152 FERC ¶ 62,052
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

FirstLight Power Resources Project No. 2576-048, -059

ORDER APPROVING LITTORAL ZONE MONITORING PURSUANT TO ARTICLES 401 AND 406

(July 23, 2015)

1. On July 15, 2014, FirstLight Power Resources, LLC (licensee) filed its Littoral Zone Monitoring Reports pursuant to license Articles 401 and 406 of the Housatonic River Project (project). [1] The Housatonic River Project is located on the Housatonic River in Fairfield, Litchfield and New Haven counties, Connecticut, and does not occupy any federal lands.

BACKGROUND

2. Article 401 of the license requires, in part, that the licensee file for Federal Energy Regulatory Commission (Commission) approval the plans, drawings, and schedules as required by the Connecticut Department of Energy and Environmental Protection (DEEP) Section 401 Water Quality Certification (WQC; attached to the license as Appendix A). WQC Condition 6 for the Shepaug Development and Condition 8 for the Stevenson Development require the licensee to file plans to study the littoral zone community of Lake Lillinonah and Lake Zoar, respectively. Article 406 of the license requires the licensee to file a plan to study the littoral zone of Candlewood Lake at the Rocky River Development, which should be similar in scope to the littoral zone studies required by the WQC for the Shepaug and Stevenson developments.

3. The purpose of the Littoral Zone Monitoring Plans (LZMP) required by Articles 401 and 406 is to assess and determine whether the fluctuations due to normal operations of the reservoirs at the Stevenson, Shepaug, and Rocky River developments affect the shoreline and littoral zone community.[2] The licensee has established surface water

[1] Order Issuing New License. 107 FERC ¶ 61,305 (issued June 23, 2004).

[2] For the purposes of these requirements, the littoral zone is defined as the shoreline area that exists between the upper and lower limits of the normal operating range of the reservoirs, including wetlands. The littoral zone community is defined as

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elevations for the normal operating range and a seasonal drawdown elevation range or target for each development; the littoral zone encompasses the lower and upper vertical bounds of the normal operating range, although typical water level fluctuation occurs over a somewhat narrower range. The normal operational range and drawdown elevations[3] for the developments, listed from downstream to upstream, are:

Development	Summer Operating Range Elevations	Winter Drawdown Elevations	Requirement
Stevenson (Lake Zoar)	98.8 to 101.3 (Δ 2.5 feet)	Target: 96.3	Article 401 WQC Condition 7
Shepaug (Lake Lillinonah)	193.8 to 198.3 (Δ 4.5 feet)	Target: 188.3	Article 401 WQC Condition 5
Rocky River (Candlewood Lake)	425.1 to 427.6 (Δ 2.5 feet)	Range: 416.0 to 424.0	Article 406

4. The littoral zone is a transitional interface along the upland-aquatic continuum, and species richness in the littoral zone is typically high, as is the range in habitat types. Further, the littoral zone may provide spawning and nursery areas for fish, and aquatic macrophytes are an essential part of the productive littoral zone in lakes. If, based on the results of the study, DEEP and U.S. Fish and Wildlife Service (FWS) determine that significant adverse effects to the littoral zone occur during normal operations, the licensee would be required to implement corrective actions to mitigate the impacts. Pursuant to Article 401(b), the licensee is required to obtain Commission approval for corrective actions prior to implementation.

5. Currently, the impoundment fluctuation during normal operations for Lake Lillinonah (excluding emergency or maintenance drawdowns) is 4.5 feet. However, the historic normal operating range for Lake Lillinonah has been 3.0 feet. The licensee's interest in utilizing the full 4.5-foot operating range to optimize power generation would potentially impact the littoral zone. In order to evaluate this proposed change in operating range, and to meet requirements of the Article 401 and WQC requirements, the

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rooted aquatic plants, fish and invertebrates that inhabit the littoral zone year-round or on a seasonal basis, and vertebrate species that may nest or burrow in the littoral zone.

[3] All units in feet National Geodetic Vertical Datum (NGVD)

licensee developed a LZMP to assess the impacts of impoundment fluctuations on the ecology of the littoral zone, including fish, mussels, wetlands, and associated wildlife species. This plan was designed to meet two objectives: (1) evaluate the freshwater mussel community in Lake Lillinonah and Lake Zoar, and (2) evaluate benthic macroinvertebrate communities in the littoral zone and sublittoral zone of each lake to provide measures of ecosystem health.

