Lone Lake Algae Management Plan
Project Information Meeting

August 23, 2018

Sponsored by:

DEPARTMENT OF ECOLOGY
State of Washington

WHIDBEY ISLAND CONSERVATION DISTRICT
WICD
preserving natural resources

Overview

- Who are we?
- Why are we here?
- Watershed/Lake Characteristics
- Project background
- Algae blooms
- Review current grant-funded project
- Q & A

What are conservation districts?

- A unique form of locally led, non-regulatory government
- Assist private landowners with voluntary actions
- Partner with other entities to implement projects
- Protect natural resources for future generations

We help landowners meet their objectives while protecting soil and water quality

WICD Provides:

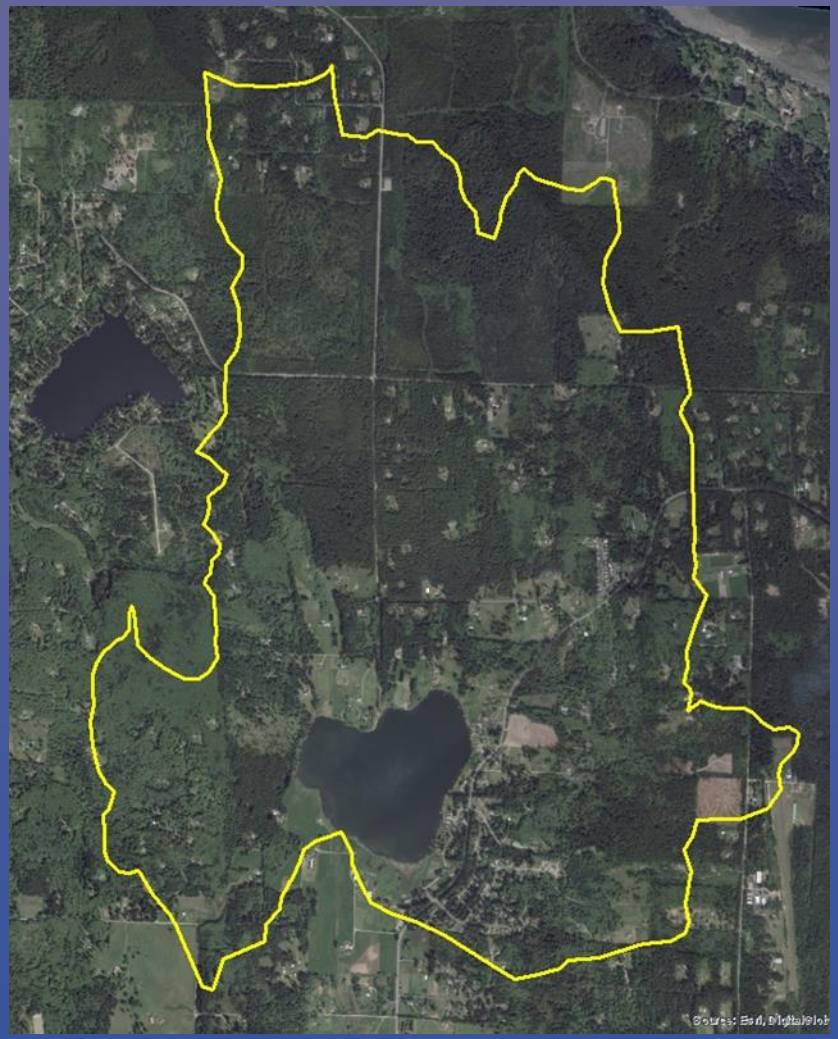
- FREE Technical Assistance for
  - Farms
  - Forests
  - Water Issues
  - Native Plants
  - Bluffs & Shorelines

- Access to state and federal cost-share funds for implementation
- Educational workshops and publications

Lone Lake Algae Management Project

- Dept of Ecology Freshwater Algae Control Program
- Algae Management Plan
- $50,000 grant
- July 1, 2018 – June 30, 2020
- 25% match = $16,666
- Mostly in-kind labor

