Fernan Lake Management Plan
Final Draft

Jan 28, 2025

Presenter: Ryan Van Goethem – EutroPHIX
Partners: AquaTechnex LLC.

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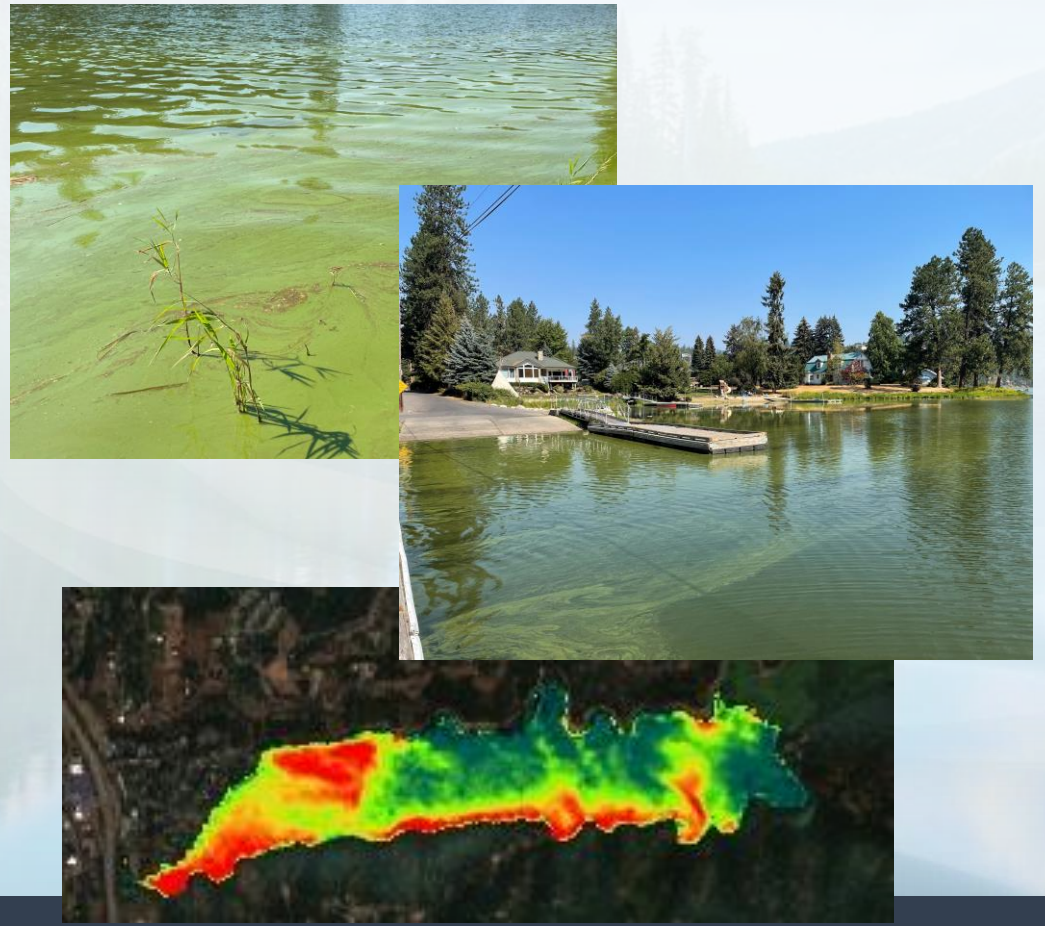
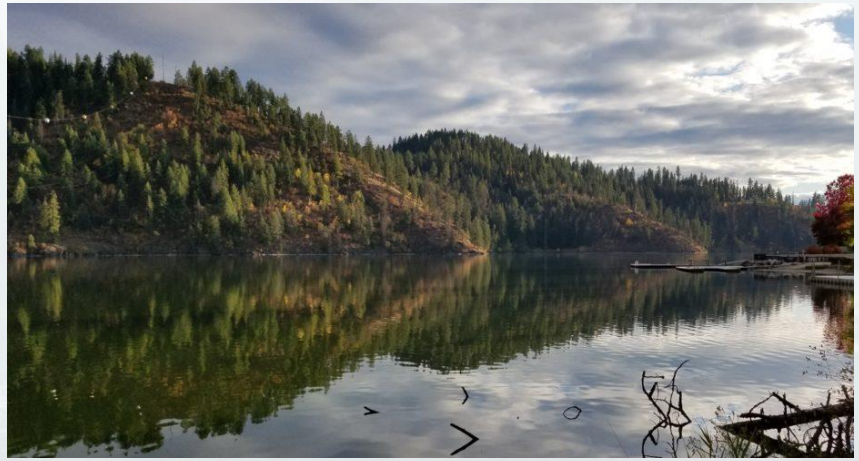
Clean water, safe and enjoyable summers at Fernan Lake





