CAR Monitoring 2009 – 2021

Executive Briefing

March 2024

Project Team:
SWM: Gi-Choul Ahn, Frank Leonetti, Yair Torres, Brendan McLane, Marisa Burghdoff, Joe Godfrey, Mike Rustay, Sheila Hagen, Janell Majewski
PDS: Terri Strandberg, David Killingstad, Sarah Titcomb

Key Messages

River, marine, and lake buffers and wetlands and wetland buffers were impacted enough to trigger additional outreach, enforcement, mitigation/restoration, and programmatic adjustments.

Bank armoring decreased along river and marine shorelines but increased along lakes.

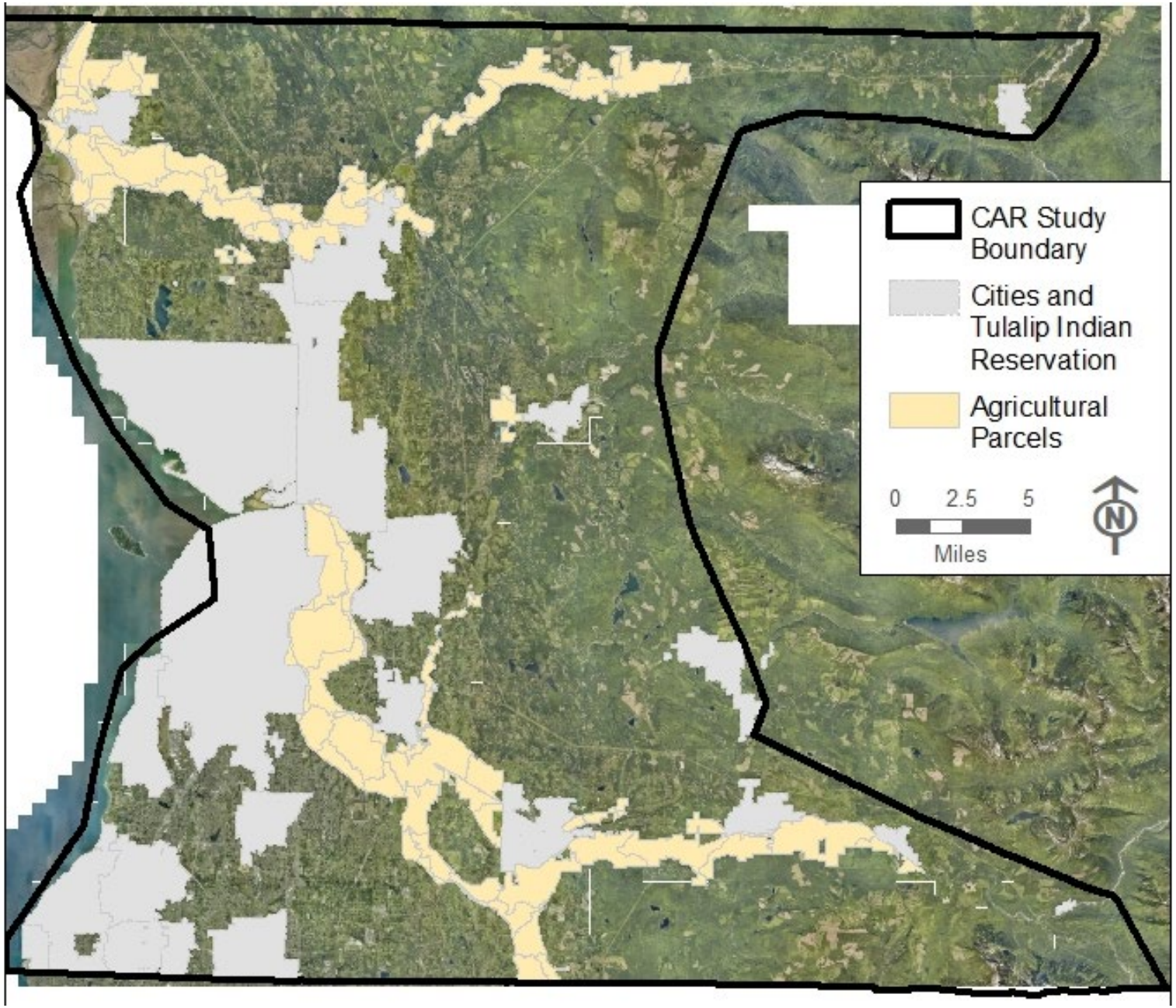
Property owners generally appear to be protecting regulated critical areas.

