US Northeast Hydro Region
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August 1, 2016

VIA ELECTRONIC FILING
Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: TransCanada Hydro Northeast Inc.'s July 15, 2016 Updated Study Results Meeting Summary
Project Nos. 1892-026, 1855-045, and 1904-073

Dear Secretary Bose:

TransCanada Hydro Northeast Inc. ("TransCanada") is the owner and licensee of the Wilder Hydroelectric Project (FERC No. 1892), the Bellows Falls Hydroelectric Project (FERC No. 1855), and the Vernon Hydroelectric Project (FERC No. 1904). The current licenses for these projects each expire on April 30, 2019. On October 31, 2012, TransCanada initiated the Integrated Licensing Process by filing with the Federal Energy Regulatory Commission ("FERC" or "Commission") its Notice of Intent to seek new licenses for each project, along with a separate Pre-Application Document for each project.

With this filing, TransCanada submits its July 15, 2016 Updated Study Results Meeting Summary for the three projects, as required by 18 C.F.R. §5.15(c)(3) and the Commission's current Process Plan and Schedule (dated May 5, 2016). The Meeting for the Updated Study Report filed June 17, 2016 was held at TransCanada's Operations Control Center in Wilder Vermont, with WebEx and call-in capability for participants who could not attend in person. Because the meeting summary due date (July 30, 2016) falls on a Saturday, this filing is being made the next business day.

The attached meeting summary includes meeting notes, points of discussion, the list of meeting attendees, and a copy of the presentation slides used during the meeting. In consultation with FERC staff, the comment period for study reports filed June 17, 2016 will be extended through the comment period for study reports filed on August 1, 2016. According to the current Process Plan and Schedule, the comment period for these studies will end on September 30, 2016.

If there are any questions regarding the information provided in this filing or the process, please contact John Ragonese at 603-498-2851 or by emailing john_ragonese@transcanada.com.

Sincerely,

John L. Ragonese
FERC License Manager

Attachment: July 15, 2016 Updated Study Results Meeting Summary

cc: Interested Parties List (distribution through email notification of availability and download from TransCanada's relicensing web site www.transcanada-relicensing.com).

UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

TRANSCANADA HYDRO NORTHEAST INC.

Wilder Hydroelectric Project (FERC Project No. 1892-026)
Bellows Falls Hydroelectric Project (FERC Project No. 1855-045)
Vernon Hydroelectric Project (FERC Project No. 1904-073)

July 15, 2016 Updated Study Results Meeting Summary

August 1, 2016

TRANSCANADA HYDRO NORTHEAST INC.
UPDATED STUDY RESULTS MEETING
JULY 15, 2016

The Updated Study Results meeting for study reports filed June 17, 2016 was held on July 15, 2016 at TransCanada's Renewable Operations Center in Wilder, Vermont. Presentation slides (corrected) follow these notes.

Meeting attendees in person or identified on the telephone:

Name	Affiliation
Bill Connelly	FERC
Brandon Cherry	FERC
John Baummer	FERC
Owen David	NHDES
Jeff Crocker	VDEC
Eric Davis	VDEC
Lael Will	VFWD
Matt Carpenter	NHFGD
Ken Sprankle	FWS
John Warner	FWS
Melissa Grader	FWS
Marie Caduto	VDEC
Katie Kennedy	TNC
David Deen	CRWC
Harold Peterson	US BIA
John Ragonese	TransCanada
Jen Griffin	TransCanada
Rick Simmons	Normandeau
Drew Trested	Normandeau
Steve Leach	Normandeau
Steve Eggers	Normandeau
Mark Allen	Normandeau
Sarah Allen	Normandeau
Jen Bryant	Normandeau
Maryalice Fischer	Normandeau

Study 13 – Tributary and Backwater Fish Access and Habitats Study:
Drew Trested summarized the study and the revised report which included the requested springtime assessment of project effects using hydraulic and operations modeling data.

Q: Did you break up the data by day/night for diurnal differences?
A: No.

Q: Before, on Cold River you said that access is primarily driven by tributary flow, what did you mean?
A: Study 8 showed that the cobble/gravel there is dynamic and moves. We also saw this in this study in field observations. The main channel seems to remain, but the margins shift and can limit access.

Q: I've fished that area a lot, and yes the channel does move but at any flows above minimum flow from Bellows Falls, you start to overtop that cobble. You don't usually see the channel braided unless it is after a high flow event and then the channel re-establishes itself. The mainstem water washes across the gravel bar at higher flows.
A: Yes, and keep in mind that the model data doesn't characterize anything in the tributaries themselves, or tributary inflow, or precipitation. Also, the model simulates 5 years with different hydrologic conditions and our field work was based upon were actual observations in a single year.

Q: TC lowers water levels at the dams in anticipation of high water events, how was that dealt with in the report?
A: We looked at both normal project operations and high water operations. The report text focuses on normal project operations and Appendix D includes high water operations. Also, it is important to note that high water operations mostly effect locations in the lower impoundments, rather than in riverine sections or upper impoundments where there is high water and spill when impoundment levels are lowered. You may not see high water in tributaries though.

Q: You chose to stick with the 50% criterion, what about the 100% criterion?
A: Both criteria were analyzed separately, and that information is in the report appendices.

Q: Data is organized into % of days, but at smaller cold water trout streams as the mainstem warms up, fish may want to move into those tributaries. Is there any way to look at the timing of access restrictions when the mainstem warms up? That is the key period when access is needed.
A: The premise that the mainstem warms up and flows decrease sooner than it does in tributaries may not be true, we don't know that. We don't have temperature data at each tributary other than during our field observations, and cannot pinpoint what tributaries are doing at all outside of the 2014 field

observations. The majority of access issues we observed (and the model data supports) are not mainstem issues, but tributary flow issues.

Q: So it is difficult to say, since there is so much natural variability. It sounds like it is not possible to tease those factors out, even if there were project effects based on one sample year.
A: The original premise was to look at these tributaries in the dry condition to assess project effects. It is all driven by the hydrology no matter what time of year. Even in the spring, we still don't know what the tributaries are doing, we assume they would generally have more flow and be deeper in the spring.

Q: You have the information at a low flow period and then you can decide for a particular stream, if in some years access would be limited in spring or when temperatures start to increase.
A: That is basically what we did for spring, not for temperature specifically, and we found that mostly very small streams have the issues, during part of the day but not necessarily for an entire day or longer than a day in each occurrence.

Q: Well, you sampled in the dry period and it is likely that access is limited by the tributaries.
A: Yes, there are a lot of natural access issues, the indications are these are very low flow streams that may have water in them after a summer rainstorm. We only looked at whether the projects have an effect or not.

Q: The size of a cold water stream isn't important, even small ones can support trout.
A: You can look at the bar plots in Appendix D to see across the season (examples shown in presentation slides), and you could line up with information you may already have on when fish might want access.

Post meeting note: An error in Table 7.0-1 in the final report was discovered after the meeting (backwaters were counted twice). While the error does not change any analysis in the report, the corrected table appears below with corrections highlighted:

Study 13 revision:
Table 7.0-1. Comparison of study sites to available sites, by stream order.

