PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)
Proposed Study Plan Meeting
March 22, 2018

BROOKFIELD RENEWABLE

TOPSHAM HYDRO PARTNERS LIMITED PARTNERSHIP

150 MAIN STREET

LEWISTON, ME 04240

GOMEZ AND SULLIVAN ENGINEERS

NORMANDEAU ASSOCIATES
Environmental Consultants

Agenda

- Introductions

- Purpose of the Proposed Study Plan Meeting

- Relicensing Process to Date

- Next Steps in the Relicensing Process

- Proposed Study Plan Presentations

- Summary of Studies Adopted with Modifications

- Summary of Studies Not Adopted

Purpose for Meeting

- Requirement under the FERC Integrated Licensing Process (18 C.F.R. § 5.11)

- Discuss the Proposed Study Plan (PSP) for Pejepscot Hydroelectric Project (February 12, 2018)

- Next step in the planning and development process for studies that will inform the License Application (August 31, 2020)

Relicensing Process to Date

- **August 31, 2017** –Notice of Intent and Pre-Application Document Filed

- **October 30, 2017** – FERC issued Scoping Document 1

- **November 28, 2017** – FERC held scoping meetings

- **December 29, 2017** – Stakeholder comments filed on PAD and SD1, as well as Study Requests

- **February 5, 2018** – FERC issued Scoping Document 2

- **February 12, 2018** – Topsham Hydro filed Proposed Study Plan

- **March 22, 2018** – Proposed Study Plan Meeting

Next Steps in the Relicensing Process

- **May 13, 2018** – Comments on Proposed Study Plans due from Stakeholders

- **June 12, 2018** – Topsham Hydro will consider comments and file Revised Study Plan

- **June 27, 2018** – Comments on Revised Study Plan due from Stakeholders

- **July 12, 2018** – FERC issues Study Plan Determination

Study Requests Received

- Maine Department of Marine Resources (December 20, 2017)

- Maine Department of Environmental Protection (December 27, 2017)

- National Marine Fisheries Service (December 28, 2017)

- Maine Department of Inland Fisheries and Wildlife (December 29, 2017)

- United States Fish and Wildlife Service (January 3, 2018)

Studies Proposed

- Water Quality Assessment

- Tailwater Benthic Macroinvertebrate Survey

- Eel Monitoring Survey

- Largemouth and Smallmouth Bass Spawning Habitat Survey

- Fish Entrainment and Turbine Survival Assessment

- Evaluation of Spring Migration Season Fish Passage Effectiveness

- Evaluation of Fall Migration Season Fish Passage Effectiveness

- Botanical Resources Survey

- Wildlife Resources Survey

- Recreation Facilities Inventory and Use Assessment

- Historic Architectural Survey

- Historic Archaeological Phase I Survey

- Precontact Period Archaeological Survey

Water Quality Assessment
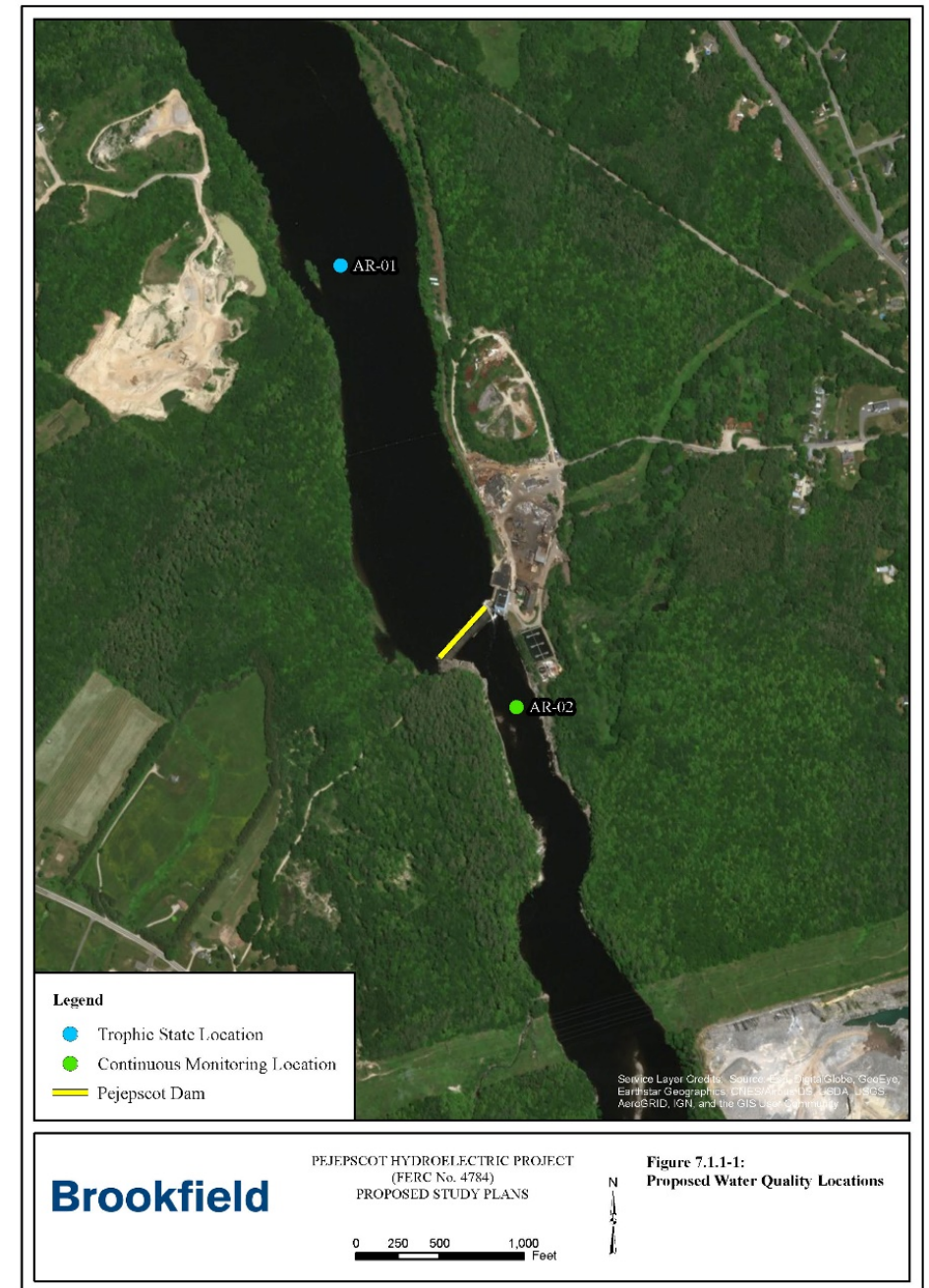
Study Goals and Objectives

- Collect periodic water quality data in the Project impoundment

- Collect continuous water temperature and dissolved oxygen data downstream of the Project dam

Water Quality Assessment

Methodology

Sampling Locations
- AR-01: Trophic state data collection at the deepest location in the impoundment
- AR-02: Temp/DO monitoring downstream of the Project

Figure 7.1.1-1:
Proposed Water Quality Locations

PEJEPSCOT HYDROELECTRIC PROJECT
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PROPOSED STUDY PLANS

Water Quality Assessment

Methodology

AR-02: Trophic State Data Collection Methods (per DEP protocols)

- Twice per month, June through October
  - Secchi Depth
  - Vertical Profiles: Temp/DO
  - Epilimnetic Grab Samples
- Late Summer Stratification Sample – One additional set of samples
  - Should thermal stratification occur, samples will be collected from epilimnion, top of hypolimnion, and one meter above sediment
  - Should thermal stratification not occur, a set of samples will be collected from the epilimnion during late summer with an integrated core sampler at a depth between the surface and two times the Secchi disk depth, or within 1 m of the bottom, whichever is less.

Parameter	Detection Limit
Field Parameters	
Secchi disk transparency	0.1 m
Temperature	0.1°C
Dissolved Oxygen	0.1 mg/L
Twice Monthly Lab Analytes	
Total phosphorus	0.001 mg/L
Chlorophyll a	0.001 mg/L
Color	1.0 SPU
pH	0.1 SU
Total alkalinity	1.0 mg/L
One-Time Late Summer Sample Analytes	
Total phosphorus	0.001 mg/L
Chlorophyll a (uncorrected*)	0.002 mg/L
Color	1.0 SPU
pH	0.1 SU
Total alkalinity	1.0 mg/L
Nitrate	0.01 mg/L
Dissolved Organic Carbon	0.25 mg/L
Total iron	0.005 mg/L
Total dissolved aluminum	0.010 mg/L
Total calcium	1.0 mg/L
Total magnesium	0.1 mg/L
Total sodium	0.05 mg/L
Total potassium	0.05 mg/L
Total silica	0.05 mg/L
Specific conductance	1 mS/cm
Chloride	1.0 mg/L
Sulfate	0.5 mg/L

* Chlorophyll a is not needed in stratification samples below the epilimnion. Uncorrected chlorophyll a will be tested via trichromatic determination

Source: MDEP, 2014

Water Quality Assessment

Methodology,

AR-01: Temp/DO Monitoring (per DEP protocols)

- July 1 to August 31 (Typical Low Flow period)
- Exact location to be determined based on initial measurements
  - DO measurements at first, second, and third quarter points along cross-section
    - If no violations of DO criteria are found and concentrations among locations are within 0.4 mg/L of each other,
      - A sensor will be installed in the area of the main flow
    - If the criteria are not met,
      - A sensor will be deployed at the area of the lowest DO concentration, and another will be deployed in the main flow (2 sensors total)
- Temp/DO Monitoring Sensor(s)
  - Deployed at mid-depth
  - Set to record data on a 1-hour increment
  - Cleaned/maintained/downloaded approximately every two weeks

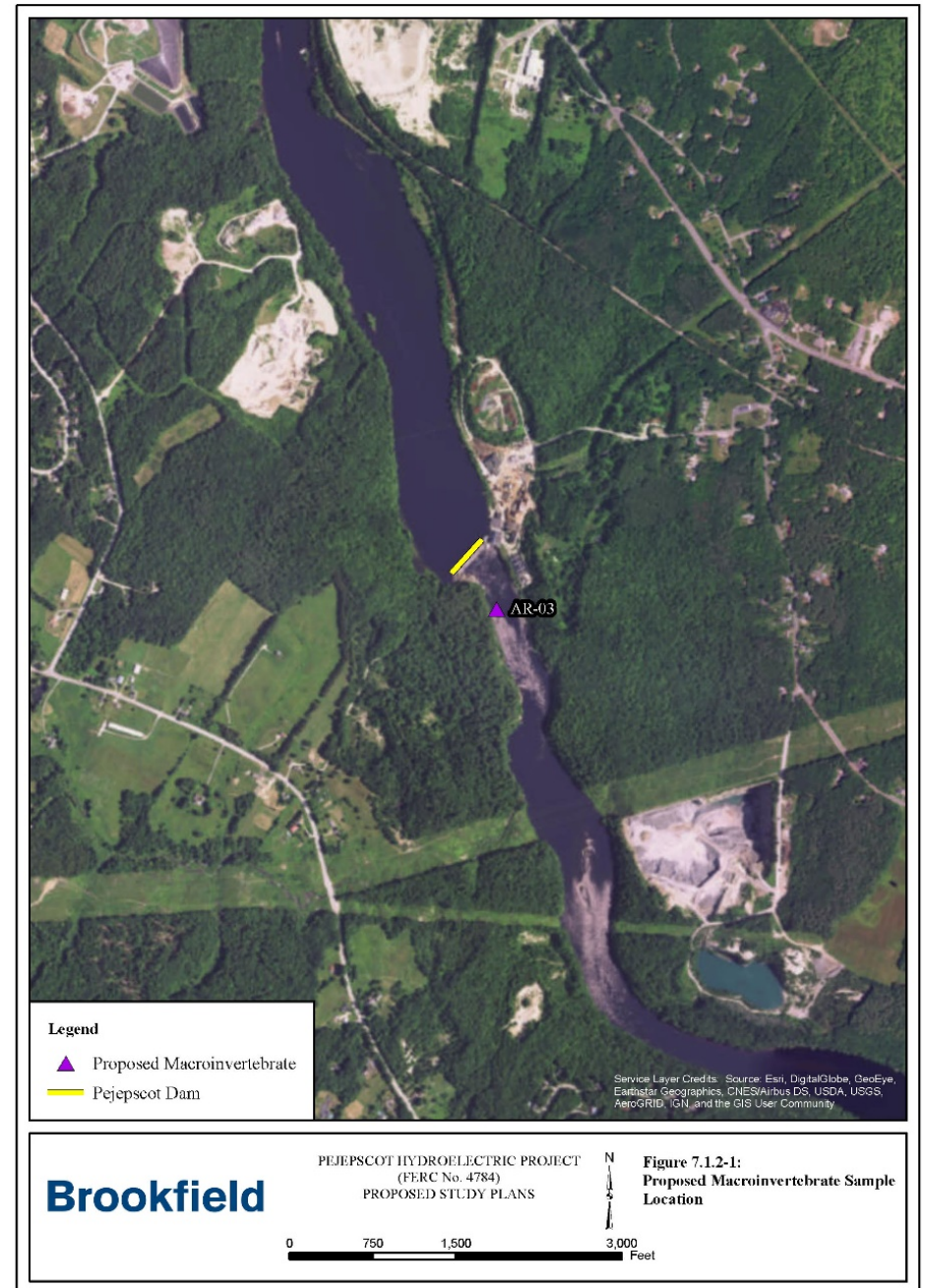# Tailwater Benthic Macroinvertebrate Survey

Study Goals and Objectives

- Determine the composition of the benthic macroinvertebrate community downstream of the Project Dam

Tailwater Benthic Macroinvertebrate Survey

Methodology

AR-03: Benthic Macroinvertebrate Sampling Methods (per MDEP protocols)

- 3 replicate rock baskets deployed for a 28 day exposure period (July 1 to September 30)

  - Within close proximity to the MDEP S-954 location (2010)

  - Capture low flow, high temperature conditions

- Rock basket retrieval will involve scrubbing rocks in a 600-micron sieve bucket

- Samples will be preserved in 70% ethyl alcohol and sent to a certified macroinvertebrate taxonomist or laboratory for processing

Legend

▲ Proposed Macroinvertebrate
— Pejepscot Dam

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Brookfield

PEJEPSCOT HYDROELECTRIC PROJECT
(FERC No. 4784)
PROPOSED STUDY PLANS

Figure 7.1.2-1:
Proposed Macroinvertebrate Sample Location

0   750   1,500   3,000
Feet

Path: P:\1925\maps\Study Plans\Figure_7_3_2_5-1_Proposed_Macroinvertebrates.mxd

Eel Monitoring Surveys

Study Goals and Objectives

- Goal is to evaluate the need and potential location for an upstream eel passage facility at the Project

- The objectives for the study include:

    - Conduct systematic surveys of eel presence/abundance at the Project to identify where eels concentrate when staging in pools or attempting to ascend wetted structures

    - Identify potential locations that may be viable sites for a permanent eel trap/pass structure

Eel Monitoring Surveys

Methodology

- Conduct nighttime visual monitoring surveys during the primary period of upstream eel migration (June 15 - August 31)

  - Twice weekly from June 15 to July 15
  - Once weekly from July 15 to August 15
  - Final survey during the last two weeks of August

- Surveys will be conducted immediately following sunset from safely accessible locations

  - Lower deck in the vicinity of the fish lift entrance
  - Eastern corner of the upper working deck overlooking the spillway section
  - Point overlooking the western corner of the spillway section

- The duration and timing of searches will be recorded and representative water quality data will be collected (i.e., temperature, DO)

- At each survey point, observations of eel activity (i.e., presence/absence, abundance, and distribution among pre-defined size classes) will be recorded

- Information related to Project operations, weather and lunar cycle will be recorded for each survey

Largemouth and Smallmouth Bass Spawning Habitat Survey

Study Goals and Objectives

- Document bass spawning habitat, and nesting areas by species (largemouth and smallmouth bass) within the Project impoundment

Largemouth and Smallmouth Bass Spawning Habitat Survey

<u>Methodology</u>

- Literature review to determine when largemouth and smallmouth bass in the Project area typically spawn and habitat-types used for spawning, spawning behavior or habits
- Two surveying events will be completed
- Study area will encompass the Pejepscot impoundment littoral zone from the Pejepscot Dam upstream to the Route 125 bridge
- Surveys will be conducted by traversing the littoral zone via boat and wading to visually identify any largemouth and smallmouth bass nests, egg masses/deposits, and/or spawning habitat
- Data collection will include
  - Photo-documentation of habitat types, egg deposits, and identified nests
  - Geo-referenced locations of identified habitats, egg deposits, and nests
  - Water temperature and clarity measurements
  - Flow velocity and depth at identified spawning habitats, egg deposits, and nests
  - Sediment/grain sizes associated with nests, embeddedness, approximate diameter of identified nests, presence of fish at nests, presence of aquatic vegetation, nest abandonment, sedimentation of eggs

Fish Entrainment and Turbine Survival Assessment

Study Goals and Objectives

- Evaluate the potential level of impingement and entrainment for diadromous fish species at the Project

  - Provide a description of the physical characteristics of the Project (including forebay characteristics, intake location and dimensions, calculated approach velocities, and rack spacing);

  - Analyze target species for factors that may influence vulnerability to entrainment and mortality;

  - Assess the potential for the impingement or entrainment of target species; and

  - Evaluate turbine entrainment passage survival using available site-specific estimates, comparable project estimates and calculated values.

Fish Entrainment and Turbine Survival Assessment

<u>Methodology</u>

- Will be conducted as a desktop assessment
- Assemble available project and species related information
  - Project intakes and turbine parameters
  - Generalized life history characteristics for each diadromous species
  - Available swim-speed information for each life stage/species
  - Physical measurements/dimensions for each life stage/species
- Evaluate impingement/entrainment potential
  - Develop qualitative rankings (by life stage/species) based on project rack spacing and body size – calculated intake velocities, the site-specific intake configuration, and other life history characteristics will all be considered
  - Review existing database summarizing previously conducted full-flow tailrace netting studies (EPRI 1997), focusing on previously tested turbine types similar to those at Pejepscot
- Evaluate turbine passage survival
  - Review previously conducted studies at similar unit types (see EPRI 1997, Winchell et al. 2000)
  - Run Franke et al. blade strike probability model for fish sizes likely to be entrained at Pejepscot
  - Where data is available – will compare Franke estimates to calculated passage survival rates obtained from field telemetry studies

Evaluation of Spring Migration Season Fish Passage Effectiveness

Study Goal

- Evaluate the effectiveness for the existing upstream and downstream fish passage facilities at Pejepscot for adult river herring (alewife and blueback herring) and American shad during the spring migration period (May 1 – July 31)
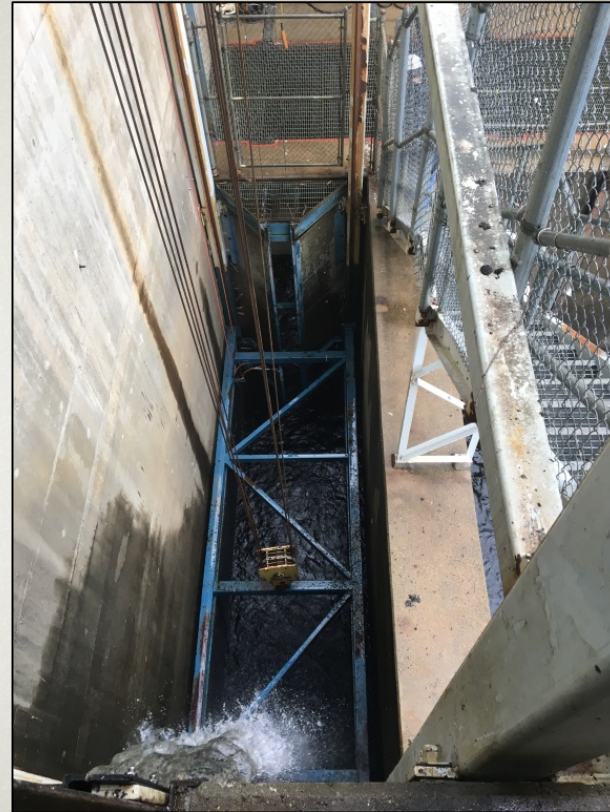
Evaluation of Spring Migration Season Fish Passage Effectiveness

Study Objectives (Upstream)

- Estimate the proportion of adult river herring and American shad which approach and successfully pass upstream via the existing Project fish lift
- Estimate the residence time for adult river herring and American shad in the area immediately downstream of the Project, prior to successful passage in the upstream fish lift or downstream departure from the study area
- Estimate the survival or passage success for adult river herring and American shad passing upstream through defined river reaches as they approach the Project
- Describe the spatial and temporal distribution of adult river herring and American shad presence within the tailwater downstream of the Project during the period of residence time prior to successful passage in the upstream fish lift or downstream departure from the study area
- Describe the extent of mortality which occurs to adult river herring and American shad during upstream passage

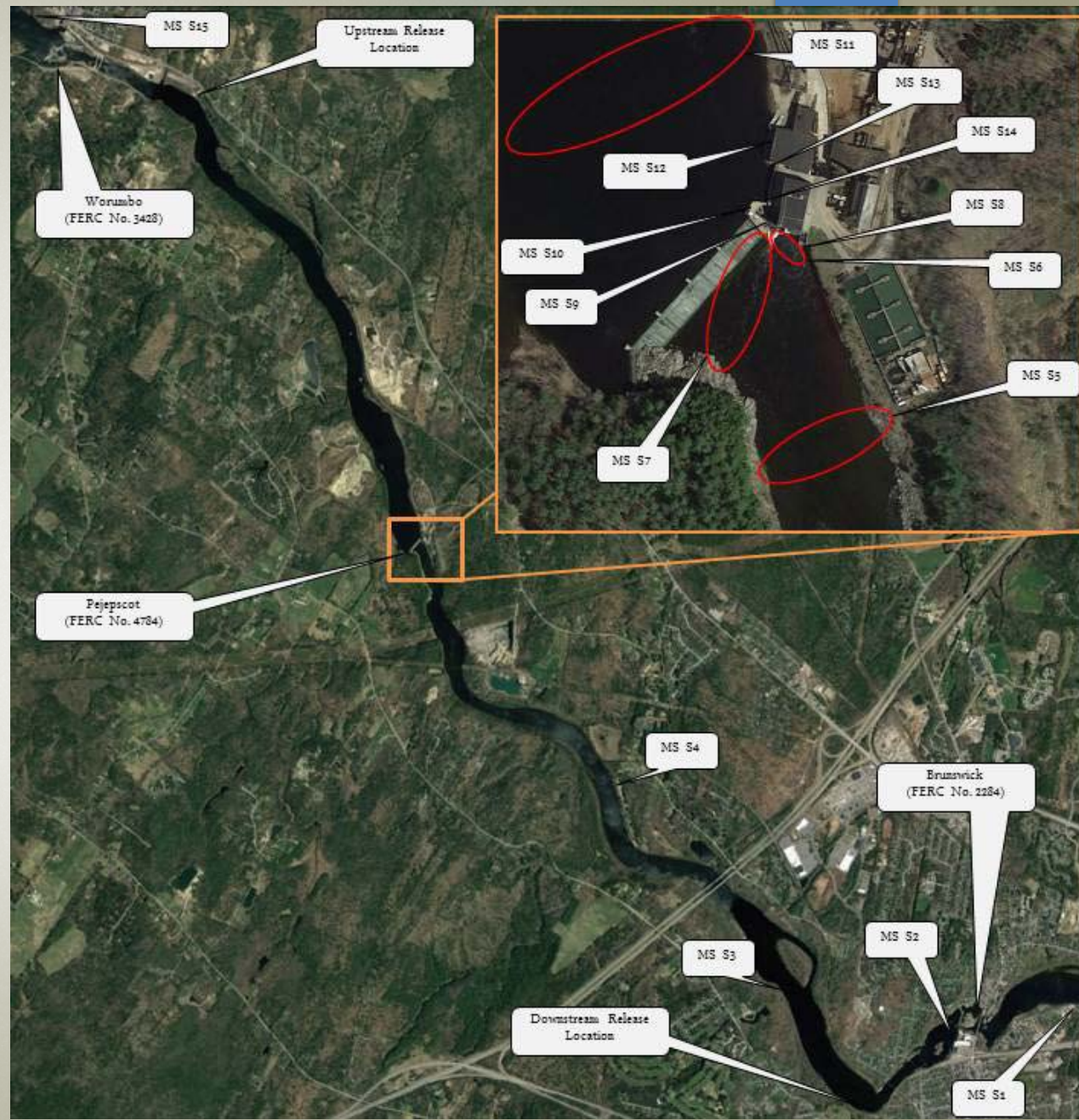# Evaluation of Spring Migration Season Fish Passage Effectiveness

Study Objectives (Downstream)

- Estimate downstream passage survival for outmigrating adult river herring and American shad at the Project
- Evaluate the use of available downstream passage routes by outmigrating adult river herring and American shad at the Project
- Estimate the residence time for outmigrating adult river herring and American shad in the area immediately upstream of the Project, prior to downstream passage
- Examine the temporal distribution of arrival times for outmigrating adult river herring and American shad to the Project area upstream of the dam
- Estimate transit times for outmigrating adult river herring and American shad through defined reaches upstream and downstream of the Project

Evaluation of Spring Migration Season Fish Passage Effectiveness

Methodology

- Effectiveness for adult alosines will be evaluated using radio-telemetry
- Movements will be monitored via an array of aerial and underwater antennas/receivers
  - 15 monitoring locations
- Telemetry receivers will be set to record detections from transmitters operating on one of three project-specific frequencies
- Based on previous Normandeau study results on Kennebec River adult alewives will be selected for radio-tagging and used as a surrogate for blueback herring

Evaluation of Spring Migration Season Fish Passage Effectiveness

Methodology

- Following capture at the Brunswick fish lift, fish will be dip-netted from sorting tank and visually examined to determine suitability for tagging
- Quick determination of TL and gender
- Radio-transmitters will be inserted gastrically
- Immediately transferred to stocking truck loaded with salted, recirculating Androscoggin River water

- A total of 200 tagged alewives and up to 250 tagged shad will be transported to one of two release locations
- Tagged fish will be sluiced directly into river to avoid additional handling

Evaluation of Spring Migration Season Fish Passage Effectiveness

Methodology

- Total of 200 tagged alewives and up to 250 tagged shad will be transported to one of two release locations
  - Minimum of 4 release groups of alewives (100 total individuals) and American shad (150 total individuals) to be released at the Mill Street public boat launch
    - Mill Street release groups will be free to ascend upriver and interact with the existing upstream passage facilities
  - Minimum of 4 release groups of alewives (100 total individuals) and American shad (100 total individuals) to be released at the Pejepscot public boat launch
    - Pejepscot release groups will be free to move downstream and interact with the existing downstream passage facilities
  - Any individuals released at Mill Street which successfully pass via the existing upstream passage facilities will also be monitored during their subsequent downstream passage event

Evaluation of Spring Migration Season Fish Passage Effectiveness

<u>Methodology</u>

- Effectiveness will be evaluated using Cormack-Jolly-Seber (CJS) models run using Program MARK (White and Burnham 1999) and will output detection and survival probabilities
- Suite of four candidate models will be run which allow both parameters to vary or remain constant
    - $S(t)p(t)$: survival and recapture allowed to vary between receiver stations;
    - $S(t)p(.)$: survival may vary between stations, recapture held constant between stations;
    - $S(.)p(t)$: survival is constant between stations, recapture allowed to vary between stations;
    - $S(.)p(.)$: survival and recapture held constant between stations.
- Goodness of fit conducted for the "starting model" (i.e., most parameterized) and over-dispersion of data corrected with variance inflation factor ($\hat{c}$) if necessary
- Akaike's Information Criteria (AIC scores) used to rank models and one with lowest value selected

Evaluation of Spring Migration Season Fish Passage Effectiveness

- *Estimate the survival or passage success for adult river herring and American shad passing upstream through defined river reaches as they approach the Project.*
  - ✓ CJS model output provides reach-specific estimates for sections between adjacent monitoring locations
- *Estimate the proportion which approach and successfully pass upstream via the existing Project fish lift*
  - ✓ Nearfield effectiveness will be defined as the product of (StnS5 to StnS6)*(StnS6 to StnS8)
  - ✓ Internal effectiveness will be defined as the product (StnS8 to StnS9)*(StnS9 to StnS10)
  - ✓ Total effectiveness will be defined as the product of (StnS5 to StnS6)*(StnS6 to StnS8)*(StnS8 to StnS9)*(StnS9 to StnS10)
- *Estimate residence time in the area immediately downstream of the Project, prior to successful passage in the upstream fish lift or downstream departure from the study area.*
  - ✓ Duration of time from initial detection (StnS5) until successful upstream passage (StnS11) or downstream departure (StnS5)
- *Describe the spatial and temporal distribution of adult river herring and American shad presence within the tailwater downstream of the Project during the period of residence time prior to successful passage in the upstream fish lift or downstream departure from the study area.*
  - ✓ Will determine proportions of downstream residence time individuals are present in detection fields below spillway and powerhouse discharge using duration interval determination
- *Describe the extent of mortality which occurs during upstream passage.*
  - ✓ Will evaluate total passage success based on product of successive reach-specific estimates. Review of manual tracking data will help to identify transmitters which became stationary

Evaluation of Spring Migration Season Fish Passage Effectiveness

- *Estimate downstream passage survival for outmigrating adult river herring and American shad at the Project.*
  - ✓ The joint probability of the two Project reach survival estimates (StnS11 to Passage)*(Passage to StnS4) will be used as the estimate of total passage survival for the Project.
  - ✓ Will result in mortality estimates that include both background and project-effect mortality in the 650-foot section upstream of the Project dam as well as in the reach downstream of the Project dam extending to the first downstream receiver. Results will reflect a minimum estimate of survival attributable to Project effects for adult alosines.
- *Evaluate the use of available downstream passage routes by outmigrating adult river herring and American shad at the Project.*
  - ✓ Full time series for each individual will be evaluated and passage route will be assigned based on pattern of detections.
  - ✓ Dependent on the distribution of downstream passage events among potential passage routes, route-specific estimates of passage survival may be available (will be driven by sample size of a given passage route).
- *Estimate the residence time for outmigrating adult river herring and American shad in the area immediately upstream of the Project, prior to downstream passage.*
  - ✓ Duration of time from initial detection (StnS11) until successful downstream passage
- *Examine the temporal distribution of arrival times for outmigrating adult river herring and American shad to the Project area upstream of the dam.*
  - ✓ Develop frequency distribution of arrival and passage times for adult alosines (binned by hour, 0-23)
- *Estimate transit times for outmigrating adult river herring and American shad through defined reaches upstream and downstream of the Project.*
  - ✓ Calculated as the duration from time of initial detection at any two adjacent detection stations.

Evaluation of Fall Migration Season Fish Passage Effectiveness

Study Goals and Objectives

- Evaluate the effectiveness for the existing downstream fish passage facilities at Pejepscot for juvenile alosines and silver-phase American eels during the fall migration period (August 1 – November 30)

- Specific objectives include:

  - Evaluate the use of available downstream passage routes by outmigrating juvenile alosines and adult American eels at the Project

  - Estimate the residence time for outmigrating juvenile alosines and adult American eels in the area immediately upstream of the Project prior to downstream passage

  - Examine the distribution for the hour of arrival at the Project for outmigrating juvenile alosines and adult American eels to the Project area upstream of the dam

  - Estimate downstream project passage survival for outmigrating adult American eels at the Project

  - Estimate transit times for outmigrating adult American eels through defined reaches immediately upstream and downstream of the Project

Evaluation of Fall Migration Season Fish Passage Effectiveness

Methodology

- Downstream passage of juvenile alosines and adult eels will be evaluated using radio-telemetry
- Movements will be monitored via an array of aerial and underwater antennas/receivers
  - 10 monitoring locations

Evaluation of Fall Migration Season Fish Passage Effectiveness

Methodology

- Juvenile alosines will be collected in-basin (likely at the outlet to Sabattus Pond)
- Following holding period, lightly anesthetized with diluted soda water then measured to ensure TL > 100 mm
- Radio-transmitters will be dorsally mounted
- Immediately transferred to release vessel submerged in tank of recirculating Androscoggin River water


- A total of 100 tagged juvenile alosines will be transported by boat to release location (approx. 0.5 miles upstream of dam)
- 4 groups of 25 tagged fish (plus untagged)
- Target early October for releases to ensure fish are active outmigrants and that individuals have achieved body size

Evaluation of Fall Migration Season Fish Passage Effectiveness

Methodology

- Adult silver-phase eels will be obtained from trapping operation on St. Croix River (ME)
- Following holding period, anesthetized with diluted clove oil
- Collect biological data
- Radio-transmitters will be surgically inserted
- Immediately transferred to recovery tank of recirculating Androscoggin River water
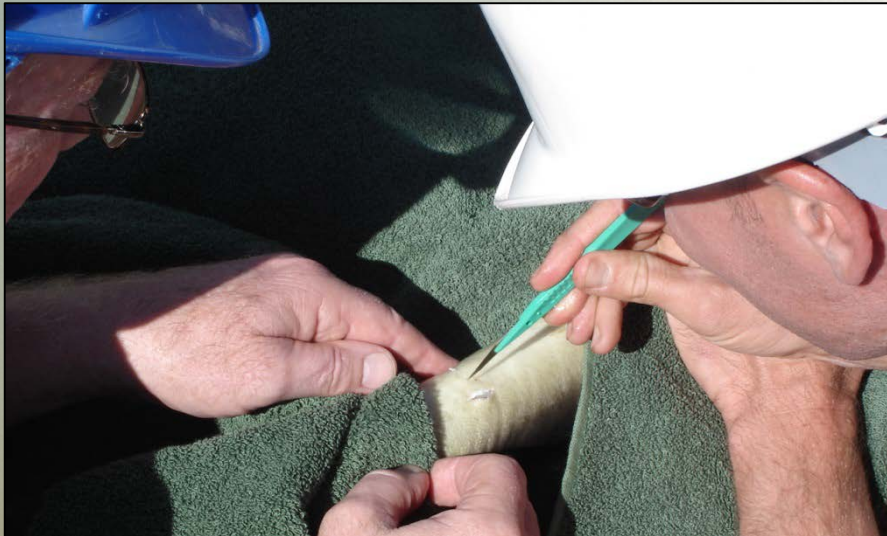
- A total of 50 tagged adult eels will be transported to release location (Pejepscot public boat launch)
- Minimum of 2 release groups of 25 tagged individuals
- Releases to occur during the evening hours

Evaluation of Fall Migration Season Fish Passage Effectiveness

Methodology

- Downstream passage success will be evaluated using Cormack-Jolly-Seber (CJS) models run using Program MARK (White and Burnham 1999) and will output detection and survival probabilities
- Suite of four candidate models will be run which allow both parameters to vary or remain constant
    - $S(t)p(t)$: survival and recapture allowed to vary between receiver stations;
    - $S(t)p(.)$: survival may vary between stations, recapture held constant between stations;
    - $S(.)p(t)$: survival is constant between stations, recapture allowed to vary between stations;
    - $S(.)p(.)$: survival and recapture held constant between stations.
- Goodness of fit conducted for the "starting model" (i.e., most parameterized) and over-dispersion of data corrected with variance inflation factor ($\hat{c}$) if necessary
- Akaike's Information Criteria (AIC scores) used to rank models and one with lowest value selected

Evaluation of Fall Migration Season Fish Passage Effectiveness

- *Evaluate the use of available downstream passage routes by outmigrating juvenile alosines and adult American eels at the Project.*
  - ✓ Full time series for each individual will be evaluated and passage route will be assigned based on pattern of detections.
  - ✓ Dependent on the distribution of downstream passage events among potential passage routes, route-specific estimates of passage survival may be available (will be driven by sample size of a given passage route).
- *Estimate the residence time for outmigrating juvenile alosines and adult American eels in the area immediately upstream of the Project prior to downstream passage.*
  - ✓ Duration of time from initial detection (StnF1) until successful downstream passage
- *Examine the distribution for the hour of arrival at the Project for outmigrating juvenile alosines and adult American eels to the Project area upstream of the dam.*
  - ✓ *Develop frequency distribution of arrival and passage times for juvenile alosines and adult eels (binned by hour, 0-23)*
- *Estimate downstream project passage survival for outmigrating adult American eels at the Project.*
  - ✓ The joint probability of the two Project reach survival estimates (StnF1 to Passage)*(Passage to StnF8) will be used as the estimate of total passage survival for the Project.
  - ✓ Will result in mortality estimates that include both background and project-effect mortality in the 650-foot section upstream of the Project dam as well as in the reach downstream of the Project dam extending to the first downstream receiver. Results will reflect a minimum estimate of survival attributable to Project effects for adult silver eels.
- *Estimate transit times for outmigrating adult American eels through defined reaches immediately upstream and downstream of the Project.*
  - ✓ Calculated as the duration from time of initial detection at any two adjacent detection stations.

Botanical Resources Survey

Study Goals and Objectives

Collect information to describe:

- the nature and extent of riparian and wetland botanical resources

- the presence or absence of TE botanical species or associated habitats within the Project area

Botanical Resources Survey

- Desktop and field reconnaissance level survey of botanical species within the Project area

  - Vegetation mapping via aerial photo and GIS interpretation to identify cover types and land use classifications

  - Field verification to describe/ground-truth the characteristics of each mapped cover type

- Information collected during desktop analysis and field surveys will include:

  - Plant species composition, including the dominate and more prominent associated species in each vegetation layer

  - Estimates of aerial (acreage) extent of the dominant cover types

  - Predominant land use(s) associated with each cover type

  - Rare, unique, and particularly high-quality habitat

  - Occurrence of exotic invasive species

Wildlife Resources Survey

Study Goals and Objectives

Collect information to describe:

- existing terrestrial wildlife (bird and mammal) habitats in riparian, wetland, and upland areas of the Project impoundment and tailwater shoreline

- the presence of wildlife species

- the presence of TE wildlife species or associated habitats

Wildlife Resources Survey

Methodology

- Reconnaissance level survey of the Project area conducted in conjunction with the Botanical Resources Survey

- Biologists will circumnavigate the entire impoundment and tailrace area

- The survey will be performed during summer months

- The information collected during the surveys will include observations of wildlife, habitats, and sign, including TE species

- Investigation of potential TE species in the Project area will include consultation with Maine Natural Areas Program (MNAP), MDIFW, and USFWS

Recreation Facilities Inventory and Public Recreation Use Assessment

<u>Study Goals and Objectives</u>

- Inventory existing public recreation sites and access areas within the immediate Project vicinity

- Conduct an updated public recreation use assessment at the Project's existing recreational facilities

Recreation Facilities Inventory and Public Recreation Use Assessment

Methodology

- Use Assessment

  - Study period Memorial Day through Columbus Day

  - Install traffic counter(s) at the Pejepscot Boat Ramp and Pejepscot Dam Recreation Area, and a trail camera along the canoe portage route to quantify recreation use

  - Traffic counters will be downloaded regularly, and calibration counts will be performed two (2) times per month to record the number of vehicles and duration on site, number of people per vehicle, and observed activities

  - Trail camera photographs of the canoe portage route will be reviewed and the recreational activity will be identified

- Condition assessment of the recreation facilities will include:
  - Photographs of the sites
  - Estimate of parking capacity
  - Assessment of the overall condition
  - General observations on site use and accessibility

Historic Architectural Survey

<u>Study Goals and Objectives</u>

- The historic structure survey is intended to identify, locate, and evaluate any historic architectural resources within the APE, and evaluate them for eligibility for the National Register of Historic Places.

Historic Architectural Survey

Methodology

- A qualified architectural historian will undertake an assessment of all structures and facilities within the Project's APE to evaluate whether any of them may be eligible for listing on the NRHP.

  - Background research will be conducted of the Project APE and its surroundings for the preparation of an historic context spanning the colonial period to the present to evaluate each resource for NRHP eligibility.

  - A field survey will be conducted at the reconnaissance level using the relevant MHPC structure survey form.

    - Digital and black-and-white photography will be taken of the surveyed individual resources.

    - Field numbers will be assigned to resources not previously surveyed.

    - Locations of all surveyed resources will be mapped on sections of the relevant USGS quadrangle maps.

  - An Architectural Survey Report and Finding of Effects Report will be completed using the MHPC Architectural Survey Report Form.

    - This report will include evaluations of eligibility, contact sheet(s) from photographs, survey matrix, negative table, USGS map(s) with properties identified, and hard-copy survey forms.

Historic Archaeological Resources Phase 1 Survey

Study Goals and Objectives

- The historic archaeological survey is intended to identify, locate, and evaluate any historic period archaeological resources within the APE, and evaluate them for eligibility for the National Register of Historic Places.

Historic Archaeological Resources Phase 1 Survey

Methodology

- Literature review to identify areas within the Project APE with a high likelihood for the presence of historic period archaeological resources.

- A Phase I assessment survey will be conducted.

    - Complete a walkover of select areas within the impoundment area between the Pejepscot Dam and the upstream project limit, as well as the river banks below the dam;

        - Identify and document any historic features or structures;

        - Complete selected shovel test pits as needed to provide data on historic features or structures identified, and collect artifacts useful in dating such features;

- A report providing recommendations for no further survey, or for additional subsurface testing, depending upon the field findings.

Precontact Period Archaeological Resources Survey

<u>Study Goals and Objectives</u>

The Precontact archaeological survey is intended to identify, locate, and evaluate any Precontact period archaeological resources within the APE, and evaluate them for eligibility for the National Register of Historic Places.

Precontact Period Archaeological Resources Survey

Methodology

- The literature search will identify areas within the Project APE with a high likelihood for the presence of Precontact period archaeological resources.

- A Phase I assessment survey will be conducted focusing on these areas.

  - Complete a walkover of select areas within the impoundment area between the Pejepscot Dam and the upstream project limit, as well as the river banks below the dam;

  - Identify and document any Precontact features;

  - Complete selected shovel test pits as needed to provide data on precontact features identified, and collect artifacts useful in dating such features;

- A report providing recommendations for no further survey, or for additional subsurface testing, depending upon the field findings.

Study Requests Adopted with Modification

- Bass Population Study (requested by MDIFW)

  - Population Assessment Not Adopted

- Upstream and Downstream Fish Passage Effectiveness for Diadromous Species (requested by MDMR)

  - Effectiveness of the existing upstream/downstream fish passage facilities for sea lamprey or striped bass Not Adopted

- Anadromous Fish Upstream Passage Effectiveness Study (requested by NMFS)

  - Desktop analysis to assess upstream passage effectiveness for Atlantic salmon Not Adopted

- Downstream Fish Passage Effectiveness and Survival: Behavior, Entrainment and Impingement at the Intake (requested by NMFS)

  - Field based direct turbine survival studies Not Adopted

Estimated Start and Completion Field Dates for Proposed Studies

Proposed Study	Estimated Start Date	Estimated Completion Date
Water Quality Assessment	June 2018	October 2018
Tailwater Benthic Macroinvertebrate Survey	July 2018	September 2018
Eel Monitoring Survey *	June 2019	August 2019
Largemouth and Smallmouth Bass Spawning Habitat Survey *	June 2019	July 2019
Fish Entrainment and Turbine Survival Assessment	August 2019	November 2019
Evaluation of Spring Migration Season Fish Passage Effectiveness	May 2019	July 2019
Evaluation of Fall Migration Season Fish Passage Effectiveness	October 2019	November 2019
Wildlife Resources Survey	August 2018	September 2018
Botanical Resource Survey	August 2018	September 2018
Recreation Facilities Inventory and Use Assessment *	May 2019	October 2019
Historic Architectural Survey	July 2018	November 2018
Historic Archaeological Phase I Survey	July 2018	November 2018
Precontact Period Archaeological Survey	July 2018	November 2018

Studies Not Adopted

- White Sucker Passage Study (requested by USFWS)

- Downstream Fish Passage Effectiveness Study (2nd year) for Atlantic salmon smolts (requested by NMFS).

  - Topsham Hydro is already committed to conducting a one-year downstream passage effectiveness study of Atlantic salmon smolts in 2018, in accordance with the Species Protection Plan (SPP).

- Downstream Passage Alternatives Study (requested by NMFS)

- Computational Fluid Dynamics Study (requested by NMFS)

- Instream Flow Study (requested by NMFS)

- Headpond Predation Study (requested by NMFS)

- Stranding Evaluation (requested by NMFS)

- Sediment Storage and Mobility (requested by NMFS)

- Large Woody Debris Study (requested by NMFS)

- Unimpaired Hydrology Study (requested by NMFS)

- Project Acoustic Effects Study (requested by NMFS)

Wrap-up