6. The approved LZMP for the Stevenson and Shepaug developments under Article 401[4] was divided into two phases. Phase 1 involved mapping the littoral zone and contiguous wetland areas, a fish spawning survey, and an analysis of operating data to determine the frequency and amplitude of fluctuations under actual operating conditions. Following completion of Phase 1, the licensee would prepare a report for the resource agencies that provides the results of the analyses (i.e., mapping, spawning, and operating and hydraulic data), and would also include recommendations and a schedule for Phase 2. Phase 2 involved the development of a report that analyzed the impact of normal operations on the littoral zone communities at the respective lakes, and a summary of the activities resulting from the Phase 1 recommendations.

7. The licensee would prepare both the Phase 1 and Phase 2 reports for DEEP and FWS to review. Following review of the Phase 2 report, if impacts requiring mitigation were identified by the licensee or the agencies, the licensee would meet with agencies and other parties (as appropriate) to discuss mitigation measures, responsibilities, and evaluations, and whether it was recommended that the licensee continue monitoring the littoral zone and project operations. Should the licensee, agencies, and other parties (as appropriate) agree that monitoring should continue, the licensee would develop a plan for an additional phase of study according to a schedule determined during discussion of Phase 2, which would include, but is not limited to, a description of the scope of the continuing work and a schedule for reporting.

8. Pursuant to the Article 401 LZMP, the Phase 2 report for Stevenson and Shepaug developments was to be filed for Commission approval by June 15, 2008.[5] On May 4, 2009, the Commission granted the licensee's request for an extension of time until May 31, 2009, to submit the Phase 1 and 2 reports and a scope for conducting additional Phase 3 studies for a shoreline forest inventory in order to address comments and recommendations for further monitoring from the DEEP.

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[4] Order Approving Littoral Zone Monitoring Plan Pursuant to Article 401. 113 FERC ¶ 62,039 (issued October 13, 2005).

[5] The filing date as corrected in an erratum issued December 14, 2005.

9. At the Rocky River Development, lake water levels are typically lowered 12 feet during the winter, usually every other year, in order to control invasive Eurasian watermilfoil. In order to determine the effect of the drawdown on resources in the littoral zone, the licensee's LZMP under Article 406[6] required a qualitative mussel survey, a wetland assessment at 6 potential wetland monitoring areas, and a qualitative fish spawning access study at tributaries to the lake (including a qualitative assessment of the tributary flows). In the Article 406 LZMP, the licensee stated that the intent of the plan is to adjust future monitoring activities based on the monitoring results and any changes in project operations. Specifically, the purpose of the LZMP is to monitor the effect of fluctuations in water surface elevation due to normal project operations on littoral zone resources of Candlewood Lake and to adjust monitoring activities as appropriate, given monitoring results and/or changes in project operations. The information collected under the Article 406 LZMP would serve as a basis of comparison to assess changes in littoral zone community composition, structure and extent in relation to any future alterations to project operations.

10. Pursuant to the Article 406 LZMP, the licensee was to file the study report for Commission approval by December 31, 2006. On January 3, 2007, the licensee filed the report in two parts, describing wetland monitoring and fish spawning access monitoring. In a letter dated April 26, 2007, Commission staff stated that the monitoring that was conducted did not provide enough information to determine whether reservoir operations were interfering with fish spawning access, and therefore required that the licensee repeat the assessment and file updated results with the Commission by December 31, 2008.

LICENSEE'S RESULTS

Article 401: Stevenson & Shepaug Developments

11. The licensee's filing for the Stevenson and Shepaug developments includes: a 2008 report on the littoral zone, a 2010 wetland inventory, a 2011 report on freshwater mussel and benthic macroinvertebrate surveys, and a 2011 report on zebra mussels. The licensee also filed the 2010 proposal for the Phase 3 shoreline forest inventory and a 2012 report on the shoreline forest inventory and inundation study for Lake Lillinonah at the Shepaug Development.

Littoral Zone Report

12. Under Phase 1 of the Article 401 LZMP, the licensee characterized the littoral zone at the Stevenson and Shepaug developments, and under Phase 2 the licensee assessed the effects of normal operation on the respective littoral zones. The licensee's

[6] Order Approving Littoral Zone Monitoring Plan Pursuant to Article 406. 111 FERC ¶ 62,157 (issued May 11, 2005).

