PROJECT MANAGEMENT PLAN

Forested Wetlands Effectiveness Project – Chronosequence Study
27-September-2022

PROJECT MANAGEMENT PLAN OVERVIEW

The Project Management Plan breaks down project work into logical steps to help provide a framework to efficiently allocate resources, reliably estimate project costs, and help guide schedule, budget development and project scope. Previously in the CMER Protocols and Standards manual (PSM), this document was titled an implementation plan (PSM Chapter 8, 2020). The Project Management Plan documents and tracks the progress of a CMER project through its various stages. The contents of the Project Management Plan will vary depending on the type and complexity of the project. The Project Team is the primary audience for the Project Management Plan; however, SAG/CMER members are required to approve them so are encouraged to provide feedback on the plan.

This Project Management Plan provides detailed logistical information about the Forested Wetlands Effectiveness Project (FWEP) Chronosequence study site selection, field and data management, and in-progress reporting, with particular emphasis on FY23. Full field implementation of the FWEP Chronosequence study was initially slated for August of 2022 to collect data in the new water year commencing on 1 October 2022. However, challenges with identifying sufficient replicate forested wetland sites, landscape complexity, and securing landowner site use permission delay full field implementation until May of 2023. Site selection and site use permission requests are ongoing at this time, and as such the project management plan largely focuses on those ongoing activities. We include herein a description if implementation activities to date, as well as a revised timeline of project activities for the remainder of FY23, during which field implementation will be completed.
The implementation team began site selection and evaluation in earnest in spring of 2022 with a desktop exercise that identified candidate wetlands that potentially met the relevant study criteria (FWEP 2019 Chronosequence Study Design). Sites were identified through forest practice application (FPA) data, aerial imagery, hydrology GIS layers, and the Wetland Intrinsic Potential (WIP) tool. The WIP tool is a digital terrain-based mapping framework that identifies the probability of wetlands occurring on the landscape based on slope, and multiple criteria.

We found thousands of forested wetland sites within our study region and narrowed these candidate sites to hundreds of potentially suitable sites based on the above study criteria. Field assessment of desktop-identified potential sites took place in May-June of 2022 with the CMER wetland scientist, WetSAG members, and contractors assessing relevant sites. However, difficulties in securing landowner access/use permission reduced the pool of potential sample sites available for field-based evaluation.

Of the sites that were visited, several sites within each age class met the study design configuration of a forested wetland nesting within a harvest unit. These sites occurred on small slope or depressional wetlands, often with mineral soils, had a single outflow that could be instrumented, and did not have any atypical forest regeneration practices or adjacent land-use (e.g. retired bridges or railroad tracks, etc.).

While several appropriate candidate sites were identified within each age class, many sites that the desktop analysis yielded were not relevant for the study. These sites were either: (1) not wetlands, (2) the wetland had not been harvested within the appropriate timeframe, (3) were peatlands (bogs) and did not have mineral soils, (4) had landscape-scale geomorphic attributes that made them incomparable to other sites (e.g. floodplains of large rivers), or (5) had management histories that warranted further investigation.

Because the forested wetlands WetSAG and CMER staff visited did not yield a full sample set for the Chronosequence study, we propose a change to the previously anticipated FWEP implementation timeline (See Project Deliverables table). We propose:

1. Revising the initial site selection based on updated WIP output and expanding the hydrologic landscape classes (to include both the VwLMH and VwLTH hydrologic landscape classes), to identify additional probable wetland areas that overlap the candidate FPA pool. This will occur during the remainder of the summer of 2022.
2. Using field-collected FWEP Chronosequence site selection data to evaluate how forested wetlands differ based on management and regeneration histories, as overlain on wetland hydrogeomorphic attributes. This successional framework will further refine site selection to assure that the most representative wetlands are identified for inclusion in the site while also creating field-based hypotheses (for testing in future studies) on how the target forested wetlands may change over time from regeneration and management actions.
3. Delaying full study implementation, initially proposed as August 2022, by several months while site selection continues, to spring of FY 2023.
4. Installing a pilot implementation at four identified Chronosequence study sites, one of each age class within the study design, in Sept-Oct 2022.

This timeline revision is intended to ensure that field implementation is undertaken at the most representative and comparable sites and to identify any possible externalities that could influence study findings. Given the many natural and management attributes, as well as access issues, WetSAG anticipates needing more time to identify and validate sites prior to instrumentation and data collection. The pilot instrumentation at a full panel of one site of each treatment age class, will allow WetSAG to evaluate the effort required to implement the full chronosequence study as well as how well logger and camera equipment overwinters *in situ*. This preliminary data collection effort is intended to streamline full implementation, and will collect data at four study sites (1/6th of the total sites) which will remain Chronosequence study sites during full implementation.

OVERSITE COMMITTEE

Wetland Science Advisory Group (WetSAG)

BACKGROUND

In 2001, the Washington State Forest Practices Board (Board) approved a comprehensive set of new forest practice rules based on the Forest and Fish Report (FFR). One of the goals of these rules is to protect water quality, including aquatic life, in streams on non-federal forest lands in Washington State. In concurrence with the approval of the FFR, the Board adopted a Forest Practices Adaptive Management Program (AMP). The purpose of the Forest Practices AMP is to "provide science-based recommendations and technical information to assist the Board in determining if and when it is necessary or advisable to adjust rules and guidance for aquatic resources to achieve resource goals and objectives". To provide the science needed to support adaptive management, the Board established the CMER Committee which has been tasked with performing research in support of the AMP.

