

Proposal for Site Selection in support of the 2015 Status and Trends Stormwater Monitoring and Assessment for Small Streams, Regional Stormwater Monitoring Program

Prepared by US Geological Survey, Washington Water Science Center

Draft February 10, 2014

Background

The Regional Stormwater Monitoring Program (RSMP) is the cumulative regional monitoring effort collectively funded by the Phase I and II Municipal Stormwater Permittees in the Puget Sound region of Washington State. Task 1 under the program, Status and Trends Monitoring in Small Streams in Puget Sound Lowlands, has begun. The Stormwater Work Group (SWG) is a coalition of federal; tribal; state and local governments; business; environmental; agriculture; and research interests that was convened at the request of the Puget Sound Partnership and Department of Ecology to develop and implement the RSMP.

Objectives

The objective of this investigation will be to assess and select 88 sites (up to 43 within the Urban Growth Area (UGA), and up to 45 outside the UGA) for status and trend sampling under the RSMP. The sites will be selected from lists of Master Sample Sites for Puget Lowland streams inside and outside the UGAs that have been specifically generated for the RSMP. Reasons for site selection or rejection will be documented based on objective criteria provided in the QAPP, along with professional judgment of USGS Hydrologists with particular expertise in surface-water monitoring of water and sediment chemistry, aquatic habitat, periphyton, and stream benthos.

Comment [RSD1]: For SWG—Do I have this right?

Approach

We will select suitable sampling sites from the supplied lists of potential sites primarily through visits to the candidate sites, with some additional GIS analysis to help us project the likelihood that a given stream reach may be perennial.

Assumptions:

- USGS will be responsible for selecting 88 sites outside the boundaries of the "opt-out" permittees (the cities of Bellingham and Redmond, and unincorporated Pierce County.)
- USGS will visit and assess up to about 108 sites; sites 50-59 on each of the two lists will be visited while we are in their vicinity in case sites between 0-49 are not suitable. We expect this to be an overall cost and time saving measure that is preferable to criss-crossing the region in search of the next suitable site on the lists.

Considerations for Site Suitability

Overall, the site selection process will evaluate the following as stated in the draft QAPP (Ecology, 2011):

1. Whether the streams can be safely accessed and sampled during the designated field season, and
2. If on-site conditions reflect target status (e.g. some streams might be found to be intermittent)

Specific considerations listed in the QAPP that we will consider regarding suitability of sites for sampling:

1. The stream or river must have lotic flow. Lotic means an aquatic system with flowing water such as a brook, stream, or river where the net flow of water is unidirectional (Armantrout, 1998). For this protocol, crews must also be able to see defined left and right banks to discern lotic from wetland systems. Lentic systems are discerned from lotic systems if they have a holding time of more than 15 days. If the point represents a watercourse that is actually a lentic system (i.e., lake, pond, reservoir, or wetland) it is disqualified.
2. The stream or river must have continuous flow. If the point represents a water course that is interrupted (subsurface) for more than 50% of the site length, it is disqualified. Site length is 20 bankfull widths surrounding the coordinates (minimum of 150 meters).
3. The stream or river must be perennial. If the point represents a water course that stops flowing on a seasonal basis, it is disqualified.
4. The stream or river must flow in a natural channel. A natural channel is one that was not constructed, although it might have been highly modified. Any constructed channel is non-target. This includes canals, ditches, or pipelines.
5. The stream or river must be freshwater only as defined by having more than 95% of its water column with < 1 ppt salinity at any time during the index period (July 1-October 15). Multiple lines of evidence may be used to make this estimation (e.g., vegetation and proximity to a known estuary).
6. Access safety will be considered based on state and federal law and organizational policy. But it will ultimately be the responsibility of individual crew members at the time of sampling to decide if the stream is safe to enter.
7. A site can be disqualified from sampling if it takes more than a day to sample, including transit to the site. Barriers that would disqualify a site may include extreme distances from parking.
8. ~~Permission-~~Property owners and tenants will be contacted prior to sampling. This requires researching the parcel information in the preceding months and a good faith effort to contact owners or tenants. A site should be disqualified from sampling if

Comment [RSD2]: Question for SWG—Are you seeking written permission at this time?

permission has been denied by land-owners, tenants, or resource managers. The Washington Department of Natural Resources describes how to discern public and state-owned waters (WDNR, 2010).