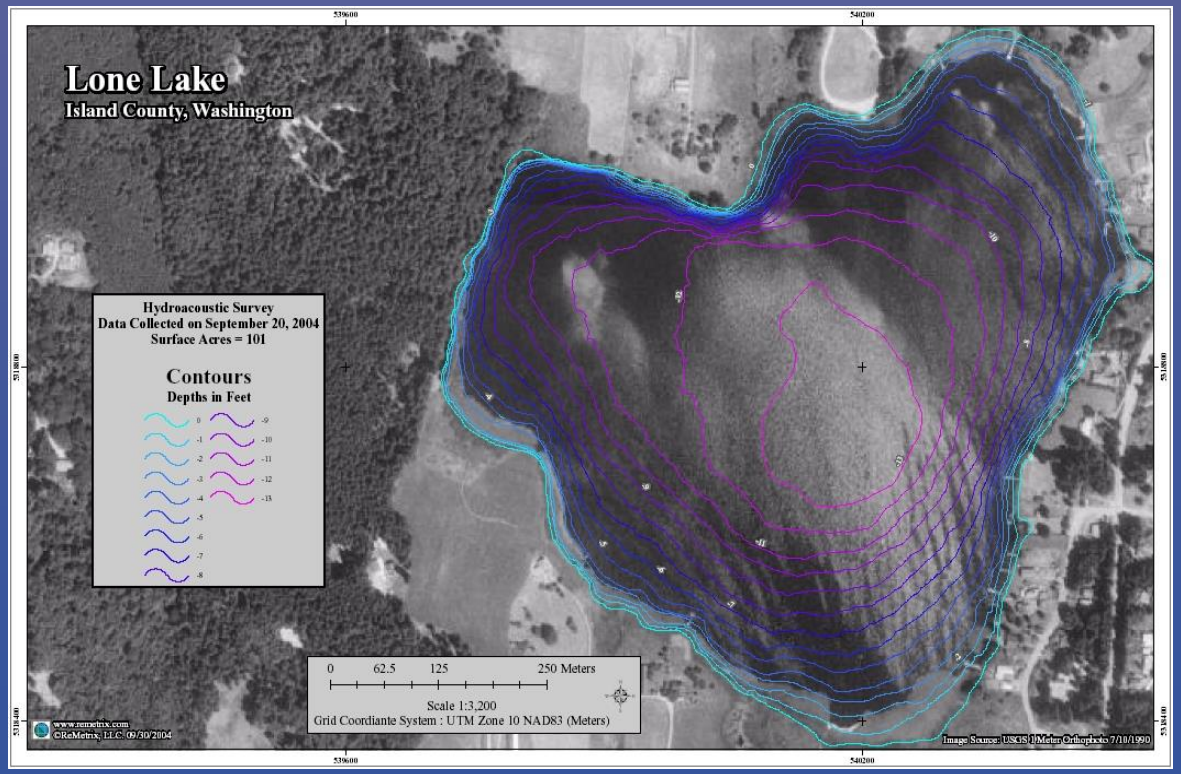
Watershed Characteristics



- 2,430 Acres
- Land uses
  - Forest (~90%)
  - Residential (~2%)
  - Farm (~6%)
- Well-drained soils
  - Low runoff
  - Septic systems

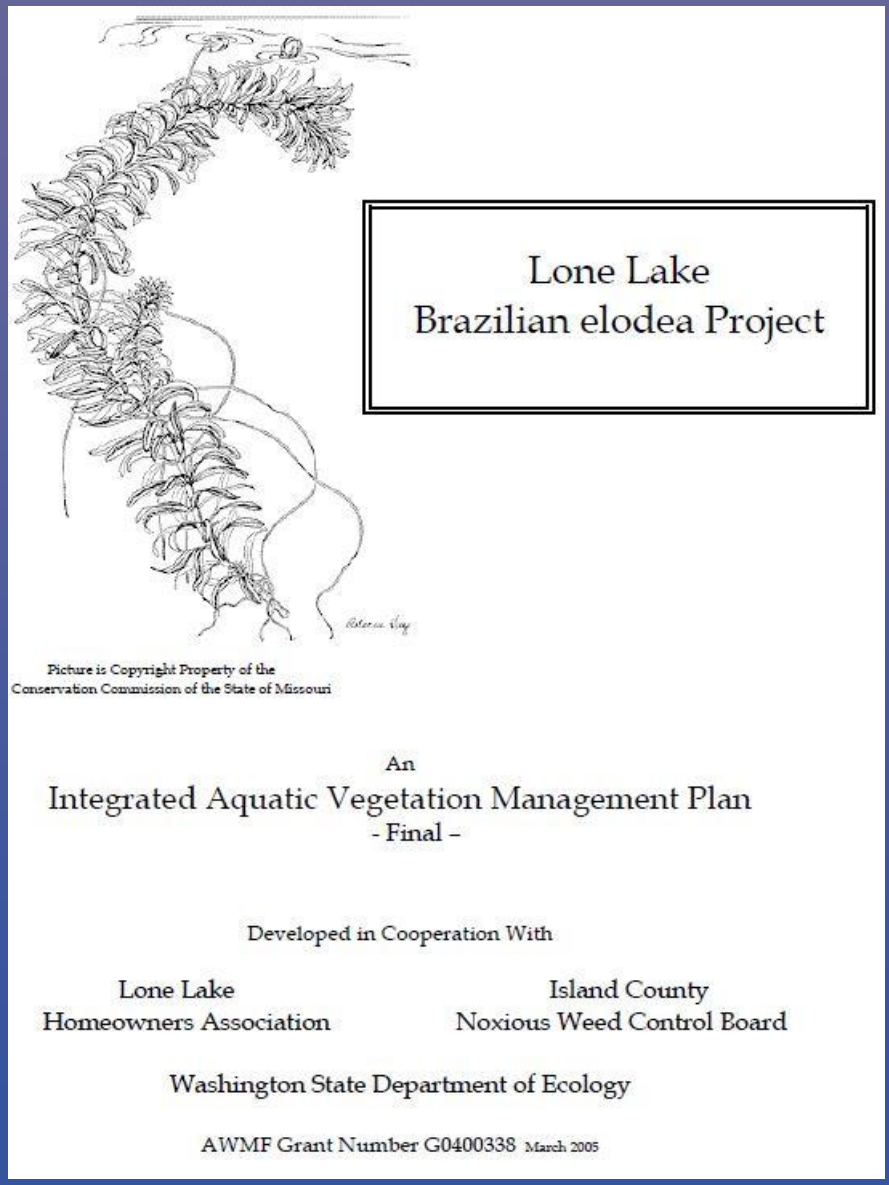
Lone Lake Characteristics

- Wide (2,700 feet across, 101 acres)
- Shallow (17 feet deep maximum)
- Fed by groundwater and several seasonal streams
- Engineered outlet
- Highly productive
- Trophy trout fishery

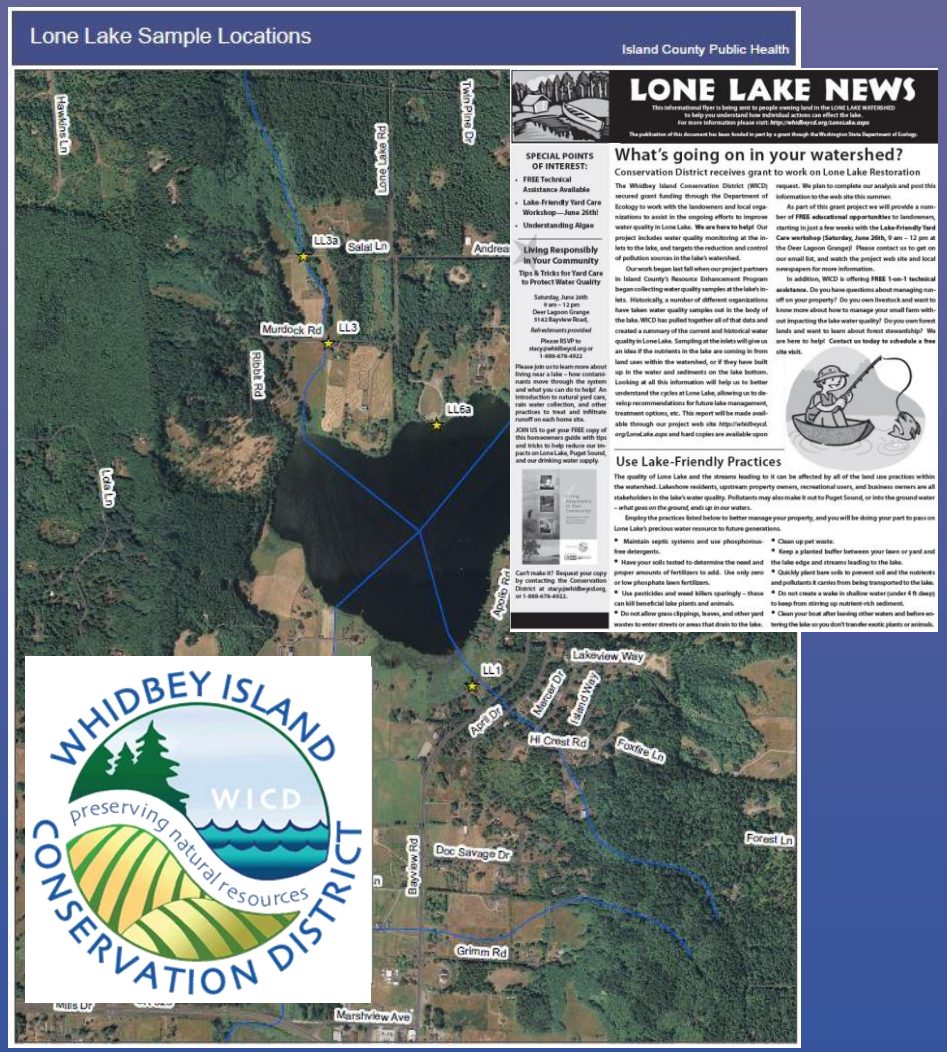


Project background

- 1996 – 2003 *Egeria densa (*Brazilian elodea) invasion
- 2003 – 2005 Integrated Aquatic Vegetation Management Plan
- 2005 – 2007 Herbicide (Fluridone) treatments
- 2007 & 2009 ~800 Triploid (sterile) Grass Carp stocked



