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Stormwater Monitoring of Nutrients and Sediment from Cropland in Puget Sound

Background

Cropland is a common land use in some Puget Sound Counties, particularly in north Puget Sound (Figure 1). Cropland activities can result in potential impacts to surface waters. These include pesticide pollution, excess sediment, and excess nutrient input. Best management practices (bmps) are used to minimize these impacts, but monitoring is necessary to document the extent of water quality improvements.

Figure 1. Puget Sound Cropland
(WA Dept. Ag. 2012)

County	Acres of Cropland	% of PS Cropland
Whatcom	61983	30.88
Skagit	57762	28.78
Snohomish	21896	10.91
Thurston	14535	7.24
King	12576	6.27
Pierce	10837	5.40
Island	6232	3.10
Clallam	4537	2.26
Jefferson	2796	1.39
Mason	1667	0.83
Kitsap	821	0.41

The Puget Sound Stormwater workgroup developed a strategy framework for monitoring potential stormwater impacts, including those associated with agricultural lands. Detailed recommendations are needed to complete the strategy. To address this need for agricultural lands, a sub-group was formed to analyze data and develop the recommendations for potential impacts from agricultural lands. This Agriculture Stormwater Sub-Group developed recommendations for pesticide monitoring associated with croplands last year. These were approved by the Puget Sound Stormwater Workgroup. This year, the sub-group focused on monitoring recommendations for nutrient and sediment inputs from cropland, and these findings are discussed below.

Process to Develop Recommendations

The recommendations were developed using the following process:

1. Document existing cropland in Puget Sound and potential impacts to nutrients and sediment. This informs the level of needed monitoring for these parameters.
2. Identify existing monitoring programs that relate to nutrient and sediment monitoring from croplands in Puget Sound. Review those programs for relevancy and to define current status of monitoring these parameters.

3. Compare existing monitoring efforts to needed levels to identify data gaps towards a complete monitoring strategy for cropland sediment and nutrients.
4. Develop recommendations to fill data gaps.

Decisions were achieved via consensus of those present at the meetings. The decisions (recommendations) were sent out for review to all sub-group members. Questions from others were posed to the group and answered/addressed via email. All of the included recommendations were agreed-to by the Agriculture Stormwater Workgroup without dissent.

Current Potential Cropland Impacts and Monitoring Programs

To define the current status and monitoring of cropland nutrients and sediment in Puget Sound, the Agriculture Stormwater Sub-Group reviewed cropland use and current monitoring efforts for nutrient and sediment inputs.

Cropland findings

- Most cropland acreage is in north Puget Sound (Figure 1 and Appendix 1), which points out a regional need to focus in that area.
- Crop types in north Puget Sound include the same crop types in other areas, thereby representing cropland throughout Puget Sound.
- The timing of parameters of interest is: February through September for manure/nutrients and springtime for sediment.
- Some crop types do not fit the usual profile. These are berries, seed, and trees, which have less impact as they are not annual crops and have less soil disturbance. Also potatoes have reduced risk of nutrient input.
- Shellfish production was not included in any of our review because we are focused on terrestrial agriculture. Different participants would be needed for inclusion of shellfish and should be a future task by a different workgroup composition.

Current Monitoring Activities and Needs

Below is a description of current monitoring activities by county. For a detailed list of specific programs reviewed, see Appendix 2.

1) Whatcom County. Cropland monitoring has been lacking for both nutrients and sediment, but new programs are beginning to fill some of these data gaps and new NRCS funding could be used to further augment monitoring at the farm scale. Fecal coliform appears to be sampled by two programs, and total suspended solids in a new program (Natural Resource Assessment Program) that will focus on Bertrand Creek. Additional new monitoring has begun by the Department of Ecology in Bertrand Creek, which is monitoring nutrients, sediment, and other parameters.

However, even with the new sampling in Bertrand for the parameters of concern, there could be a remaining need for sediment monitoring in other areas of the county. There are numerous ditches on agricultural land that have a potential impact on transporting sediment and nutrients downstream to beneficial use areas. Also, annual crops and perennial crops that are rotated out of production and for which no cover crop has been established, can contribute sediment that

directly impacts salmon redds. The accumulation of sediment over time diminishes watercourse drainage capacity. This results in the desire/need to dredge out watercourse, eliminating fish habitat. Current monitoring does not record the magnitude of this problem. Once results from the new sampling are available, they should be analyzed and discussed as to whether or not they are sufficient to represent the remainder of the county. The new edge-of-field sampling could be used to fill some of the gaps too. Additional monitoring might be needed in the future for both nutrients and sediment, but that should be decided after the initial results from the new programs are analyzed.

