



Assessment of Potential Source Water Quality Risks using a Pollutant Load Modeling Tool

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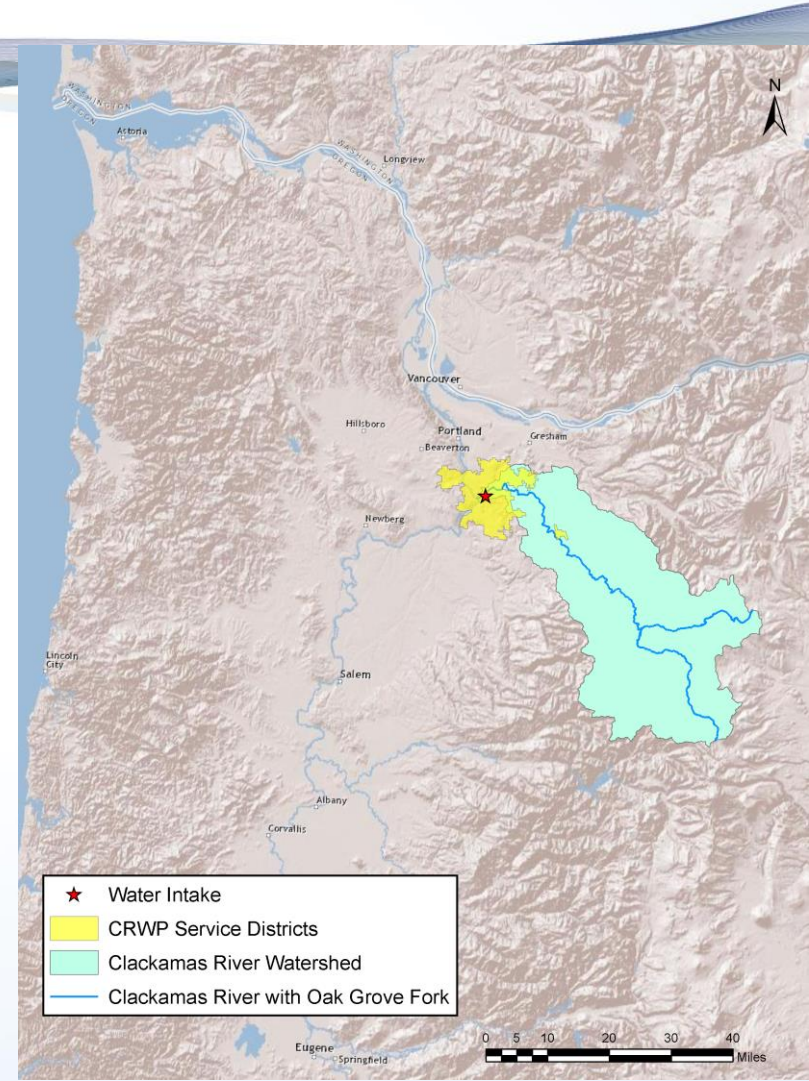
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- Background
- Source Water Protection
- Risk Analysis
- Pollutant Load Model
- Drinking Water Protection Plan
- Possible Next Steps



Clackamas River

- **Clackamas River Water Providers**
 - 8 municipal water providers
 - Serves over 300,000 people
- **Watershed**
 - 940 sq.miles
 - Mt. Hood National Forest
 - Hydroelectric Projects
 - Main Fork – three dams
 - Oak Grove Fork – two dams
 - Source to meet future demand



