



United States Department of the Interior



FISH AND WILDLIFE SERVICE

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In Reply Refer To: FERC Nos. 1904-073, 1855-045, and 1892-026
TransCanada Hydro Northeast Inc.
Connecticut River
COMMENTS ON INITIAL STUDY REPORT

November 14, 2014

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

Dear Secretary Bose:

This responds to the Initial Study Report (ISR) submitted by TransCanada Hydro Northeast Inc. (TC) on September 14, 2014 as part of the relicensing of the Vernon, Bellows Falls and Wilder projects, located on the Connecticut River in New Hampshire and Vermont. We have reviewed the ISR and offer comments on a number of the studies as discussed below.

STUDY 7: AQUATIC HABITAT MAPPING

The U.S. Fish and Wildlife Service (Service) has no comments on how the data were collected. However, we have requested that TC upload additional geodatabase files (in KMZ format) to stakeholders that provide more detail than the files originally uploaded. It is our understanding that data layers from other (related) studies also will be uploaded in a similar format (e.g., water level logger locations, tributary and backwater access sites, etc.).

STUDY 9: INSTREAM FLOW STUDY

As noted in the ISR, three activities were scheduled to occur in October: (1) transect selection in the Bellows Falls bypass reach; (2) an agreement on an assessment methodology at Sumner Falls; and (3) data collection for both of those study areas. On October 15, 2014, stakeholders visited the Bellows Falls bypass reach to select transect locations.

Additionally, at the September 29, 2014 ISR meeting, TC indicated that, due to sustained low flows, Normandeau Associates (NA) had been unable to collect transect data under a high flow condition. While it may still be possible to collect measurements this fall, that component of the study may need to be delayed and completed next spring. Also, TC indicated that the proposed

habitat suitability curves would be sent out to stakeholders for review and comment by mid-October. To date, we have not received the suitability curves.

STUDY 13: TRIBUTARY AND BACKWATER FISH ACCESS AND HABITAT STUDY

In the ISR, TC states that initial site visits began in late July and continued into August and that final visits to all study sites would occur during late October. It is unclear how long each logger has been deployed. Those data should be provided, so that the Service can assess whether logger deployment has been sufficiently long to collect the required data. The Service raised this issue with TC at the September 29, 2014 ISR meeting and in response, NA indicated that it would provide a table of the dates each logger was deployed. NA also expressed confidence that data sufficient to conduct analyses are being collected, due to extremely low flows during the logger deployment period.

STUDY 17: UPSTREAM PASSAGE OF RIVERINE FISH SPECIES

In the ISR, the three bullets under the Study Progress section are not relevant to this study (which calls for monitoring the fish ladders).

STUDY 22: DOWNSTREAM MIGRATION OF JUVENILE AMERICAN SHAD – VERNON

Under the Introduction section, TC states that the Revised Study Plan (RSP) was approved without modification. While the Federal Energy Regulatory Commission's Study Plan Determination (SPD) did approve Study 22 (which included hydroacoustic monitoring at a single location) without modification, the SPD also added a stand-alone comprehensive hydroacoustics study (Study 34), currently under appeal by TC.

STUDY 24: DWARF WEDGEMUSSEL AND CO-OCCURRING MUSSEL STUDY

In the ISR, TC states that Phase 1 work was completed and presented in the Phase 1 Study Report (Biodrawiversity and LBG 2014). A Proposed Phase 2 Study Plan was distributed to stakeholders on May 23, 2014. Although it was not released to stakeholders, a Revised Phase 2 Study Plan was completed on July 14, 2014. By electronic mail dated September 4, 2014, the Service provided comments and a counter proposal on the original Phase 2 Study Plan. The delay in providing comments was due to extensive consultation the Service undertook with a number of mussel experts. In August of 2014, TC initiated field work pursuant to its Revised Phase 2 Study Plan.

During the September 29, 2014 ISR meeting, Biodrawiversity (consultant for the subject study) provided a summary of the Phase 2 data that have been collected to date: (1) no federally endangered dwarf wedgemussels were collected in any of the 400 quadrats placed in the 2-D study area; and (2) of the 20 transects placed in six separate locations, dwarf wedgemussels were found only in six transects and at very low densities (never more than one per transect). At the ISR meeting, the Service requested a follow-up meeting specifically to discuss the Phase 2 Study Plan. On October 9, 2014, the Service, TC, Biodrawiversity and other stakeholders met. Based on

the discussion that took place, the Service indicated at the end of the meeting that it would be modifying its Counter Proposal.