Summary of FWEP – Chronosequence study

The Chronosequence study addresses 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*- [and third-] *growth forested wetlands?*
    b. *How does the timing, duration, and magnitude of flow and material transport differ between recently harvested and recently undisturbed second- [and third-] growth forested wetlands?*
2. *How do forested wetland vegetation and canopy-mediated 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*- [and third-] *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*- [and third-] *growth forested wetlands over time?*[1]

In addressing these questions, the Chronosequence study will identify post-harvest patterns in forested wetland ecology and hydrology within forested wetlands that have not been harvested in at least 40 years (recently unharvested, second or third growth, (herein referred to as "reference" wetlands) and forested wetlands of different ages since forest harvest up to the time of half of a timber harvest rotation cycle. By comparing ecological and hydrological conditions in groups of forested wetlands that were harvested at different times in the past (i.e.., two, 10, 20, and 40+ years), the change of wetland functions can be estimated over half of a timber rotation cycle (at

[1] Forested Wetlands Effectiveness Project Chronosequence Study Design, Hough-Snee et al. 2019

minimum, 20-years). This observational study design will identify common developmental trajectories within forested wetlands following disturbances associated with forest practices.

Findings from the Chronosequence study will inform the future Phase II BACI study design and provide fundamental research that improves CMER's understanding of how stream-adjacent forested wetlands change following forest practices.

The approach for the Chronosequence study is to compare six forested wetlands from each post-harvest age class (i.e., two, 10, 20 years), as well as six reference forested wetlands that are 40+ years old (24 sites in total). All wetlands will be located within the same, or similar, hydrologic landscape classes (Leibowitz et al. 2016) and ecoregion (Omernik 1995) to ensure similar landscape-scale characteristics, including regional hydroclimatic regime. This strategy should help reduce natural and spatial variability inherent in chronosequence data (Kappes et al. 2010). Because site-scale hydrological and ecological attributes among the wetlands will be sampled within comparable locations, observed site-scale differences are assumed to be more attributable to differing ages of the wetlands since harvest, rather than differing landscape characteristics (See *Site Selection* below).

PROJECT DELIVERABLES

Proposed FWEP Chronosequence tasks, timelines, and deliverables for Fall 2022 / Spring 2023.				
Period	**Tasks**	**Deliverables**	**Deliverable Date**	**Status**
July-August 2022	Refine Wetland Intrinsic Potential (WIP) models • With ground-truth data obtained through field evaluations of potential forested wetland sites conducted in May-July 2022. • With FPA data of known forested wetland positions. • With field surveys of forested wetlands conducted in ~2004 and ~2016 by CMER staff and others. • With previous WIP modeling efforts conducted in some, but	Refined WIP models for the following WRIAs. • Lower Chehalis • Upper Chehalis • Elwha • Soleduc • Grays • Willapa • Lyre • Skokomish • Queets	31-August-2022*	Complete

	not all, of the target FWEP WRIAs. • With additional field evaluations in the Willapa Hills region, landowner permissions pending.			
Aug-Oct 2022	Expand the temporal search window within the hydrologic landscape class (HLC) VwLMH (Very wet climate, winter seasonality, low aquifer permeability, mountainous terrain, high soil permeability) to generate a broader list of potential sites. • An initial site selection step limited our search to FPAs with an effective date within 3 years of targeted Chronosequence harvest dates. However, significant variability surrounding FPA effective date and actual harvest date has been observed. This warrants a further look at FPAs initially considered to be outside the study's targeted Chronosequence harvest dates.	Additional sites for evaluation / inclusion in the final pool of potential available sites.	31-Oct-2022	In progress
Aug-Oct 2022	Expand the spatial search window into an additional HLC, the VwLTH (Very wet climate, winter seasonality, low aquifer permeability, transitional terrain, high soil permeability). This HCL was initially identified as an additional secondary area to include in the study, if enough sites could not be found in the VwLMH HCL. Current field	Additional sites for evaluation / inclusion in the final pool of potential available sites.	31-Oct-2022	In progress

	efforts to date have found that a high percentage of sites identified through desktop analysis are unsuitable. As such, it warrants expanding our study area into this region.			
July-Oct 2022	Identify and fully instrument 4 wetland sites within a single “block” or “bin” (see below for information regarding site blocking / binning). • 1 each from the 2, 10, 20, and reference (40+) year age classes. • Survey trees, and shrubs, but not herbaceous understory plants.	4 fully instrumented sites	31-Oct-2022	In progress
July-Dec 2022	Develop successional model for wetland site binning / blocking • Significant variability within forested wetlands has been found on the landscape, even within the fairly narrow confines of the study area. • This increases the challenge of finding replicate wetlands within age classes, as hydrogeomorphic setting interacts with management activities to produce differing successional pathways and timelines • Developing a successional model will allow us to capture and articulate the variability that exists within forest wetlands. • This will be used to refine the study focus on a subset of forested wetland types.	Completed model, with associated methods write up, for submission to peer-reviewed publication, pending CMER approval process.	1-Jan-2023	In progress

July 2022-Feb 2023	Continue landowner outreach and access permissions. Some landowners require a 2-step permission process. Step 1 for access to the site for evaluation, and Step 2 for inclusion in the study.	Permission to conduct site visits and include sites in the study.	Feb 2023	In progress
Sept 2022-Mar 2023	Data collection and analysis of 4 sites instrumented in Sept of 2022. This will allow us to assess and refine methods in advance of the full field implementation at the remaining 20 sites.	Report from initial pilot field implantation at 4 sites.	Mar 2023	Not initiated
Feb-Mar 2023	Complete contracting for groundwater well installation at the remaining 20 sites	Installation of groundwater wells	May 2023	Not initiated
May-June 2023	Additional fieldwork activities • Instrumentation of associated N type stream. • Installation of game cameras to monitor surface water connectivity. • Vegetation surveys (tree, shrubs, herbaceous plants).		June 2023	Not initiated

*Use asterisk to distinguish actual dates.