At each site, we will complete a form similar to the Site Verification Form used by Ecology for their ambient biological monitoring ([Adams, 2010](#)). In addition to the criteria above, we may consider additional criteria that may affect the suitability of the site for the specific sampling intended, such as the presence of an accessible >150-m long reach for habitat and biological measurements. We will seek approval from the RSMP administrators (or the appropriate Stormwater Work Group sub-group) for any such criteria we feel are critical to the success of the sampling program.

Deliverables

The primary deliverable will be Excel spreadsheets containing the metadata of all visited sites (as provided in advance by the SWG) with 88 suitable sites identified. In addition, the spreadsheets will be annotated with observation notes, digital photographs, a brief discussion about the final decision on selection for each site visited. We will likely collect additional ownership/permission/contact information in the field from land-owners (such as site owner names, addresses, and phone numbers). To be sensitive to the owner's privacy concerns, we will work with SWG representatives to share this Personally Identifiable Information only with selected others who have a clear need for it for the RSMP. All other original field notes and forms will be archived at the USGS WAWSC, and copies will be openly provided on request.

Schedule

Site reconnaissance and selection is anticipated to begin April 2014 and we anticipate needing approximately 25 working days to complete the task. We expect to fully complete and document the work by the end of July 2014; this date can be negotiated. It is recognized that unforeseen issues may become apparent at sites during actual monitoring under varying flow conditions, so the suitability of list of sites may change through the sample season, and alternative sites may need to be considered.

Costs

The total costs for this site conformation work is estimated at \$33,900. This estimate assumes two USGS hydrologist (one senior, one junior) will visit every site. This estimate could change (be less) if representatives from the local permittees were to accompany the senior USGS hydrologist on site visits within their jurisdictions; however we are not certain if this is consistent with Stormwater Work Group procedures or if such representatives would be available to participate.

Appendices

Appendix A – Types and frequency of sampling to be done at RSMP sites

The status and trends monitoring will include collecting and reporting the following at all RSMP sites.

1. Monthly water quality index (WQI) and instantaneous flow monitoring for one year (January through December 2015).

- WQI Parameters: total phosphorus, total nitrogen, turbidity, total suspended solids, specific conductance, pH, chloride, fecal coliform, temperature, and dissolved oxygen.
- Estimate streamflow following Ecology SOP #EAP024.

2. Stream benthos and habitat monitoring data once in summer 2015.

- Benthos parameters: aquatic macroinvertebrates and periphyton.
- Water quality parameters: chlorophyll a, ammonia, nitrate-nitrite, total suspended solids, hardness, total phosphorus, total perchlorate nitrogen, chloride, and turbidity
- Habitat monitoring: slope, bearing, habitat unit presence, wetted width, bankfull width, bar width, substrate size, substrate depth, shade, human influence, riparian vegetation, large woody debris and grain size estimation.
- Sediment chemistry parameters
 - Metals: copper, lead, arsenic, and zinc
 - PAHs: naphthalene, 2-methylnaphthalene, 1-methylnaphthalene, 2-chloronaphthalene, acenaphthylene, acenaphthene, dibenzofuran, fluorene, anthracene, carbazole, phenanthrene, fluoranthene, pyrene, retene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, benzo(ghi)perylene, chrysene, benzo(b)fluoranthene, and benzo(a)anthracene
- Additional sediment chemistry parameters subject to available funding:
 - Pesticides: 2,4-D, triclopyr, diclobenil, diuron, carbaryl, chlorpyrifos, and imidacloprid
 - Phthalates: Bis(2-ethylhexyl) phthalate, butyl benzyl phthalate, diethyl phthalate, dimethyl phthalate, di-n-butyl phthalate, and di-n-octyl phthalate
 - PBDEs: 47, 49, 66, 71, 99, 100, 138, 153, 154, 183, 184, 191, 209
 - PCBs: all 209 congeners
 - Hormone disrupting chemicals: PPCPs (EPA Method 1694) and hormones and steroids (EPA Method 1698)

Comment [RSD3]: Note to SWG—These are primarily for USGS reviewers to get an idea of the sampling requirements expected for the sites.