2) Skagit County. The Skagit County Monitoring Program samples both nutrients and total suspended solids. Originally, they sampled monthly from 2003-2008. Now they sample quarterly. While they don't specifically target crop locations, many of the sites are in actively-farmed crop areas. It is ambient monitoring every two weeks for fecal, DO, temperature, pH, conductivity, and turbidity. Given the size of their data set and the time span over many years, the county believes it has data showing impacts from storm events. This level of monitoring fills much of the data need in this cropland-heavy county.

3) Whidbey and Camano Islands. The county has a similar program to Skagit that includes both nutrients and sediment with about 5 years worth of data. However, it probably is not linked to storm events. It was developed with Critical Area Ordinance issues in mind.

All north Puget Sound counties recognized a need to know where drainage tiles exist. These convey pollutants to surface waters quickly and need to be addressed.

Monitoring Conclusions

- Monitoring potential cropland sediment and nutrient impacts in north Puget Sound is the top geographic priority and likely well-represents other areas in Puget Sound.
- Current levels of monitoring covers much of the need. Notable gaps include specific linkage to stormwater events, effect of bmp implementation on marine dissolved oxygen levels, certain cropland areas of interest, impacts from drainage tiles, combining existing monitoring to NRCS's new edge-of-field monitoring, and a need to address data sharing laws that impede the flow of information.

Recommendations to Address Monitoring Needs

1) Current monitoring is generally good in Skagit and Whidbey Island Counties. Monitoring in Whatcom County is improving with the addition of programs by the Washington Departments of Agriculture and Ecology who are separately conducting new monitoring there. Our first recommendation is to coordinate existing sampling of sediments, nitrogen, and phosphorus with each other and with future sampling. This includes the edge-of-field monitoring funded by NRCS in Fishtrap and Bertrand Creeks and the Dept. of Ecology's and Agriculture's sampling. This would leverage the work in existing programs. Sampling should include stormwater events. An action item from this recommendation would be the development of a joint plan that melds the different monitoring programs together in a cohesive, efficient way.

2) Develop a strategy for data sharing, particularly for the NRCS edge-of-field monitoring. Currently, some data from this funding source are prohibited from sharing under the federal Farm Bill. A signed agreement will be needed to assure landowners of data use limitations, while also allowing landowner data to be used by coordinated monitoring efforts, including those by the Dept. of Ecology. The ability to combine these data with state agency programmatic data will allow important linkage between bmp implementation and pollution levels. This will allow for adaptive management and demonstration of success or failure.

3) Increased nutrients can reduce dissolved oxygen levels by triggering algae blooms that upon decomposition, lower oxygen levels. One source of nutrients is agricultural lands. As BMPs are installed to decrease these loads, monitoring should be done to show the effectiveness in nearby marine areas. Data are lacking for this topic, which is becoming elevated in importance. The Puget Sound dissolved oxygen model nutrient load summary is supporting documentation for this need, and can be found here: https://fortress.wa.gov/ecy/publications/publications/1103057.pdf

4) Sub-surface drainage structures, such as tiles, are known to quickly convey pollutants and flow to surface waters. However, their locations are mostly unknown. These need to be inventoried in many areas of Puget Sound, including Whatcom, Island, Snohomish, Jefferson (Chimacum Creek Valley) and Skagit Counties. Once inventoried, areas should be prioritized to address problem areas. This work may also need a data sharing agreement as mentioned in Recommendation 2.

5) A few areas have significant cropland with unique circumstances and are lacking in monitoring of nutrients and sediment from croplands. This is needed in the Marshland, French Creek, and Warm Beach areas of Snohomish County and Ebey's watershed on Whidbey Island. Monitoring should be bracketed to separate non-ag sources from ag sources. The Ebey Watershed has potential inputs from other land uses upland that make it a unique monitoring scenario.

Sub-Group Involvement: Heather Kibbey (City of Everett), Bobbi Lindemulder (Snohomish Conservation District), Karen Bishop (Whidbey Island Conservation District, phone), Bob Cusimano (ECY), Chery Sullivan (Washington Dept. of Agriculture), John Bolender (Mason Conservation District), George Boggs (Whatcom Conservation District), Rich Doenges (Thurston County), Monte Marti (Snohomish Conservation District), Rick Haley (Skagit County), Kelly McLain (Washington Dept. of Agriculture), and Carol Smith (WA Conservation Commission) participated in one or both of the two meetings when these were developed. In addition, Meghan Adamire (Clallam Conservation District), Adam Lorio (Samish Indian Nation), Dino Marshalonis (EPA), Jay Gordon (WA Dairy Fed), Joe Holtrop (Clallam Conservation District), Carolyn Kelly (Skagit Conservation District), Western WA Agriculture, Clare Flanagan (NRCS), Sherre Copeland (NRCS), Bill Bowe (Snohomish Conservation District), Seth Book (Mason Conservation District), and Michael See (Skagit County) were provided with opportunities to participate in email reviews and discussions and a few of these provided comment.