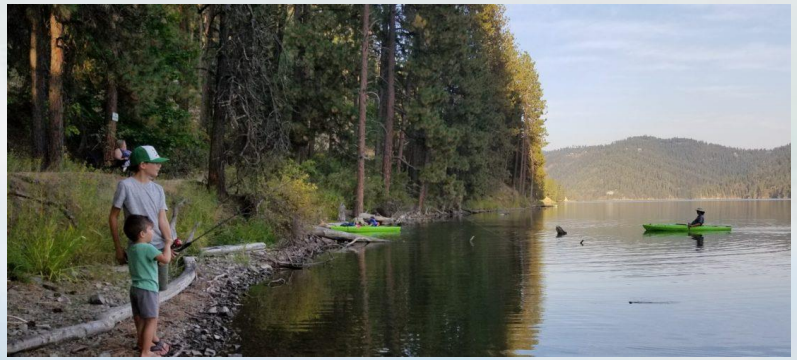


Photo source: City of Fernan Lake Village

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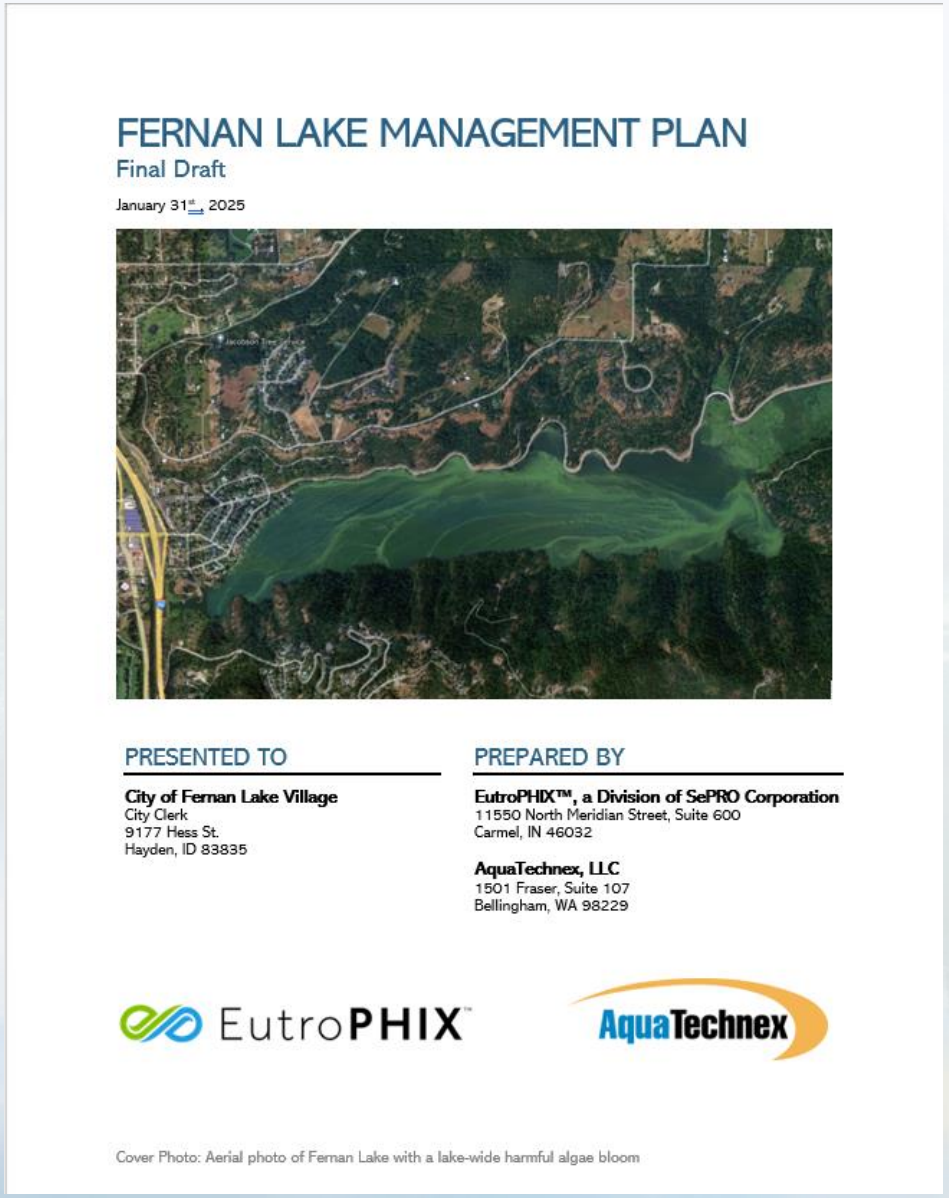
Agenda

- Key Findings
- Lake and Watershed Recommendations
  - Short-term Solutions
  - Long-term Solutions
  - Stakeholder roles & funding
- 1st projects to request funding



FERNAN LAKE MANAGEMENT PLAN

Final Draft

January 31st, 2025

PRESENTED TO

City of Fernan Lake Village
City Clerk
9177 Hess St.
Hayden, ID 83835

PREPARED BY

EutroPHIX™, a Division of SePRO Corporation
11550 North Meridian Street, Suite 600
Carmel, IN 46032

AquaTechnex, LLC
1501 Fraser, Suite 107
Bellingham, WA 98229

EutroPHIX™ AquaTechnex

Cover Photo: Aerial photo of Fernan Lake with a lake-wide harmful algae bloom

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1. Hydrology functions like annual reset for water quality