Appendix B – Summary of sampling procedures and protocols

A draft QAPP dated October 2011 refers to a number of Department of Ecology publications that described the specific sampling procedures and protocols to be followed. An updated QAPP is currently (February 2014) under production, but the following generalized procedures will likely remain unchanged, and they are relevant for selecting suitable sites.

Water Quality sampling

Ecology's water quality measurement and sampling procedures are described in the 2003 revision of "Quality Assurance Monitoring Plan: Stream Ambient Water Quality Monitoring, Revision of 1995 Version." Relevant sampling protocols in that document include:

Water collection consists of a single, near surface water sample usually taken from **bridges** or, in a few cases from the riverbank, where the river appears to be well mixed vertically and horizontally. The time of day when samples are collected is determined by the logistics of sampling all stations and delivering the samples to the lab for timely analysis. We attempt to sample a particular station at the same time each trip during a given WY.

Sample collection will involve the following steps:

1. Temperature is measured *in situ* with a **long-line thermistor**.
2. Dissolved oxygen (DO), turbidity, pH, and conductivity samples are collected simultaneously with a **DO sample bucket** with two attached 1-L bottles. Water for the Winkler titration is collected directly into a BOD bottle mounted inside the bucket. Also collected in the bucket is water for the turbidity sample, and for pH and conductivity analysis. One of the two 1-L bottles attached to the DO sample bucket has been acid-washed and collects water to be processed for nutrient analyses. The other 1-L sample bottle collects the total suspended solids sample.
3. Fecal coliform and enterococci samples are collected with the **flow-orienting bacteria sampler** and an autoclaved bottle.

Note: the biological QAPP describes using Hydrolabs for in situ measurements, an approach USGS would strongly recommend over field analyses such as Winkler titrations for dissolved oxygen measurements.

Habitat, sediment, benthos, and periphyton sampling

Ecology's habitat, sediment, benthos, and periphyton sampling procedures are described in the 2010 report "Quality Assurance Monitoring Plan: Ambient Biological Monitoring in Rivers and Streams: Benthic Macroinvertebrates and Periphyton." Relevant sampling protocols in that document include:

Overall, sites must be no shorter than 150 m and no longer than 2000 m. Multiply the average bankfull width times 20. This value (whole meters) is the site length for a path that follows the main flow of the river. However, for any site with bankfull width less than 8 meters, the site length will be extended to 150 m. Physical **habitat** measurements (straightforward) are made for the reach.

For **sediment** chemistry, each composite sample will be composed of scoops taken from 3 separately-located shallow-water stations in the site. Collect the sample by compositing from each of three suitable locations near the point of arrival. A suitable location will have these characteristics:

- Surface sediment is dominated by particles < 2 mm diameter,
- Water depth above the sediment is < than 30 cm,
- The station is always under water throughout the day.
- Anywhere within 10 bankfull widths (upstream or downstream) of the index station.
- Upstream from where staff have entered the stream channel.

Using a stainless steel spoon, sample the top 2 cm of sediment and place it into a stainless steel mixing bowl.

Visually estimate the composition of the sediment in the composite sample; gravel should never be a dominant component of the sample.

For **benthos**, one kick sample is collected at each of 8 transects and added to the composite sample for the site.

Periphyton sampling can be performed on-site with macroinvertebrate sampling, after site verification and layout. One sample is collected at each of 8 major transects and are added to a single composite sample jar for the site. Methods are available for habitats with predominantly coarse, woody, emergent vegetation, and submerged vegetation substrates.