Stream Order	Study 13 Selected Sites	Number of Available Tributaries	Study 13 % of Available Tributaries
undetermined (-99)	0	3	0.0%
1	8	31	25.8%
2	13	53	24.5%
3	8	36	22.2%
4	0	17	0.0%
5	1	8	12.5%
6	0	3	0.0%
backwaters	7	41	17.1%
TOTAL	**37**	**192**	**19.3%**

Study 20 – American Eel Downstream Migration Study:
Steve Leach summarized the study and results.

Q: Were there any studies that looked at year round migration?
A: There isn't a lot of information on that. Other studies that examined timing of outmigration over a broader temporal scope than just fall but not necessarily year round, like at the St. Lawrence River documented some summer outmigration (but still fall peak), and in the Shenandoah River outmigration was documented occurring through winter. Latitudinal differences mean earlier outmigration in higher latitudes where cooling occurs earlier in the year relative to more southerly rivers, and more protracted outmigration in southerly rivers that may not cool below 5°C until late if at all. Silver eels may also remain in-river in the silver-phase and emigrate the following year (based on A. Haro information).

Aquatics Working Group consultation:

Study 18 – Upstream Eel Passage:
Steve Leach and John Ragonese summarized issues and questions for discussion.

- How do we address eel ladder results that might be low due to low abundance?
- It may not be a study goal to compare what happens between years, it may be more about route selection. We wondered if it matters or not whether Turners Falls is operating in 2016.
- We are unlikely to get any ramp/trap installed in 2016 without potentially missing the expected peak migration

Ken S: We have the report form Turners Falls of Alex Haro's work and we did speak with him recently. He believes it could be a similar configuration as at Turners Falls. Alex recommends following his guidance at the Cabot and spillway ladders (1 ft differential for attraction flow to the ladder), and you'd want to have supplemental flow once eels enter the lower ladder so they can find the eel ramp/trap. We were thinking the timing is fine for this year.

Steve L: To clarify, Alex's recommendation is a 1-ft differential at the ladder entrance weir?
Ken: Yes.

John R: We hope to get Alex out there to help us design it. But we are just concerned about missing the season.
Ken S: Can eels still be attracted, and to what extent under non-seasonal fishway operations?
John W: To clarify, the location of the eel ramp could be anywhere above the diffuser with some additional wetting flows, to evaluate operations during the post-fish ladder season.

John R: I was thinking your study request was more about assessing whether based on the numbers we saw in 2015 in the ladder, they are all passing upstream.

John W: No, it was to evaluate the rest of the season when the ladder is not normally operating. There may be multiple ways to pass eels at Vernon, and those might or might not be to operate the fish ladder.

John R: We are not sure what the data will mean. Are you saying if we use a trap at the ladder entrance with some level of attraction flow, you will want to see if that device still maintains a primary route vs. other potential routes at the dam?

John W: Yes with the ladder not running, that location provides a good spot and will give an indication in general, of how it compares to the overall passage number. This approach doesn't answer all questions but it can show if it might be a viable route.

Matt C: If you could reduce the flow in the ladder itself…

John R: We know that if we can get eels in over the weir at the entrance and if we can physically put the trap right there too, then we don't have to worry if some get by the weir.

John W/Melissa G: There are specifications, as in the FirstLight report methods section.

John R: Yes, it just means we have to go out to the site and figure it out.

Steve L: The temporary traps we have from last year's study aren't going to work in the fish ladder itself. So we will have to design and fabricate something new.

John R: What would we do with the data? Let's say we trap eels, how do we evaluate that?

Melissa: Look at the relative numbers of eels at different areas of concentrations under a non-ladder running but to maintain the 1-ft differential.

John R: That would basically be the same flow as we had last year as the attraction flow is 200 cfs and the fishway flow is about 65 cfs. Since both are being requested if the trap were in the ladder it means the same flow as in 2015.

Jen G: Can we change the attraction flow?

John R: What if we run the study and not presume we need a foot of water? Here's the challenge – the way the ladder runs there is a foot of water going over the bottom weir, which is governed by the water going down the ladder (65 cfs) plus supplemental water (200 cfs). As opposed to, if we put an eel trap in somewhere outside of the ladder you won't have attraction flow, it would be a trickle of water instead.
Ken S: We don't know yet how much water we'd want.

John W: There may be more variables than you can test in one year. At Turners, they had information on passage of eels and looked at whether the fishway attraction water attracts enough eels in to make that the preferred route? Whether or not it could still be effective at lower flows is a different question.

John R: If there is another way of testing or providing passage to eels that uses less water than the normal ladder flow that would be preferable.

Eric D: The context is that last year at Vernon you ran the ladder and this year with the same attraction flow and a trap you'd get much more information on those eels.

John R: We may get a better count of eels, but we're not changing any other variables since attraction flow would be the same. If we change the flow during the study, maybe we can tell if there is any difference.

John W: Passage can be highly variable, and we don't know periodicity in order to test on/off conditions of the ladder. If you want to test the flows you need an actual count. If you run at existing flows you will get some number of eels, then come back and do something different (reduce flows) and see what you get for numbers of eels. If you can catch all the eels that enter under 200 cfs, that gives you some comparison if you later drop the flow. We haven't thought about whether you could do that in a single year.

Rick S: We could place the ramp to extend down into the tailrace, like at Amoskeag so we don't need attraction flow.

John R: Right, do we need the attraction flow to study this? Eels will get attracted toward the fish ladder due to generator flows so they are already in the vicinity. If we put the trickle of water at the ramp down into the tailrace wouldn't that be a potential starting point rather than starting from the full attraction flow at 200 cfs?

Jeff C: That was our logical starting point based on the ladder being the primary attraction flow.

John R: You presume that but it could also be that that location is the only route.

Ken S: is it problematic to make this 200 cfs part of your minimum flow?

John R: Right now, 200 cfs represents some percentage of our minimum flow but we can generate all of our minimum flow and make money from that rather than lose it through the attraction flow. There are also times when we want to save water. There are lots of places where eels don't require 200 cfs to attract them to a trap.

John W: The idea was, we know eels got into the ladder so if we change the flow and put the ramp in, and do visual surveys again we will get more information. This will be a multi-year study no matter what.

John R: My concern is that we may not see many this year due to timing of the run.

Melissa: FirstLight had eels right after they shut the ladder down in their study.

Matt C: There is a lot of annual variability too.

Steve L: That is very important and problematic to compare between years. It makes a lot of sense to try it with a lower amount of water and see if that still attracts them there or do they go to other locations? If that doesn't work at least it is based on observation.

Melissa G: If TC is committed to evaluating a lower flow and then a higher flow that would be fine.

John R: (overview photo) if we continue to have generation dominating over in that corner near the ladder, then eels are likely to be attracted there. We have other potential collection locations along the powerhouse.

John W: the design of where you put an eel ramp, either outside or inside the fish ladder would be something for Alex to look at.
Rick S: Yes, Vernon is a lot more like Amoskeag than like Turners and when the Vernon ladder shuts down soon, we will have a better look at the ladder.

John R: Should we leave it like this? We will think about where/how to install a ramp/trap without the 200 cfs flow. We will also plan on conducting weekly visual night surveys this year too.

The group agreed to that, and Jen G will schedule a site visit with Alex and others when the ladder is shut down sometime the week of July 18.

Post Meeting Note: A site visit was conducted on July 20, summary notes from the meeting are included herein, after the remaining meeting notes.

Aquatics Working Group consultation:

Study 9 – Instream Flow Study:

Steve Eggers summarized the needs for remaining analyses based on working group input that is needed to complete the analyses.