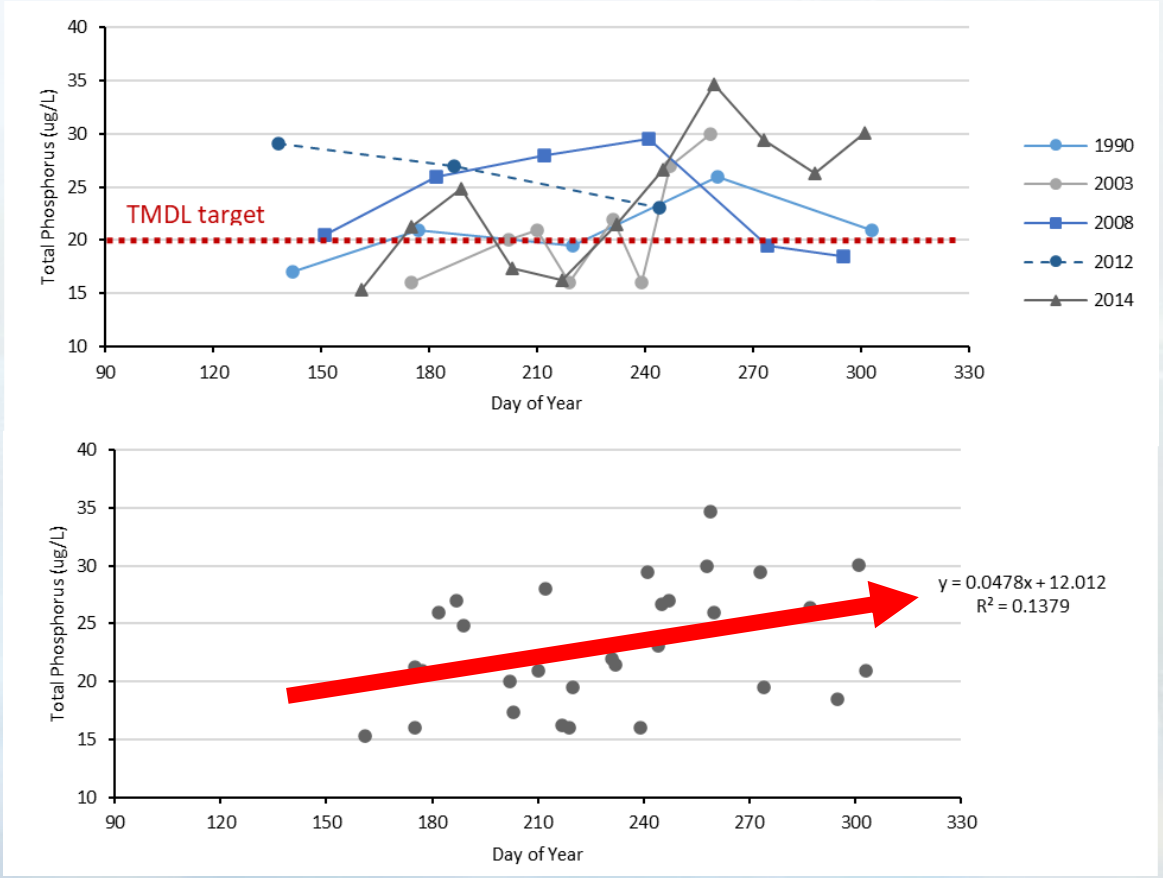
Table 1: Annual water budget for Fernan Lake during the 2014-2015 water year		
Inputs	**Ac-ft/yr**	**Annual Percent**
Fernan Creek	6,729	64%
Precipitation	1,054	10%
Culverts	15	0%
Gain from groundwater	2,756	26%
Outputs		
Fernan Dam	7,134	70%
Evaporation	1,378	14%
Loss to aquifer	1,621	16%

Winter-Spring = High inflows that flush lake 2-6x

Summer = minimal inflows

2. Phosphorus increases across summer in Fernan Lake

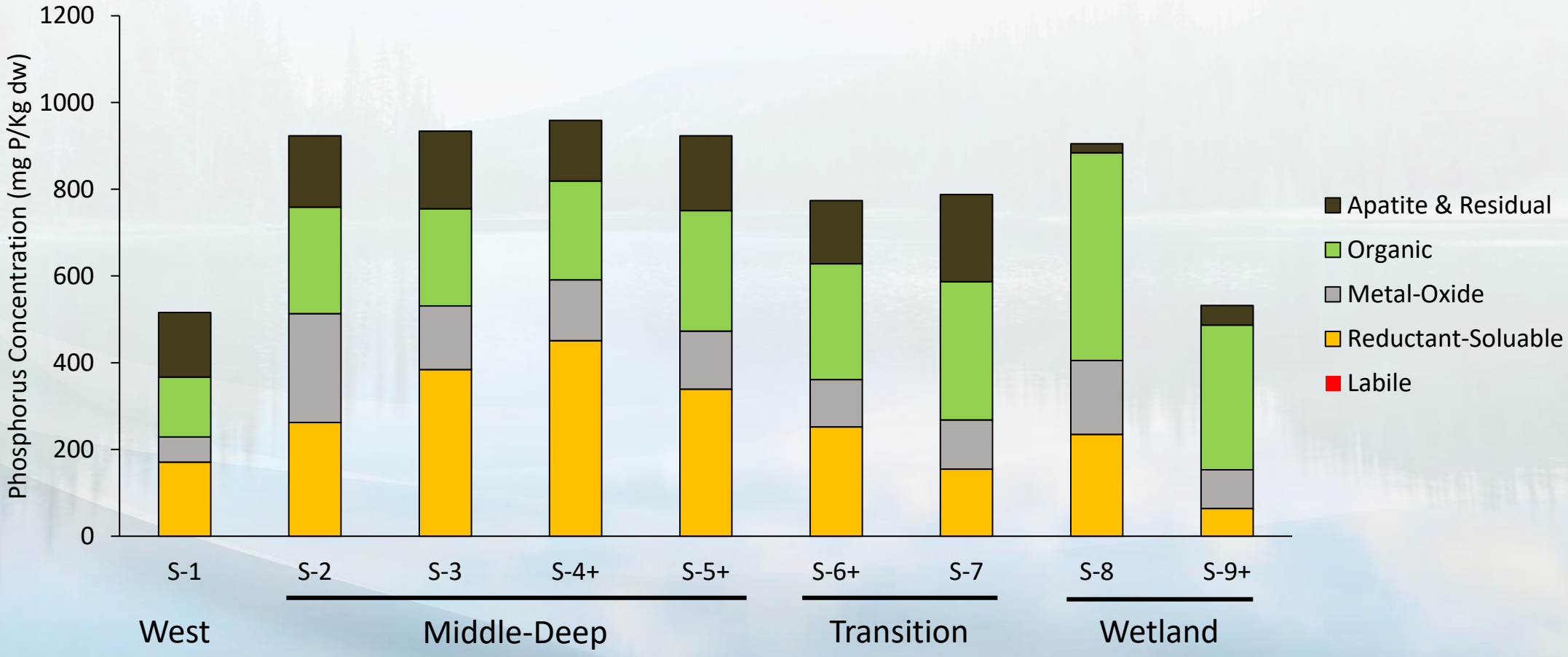
- P Usually at or below goal each spring when most watershed runoff occurs
- Increasing P trend through the year from internal sources



