PROJECT CHARTER

Evaluation of potential habitat breaks (PHBs) for use in delineating the upstream extent of fish habitat in forested landscapes in Washington State

July 18, 2023

PROJECT CHARTER OVERVIEW[1]

The purpose of the Project Charter is to describe the project and give the Project Manager and the Project Team the authority to begin utilizing program resources and spending allocated project funds (CMER Protocols and Standards Manual (PSM) Chapter 7, section 4). In general, Project Charters should be brief and updated as needed as the project is implemented to accurately, reliably, and concisely communicate the projects' basic elements and objectives. When substantive changes are considered necessary, which amend the scope of the project (i.e., study design, budget, or schedule), the charter should be updated (version #2, #3, etc.) to communicate those changes.

PROJECT CHARTER APPROVAL DATES

CMER:

Version 1: February 24, 2021
Version 2: July 25, 2023

TFW Policy:

Version 1: The Project Charter did not go through an approval process at TFW Policy because the project was under supervision of the Forest Practices Board at that time.
Version 2: September 7, 2023

OVERSIGHT COMMITTEE

Instream Scientific Advisory Group (ISAG)

PROJECT TEAM MEMBERS

Jason Walter (Weyerhaeuser Co./ISAG Co-Chair), Jenelle Black (CMER Science staff), Doug Martin (Martin Environmental/WFPA), Chris Mendoza (Conservation Caucus), and John Heimburg (WDFW). Members emeriti include: Cody Thomas (Spokane Tribe of Indians/ISAG Co-Chair), Don Nauer (WDFW). Emma Greenwood (Spokane Tribe of Indians) added as Project Team member July 18, 2023 for implementation phase.

PROBLEM STATEMENT[2]

[1] Language from Project Charter template.
[2] Language primarily from FY23 Project Summary Sheets. Edits to language will be reviewed in next Project Summary Sheets update to ensure consistency.

At the November 13, 2019 Forest Practices Board (Board) meeting the following motion was passed:

> *"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map-based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map-based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."*

In December 2019, CMER voted that ISAG would be the lead in responding to the Board motion (above) and develop an overall CMER based Water Typing Strategy.

The CMER Water Typing Strategy includes (individually or in combination) the following elements:

1. Potential Habitat Breaks (PHBs)
2. Default Physical Criteria (DPC)
3. LiDAR Based Water Typing Model and Map
4. Fish/Habitat Detection Using eDNA

ISAG will consider whether, and if so how, to combine these elements (as directed by the Board), and to consider if/how additional elements may be added to the list.

Completion of individual project elements in this strategy is not dependent on completion of the entire strategy. Individual project milestones will continue to be completed and reviewed without the necessity to wait until completion of all projects included in the entire strategy.

PURPOSE STATEMENT[3]

The purpose of this study is to develop criteria for accurately identifying PHBs and to evaluate the utility of PHB criteria for use in the Fish Habitat Assessment Methodology (FHAM) as part of a water typing rule. The study is designed to assess which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions are associated with uppermost detected fish locations. This will 1) inform which Board-identified PHB criteria most accurately identify the upstream extent of fish habitat in an objective and repeatable manner as applied in the FHAM and 2) evaluate whether an alternative set or combination of empirically derived criteria more accurately achieves this goal (CMER 2020). Additionally, this study is intended to provide insight into how uppermost detected fish points, upstream extent of fish habitat based on FHAM, and PHBs proposed by the Washington Forest Practice Board may vary across geography, seasons, and years. The Board is expected to use the study findings to inform which PHB criteria to use in FHAM.

[3] Language from final ISPR-approved PHB study design dated April 18, 2023.

PROJECT OBJECTIVES[4]

The Water Typing Strategy objective is to determine the possibility/advisability of combining the 'Physicals,' 'PHB,' 'LiDAR Model', and/or 'eDNA' studies. Completion of individual project elements in this strategy is not dependent on completion of the entire strategy. PHB project specific objectives are listed below:

- Test the proposed PHB criteria and evaluate if those criteria or some other criteria will allow for the identification of potential habitat breaks for use in water typing to accurately and consistently identify the upstream extent of fish habitat when determining the F/N break using the FHAM that is currently in development.
- Determine which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions of the Board identified PHB criteria best identify the upstream extent of fish habitat (WAC 222-16-010) in an objective and repeatable manner as applied in the FHAM.
- Provide insight into how identification of uppermost detected fish locations (EOF), end of fish habitat (EOFH), and PHBs being considered by the Board as part of DNR's permanent water typing rule may vary across ecoregions, seasons, and years.
- Identify potential alternative PHB criteria that can be used to delineate EOF habitat in forested streams across Washington; and
- Better understand how PHBs may be influenced by seasonal and annual variability, and by location within Washington.

CRITICAL QUESTIONS

Critical questions from the Cooperative Monitoring, Evaluation and Research Committee (CMER) Work Plan (CMER 2023-2025 Biennium Work Plan):

- How can the line demarcating fish and non-fish habitat waters be accurately identified?
- To what extent does the current water typing survey window account for seasonal and annual variability in fish distribution considering potential geographic differences?
- How do different fish species use seasonal habitats (timing, frequency, duration)?
- How does the upstream extent of fish use at individual sites vary seasonally and annually?
- How does the delineation of the upstream extent of fish habitat change seasonally?

Additional project-specific research questions that were developed by the Study Design team:

UPSTREAM-MOST FISH LOCATIONS

1. How do the locations of the last (uppermost) detected fish vary interannually?
2. How do the locations of the last (uppermost) detected fish vary seasonally?
3. How do the locations of last (uppermost) detected fish vary geographically across the state of Washington?

HABITAT ASSOCIATED WITH UPSTREAM-MOST FISH LOCATIONS

4. How do the physical channel and basin characteristics (e.g., bankfull width; average

[4] Language primarily from FY23 Project Summary Sheets. Edits to language will be reviewed in next Project Summary Sheets update to ensure consistency.

gradient, basin size) associated with the identified end (upstream extent) of fish habitat vary geographically across the state of Washington?

5. Where the location of the last (uppermost) detected fish changes (seasonally or interannually), how does that influence which PHB would be associated with the F/N break and how frequently does that occur?
6. How do the physical channel features at the locations initially identified as PHBs change over the course of the study?
7. How often do similar features appear to limit upstream fish distributions in some contexts but not others (e.g., further into the headwaters vs. downstream; different flow levels)?

PHB PERFORMANCE ANALYSES

8. Which combinations of physical channel features and basin characteristics (for example, gradient, channel width, barriers to migration) best identify the end of fish habitat relative to the location of the last (uppermost) detected fish?
9. Can protocols used to describe PHBs be consistently applied among survey crews and be expected to provide similar results in practice?
10. How well do the PHB criteria provided by the Washington Forest Practices Board accurately identify the EOF habitat when applied in the Fish Habitat Assessment Methodology (FHAM)?

STUDY APPROACH

The study will be conducted across multiple years and seasons at sites in Washington State. Upstream fish distribution limits (i.e., EOF locations) will be determined during each season at each site using electrofishing. Data from this study will be analyzed to determine which combinations of stream and geomorphic variables (e.g., gradient, channel width, and basin area) best define PHBs and whether these vary spatially and temporally. The results of this study will be used to evaluate the accuracy of PHB criteria selected by the Board and to consider other criteria that might perform better for use in determining the regulatory break between fish (Type F) and non-fish bearing (Type N) waters within the context of a Board-approved fish habitat assessment methodology (FHAM).

CMER RULE GROUP AND PROGRAM

Stream Typing Rule Group.

PROJECT DELIVERABLES AND PROJECT TIMELINE

		Estimated Dates of Completion						
Project Milestones	**Responsible Party**	**FY23**	**FY24**	**FY25**	**FY26**	**FY27**	**FY28**	**FY29**
Study Development								
Project Charter Updated	Project Team	Jun-23						
PHB Study Design - ISAG/CMER approved	Project Team	Sep-22						

PHB Study Design - ISPR approved	Project Team	Jun-23						
Prospective 6 Questions	Project Team		Jul-23					
Field Implementation								
RFQQ for field implementation	PM	Jun-23						
Site Selection and Data Collection Document	Project Team	Feb-24						
Site Selection (Desktop)	Project Team/Contractor	Feb-24						
Site Selection and Field Reconnaissance	Project Team/Contractor		Oct-24					
Data Collection	Contractor			Dec-27				
QA/QC	Project Team/Contractor			Jan-28				
Data Analysis and Reporting								
Data analysis	PI/Contractor			Mar-28				
Final Report - ISAG/CMER approved	PI/Contractor							Sep-28
Final Report - ISPR approved	PI/Contractor							Mar-29
6 Questions Document	Project Team							Jun-29

Timelines are based on the assumption that PHB and DPC will be implemented as part of the same field effort.

