

# Riparian Buffers Along Lowland Agricultural Streams in Skagit County

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# Background

1) Salmonid Use = rearing, migration, access to upland streams





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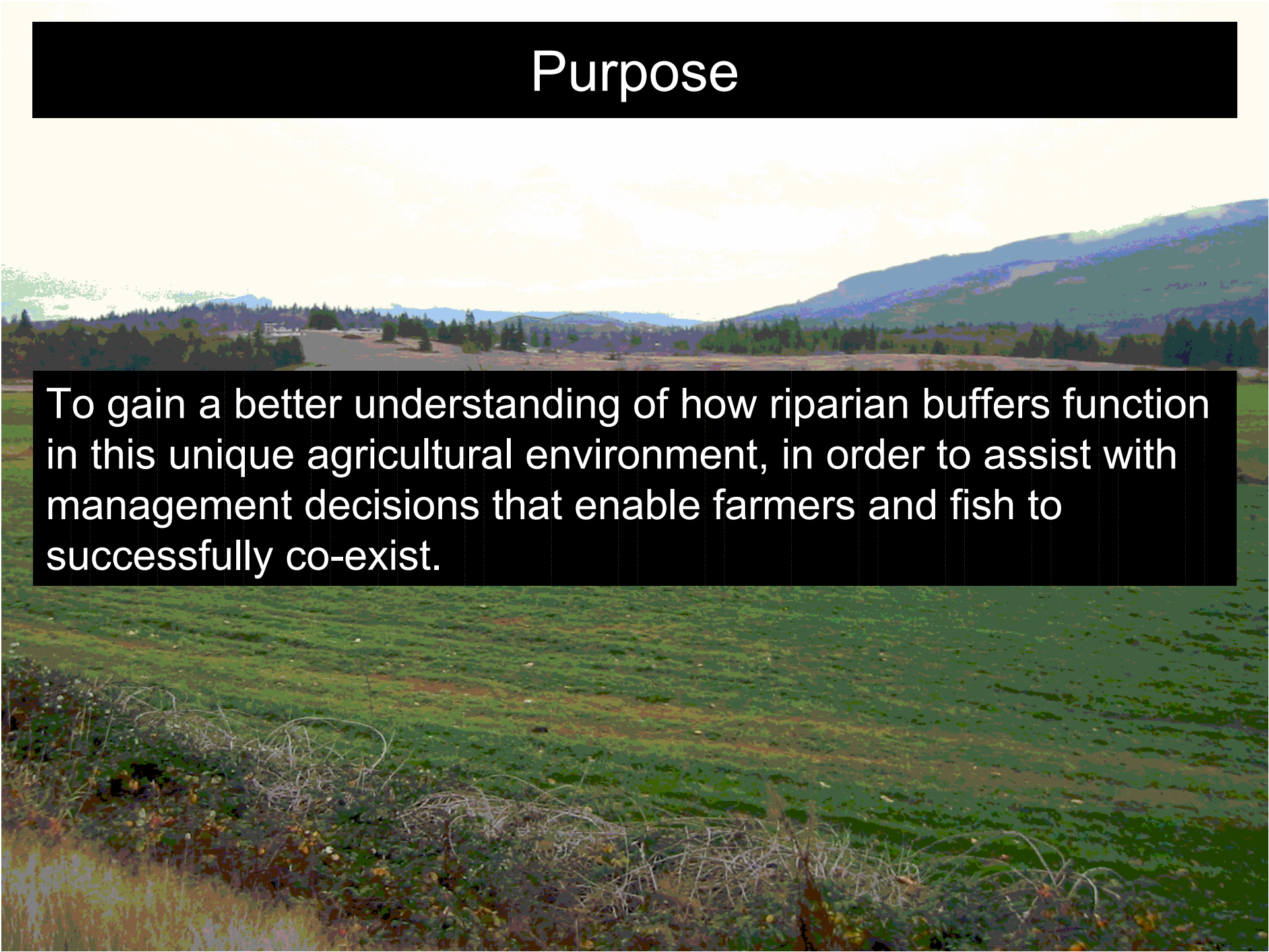
1) Salmonid Use = rearing, migration, access to upland streams

2) Agriculture = vegetation removal, fertilizers, channel maintenance





# Purpose



To gain a better understanding of how riparian buffers function in this unique agricultural environment, in order to assist with management decisions that enable farmers and fish to successfully co-exist.



# Overview

## Independent Variables:

Buffer Width  
Composition  
Density

## Response Variables:

Temperature  
Water Chemistry  
TN, NH<sub>4</sub>, NO<sub>3</sub>  
TP, PO<sub>4</sub>