Project Background



- 2009 – 2011 WICD grant-funded project
- Reduce & control of nutrient sources
- Watershed survey
- Water quality sampling
- Technical assistance
- Public outreach & education

Project Background

- Herbicide and carp treatments successfully eradicated Brazilian elodea but…
- *Carp eliminated nearly all other submerged plants*
- Lake has low flushing capacity (inlets/outlet)
- Exacerbates eutrophication process
- Shifts lake to algae-dominated state

Fish Kills & Algal Blooms

factors contributing to fish kills

Low dissolved oxygen
due to oxygen consumption associated with algal blooms, chemical demands, or poor mixing.

Algal toxins
toxins produced by some species, under certain conditions

Contaminants
eg. hydrogen sulfide, carbon dioxide, ammonia, methane and other contaminants (e.g. metals)

Physical irritants
suspended sediment, algal cells and bacteria interfere with fish gills

factors contributing to algal blooms

Nutrients
food for algae; sources can be natural or include rural and urban inputs

Water temperature
higher temperatures promote growth and thus proliferation of algae

Reduced flushing
Nutrients more commonly accumulate in poorly flushed or mixed areas

COMMON LOCATIONS OF BLOOMS & FISH KILLS

- In depositional areas (poorly flushed), e.g. lower catchments and near barriers
- In conjunction with salt wedge (due to low oxygen condition at bottom)
- In urbanised or rural catchments

COMMON TIMES FOR BLOOMS & FISH KILLS

- Spikes in nutrients (food for algae) and other contaminants often occur following rainfall (typically first flows of season). Flow stirs up sediment and washes contaminants in from the catchment
- Summer is a common period as higher temperatures increase growth rate of phytoplankton and bacteria

BARRIERS TO FLOW

- Barriers to flow create areas where organic material and nutrients accumulate (deposition areas)
- Barriers can also restrict the ability of biota to avoid poor water quality
- *Low Oxygen* conditions often occur in deposition areas

LOW OXYGEN

- Low oxygen conditions typically occur in deeper or stratified areas, or around *Barriers to Flow* (poorly mixed). Salinity stratification is a common cause of reduced mixing in estuarine environments.
- Low oxygen condition results in favourable conditions for breakdown of organic material by bacteria, which can reduce oxygen (due to respiration) and release bound contaminants.

MICRO & MACRO ALGAE BLOOMS

- Algal growth requires nutrients and light. Higher temperatures can promote growth.
- Environmental effects from blooms include low oxygen (due to algae respiring at night), excess oxygen (due to algae photosynthesising during day), and the possibility of toxins produced by some species, which can affect biota.
- Social effects include odour and aesthetics
- Excessive growth of aquatic macrophytes can also occur; having similar causes but minor negative environmental effects.

DECAY OF ORGANIC MATERIAL

- Effects from decay of organic material include low oxygen (due to growth of bacteria)
- Sources of organic material include vegetation, eroded soils and animal wastes from the catchment (natural, rural and urban sources) and large inputs following crash of *Micro & Macro Algal Blooms*

Image source: http://www.water.wa.gov.au/__data/assets/image/0003/3999/Factors-contributing-to-fish-kills-and-blooms-.jpg

Project Background

- 2010-2013 Fishing clubs removed 44 carp
- 2013-2016 Carp exclusion project
  - Desired plants recovered in exclusion areas
- 2017 Bow-fishers removed 16 more carp
- 739 fishing hours to remove 60 carp (12 hrs/fish)
- Negative impacts to shoreline landowners (lights)

Project Background

- 2016 – Massive fish kill (trout) after dense algae bloom
- 2017 – DO levels exceed state standards
- 2017 - 8 of 10 algae samples exceed state standards
- Forced lake closure
- Significant impact on lake users and local economy

Project Background

- Carp 8-10 year lifespan
- Mortality 5% per year
- Current estimate 4/acre
  - 5/ac recommended for invasive maintenance
- Native plants recovering well
- No reports of invasives
- Carp expected to die off naturally over next few years