PROJECT TEAM MEMBERS

Name, Title, Affiliation, Contact Info	Roles and Responsibilities
Jenny Schofield, Project Manager, DNR	• Monitors project activities and the performance of the Project Team. • Communicates progress, problems, and problem resolution to the Adaptive Management Program Administrator (AMPA), CMER, and WetSAG. • Works with WetSAG/CMER, and Project Team to manage Project Charter and other managing documents, and keeps them updated. • Works with the AMPA, WetSAG/CMER, and Project Team to monitor contract performance, and provide input on budgeting, schedule, scope changes, and contract amendments.

	• Works with WetSAG, CMER, and Project Team to resolve problems and build consensus. • Works with PI and Project Team to develop interim and final draft reports. • Ensures communication between team members is clear, concise, and consistent. • Coordinates technical reviews and responses in a timely fashion. • Facilitates archiving of data and documents. • Ensures that contract provisions are followed. • Provides direction and support to the Project Team to achieve clear and specific scopes of work, schedules, and budgets within approved contracts. • Maintains sole responsibility for all aspects of project management even if other individuals are completing or helping complete parts of the project.
Principal Investigator, Tanner Williamson (CMER Staff)	• Executes the technical and scientific components of the project, including protocol development and refinement, site selection, data collection, analysis, and reporting. • Develop a QA/QC plan. • Conducts QA/QC throughout the acquisition, compilation, and analyses of data. • Provides materials needed by the PM. • Prepares quarterly summary and progress reports of project status. • Conducts field data collection, hires staff and purchases supplies and equipment to support data collection. • Develops summaries and conducts statistical analyses to inform Final Report development. • Leads in the development and writing of the Final Report and Six Questions for Policy. • Presents study progress and/or findings to WetSAG, CMER, and Policy. • Communicates project status and issues to the PM and Project Team. • Coordinates project meetings as needed.
Contractor, Nate Hough-Snee (Meadow Run Environmental)	• Collaborates on site selection and field evaluation of potential candidate sites. • Support other technical and scientific components of the project. • Provide technical expertise for successful implementation of project components. • Assist with review of Final Report and Six Questions for Policy. • Attends project meetings as needed.
Project Team Members, Debbie Kay Jenelle Black	• Support the technical and scientific components of the project. • Provide technical expertise for successful implementation of project components.

Joe Murray Amy Yahnke	• Assist with review of Final Report and Six Questions for Policy. • Participate in project meetings and conference calls.

PROJECT CONSTRAINTS AND ASSUMPTIONS

Project constraints are limiting factors (internal or external) that affect the initiation, planning, execution, monitoring & control, and close-out of a project. Constraints restrict or dictate the actions of the project team. There are four specific constraint types that will be considered herein: schedule constraints, budget constraints, human resource constraints, and resource constraints. Assumptions on the other hand are factors in the planning process that are considered to be true, real, or certain, without proof or demonstration and are outside the total control of the project team.

Schedule constraints:
Challenges with identifying sufficient replicate forested wetland sites, landscape complexity, and landowner permission issues will delay full field (all 24 sites)implementation until May of 2023.

Budget constraints:
There are no specific budget constraints at this time.

Human resource constraints:
The implementation of this project will primarily be executed internally, with the majority of the study tasks being completed by a CMER Scientist. Limited contracting will occur to provide technical assistance to the CMER Scientist in study design, project execution, data analysis and report review and revision.

Resource constraints:
There are no specific resource constraints at this time.

Project assumptions:
The following are key assumptions for implementation of this project:

- The core members of the Project Team stay on the team throughout the majority of the project.
    - If a core member were unavailable, time could be lost in replacing them.
    - Loss of certain expertise could limit or slow the ability to execute some portions of the study design.
- Funding for the project remains stable.

A separate Risk Management Plan will not be developed unless one of these constraints or assumptions occurs or if one is deemed necessary. The process for developing a detailed Risk Management Plan is outlined in section 7.11 of the PSM. A Risk Management Plan identifies potential actions to avoid, reduce, and/or mitigate impacts to a project.

DECISION-MAKING AUTHORITY

The Forest Practice Board (Board) has approval authority over proposed CMER projects, annual work plans, and expenditures. The Board manages the Timber, Fish and Wildlife Policy Committee (Policy), the Cooperative Monitoring, Evaluation, and Research (CMER) Committee, and the Adaptive Management Program Administrator (AMPA) to assist with the Board's directives. Policy assists the Board by providing guidance to CMER and recommendations on adaptive management issues. CMER is responsible for understanding available scientific information that is applicable to the questions at hand, selecting the best and most relevant information and synthesizing it into reports for Policy and the Board. The AMPA coordinates the flow of information between Policy and CMER according to the Board's directives. Decision-making authority described in this section needs to be consistent with CMER process and ground rules per the Board Manual section 22.

Decisions related to science and/or technical items is the responsibility of the PIs and the Project Team. If needed, decisions for scientific and/or technical items could be expanded to include the SAG and CMER. Final project reports will be prepared by the project team and then reviewed and approved by the SAG, CMER, and Independent Scientific Peer Review (ISPR), before being delivered to Policy. Although the PM will assist in the facilitation of the discussion and decision making process, the PM will not be directly involved in decisions related to science and/or technical items.

Decisions related to contractual (scope of work, RFQQ, contract process, contractor interaction, etc.) and budgetary items is the responsibility of the PM along with input from the Project Team. Requests for additional funding will be approved by the PM and Project Team and sent to the SAG and CMER for formal approval. Minor budgetary or contractual items will be handled directly by the PM with notification provided to the Project Team. Major budgetary or contractual items will be decided between the PM, Project Team, and AMPA. If needed, decision making for budgetary items may require CMER and/or Policy input and/or approval.