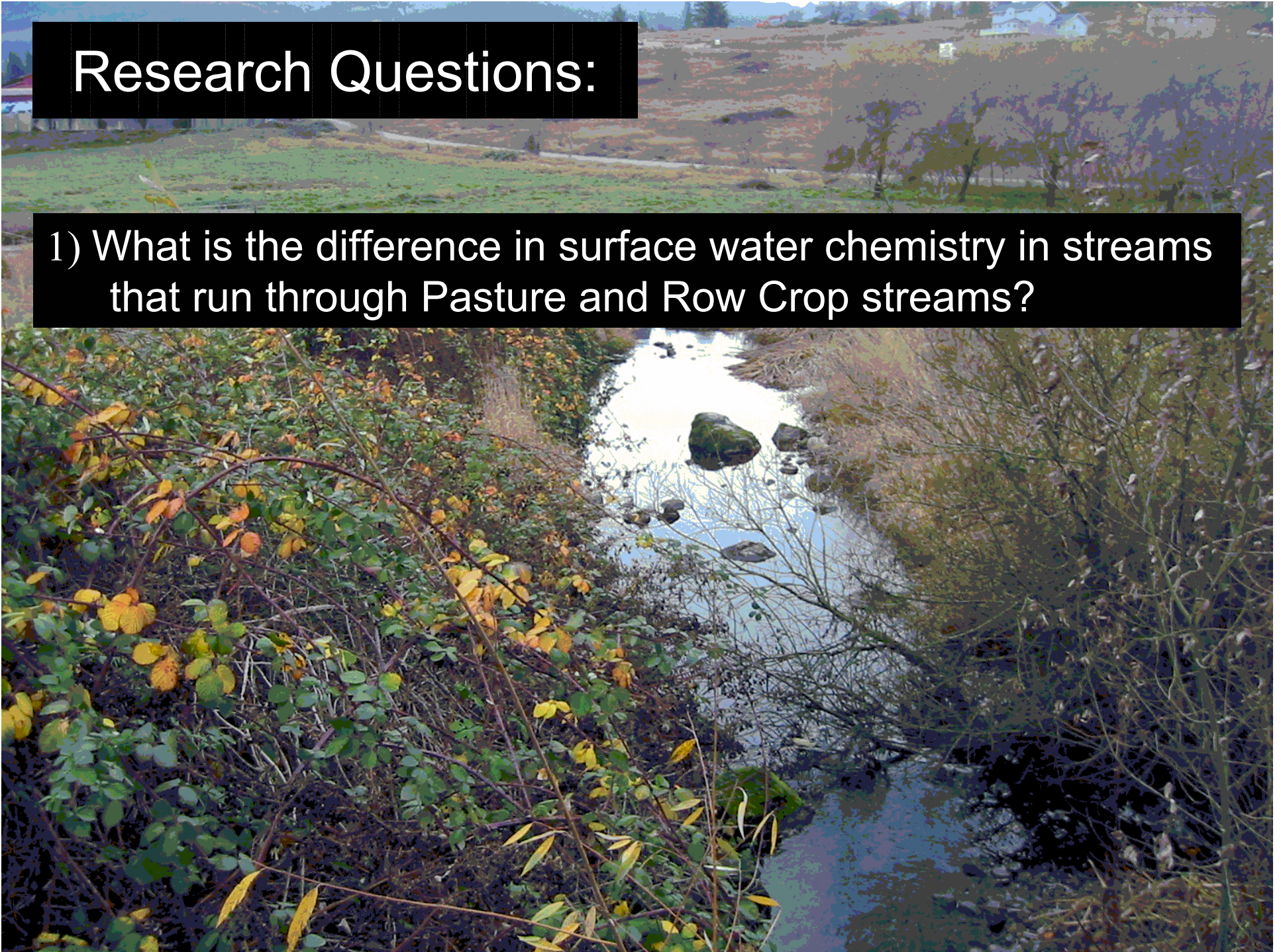
## Co-Variants:

Drainage Basin Area  
Discharge  
Hyporheic exchange  
Land Use



# Research Questions:

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- 2) How does buffer width affect surface water chemistry?
- 3) What is the relationship between buffer width and temperature?



# Study Design

Total of 14 sites:

7: Pasture Streams

7: Row Crop Ditches

3: No Buffer

7: No Buffer

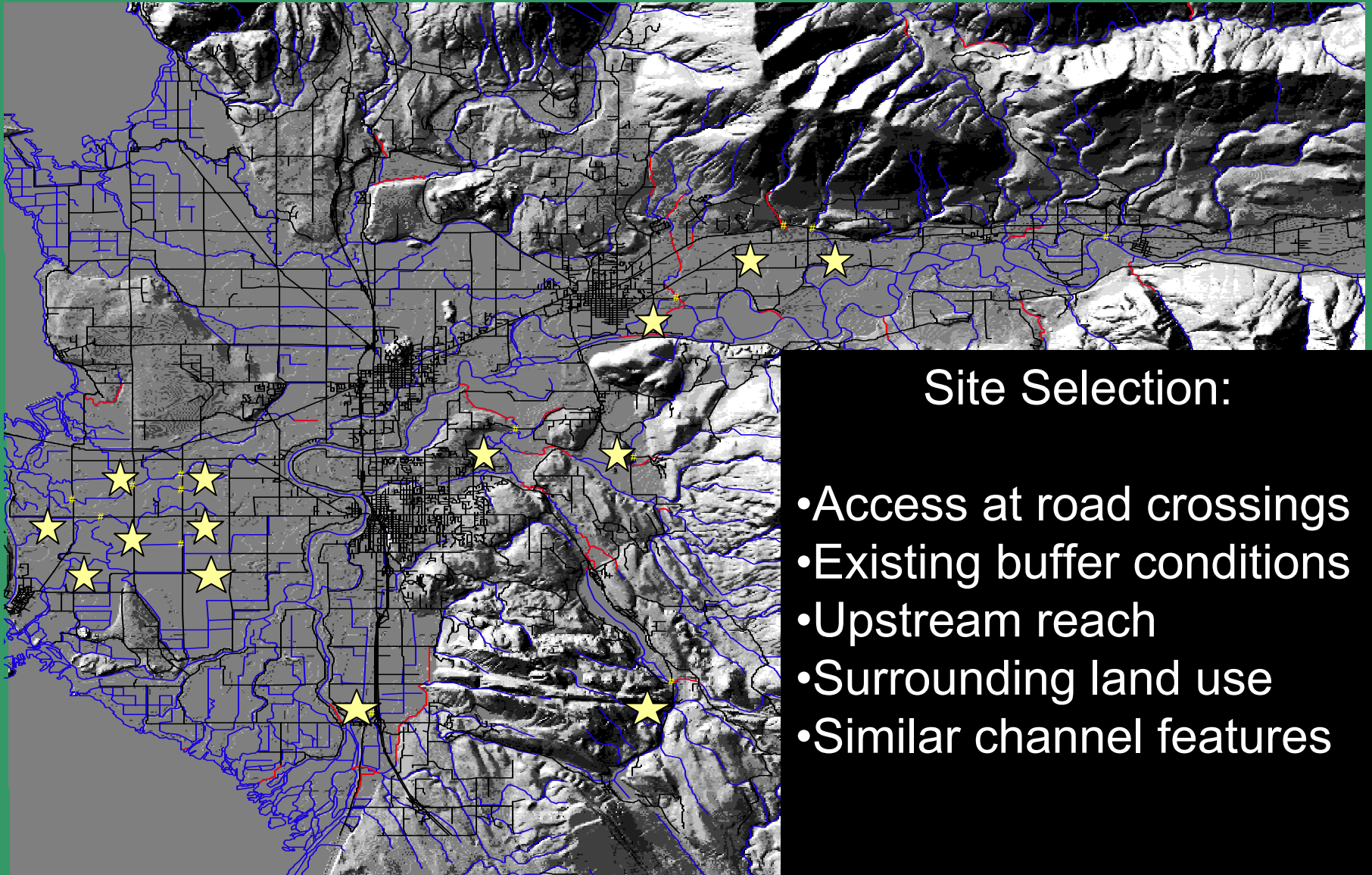
2: 12m (40ft) Buffer

2: 23m (75ft) Buffer

**Sampling:** Water Chemistry: Summer 2001-2003 monthly May-Oct  
Temperature: Tidbits June-Oct Every Half hour



# Skagit Valley Site Selection



## Site Selection:

- Access at road crossings
- Existing buffer conditions
- Upstream reach
- Surrounding land use
- Similar channel features



# Row Crop Agriculture





# Row Crop Agriculture: Ditch type streams

Low flow  
Channelized  
Steep Banks  
Very silty  
Reed Canary  
Grass  
Eutrophic  
Fish Presence?





# Pasture Type Agriculture





# Pasture Type Agriculture: Stream

Gravel/Cobble

Pool/Riffle

Existing

Buffer:

Maple/Alder,  
some Conifer

Patchy vs.  
Dense Buffers

Salmonids!