Phase 1 report characterizes habitat properties, biota, and potential sources and locations of disturbance in the littoral zone (such as bank sloughing). The licensee characterized littoral zone properties based on four attributes: (1) overall lake water chemistry; (2) substrate type; (3) fish spawning nest distribution; and (4) other properties (e.g., slope, toppled trees, bank sloughing, wetlands, land use patterns, tributaries, mammal burrows, mussel populations, and invasive wetland plants). [7]

13. The licensee's Phase 1 studies indicated that the steep bathymetry in both lakes restricted the littoral zone to narrow bands along the lake perimeter, and that there were very few instances where the littoral zone extended significantly outwards into the main channel. The licensee reported that observed substrate types in the littoral zone of both lakes included organics, fine sand, coarse sand, cobbles, and occasionally boulders. More fish spawning nests were identified in Lake Lillinonah than in Lake Zoar, suggesting that the spawning conditions are more favorable in Lake Lillinonah. Both lakes had similar general water chemistry, although Lake Lillinonah had greater levels of turbidity in the upper reaches, possibly due to higher levels of phytoplankton. Fish spawning nests occurred exclusively on coarse-grained mineral substrates that were not exposed to rapid flows or wind-induced mixing. The licensee found that large areas of unoccupied habitat suitable for nesting were available, indicating that the nesting aggregations are not resulting from limited availability of habitat type. The licensee states that spawning nests were constructed in the shallow waters of the littoral zone of both lakes, with little spawning activity in water depths greater than 3 feet. Spawning nests occurred at greater depths in Lake Lillinonah compared to Lake Zoar, and in an addendum the licensee clarifies that all of the nests in Lake Lillinonah were located at least 0.3 feet below the lower limit of the normal operating range (193.8 feet), and therefore were not vulnerable to dewatering. However, at Lake Zoar, about 30 percent of the spawning nests observed were located above the lower limit of the normal operating range (98.8 feet): all were located 0.2 feet or less above that elevation but were vulnerable to dewatering because they were within the normal operating range. The remaining spawning nests were within 1.8 feet of the lower limit.

14. Under Phase 1, the licensee provided data on water surface elevation in both lakes for 2006 and 2007. Water surface elevation data was recorded at two locations in each lake at 15-minute intervals, 24 hours a day. With some exceptions where the licensee drew the impoundment down to minimize flood impacts, the water surface elevation at both developments remained within the normal operating range most of the time during 2006 and 2007. At the Shepaug Development, the licensee did not exceed the upper limit

[7] The licensee's report includes an extensive discussion of the invasive plants identified during the littoral zone surveys, which falls under Article 409 of the license order and will not be discussed further here.

of the normal operating range (198.3 feet), but exceeded the voluntary upper limit of 196.8 feet on a total of 6 days over the two years of interest. At Stevenson Dam, the licensee reported that the water surface elevation was often higher than the upper limit of the normal operating range (101.3 feet), most commonly within 6 inches of the limit. The upper limit was exceeded by more than one foot in April 2006 and 2007, due to high spring runoff. Spill occurs at the Stevenson Dam when the water surface elevation exceeds the upper limit of the normal operating range.

Wetland Inventory

15. The licensee characterized and catalogued the wetlands as part of the LZMP in order to better understand the possible effects of lake level fluctuations that are common for hydroelectric impoundments. The licensee conducted fieldwork and wetland sampling at Lake Lillinonah in June 2010, and at Lake Zoar in July and August 2010.

16. Due to the steep terrain that dominates most of area between the operating water level and the project boundary at both developments, there is little opportunity for poorly drained soils to form. Of the 8 selected wetland areas examined at Lake Lillinonah, the licensee states that all of the sites are under the influence of water level fluctuations in the lake, and would be inundated if water levels approached the project boundary and exposed when the lake is drawn down. Of the 11 wetlands studied in Lake Zoar, the licensee states that all but one are under the influence of water level fluctuations in the lake, and would be inundated if water level increases approach the project boundary elevation. The remaining wetland area was below Stevenson Dam and may be influenced by lake level management practices.

17. The licensee states that sediment bars are forming at both lakes due to deposited sediments, and will likely grow over time as eroded materials from high in the watershed are swept into the lake and deposited in the impoundment. These sediment bars could eventually grow in size and elevation, and some areas could begin to support populations of emergent vegetation; once such areas become established, it would increase the coverage of wetlands under the influence of lake level fluctuations and work to improve water quality.

Freshwater Mussels and Benthic Macroinvertebrates

18. The licensee conducted a freshwater mussel and benthic macroinvertebrate survey in Lake Zoar and Lake Lillinonah in October 2010. The objective of the surveys was to characterize nearshore communities of mussels and macroinvertebrates, which would contribute to a broader assessment of the ecological effects of impoundment fluctuations associated with routine operations of the Shepaug and Stevenson developments. The licensee performed semi-quantitative catch-per-unit effort freshwater mussel surveys at eight representative locations in each lake using snorkel and SCUBA surveys to compare mussel populations in shallow (<2 meters) and deep (>2 meters) water. The licensee

further collected benthic macroinvertebrate samples at five of the mussel survey locations in each lake in the shallow littoral zone.