PROJECT BUDGET

	Pre-FY22	FY 2022	FY 2023	FY 2024	FY2025	FY2026	FY2027	FY2028	Total Project Budget
Budget Totals	$194,279	$144,279	$280,176	$173,305	116,219	85,000	55,000	200,000	$1,077,062

PROJECT SITES

Site selection

This section contains the following Chronosequence study design elements:

1. Sampling frame

2. Study area
3. Study site criteria
4. Site blocking
5. Sample size
6. Site selection process
    6.1. Initial (April – Aug 2022)
    6.2. Ongoing (Aug 2022 – May 2023)
7. Site access

1. Sampling frame

Forested wetlands are defined as a *"wetland or portion thereof that has, or if the trees were mature would have, a crown closure of 30 percent or more"* (WAC 222-16-035). The study population for the Chronosequence study is forested wetlands that are adjacent to perennial non-fish bearing streams (Type Np) to which they are at least seasonally connected.[2] For this study, "treatment" study sites are forested wetlands within timber harvest units on state and private timberlands in Washington State that are managed under the Forest Practices Habitat Conservation Plan (FPHCP). Federal and tribal lands are harvested under different guidance and are not considered for treatment wetlands in this study. Reference sites are "recently unharvested" and defined as 40+ year old forest stands that were previously harvested and have not undergone recent large-scale natural disturbance, commercial harvest, or silvicultural management prescriptions (e.g., thinning). These may be selected from other lands, including Federal, as 40 years ago, forest practices rules regarding forested wetlands were similar for all managed lands.

The success of a chronosequence study hinges on the ability to compare sites with similar underlying features and conditions. For this study, the crucial underlying elements are believed to be hydrology and general ecological characteristics (spatial patterns in biotic and abiotic attributes). Hydrologic variability will be addressed by stratifying site selection within hydrologic landscape classes (HLC; Winter 2001). Hydrologic landscape classes are an index that accounts for climate, climate seasonality, aquifer permeability, terrain class, and soil permeability. Leibowitz et al. (2016) has defined HLCs for 80 km^2 watershed units across Washington State (similar to 12-digit HUC watersheds). Ecological variability will be addressed by selecting sites within one EPA Level III EcoRegion (Omernik 1995). Ecoregions indicate areas where biotic, abiotic, terrestrial, and aquatic ecosystem components are similar. This systematic approach to site selection will consolidate sample sites within similar ecological and hydrological landscape domains, minimizing the natural spatial variability inherent to chronosequence studies.

Preliminary analyses of where wetlands in Forest Practice Applications (FPA) have occurred most frequently in Washington State (Hough-Snee 2019) led to the decision to focus this study on sites within the Coast Range Level III EPA EcoRegion (Omernik 1995) and the VwLMH hydrologic landscape class. The VwLMH HLC represents areas with very wet climate (V), winter seasonality (w), low aquifer permeability (L), mountainous terrain (M), and high soil permeability (H) (Leibowitz et al. 2016). If we are unable to obtain enough sites within the

[2] Connectivity determined by vegetation, topography, hydrologic indicators, or other evidence observed on site during site validation

VwLMH HLC, we may include lands in the VwLTH HLC, which tend to be adjacent and similar to the VwLMH class but includes transitional terrain (T). DNR regions that occur within the Coast Range ecoregion include Olympic, Pacific Cascade, and South Puget Sound, all of which also contain substantial areas of the VwLMH HLC (Figure 1).