Whitestem Pondweed
(Potamogeton praelongus)

Project Background

- Eliminating aquatic vegetation with herbicide and grass carp treatments substantially changed lake chemistry
- Total Phosphorous increased nearly 5 times after treatment
- Total Nitrogen increased nearly 24 times greater after treatment
- TN:TP ratio averaged 16.1 before treatment and 7.3 after
- Suggests a shift to a nitrogen-limited state that benefits nitrogen-fixing cyanobacteria (toxic algae)

Cyanobacteria Blooms

- Commonly known as Blue-Green Algae
- Reproduces rapidly
- Often looks like green paint floating on the water
- Can be bright green, bluish, brownish or reddish green
- Blooms most common in summer and fall but can occur anytime

Slide provided by Island County Public Health

Toxic Blooms

- Not all blue-green algae is toxic
- Range of toxicity
- Can be non-toxic one day, toxic the next
- Common types of algae-produced toxins:
  - Microcystins are a hepatotoxin; responsible for most human & animal poisonings
  - Anatoxin-a is a neurotoxin; can be lethal
- Exposure by contact or consumption

Symptoms of Toxicity

Neurotoxins:

- In animals signs may include:
  - weakness, staggering, difficulty breathing, convulsions, and death
- In humans signs may include:
  - Muscle cramps, numbness of the lips, tingling in fingers and toes, and dizziness

Hepatotoxins:

- Nausea, vomiting, or acute liver failure

Other toxins:

- Irritants that may affect the skin, GI tract, or any exposed tissue

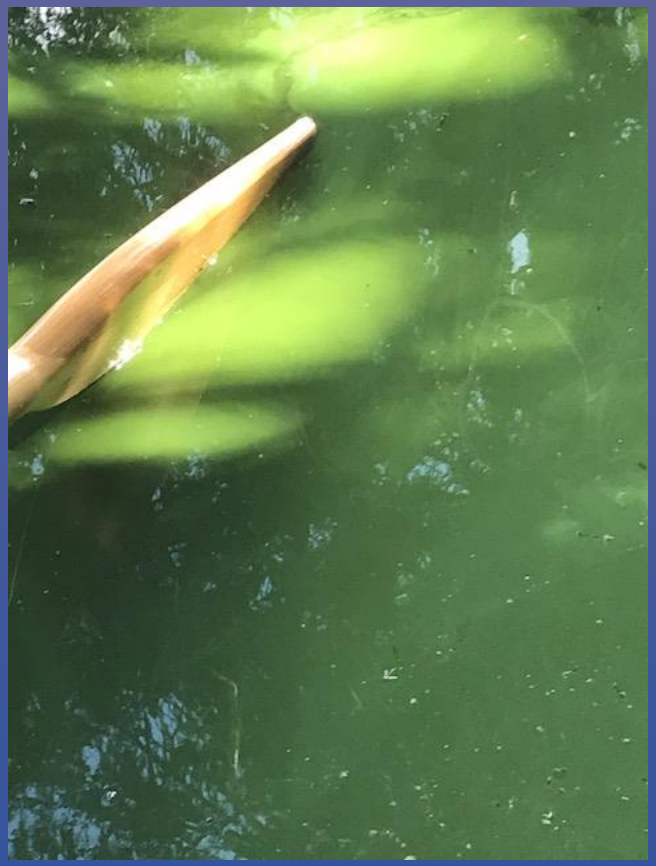
Lone Lake Algae Blooms
2006

Slide provided by Island County Public Health

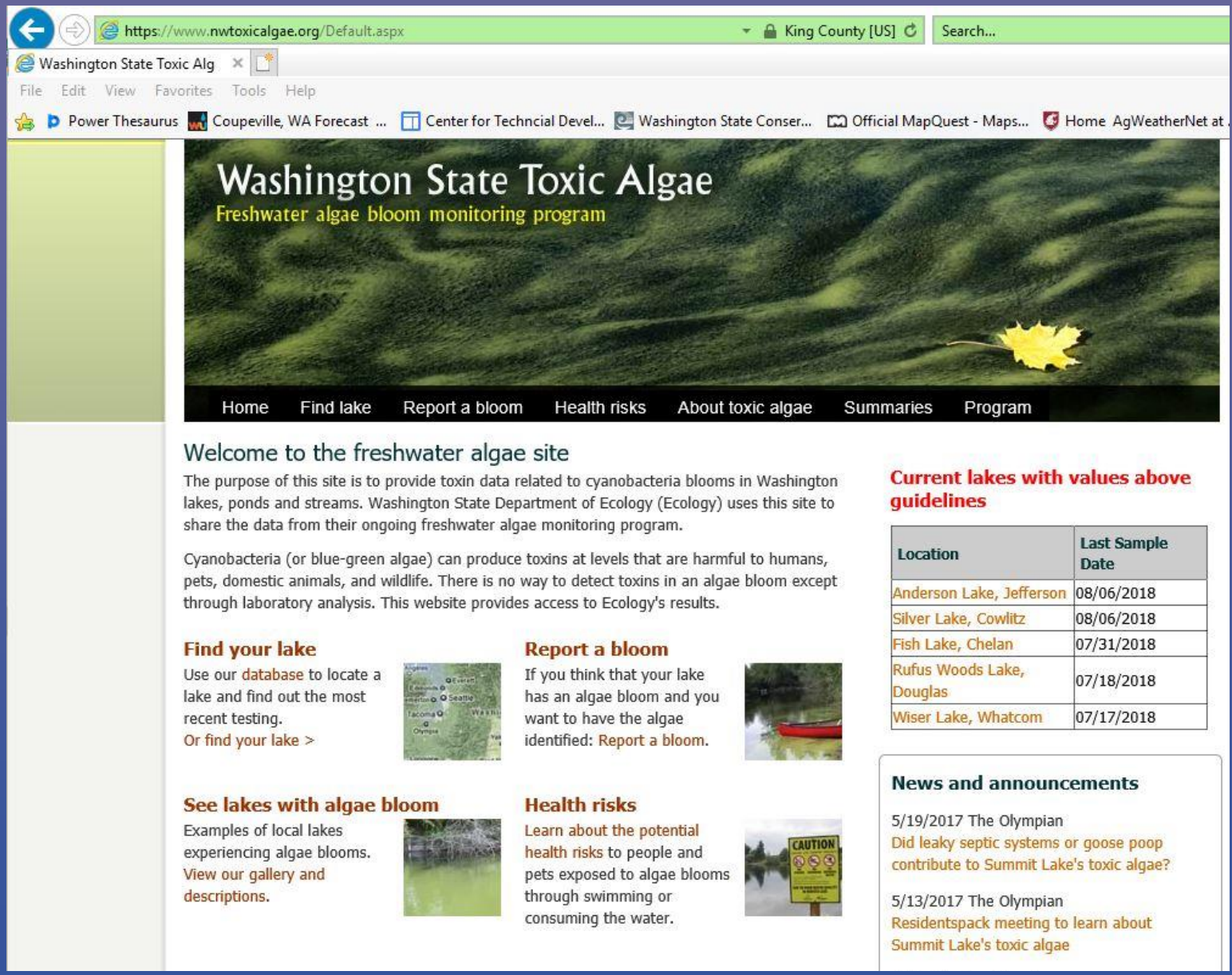
Lone Lake Algae Blooms

2010

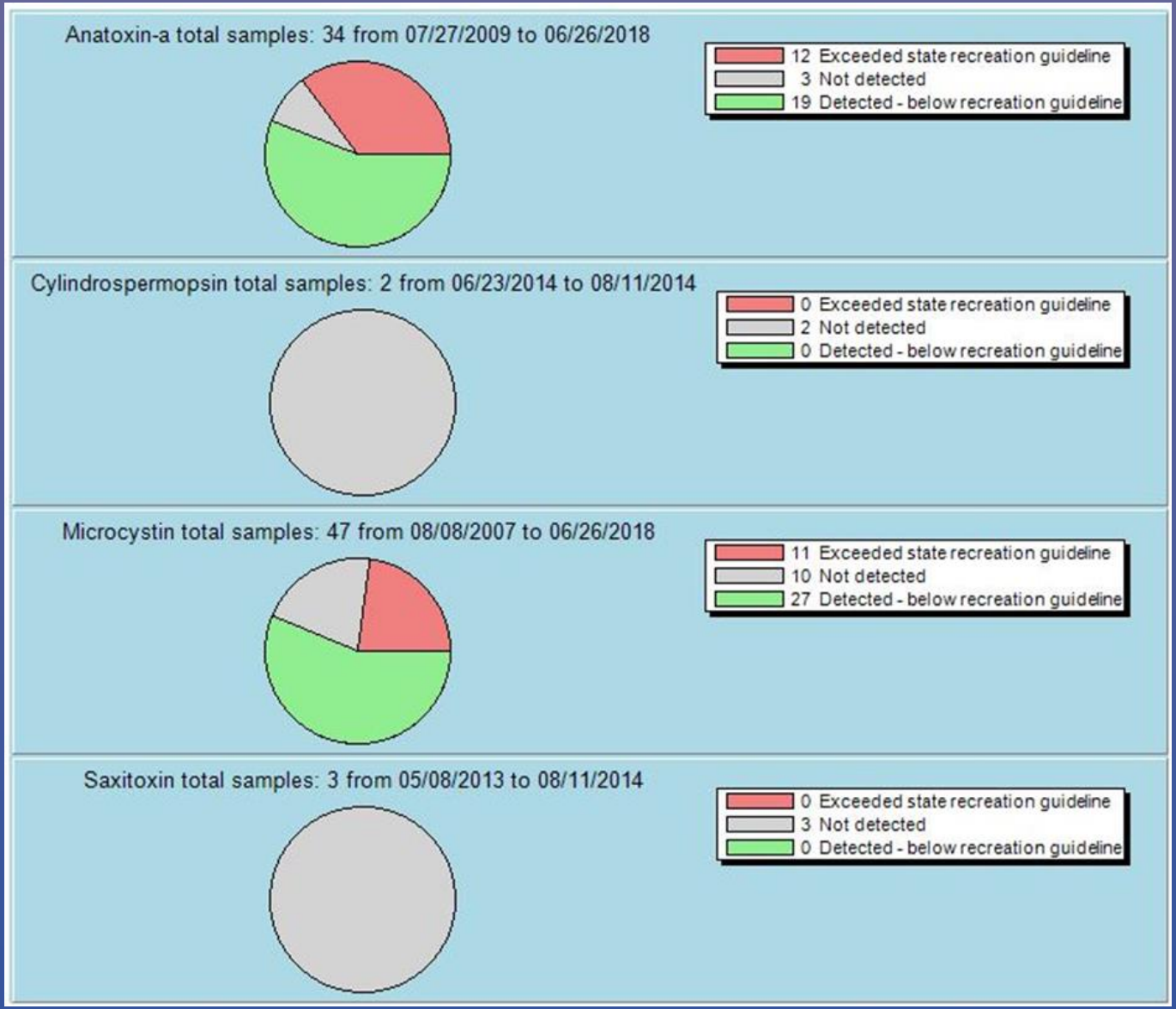
2017



www.nwtoxicalgae.org



Lone Lake Algae Monitoring



Lone Lake Algae Management Project

