**Nutrient Sensor Action Challenge** 

**Registration**

Upload the completed form to challenge.gov by clicking on the

“**Submit Solution**” tab on the [Nutrient Sensor Action Challenge](http://www.challenge.gov/nutrient-sensor-action-challenge-stage-II) page.

**General Information**

**Project Lead:**

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| First name: | | | David | | Last name: | | Hooper |
| Organization: | | | | Dept. of Biology, Western Washington University | | | |
| Title: | Professor | | | | | | |
| Phone: | | 360-650-3649 | | | Email: | David.Hooper@wwu.edu | |

**Contact for matters of communication and media:**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| First name: | | | David | | Last name: | | Hooper |
| Organization: | | | | As above | | | |
| Title: |  | | | | | | |
| Phone: | |  | | | Email: |  | |

Do you agree to allow EPA to share project information with journalists for potential coverage of the project?

☒ Yes

☐ No

Are there others who should be notified via email about webinars and other updates? (provide as many as needed)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| First name: | | | Nichole | | Last name: | | Embertson |
| Organization: | | | | Whatcom Conservation District | | | |
| Title: | Science and Planning Coordinator | | | | | | |
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Is there is any information about the project that should be treated as confidential?

☐ Yes

☒ No

If yes, please explain:

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**Project Description and Potential for Impact [limit 250 words]**

Describe the specific nutrient issue that the project will address.

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| The Nooksack Basin in Whatcom County, WA falls within a “very high” nitrate priority region according to the Washington Dept. of Ecology. Groundwater nitrate levels exceed the EPA recommended 10 mg/L in much of the Nooksack-Sumas Aquifer, a drinking water source with connection to surface water. Contributing sources of nitrate to groundwater include agricultural fertilization, septic systems, and natural inputs, but levels are not well characterized for surface waters. This project will install real-time nitrate sensors through the Basin to better understand nitrate levels in surface waters and prioritize actions to reduce contamination. |

How will the addition of data and information from nutrient sensors inform and improve specific decisions and actions pertaining to nutrient management?

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| Substantial local, regional, and international efforts are underway to better monitor and manage nutrients in the Nooksack River basin, but adequate quantity and quality of nutrient data are needed to validate efforts. Data from this sensor comparison will help inform several efforts including the Whatcom Clean Water Program (WCWP), an interagency working group focused on water quality (https://www.whatcomcounty.us/1072/Water-Quality), the Nooksack Fraser Transboundary Nitrogen (NFT-N) Project, a demonstration project of the International Nitrogen Management System (http://www.inms.international/north-america-demonstration/north-america-demonstration), and Western Washington University’s (WWU) work to model effects of nutrient Best Management Practices in local watersheds using the Agricultural Policy/Environmental eXtender (APEX) model with the goal of helping to prioritize restoration and management actions. |

What are the potential impacts and benefits of the project?

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| Real-time, quality nutrient data and validated models will help inform local stakeholders of ways to prioritize efforts in the study region to improve water quality. Through NFT-N, this information will also inform the regional nutrient budget and work by Canadian colleagues to address nutrient inputs from Canada. |

**Sensors**

Provide the following information for each type of sensor that will be used in the project.

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| Manufacturer/Model | YSI and OTT-Hydromet are developing and testing low-cost solid-state optical sensors. Anticipate availability in mid-Aug., 2018. |
| Parameter being measured | Nitrate |
| Sensor Price | $10,000-$12,000 (manufacturer estimates) |
| Maintenance Requirements |  |
| Accuracy |  |
| Precision |  |
| Range |  |

**Monitoring [limit 250 words]**

What is the general schedule for the project? Include: sensor deployment, maintenance and calibration, data analysis, and approximate date that data will be available to the Challenge Administrator.

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| Manufacturers (YSI, OTT) of the low-cost optical nitrate sensors anticipate release by mid-August 2018. Deployment should occur by mid-September, with three months of data collection through mid-December. USGS partners will assist with installation and calibration of sensors, and WWU will be responsible for maintaining the sensors, downloading the data, and doing QA wet chemistry. Data should be available starting November 2018. |

Describe location (provide map or link to a map) and monitoring frequency for each sensor.

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| We will deploy three sensors at the following locations:   1. Fishtrap Creek in Lynden is an impaired waterbody with diverse land uses and substantial restoration aimed to improve water quality and salmon habitat. This site has existing telemetry, flow gage (https://streamstatsags.cr.usgs.gov/gagepages/html/12212050.htm), ZAPS instrument, and a SUNA nitrate sensor (https://waterdata.usgs.gov/wa/nwis/uv?site\_no=12212050) with monthly nutrient sampling by USGS. The new sensor here will be added to the USGS realtime network. 2. Nooksack River at Ferndale will provide an integrated measure of nitrate flux into Bellingham Bay and testing of the low-cost sensor in water with turbidity from run-off and glacial silt. This site has an existing flow gage (<https://streamstatsags.cr.usgs.gov/gagepages/html/12213100.htm>), ZAPS, and telemetry. The new sensor here will be added to the USGS realtime network. 3. Kamm Creek at Kamm Road is an impaired waterbody with primarily agricultural land use. WWU has measured flow and nutrient concentrations at this site every two weeks since September 2015. They have modeled the watershed in APEX, but need more data for calibration and validation. (<https://www.waterqualitydata.us/provider/NWIS/USGS-WA/USGS-12211390/>) 4. If able to purchase a fourth sensor, it will be placed on Double Ditch Creek at the border with Canada to better quantify surface water nitrate fluxes entering the US. This site has an existing ZAPS sensor. Double Ditch is a major tributary to Fishtrap Creek just above our sampling site 1.   Continuous data collection from all sensors will occur during the three-month deployment period with wet chemistry validation sampling every two weeks (approximately Oct-Dec 2018). |

If applicable, describe any existing monitoring data being collected in the area and whether these data will be integrated:

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| See descriptions above. |

**Data Architecture [limit 250 words]** [Web service endpoint and authentication information are due to Challenge Administrator by November 1, 2018.]

Describe the plan for sensor data collection and management. Please provide any information about plans to meet data and web interface standards. Also identify any software products you intend to use that support the use of the standards.

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| Data from the sensors will be either collected via telemetry from the gauged sites and/or data download from the units. This is yet to be determined, based on the instrument and field deployment conditions. WWU will follow instrument recommended timeframes for data download periods, which will be approximately daily (telemetry) or every two weeks (download). USGS is preparing a QA plan for the Fishtrap SUNA nitrate sensor and EPA has a QAPP for the ZAPS. Data will be uploaded into a database for statistical analysis and comparison with laboratory/sensor validation data. All data will undergo quality control prior to release. We will explore a live, web based display of the data using the existing USGS interface for the two sites with USGS gauges and telemetry. Additionally, we will share the data with local WCWP partners for display on their webpage, with outreach materials to encourage local use of the data. The goal is to inform local agencies and land owners of any existing water quality impairments and promote the adoption of management practices to reduce pollution and improve water quality in the region. |