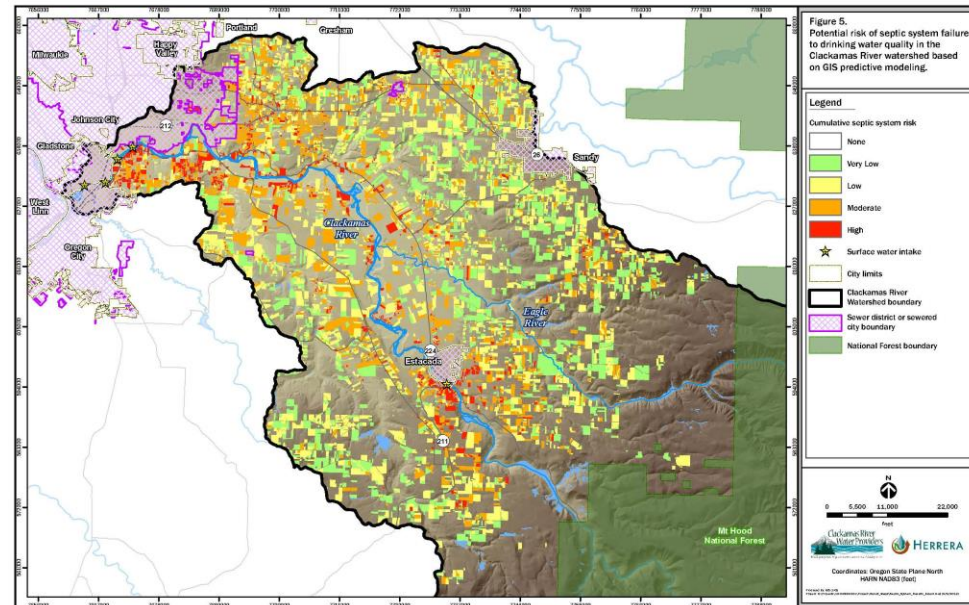
- **Problem:**
 - Protection of an unprotected resource in an area not under your control
- **Clackamas River**
 - Great opportunity and resource
 - How to keep it that way?
 - Drinking Water Protection Plan



- **CRWP Drinking Water Protection Plan**
 - Primary Goals
 - Identify, prevent, minimize, and mitigate harmful or potentially harmful activities on drinking water quality
 - Promote public awareness and stewardship in collaboration with other stakeholders
 - Source water assessments and ranking of risks



- **Herrera Risk Assessment**
 - Drinking Water Protection geodatabase
 - Spatial risk analyses on six high-risk contaminant categories
 - Agricultural Activities
 - Forest Activities
 - Urban Development
 - Septic Systems
 - Point Source Pollutants
 - Vulnerable Soils
- **Led to development of a Pollutant Load Model**

