Forested Wetlands Effectiveness Project

Prospective Answers to Six Questions from the CMER / Policy Interaction Framework Document

(Adaptive Management Board Manual Section 22)

Chronosequence Study Design December 2019

February 18, 2020

Presented by the Wetland Scientific Advisory Group (WetSAG)
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Project status - to be updated in the CMER work plan 2021:

The Forested Wetland Effectiveness Project's (FWEP) chronosequence study design, an exploratory study, was developed by a technical writing and implementation group (TWIG) under the LEAN pilot project process. The TWIG's resulting study design was reviewed and approved by CMER, consistent with the Protocol and Standards Manual (2016), and successfully went through Independent Scientific Peer Review (ISPR). The study design was approved at the December 2019 CMER meeting.

1. Does the study inform a rule, numeric target, performance target, or resource objective?

This is a study design that is a larger part of the FWEP, which will include a long-term before-after-control-impact (BACI) study. These studies are jointly intended to inform several rules, performance targets, and functional objectives. As a design only, and not as a fully an implemented study, the chronosequence study design does not yet directly inform these items. When implemented and paired with the BACI study, the FWEP will inform multiple attributes of the Schedule L-1, compliance with Clean Water Act assurances, and protections for listed species.

2. Does the study inform the Forest Practices Rules, the Forest Practices Board Manual guidelines, or Schedules L-1 or L-2?

The Forest Practices Rules and/or board manual guidance will be indirectly informed from the main portion of the exploratory chronosequence study, which directly informs the larger FWEP's study initiatives. The chronosequence study will inform the BACI study design for the FWEP by narrowing the focus of the number and type of wetlands functions most likely impacted by WA Forest Practices Rules (WAC 222-30-020).The chronosequence and related BACI will inform functional objectives and performance targets as follows:

Functional Objectives

The functional objectives in schedule L-1 that this study address include those for heat/water temperature (stream temperature, groundwater temperature, shade), LWD and organic inputs (litter fall, riparian condition), sediment (total suspended solids/fines), hydrology (peak flows and wetlands). This study is specifically designed to address these functional objectives and their associated performance targets for the AMP.

Performance Targets

This study is primarily designed to address overall performance goal C: "*Meet or exceed water quality standards (protection of designated uses, narrative and numeric criteria, and antidegradation).*" Accordingly, it informs the functional objectives and performance targets listed above: heat/water temperature (stream temperature, groundwater temperature, shade), LWD and organic inputs (litter fall, riparian condition), sediment (total suspended solids/fines), hydrology (peak flows and wetlands).

3. Was the study carried out pursuant to CMER scientific protocols (i.e., study design, peer review)?

Yes, the study design was proposed, revised, and approved appropriately, although the study itself is yet to be implemented in the field. The chronosequence study design was written by the FWEP TWIG under the LEAN planning process. CMER proposed the study to the Timber Fish, and Wildlife (TFW) Policy Committee as a precursor to the main BACI Effectiveness study. The table below outlines the sequence of the CMER/ISPR approval process as followed for this study design.

Date	Action	Comments
2015	TWIG formed	TWIG was formed in collaboration with NWIFC wetland ecologist
December 2016	BAS alternatives document presented to Policy	TWIG review and proposed designs based on state of the science
January 2017	Policy's selection of study design	Policy voted on hybrid chronosequence and BACI study design
June 2018	CMER Review and revisions	Critical question clarification to make sure study addressed the questions approved by CMER in previous study charter.
July 2018	CMER approval to send document to ISPR; Document sent to ISPR	Study approved and sent to ISPR for review
December 2018	ISPR Reviews Returned with major revision designation	Study scope reduced from statewide to only regions with most forested wetlands on forest practice application lands
July 2019	Returned to ISPR for review	Reviewed by ISPR associate editor and approved with several additional clarifying suggestions.
6 December 2019	Revised ISPR-approved study design returned to CMER	Sent to CMER
17 December 2019	Final CMER approval of ISPR-revised study design	Study design was approved at CMER meeting
February/March 2020	CMER- approved prospective six question document delivered to Policy	This document

Table 3.1 Summary of CMER and associated WetSAG and Policy benchmarks for the chronosequence study.

4. What will the study tell us? What will the study not tell us?

The Forested Wetland Effectiveness Project is designed as a two-part, scientific investigation into how forested wetlands and their connected waters are affected by forest practices as presently implemented under Washington State DNR's Forest Practices Rules. The chronosequence study is the predecessor study to a BACI study on how forested wetlands recover from harvest[1]. The BACI study has two sets of related critical questions:

A. What are the effects of forest practices on hydrologic regimes, water quality, and terrestrial and aquatic plant and animal habitats in forested wetlands and their connected downstream waters linked by surface or subsurface flow? What are the magnitude and duration of these effects?