There has likely been a loss of functions and values based on buffer changes. Loss due to CAR implementation is likely to be minimal compared to losses caused by cumulative impacts from upland development, climate change, groundwater withdrawals, and other stressors (some external to County jurisdiction).

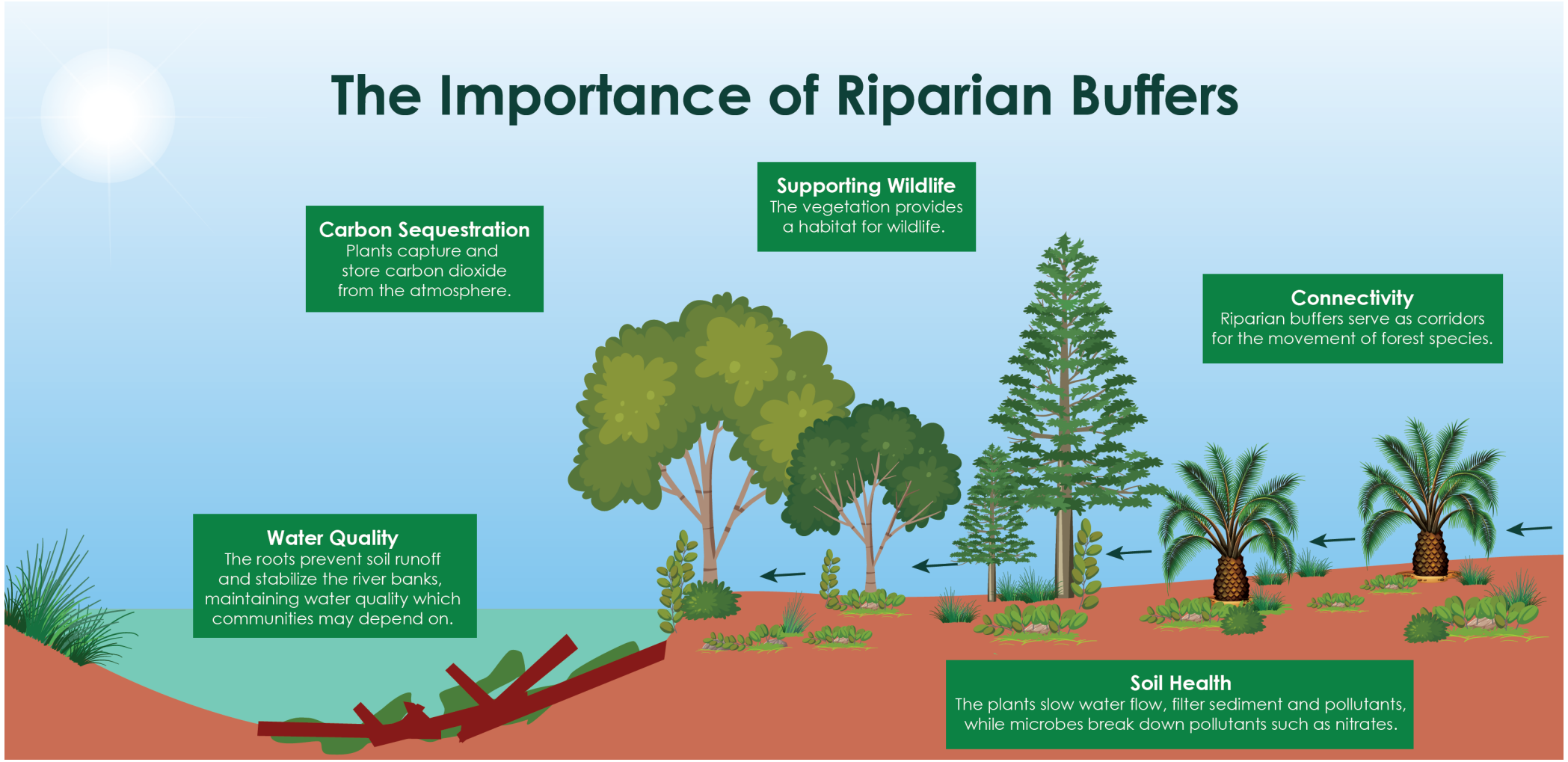
The County should continue to use all the tools in its toolbox including critical area and stormwater management regulations, Comprehensive Planning, etc. to protect functions and values.

Buffer Impacts

CAR Study Area



Why Buffers Matter



Buffer Impact – Overview of Section

How much impact to buffers and wetlands occurred between 2009 and 2021?