19. The licensee documented three freshwater mussels in both lakes: eastern lampmussel, eastern floater, and eastern elliptio. Most mussels were found in sublittoral areas. In Lake Zoar, mussels were found at 6 of 8 sites (in total, 80 live mussels); at Lake Lillinonah, mussels were found at 3 of 8 sites (in total, 5 live mussels). The licensee states that there appears to be ample high-quality habitat in Lake Lillinonah but the lack of mussels may be related to water chemistry and water level fluctuations.

20. The licensee identified a total of 29 families of benthic macroinvertebrates, comprised of a relatively low diversity of pollution-tolerant annelids, mollusks, crustaceans, and insects. The two lakes had similar macroinvertebrate diversity, evenness, and biotic indices. Sublittoral areas were typically dominated by midges and aquatic worms that can tolerate low oxygen and poor substrate conditions, while shallow littoral areas typically supported a less impaired community with species more sensitive to low dissolved oxygen (such as mayflies and caddisflies). The licensee concludes that the macroinvertebrate data indicates fairly poor water quality with moderate organic enrichment.

21. Based on its study, the licensee concludes that environmental conditions in the impoundments at both developments may impede the establishment of viable mussel populations. The high productivity of the impoundments leads to seasonal hypoxic conditions in deeper water, combined with periodic drawdowns may also contribute to the overall lack of mussels. The results of the benthic macroinvertebrate studies further indicates that the lakes are large eutrophic warmwater reservoirs that receive a large amount of nutrients, sediments, and pollutants from the watershed which contributes to macroinvertebrate assemblages comprised of low-diversity, pollution tolerant species. During a 2011 survey of invasive mussels and clams, the licensee reported similar results for the native mussels as was found in 2010, although there was a relatively higher percentage of eastern floater in Lake Lillinonah and better documentation of recruitment success for all three mussel species based on the presence of small mussels.

Zebra Mussels

22. After the discovery of non-native zebra mussels during the 2010 freshwater mussel survey, the licensee conducted a follow-up study to determine the distribution, abundance, and demographics of zebra mussels in the lakes. The licensee performed zebra mussel surveys at 16 sites in each lake during the autumn drawdowns to maximize detection of mussels. During the study, zebra mussels were found in 12 of 16 sites at Lake Zoar (a total of 798 zebra mussels) with the highest densities in the middle and upper portions of the lake. Zebra mussels were found to be widely distributed in Lake Lillinonah, and were found in 6 of 16 sites (a total of 34 zebra mussels), primarily located in the lower half of the lake but at low densities. Both lakes contain extensive suitable

habitat for zebra mussels, although low oxygen may limit their distribution in deep water and excessive algal growth and water level fluctuations might limit their occurrence in shallow water. The licensee concludes that the population at Lake Lillinonah appears to be very small and the likelihood of within-lake fertilization is generally low (except at one site), however, there are enough zebra mussels in Lake Zoar to establish a self-sustaining population, suggesting that the entire impoundment and areas further downstream in the watershed are at high risk.

23. During the 2010 freshwater mussel survey, the licensee found non-native Asian clams in Lake Zoar. The licensee conducted a follow-up survey in 2011 and found Asian clams in 12 of 16 survey sites in Lake Zoar, and states that it was locally common, suggesting a reproducing population that has probably been established for several years. Asian clams were also found in Candlewood Lake (Rocky River Development).

24. Based on these studies, the licensee concludes that zebra mussels are present in both lakes but their long-term success in becoming established and stable in the lakes is uncertain. The licensee describes several factors that may help limit the zebra mussel populations in Lake Zoar, including the fact that approximately 80 percent of the zebra mussels found were in dewatered areas and were either dead or likely to die before the impoundment was refilled, the calcium concentrations in the lake are lower than what is considered optimal for zebra mussel growth, and low oxygen levels in deep water might preclude zebra mussel establishment in otherwise suitable physical habitat.

Shoreline Inventory and Inundation

25. The licensee's filing includes a description of Phase 3 studies conducted at Lake Lillinonah to conduct a shoreline forest inventory, which included a quantitative assessment of the typical tree species within the project boundary and the littoral zone on Lake Lillinonah. The purpose of the study was to determine the anticipated effect on trees and forestland along Lake Lillinonah's shoreline during inundation to an elevation of 198.3 feet if inundation to this elevation was to be regularly maintained. The methods followed a pilot program conducted by the Connecticut Certified Foresters in 2010, and included a strip sampling method (which is more intensive than a variable radius plot methods and better suited for a shoreline survey), and involved an intensive inventory of forest resources and slopes at various locations around the lake's shoreline within open space areas, along with a literature search for information regarding the flooding tolerance of various tree species.