[1] See: "Forested Wetlands Effectiveness Project: Chronosequence Study Design"

i. How does timber harvest in and around forested wetlands alter processes that influence hydrologic regimes in those wetlands, in downstream waters and the connectivity between them?

ii. How does timber harvest in and around forested wetlands alter processes that influence water quality in those wetlands and downgradient waters?

iii. How does timber harvest in and around forested wetlands alter processes that influence plant and animal habitat functions in wetlands, in connected waters, and surrounding uplands?

B. How well do current Forest Practices Rules in forested wetlands meet FPHCP (Schedule L-1, Appendix N) aquatic resource objectives and performance targets (see Question 2)?

The chronosequence study will inform how disturbance associated with forest harvest[1] is affecting forested wetland hydrology, habitat, and water quality. It strives to answer two sets of actionable questions derived from the CMER work plan's critical questions:

1. How does forested wetland hydrology change over time following post-harvest forest stand development? Specifically:
    a. How does the hydrology of recently harvested forested wetlands compare to the hydrology of recently undisturbed second-growth forested wetlands?
    b. How does the timing, duration, and magnitude of flow and material transport differ between recently harvested and recently undisturbed[1] second-growth forested wetlands?
2. How do forested wetland vegetation and canopy-mediated[1] habitat conditions change over time following post-harvest forest stand development? Specifically:
    a. How does recently harvested forested wetland vegetation composition compare to recently undisturbed second-growth forested wetland vegetation over time?
    b. Do canopy and vegetation-mediated habitat attributes (e.g., inundation duration, soil, and wetland temperature, etc.) converge between recent post-harvest forested wetlands and recently undisturbed second-growth forested wetlands over time?

Preliminary Work

During the design of both the chronosequence and the BACI study, the FWEP TWIG found, with ISPR concurrence, that it was not practical to implement a statewide study based on the potential natural variability of response variables across the state. Ideally, the study will highlight how the critical questions as listed above are answered in the regions where forested wetlands are most likely to be impacted based on recent trends in forest practice applications. This study is predicated upon two literature reviews (Adamus 2014a, Adamus 2014b), a CMER best available science document (Beckett et al. 2016), a geospatial literature review (Hough-Snee et al. 2019), and historic CMER guidance on wetlands (Cooke et al. 2006), which point to several likely trends in forested wetland recovery and succession that impact water quality and habitat value. The anticipated answers to the chronosequence critical questions are founded in the scientific literature and have been reviewed by WetSAG, CMER, and ISPR.

The figures below show active forest practice applications (through March 2019) without forested wetlands (Absent) and with forested wetlands (Present) by Washington State DNR regions. In general, most FPAs are not submitted where forested wetlands occur, regardless of region.

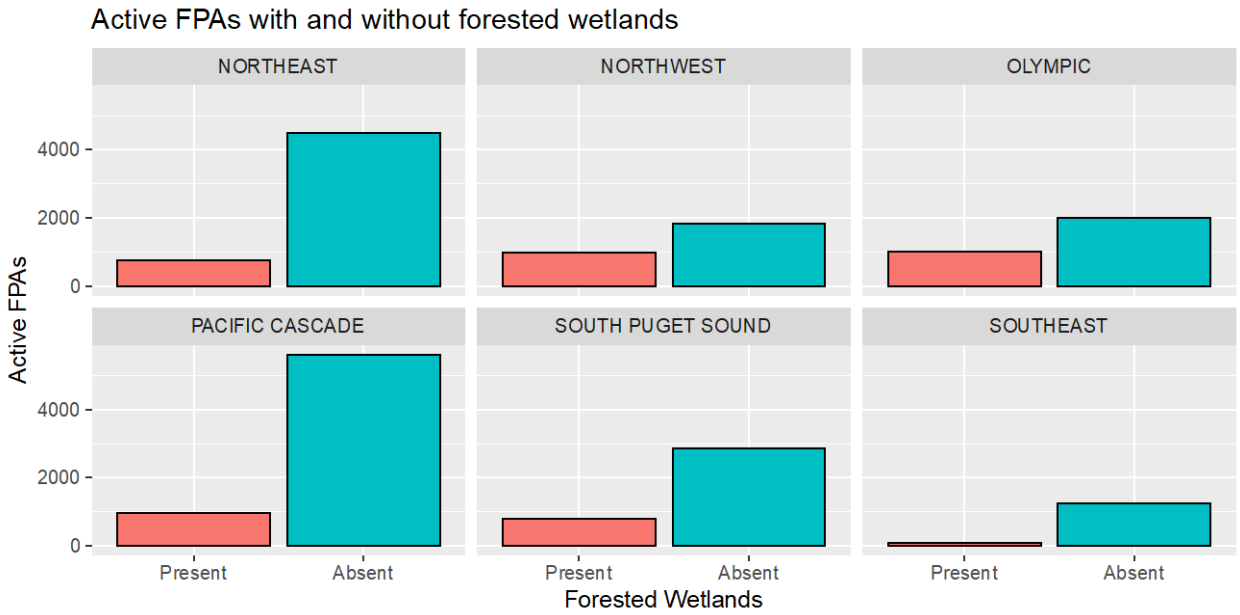

Figure 4.1. Active forest practice applications without (Absent) and with forested wetlands (Present) by Washington State DNR regions. In general, most FPAs are not submitted where forested wetlands occur, regardless of region.