Fry and Adults





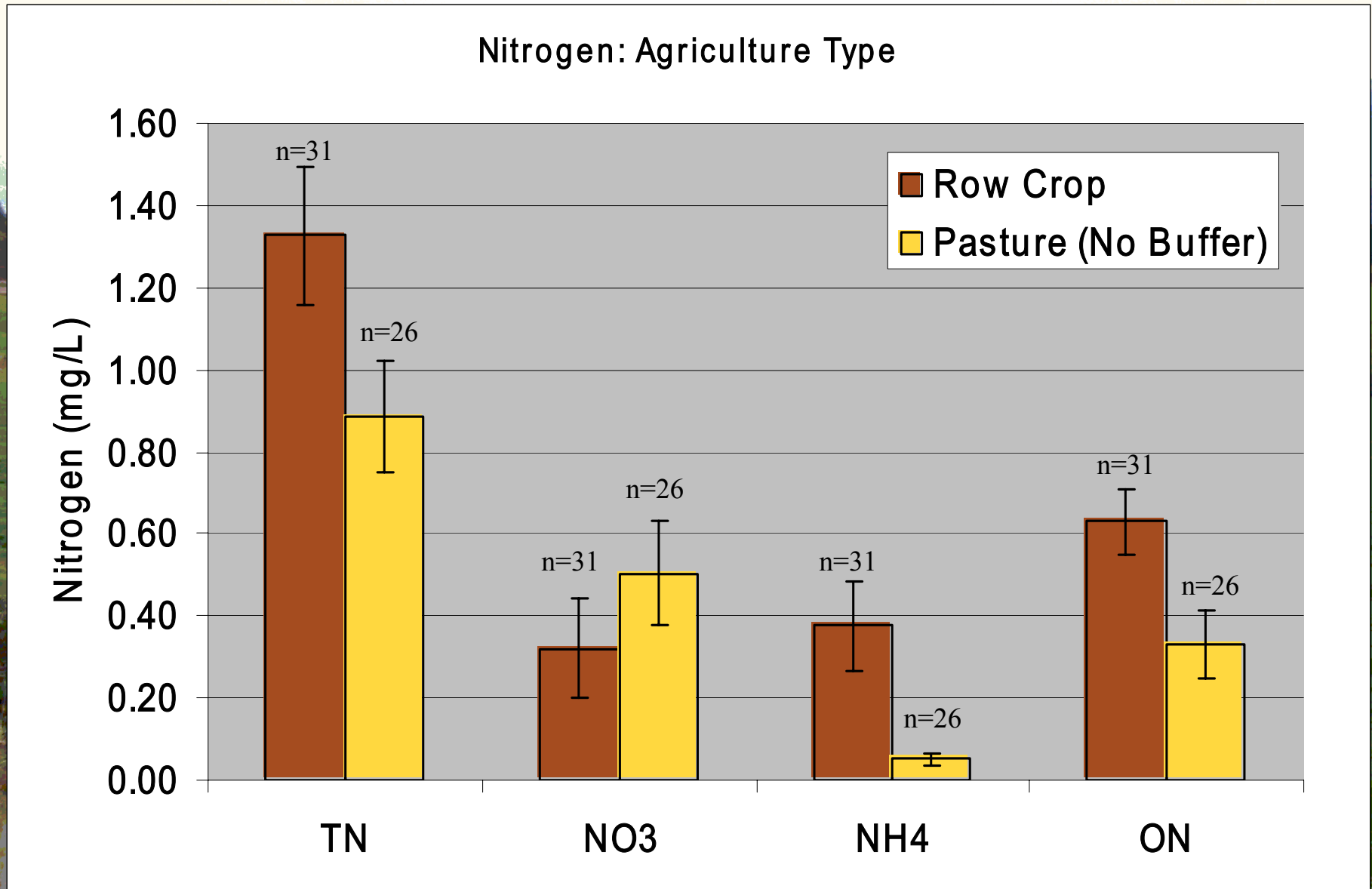
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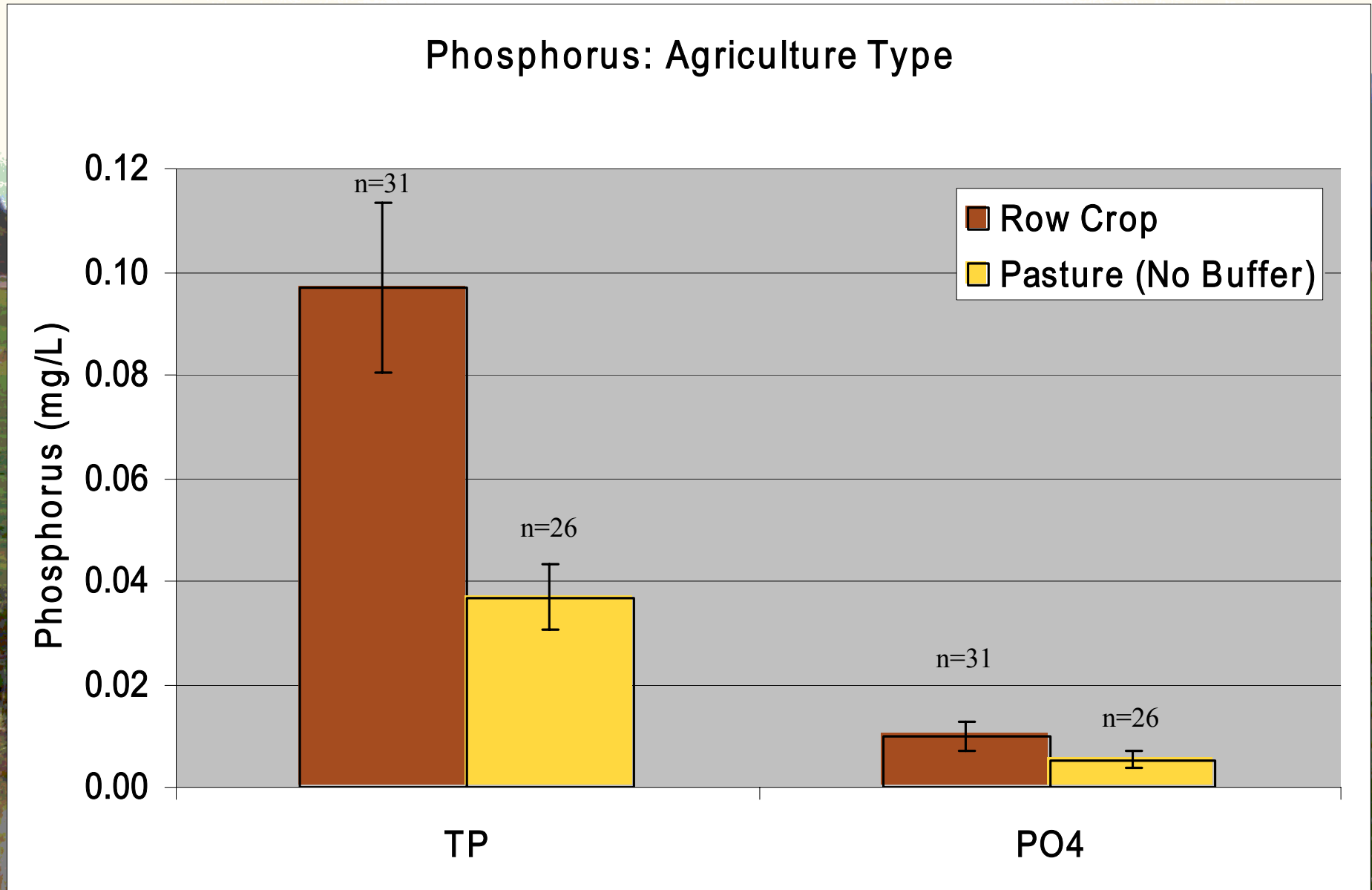