2. Study area

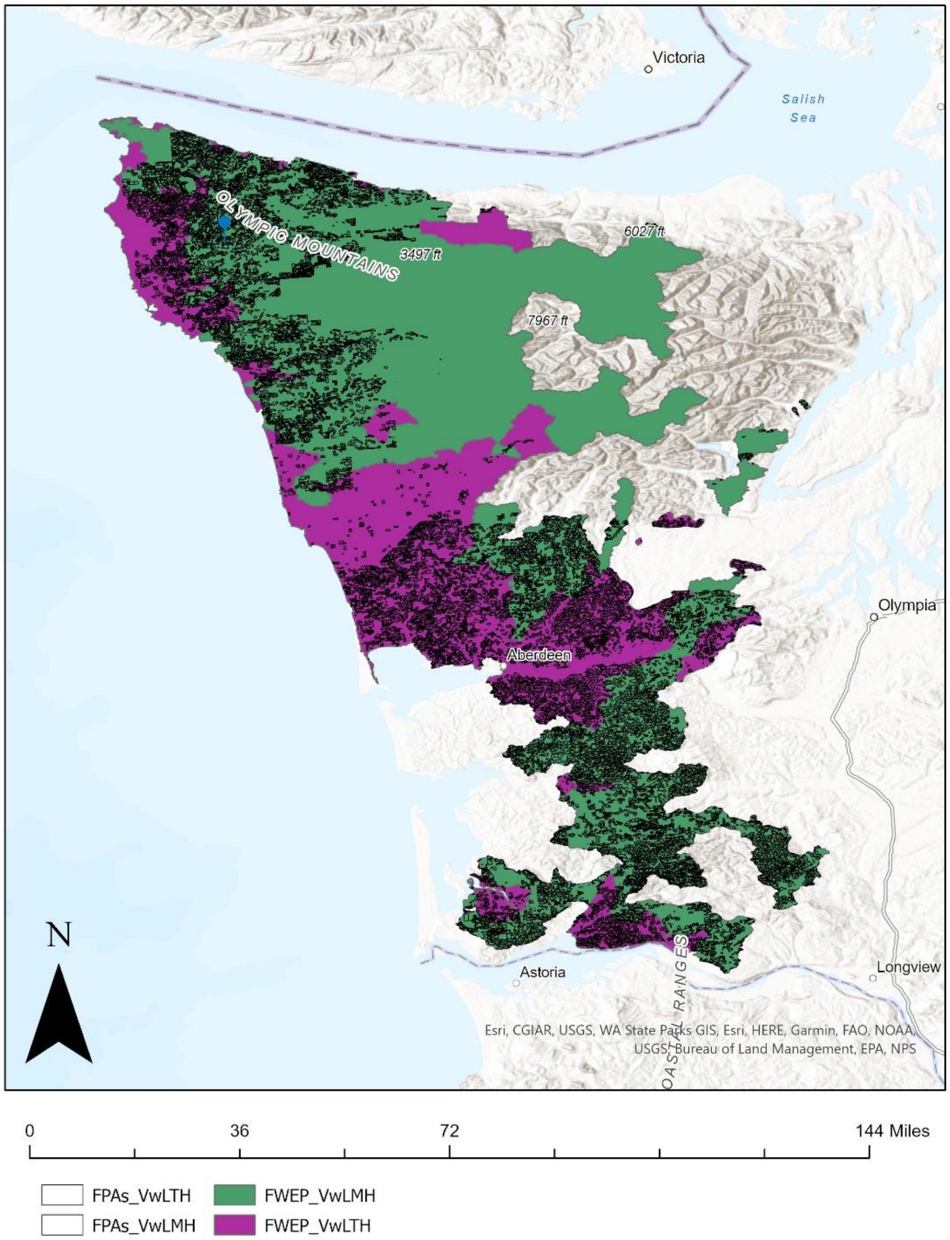


Figure 1: The current FWEP – Chronosequence study region VwLMH hydrologic landscape class (green; Very wet climate, winter seasonality, low aquifer permeability, **mountainous** terrain, high soil permeability), and the additional hydrologic landscape class VwLTH (purple; Very wet climate, winter seasonality, low aquifer permeability, **transitional** terrain, high soil permeability). Black lines indicate FPA harvest unit polygons from 1998 to present.

3. Study site criteria

Because this study relies most heavily on a set of sites that are defensibly similar, we may need to alter some of these criteria as site selection proceeds. Desired forested wetland characteristics include:

- Forested wetlands are a single, hydrologically continuous wetland with connection to the adjacent stream via surface water for some portion of the wet season, based on the stream's ordinary high-water mark.
- Are within 3-6 acres in size, with boundaries delineated per the Forest Practices Board Manual (Section 8).
- Not geographically isolated or slope wetlands that are perennially isolated from surface flows to larger water bodies.
- Not forested peat bogs.

Desired harvest unit (treatment) site characteristics include:

- Pre-harvest status was harvestable second- or third-growth forest.
- Harvest units are 30-60 acre harvest units, though consistency among sites is more important than any specific unit size.
- Surrounding harvest unit and forested wetland were subject to harvest within the following timeframes:
    - 2 years since harvest
    - 10 years since harvest
    - 20 years since harvest

Desired reference site criteria include:

- Forested wetlands in mature second or third growth stands that have not been harvested in at least 40 years
- Similar commercial harvest or silvicultural management prescriptions among sites.
- Sites are free from natural disturbances that cover 10% or more of the wetland .

Further factors to consider in site selection include:

- Proportion of catchment harvested.
- Setting of wetland within harvest unit (edge, center, partly outside). We will generally exclude sites with larger forested wetlands that are only partly impacted by harvest.
- Catchment-level disturbance among sites (fire, pathology, windthrow, harvest, etc.).
- Factors associated with wetland hydrology
    - Precipitation band
    - Area of drainage basin (to lowest point of wetland)
    - Closed / open basins
    - Culvert and water diversion influence
- Factors associated with vegetation
    - Dominant timber type by species (planted vs natural?)
    - Pre-harvest stem density (count stumps) or canopy cover (from aerial photos)
    - Percent of drainage area with overstory less than 5' tall
        - 0-25, 26-50, 51-75, >75%
    - Percent of drainage area with overstory over 100' tall
        - 0-25, 26-50, 51-75, >75%

    - Presence of invasive knotweeds, reed canarygrass, or other invasive plant species as needed
- Factors associated with harvest
    - Harvest system
    - Replanted/natural/combined seedling regeneration
    - Age of seeding or time since planting, and site preparation
    - Site preparation information (e.g., controlled burns, scarification, herbicide application, natural regeneration, seeding, planting).
    - Change of species planted vs. harvested
    - Silvicultural treatments
        - Pre-commercial thinning, pruning, commercial thin
- Exclusion criteria
    - Other major disturbance
    - Signs of hydrologic manipulation, besides roads, such as ditching, draining or filling (other than incidental filling with slash during harvest)

4. Site blocking

Due to variability in landscape position, soil typing, hydrology, wetland morphology, and management we will block sites based on common types of forested wetlands. To do so, we will develop a conceptual successional model of forested wetlands to characterize and articulate the variability that exists on the landscape. Potential blocking factors will consist of a set of sites that approximately match hydrologically and that contain a site representing each of the treatment and reference timeframes: 2 yr. since harvest, 10 yr. since harvest, 20 yr. since harvest, and recently-unharvested (40+ years since harvest).

- Geomorphic setting of each wetland based on bedrock composition and depth of bedrock and organic soils.
- Wetland hydrogeomorphic classification (Slope, riverine, depressional).
- Streams and valley bottom classification: Valley geometry metrics such as confinement, valley width, sinuosity, proportion of valley with wetland soil.
- Size of forested wetland, harvest unit, and watershed,
- Slope and stream gradient, aspect, soil type.
- Pre-harvest (for treatment sites) and current (for reference sites) merchantable timber species composition

5. Sample size

Because the study is evaluating differences among four post-harvest ages, the sample size needs to be a multiple of four in order to have equal numbers of sites in each class. We will have a *minimum* sample size of 24 forested wetlands with six wetlands in each age class (n = 6). Ideally, we will randomly select sample sites from within a pool of candidate sites, thus it is paramount that GIS-based site selection identifies as many sites within each age class as possible. Over selection of sites will allow for random sampling within each age class and for attrition of sites.