Appendix A contains our Revised Counter Proposal for the Phase 2 Study Plan, in the format required pursuant to 18 CFR §5.9(b).

STUDY 27: FLOODPLAIN, WETLAND, RIPARIAN, AND LITTORAL VEGETATION HABITATS SURVEY

According to the RSP, TC was to collect the following information with respect to the American bald eagle:

- use data from the ongoing bald eagle breeding survey to characterize the known nest trees in the project area, including the location, condition, and conservation/protection status of parcels within 250 yards of the nest tree; and
- map potential bald eagle winter roosting sites along the River.

The ISR only discusses winter roosts. TC should provide an update on the status of the bald eagle nest characterization effort.

STUDY 34: REQUESTED VERNON HYDROACOUSTIC STUDY

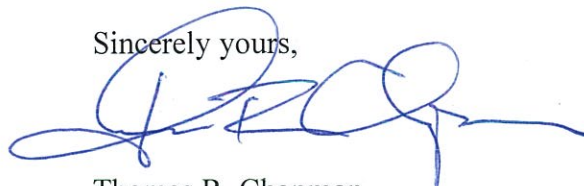
In the ISR, TC notes under the Study Progress section that it developed a Proposed Study Plan (PSP) as directed by the Federal Energy Regulatory Commission in its SPD. The PSP was filed concurrent with, but separately from, the ISR. The Service has reviewed the PSP and submitted comments on it separately from this filing.

2015 STUDIES CONSULTATION

At the September 29, 2014 ISR meeting, TC noted that additional site selection consultation will occur by mid-November of 2014 for studies 6, 10, 11, 12, 14, 15 and 16. In addition, TC will work with Vermont Agency of Natural Resources staff to set up the SalmonSoft system that will be used to monitor the fish ladders in 2015.

Thank you for the opportunity to comment on the revised study plans. If you have any questions regarding these comments, please contact John Warner of this office at 603/223-2541.

Sincerely yours,



Thomas R. Chapman
Supervisor
New England Field Office

Attachment

Kimberly D. Bose, Secretary
November 14, 2014

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Reading File
ES: MGrader:11-14-14:(603)223-2541

REFERENCE

Biodiversity and LBG (Biodiversity and The Louis Berger Group, Inc.). 2014. Freshwater Mussel Survey in the Connecticut River for the Wilder, Bellows Falls, and Vernon Hydroelectric Projects - Draft Confidential Report. Prepared for TransCanada Hydro Northeast Inc.

APPENDIX A

STUDY 24
DWARF WEDGEMUSSEL AND CO-OCCURRING MUSSEL STUDY
FWS REVISED PROPOSED PHASE 2 STUDY PLAN

Goals and Objectives

§5.9(b)(1) – *Describe the goals and objectives of each study proposal and the information to be obtained.*

Goal 1: Assess the distribution, population demographics, and habitat use of the dwarf wedgemussel (DWM) in the Wilder and Bellows Falls project areas.

- Objective 1 (Phase 1): conduct an initial survey of the 17-mile-long reach of the CT River from Wilder dam to the upstream end of the BF impoundment to determine the distribution, relative abundance, and habitat of the DWM.
- Objective 2 (Phase 1): Determine the best sites for quantitative mussel sampling in areas where DWM are known to occur in the Wilder and BF project areas and the reach surveyed for Objective 1; and
- Objective 3 (Phase 2): At sites identified in Objective 2, collect statistically sound and repeatable data, using quantitative methods, to determine density, age-class structure, and habitat for DWM and co-occurring mussel species.

Goal 2: Assess the influence of flow regime on DWM, co-occurring mussel species, and mussel habitat.

- Objective 4 (Phase 2): Observe and record behavior of DWM and co-occurring mussel species in situ during varying flow conditions; and
- Objective 5 (Phase 2): Assess the potential effects of flow regime on DWM and their habitat.