26. The licensee's June 2012 Lake Lillinonah Shoreline Forest Inventory and Inundation Report states that forest inventory plots selected for the study were restricted to portions of the shoreline that are both forested and adjacent to either open space or utility-owned. Plots were not located on portions of the shoreline considered to be developed or privately owned, therefore residential and potentially developable property was not used. This approach ensured that the results were restricted to areas that can be

reasonably assumed to remain in a forested state into the foreseeable future. Each of the 78 forest inventory plots consisted of a 10 foot wide by 50 foot long fixed area plot oriented parallel to the shoreline, and the licensee obtained data for all trees with a 1-inch and greater diameter at breast height (species, size, merchantable height, lean, undercut, and elevation); at five plots, individual tree elevations were not taken and therefore those plots are not considered in elevation-related analyses. In addition to the shoreline forest resource data, the licensee also examined other influences on forest structure, including substrates (soils), wetlands, and wave action.

27. The licensee states that no trees were measured below elevation 198.3 feet at a total of 5 plots along the Lake Lillinonah shoreline, meaning that no trees lie within the current (3.0 feet) or proposed (full 4.5-feet) operating ranges at these locations. There were 39 plots with trees below elevation 196.8 feet, and 66 plots with trees between elevations between 196.8 to 198.3 feet (the primary study area). Based on the study, the licensee concluded that a total of approximately 39,822 trees lie within the study area portion of Lake Lillinonah's shoreline forest: 3,223 trees are below the primary study area (below elevation 196.8 feet) and therefore already subjected to periodic inundation; 9,601 trees lie within the primary study area (196.8 to 198.3 feet) and could be affected during normal operations; and 27,000 trees lie above elevation 198.3 feet. The licensee states that inundation could be a minor factor in some tree mortality, but that it is likely not as important as natural competition and erosion, and that many of the species along the shoreline are capable of surviving periodic inundation. While there may be some reduced vigor due to long inundations, the licensee states that most trees would recover as long as the inundation is not sustained.

28. The licensee notes that an important factor in tree mortality at the shoreline is erosion, which is caused by several factors. Because the shoreline at the Lake Lillinonah impoundment is relatively young, the licensee states that some erosion would continue to slowly happen until a more natural shoreline is created. The licensee concludes that the data shows the health and stability of the trees at the Lake Lillinonah shoreline is a function of distance to the water, soil stability, aspect, and slope. Further, wave action could exacerbate soil instability in some areas which could consequently affect the shoreline forest. The licensee states that it is possible that the net number of trees within portions of the primary area of interest would not change due to normal operations, although changes in shoreline species composition could occur over time, favoring more moisture-tolerant species.

29. The literature review generally suggests that the timing and duration of an inundation event (or series of events) are important causal factors for the amount of tree damage and mortality that can be expected to occur because of the inundation. The licensee states that a possible result of more sustained operations at the upper license limit for the development (198.3 feet) is that while areas within the primary study area

may not necessarily become deforested, they may convert over time to contain more flood tolerant tree and shrub species.

Article 406: Rocky River Development & Candlewood Lake

30. The licensee's filing for the Rocky River Development includes: the original fish spawning access assessment and wetland monitoring results (both dated 2006) with an addendum for each (dated 2011); an analysis of drawdown impacts at Saw Mill Brook (dated 2010, with stream sections and topographic maps from 2008); and reports on freshwater mussels and mussel habitat in the drawdown zone (dated 2008 and 2011).

Fish Spawning Access Assessment

31. The purpose of the fish spawning access assessment (fish study) is to qualitatively assess the effects of drawdown and refill activities on fish access to spawning areas, to identify water surface elevations in the lake and determine whether there are physical barriers to fish movement. Specifically, the licensee needed to determine whether the winter drawdown of Candlewood Lake prevents access to tributary spawning areas by fall spawners (brown trout) and early spring spawners (white sucker and walleye).

32. In order to accomplish this, the licensee's plan proposed: (1) establishing photograph reference points at assessment sites in Glenn Brook, Ball Pond Brook, and Saw Mill Brook; (2) placing a staff gauge at the mouth of each tributary; and (3) recording observations about water temperature, dissolved oxygen, fish presence, and indications of erosion. The Commission's Article 406 LZMP Order further required that the licensee make a qualitative estimate of tributary flow during the fish study, using descriptors such as "full bank", "half bank", and "less than half bank" as a way to analyze the effects of the drawdown on tributary access.