Where were the impacts to buffers and wetlands?

How do data limitations impact the accuracy of results?

What actions could the County undertake given results?

Countywide Buffer Change

-3.7%

Loss in Stream, Lake, Marine Buffers at Countywide scale based on **positive and negative change**

-4.7%

Loss in Wetlands and Wetland Buffers at Countywide scale based on **positive and negative change**

Positive and Negative change = cumulative estimate of changes in land cover based on the impact the change has on hydrologic functions

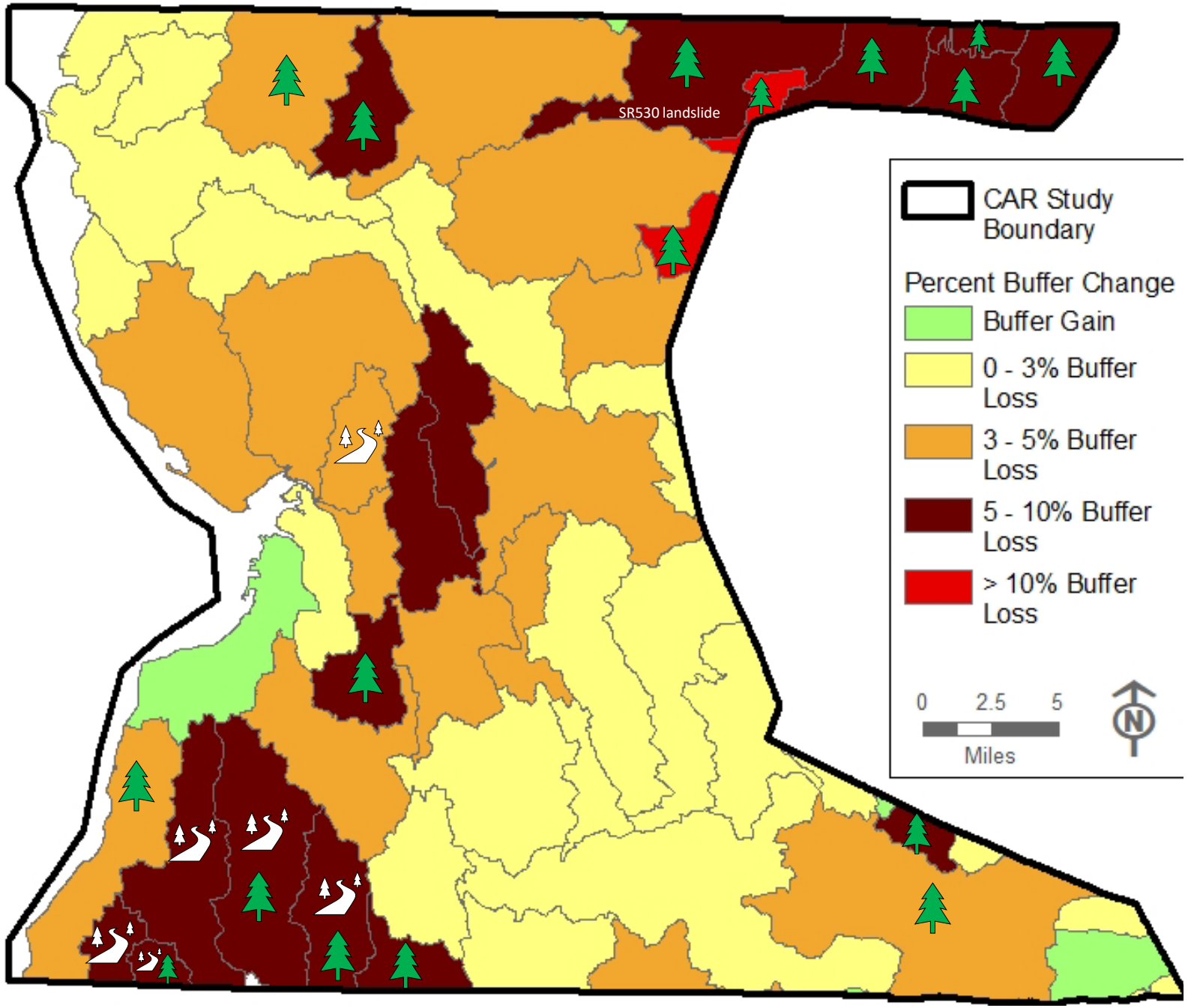
Summary of Negative Land Cover Changes in Buffers

- Impervious land cover in buffers increased by 0.7%.
- Forested land cover in buffers decreased by 2.2%.
- Positive vs Negative land cover change in all buffers + wetlands resulted in a decrease of 4.3% of the total buffer + wetlands area.

