

TECHNICAL MEMO

To: Kitsap County
Long Lake Management District

From: Tetra Tech, Inc.
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Date: July 9th, 2010

Subject: 2019 mid-Summary update

Monitoring by Citizen Volunteers

Citizen volunteers have continued in 2019 to conduct lake monitoring on a monthly basis (May through October, as in 2018) for dissolved oxygen (DO), conductivity, temperature, and pH at three sites in Long Lake and in the inlet of Salmonberry Creek (Figure 1). At the lake sites, these parameters are measured at 1-meter intervals within the water column. Citizens record secchi disk depth, or transparency, at each station, and made notes on the weather at the time of sampling and water condition. At the mid-lake site, citizen volunteers also collect a water sample at a depth of 0.5 meter for laboratory analysis. From mid-May to mid-October, a second water sample are collected at the mid-lake site at a depth of 2.5 meters. These lake water samples are analyzed to determine total phosphorus (TP) concentrations and concentrations of soluble reactive phosphorus (SRP) and chlorophyll (chl). During each monitoring event, citizen volunteers also collected a grab sample from Salmonberry Creek. The creek water sample are analyzed for TP. All samples are packed with ice and sent to IEH Analytical Laboratory on the same day they are collected.

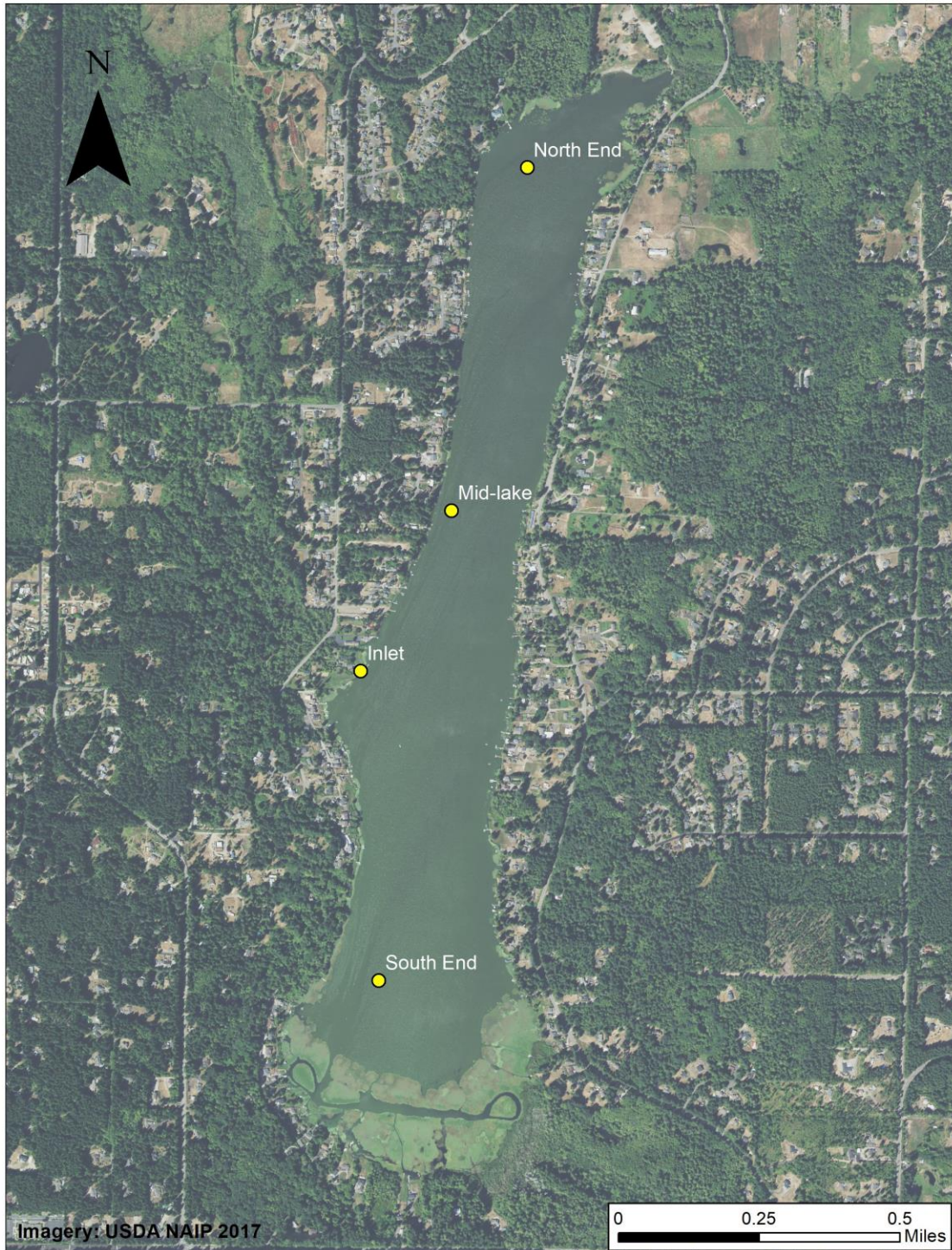


Figure 1. Map showing sampling locations.

Aquatic Plant Management

In June 2018, Tetra Tech staff and citizens conducted an aquatic plant survey of Long Lake (Figure 2). Brazilian elodea (*Egeria densa*) was the dominant submersed plant observed during the survey and was observed throughout the lake. Lilies are abundant in the nearshore areas near each end of the lake with the invasive