33. The licensee states that it qualitatively assessed fish access to spawning areas in tributary streams after the winter drawdown had occurred (January 11, 2006) and before the spring refill began (March 14, 2006). On each sampling date, the licensee searched the stream channel for silt bars and other obstructions that could impede the upstream migration of spawning fish. On the March 2006 sampling date, the licensee also assessed tributary flow and stream conditions qualitatively. The licensee established permanent photograph stations at each site and placed a standard measuring instrument (a staff gage) at the mouth of the Saw Mill and Glenn brooks in order to convey scale. The licensee's filing includes the 2006 results, which were previously found to be deficient,[8] and a 2011 addendum to the fish study consisting of photographs of sites at Saw Mill Brook, Glenn Brook, and Ball Pond Brook. The 2011 addendum contains no explanation of any

[8] Letter issued by the Commission on April 26, 2007.

conclusions based on the photographs, but includes the date the photographs were taken, the lake elevation, and the orientation of the view.

34. The licensee's evaluation at Saw Mill Brook indicated that the brook followed a fairly well-defined channel through the flats near its outlet. Flow occupied the full width of this channel during the March 2006 sampling period but was well below bank-full. There was an area of erosion and deposition upstream of the summer pond level, which the licensee stated was the result of recent rain storms.

35. At Glenn Brook, the licensee examined two channels at summer pond level in January and March 2006: an eastern channel approximately 15 to 20 feet wide and one foot deep, and a western channel approximately 1 to 2 feet wide and a half foot deep. The licensee states that the shallow depth in the west channel may preclude fish access in January and March, but that the east channel appeared to have adequate depth to allow fish access during those months. Flow through the east channel followed a relatively narrow channel cut through the fine sediments downstream of the summer pond level and flow occupied the full width of this channel during the March sampling but was below bank-full.

36. The licensee evaluated fish spawning access to Ball Pond Brook in January and March 2006, at a location approximately 600 feet upstream of the brook's outlet to Candlewood Lake. There is a 3 to 5 foot falls at the location that may become a barrier to upstream spawning fish migration during low water flow, as well as a 5 to 10 foot falls located approximately 100 to 150 feet upstream from the edge of Candlewood Lake, which may be a migration impediment even during high flows. No other impediments to migration were observed. The substrate composition at the site was generally boulder and rock, and flow through the area appeared to fill the streambed.

37. During the licensee's 2006 evaluation, no fish were observed during the assessments. The licensee concluded that Saw Mill Brook and Glenn Brook did not have any physical barriers to fish migrations, while two falls at Ball Pond Brook may present a migratory barrier. Based on this, the licensee concluded that there were no impediments to fish migration caused by the Rocky River Development.

38. The licensee's addendum includes photographs taken on November 30 and December 17 and 21, 2010, and provide the Candlewood Lake elevations (425.6, 422.0, and 419.0 feet, respectively). No other data, such as observations of fish, descriptions of tributary flow, or assessment of migratory impediments, are included in the addendum.

Wetlands Monitoring

39. The licensee selected six representative wetland plots along the shoreline of Candlewood Lake in October 2005. The plots include a variety of wetland types and would be used to evaluate the effects of fluctuating water levels on wetland habitats. The

licensee recorded observations of vegetation within 1 square meter (m^2) quadrats in the littoral zone, reported the dominant wetland shrub species bordering the shoreline and described the inundated and upland soils of each plot. The 2011 addendum to the wetlands report states that in November 2010, the licensee re-examined the same six wetland plots.

40. The licensee classified the plants identified in each plot according to the Wetland Indicator Status Database. The licensee states that a side-by-side comparison of the 2006 and 2010 wetland plant species data allowed the licensee to compare the average wetland indicator status between the two sampling events. Specifically, if the wetland's hydric regime was becoming saturated, the average wetland status would trend towards obligate and facultative wetland status symbols; if it was becoming drier the average wetland indicator status would trend towards facultative and facultative upland status symbols. The licensee assessed whether changes had occurred in the six plots by comparing photographs of the sites taken in the 2006 and 2010 surveys, which provide a sense of the overall wetland area composition. Due to seasonal differences (the incidence of a killing frost), the 2010 investigation concentrated on mostly shrub and tree species with a few frost-hardy herbaceous plants, and the licensee notes that foliage is less evident in the 2010 photographs.

41. The licensee concluded from the comparison of average wetland indicator status in 2006 and 2010 that there was little change in plants at plots 1, 3, and 4, while plots 2, 5, and 6 all tended toward species that can tolerate drier conditions. In the 2006 survey, plots 5 and 6 had been inundated with up to 6 inches of water. The licensee states that the apparent drying trend was likely created by the presence of non-native plants: many of the non-native species identified have a wetland indicator status of facultative upland (plants more likely to appear in upland soils than wetland soils). The licensee documented fewer non-native species in 2006 compared to the 2010 sampling event.

