INTRODUCTION
Arsenic (As) is a semi-metal element that exists in both organic and inorganic form. As is considered highly toxic to humans and wildlife and can cause acute and chronic illness. Common sources of As include contaminated drinking water, contaminated food, air particulates and contaminated soil. As is found in both organic and inorganic form and can naturally accumulate in the environment or be released by anthropogenic pollution from metal smelting, agricultural applications, and combustion of fossil fuels. For almost 100 years Vashon-Maury Island was exposed to inorganic As, cadmium and lead contamination released by the ASARCO copper smelter as a byproduct of production. Vashon island currently offers free removal and safely and effectively removing arsenic and associative metals.

METHODS
Salix Screening for Arsenic Tolerance
Objective: to quickly screen Salix species for As tolerance in hydroponic solution to identify candidates for further study.

- Screenings were conducted in hydroponic solution spiked with arsenate (AsV)
  - AsV was a single concentration of 500 uM (~37.5 ppm)
  - Solution was changed weekly.
- Each experiment had six replicates.
- Each experiment lasted four weeks.
  - Two weeks untreated (establishment of roots)
  - Two weeks treated
- Tolerance was assessed using:
  - Change in [AsV] concentration in the solution, analyzed through ICP-OES.
- Controls
  - Plants with no AsV (x3)
  - Solution with AsV, not plant (x1)
- Species/ Clones screened:
  - S. hookeriana
  - S. sessilifolia

Salix Screening Results

Endophyte supported phytoremediation holds great potential for safely and effectively removing arsenic and associative metals. Utilizing native Salix species further enhances viability in the Puget Sound region. While the Salix screening experiment results were inconclusive, the assay provided data that can be utilized to develop improved protocols. To properly assess Salix accumulation of As in future screenings, the plant tissues itself should be analyzed to indicate accumulation in the plant tissue. Likewise, the results of the soil sample analysis reveals possible ways to improve sample preparation and execution of the acid digest, including oven drying and fine grinding of the soil sample. Analysis of the soil samples do indicate As contamination as expected, as well as associative metals including cadmium and lead. Further research is warranted to better understand the capabilities of endophyte supported phytoremediation of As contaminated soils on Vashon-Maury Island using Salix species.

RESULTS
Salix Screening
Salix screening results were inconclusive (see table 1: Salix hydroponic ICP-OES analysis results). Analysis of the treatment samples reflected higher than anticipated results. Further consideration brought to light an issue with the experiment design. Due to transpiration, As concentrations in the hydroponic solution resulting in the abnormally high readings. The final solution results indicated ppm concentrations of 85 – 164 ppm AsV.

Table 1: Salix hydroponic ICP-OES analysis results

<table>
<thead>
<tr>
<th>Species/Clones</th>
<th>AsV (ppm)</th>
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<tbody>
<tr>
<td>S. hookeriana</td>
<td>85 – 164</td>
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<td>S. sessilifolia</td>
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CONCLUSIONS
Endophyte supported phytoremediation holds great potential for safely and effectively removing arsenic and associative metals. Utilizing native Salix species further enhances viability in the Puget Sound region. While the Salix screening experiment results were inconclusive, the assay provided data that can be utilized to develop improved protocols. To properly assess Salix accumulation of As in future screenings, the plant tissues itself should be analyzed to indicate accumulation in the plant tissue. Likewise, the results of the soil sample analysis reveals possible ways to improve sample preparation and execution of the acid digest, including oven drying and fine grinding of the soil sample. Analysis of the soil samples do indicate As contamination as expected, as well as associative metals including cadmium and lead. Further research is warranted to better understand the capabilities of endophyte supported phytoremediation of As contaminated soils on Vashon-Maury Island using Salix species.

ACKNOWLEDGEMENTS
Special thanks to Rob Tournay and Dr. Sharon Doty for their mentorship and guidance.

BIBLIOGRAPHY

Soil Analysis
Soil analysis indicated the majority of the area sampled was below the state mandated clean-up threshold for at 20 ppm. However, analysis performed separately by a private lab had higher results (see table 2: Soil Analysis Results, comparisons highlighted in red). Some possible explanations for the difference in results include the weather conditions at time of collection (soil samples were collected in March during rain, AEMlab samples were collected in May in dry conditions), soil drying techniques (air dry vs. oven dry) as well as overall special equipment availability and experience conducting an acid digest to prepare samples for ICP-OES analysis.

Table 2: Soil Analysis Results

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<tr>
<th>Property</th>
<th>Soil-pH</th>
<th>Organic Matter</th>
<th>Total Carbon</th>
<th>Total Nitrogen</th>
<th>Available P1</th>
<th>Available K</th>
<th>Available Mg</th>
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<th>Available Si</th>
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