Relevant Resource Management Goals and Public Interest Considerations

§5.9(b)(2) – *If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.*

The dwarf wedgemussel (*Alasmidonta heterodon*) is a federally-endangered species. As such, this study request is intended to facilitate the collection of information necessary to conduct effects analyses and to develop reasonable and prudent conservation measures and protection, mitigation, and enhancement measures for the species pursuant to the Endangered Species Act of 1973, as amended (16 U.S.C. §1531 *et seq.*).

It is the goal of the U. S. Fish and Wildlife Service (USFWS) to recover the dwarf wedgemussel so that it can be removed from the Endangered Species list in the future. According to the Recovery Plan (USFWS 1993), the Connecticut River dwarf wedgemussel population is one that must be demonstrated to be viable before the species can be downlisted to threatened. The Upper

Connecticut metapopulation is considered to be the largest remaining population in the world (USFWS 2007), and so its protection is essential to the recovery of the species as a whole.

Public Interest

The requestor is a resource agency.

Existing Information and Need for Additional Information

§5.9(b)(4) – *Describe the existing information concerning the subject of the study proposal, and the need for additional information.*

In 2011, Biodrawversity, LLC conducted a freshwater mussel survey throughout the Vernon, Bellows Falls, and Wilder project areas (Biodrawversity and LBG 2012). This survey was semi-quantitative (i.e. timed searches were used) and the main goal was to assess the distribution, abundance, demographics, and habitat of the DWM in the project areas. Dwarf wedgemussel were found in the Wilder impoundment (all within a 14-mile stretch of the river beginning 27 miles upstream of the Wilder Dam) and Bellows Falls impoundment (located sporadically in the upper 17 miles of the impoundment); none were found in the Vernon project-affected area. These results corroborate the results of other studies performed in the past in these areas (Nedeau 2006a, Nedeau 2006b).

In 2013, Biodrawversity, LLC conducted a second freshwater mussel survey and the combined results of both surveys are presented in the 2013 Mussel Study Phase 1 Report (Biodrawversity and LBG 2014). In general, the 2013 survey found fewer sites with DWM and lower CPUE of those sites with DWM, relative to the 2011 survey (Table 1).

Table 1. Summary results of Appendix B (Mussel Survey Data) in the 2013 Mussel Study Phase 1 Report (Biodrawversity and LBG 2013).

Survey Year	2011	2013
# Sites Surveyed	140	70
% Occurrence	15.7	12.9
Average CPUE	2.22	1.09
Max CPUE (# obs. / hr.)	8	3

The FERC-approved Revised Study Plan (RSP) for Study 24 was designed to use an adaptive, two-phase approach; Phase I would focus on surveying sites throughout the project-affected reach of the Connecticut River and based, on those results, Phase II would identify a subset of sites with sufficiently large DWM populations to conduct quantitative sampling, behavioral assessments and project effects analyses.

Unfortunately, results of the 2011 and 2013 surveys indicate that it will not be possible to meet the study goals using all of the original objectives. Given the relatively low densities and the location of those sites with the highest densities of DWM, it appears that Objective #4 should be

removed. However, the Service continues to believe that Objectives 3 and 5 can still be achieved, with the modified methodology proposed herein.

Project Nexus

§5.9(b)(5) – *Explain any nexus between project operations and effects (direct, indirect, or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.*

The dwarf wedgemussel is known to occur within the Wilder and Bellows Falls project-affected areas and operations of these two dams may affect the viability of this species in the Connecticut River. This study plan will allow for a better understanding of how sub-daily flow and water level fluctuations influence DWM abundance, distribution, and habitat suitability. This information can be used to inform the development of license requirements that can ensure the continued existence of this species within the project-affected areas.

Methodology Consistent with Accepted Practice

§5.9(b)(6) – *Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.*

Task 1 - Quantitative Habitat Data: Quantitative habitat metrics should be collected from a number of sites representing low, medium and high CPUE based on current or historical data.

- Determine how many sites will be surveyed - tentatively, propose that a minimum of two sites within each proposed abundance category (Table 2), plus Cornish Covered Bridge (north and south) and Sumner Falls, for a total of n=9 sites.

Table 2. Example/proposed locations for 2015 quantitative sampling.