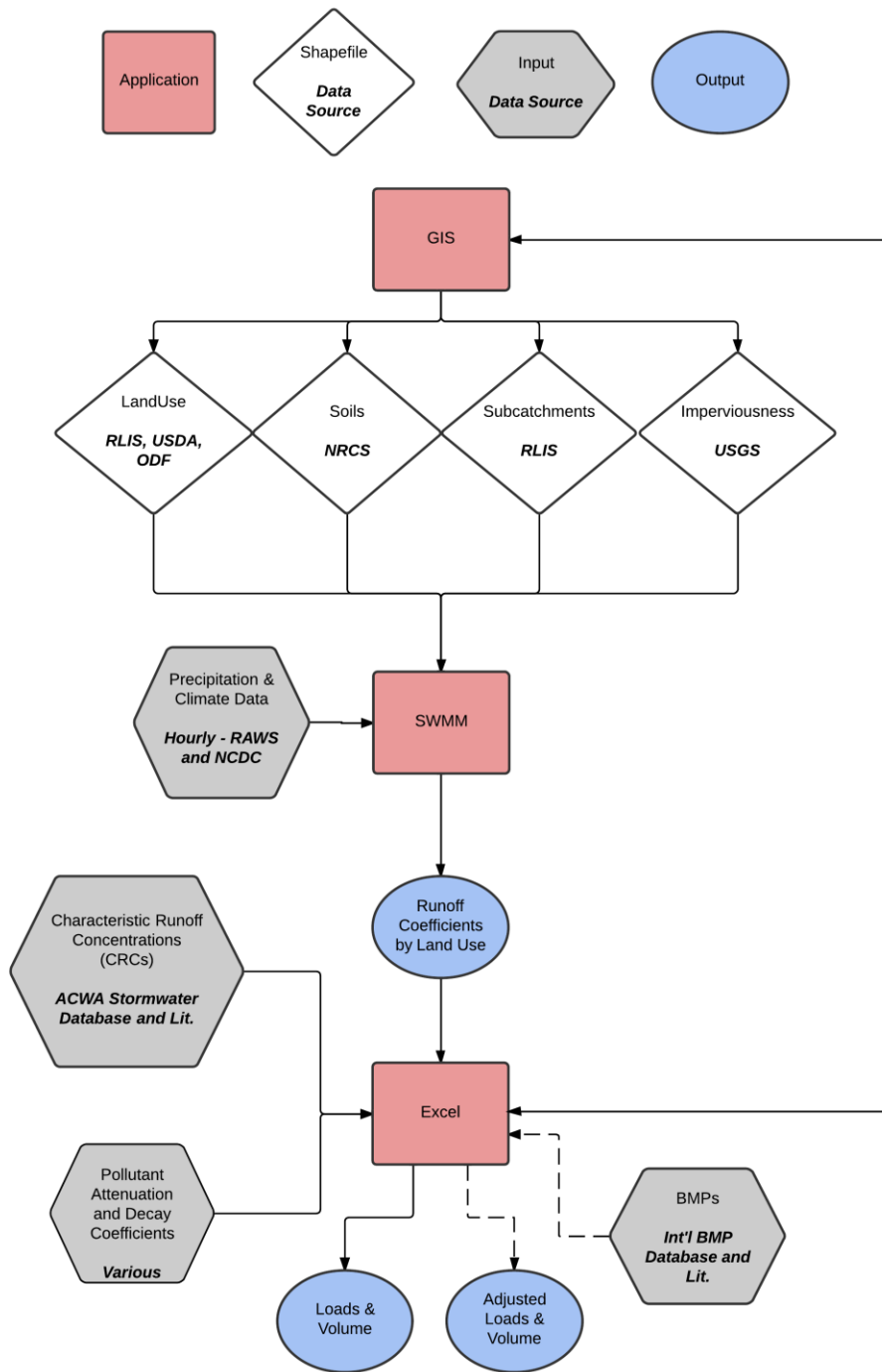


Risk of septic system failure – Herrera Environmental, 2012

- **What is it?**
 - A numerical model (conceptual) that estimates pollutant loading
 - Estimation can be based on monitoring results or scientific literature
 - The estimation algorithm can range from simple to very complex

- **What can it do for you?**
 - Assist water resources managers in:
 - Prioritization of future water quality sampling
 - Selection of best management practices (BMPs) to mitigate existing or potential risks
 - Prioritization of funding to maximize source water quality benefits

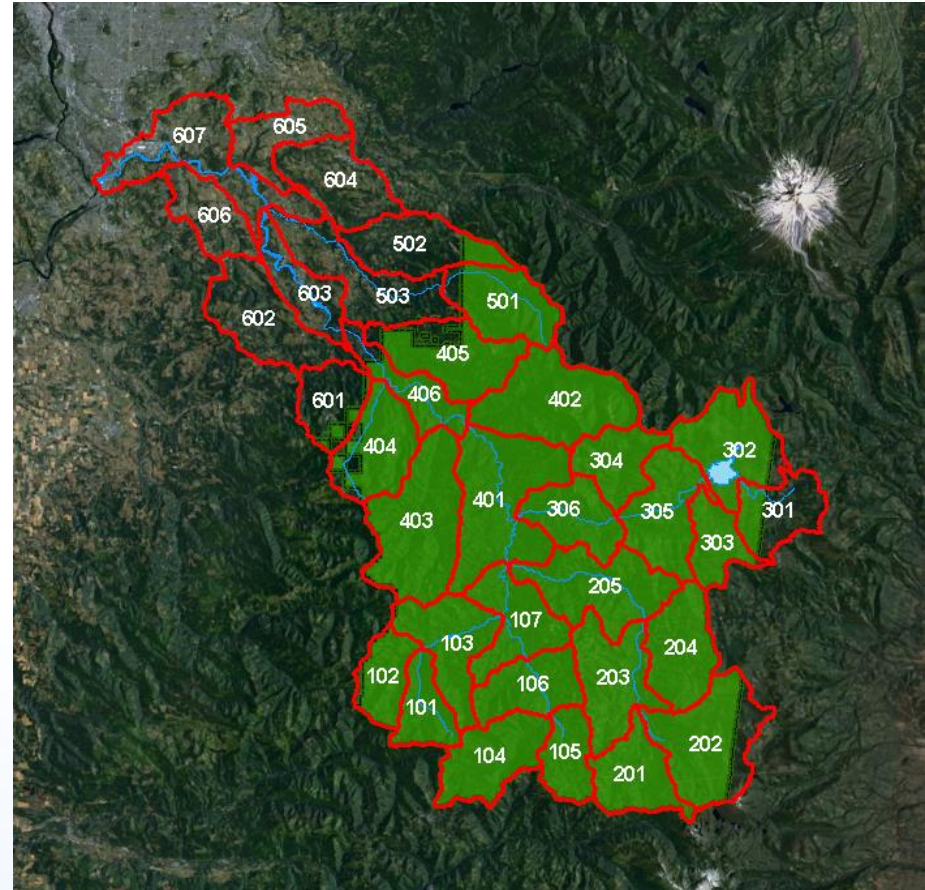
PLM - Methodology



■ Geodatabase

- HUC6 Subwatersheds – RLIS
- Land Use – RLIS, USDA, ODF
- Soils – USDA CropScape
- Imperviousness – USGS