fragrant white lily (*Nymphaea odorata*) as the dominate species. The native yellow pond lily, *Nuphar lutea*, covered less than 30% of the emergent plant beds. Eurasian water milfoil (*Myriophyllum spicatum*) was observed throughout the lake but in small groupings of relatively isolated plants. This was also the case for the invasive Curly-leaf pondweed (*Potamogeton crispus*). Several other pondweed species were observed throughout the lake with a relatively small percent cover (Figure 2).

On July 1, 2019 another aquatic plant survey was conducted. All the aquatic plant species mapped in 2018 were again present with the following changes:

- The non-native invasive fragrant white lily (*Nymphaea odorata*) was a dominate species and had expanded its near shore littoral coverage significantly on the west side of the lake and in the north east littoral areas.
- Two new species, both native have taken up dominance with a third native species already present *Potamogeton zosteriformis* (flat stem pond weed), a within the mid depth littoral areas especially on the east side of the lake but are also expanding on the west side. These two new species are *P. pectinatus* and *P. filiformis* (sago pondweed and slender-leaved pondweed)
 - These three species although native have grown to extreme densities that exceed a balanced habitat and will adversely impact water quality.
 - This sudden production is due to several drives including clearer water, abundant solar energy, and nutrients within the shallow sediments.
 - Over time bring these species back into a balanced littoral habitat will be easier than controlling non-native species, such as the white lily.