Analysis of Drawdown Impacts: Saw Mill Brook

42. The licensee reported on the potential effects to the streambanks of the Saw Mill Brook outfall into Candlewood Lake due to drawdown. The brook was examined in several sections, and the licensee concluded that there was no instability in the streambanks caused by the drawdown. However, at several sites heavy foot traffic at the water's edge had stripped some banks of vegetation, which could cause the banks to lose stability. In order to correct this, the report recommended that there should be an unmowed buffer along the streambanks in to discourage foot traffic and help maintain bank stability.

Freshwater Mussels and Mussel Habitat in the Drawdown Zone

43. The objective of the licensee's freshwater mussels and mussel habitat studies was to assess the effects of the winter drawdowns on resident mussels within the Candlewood

Lake drawdown zone. The licensee conducted studies during the winter drawdowns in 2007 and 2010. During winter 2007, Candlewood Lake was to be drawn down 3 feet, and the elevation of the lake was 426.1 feet during the mussel survey. During winter 2010-2011, Candlewood Lake was scheduled to have a 12-foot drawdown (first drawn down 3 feet in December 2010, and then drawn down 9 feet in January 2011). The 2010 mussel survey was conducted when the lake elevation was dropping from 425.68 to 425.34 feet.

44. Although most of the Candlewood Lake shoreline is rocky and inhospitable for mussels, the licensee identified several locations offering more suitable substrates (gravel, sand, silt), and conducted all sampling in potential mussel habitats. The licensee conducted its mussel surveys at 20 randomly located 0.25 m^2 quadrats located in suitable habitats within the drawdown zone. In 2007, 14 quadrats were located on the exposed shoreline and 6 quadrats were located underwater at a depth of 3 feet or less. The 2010 survey used the same 20 quadrats, but the licensee stated that 15 were located on the exposed shoreline and 5 were underwater at a depth of 3 feet or less. The licensee searched each quadrat to a depth of 4-6 inches, and recorded the elevation of each quadrat relative to the lake level at the time of sampling. All mussels were identified to species and measured. In addition to the mussel surveys, in 2007 and 2010 the licensee examined mussel habitat along the entire shoreline and its island by boat in order to visually estimate substrate composition in the littoral zone.

45. Surveys in suitable mussel habitats yielded few live mussels and very few relic shells. In 2007, the licensee found two live specimens of eastern floater located in a protected cove on Orchard Point, and two eastern elliptio relic shells along the shoreline at the south end of Candlewood Lake (located outside of a quadrat). During the 2010 survey, the licensee did not find any relic shells or live mussels.

46. In addition to the 2010 mussel survey, the licensee examined a total of 68.8 miles of shoreline to estimate overall mussel habitat quality along the littoral zone exposed during the drawdown, in order to visually estimate substrate composition and assign a habitat value of good, moderate, or poor. The licensee's results indicate that approximately 33 percent of the shoreline was identified as good habitat (fine grained substrate), 9 percent was moderate habitat (combination of fine and coarse substrates), and 58 percent was poor habitat (coarse substrate). Poor habitat was most prevalent along both the eastern and western shores of Vaughns Neck and in the southwest portion of the lake, while good habitat was observed along the western shoreline from Squantz Pond to the northern tip of Deer Island. Moderate habitat was interspersed throughout the study area and not concentrated in any specific area.

47. The licensee's 2007 and 2010 mussel surveys indicated that the Candlewood Lake shoreline does not support a large freshwater mussel community, and most of the shoreline is poor mussel habitat due to the abundance of coarse bedrock, boulders, and cobble substrate. The licensee states that the lack of live mussels along the shoreline was

consistent with lakes that are subjected to fluctuating water levels. Because Candlewood Lake is subjected to annual drawdown in an effort to eradicate Eurasian water milfoil, the licensee states that the mussel community in the drawdown zone has likely been reduced, although there may be mussels present in deeper portions of the lake.

AGENCY COMMENTS

48. The licensee states that littoral zone reports were filed with DEEP and FWS on June 5, 2014, and that the agencies did not provide comments.

DISCUSSION AND CONCLUSION

Lateness of the Reports

49. The licensee's Littoral Zone Monitoring Reports were filed long after the May 31, 2009 deadline (for Article 401 studies) and the December 31, 2008 deadline (for Article 406 studies), and contained no explanations for why the filings were late. The licensee's July 2014 filings each contained a list of documents identified as either "final/filed" or "for review" and the documents have completion dates ranging between 2008 through 2012 for Article 401, and 2006 through 2011 for Article 406. Additionally, the filings were not clear what information had been provided to the agencies and when, nor was it clear whether the multiple follow-up studies were conducted to meet agency recommendations.