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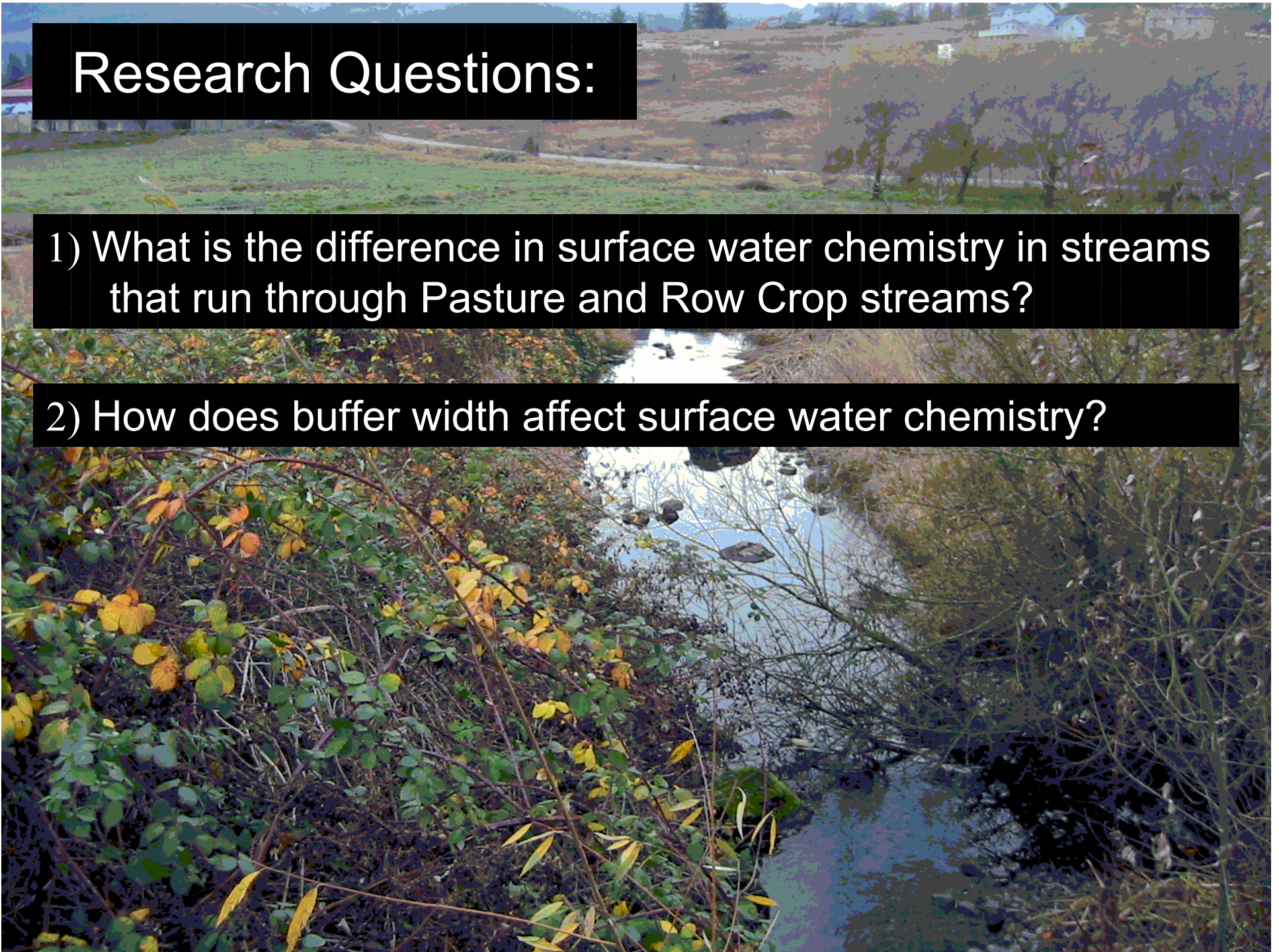




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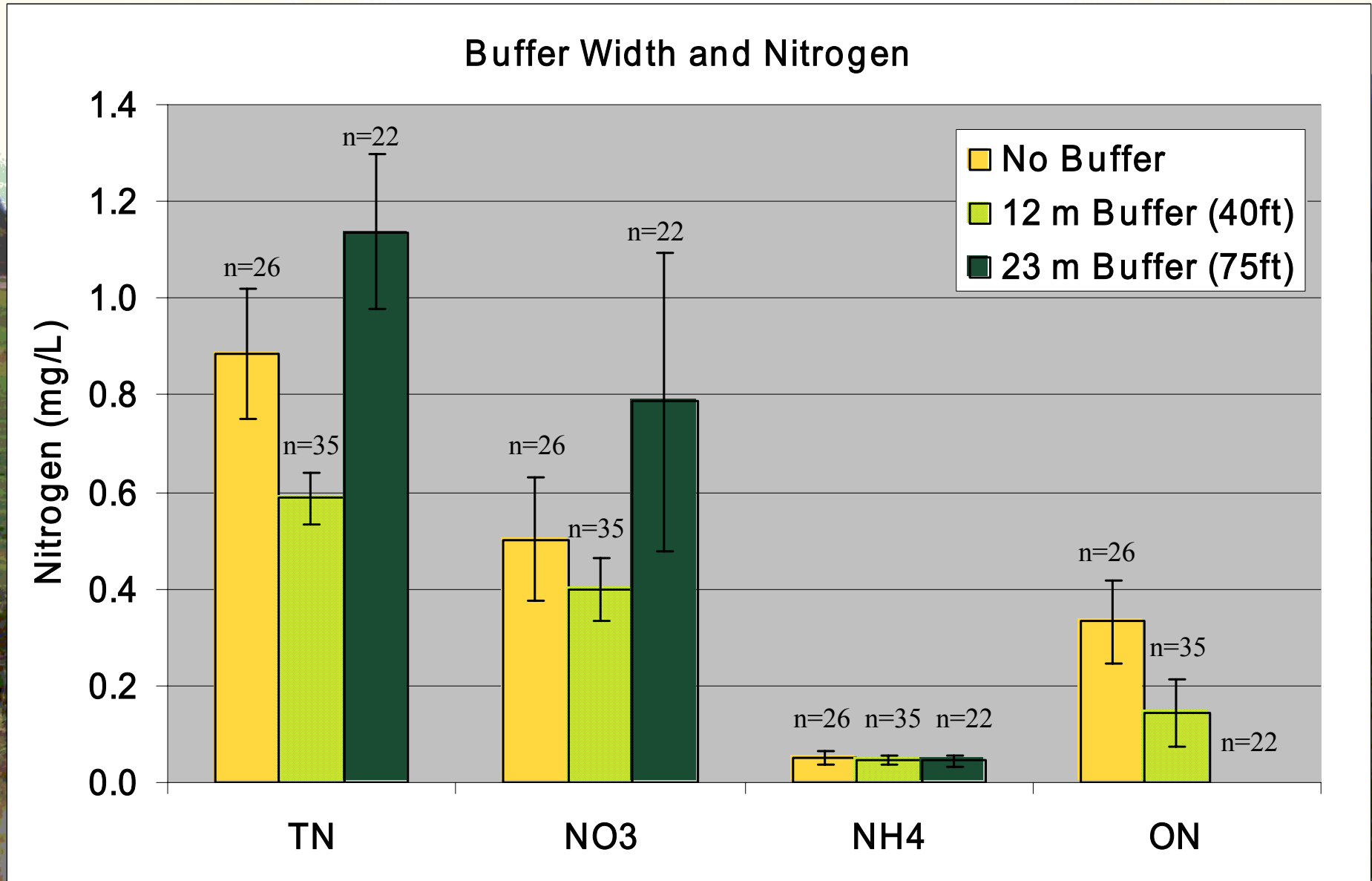
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# Results: Buffer Width vs. Chemistry