Species and Life Stages:

John R: We provided a prior memo (revised and filed June 2, 2016) providing rationale for omitting some species/life stages. Where is the group on that?

Eric D: Can you clarify for what analysis you want to exclude those species?
Steve E: For the time series and dual flow analyses.

Q: Can you explain why walleye spawning was eliminated?
A: Because Walleye spawning takes place during April and May, normally when spill occurs and flows from normal project operations have little effect. In addition, it appears that temperature may drive spawning as much as flows would.

Steve E: I assumed the species/life stage list would be the same for both time series and dual flow analyses.
John W: Don't assume that.

John R: is there another list you have then?
John W: We have a list that is substantially shorter than the original list for dual flow analyses.
John R: please send that.
Jen G: Can we still put next Friday (July 22) on as the deadline for comments on that?

Steve E: We identified common needs for some species/life stage that are the same.
Eric D: Agencies went a different route. For dual flow we focused on less mobile species. For habitat time series we're not ready to exclude species since it may be more based on operations model scenarios. Operations will depend a lot on your equipment.
John R: Wouldn't you want to focus on habitat anyway, even with the operations model scenarios?

Steve E: So you are saying run everything in the time series analysis?
Group: Yes.

Dual Flow Analysis:
Steve E: With regard to dual flow analysis, has anyone thought about which flows to use? Or should we just do some increments? Do people have alternative minimums they want to look at? (slides of duration curves at each project are included in the presentation). The intermediate flows don't occur that often, either minimum flows or peaking flows occur most often.
Melissa: I think we can come up with some intermediate flows.
John R: When can you get us the list?
Melissa: Within a week (refers to by July 22), along with the species lists.

David D: If some species/life stages are eliminated they should still be reported and noted that the other species are surrogates for those eliminated from analysis.
Katie: Make sure you indicate what species/life stages are being used as surrogates for others.
Eric D: VANR is not supportive of eliminating species/life stages for dual flow analysis.

Critical Reach Analysis:
Steve E: We selected some groups of transects (run/riffle/run/glide). Has the group picked out some?
Jeff C: I would want to see all riffles.
Matt C: Any reach that included sea lamprey spawning – Wilder riverine and from the Westminster Bridge upstream. Places where you had observations of or tracked lamprey and identified as suitable spawning habitat. Riffles will cover most lamprey habitat.

Katie: Also Hart Island should be included.
Steve E: There are two riffles there as well do you want the whole island/complex? There are six transects in the main channel and three in the side channel.
John R: We will do all of those transects.

Katie: Can we clarify that we are talking about critical reaches for what analysis?
Steve E: We run the critical reaches and then run time series for those reaches.

Katie: I would also include locations with heterogeneity – like islands, mid channel bars, and diverse habitats.
John R: To clarify, you want to make sure that we include as critical reaches those that have high heterogeneity if they are not already included?
Katie: Yes.
John R: Steve E. will compile list of cross sections for critical reaches, and get started on that since the working group is unlikely to remove any. But to the extent that anyone has additional specific things need to get back to us right away. We will also wait on feedback about which flow comparisons to use from the working group.

Study 24 – Dwarf Wedgemussel and Co-occurring Mussel Study

Maryalice: Have people provided feedback on DWM HSCs as part of comments received July 14?
Melissa: Yes, in our comment letter.

Marie C: No, not in VANR's letter.
John R: Can VANR provide those comments by next Friday (July 22)?
Post meeting note: As of August 1, no comments have been received from VANR.

Study 25 – Dragonfly and Damselfly Inventory and Assessment:

Sarah Allen summarized final study results and assessment of project effects using model data.

Q: In the site selection, you picked areas with a good slope, so on the flatter areas they would be more impacted by inundation.
A: Odonates typically emerge on steeper areas rather than flatter areas. The clubtails (riverine species) especially don't tend to use flatter surfaces.

Q: You have real-time elevations?
A: We took RTK elevations of topography but also calibrated to the water level logger elevations. That data was specific to the 2015 study period and used to compare habitat elevation ranges with water levels.

Study 26 – Cobblestone and Puritan Tiger Beetle Survey:

Sarah Allen summarized final study results and assessment of project effects using model data.

Q: Can I assume the spring flows were above station capacity?

A: Yes, those flows and time periods included both high water and normal project operations. We looked at average flows.

Study 28 – Fowler's Toad Survey:
Sarah Allen summarized final study results and assessment of project effects using model data.

Q: If you had more acoustic monitors would you have found toads in more locations?
A: Probably not, these toads call all evening long, and if a toad had been there the biologists feel that they would have likely heard it. And the recorders were placed at the most likely sites.

Q: The May 21 – July 21 breeding period and high flows during that time would negatively impact them. The period should be extended to mid-August to account for tadpoles that could be flushed out under high flows.
A: Comment noted.

Q: Is there a way to enhance habitat via annual scheduling/timing of scouring releases?
A: No, it is more about volume of high flows. We used to try and move ice with sustained high flows, and there just wasn't enough water in the Wilder impoundment to do that.

Written comments from Jim Andrews were submitted by Marie Caduto (attached).

Study 29 – Northeastern Bulrush Survey:
Sarah Allen summarized final study results and assessment of project effects using model data.

Written comments from Bob Popp were submitted by Marie Caduto (attached).

TransCanada Hydro Northeast Inc.
Aquatics Working Group Vernon Dam Site Visit
July 20, 2016

Notes

Attendees:

Melissa Grader – USFWS
Lael Will – VTDFW
Alex Haro – USGS Conte Lab
Rick Simmons – Normandeau Associates
Steve Leach – Normandeau Associates
Ethan Sobo – Normandeau Associates
Tony Amato – TransCanada
Jennifer Griffin – TransCanada

The purpose of the site visit was to identify possible locations for installation of a(n) eel ramp/trap at the Vernon dam as part of Study 18 – American Eel Upstream Passage Assessment. The site visit was a continuation of consultation initiated on July 15, 2016 with the aquatics working group, but also included Dr. Alex Haro of USGS, as recommended by FWS and NHFGD. In their comments on TransCanada's study report, FWS, VANR, and NHFGD recommended installing an eel way at the Vernon project (VANR also recommended installation at Wilder and Bellows Falls) after shutdown of the fish ladder to provided continued upstream passage. TransCanada agreed that additional study should be done. In its determination letter FERC stated that:

> Concentrations of eels were identified at the Vernon Project (80 eels) and a study of the potential to trap eels in the fishway as a means to provide upstream passage during periods when the fishway does not operate would be consistent with the study objectives. Because this information is needed for staff's analysis and development of license articles (section 5.9(b)(5)), we recommend that TransCanada proceed with the proposed eel trapping in the Vernon fishway during 2016. However, because only 3 eels were observed at the Bellows Falls Project and no eels were observed at the Wilder Project, we do not recommend additional trapping at those sites in 2016.
>
> Prior to the installation of any temporary eel trap passes, TransCanada should consult with the aquatics working group to seek to reach agreement on appropriate locations, design, operation, and attraction flow for the eel trap passes.

The group met at Vernon at 9:30am and concluded by about noon. Two potential locations were identified: (1) within the fish ladder, approximately at the public viewing window turning pool, and (2) along the outside of the gallery wall, with the entrance in the west corner.

The location inside the fish ladder offers a protected area (from potential battering due to turbulence in the tailrace); however it would require attraction flow through the entrance of the fish ladder (an amount of about 125 - 200 cfs was discussed) that would be sourced from the attraction water pipe, sufficient flow to attract eels up the ladder to the ramp likely sourced from the ladder, and a small amount of water on the ramp. We were unable to determine an immediate source of water to wet the ramp.

The location along the gallery wall provides an entrance in a hydraulically quite corner that eels are anticipated to naturally find. The location is closest to Unit 10, which wasn't operating during the site visit, as Units 5-8 are first on when the fish ladder is not operating. Attraction flow at this location would be supplied by an approximately 50 gallon per minute (gpm) pump, and as necessary, a second ump would provide water to the ramp. A possible third pump would be used for an attraction spray directed at the concrete wall facing the ramp entrance.

Other locations were investigated, such as a particularly wet section of one of the stanchion bays and the sluice gate, but were quickly dismissed for various reasons including safety, logistics, and conflicting flows.

Melissa expressed interest in using the fish ladder location because eels found the entrance to the ladder last year. TransCanada's primary concern with this location is diverting water from generation to spill to serve this purpose. Additionally, the quantity of flow to attract eels to the ladder is unknown as only approximately 255 cfs (normal ladder operation flows) was examined and that amount of flow would not be used this year.

TransCanada's preference is to locate the ramp along the gallery wall. FWS and VTDFG agreed with this location for this year, commenting that finding the best location will likely be an iterative process. Considering the temporal passage of the relatively small number of eels that passed the fish ladder last year, it is likely that peak passage has already occurred and it is possible that few fish are available for passage. Night surveys, similar to those conducted last year and scheduled to begin the week of July 25, will help to address that question.

Normandeau is designing a ramp and trap for the gallery location with design, and operation and attraction flows as provided by Dr. Haro. The design will be shared with the working group.

Caduto, Marie

Subject: FW: TransCanada - USR Filing June 17 2016

From: Jim Andrews [mailto:jandrews@middlebury.edu]
Sent: Friday, July 01, 2016 12:45 PM
To: Caduto, Marie <Marie.Caduto@vermont.gov>
Cc: Ferguson, Mark <Mark.Ferguson@vermont.gov>
Subject: Re: TransCanada - USR Filing June 17 2016

Marie, I did a quick read of Study Number 28 regarding Fowler's Toad surveys. The study and the report seem pretty comprehensive. They did show that the call surveys did not pick up Fowler's Toad populations when the remote loggers did. So one question would be if the researchers felt there were areas that had appropriate habitat conditions to hold populations of Fowler's Toads where there were no data loggers, or where the data logger failed. If so, follow up study at those sites could be recommended.

The conclusions suggest as expected that heavy flooding events are needed to scour and create egg-laying habitat, but that they would impact recruitment if they occurred during breeding season (May 21-July 21). I would extend that period long enough for the small toads to metamorphose and disperse (mid-August seems reasonable). So, if releases strong enough to scour vegetation and create habitat were scheduled annually (but outside of that window), they should help sustain populations of Fowler's toads.

Requirements could address:

- filling in any survey gaps,
- the annual scheduling and timing of scouring and habitat creating releases,
- monitoring of the breeding habitat on Stebbin's Island and addressing it as needed through flow control or local manipulation of the breeding pool and its surroundings,
- mitigation in the form of protected terrestrial habitat for the adults to forage adjacent to the river,
- reintroduction (use the study data on appropriate habitat to determine a pool or two with appropriate habitat that does not currently have known populations, where eggs or tadpoles could be moved from the Stebbins Island site. Almost all tadpoles and recent metamorphs normally die before reaching adult age, so spreading them out might improve their chances of success and could possibly help them recolonize appropriate sites.

Hope this is useful,

James Andrews
642 Smead Road
Salisbury, VT 05769
802-352-4734
jandrews@middlebury.edu
VtHerpAtlas.org

The Vermont Reptile and Amphibian Atlas now has a Facebook page. Check it out if you are interested.

Caduto, Marie

Subject: FW: TransCanada - USR Filing June 17 2016

From: Popp, Bob
Sent: Monday, July 11, 2016 3:52 PM
To: Caduto, Marie <Marie.Caduto@vermont.gov>
Subject: RE: TransCanada - USR Filing June 17 2016

Hi Marie, I just looked at Report 29, the Northeastern Bulrush Survey. I am familiar with only one site that they visited, the known population in Rockingham. I totally agree with Normandeau's contention that the population is isolated from regular river fluctuations by beaver dams. They make the same case for all the other potential sites that they visited in VT. Although I am not familiar with them, I have no reason to doubt the accuracy of their contention. So I have no issues with the report.

Thanks for checking in.
Bob

Bob Popp
Department Botanist
VT. Dept of Fish and Wildlife
Natural Heritage Inventory
(802) 476-0127

Please Note New Email: bob.popp@vermont.gov

Wilder, Bellows Falls, and Vernon Project Relicensing

Updated Study Results Meeting: July 15, 2016

TransCanada

Agenda

Study No.	Study Title	Study Lead
13	Tributary and Backwater Fish Access and Habitats Study	Drew Trested
20	American Eel Downstream Migration Timing Assessment	Steve Leach
18	Consultation: American Eel Upstream Passage Assessment	Rick Simmons, Steve Leach
9	Consultation : Instream Flow Study - HSCs	Steve Eggers
Break		
25	Dragonfly and Damselfly Inventory and Assessment	Sarah Allen
26	Cobblestone and Puritan Tiger Beetle Survey	Sarah Allen
28	Fowler's Toad Survey	Sarah Allen
29	Northeastern Bulrush Survey	Sarah Allen

TransCanada

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Study 13
Tributary and Backwater
Fish Access and Habitats Study

TransCanada

3

Study 13 – Tributary and Backwater Fish Access and Habitats

Study Recap:

- 37 study locations (tributaries and backwaters) selected for evaluation
- Field measurements conducted July-November 2014
- Initial study report filed September 14, 2015
- Working group requested evaluation of access during springtime
- TC proposed an approach and working group made recommendations
- Once hydraulic and operations model data was available, springtime access was evaluated
- Final report filed June 17, 2016

TransCanada

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Study 13 – Tributary and Backwater Fish Access and Habitats

The revised report (June 2016) includes:

1. the evaluation of study sites during the spring spawning period (April – June), and
2. the original summer/fall evaluation based on field observations and water level logger data.

We performed 2 classifications for spring dates:

- "100% criterion": flagged dates where < 0.5 ft of water depth for one hour or more
- "50% criterion": flagged dates where < 0.5 ft of water depth for 12 hours or more.

Classification Approach:

1. For each location, all spring dates where less than 0.5 ft present for the 100% and 50% criteria were flagged
2. Determined the proportion of spring dates at each site where access restricted (for both the 100% and 50% criteria)
3. Model years where the resulting proportion was greater or equal to 10% of spring dates were flagged (NOTE: 10% of spring dates represents less than one day per week)
4. Access restrictions were categorized using these two criteria for both scenarios

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Study 13 – Tributary and Backwater Fish Access and Habitats

Categories of Access Restriction:

Level of Access Restriction	% of Days (April – June) with < 0.5 ft of Access	During this Number of Model Years
None	0	All 5 years
Negligible	<10%	1, 2 or 3
Infrequent	< 10%	4 or 5
Occasional	≥10%	1, 2, or 3
Frequent	≥10%	4 or 5

Within the final report document:

- The "50% criterion" was considered reasonable for quantifying project effects as adequate access under this criterion would exist for no less than 50% of the total time on any un-flagged date.
- The "100% criterion" was considered a worst-case condition

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Study 13 – Tributary and Backwater Fish Access and Habitats

Results:

50% Daily Access Restriction (April 1 – June 30)					
Reach	**None**	**Negligible**	**Infrequent**	**Occasional**	**Frequent**
Wilder	8	3	1	2	0
Wilder Riverine	0	0	0	2	3
Bellows	5	1	0	0	0
Bellows Riverine	0	1	0	3	0
Vernon	4	0	0	1	1
Vernon Riverine	0	1	0	1	0
All Reaches	**17**	**6**	**1**	**9**	**4**
100% Daily Access Restriction (April 1 – June 30)					
Reach	**None**	**Negligible**	**Infrequent**	**Occasional**	**Frequent**
Wilder	7	1	1	3	2
Wilder Riverine	0	0	0	0	5
Bellows	4	0	0	2	0
Bellows Riverine	0	0	0	0	4
Vernon	2	1	1	0	2
Vernon Riverine	0	0	0	0	2
All Reaches	**13**	**2**	**2**	**5**	**15**

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Study 13 – Tributary and Backwater Fish Access and Habitats

Of the 13 sites with occasional or frequent access restriction in springtime (based on 50% criterion, and 10% of spring dates):

- One site (CT-VR-6.01) is affected by operations of the Turners Falls Project and not by Vernon project operations.
- Ten additional sites have less than 300 feet of project-affected reach, limited outflow with little mainstem-connected habitat, culverts that limit connectivity under some conditions, and/or blockages due to debris accumulation or man-made causes.
- One site (CT-WR-2.11) has a variable thalweg which can limit connectivity under low outflow and low mainstem WSE, along with significant debris accumulation that is likely to limit access.
- The Cold River (stream order 5) has a broad delta bar at the mainstem confluence with coarse-grained substrate (gravel/cobble) contributed primarily by outflow from the tributary itself (Study 8 – Channel Morphology and Benthic Habitat Study). This condition also exists within the tributary itself as observed in 2014. Cobble is deposited at the confluence with tributary outflow, and broad shallow areas are created which can limit the extent and depth of mainstem WSE into portions of the tributary.

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Study 13 – Tributary and Backwater Fish Access and Habitats

Site CT-WR-2.11 (Lulls Brook S.O. 3)
Vermont side
Wilder Riverine
Required Confluence WSE: 299.9 ft

Occasionally restricted under normal project operations, 50% of date criterion

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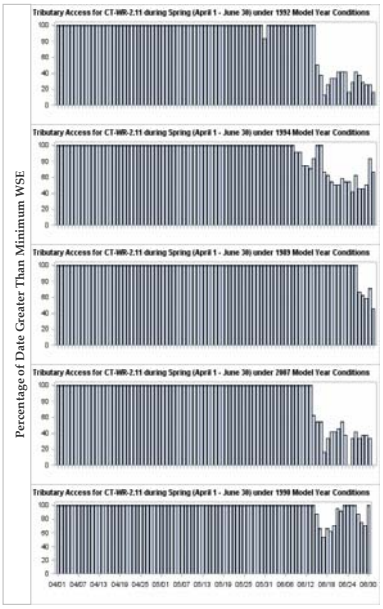

Study 13 – Tributary and Backwater Fish Access and Habitats

Site CT-V-5.02 (Mad Brook S.O. 2)
New Hampshire side
Vernon Impoundment
Required Confluence WSE: 222.1 ft

Occasionally restricted under normal project operations, 50% of date criterion

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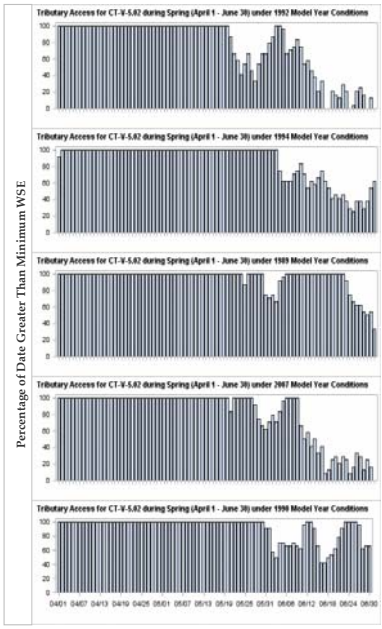

Study 13 – Tributary and Backwater Fish Access and Habitats

Site CT-V-4.02 (Cold River S.O. 5)
New Hampshire side
Bellows Falls Riverine
Required Confluence WSE: 223.7 ft

Occasionally restricted under normal project operations, 50% of date criterion

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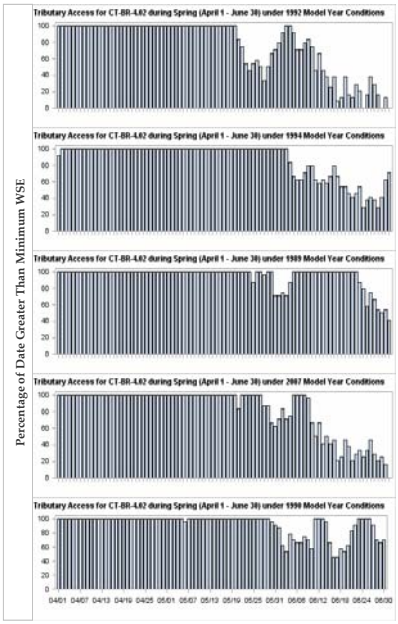

Study 13 – Tributary and Backwater Fish Access and Habitats

Site CT-WR-2.13 (Bashan Brook S.O. 1)
Vermont side
Wilder Riverine
Required Confluence WSE: 304.0 ft

Frequently restricted under normal project operations, 50% of date criterion

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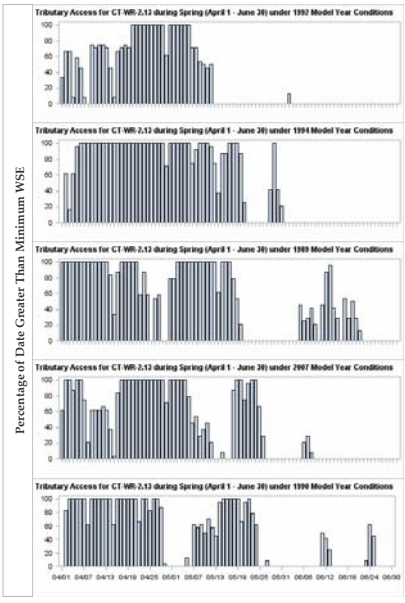

Study 13 – Tributary and Backwater Fish Access and Habitats

Conclusions:

- Conservative assumptions were used: ≥10% of dates in spring with at least 50% of date with < 0.5 ft of confluence water depth.
- 6 of the 13 sites with occasional or frequent restriction in spring were also identified as having 25% or greater restriction in summer/fall as did 2 sites with undetermined restrictions in summer/fall.
- 9 of the 13 sites with occasional or frequent restriction in spring are stream order 1 or 2, including 1 intermittent stream.
- All backwaters were categorized as having no or negligible restrictions
- Most sites also have non-project related characteristics that can limit access.
- Study sites are a small fraction of all available fish habitat in tributaries and backwaters within the study area.
- This study was biased toward the smallest tributaries (stream orders 1, 2, and 3) which would be most likely to have limited stream flow.
- It is extremely likely that adequate access exists at the many other larger tributaries and backwaters throughout the project-affected areas.

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Study 20

American Eel Downstream Migration Timing

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Study 20 – American Eel Downstream Migration Timing

Study Goal:

To assess the timing of American eels migrating from the Connecticut River to their spawning grounds via a desktop literature review.

Study Objective:

To characterize the general migratory timing and presence of silver phase American eels in the Connecticut River relative to environmental factors, including:

- air temperature
- water temperature
- turbidity
- rainfall
- river flow
- lunar phase
- flow-related operations of mainstem river hydroelectric projects

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Study 20 – American Eel Downstream Migration Timing

- The literature review focused on existing Connecticut River Basin primary publications, reports, and data (as made available).
- Existing information from basins in the Northeast were included to compare and contrast with specific information for the Connecticut River Basin.
- A broader search for information specific to cues that instigate migration was also conducted.
- Specifically, this effort consolidated information regarding the timing of emigration and the environmental cues that may trigger downstream migration of silver eels.

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Study 20 – American Eel Downstream Migration Timing

Results of other studies were reviewed:

- Study 10 – Fish Assemblage Study
- Study 11 – American Eel Survey
- Study 17 – Upstream Passage of Riverine Fish Species Assessment
- Study 18 – American Eel Upstream Passage Assessment
- Study 19 – American Eel Downstream Passage Assessment

Only Study 19 could potentially provide information on timing of silver eel downstream migration; however, eels were sourced from out-of-basin and release dates for radio-tagged eels were necessarily delayed. As a result, timing of migration was not "natural" for the river.

FirstLight is also conducting a downstream eel passage study including evaluation of Connecticut River eels emigrating naturally, but results of that study are not available at this time.

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Study 20 – American Eel Downstream Migration Timing

Factor	Study Area	Migration Range	Peak
Seasonality	American Eel, general	Late summer – through fall	Mid-October
	Northeast rivers	Mid-August - November	Mid-October
	Connecticut River	Mid-August - November	Mid-October
Water Temperature	American Eel, general	20°C - 3°C	9°C - 5°C
	Northeast rivers	20°C - 5°C	11°C - 9°C
	Connecticut River	20°C - 5°C	11°C - 9°C
River Flow	American Eel, general	Variable reported but generally occurs with increased flows	Variable dependent upon System
	Northeast rivers	Variable reported but generally occurs with increased flows	Variable dependent upon System
	Connecticut River	Variable reported but generally occurs with increased flows	Variable dependent upon System
Lunar Phase	American Eel, general	Variable reported	Last Quarter and New moon
	Northeast rivers	Variable reported	Last Quarter and New moon
	Connecticut River	Variable reported	No firm confirmation

Study 20 – American Eel Downstream Migration Timing

Results:

- Migratory timing and cues that trigger it remain only generally defined in terms of:
  - seasonality
  - water temperature
  - river flow (specifically decreases in water temperature and increases in discharge)
- Potential effects of atmospheric events and the physical variables associated with them are even less understood:
  - changes in atmospheric pressure
  - rainfall
  - increased flows
  - turbidity
  - olfactory indicators

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Study 20 – American Eel Downstream Migration Timing

Conclusions:

- Several environmental variables may be associated with factors that influence silver eel migration.
- These variables may act independently or in concert with one or more other variables in different river systems.
- The seasonality of emigration is similar to other river systems, occurring generally in the fall, and seems to be potentially cued by multiple variables (temperature, precipitation, increasing flows).
- Peak emigration is likely to vary annually in response to variations in those physical factors that stimulate and/or facilitate migration.

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Study 18
American Eel Upstream Passage Assessment

Working Group Consultation

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Study 18 – American Eel Upstream Passage Assessment

- In 2015:
  - Holyoke passed 20,000 eels
  - FirstLight collected and passed 5,972 eels in their upstream eel study.
  - 1,545 eels (net upstream) were counted at the Vernon fish ladder in Study 17 (early May – early January).
- In 2014:
  - Holyoke passed 49,817 eels
  - FirstLight observed (but did not pass) 6,263 eels in their upstream eel study.
  - 124 eels were counted at the Vernon fish ladder (April 15 – July 15).

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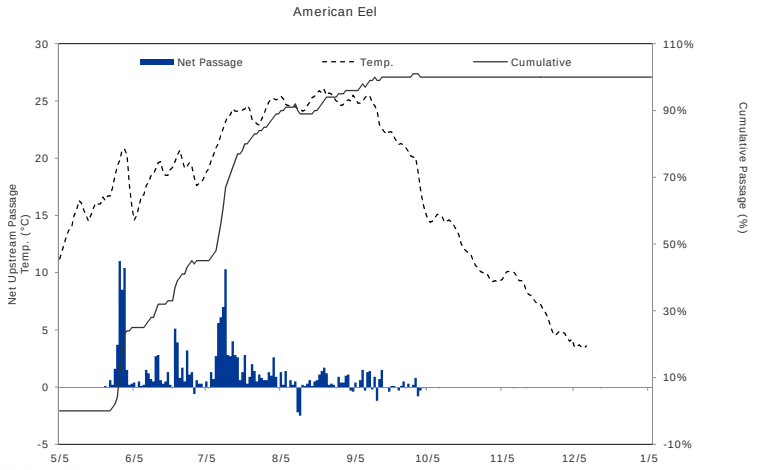
Study 18 – American Eel Upstream Passage Assessment

Vernon fish ladder: 2015 American Eel daily net upstream passage count and cumulative passage (as % of annual total) with water temperature (°C).



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Study 18 – American Eel Upstream Passage Assessment

- Study Report Filed March 1, 2016
- Stakeholder comments filed: *TC should repeat Study 18 in 2016,*
  - *using visual observations at wetted locations along the dam,*
  - *install temporary eel trap passes at any locations where adequate concentrations of eels are found including the fishway entrance area, and*
  - *placement of an eel trap within a lower portion of the Vernon fish ladder.*
- FERC determination: "*we recommend that TransCanada proceed with the proposed eel trapping in the Vernon fishway during 2016*"
  - where in the fishway?
  - at what flows?
  - site challenges to eel trap installation, configuration, etc.
  - timing?
- What is the goal of a fish ladder eel trap?
  - test ladder for passage effectiveness?
  - test ladder entrance for attraction effectiveness?

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Study 18 – American Eel Upstream Passage Assessment

Study 18 Continuation

- 2016 fish ladder work given design/fabrication issues, would be late for the season based on 2015 (80% passage by July 21 from Study 17, FirstLight reached 80% later ~ August 23).
- 2016:
  - review site conditions/constraints, develop potential design, and define operational parameters to conduct eel trapping in Vernon fishway per FERC Determination.
- Post 2016:
  - Install and conduct eel trapping field work pending passage from downstream projects or not, based upon agency consultation

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Study 9
Instream Flow Study

Working Group Consultation

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Study 9 – Instream Flow Study

Remaining Analyses:

- **Habitat times series**
- **Dual-Flow analysis**
  - **Outstanding items and discussion points:**
    1) Select species/life stages to run for the time series and dual-flow analyses
    2) Determine primary flow combinations for dual-flow analysis
    3) Determine critical reach or reaches?