50. On August 20, 2014, Commission staff issued a letter requesting that the licensee provide additional information about the reasons for the late filings and the timeline for when studies were conducted and provided to the agencies for review. The licensee's September 12, 2014, response noted, in part, that delays were due to the lack of a response from DEEP with regard to the studies and reports. The licensee further stated that the documents were filed together, later than the established deadlines, because of the difficulty in obtaining comments from DEEP.

51. The licensee's September 2014 letter provided a timeline of events pertaining to the LZMP, and copies of correspondence with DEEP from 2009 through 2013 which demonstrated that it had consulted with DEEP on the littoral zone studies. The DEEP had provided comments in a letter dated September 15, 2009, stating that certain portions of the LZMP needed additional evaluations, including wetland mapping at the Stevenson and Shepaug developments. The licensee's July 2014 filings include an updated 2010 wetland mapping report which provides the information requested by DEEP.

52. Also in the September 2014 letter, the licensee stated that in early 2011, DEEP informed the licensee that because of personnel changes at the agency it would take approximately one year to determine who would be the point of contact for littoral zone

issues at the project. The licensee made a request to DEEP for comments on the Littoral Zone Monitoring Reports on June 5, 2014, but received no response.

53. The licensee's reports were filed 5 years after the established deadlines. The lateness of the filings and the failure of the licensee to request an extension of time for filing the reports constitutes a violation of the license. In its September 2014 letter, the licensee stated that it recently revised its practices with regard to ensuring timely filing of documents required by the Commission, and is committed to ensuring license compliance. The corrective actions proposed by the licensee should improve future compliance with deadline requirements. No enforcement action or penalties pursuant to Section 31 of the Federal Power Act will be recommended at this time for this violation. This violation will be made a part of the compliance history for this project and considered in the course of our review of any other violation to determine appropriate Commission action.

Littoral Zone Monitoring Reports

54. Commission staff notes that some of the data provided in the reports are now several years old. It is difficult to determine, based on the multiple disparate reports and lack of a unifying conclusion based on the collective data, the licensee's overall conclusions regarding the effects of impoundment fluctuations on the ecology of each development's the littoral zone. Depending on the resource and the individual lake under review, it appears there may or may not be an influence of the drawdown and/or water surface elevation, although no significant effects are expected to occur.

55. Under the various reports for the Article 401 LZMP, the overall determination for Lake Lillinonah and Lake Zoar appears to be that: (1) fish spawning is not affected by the drawdowns; (2) wetlands may be inundated if water levels are increased; (3) sediment bars are likely to increase and therefore wetland coverage could increase; (4) freshwater mussel populations and benthic macroinvertebrates may be affected by drawdowns and high productivity of the reservoirs; and (5) invasive zebra mussels and Asian clams are present in the impoundments. At Lake Lillinonah, the shoreline tree inventory results appear to indicate that a number of trees are at risk (of damage and mortality) due to inundation, and that the species composition would be expected to change over time to contain more moisture-tolerant species.

56. Under the various reports for the Article 406 LZMP, the overall determination for Candlewood Lake appears to be that: (1) fish spawning access is not affected by reservoir levels, although there are two falls at Ball Pond Brook where accessibility is related to tributary flow; (2) the wetland inventory showed little change through time; (3) stream banks at Saw Mill Pond appear to be stable; and (4) mussel populations are likely low due to drawdowns.

57. Pursuant to the approved LZMPs, the licensee was required to present the results of the littoral zone studies in a report and submit it to DEEP and FWS for review, and to the Commission for approval. The licensee's reports are intended to describe the overall effects to the entire littoral area that may be affected by the operating range of the respective developments of Housatonic River Project. The reports adequately describe effects of impoundment fluctuations associated with normal operating range to multiple resources in the littoral zones of each of the three developments. The final reports were provided to DEEP and FWS for review and no comments were received. According to the licensee's September 2014 supplemental filing, the licensee has attempted on multiple occasions to consult with the resource agencies and received no responses.

58. Pursuant to the WQC and Article 401(b), if, based on the results of the study, the DEEP and U.S. Fish and Wildlife Service (FWS) determine that significant adverse effects to the littoral zone occur during normal operations, the licensee would be required to implement corrective actions to mitigate the impacts; any corrective actions would require Commission authorization. DEEP and FWS have not indicated that there is a significant adverse impact to resources based on the reports, and the Commission staff do not conclude that there is a need to implement corrective actions at this time to protect littoral zone resources. The licensee's reports meet the requirements of Articles 401 and 406 and should be approved.

The Director orders:

(A) FirstLight Power Resources Services LLC's (licensee) Littoral Zone Monitoring Reports for the Housatonic Project, filed on July 15, 2014, pursuant to Articles 401 and 406, are approved.

(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l* (2012), and the Federal Energy Regulatory Commission's regulations at 18 C.F.R. § 385.713 (2014). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance