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| **Project Name and Background** | Water Typing Strategy<br>At the November 5, 2019 Forest Practices Board (Board) meeting the following motion was passed:<br>*"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."*<br>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. |
| **Strategy Elements** | The CMER Water Typing Strategy will include (individually or in combination) the following elements:<br>1. Potential Habitat Breaks (PHBs)<br>2. Default Physical Criteria Assessment (DPC)<br>3. LiDAR Based Water Typing Model<br>4. Fish/Habitat Detection Using eDNA<br>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. |
| **Work Plan Critical Question Addressed** | **1. Potential Habitat Breaks (PHBs) (Critical questions from study design)**<br>• How can the line demarcating fish- and non-fish habitat waters be accurately identified?<br>• To what extent does the current water typing survey window account for seasonal and annual variability in fish distribution considering potential geographic differences?<br>• How do different fish species use seasonal habitats (timing, frequency, duration)?<br>• How does the upstream extent of fish use at individual sites vary seasonally and annually?<br>• How does the delineation of the upstream extent of fish habitat change seasonally?<br>**2. Default Physical Criteria Assessment (DPC)**<br>• 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?<br>• 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?<br>• Are there sustained gradient or stream size thresholds alone that serve as default physical criteria?<br>**3. LiDAR Based Water Typing Model**<br>• 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? |

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| | **4. Fish/Habitat Detection Using eDNA**<br>• 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 and Project Manager** | SAG: ISAG<br>Project Manager: Anna Toledo |
| **Project Team Members** | **PHB:** 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). Former members include: Cody Thomas (Spokane Tribe of Indians/ISAG Co-Chair), Don Nauer (WDFW)<br>**DPC:** Jason Walter (Weyerhaeuser Co./ISAG Co-Chair), Jenelle Black (CMER Science staff), Doug Martin (Martin Environmental/WFPA), Chris Mendoza (Conservation Caucus), John Heimburg (WDFW), Mark Meleason (County Caucus), and Emma Greenwood (Spokane Tribe of Indians) |
| **Status/Phase** | The PHB Study Design was approved by CMER in September 2022 and is currently in an interactive (open) ISPR process. The final ISPR-approved Study Design is expected in June 2023.<br>The ISAG project team is currently working on the DPC study design, which is expected to be delivered to CMER to initiate concurrent CMER/ISAG review in February 2023. As part of their recommendation to the Board, ISAG will develop the LiDAR study design after the completion of the DPC and PHB study designs and development of a statewide LiDAR derived stream network.<br>The eDNA final report and answers to the 6 questions were approved by CMER in May 2021. The final report was delivered to the Board with a presentation at their August 2021 meeting with a recommendation from Policy that no formal action be taken in response to the study. ISAG is exploring options for including an eDNA component into the PHB/DPC study designs. |
| **Expenditures** | **1. Potential Habitat Breaks (PHBs)**<br>Expenditures through FY22: $439,426<br>**2. Default Physical Criteria Assessment (DPC)**<br>Expenditures through FY19: $115,133<br>**3. LiDAR Based Water Typing Model**<br>Expenditures through FY19: $189,326<br>**4. Fish/Habitat Detection Using eDNA**<br>Expenditures through FY21: $65,012 |
| **Project Timeline** | Timelines are based on the assumption that PHB and DPC will be implemented as part of the same field effort.<br>**1. Potential Habitat Breaks (PHBs)**<br>FY22-FY23: ISAG and CMER approval of study design, begin ISPR.<br>FY23: Complete ISPR of study design and begin site selection.<br>FY24: Develop Project Management Plan and begin site selection.<br>FY25: Finish site selection and begin data collection.<br>FY26-FY28: Data collection and analysis.<br>FY28-FY29: Final report writing, review, and approval. |

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| | **2. Default Physical Criteria Assessment (DPC)**<br>FY22-FY24: Study design development, review, and approval.<br>FY24: Develop Project Management Plan and begin site selection.<br>FY25: Finish site selection and begin data collection.<br>FY26-FY28: Data collection and analysis.<br>FY28-FY29: Final report writing, review, and approval.<br>**3. LiDAR Based Water Typing Model (LiDAR)**<br>Timeline TBD upon completion of DPC and PHB studies.<br>**4. Fish/Habitat Detection Using eDNA**<br>FY22: The final report was delivered to the Board with a presentation at their August 2021 meeting with a recommendation from Policy that no formal action be taken in response to the study. ISAG is currently working on a recommendation for possible inclusion of an eDNA component into the PHB and/or DPC study designs. |

**Project Summary and Purpose**

**Summary:** Refine study designs for the PHB validation and DPC studies in FY21-FY24. Develop LiDAR study design after the completion of PHB and DPC, and development of statewide LiDAR derived stream network. 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:** To 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. **Potential Habitat Breaks (PHBs)**
   - 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 identify the upstream extent of habitat likely to be used by fish 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 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.
2. **Default Physical Criteria Assessment (DPC)**
   - 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.
3. **LiDAR Based Water Typing Model**
   - Prepare 'LiDAR Model' study design to evaluate the effectiveness of a LiDAR based logistic regression model to identify and locate the extent of 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 analyses 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***

| | PHB | DPC | LiDAR | eDNA |
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| **FY22** | $31,247 | $0 | $0 | $0 |
| **FY23**** | $69,798 | TBD | $0 | $0 |
| **FY24**** | $185,600 | TBD | $0 | $0 |
| **FY25**** | $450,000 | TBD | $0 | $0 |
| **FY26**** | $1,158,900 | TBD | $0 | $0 |
| **FY27**** | $1,153,400 | TBD | TBD | $0 |
| **FY28**** | $419,300 | TBD | TBD | $0 |
| **FY29**** | $59,500 | TBD | TBD | $0 |
| **Project Total** | **$3,527,745** | TBD | TBD | $0 |

* August 10, 2022 Board-approved budget. Funding approved for FY22-FY23. Budget beyond FY23 are estimates only.

**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.