BUDGET*

	PHB	DPC**	LiDAR	eDNA
FY22	$31,247	$0	$0	$0
FY23	$69,400	TBD	$0	$0
FY24	$185,600	TBD	$0	$0
FY25	$1,134,600	TBD	$0	$0
FY26	$1,097,100	TBD	$0	$0
FY27	$1,118,300	TBD	TBD	$0
FY28	$342,400	TBD	TBD	$0
FY29	$65,700	TBD	TBD	$0
Project Total	**$4,044,347**	TBD	TBD	$0

* Estimated budget based on the current project timeline and PHB study design. Additional revisions will be made as study designs and project management plans are developed.
** Some values under PHB include field work and data acquisition for DPC. Additional budget will be required for data analysis. Also, pending analysis of first year sample data, budget may be required for acquisition of additional sites for DPC.

PROJECT TEAM ROLES AND RESPONSIBILITIES

Position (Role)	Roles and Responsibilities
Project Manager (PM): Anna Toledo anna.toledo@dnr.wa.gov	• Monitors project activities and the performance of the Project Team. • Communicates progress, problems, and problem resolution to the Adaptive Management Program Supervisory Project Manager and Administrator (AMPA), and CMER. • Works with ISAG/CMER, and Project Team to help develop Project Charters and Project Management Plans, and keeps them updated as needed over time. • Works with ISAG, CMER, and Project Team (including PI, contractors, and other Team members) to resolve problems and build consensus. • Works with PI and Project Team members to develop interim and final reports. • Ensures communication between all team members is clear, concise, and consistent. • Maintains contact and process access agreements, once site access is granted. • Ensures coordination between ISAG/CMER, Project Team and landowners. • Coordinates all technical reviews and responses in a timely fashion. • Facilitates archiving of all data and documents. • Works with PI to manage documents on SharePoint Online. • Works with the AMPA, ISAG/CMER, and Project Team to develop and review proposals, RFPs or RFQQs, review contractor proposals, monitor contract performance, and provide input on budgeting, schedule, scope changes, and contract amendments. • Sees 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. • Communicates and/or authorizes communication with all project-related contractors. • Maintains sole responsibility for all aspects of project management even if other individuals are completing or helping complete parts of the project.

Principal Investigator(s): *TBD*	• Oversees the technical aspects of the project including protocol development and refinement, site selection, data collection, analysis, and reporting. • Works with PM and field manager in overseeing data collection by field crew. • Oversees and conducts data analysis and QA/QC of data provided by field staff. • Leads in developing, writing, and preparation of the final report. • Serves as lead author of findings report. • Responds to comments by reviewers of reports. • Prepares quarterly summary and progress reports of project status, as needed. • Presents technical findings to ISAG, CMER, TFW Policy, and the Board as necessary. • Participates as a member of the project team. • Communicates concerns or issues that arise with PM. • Attends ISAG and Project Team Meetings.
Project Team Members: Jason Walter, Jenelle Black, Doug Martin, Chris Mendoza, John Heimburg, Emma Greenwood	• Develop project documents, including study designs and site selection and data collection document. • Provide expertise as necessary for successful completion of project. • Assist PI for addressing technical and scientific questions/issues. • Assist PI with communications, data analyses, and reporting, as needed. • Provide timely review and constructive feedback on project documents and the final report. • Participate in completing site selection. • May assist contractor and PI with training of field crews. • Help implements QA/QC protocol. • Works with PI and PM to develop contract work scopes and review/select contract bidders. • Attend Project Team and ISAG meetings.
Contracted Statistician: Western EcoSystems Technology, Inc.	• Provides statistical consultation services. • Provides timely review and constructive feedback on project documents, as detailed in contract. • Transmits contract deliverables to PM, as detailed in contract. • Attends Project Team meetings as needed.
Contracted Field Manager: *TBD*	• Works with PI to coordinate field activities. • Provides primary oversight of field crew schedules, logistics, and needs. • Works with PI to provide training to field crews. • Communicates implementation status, changes, and needs to PI and PM. • Provides expertise as necessary for successful completion of project. • Provides timely review and constructive feedback on

	project documents and the final report. • Participates in Project Team meetings, as needed.
Contracted Field Crews: *TBD*	• Collect and QA/QC field data. • Maintain responsibility for field gear and equipment. • Transmit data to Field Manager and PI according to designated schedule. • Participate in Project Team meetings, as needed.
Contracted Technical Lead Staff: *TBD*	• In coordination with the PI, oversees and conducts QA/QC of data provided by field staff. • Conducts project data summaries and analyses. • Assists PI with reporting. • Helps prepare interim and final reports. • Responds to comments by reviewers of reports. • Creates spatial and tabular databases for all project data. • Participates in Project Team meetings, as needed.

AUTHORIZATION[5]

The Washington Forest Practices Board (Board) has empowered the CMER committee and the TFW Policy committee to participate in the Adaptive Management Program (AMP) (WAC 222-12-045(2)(b)). CMER is responsible for completing technical information and reports for consideration by TFW Policy and the Board. CMER has been tasked with completing a programmatic series of work tasks in support of the AMP; these tasks are outlined in CMER's biennial work plan approved by TFW Policy and the Board.

RECOGNITION OF SUPPORT

Committee	Date of Acceptance	Reference
ISAG	02/16/2021	meeting minutes
CMER	02/24/2021	meeting minutes
FP Board		meeting minutes
ISAG	06/20/2023	meeting minutes
CMER	07/25/2023	meeting minutes
TFW Policy	09/07/2023	meeting minutes

[5] Language from Project Charter template

REFERENCES

Cooperative Monitoring Evaluation and Research (CMER) Committee. (January 2023), 2023- 2025 Biennium Work Plan. https://www.dnr.wa.gov/publications/fp_cmer_2023_2025_wrkplan.pdf

Protocols and Standards Manual (PSM). (Revised 2020), Chapter 7, Section 4. https://www.dnr.wa.gov/publications/fp_cmer_psm_version_20201210.pdf

WAC 222-12-045. April 2013. http://apps.leg.wa.gov/wac/default.aspx?cite-222-12-045.

APPENDIX A: Water Typing Strategy

DEPARTMENT OF
NATURAL RESOURCES

Forest Practices Division
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360-902-1400
FPD@DNR.WA.GOV
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MEMORANDUM

May 1, 2020

TO: Forest Practices Board

FROM: Mark Hicks, Adaptive Management Program Administrator

SUBJECT: CMER strategy for completing Water Typing Study Designs

At the November 5, 2019 Washington Forest Practices Board (Board) meeting the following motion was passed:

> "Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map-based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."

On April 28th the Cooperative Monitoring Evaluation and Research (CMER) committee approved a strategy for the In-stream process Science Advisory Group (ISAG) to complete study designs for the three projects identified by the Board: i) Potential Habitat Breaks, ii) Default Physicals, iii) LiDAR Model Map. The attached strategy is intended to serve as the requested May 2020 report to the Board.

To date ISAG has re-familiarized themselves with the draft study designs, cataloged outstanding comments, and met on a more frequent basis to assess how to efficiently move forward. The strategy provides a timeline for doing the actual work of updating the study designs in a way that will enable the projects to move forward effectively.

April 28, 2020

TO: **Mark Hicks (AMPA)**

FROM: **CMER**

SUBJECT: **CMER Water Typing Strategy Update**

At the November 5, 2019 Washington Forest Practices Board (Board) meeting the following motion was passed:

> *"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map-based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."*

In December 2019, CMER voted that the Instream Scientific Advisory Group (ISAG) should have the lead in drafting a response to the Board motion (above) by developing a Water Typing Strategy for CMER approval that addresses the Board's request. Consistent with the Board's motion, that strategy should include (but not be limited to) recommendations for how to proceed with the 'PHB Validation' (PHB), 'Default Physical Criteria (DPC)' and 'Map-based Lidar Model' (LiDAR Model) studies. In response to these directives, ISAG developed and/or compiled the following:

- **Recommendations (1-7) in response to the Board motion**
- **Proposed workplan and budget**
- **Appendix I** – Table comparing elements of three water typing approaches that are part of the CMER Water Typing Strategy. These elements provide a basis for the following recommendations.
- **Appendix II (Water Typing Strategy Project Summary)** – Includes the 'critical questions', 'timeline', 'current status', and 'project objectives' for the individual components of the CMER Water Typing Strategy, along with a summary of the current budget associated with the strategy.
- **Appendix III (Excerpt from CMER Protocol & Standards Manual, Section 7.8.8)** – Provides support for 'Recommendation 1'.

Prior to formulating specific Water Typing Strategy recommendations, ISAG developed the following water typing points in order to provide clarity on how to proceed with the strategy.