2. Internal loading related to sediments are driving summer phosphorus loading

Table 3: Annual and Bloom Period Total Phosphorus budget for Fernan Lake in 2014						
	Annual			Bloom period (June-Oct)		
Inputs	**mass (kg)**	**% of Total**	**Source**	**mass (kg)**	**% of Total**	**Source**
Fernan Creek	1125	68%	LaCroix 2015	44	11%	LaCroix 2015
Wet Deposition	145	9%	LaCroix 2015	30	7%	LaCroix 2015[4]
Dry deposition	99	6%	LaCroix 2015	41.2	10%	LaCroix 2015[4]
Road Culverts	4	0%	LaCroix 2015	0	0%	Hanna 2022
Internal Loading (wetlands, wind, sediment, biotic)	293	18%	LaCroix 2015[1]	293	**72%**	LaCroix 2015
Outputs						
Fernan Dam	264	16%	LaCroix 2015	0.2	0%	LaCroix 2015
Lake P storage	0	0%	LaCroix 2015[2]	109	27%	LaCroix 2015[2]
Sediment P storage	1432	84%	LaCroix 2015[3]	299	73%	LaCroix 2015[3]

3. Sediment has high amounts of bioavailable P that can release into lake, est. 13,529 lbs. P



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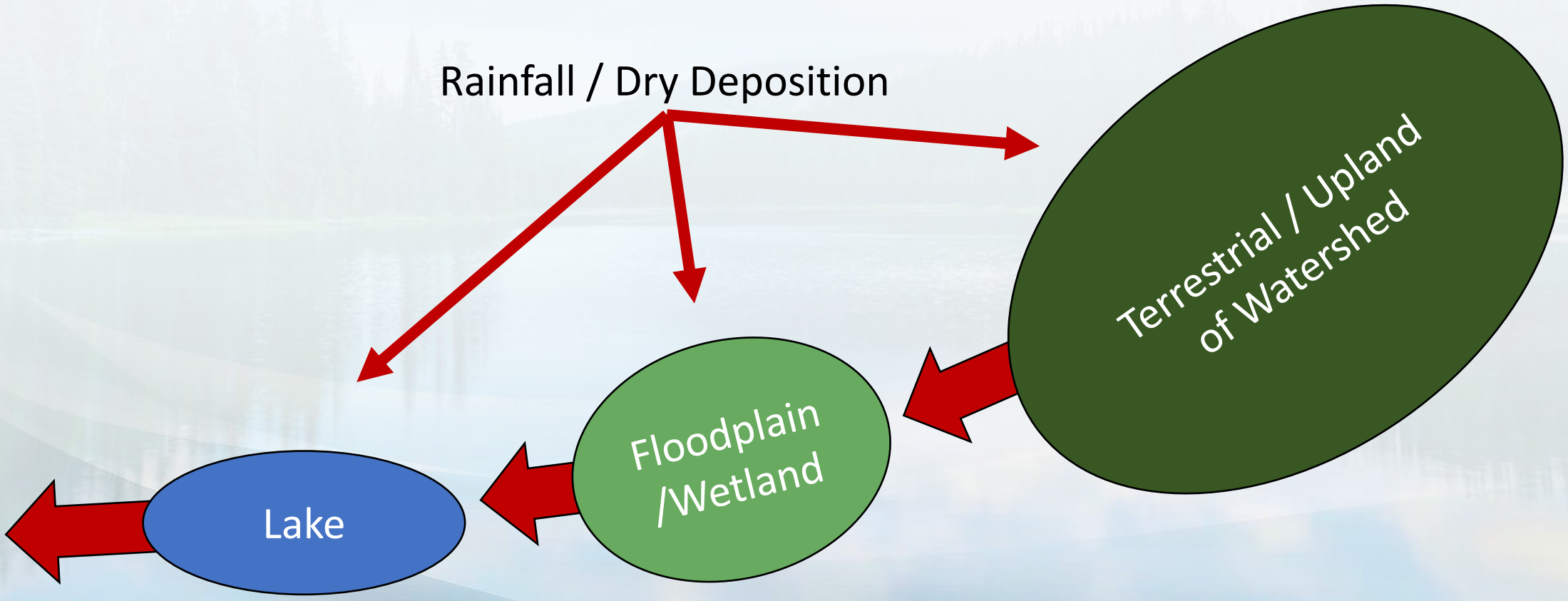
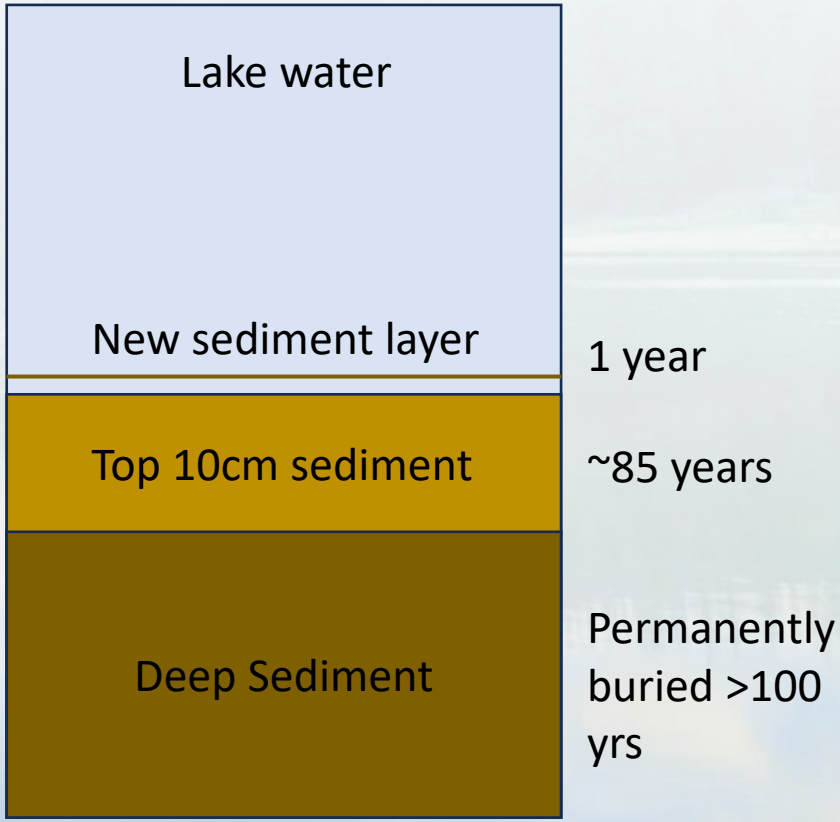
4. Phosphorus (P) is transported through a landscape down gradient with each pool being a P sink, source, and <u>transformer</u>