6.1. Initial site selection process (April – Aug 2022)

Multiple sources of information were used to identify potential candidate forested wetland sites. Where available, FPA data were used to identify forested wetland sites. However, the 40+ year old reference sites pre-date FPA filing rules, and are not captured in FPA data. Further, the DNR has purged FPAs from 2001 and before from the FPARS database. So, a significant number of potential 20-year old sites no longer have FPA documentation associated with the timber harvest. Due to these limitations, all potential harvest units were assessed with the Wetland Intrinsic Potential (WIP) tool to identify presence, location, and size of potential forested wetlands. Additional wetland GIS layers were also used to identify potential sites (e.g., National Wetland Inventory, DNR Waterbodies), although these products are notorious for underrepresenting forested wetlands.

To generate the initial list of potential harvest units to review, we subset FPAs within the VwLMH hydrologic landscape class and Olympic, Pacific Cascade, and South Puget Sound DNR Regions that occur within the Coast Range Level III ecoregion. These were further reduced to FPAs with an effective date 3 years prior to the target age classes for the 2-, 10-, and 20-year old treatment sites.

To reduce potential for bias, we looked for reference sites that were located within the landscape matrix of harvest units for the same range of timeframes used for the treatment sites, but that were not directly located in a recent harvest unit identified in the FPAs. To date, we have conducted reconnaissance visits to approximately 70 potential forested wetland study sites. However, an insufficient number of these sites met the study criteria, so far.

6.2. Ongoing site selection and phased implementation process (Aug 2022 – May 2023)

Our initial site selection process returned an insufficient number of forested wetlands that met the study criteria. This necessitates another round of desktop site selection. Table 1 details in full how we will expand site selection efforts for the remainder of the 2023 FY.

7. Site access

The Project Team or representatives will continue to work with landowners to obtain permissions to use specific sites for CMER research. Landowner participation in CMER projects is voluntary, and defining access requirements is the responsibility of individual landowners. CMER interaction with landowners is not limited to formal requests for permission to access research sites. Landowners may be consulted in site selection during project development. A template draft of the landowner contact letter is included with this document (Appendix A). Once permission to use a site is granted, it is the responsibility of the PM and his or her delegate(s) to maintain contact and process access agreements. It is the responsibility of the field teams to follow stipulations contained in the access permits

Data collection

A minimum of five site visits are required per site. Those site visits include the following objectives and actions:

Recon visit

- Evaluate site access and field reconnaissance.
- Conduct recon visits as access permission allows before initiating monitoring.

- Confirm that sites are appropriate (existence of wetland, verify forest and vegetation types, etc.)
- Coarse map of wetland approximate boundary and stream location (GPS as available; compass and distance measures if not and for a check on the GPS)
- Preliminary mapping of sites for instrumentation
- Identify likely access and safety issues

Planning visit

- Once decided to use site, plan instrumentation.
- Final verification that site will be used
    - Matches the block intended
- PI decides and flags for locations for instrumentation, transect, and other point measurements

Installation visit

- Collect point measurements and install probes, data loggers, and gauges.
- Conduct initial visits after leaf-out (Jun-July)
- Collect point measurements for the following:
    - Forest basal area
    - Leaf area index
    - Stand age
    - Dominant tree height
    - Trees/acre (by species)
- Produce species lists for each site
- Install equipment at locations mapped during planning visit. Hydrologic monitoring must begin by October 1 for two water years of monitoring.

Measurement visits

- Collect growing-season point measurements and download data from loggers (at 2 month intervals).
- Conduct measurement visits in mid-summer (July-August) each year of sampling (minimum of two visits per site)
- Collect full panel of growing season vegetation and habitat measurements (years one and two)

Final visit

- Collect gauges and data loggers and take additional point measurements as necessary.
- Collect probes and gauges after two full water years (approximately 28 months) of monitoring with data loggers.

Additional visits (site check)

- Maintain and monitor data loggers.
- Maintain equipment and download data as needed.

The quality of data collection protocols is directly related to the quality of the data collected. The general components found in comprehensive data collection protocols include:

Desktop measurements

- Percent of drainage area harvested
    - At same time of harvest
    - In different height classes (based on lidar)

    - <5’
    - 6’ - 15’
    - 16’- 40’
    - 41’ – 60’
    - 61’- 100’
    - >100’
  - In different age classes (based on FPA approval date in FPARS)
    - 2-5 yrs.
    - 6-10 yrs.
    - 11-20 yrs.
    - 21-30 yrs.
    - 31-40 yrs.
    - >40 yrs.

Data dictionary

Table 1. Independent variables considered for site selection. Hydrologic Landscape Class (Leibowitz et al. 2016) is the primary selection criteria from which sites will be selected as it encompasses multiple hydrologic, climatic, and soil attributes.