- The goal of the DNR water typing system is to accurately identify the upstream extent of fish habitat (see WAC 222-16-010 for definition of 'fish habitat').
- This goal (above) is the same for all three studies included in the Water Typing Strategy.
- While the goal is the same for each water typing approach, the different approaches will not (necessarily) result in identifying the same point on the landscape as the upstream extent of fish habitat.
- There is inherently a different level of error associated with each approach at the individual site scale (error here is defined as the difference between the **actual** upstream extent of fish habitat in a given watershed relative to where the individual approaches [DPC, PHB, and LiDAR Model] identify it).
- The intent of identifying the upstream extent of fish habitat relative to the location of the last/uppermost detected fish is, in part, to account for the spatial and temporal variability in fish distribution (fish move and detection locations can change between seasons and/or years).
- All three study approaches utilize physical channel/geomorphic features and temporal distribution patterns (i.e. season and annual variability) of fish to derive criteria for assessing/defining upstream extent of fish habitat.
- The CMER Water Typing Strategy should not necessarily be limited to an assessment of the three water typing approaches addressed in the Board's motion but may also capture additional elements identified within the CMER Workplan.

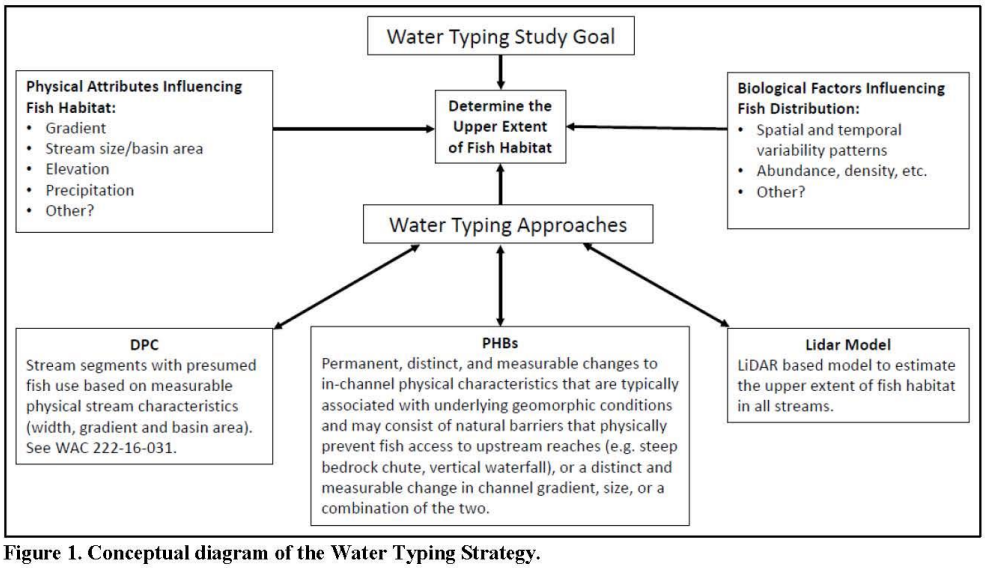

Figure 1. Conceptual diagram of the Water Typing Strategy.

Water Typing Strategy Recommendations

Recommendation 1 – Study design authors should incorporate 'Best Available Science' (BAS) and other steps outlined in the CMER Protocol and Standards Manual (PSM), Chapter 7, when developing study designs for the individual approaches that are part of the CMER Water Typing Strategy (see Appendix III).

Justification(s):

- The current drafts for DPC, PHB and LiDAR Model study designs occurred outside the CMER process, therefore, they did not follow the CMER PSM process for project scoping and study design development. The PHB Validation Study went through the Independent Scientific Peer Review (ISPR) process, but with limited involvement by CMER. The DPC and LiDAR Model study designs did not go through the ISPR review process.

Recommendation 2 – Collect initial data at a single set of unbiased and representative field sites to potentially inform at least some elements of all three studies.

Justification(s):

- Certain data (e.g. location of the uppermost detected fish in a given stream) are relevant to all three studies.
- Provide cost savings by improving implementation efficiencies.
- Enhance the ability to compare results from the different approaches.

Recommendation 3 – Coordinate implementation of the DPC and PHB studies to take advantage of their shared elements (e.g. sample sites, upstream extent of fish distribution information), but maintain separate study-specific elements (e.g. focused analysis) that are designed to accomplish study objectives and answer project related critical questions in the CMER work plan (2019 - 2020).

Justification(s):

- Same justifications as those presented for 'Recommendation 2'.

Recommendation 4 – Postpone implementation of the LiDAR Model study until after completion of the DPC and PHB studies and the development of a statewide LiDAR derived stream network.

Justification(s):

- The primary objective of developing a LiDAR model would be to identify PHB and DPC points as defined by the other two studies. Therefore, it is logical to wait until metrics associated with those approaches are permanently defined before developing a new model.
- LiDAR coverage of Washington is currently incomplete, and statewide coverage will be necessary for full implementation of the new LiDAR model map.