5. Surficial lake sediments may represent ~ past 85 years of phosphorus dynamics (Legacy P)

- Surficial sediments interact with lake water and nutrients
- Estimated 0.12cm/yr deposition from external sediment
- May take >85 years to fix issues if only focused on watershed nutrient reductions



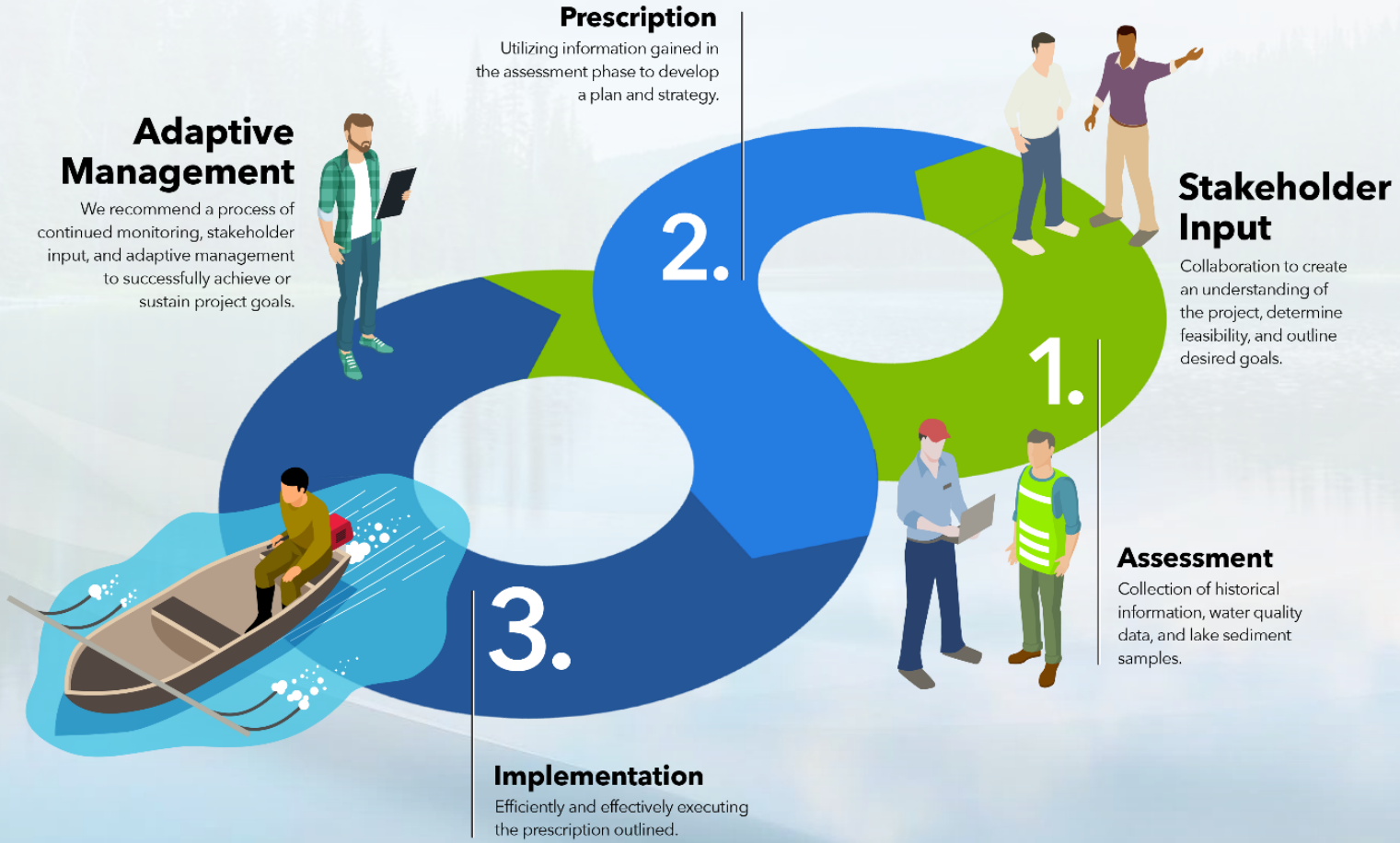
6. Combined Approach Needed

- In-lake efforts to mitigate P release from conditions that built up over past decades. See immediate results
- Watershed efforts to reduce incoming P and sediment. Slow improvements over decades.
- Doing both will speed up lake recovery and meet goals.

Short-term and Long-term Management Recommendations

- Adaptive Management
- Short-term solutions
- Long-term solutions
- Stakeholder roles & funding

Utilize Adaptive Management to drive Restoration and Future Planning



Benefits

- Action/Restoration oriented
- Will learn more from monitoring results
- Optimize most effective tools
- **Faster Results!**