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Study 9 – Instream Flow Study

Select species/life stages:

- Memorandum dated May 17, 2016 provided rationale for omitting some species/life stages
  - **Suggested at a minimum to exclude**:
    Longnose Dace (all life stages)
    Walleye Spawning

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Study 9 – Instream Flow Study

Dual-Flow Analysis – Selection of Paired Flows

- Selecting minimum flows
  - Current minimum generation flow
  - Alternate minimum(s) based on evaluation of habitat indices
- Selecting peaking flows
  - Current maximum station capacity (e.g. Wilder 10,700 cfs)
  - Typical current operational peak flows (from flow duration curves)
  - Based on turbine capacity, efficiency and number of turbines
    - o Wilder 2 units, Bellows 3, Vernon 10

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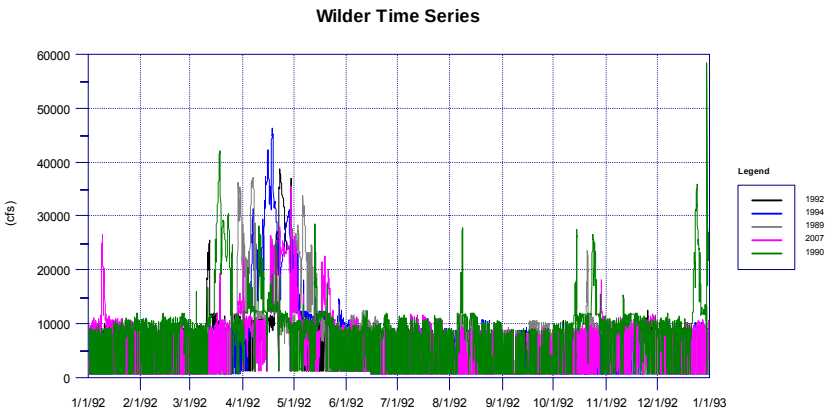
Study 9 – Instream Flow Study



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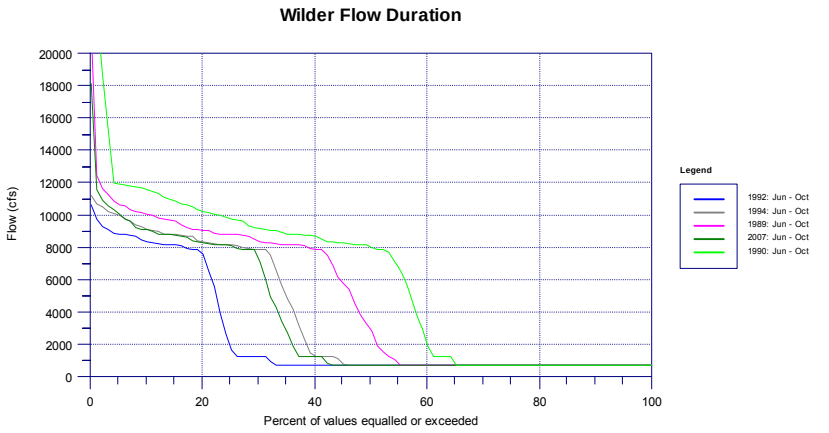
Study 9 – Instream Flow Study



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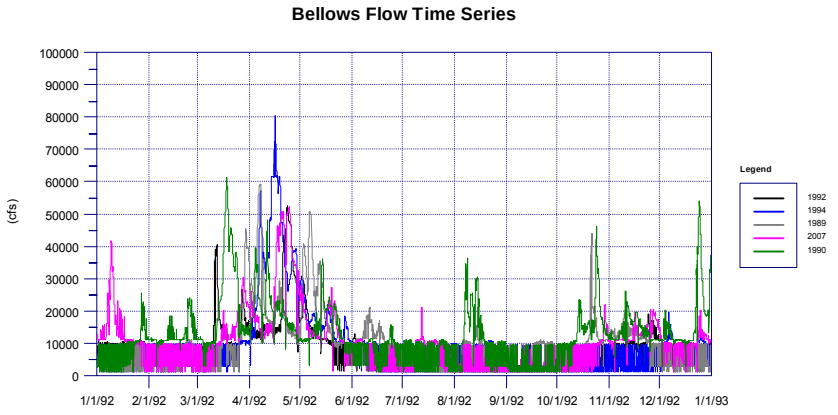
Study 9 – Instream Flow Study



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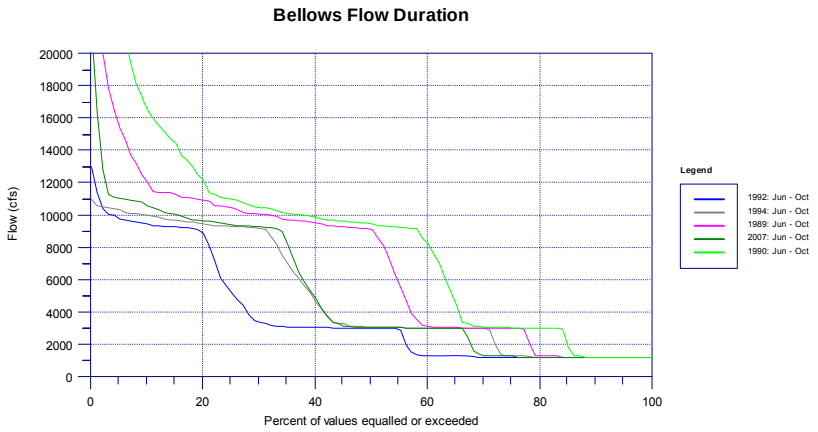
Study 9 – Instream Flow Study



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Study 9 – Instream Flow Study

Dual-Flow Analysis – Selection of Paired Flows

- Wilder typically operates from minimum flow (700 cfs) to between 8,000 and 10,000 cfs. Intermediate flows only occur about 5% of the time.
- Bellows Falls typically operates from minimum flow (1,300 cfs) to peaks of 3,000 cfs and 9,000 to 11,000 cfs. Intermediate flows only occur about 10% of the time.
- Vernon (to be determined)

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Study 9 – Instream Flow Study

Critical Reaches

Potential areas:

- Wilder
  - Transects WR2-1 to WR2-4 - includes shallow bars exposed at low flows (run/riffle/run/glide)
  - Johnston Island 2D site
  - Transects WR3-3 to WR3-7 - includes exposed bars at low flows (glide/riffle/run/run/glide)
- Bellows
  - Transects BF4 to BF9 – Saxtons River to Cold River includes exposed bars at low flows (run/glide/riffle/riffle/run/run)
- Vernon
  - Transects VR5 to VR10 – encompasses Stebbins Island (glide/run/glide/run/glide/pool)

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Break

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Study 25
Dragonfly and Damselfly Inventory and Assessment

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Study 25 – Dragonfly and Damselfly Inventory and Assessment

Study Results

- Eleven sites were selected to cover geographic extent of the project area and a variety of hydrologic and habitat conditions
- Six visits during June and July, 2015 to all eleven sites
- Searched five 3-meter wide transects at each site for dragonfly larvae, exuviae, and tenerals (pre-flight adults)
- Recorded water levels using HOBO dataloggers
- Over 750 observations of 19 species, with at least 1 observation at each study site
- Six of the eight target listed odonates were observed throughout the projects
- Multiple larvae were observed from emergence to eclosure to flight
- Critical period for emergence is approximately 30 minutes during eclosure

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Study 25 – Dragonfly and Damselfly Inventory and Assessment

Rapids Clubtail teneral in Wilder Impoundment (Site 25-02), prior records from Vernon

Arrow Clubtail larva preparing to leave water to eclose

Spine-crowned Clubtail exuvia in Bellows Falls Impoundment (Site 25-08), prior records only from Vernon

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Study 25 – Dragonfly and Damselfly Inventory and Assessment

Assessment of Project Effects

- Two potential effects from normal project operations
  - Loss of habitat due to inundation
    - Operations Model (Study 5) data used to analyze the timing, frequency, and duration of high water events
  - Mortality due to rapid water level rises during eclosure
    - Water level logger data used to analyze the frequency of rapid rises
- No effect on odonates due to habitat loss from inundation
- No mortality of odonates due to rapid water level rises in impoundments
- Low mortality of odonates due to rapid water level rises in riverine reaches

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Study 26
Cobblestone and Puritan Tiger Beetle Survey

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Study 26 – Cobblestone and Puritan Tiger Beetle Survey

Study Results

- 13 study sites selected and surveyed in 2014
- Cobblestone Tiger Beetle (CTB) observed and photographed at 7 sites
- CTB observed with lower certainty at 3 additional sites
- Study resulted in 2 new CTB VT records (Ascutney Riverbank, West River)
- Reproductive behavior observed (adults clasping) at 4 sites
- Adult cobblestone tiger beetles appeared to have specific habitat requirements preferences related to the size and variability of cobble substrate (5-8 cm), but not to other site characteristics such as vegetative cover or habitat area
- Appropriate habitat and survey observations of cobblestone tiger beetle were most common in the riverine and upper sections of Bellows Falls and Vernon impoundments
  - Optimal habitat often found on upstream sides of riverine islands
- No Puritan Tiger Beetles observed

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Study 26 – Cobblestone and Puritan Tiger Beetle Survey

Burnaps Island, upper Wilder riverine

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Study 26 – Cobblestone and Puritan Tiger Beetle Survey

Assessment of Project Effects

- Operations Model (Study 5) data used to analyze the timing, frequency, and duration of water level fluctuations
- Study sites with occasional but infrequent complete habitat inundation appear to provide the best habitat for CTB adults
  - Optimal inundation frequency is <20% of summer days (for at least 1 hour)
  - Periodic inundation presumably limits vegetative encroachment and controls substrate quality
- CTB larval life history has not been described but similar species can tolerate 1-4 days of complete immersion
- Average spring water surface elevations at most study sites partially or fully inundate CTB larval habitat.
  - Highest spring flows are a result of spring rain/snowmelt rather than normal project operations

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Study 28
Fowler's Toad Survey

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Study 28 – Fowler's Toad Survey

Study Results

- 15 sites surveyed in 2014
  - 11 call survey sites with 3 rounds of site visits.
  - 4 acoustic monitoring sites over 2 – 4 weeks.
- Survey methods consisted of direct listening (call surveys) and acoustic recording
- Fowler's toad was detected in one location – Stebbins Island, (subject to water level fluctuations in Turners Falls impoundment)

NOTE

- Vermont listed Fowler's toad as a state-endangered species as a Priority 1 "Very Rare" species in 2015.

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Study 28 – Fowler's Toad Survey

Breeding pool Stebbins Island, June 3, 2014

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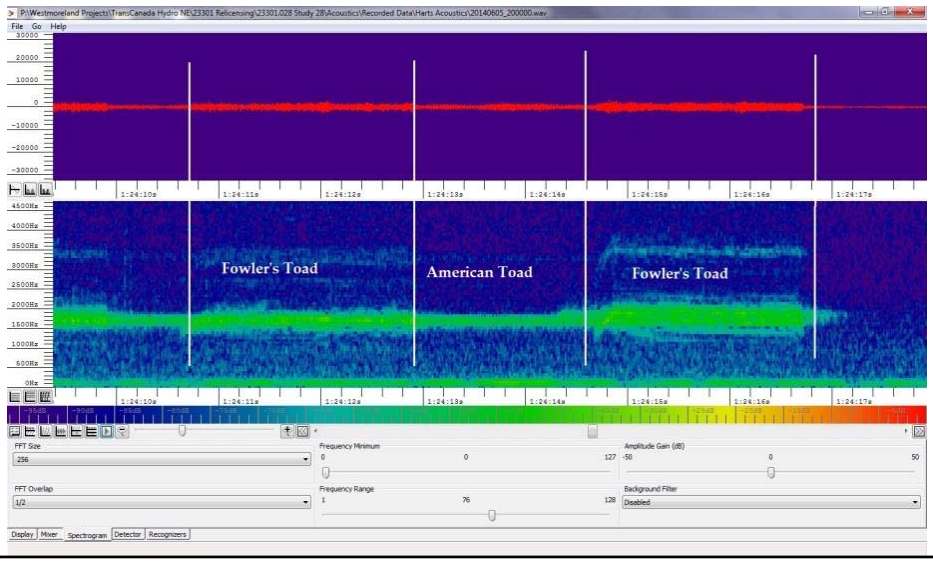
Study 28 – Fowler's Toad Survey

Example Sonogram
June 5, 2014 from Stebbins Island



Study 28 – Fowler's Toad Survey

Effects of Project Operations on Breeding Habitat

Suitable Fowler's toad habitat occurs in locations, typically pools that are

- occasionally scoured; but
- generally buffered from water fluctuations and high velocities by the topography of the site during the breeding season.

- This type of habitat is uncommon in the study area, but occurs at the one site (Stebbins Island) where Fowler's toad was confirmed present, and at two other study sites where Fowler's toad was not present.
- The magnitude of project-related water level fluctuations during the Fowler's toad breeding season (May 21 – July 21) does not prevent the persistence of suitable habitat at these sites.

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Study 29
Northeastern Bulrush Survey

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Study 29 – Northeastern Bulrush Survey

Study Results

- Developed a typical profile of suitable habitat
- Vegetation habitat maps were reviewed for potential sites
- Field verification was conducted in August and September 2014
  - 8 sites were initially identified
  - 4 sites were eliminated based on field review
  - The remaining 4 sites were more intensively surveyed, including the one site where northeastern bulrush was last observed
- All 4 high-potential sites were controlled by beaver dams
- No plants were found

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Study 29 – Northeastern Bulrush Survey

Previously recorded northeastern bulrush site

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Study 29 – Northeastern Bulrush Survey

Effects of Project Operations

- Field elevations were taken on beaver dams limiting typical riverine flows into site, and compared to modeled water surface elevations
- Two of the four sites surveyed (including the previous known NE bulrush location) were not able to be evaluated by operations model data due to distance from mainstem
- The two sites that are near the mainstem are modeled to be within the range of normal project operations.
  - Elevations of the beaver dams are at the high end of normal project operations, therefore overtopping would be infrequent
- At all sites, mean water surface elevation remains below beaver dams most of the year, including during the growing season, potentially providing suitable habitat

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