Location	Site	CPUE in TC surveys	Proposed Abundance Category
Black River	BF 26	3.0	MED
Hubbard Island	BF 39-41	0.5-1.5	LOW
Jarvis Island	BF 48-49	1-2.4	LOW-MED
Below Chase Is.	BF 60, 62	1-1.33	LOW
Cornish Covered Bridge	FF 3-5	0.0 (1.4-9.5 in 90s)	
Sumner Falls	FF 26	0.0 (1.5-24.3 in 90s)	
Bradford	W 31, 33	4.8-5.0	HIGH
Downstream BBSP	W 48	5.0	HIGH

Bedell Bridge SP	W 52, 53	1.0	LOW
Upstream of BBSP	W 58, 60	4.0-8.0	HIGH

- Data collection will entail sampling 1-meter² (m²) quadrats along transects, similar to what was proposed in Task 3, Part 1 of the Proposed Phase 2 Study Plan. At each site, the total number of quadrats will be equivalent to the average channel width in meters divided by 5, rounded up to the nearest multiple of 9, or N = 27, whichever is greater. There will always be 9 quadrats per transect. The number of transects will be equivalent to the total number of quadrats divided by 9; however, there will be a minimum of 3 transects per site.
- Each transect will be placed *perpendicular* to flow (bank to bank), 10 meters apart. Along each transect, quadrats will be selected in a stratified-random fashion, with 3 random quadrats selected and sampled in each of three lateral channel sections: right bank, mid-channel, and left bank. The division between the sections will be based on depth (e.g., maximum channel depth)/2, or a mutually-agreeable alternative), with a minimum section width of 3 meters. Selection of transects and random selection of quadrats will occur formally and prior to the day of field sampling, using a random number generator or similar technique.
- For each quadrat, a 0.25 m² will be excavated to a depth of 10 cm and sieved through a 10-mm sieve to estimate density of sub-surface DWM.
- In addition, observations will be made between quadrats and within 1 m of each side of each transect to survey and collect data for additional DWM.
- For *each site* (n=21), the following data will be collected:
 - stream shading
 - bank angle
 - bankfull width
 - bankfull cross sectional area
 - bankfull mean and maximum depth
 - width to depth ratio
 - bank erosion hazard index
 - median particle size (D50), D16 and D84
 - continuous hourly temperature @ 10 cm above, 5 cm below and 15 cm below interface
 - watershed area
 - land use
 - riparian land use (15 and 30 m buffers)
 - ecoregion
 - geologic rock type
 - stream power
- For *each quadrat* and for *each transect*, the start and end time of sampling (to determine CPUE – #/quadrat and #/observation hours – as well as to correlate to flow and/or WSE) will also be recorded.
- For *each quadrat*, the following additional data will be collected:
 - Number of DWM
 - Presence and number of tessellated darters
 - Co-occurring mussel species

- Species composition and percent cover of aquatic vegetation
 - Percent cover of woody debris
- For *each quadrat*¹ (with or without DWM) and for each DWM encountered outside of a quadrat¹, the following additional data will be collected:
 - GPS coordinates
 - Distance to shore (specify bank)
 - Presence of groundwater seeps or other groundwater inflow
 - Variables necessary to calculate shear velocity, shear stress, Froude number and Reynolds number
- For *each individual DWM* encountered on the surface (within quadrats, outside of quadrats, or along the sides of each transect), and for *quadrats without DWM* (on the surface or at all), the following additional data will be collected:
 - water depth
 - mean column water velocity (m/s)
 - bottom water velocity (m/s)
 - embeddedness/substrate penetrability
 - substrate roughness
 - bottom temperature
 - dominant and subdominant substrate
 - distance to nearest cover and nearest cover type (per Pandolfo, cover in this context is the nearest material that could slow water velocity or potentially provide shelter or habitat for DWM)
- For *each individual DWM* encountered within each quadrat (surface and subsurface), between quadrats, and along the sides of each transect, the following data will be collected:
 - Shell length and width. According to Baginski et al. (2009), DWM can be accurately assigned as male or female based on length-width ratios.
 - Shell condition
 - Location (transect, quadrat or location along transect, surface or subsurface)

Water level loggers should be placed at each site prior to initiating field work and should remain in place until the end of the summer. River flow should be measured, estimated or calculated during each sampling event. If bathymetric data do not exist at a given survey site (e.g., those outside of the project affected area or in free-flowing reaches within the project affected area) then it should be collected.