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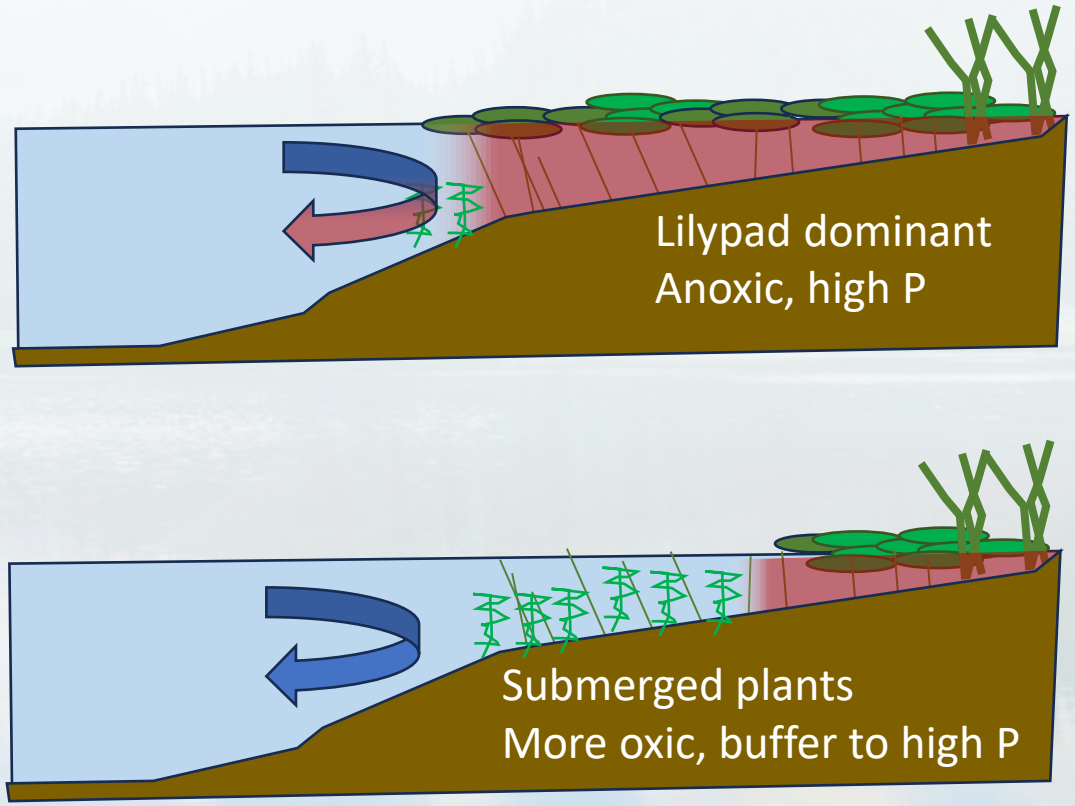
Short-term: Wetland Aquatic Plant Management to improve water quality and decrease P loading

- Macrophyte management of lake/wetland interface
  - Reduce lilypads, promote submerged aquatic plants
  - Increase oxygenation via primary production
  - Reduce extent/duration of anoxia & P release
  - Increase physical buffer of anoxic/P rich water from circulating lake currents



Short-term: Wetland macrophyte management zone at lake/wetland interface

- Approximately 13 acres
- 1-3 year of management
- $15-20K total expected
- <$12k initial treatment, less for follow ups applications of reduced area
- Selective + systemic herbicides (Clearcast®)
- Mechanical removal is more costly, less effective against lilypad (tubers), disposal challenges

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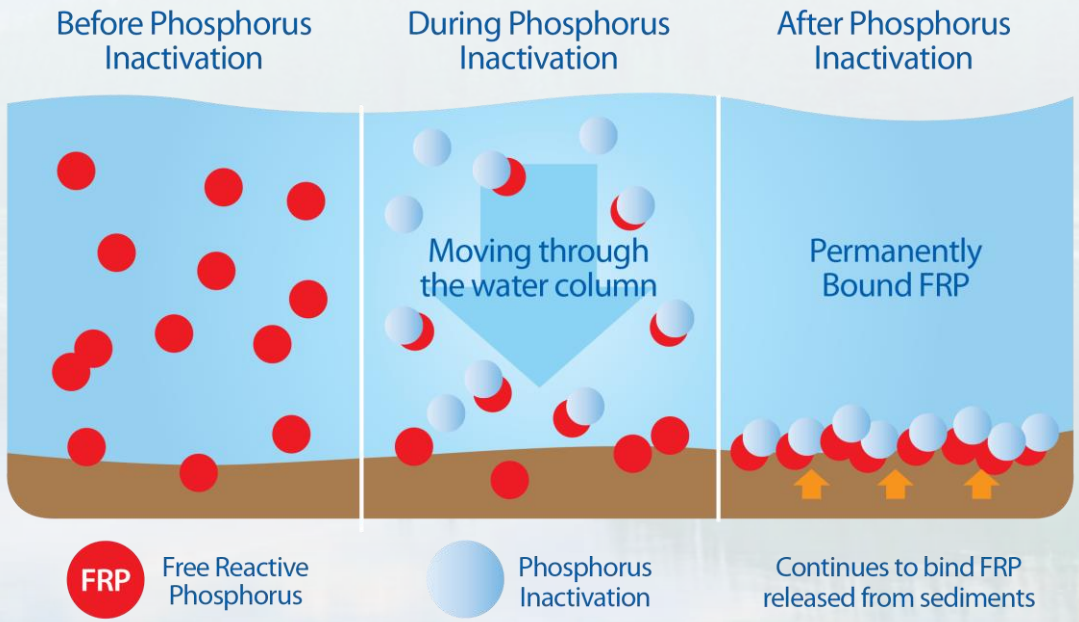
P sequestration of BAP in lake sediments reducing dissolved phosphorus release to lake

- P sequestration treatment of sediments with appropriate P binders to prevent P release
- “Reset” lake sediments and offset Legacy P interactions.
- La-based technologies recommended
- Short-term: target wetland and deep lake sediments
- Long-term: target mid-lake sediments.



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Short-term: Wetland sediment P release sequestration

- Wetland area
  - 38.5 acres, 27.2 lbs. P/acre
  - 1047 lbs. of mobile sediment P to target
  - May need follow up maintenance dosing 3-5 years pending monitoring
  - ~$255-280K P mitigation initially