- **Precipitation**
 - SWMM
 - ASOS – National Climate Data Center
 - RAWS – USFS and BLM
 - Pollutant Load Model
 - PRISM – 30 year annual precipitation normals; Oregon State University
- **Pollutant Runoff Concentrations**
 - Stormwater database – ACWA
 - Literature
- **BMP Effluent Quality**
 - International BMP database
 - Literature



Clackamas River Water Providers Load Modeling Tool v.0.1



1) Project Description

Title:

Description:

2) Subwatershed Selection

Subwatershed	Select	Subwatershed	Select	Subwatershed	Select	Subwatershed	Select	Subwatershed	Select	Subwatershed	Select
101	1	201	0	301	0	401	0	501	1	601	0
102	0	202	0	302	0	402	0	502	1	602	0
103	0	203	0	303	0	403	0	503	1	603	0
104	0	204	0	304	0	404	0			604	0
105	0	205	0	305	0	405	0			605	0
106	0			306	0	406	0			606	0
107	0									607	0

To select a subwatershed, set 'Select' value to 1.

3) BMP Selection

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
	×	×	×	×	×	×	×	×	×	×	×	×	×
	Nutrient Mgmt Plan - Ag	Nutrient Mgmt Plan - Urban	Integrated Pest Mgmt	Incentive Program	Conservation Buffer	Streamside Mgmt Area	Water Quality Basin	Bioretention/Biofilter	Media Filter	Impervious Area Reduction	Organic Farming	Drinking Water Protection Zone	Emergency Response Plan
LANDUSE													
AGR	20	0	0	0	0	50	0	0	15	0	0	0	0
COM	0	0	0	0	0	0	0	0	0	0	0	0	0
FDR	0	0	0	0	0	35	0	0	0	0	0	10	0
DPS	0	0	0	0	0	0	0	0	0	0	0	0	0
PUB	0	0	10	0	0	0	0	0	0	0	0	0	0
RES	0	0	0	0	0	0	0	0	0	0	0	0	0
TRA1	0	0	0	0	0	0	0	0	25	0	0	0	0
TRA2	0	0	0	0	0	0	0	0	0	0	0	0	0
TRA3	0	0	0	0	0	0	0	0	0	0	0	0	0
TRA4	0	0	0	0	0	0	0	0	0	0	0	0	0
TRA5	0	0	0	0	0	0	0	0	0	0	0	0	0

4) Save Results

Macro button

Steps

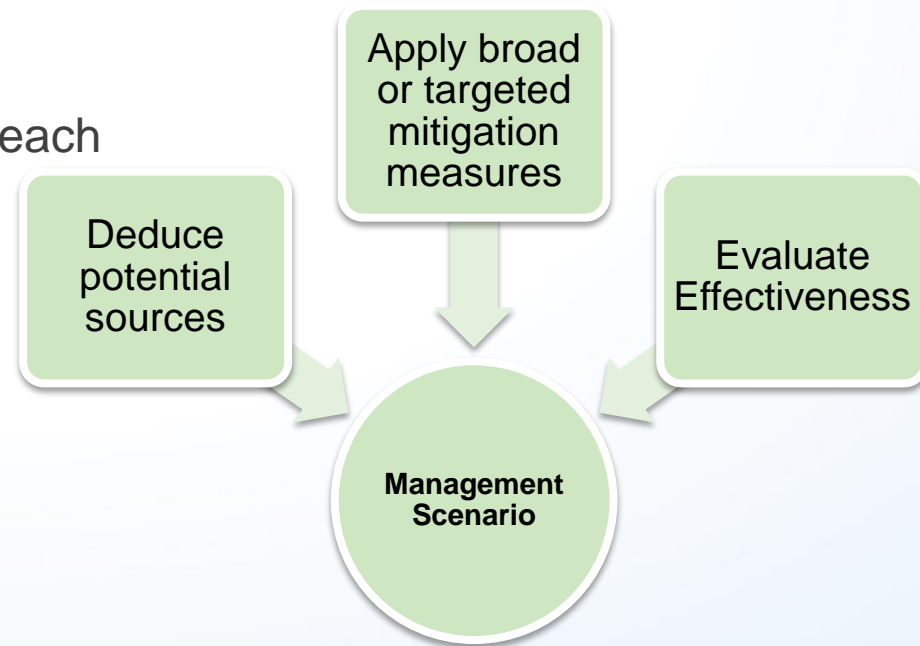
- Provide project information
- Select an individual or a combination of subwatersheds for BMP implementation
- Implement up to nine BMPs per land use in selected subwatersheds
- Attenuation of loads due to in-stream travel
- Output table of annual loads – linked to GIS shapefile

