of the riverine fish passage study report, yet to be filed. Rather, this study request is intended to obtain additional information to better understand the relative benefits and drawbacks of different fish passage scenarios to assist us in developing recommendations and prescriptions as part of the relicensing process.

**Study 21: American shad telemetry study**

We support and concur with comments filed by the USFWS on May 2, 2016, regarding this report.

**Study 30: Recreation**

Please detail the next steps in regards to how decisions will be made concerning what TransCanada boat ramps will undergo improvements or repairs.

In the report it is detailed that 42.8% of those surveyed desired lower water level fluctuations and 42.9% stated current water level fluctuations are fine. How does this information get incorporated into the relicensing of these dams and future project operations?

The "Hinsdale access" referenced on Page 100 is owned by NH DRED, not NHFGD.

Thank you for this opportunity to comment on this very important relicensing project. If you have any questions or comments regarding these recommendations, please do not hesitate to contact either Fisheries Biologist, Gabe Gries at 603-352-9669 or Carol Henderson, Environmental Review Coordinator at 603-271-3511.

Sincerely,

Glenn Normandeau
Executive Director

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