Recommendation 5 – There is potential for eDNA (Environmental DNA) to be included as an added element to the PHB and/or DPC studies, however, continued investigation of eDNA as a prospective water typing tool should not necessarily be limited to work within these other studies.

Justification(s):

- Potentially take advantage of efficiencies around study elements such as site selection as presented in justifications for 'Recommendations 2 & 3'.
- Potentially provide additional/alternative evidence of fish presence/absence to compliment electrofishing work.

Recommendation 6 – Structure the studies so that the eastside and westside portions of each study may function independently if needed.

Justification(s):

- The climate on the two sides of the Cascades is sufficiently different that the eastern and western WA sample sites do not need to be looked at simultaneously (i.e. during the same calendar, fiscal or water years).
- This approach will allow flexibility in implementing the studies.

Recommendation 7 – CMER should be tasked with development and approval of the final study designs for the individual approaches that are part of the CMER Water Typing Strategy.

Justification(s):

- Allow for modifications necessary to improve individual study designs and potentially combine appropriate aspects of these studies for efficiency and cost savings.

Workplan and Budget

The degree to which modifications are needed for each study design will largely dictate the timing for completion and budget estimates. CMER recommends conducting these tasks "in-house" to the extent practicable using existing human resources (CMER/SAG members, Project Managers, and CMER science staff). Doing so will push out budget needs past Fiscal Year '21, so the Board's budget line item will need to be modified accordingly. More accurate budget estimates for field implementation, site selection, data collection and analysis, and final report writing will be forthcoming pending completion of the study designs. However, the current budget amounts in the CMER Master Schedule for Fiscal Years '20 and '21 ($65,850 and $552,456, respectively) will not be expended, and the later phases of the projects once implemented will likely spread those costs out over several years.

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<tr><th></th><th>FY20</th><th>FY21</th><th>FY22</th><th>FY23</th><th>FY24</th><th>FY25</th><th>FY26</th><th>FY27</th></tr>
<tr><td rowspan="6">PHB</td><td colspan="2">Study Design</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>LiDAR</td><td colspan="8">Postpone implementation of the LiDAR Model study until after completion of the DPC and PHB studies and the development of a statewide LiDAR derived stream network.</td></tr>
<tr><td>LiDAR Budget</td><td>$0</td><td>$0</td><td>$0</td><td>$0</td><td>$0</td><td>$0</td><td>$0</td><td>$0</td></tr>
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Appendix I: Comparison of elements of three water typing approaches that are part of the water typing strategy.

	Default Physical Criteria (DPC)	Potential Habitat Breaks (PHBs)	Lidar Model
How is each water typing approach defined?	Stream segments with presumed fish use based on measurable physical stream characteristics (width, gradient and basin area). See WAC 222-16-031.	PHBs are defined as permanent, distinct, and measurable changes to in-channel physical characteristics. PHBs are typically associated with underlying geomorphic conditions and may consist of natural barriers that physically prevent fish access to upstream reaches (e.g. steep bedrock chute, vertical waterfall), or a distinct and measurable change in channel gradient, size, or a combination of the two.	LiDAR based model to estimate the upper extent of fish habitat in all streams.
What is the purpose of each approach?	To classify stream segments as 'F' or 'N' where fish use has not been determined using accepted protocol electrofishing survey (PES) methodology.	To identify the point (F/N break) that; 1) represents the upper extent of fish habitat, 2) is based on measurable physical stream characteristics, 3) is associated with a protocol electrofishing survey, and 4) is within the context of FHAM.	To generate a statewide water typing map identifying F/N break points and thereby classifying stream segments as 'F' or 'N' using LiDAR based model where fish habitat has not been determined using accepted protocol electrofishing survey methodology.
At what scale is each approach is implemented?	Segment/Point	Point	Landscape
Why is study needed on each approach?	To understand the extent to which current default physical criteria for Type-F waters accurately identify and/or encompass the upstream extent of (detected) fish presence (all species) and/or fish habitat considering potential geographic differences.	To identify specific PHB criteria that most accurately inform a consistent and systematic approach to water typing which recognizes and identifies "fish habitat" not just fish use. Once measurable metrics or threshold criteria are adopted, this approach to conducting protocol electrofishing surveys within the context of FHAM will meet DNR's objective of developing an alternative that is "repeatable, enforceable, and implementable".	To identify what, if any, potential opportunities exist to improve or replace the existing model using high resolution (LiDAR) topographic information.