GOAL: *To improve water quality and reduce toxic algae blooms for the enhancement of mutually beneficial uses (quality of life, habitat, recreation, aesthetics)*

OBJECTIVES:

– Build on past & ongoing efforts

– Fill data gaps

– Involve stakeholders

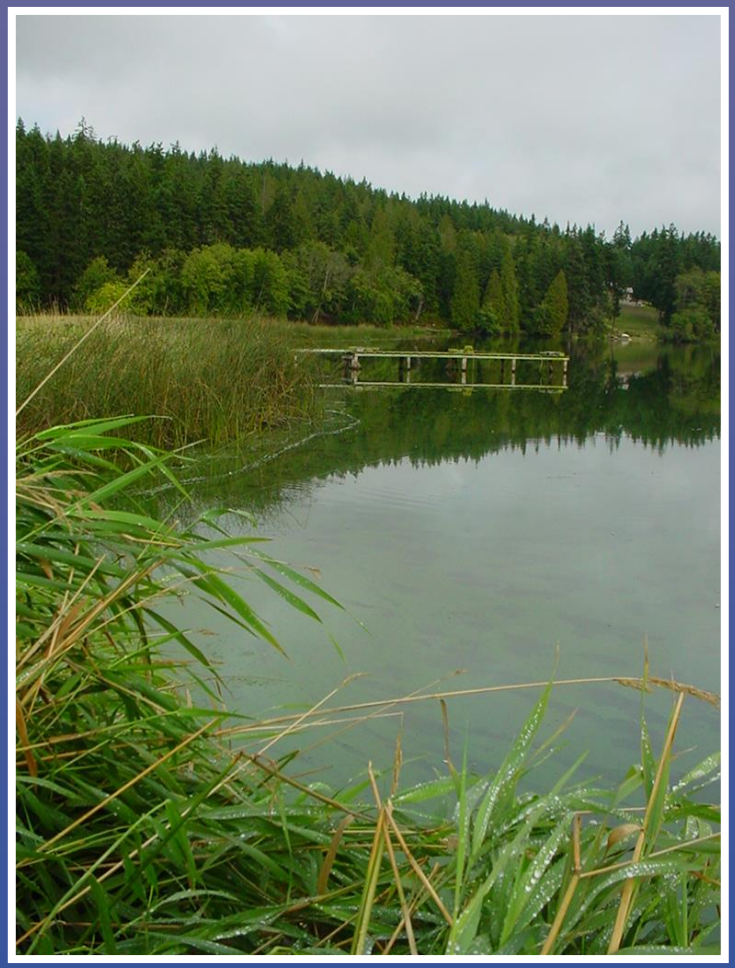
– Develop a strategy

Project Partners

- Landowners
- Fishing Clubs
- Island County Public Health
- WA Dept of Ecology
- Other stakeholders

