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Quantifying Removal of Selenium by Aquatic Plants via Methylation and Volatilization in San Joaquin Marsh (SJM)

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Publication Date

2026-04-15

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Quantifying Removal of Selenium by Aquatic Plants via Methylation and Volatilization in San Joaquin Marsh (SJM)

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Project Description

Goal: Quantify the amount of selenium (Se) removal taking place via volatilization in the SJM ponds.

- Plexiglass chambers are to be deployed over existing plant matter in the SJM.

Background

- **Project Location:** San Joaquin Marsh in Upper Newport Bay Watershed
- Selenium Pollution is naturally occurring through urban runoff and groundwater
- **Marsh Mass Balance:** Se is presumed to be trapped in the sediment, taken up by plants, and volatilized as methylated Se. The exact method of this is still unknown.

Significance

- Demonstrates plant-driven selenium removal through natural volatilization
- Provides quantitative flux data under real wetland conditions
- Evaluates a **low-cost, sustainable, nature-based remediation strategy**

Approach and Design

Construct a floating plexiglass chamber.

- Enclose bulrush cattail in the marsh.
- Connect top chamber wall to a vacuum pump.
 - The pump draws air from the enclosed headspace through an array of activated charcoal filters.

The filters will then be analyzed in the laboratory using ICP-MS to detect and quantify the volatilization of selenium.

- Charcoal filters collect volatilized selenium over set time period

Constraints:

- A** Chamber stability in wind and water movement
- B** Temperature affecting volatilization rates
- C** Air leakage and flow control affecting measurement accuracy

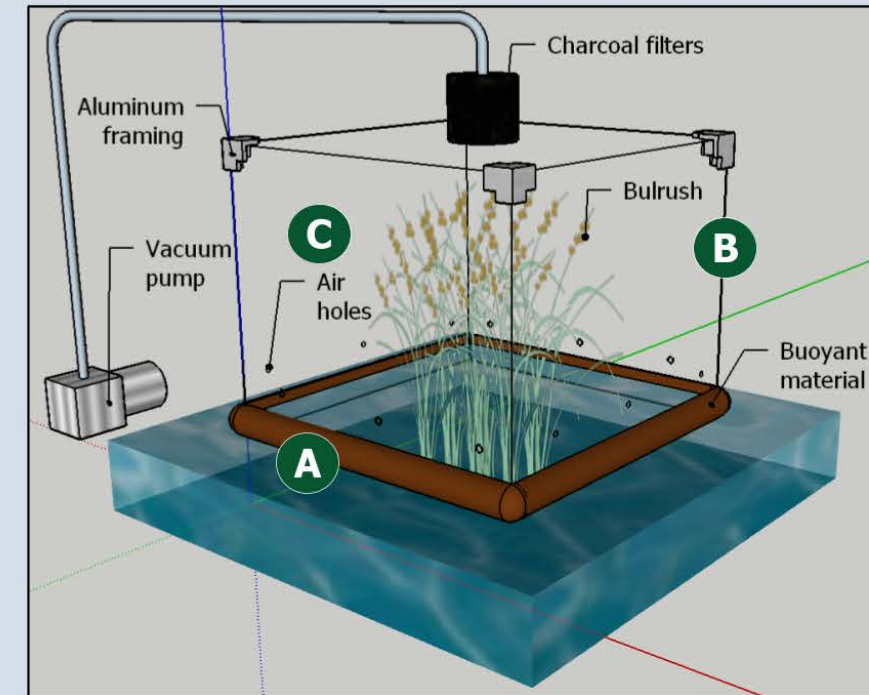
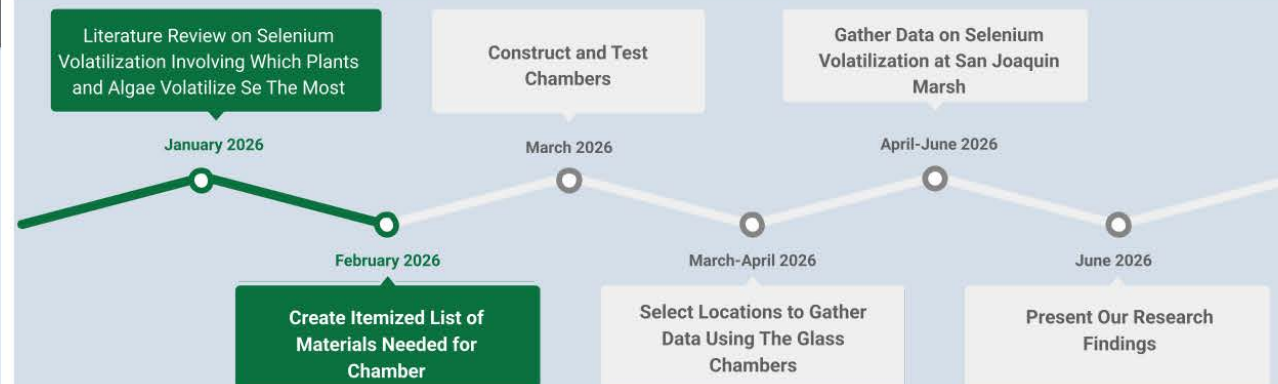


Figure: 3D SketchUp model of premature chamber design

Timeline



Next Steps

- **Review and modify** itemized list of materials for the glass chamber.
- **Construct and test** prototype chamber to finalize design
- **Select locations** to set up glass chambers.
- **Gather data** at the SJM using the glass chambers at the selected locations.

FUN FACT: Did you know that there is a global market for selenium with an 8.8% growth rate?