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Scope of Work for Watershed Basin Delineation and Technical Assistance to plan for the round two of status and trends sampling Stormwater Action Monitoring (SAM) program

Prepared by US Geological Survey, Washington Water Science Center

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Background

The Stormwater Action Monitoring (SAM) program a cumulative regional monitoring effort collectively funded by the Phase I and II Municipal Stormwater Permittees in the Puget Sound region of Washington State. Under the SAM program, there is a regional effort to document and track the status and trends of small streams and the marine nearshore in the Puget Lowlands with respect to water chemistry, sediment chemistry, habitat and biota (mussels, algae and macroinvertebrates).

The first round of the SAM small streams and nearshore work took place in 2015 and analysis of that data was released in 2018 (DeGasperi and others, 2018) and 2017 (Lanksbury and others, 2017), respectively. Based on the first round of SAM work, several changes to how sampling sites are selected for future rounds of SAM work were proposed. These changes along with an updated, higher-resolution, national hydrography dataset (NHD) have made it necessary to redraw the master sample list for candidate sampling sites for the future monitoring program slated to begin in 2020.

The master sample list generates a spatially balanced and random sample site list that can be used in probabilistic studies within the Puget Lowland ecoregion. The probabilistic approach allows one to collect data at a subset of randomly chosen sites and extrapolate the findings to unsampled sites within the study area. New master sample points for Puget Lowland ecoregion were already generated by Washington State Department of Ecology.

The biggest changes to site selection recommended for future SAM studies was to target a given range of urbanization within each candidate watershed. For the small streams study, an additional change was recommended that limits sampling sites to small watershed (2.5 to 50 km^2).

Therefore, to finalize the new list of candidate sites for status and trends sampling in 2020, one needs to have an estimate of watershed area and landscape information for each delineated watershed area, including percent imperviousness for every potential sample point in the new sample frame from the master sample lists.

The U.S. Geological Survey was asked to provide technical assistance with this data need because of their expertise in GIS analysis and previous GIS support during round one of the SAM status and trends program.

Objectives

This Scope of Work includes two tasks in support of the SAM small streams program:

Task 1. Delineate and characterize basins from master point sample file for both small stream nearshore status and trends sites. Update basin characteristics of 2015 SAM basins with 2016 NLCD data, if available.

Task 2. Assist members of the SAM small stream program in conducting field reconnaissance assessments of new candidate sites for the 2020 sample.

Approach

Task 1 – Master sample points generated by Washington State Department of Ecology (Ecology) will be provided to USGS for this task. There are approximately 20,000 potential small streams sites and 3,000 nearshore marine sites that need to be evaluated.

For the stream sites, the master sample points will be verified that they lie on or "snap" to valid flowlines in the national hydrography data (NHD) high resolution product. Next, using the national 10m digital elevation model (DEM), we will hydro-condition and hydro-enforce the DEM to ensure that all flowlines in the project flow according to general hydrographic principals. For example, that water will always flow within a channel from high-to-low, unimpeded and regardless of stream capacity, precipitation, etc. This process involves filling any possible sinks and "burning" in flowlines in accordance with the AGREE surface reconditioning method (Hellweger, 1997). Flow accumulation and direction grids are created from the reconditioned DEM. For each master sample point, the basin drainage area will be determined from a unique polygon created using a modified New England method described in Johnston and others (2009). In the case of intersection with the watershed boundary dataset (WBD) basin lines will be refined to the WBD. This method for delineating the SAM basins is currently being published as a USGS report and will be available for use after this project.

For the nearshore master samples sites, we will follow a similar method as described above for the watersheds or use the same method from the first round of SAM nearshore monitoring and is described in Lanksbury and others (2017).

Basin characteristics associated with all master sample sites will be determined based on the NLCD categories and described in both square meters and as a percentage of total basin. This will be achieved using the zonal statistics geoprocessing tool in ESRI ArcGIS. Prior to delivery, delineated basin boundaries and characteristics will be go through a quality assurance check to make sure they meet the USGS product standards. Assuming that the newest version of the NLCD data set is available, all basin characteristics will use the 2016 NLCD database. However, if significant delays exist in the release of this dataset, the current (2011) data set will be used.

In addition to determining basins and GIS characteristics for the new master point sites, the USGS will also update the 2015 SAM basins with the new 2016 NLCD data if it is available.

Task 2- Once a list of new candidate sites for small streams monitoring has been selected by Ecology from the master sample site list, USGS will assist members of Ecology's SAM team in conducting field reconnaissance assessments of the sites. The USGS led the site selection process for the 2015 sampling and conducted most of the fieldwork in the first round. Therefore, the USGS brings working knowledge and expertise on site suitability for this project. It is believed that at least 10-20 sites might need to be evaluated for the 2020 sampling.

However, USGS will only assist with site reconnaissance on 3 to 5 candidate sites to assure consistency between USGS and Ecology assessment processes.

Deliverables

Task 1 – All the data generated from this task will be made publically available on USGS ScienceBase. The data will include a nested basin polygon feature class (or shapefile) which contains all of the generated basin boundaries with land use characteristics within the basin based on the National Land Cover Dataset (NLCD) 2016 (Yang, et al. 2018), as well as an Excel table with the same data. In the event the release of the NLCD 2016 dataset is delayed, the NLCD 2011 (Homer et al. 2015) dataset will be used and an updated release based on the 2016 dataset will be provided when available.

Schedule

The timeline for this project will begin once the Joint Funding Agreement is signed and take approximately 2 to 3 months to complete. Field reconnaissance visits for small streams sites are expected to take place in August 2019 during low flow to help ensure that channels will not be dry during the planned summer sampling in 2020. All work for this project will be completed by September 30, 2019.

Task or Element	FY 2019	
	Apr-Jun	Jul-Sep
Task 1 – GIS work	X	X
Task 1 – ScienceBase release		X
Task 2 – stream site reconnaissance		X

Costs

The total costs for this work is estimated to be $32,000. This estimate includes salary for approximately 7 weeks for a GIS specialist and 1 week for a senior hydrologist to oversee the work and assist in the site field reconnaissance. It also includes preparation, review and posting of all the spatial data on ScienceBase.

References cited

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