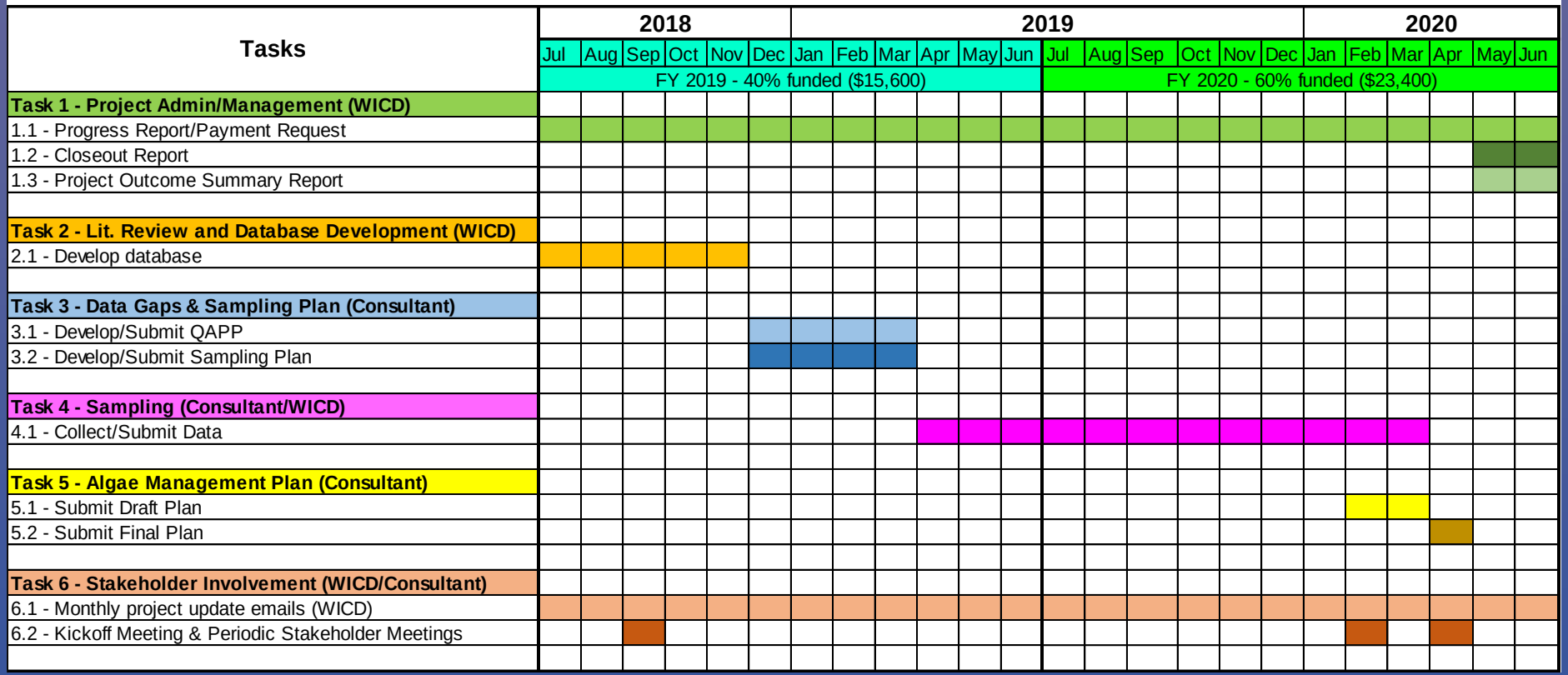
Tasks

- Outreach & stakeholder involvement
- Literature review & database development
- Data gap identification & sampling plan development
- Sampling
- Management plan development



Project Timeline

Lone Lake Algae Management Project



Current Status

- Created project webpage
  - www.whidbeycd.org/lone-lake-algae-management
- Gathering data & developing database
- Published Request For Proposals
  - Seeking to hire consultants
  - Proposals due Aug 31st
- Project kickoff meeting

Next Steps

- Develop current stakeholder/volunteer contact lists
- Provide regular updates
- Hold periodic meetings
- Hire consultant
  - Contract in September
  - Identify data gaps
  - Create environmental sampling plan
  - Conduct sampling
  - Produce a predictive model
  - Develop strategies and a management plan

QUESTIONS?

www.whidbeycd.org/lone-lake-algae-management

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