Independent Variable Category	Variable	Methods	Data Source
Hydrologic Landscape Class	**VwLMH VwLTH**	**GIS – Primary stratifying variable**	**EPA – Hydrologic Landscape Classes**
Watershed	Catchment drainage area, slope, elevation, aspect	USGS Stream Stats; GIS	USGS National Elevation Dataset;
	Slope of harvest unit	GIS - during site selection	USGS National Elevation Dataset
	Aspect of harvest unit	GIS - during site selection	USGS National Elevation Dataset
	Harvest unit area	GIS - during site selection	WA DNR - Forest practices applications
	Peak and minimum discharges	USGS StreamStats	USGS StreamStats
Forest vegetation	Conifer vs deciduous forest cover	GIS - during site selection; Field validated	Remote sensing (Classified NAIP imagery)
	Stand-level dominant species in the surrounding watershed	GIS - during site selection	USGS Pacific Northwest SPARROW model inputs; LANDFIRE existing vegetation type
	Stand age prior to and following	GIS - during site selection	WA DNR - Forest practices applications and landowner data;

	harvest; Watershed stand average age		LANDFIRE existing vegetation height (EVH)
	Existing wetland vegetation	GIS - during site selection	LANDFIRE existing vegetation type
Site biophysical setting	Site productivity (site class)	GIS - during site selection	WA DNR
	Soil types	GIS - during site selection	USDA STATSGO; WA DNR soils
	Wetland type - Cowardin and HGM class	Estimated in GIS and field validated following GIS analyses	National wetland inventory, Landfire map, ground sample

Table 2. Response variables to be measured in the Chronosequence study. Priority variables from Beckett et al. (2016) are in **bold**, and secondary variables are in plain text.

Variable group	Response Variable	Methods under consideration	Sampling interval	Within-site measurements per observational unit
Hydrology	Streamflow	Stage-discharge relationships	Daily/hourly	2 - upstream-downstream
	Wetland water table depth	Groundwater wells with water level loggers	Daily/hourly	3
	Wetland surface water occurrence (hydroperiod)	Time-lapse camera paired with groundwater wells	Daily	1
	Stream-wetland surface connectivity			
Vegetation	Tree basal area, stem density, and height by species and live/dead	Modified forest inventory plots	Point; Annual measurement visit	3
	Dominant understory shrub and herb composition	Relevé samples (Mueller-Dombois and Ellenberg 2002)	Point; Annual measurement visit	3
	Stand age structure	Tree age derived from cores	Point; Annual measurement visit	5
	Leaf area index	Hemispherical photography	Point; Annual measurement visit	3
Ground Condition	- slash % cover - hummocky	Transect	Point, Annual	

	- large wood (count & measure)			
Habitat	**Sediment concentration and turbidity**	Turbidity meter	Point; Seasonal measurements	
	Nitrogen, phosphorus, dissolved organic carbon	Combination hand, in-situ sensors, and analytical chemistry	Point; Annual measurement visit	3
	Wetland canopy and effective shade	Hemispherical photography and/or solar pathfinder.	Point; Annual measurement visit	3
	Soil temperature and moisture	Soil temperature and moisture probe and data logger	Daily/hourly	3
	Stream temperature	Part of stream flow (water level) monitors	Daily/hourly	2 - upstream-downstream of wetland
	Physical attributes to characterize stream	Bankfull width, surface water gradient, sinuosity, and sediment size distribution	Point; Modified from USFS PIBO protocols.	One reach per wetland site will be measured.

Definitions and Acronyms

BACI – Before-after-control-impact study design
DEM – Digital Elevation Model
FAC – Facultative- plants that occur in a variety of habitats, including wetland and mesic to xeric non-wetland habitats but commonly occur in standing water or saturated soils
FACW – Facultative Wet – plants that nearly always occur in areas of prolonged flooding or require standing water or saturated soils but may, on rare occasions, occur in non-wetlands
FACU – Facultative Upland – plants that typically occur in xeric or mesic non-wetland habitats but may frequently occur in standing water or saturated soils
FPHCP – Forest Practices Habitat Conservation Plan
Forested wetlands - wetlands with at least 30% canopy cover of merchantable tree species per WAC 222-16-035.
FWEP – Forested Wetlands Effectiveness Project
GIS – Geographic Information System
GPS – Global Positioning System
GRTS – Generalized Random Tesselation Stratified
HGM – Hydrogeomorphic wetland class
LiDAR – Light Detection and Ranging
NAIP – National Agriculture Imagery Program
NHD – National Hydrography Dataset
NWI – National Wetland Inventory

NWPL – National Wetland Plant List
OBL – Obligate – plants that always occur in standing water or in saturated soils
Sample frame – Source material from which a sample is drawn
UPL – Upland – plants that almost never occur in water or saturated soils
VwLMH - Very wet climate, winter seasonality, low aquifer permeability, mountainous terrain, high soil permeability landscape class
VwLTH – Very wet climate, winter seasonality, low aquifer permeability, transitional terrain, high soil permeability landscape class

Landowner access to research data
Upon request, the PM or the AMPA will provide the landowner with the QA/QC'd data collected on their property as part of a CMER project.

COMPANION CMER DOCUMENTS

Document	Completion Date (Actual* or Estimated)
Charter (Updated)	8/24/2021*
Study Design	12/17/2019*
Prospective Six Questions Document	4/28/2020*
Literature Review	5/26/2020*
Wetland Intrinsic Potential (WIP) Tool Final Report	4/27/2021*
Wetland Intrinsic Potential (WIP) Tool Final Report answers to the Six Questions	4/27/2021*

*Use asterisk to distinguish actual dates.

PROJECT COMMUNICATION OVERVIEW

Transparent and accurate communication between the different adaptive management parties (Project Team/SAG/CMER/AMPA/TFW Policy) is critical for the AMP to guide and oversee the work of the Project Team. This section provides a framework to manage and coordinate the communications needed for all phases of a project. If a separate Communication Plan is needed for a project, see section 7.6 of the PSM for detailed guidelines.

Two primary pathways exist for project communication to occur when working on CMER projects - 1) between the Project Team and project oversight committees (i.e. SAGs/CMER/TFW Policy), and 2) communication within the Project Team.

PROJECT OVERSIGHT COMMITTEE COMMUNICATION

This section covers communication between the Project Team and the project oversight committees (i.e. SAGs/CMER/TFW Policy). Project oversight communication includes three categories of documents/communication: 1) Project management documents that enable oversight committees to understand how projects will be managed, 2) Project tracking and communication to enable the oversight committee(s) to track project progress and provide guidance and approvals to move projects forward, and 3) communication with contractors.