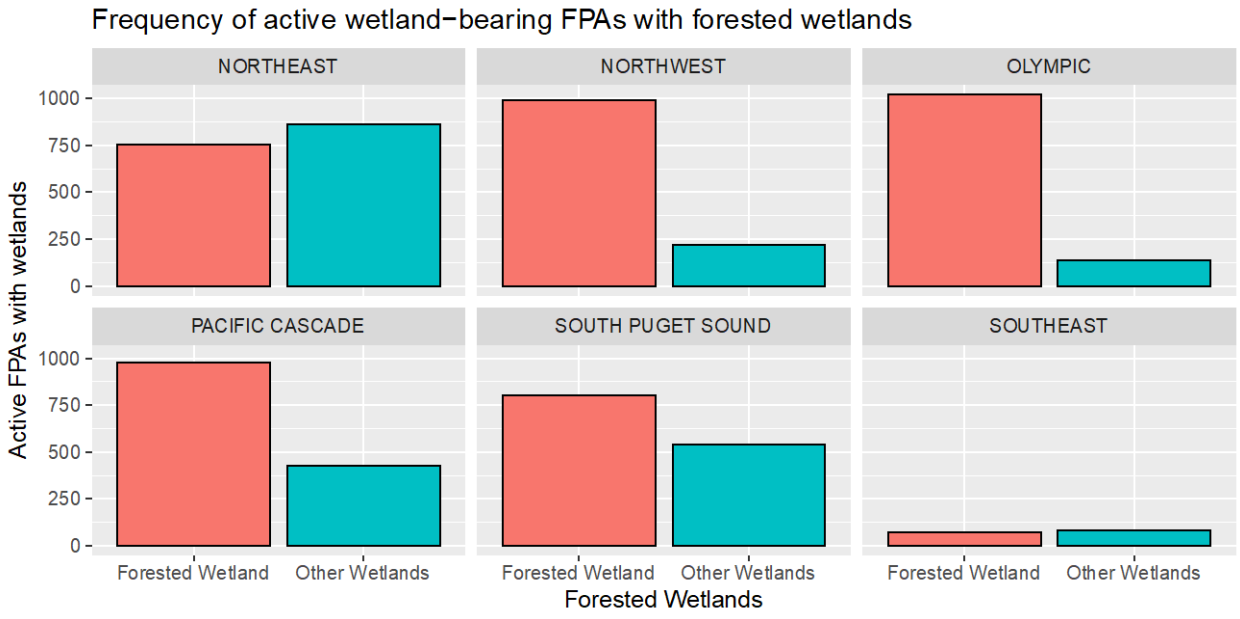

Figure 4.2. Wetland-bearing active forest practice applications (FPAs with wetlands of any type) show that in many Washington State DNR regions, such as the Olympic and Pacific Cascade regions, forested wetlands are the majority wetland type on which FPAs are submitted. The “Other Wetlands” column in this figure corresponds to the absence of forested wetlands and the presence of Type A, Type B, or Type A and Type B wetlands at a given FPA.

What this study will not tell us.

This study is designed to quantify the rates of change in forested wetland habitat parameters following forest harvest and does so in the western coastal regions of Washington State where forested wetlands are most common on forest practice applications (Figure 4.1). A trade-off of this approach is that the study is not statewide, instead focusing on priority regions. That is, to maintain sufficient replication and power and reduce environmental variability, the study sites will be selected from within a specific are based on regional hydrology, climate and forest types. Consequently, answers to the critical questions may not necessarily apply to all locations and conditions. Therefore, the most recent literature review (Adamus 2014) was updated to understand where recent literature had grown the regionally-applicable body of knowledge surrounding forested wetlands and forest practices. While this review improves the understanding of the state of the science around forested wetlands in Washington State, additional investigations may be warranted in order to inform answers to the critical questions on a statewide level.

Additionally, there are temporal limitations to this study. The study is a space-for-time chronosequence in which timber stands in forested wetlands of different ages are compared as a substitute for monitoring many forested wetlands in direct response to a treatment (which is what the subsequent BACI is intended to do). This study is intended to identify whether functions of forested wetlands recover within half a timber rotation cycle and whether Clean Water Act assurances are met.