Updated 1/31

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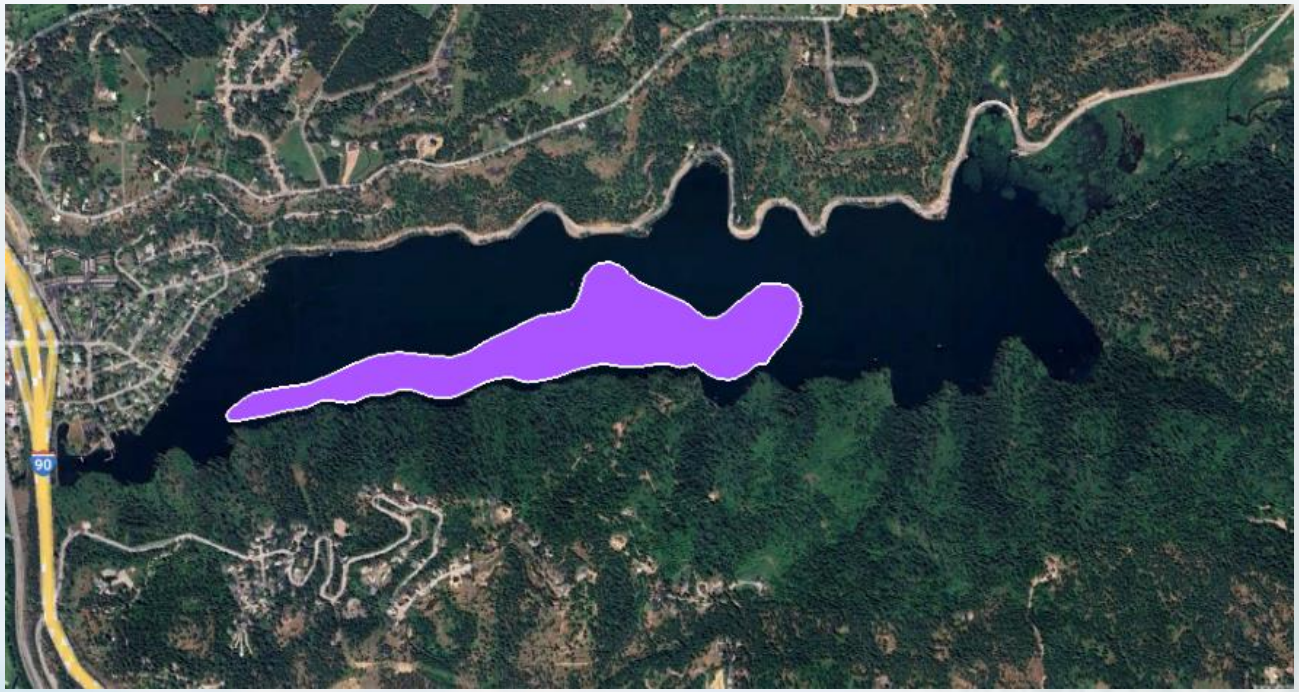
Short-term: Lake sediment P sequestration

- Deepest area
  - 21ft+ = 75.6 acres
  - 40.7 lbs. P/acre
  - 3077 lbs. of mobile P
  - $770K to mitigate
- Additional maintenance dosing may be required if TMDL reductions not met long-term



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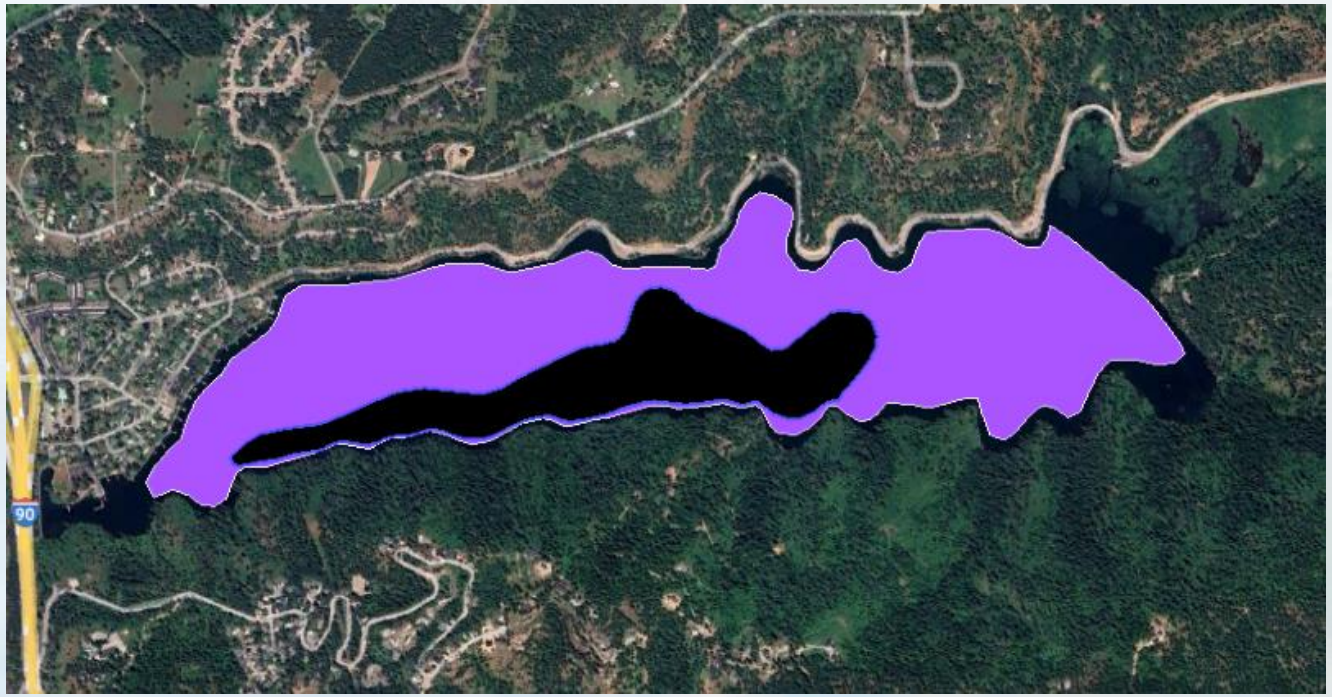
Long-term: Lake sediment P sequestration

- Mid-depth sediments
  - 13-20ft lake depth
  - ~230 acres, 33 lbs. P/acre
  - 7,574 lbs. mobile P
  - Up to $1.9 MM to fully implement
  - Can break up dosing over multiple projects, 5-15 years
- Additional maintenance dosing may be required if TMDL reductions not met long-term



Long-term solutions to reduce overall P loading and sediment transport

- Projects to achieve 35% reduction of P loading identified with Fernan Lake Watershed TMDL
  - Reducing sediment and P transport from the upper watershed
  - Stream + shore stabilization
  - Agricultural BMPs
  - Residential shorelines & fertilizer use
- Enhance ecological functions of the Fernan Creek, floodplain, and delta
  - Naturalize channel paths
  - Increase sediment capture and storage during runoff
  - Reduce soluble phosphorus release during summer*
  - Habitat improvements for wildlife
  - *Not significant changes in lake level*