■ Design to Evaluate Program Effectiveness

- Incentive Programs
- Conservation Buffers
- Impervious Area Reduction
- Broad application based on potential reach of program

■ Design to Estimate Target Load Reductions

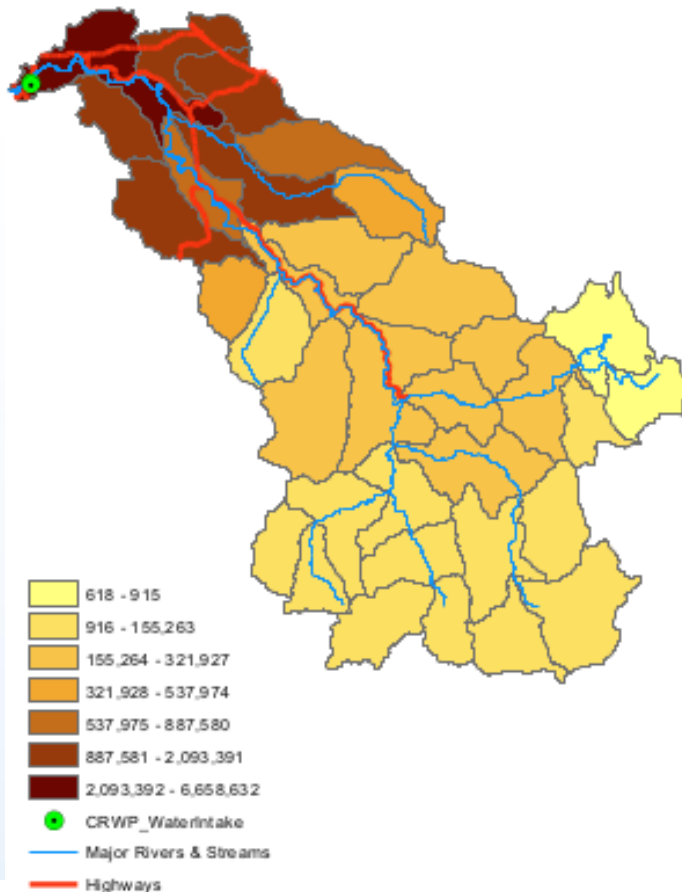
- Metals Management
- Nutrients Management
- Pesticides Management
- Targeted application based on land uses with highest concentrations



- **Scenario 1 - Baseline**
 - Establish current loads
 - Locate sources of loads
 - Account for in-stream attenuation
- **Scenario 2 – Impervious Area Reduction**
 - Build on Scenario 1
 - Apply Impervious Area Reduction to Select Land Uses
 - Review Load Reductions
 - Compare to Scenario 1