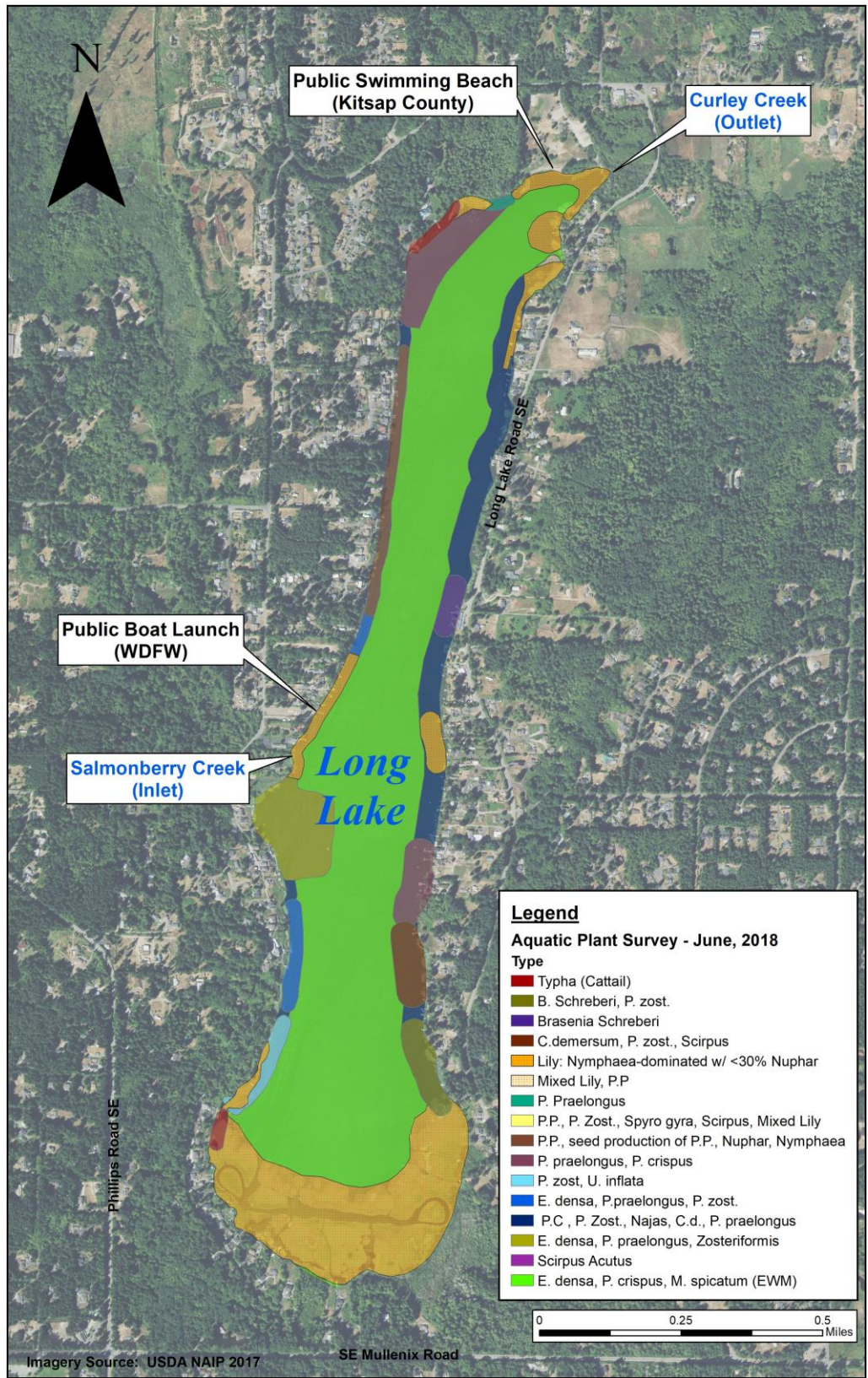


Figure 2. Aquatic Plant Distribution from June 2018 Survey.

Lake Management Activities

Aquatic plant management activities restarted in 2018 with a late growth season treatment of 25% of the shallow littoral area targeting the invasive, non-native (AIS-aquatic invasive species) white lily, Brazilian elodea, and Eurasian water milfoil (Figure 3). Also, included in this treatment were excessively dense beds of native pond weed that also included a small amount of targeted invasive, non-native species.