Data collection should take place in early summer, 2015 (June and July). To the extent practicable, surveys should occur during base flow conditions.

Task 2 - Data Analysis:

Habitat

This methodology is based on Pandolfo (Chapter 4, 2014²). In general, the analysis components include:

¹ If DWM encountered outside of transects are at densities > 1 m², one measurement point may be taken per 1 m² (equivalent to the size of a quadrat).

- Microhabitat suitability:
 - Suitability calculated by dividing microhabitat use at a site by availability at that site over range of values for each parameter.
 - Bootstrap two-sided Kolmogorov-Smirnov test to test for significant differences between use and availability distributions for each habitat parameter (i.e., non-random use of habitat by DWM).
- Assessment of relationship between abiotic/biotic factors and DWM density, using correlation and linear regression techniques.

HSC Development

Using the data from the quadrat task as well as other relevant data from DWM studies conducted both within and outside of the Connecticut River basin, a DELPHI panel of DWM experts will develop habitat suitability curves. These curves will then be used in the instream flow study (1D and 2D) for the free-flowing reaches within the project affected area (including steady state analysis, habitat time-series analysis, and habitat persistence analysis). For impounded reaches, the potential for water surface elevation fluctuations to influence relevant habitat metrics, both spatially and temporally, should also be analyzed.

The proposed methodology is consistent with accepted practice (Table 3):

Table 3. Gray and peer-reviewed literature supporting use of FWS proposed methodologies.

Study	Methodology
Allen and Vaughn (2010)	Cross-river transect placement; univariate and multiple regression model analysis
Maloney et al. (2012)	Quadrat-based data collection; habitat persistence analysis using 2D, hydrodynamic model
Pandolfo (2014)	Cross-river transect placement to collect reach-level habitat data; bank to bank mussel survey; detailed biological and micro habitat data collection;
Baldigo et al. (2003-2004)	Reach level habitat and hydraulic data collection at points along transects spaced set river widths apart; correlation and simple linear and partial multiple regression analysis
FERC (2014)	Use of Delphi approach to develop HSI criteria for rare mussels downstream of the Turners Falls Project

Level of Effort and Cost & Why Alternative Studies Will Not Suffice

§5.9(b)(7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The expected level of effort for the data collection and analyses will be moderate. Costs are estimated to be between \$50,000 and \$80,000.

² Pandolfo, T.J. 2014. Biotic and abiotic influences on common and imperiled freshwater mussels at multiple spatial and temporal scales with inferences to global change. PhD dissertation, North Carolina State University, Raleigh, North Carolina. 179 pp.

The FERC-approved study goals and objectives include:

Goal 1: Assess the distribution, population demographics, and habitat use of the dwarf wedgemussel (DWM) in the Wilder and Bellows Falls project areas.

- Objective 1 (Phase 1): conduct an initial survey of the 17-mile-long reach of the CT River from Wilder dam to the upstream end of the BF impoundment to determine the distribution, relative abundance, and habitat of the DWM.
- Objective 2 (Phase 1): Determine the best sites for quantitative mussel sampling in areas where DWM are known to occur in the Wilder and BF project areas and the reach surveyed for Objective 1; and
- Objective 3 (Phase 2): At sites identified in Objective 2, collect statistically sound and repeatable data, using quantitative methods, to determine density, age-class structure, and habitat for DWM and co-occurring mussel species.

Goal 2: Assess the influence of flow regime on DWM, co-occurring mussel species, and mussel habitat.

- Objective 4 (Phase 2): Observe and record behavior of DWM and co-occurring mussel species in situ during varying flow conditions; and
- Objective 5 (Phase 2): Assess the potential effects of flow regime on DWM and their habitat.

The Service and TC are in agreement that, given the overall low DWM densities and location of DWM observed within the survey area (typically in deeper water that is beyond the influence of daily fluctuations in water surface elevation), there would be limited benefit to conducting video observations to assess behavior under different operational regimes; therefore, Objective 4 should be omitted. This leaves Objectives 3 and 5 to be addressed by the Phase 2 Study Plan.