Buffer Type	Total Acres	Forest Change (Acres)	Impervious Change (Acres)	Positive Change (Acres)	Negative Change (Acres)	%Positive/Negative Change
Lake	1,535	-24	20	41	120	-5%
Marine	367	-6	3	11	28	-5%
Stream	43,348	-872	174	733	2,323	-4%
Wetland	69,346	-1,590	595	1,170	4,425	-5%
Grand Total	114,596	-2,492	792	1,956	6,896	-5%
% of Total Area		-2%	1%	2%	6%	-4%

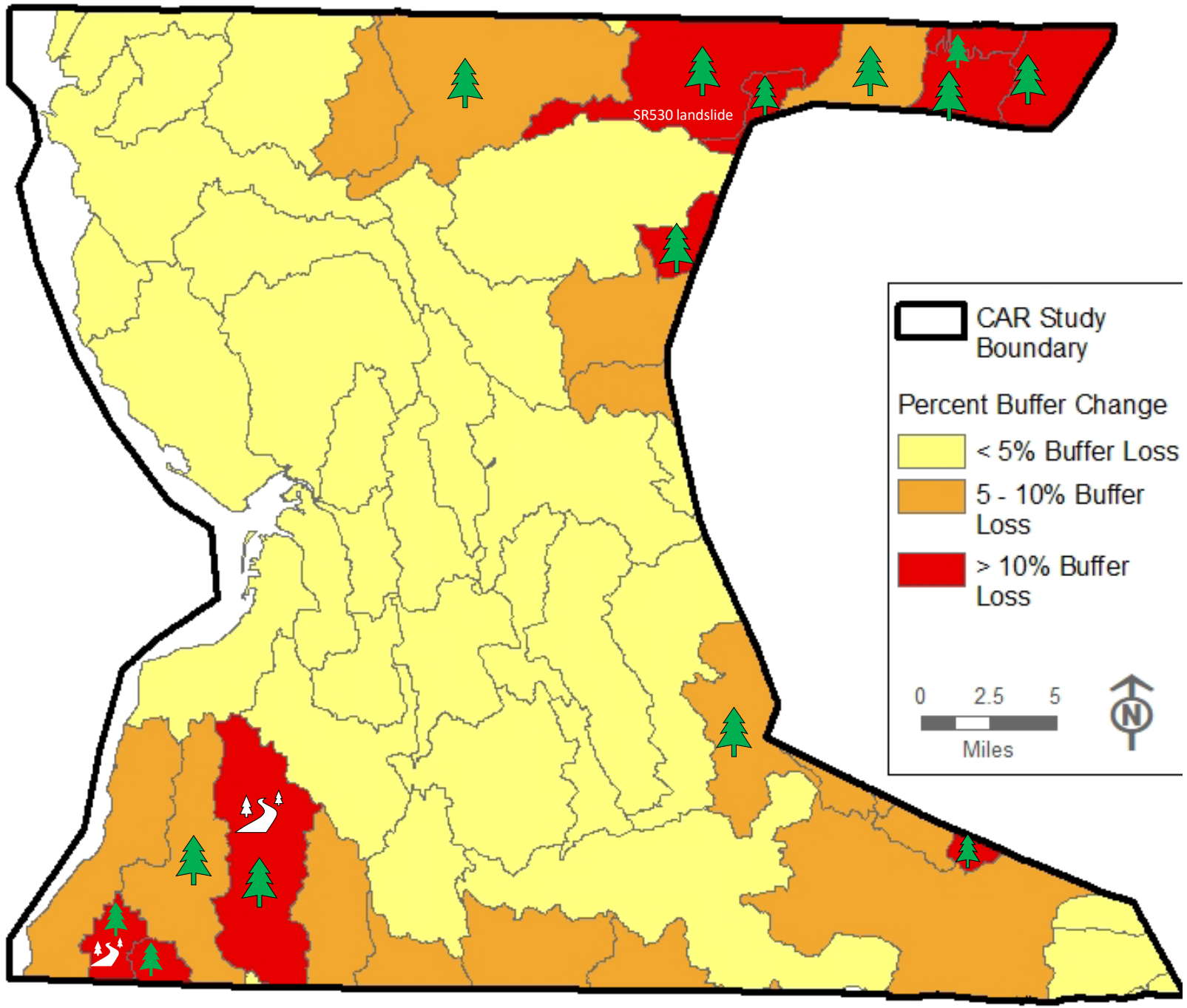
Where are Impacts to Lake, Marine, & Stream Buffers?