1. **Project management documents**

   The PM is the lead author for the Project Charter, Project Management Plan, and other project management documents. If the Principal Investigator (PI) has been identified at the time of project launch, the PM will work with the PI to draft the Project Charter and Project Management Plan, in consultation with the oversight committee.

Project Management Documents*	Primary Author	Collaborators	Final Approval	Primary Audience
Project Charter	PM	PI and Project Team (if identified)	CMER and TFW Policy	Project Team, WetSAG, CMER, and TFW Policy
Project Management Plan (including communication and risk sections)	PM	PI and Project Team (if identified)	CMER	Project Team, WetSAG, and CMER
Document Management and closure plan	PM	PI	N/A	Project Team, WetSAG, and CMER

*For details regarding these documents, see PSM Section 7.6

2. **Project tracking and guidance documents**

   The PM is responsible for ensuring that all reporting tasks are complete and provided on schedule. When preparing progress reports, the PI is responsible for providing detailed and comprehensive costs, schedule, and project updates, in writing, to the PM consistent with prior written agreement. The PM, in turn, is responsible for summarizing project update information into progress reports, and presenting these progress reports to the overseeing SAG and to CMER per the project schedule or as requested by the SAG or by CMER. The PM may delegate preparation or presentation of progress reports to the PI or other Project Team members, with their consent.

Project Tracking/Guidance Documents*	Primary Author	Collaborators	Final Approval	Primary Audience

Project updates	PM	PI	N/A	Project Team, SAG, CMER, and TFW Policy
CMER quarterly and annual project progress reports	PM	PI	N/A	SAG and CMER
CMER Requests	PM	Project Team	CMER	CMER
TFW Policy Requests/Check-ins	AMPA	Project Team	CMER	TFW Policy
Public Presentations	PI/PM	Project Team	N/A	Public

*For details regarding these documents, see PSM Section 7.6

3. **Contractor Communications**
   In all cases, the PM is primarily responsible for facilitating open and transparent communication between contractor(s) and project oversight committee(s) members. Committee members should generally not directly communicate with the contractor(s) about substantive project elements outside of formally organized meetings, conference calls, or PM-facilitated group e-mail discussions, unless specifically authorized in pre-established contract terms, or approved in advance to do so by the PM. The PM may verbally grant authorization, and the rest of the Project Team and oversight committee members should be informed when this occurs. The PM is responsible for informing the contractor(s) of this policy as well.

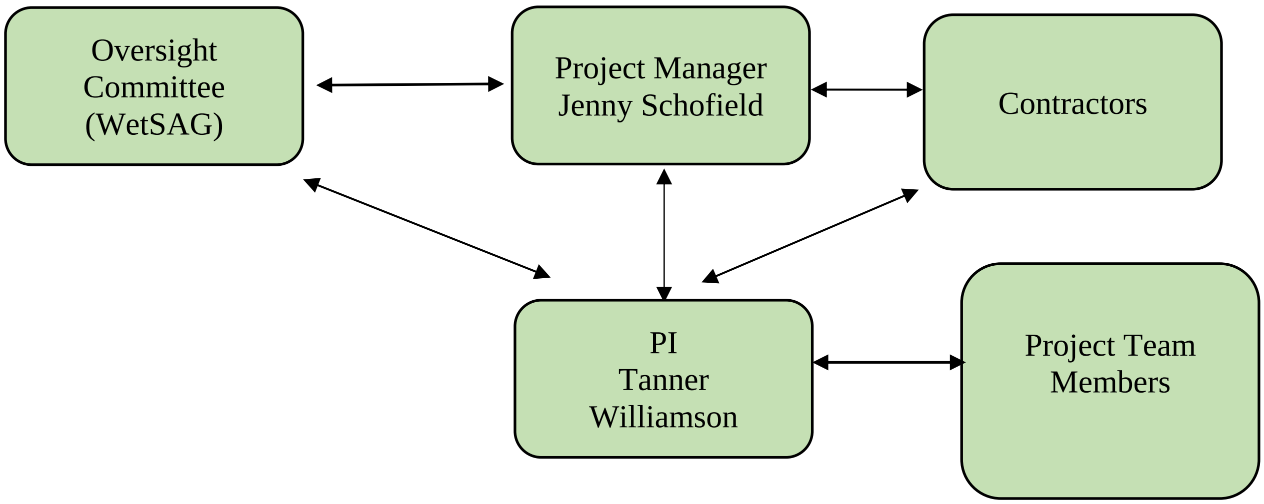
INTRA-PROJECT TEAM COMMUNICATION

The PM provides assistance to Project Team members by coordinating communication (e.g. one-on-one and group meetings, conference calls, etc.) when needed as well as maintaining the e-mail distribution list for the Project Team. The PM also ensures that any communication resulting in a formal decision about the project occurs in a transparent and inclusive way.

The PI is responsible for preparing and writing technical reports for CMER. How the PI communicates and works with other Project Team members to produce these documents will vary based on the nature of the project and dynamics of the Project Team. The PI works together with the PM to coordinate communication with other team members as needed.

Communication by individual team members includes participation at meetings and conference calls, providing feedback on draft documents, researching specific topics/issues, taking the lead on writing report sections, and/or acting as co-author(s) of CMER documents. The expectation is that Project Team members, including PMs and PIs, who communicate outside of normal project meetings, conference calls, and other venues will share substantive, project-related conversations they have with the rest of the Project Team. For additional details regarding project team communication see PSM section 7.6.3.

Communication structure


Oversight
Committee
(WetSAG)
Project Manager
Jenny Schofield
Contractors
PI
Tanner
Williamson
Project Team
Members