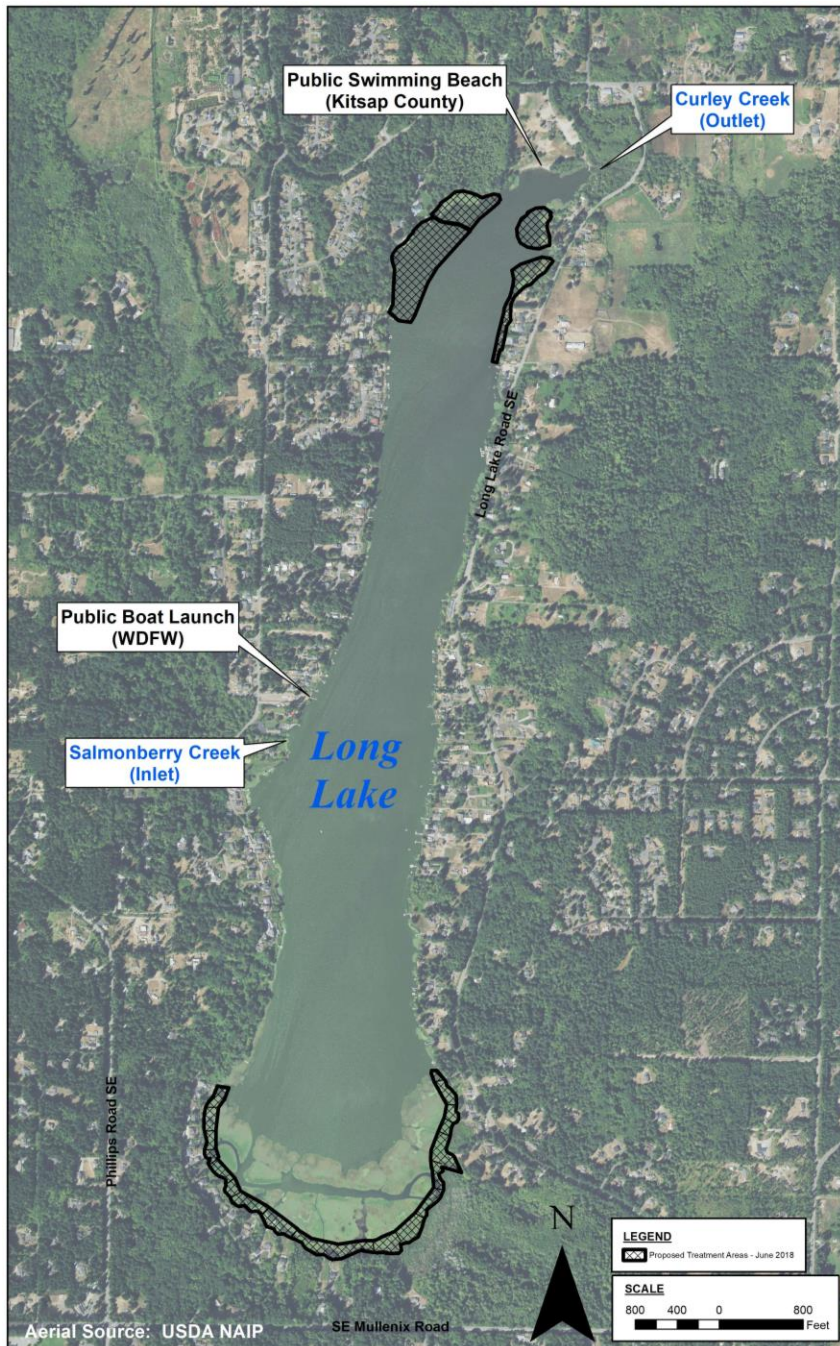


Figure 3: Aquatic plant treatment areas (hatched areas) in 2018.

The 2019 aquatic plant management is currently in the advanced planning stages. Based upon the July survey results targeted areas will be the expanded white lily beds and the extensive native pondweed coverage on both the west and east shoreline littoral areas.

Phosphorus management in 2019 was conducted during the week of April 22 via a whole lake alum treatment to remove phosphorus from the water column and to inactivate the release of phosphorus from the lake sediments to reduce algal production. This treatment was a relatively low dose at 5 mg Al/L throughout the lake due to the increase in alum cost resulting from tariffs on the importation of aluminum from Canada. Nevertheless, there was a significant increase in water clarity due to the reduction in algal production.