Long-term: Revisit Floodplain + Delta Enhancement

- Revisit IDEQ and DU plan
- Create a shovel ready plan and design created by a specialized contractor
- Goals
  - No major change lake levels
  - Increase sediment capture
  - Reduce soluble P, plant materials, and organic sediment export
  - Improve habitat for wildlife
- New design = $100-300K
- Implementation roughly 1MM

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Routine Lake Monitoring & Data $2-4K/yr

- Routine lake monitoring
  - Water clarity
  - DO/temp vertical profiles
  - Water samples to track nutrients and algae

- Assemble and host all past research and data for Fernan Lake
  - Spreadsheets of lake data
  - Links to documents + reports
  - Data dashboard

Roles and Responsibilities

City of Fernan Lake Village

- Fernan Lake Committee

Goal to coordinate and direct efforts efficiently to pursue, fund, and implement projects

Members/Stakeholders

- City of Fernan Lake Village
- Fernan Lake Conservation and Recreation Association
- City of Coeur d'Alene
- Kootenai County
- IDEQ
- University of Idaho
- Coeur d'Alene Tribe
- Citizens

Funding Sources

In-lake Projects

- Taxes/Loans
- Private donations
- Local match (city, county)
- State and Federal specific Appropriations to Fernan Lake
  - Need a good story + plan!

Watershed Projects

- NRCS – section 319
- IDEQ - grants
- Ducks Unlimited
- Outside Grants

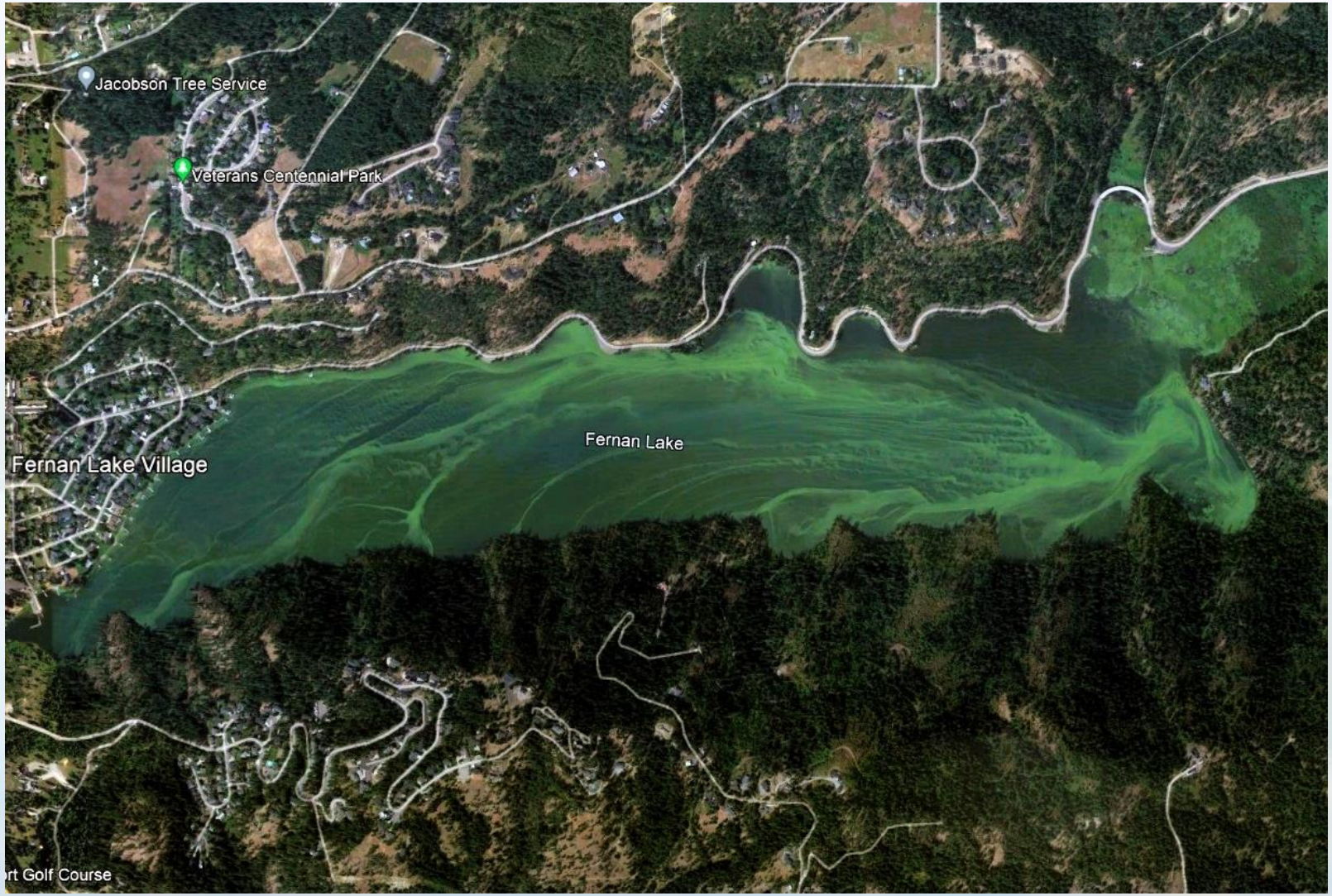
Initial Projects to Request funding $$

- Appropriations Federal and/or State, start efforts Feb 2025
- Wetland Aquatic Plant Management $15-20K
- P mitigation of In-Lake Sediment up to $2.1MM
  - Wetland sediment = $255-280K
  - Deep sediment = $770K
  - Project monitoring = $50K
  - Also include Mid-lake 50% dose = $ 950K
- Floodplain + delta Enhancement Plan Development $100-300K

Questions

Ryan Van Goethem, CLM
Limnologist & Project Lead
ryanv@eutrophix.com
303-229-9622

Case Studies and info:
www.eutrophix.com



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