- Greater than 1% increase in impervious surface within buffers (range 1.2% to 6.6%)
- Greater than 3% forest cover loss within buffers (range 3.2% to 14.8%)



Where are Impacts to Wetlands & Wetland Buffers

- Greater than 1% increase in impervious surface within buffers (range 5.0% to 6.0%)
- Greater than 5% forest cover loss within buffers (range 5.3% to 19.6%)



Summary of Buffer Changes

Urban areas, where the Growth Management Act (GMA) directs development, saw some of the greatest overall negative change in land cover that impacts hydrologic function over the 12-year period.

Rural subbasins in the eastern parts of the County saw high levels of changes in forest cover. Some of those changes are due to timber harvesting and natural changes (i.e. channel migration, landslides, etc.).

The decrease in buffers around lakes is concerning. Because lake locations and edges are better defined than streams and wetlands, we have more confidence in the estimates of negative buffer impacts.

Decreases in marine buffers could be due to development that is consistent with the Shoreline Management Program (SMP).

Data Limitations and Impacts on Results

Uncertainties in Results due to Data Limitations

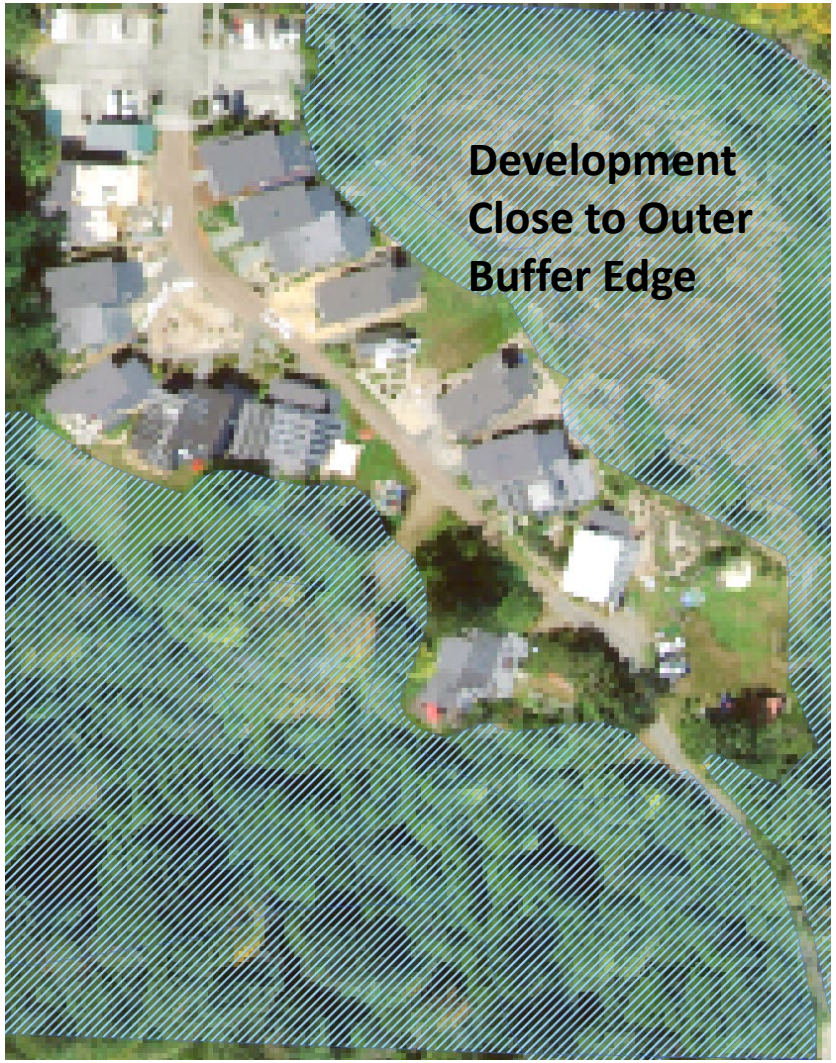
Waterbody	Data Limitation	Impact on Results
Streams	• Stream location is not always accurate. When buffers are applied, the buffer edges are therefore not always accurate.	• Overestimate impacts to stream buffers, especially in urban areas. • Underestimate impacts to stream buffers.
	• Not all streams are mapped.	• Underestimate impacts to stream buffers.
Wetlands	• Wetland location is not always accurate. When buffers are applied, the buffer edges are therefore not always accurate.	• Overestimate impacts to wetlands and their buffers in some locations including urban areas. • Underestimate impacts to wetlands and their buffers, particularly to small wetlands and forested wetlands.
	• Not all wetlands are mapped and some mapped wetlands don't exist on the landscape.	• Overestimate impacts to wetlands and their buffers. • Underestimate impacts to wetlands and their buffers.
	• A 75-foot buffer was applied to all wetlands when County Code requires buffers ranging from 25 to 300 feet depending on wetland category and land use.	• Overestimate impacts to wetlands and their buffers. • Underestimate impacts to wetlands and their buffers, particularly to the most ecologically important wetlands.