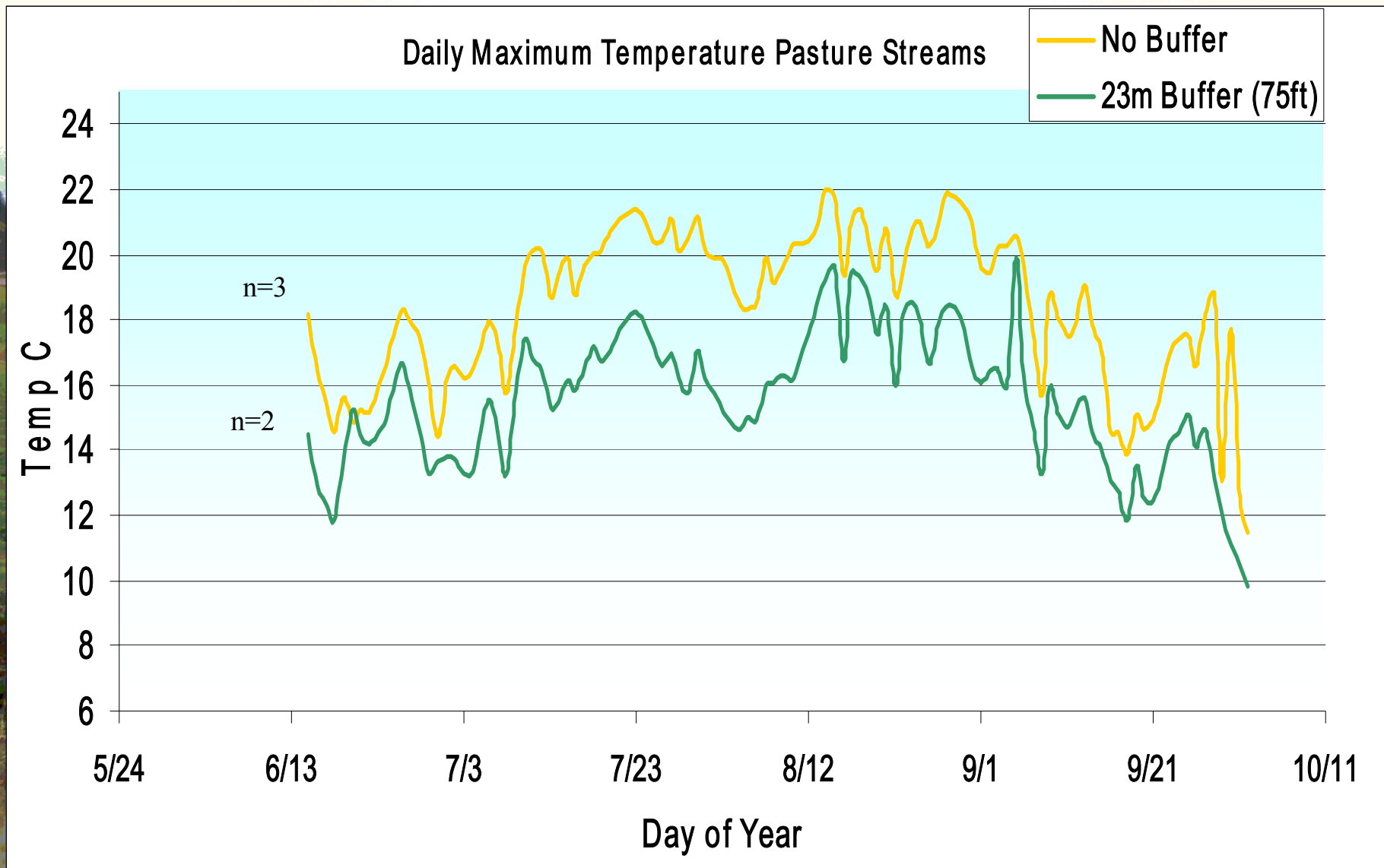


# Research Questions:

- 1) What is the difference in surface water chemistry in streams that run through Pasture and Row Crop streams?
- 2) How does buffer width affect surface water chemistry?
- 3) What is the relationship between buffer width and temperature?