Appendix II: Water Typing Strategy Project Summary (prepared Jan. 2020, updated Apr. 2020)

Project Name & Background	**Water Typing Strategy** At the November 5, 2019 WFPB Meeting the following motion was passed: *"Recommend the Cooperative Monitoring, Evaluation and Research Committee (CMER) to develop study designs for the PHB validation, physical characteristics, and map-based Lidar model studies. Design the studies for cost savings, including the phasing of the studies with eastern Washington to be initiated first, and the possibility and advisability of combining the PHB validation, physical characteristics and map based Lidar model studies, and then to report on the study designs to the Board by their May, 2020 meeting."* In December 2019 CMER voted that ISAG should have the lead in responding to the Forest Practices Board motion (above) and developing an overall CMER based Water Typing Strategy.
Strategy Elements	The CMER Water Typing Strategy will include (individually or in combination) the following elements: 1. Default Physical Criteria Assessment 2. Potential Habitat Breaks (PHB) 3. LiDAR Based Water Typing Model 4. Fish/Habitat Detection Using eDNA ISAG will consider whether, or if so how, to combine these elements (as directed by the WFPB), and to consider if/how additional elements may be added to the list.
Work Plan Critical Question Addressed	**(1) Default Physical Criteria Assessment** • To what extent do current default physical criteria for Type-F waters, considering potential geographic differences, accurately identify the upstream extent of (detected) fish presence (all species) and/or fish habitat? • Can alternative (to current) default physical criteria for Type-F waters, considering potential geographic differences, be identified that would more accurately and consistently identify the upstream extent of (detected) fish presence (all species) and/or fish habitat? • Are there sustained gradient or stream size thresholds alone that serve as default physical criteria? **(2) Potential Habitat Breaks (PHB)** • How can the line demarcating fish- and non-fish habitat waters be accurately identified? • To what extent does the current water typing survey window capture seasonal and annual variability in fish distribution considering potential geographic differences? • How do different fish species use seasonal habitats (timing, frequency, duration)? • How does the upstream extent of fish use at individual sites vary seasonally and annually? • How does the delineation of the upstream extent of fish habitat change seasonally?

	(3) LiDAR Based Water Typing Model • To what extent can LiDAR be used with the current fish habitat model to develop a new model for predicting the upstream extent of fish habitat sufficient to meet the requirements of the Forest and Fish Agreement? **(4) Fish/Habitat Detection Using eDNA** • How well and under what conditions does eDNA sampling accurately and consistently identify the upstream extent of fish presence, abundance, and/or fish habitat?
Responsible SAG & Project Manager	SAG: ISAG Project Manager: Eszter Munes
Project Team Members	TBD
Status/Phase	The overall CMER Water Typing Strategy is currently being developed within ISAG. The following provides specific details associated with each of the (4) active projects within the strategy: **(1) Default Physical Criteria Assessment** • The development of a study design to evaluate default physicals was initiated in 2016. • In March 2019 Cramer Fish Sciences presented a draft 'Physicals' study design to ISAG. During this presentation Cramer recommended combining this project with the PHB Validation Study. • Following the March 2019 presentation ISAG provided comments back to the authors on the draft 'Physicals' study design, however, no final/approved 'Physicals' study design was produced. • In November 2019 the Board recommended that CMER develop a 'Physicals' study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board motion (above). ISAG is currently considering how the 'Physicals' project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board's motion. **(2) Potential Habitat Breaks (PHB)** • A PHB pilot project has been completed and a report was delivered to the Board in January 2016. • A 'PHB' study design was developed by the Board designated science panel and subsequently approved by ISPR in November 2018. • The study design was also reviewed by members of CMER/ISAG (informally, outside of the CMER process) and a comment matrix was provided to the authors in January 2019. • An updated (most recent) version of the 'PHB' study design was presented to the Board in May 2019. • The Board then created a special Water Typing Committee in June 2019 to provide recommendations on next steps back to the full Board in August 2019.