TransCanada has proposed to collect detailed quantitative habitat and demographic data on DWM and co-occurring mussels (eastern elliptio, eastern lampmussel, creeper and triangle floater) using two different methodologies: within quadrats placed along 20 transects located in six discrete areas where DWM have been found previously and within 400 randomly chosen quadrats occurring throughout a stretch of river from Cornish Covered Bridge to below Chase Island. Collected data would be used to characterize DWM demographics within the study area, to develop habitat suitability criteria, and to use those criteria to quantify changes in habitat suitability/availability over a range of flows, in both the 1D and 2D study areas.

For the reasons stated below, the Service does not believe that the proposed methodology will be sufficient to meet the study goals and objectives.

1. In order to produce data-driven HSI criteria, a sufficient number of observations across a range of mussel density and habitat conditions is needed.³ Based on the information

³ FERC Study Plan Determination for FirstLight's Turners Falls Project (FERC No. 1889), dated February 21, 2014. Page B-77.

provided in the Phase 1 Report (Biodrawversity 2014) and at the October 10, 2014 meeting, very few DWM were found during both qualitative surveys (Table 3) and the 2014 quantitative effort. The lack of a range of densities means there is no way to assess the relative suitability of the habitat.

Table 4. Summary of Phase 1 Report data (Biodrawversity 2014).

Location	Site	CPUE in TC surveys
Hubbard Island	BF 39-41	0.5-1.5
Jarvis Island	BF 48-49	1-2.4
Below Chase Is.	BF 60, 62	1-1.33
Cornish Covered Bridge	FF 3-5	0.0 (1.4-9.5 in 90s)
Sumner Falls	FF 26	0.0 (1.5-24.3 in 90s)
Bedell Bridge SP	W 52, 53	1.0

The Service's proposed methodology would quantitatively sample at sites covering a range of DWM density categories.

2. According to the protocol outlined in the Revised Phase 2 Study Plan, flow velocity will be estimated. Visual estimates will not be of sufficient resolution for the analyses that will be conducted. For example, Pandolfo (2014) found that DWM were found at velocities of 0.00 to 0.02 m/s. In addition, the protocol specifies that embeddedness will be measured. The Service's counter proposal recommends collecting embeddedness and substrate penetrability, which has been shown to be an important habitat parameter for freshwater mussels (Van Hassel 2007; Pandolfo 2014).

The Service's proposed methodology would utilize standard flow measuring equipment and collect substrate penetrability data.

3. In 2014, TC collected transect-based quantitative data within six areas. The number of transects at each area varied from two to four. Given the rarity of this species, more intensive effort is needed in order to collect enough data to conduct effects analyses.

The Service's proposed methodology bases the number of transects at a given site on the river width at that site (with a specified minimum number of transects per site). This will result in more transects at wider sections of river, and an overall greater level of effort that will increase the likelihood of detection. A number of studies have stressed the necessity of increasing effort for rare mussel species (Metcalf-Smith et al. 2000; Smith 2006; Thompson 2004).

4. The 2014 quantitative data collection effort used transects placed parallel to the river flow. This will restrict the types of habitats encountered (i.e., narrower range of water depth, velocity, substrate, etc.) and limit the habitat analyses that can be conducted.

The Service's proposed methodology will place multiple transects cross-channel. This will allow for collecting biological and physical data over a range of habitat conditions and mussel densities that will enable analyses such as habitat preference to be conducted (which requires knowing what habitat is being used in relation to the total amount of habitat available at a given site).

5. In the Revised Phase 2 Study Plan, TC states that it will complete Task 5 using DWM and co-occurring mussel data; the justification being that (1) DWM may be rare or absent from certain areas and (2) DWM can occupy all of the same water depths and habitat types as other species. The Service disagrees with this premise; DWM is listed as an endangered species because of limiting factor(s) that are not acting on other species (or at least not to the same extent). Therefore, habitat suitability for co-occurring species may not be reflective of suitability for DWM.

The Service's proposed methodology calls for conducting effects analyses only for DWM, in order to best determine which habitat parameters are most important and how those habitats are affected by project operations.

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