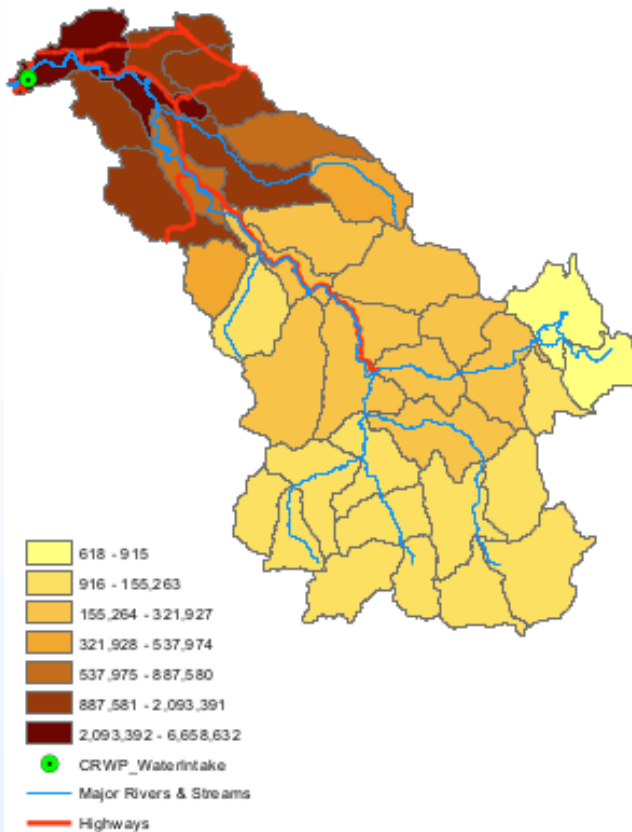


Existing Conditions (TSS) Annual Loads (lbs)

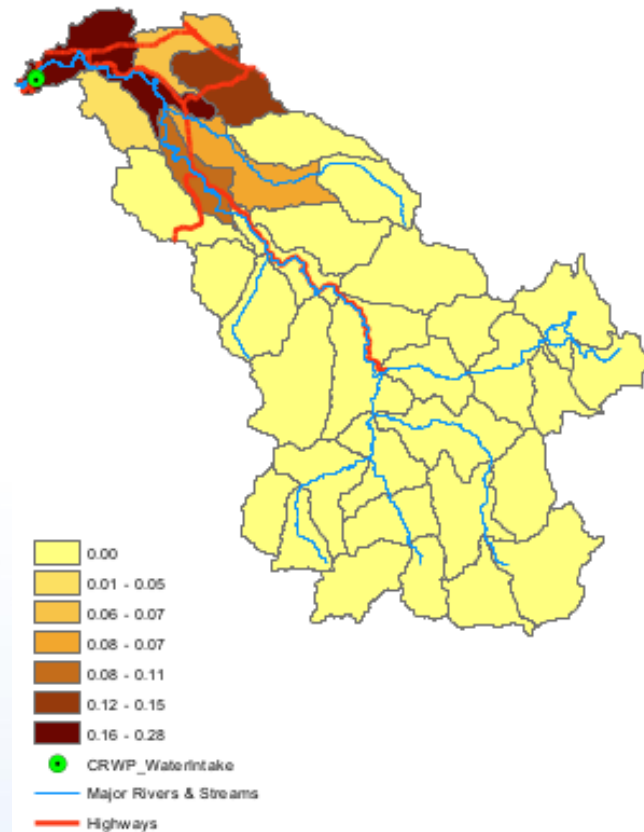


- **TSS and Oil & Grease**
 - Access/roads, urbanization (residential and commercial), agriculture (TSS)
- **BOD and E. Coli**
 - Urbanization, access/roads, agriculture
- **Metals**
 - Urbanization, access/roads
- **Nutrients**
 - Agriculture, urbanization
- **Pesticides**
 - Agriculture and urbanization (e.g. Roundup)
 - Upper basin loading is negligible

**Existing Conditions (TSS)
Annual Loads (lbs)**



**Post BMP (TSS)
Annual Loads (% Reduction)**



- Strategies listed in the Drinking Water Protection Plan (strategies that could utilize the PLM are highlighted red):
 - **Basin Analysis: Understanding of potential threats**
 - Watershed/Pollution load modeling
 - **Education and Research Assistance Subprogram**
 - Point Source Evaluation and Mitigation Subprogram
 - **Nonpoint Source Evaluation and Mitigation Subprogram**
 - This one is big
 - Disaster Preparedness and Response Subprogram
 - **Public Outreach and Information Sharing Subprogram**

Available Source Water Protection BMPs in the PLM

■ Structural

- Conservation Buffers
- Streamside Management Areas
- Water Quality Basins
- Bioretention/Biofilters
- Media Filter
- Impervious Area Reduction



■ Programmatic

- Nutrient Management Plans
- Integrated Pest Management
- Incentive Program (septic)
- Organic Farming
- Emergency Response Plan
- Drinking Water Protection Zone



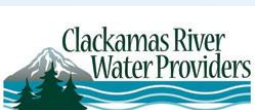
- **Quantitative**
 - Target load reductions
 - Efficacy of proposed programs
 - Cost/benefit ratio estimate

- **Qualitative**
 - Education and Outreach
 - Funding opportunities
 - Linkages to pollutants



Thank You

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