At present there are limited rules governing the harvest of timber within and around forested wetlands and timber may be harvested within and around forested wetlands without buffering as long as these wetlands do not occur adjacent to a fish-bearing stream. From the study design:

"Under current rules, forested wetlands may be harvested without buffering even though the effects of timber harvest and other forest practices on forested wetland structure and function have not been extensively studied. This poses a challenge to the adaptive management program because the impacts of timber harvest in and around forested wetlands on these ecosystems' hydrological, ecological, and habitat functions are not well understood (Beckett et al. 2016). Given the full range of forested wetland and forest types that occur within Washington State and are impacted by harvest, this knowledge gap is compounded when applying or revising relevant Forest Practices Rules."

5. What is the relationship between this study and any others that may be planned, underway, or recently completed?

This chronosequence study along with the planned subsequent BACI study, is an initial implementation step in the WetSAG wetlands research strategy in the workplan. This *strategy outlines a comprehensive, scientifically sound approach to addressing whether Forest Practices Rules are effective at protecting wetlands and wetland functions. The strategy includes the following six programs:*

1. *Forested Wetlands Effectiveness Project*
2. *Wetland Management Zone Effectiveness Monitoring Project*
3. *Forest Roads and Wetlands*
4. *Silvicultural Chemicals and Wetlands*
5. *Wetlands Intensive Monitoring Program*
6. *Wetlands Mapping Program*

Figure 5.1 from the study design shows the specific relationships between the chronosequence study, the BACI Study and Best Available Science reviews.

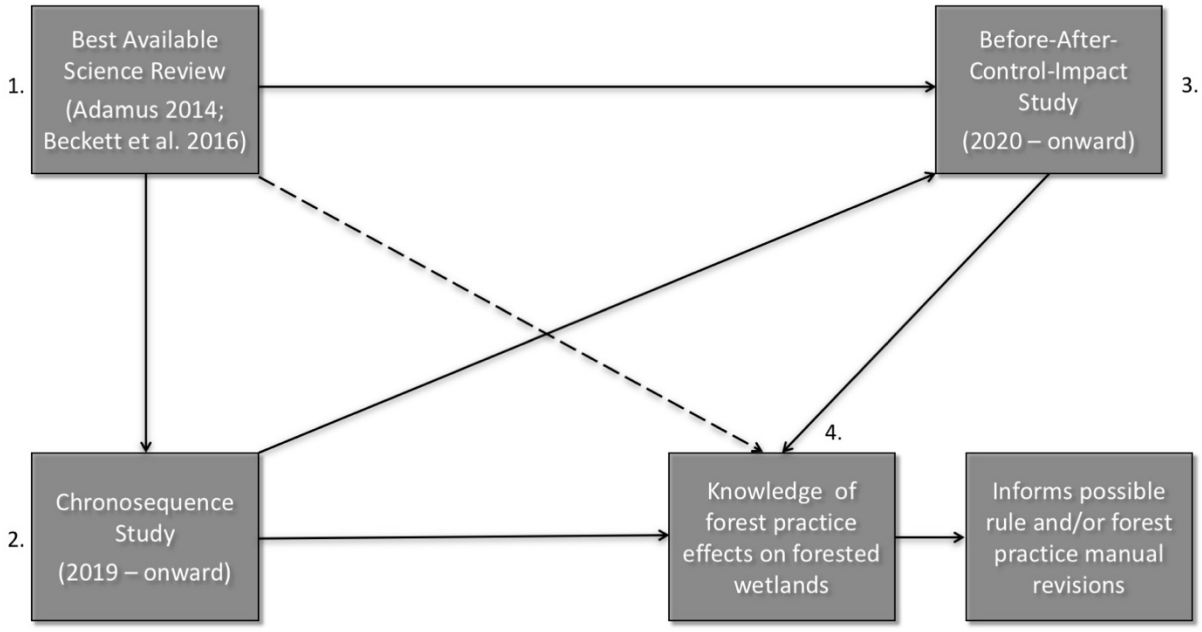

Figure 5.1. Conceptual map of how recent FWEP TWIG efforts, including recent literature review and best available science documents (1; Adamus 2014, Beckett et al. 2016), inform CMER mandates by increasing the body of information on forested wetland function (4) and how the proposed chronosequence study (2) serves as a pilot that informs the proposed before-after-control-impact study (3).

6. What is the scientific basis that underlies the rule, numeric target, performance target, or resource objective that the study informs? How much of an incremental gain in understanding do the study results represent?

To be determined based on the results of the study.

If not already done so within the answers to the six questions above, provide the technical implications/recommendations resulting from the study.

To be determined based on the results of the study.