	• Per recommendation of the Water Typing Committee, in November 2019 the Board recommended that CMER develop a 'PHB' study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board motion (above). ISAG is currently considering how the 'PHB' project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board's motion. **(3) LiDAR Based Water Typing Model** • The development of a study design RE a LiDAR based water typing model was initiated in 2016. • In May 2019 Cramer Fish Sciences delivered a draft 'LiDAR Model' study design to ISAG, however, no final/approved 'LiDAR Model' study design was produced. • In November 2019 the Board recommended that CMER develop a 'LiDAR Model' study design. • In December 2019 CMER voted that ISAG should have the lead in responding to this Board motion (above). ISAG is currently considering how the 'LiDAR Model' project fits within the overall Water Typing Strategy and if it could be combined with other elements per the Board's motion? **(4) Fish/Habitat Detection Using eDNA** • An eDNA pilot project has been completed (Brooke Penaluna – Principal Investigator) and a draft report was delivered for ISAG review in December 2019.
Project Timeline	ISAG will report on the 'Physicals', 'PHB', and 'LiDAR Model' study design(s) to the Board by May 2020. Project timelines thereafter will be based on recommendations developed at the May 2020 FP Board meeting. The following provides specific details on near-term tasks associated with each of the (4) active projects within the Water Typing Strategy: **(1) Default Physical Criteria Assessment** • ISAG will review the existing 'Physicals' study design and associated comments (from ISAG members in 2019) and develop options for how the existing study design could be modified and/or merged with other Water Typing Strategy elements moving forward. **(2) Potential Habitat Breaks (PHB)** • ISAG will review the existing 'PHB' study design, associated recommendations from the ISPR review, and associated comments (from ISAG/CMER members) and develop options for how the existing study design could be modified and/or merged with other Water Typing Strategy elements moving forward. **(3) LiDAR Based Water Typing Model** • ISAG member(s) will investigate other (ongoing/completed) LiDAR (fish) modeling studies to identify current knowledge gaps and assess whether further/new work on this subject is needed. An update on this topic will be provided at the February ISAG Meeting.

	(4) Fish/Habitat Detection Using eDNA • ISAG members reviewed the updated eDNA report and voted to have the P.I. make revisions based on consensus-based comments. Funding to make revisions ($5,500) was approved during the CMER meeting in February 2020. A draft with comments from concurrent, ISAG/CMER review will be submitted for CMER approval in April 2020.

Project Summary and Purpose

Summary: Refine study designs for the PHB validation, physical characteristics, and map-based LiDAR model studies in FY2020. Design the studies for cost savings, including the phasing of the studies in eastern Washington to be initiated first, and the possibility and advisability of combining the default physical criteria, PHB validation, and/or map-based LiDAR model studies.

Purpose: Inform a permanent water typing system that meets FFR objectives.

Project Objectives

Determine possibility/advisability of combining the 'Physicals', 'PHB', and/or 'LiDAR Model' studies. Project specific objectives are listed below:

(1) Default Physical Criteria Assessment

- Compare and quantify how the current default physical criteria correspond to the uppermost point of fish presence and potential fish habitat.
- Determine the physical characteristics of habitat likely to be used by fish.
- Determine if sustained gradient or stream size thresholds alone serve as sufficient default physical criteria.

(2) Potential Habitat Breaks (PHB)

- Test the proposed PHB criteria and evaluate if those criteria or some other criteria will allow for the identification of potential habitat breaks for use in water typing to accurately and consistently identify the upstream extend of fish presence and/or fish habitat when determining the F/N break.
- Determine which combinations of gradient, channel width, barriers to migration, and other physical habitat and geomorphic conditions of the Board identified PHB criteria best identifies last detected fish location in an objective and repeatable manner as applied in the FHAM.
- Provide insight into how last detected fish points, end of fish (EOF) habitat, and PHBs proposed by the Board may vary across ecoregions, seasons, and years.
- Identify PHB criteria that can be used to capture EOF habitat in forested streams across Washington; and better understand how PHBs may be influenced by seasonal and annual variability, and by location within Washington.

(3) LiDAR Based Water Typing Model

- Prepare 'LiDAR Model' study design to evaluate the effectiveness of a LiDAR based logistic regression model and identify and locate presumed fish habitat across the state.
- Develop a logistic regression model that predicts fish habitat across non-federal forestlands in Washington.
- Select the appropriate spatial scale for the study. Include analytical (validation) that may be necessary to validate the model.

(4) Fish/Habitat Detection Using eDNA

- Assess how eDNA sampling compares with electrofishing for overall effectiveness, costs, and accuracy for identifying fish presence.

Budget

- Board Approved August 14, 2019.
- Expenditures do not include CMER staff or ISPR review.

	PHB	DPC	LiDAR	eDNA
Expenditures to Date	$374,420.91	$115,132.94	$245,241.70	$59,512.47
FY 20 Budget	$0			$5,500
FY 21 Budget	$552,456.00			$0

Appendix III: Excerpt from CMER Protocol and Standards Manual, Section 7.8.8

Consider the following BAS elements in the alternatives analysis (BM22-9):

1. Information source
2. Spatial scale
3. Temporal scale
4. Study design
5. Methods
6. Data
7. Quantitative analyses
8. Context
9. References
10. Logical conclusions and reasonable inferences
11. Level of peer review