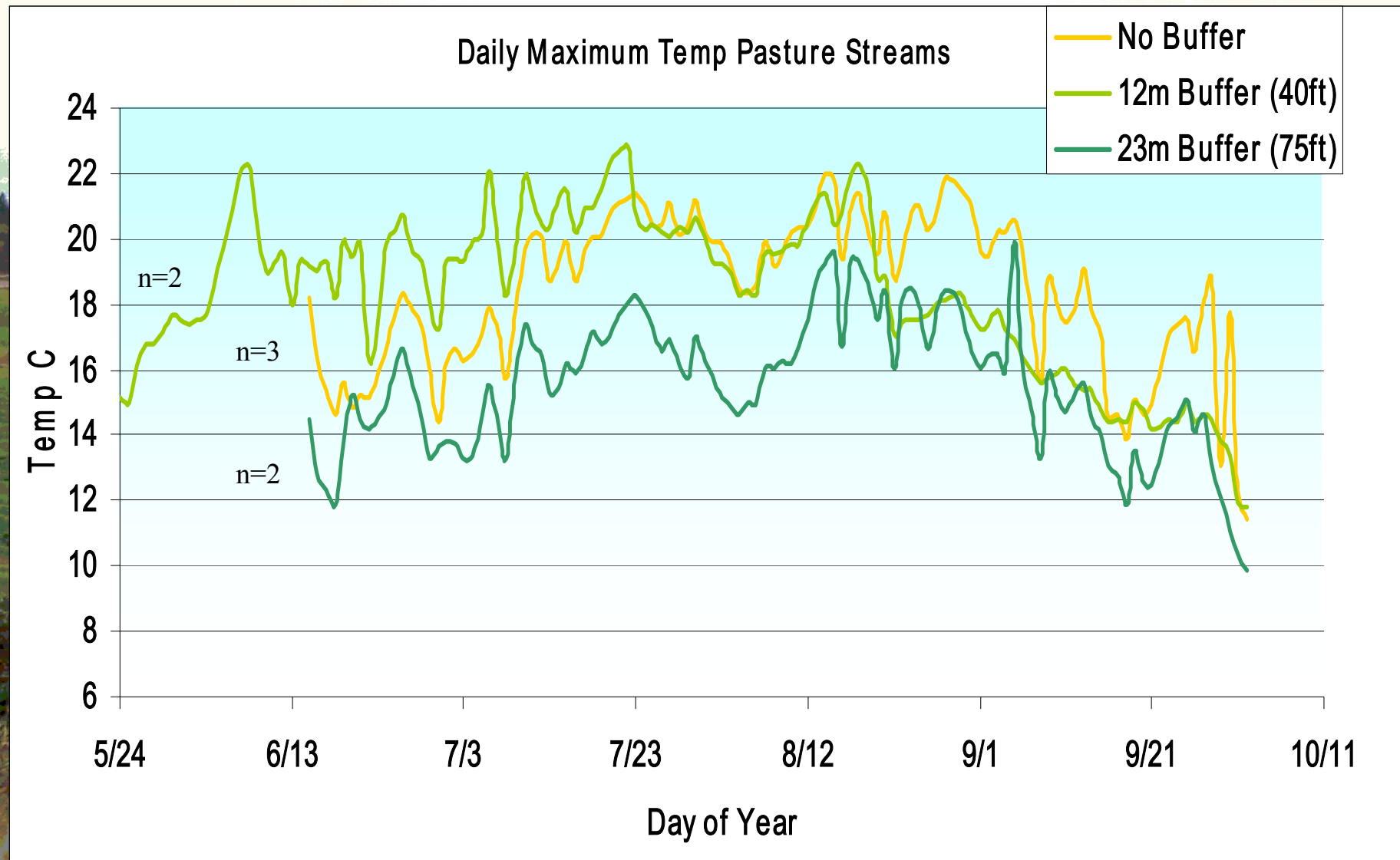


# Results: Buffer Width vs. Temperature



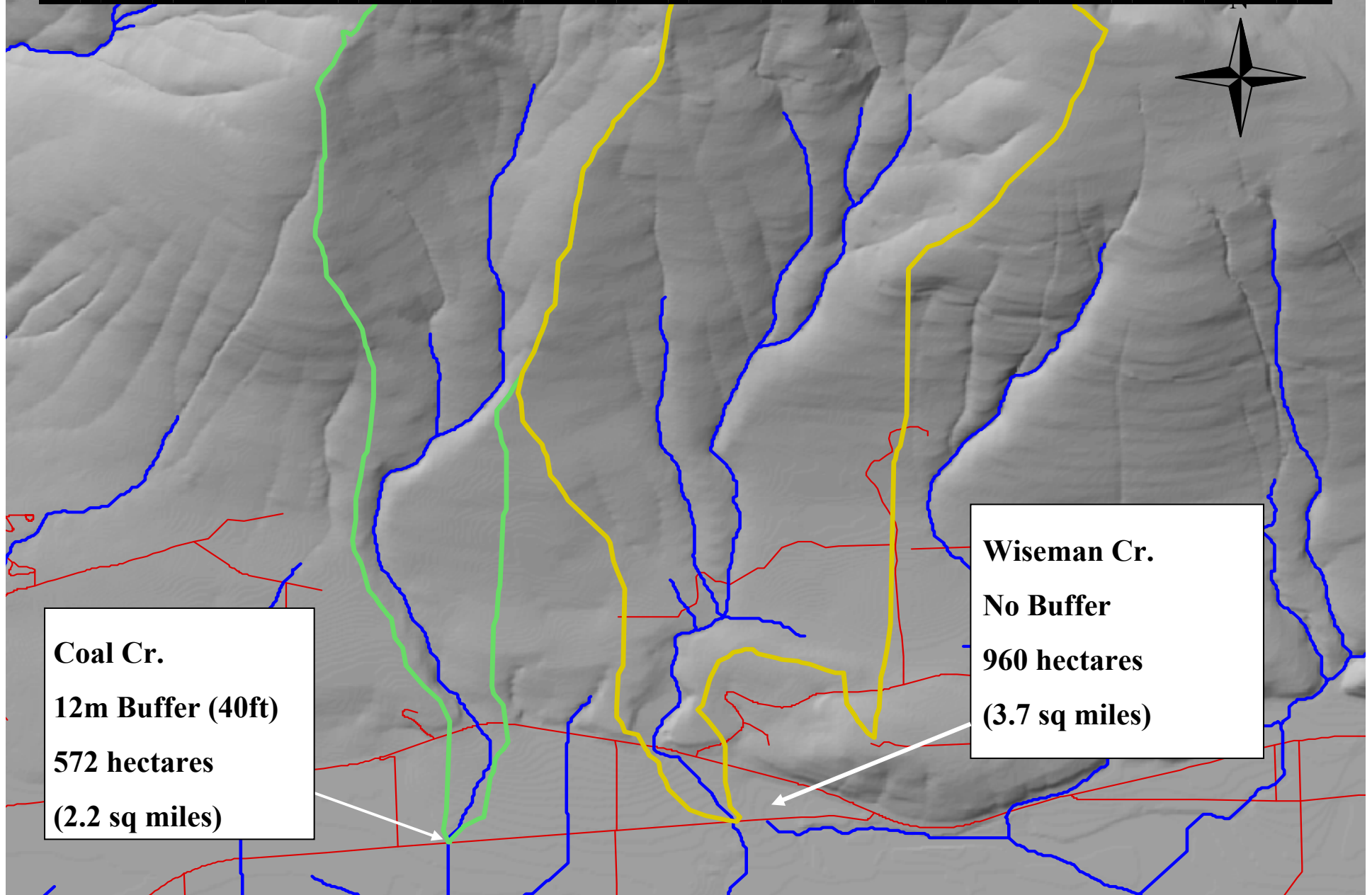


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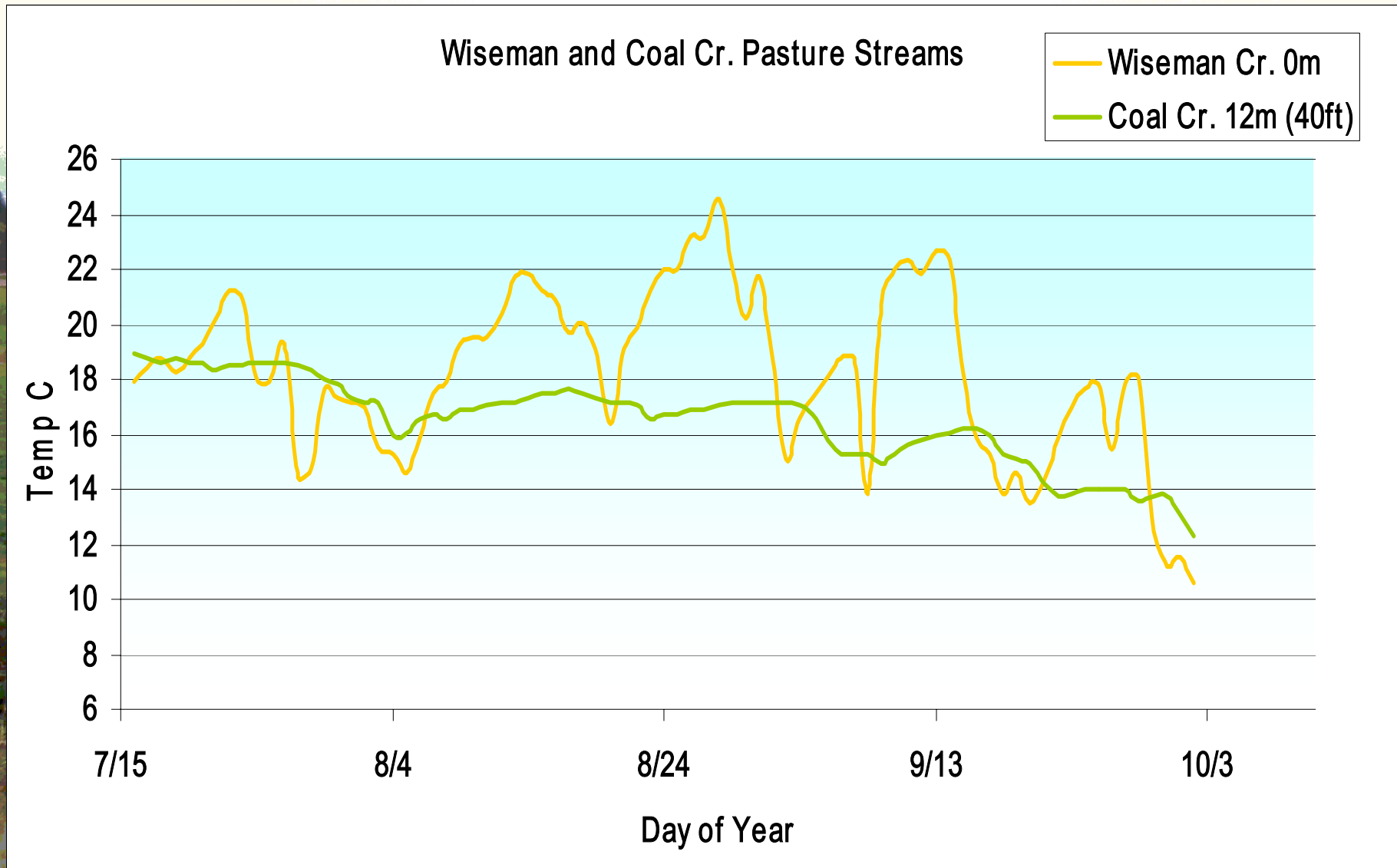


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# Further Analyses

- Watershed area
- Land use coverage
- Discharge
- Subsurface nitrogen transformations



# Data Summary

- Higher TN levels in Row Crop than in Pasture type streams with no buffers ( $\text{NH}_4$  fertilizer inputs?)
- Higher TP levels in Row Crop than in Pasture type streams (Channel maintenance?)
- $\text{NO}_3$  increased with buffer width ( Red Alder?)
- Temperature decreased with buffer width (Influenced by density and drainage basin area?)



# Conclusions

1. The type of agriculture surrounding streams affects in-stream chemistry.
2. Pasture type streams have a unique nitrogen cycle, probably driven by Red Alder in riparian buffers.
3. Streams with large buffers have lower water temperature.
4. Other watershed factors affect stream temperature, including drainage basin size, connectivity and land use.





# Thank You

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