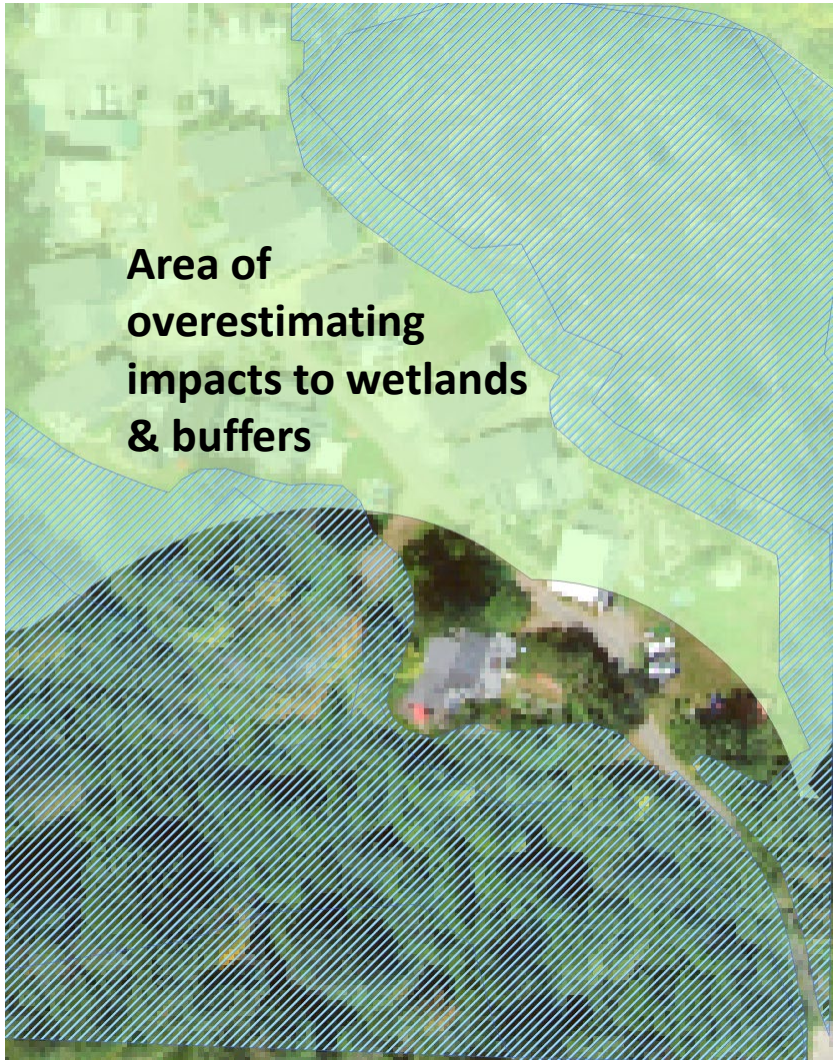
Testing Impact of Data Limitations

Pilot study of two small areas:

- Urban study area showed a factor of 2 difference in impacts, with estimates based on County data higher.
- Rural pilot study area showed much smaller (<1%) difference.

Overall, pilot study results show that the approach used was sufficiently accurate to assess the general trend and extent of land cover changes, even with the level of uncertainty.





CASP critical area

Wetland + Wetland Buffer

Note that the CASP digitized wetlands is a subset of all critical areas as only those where permit-required development occurred are included.

Adaptive Management Actions the County could take to respond to results

Adaptive Management

Stream, lake, and marine buffers and wetlands and wetland buffers had enough impact to trigger Adaptive Management Threshold 2.

Plan Component	Monitoring Element	Threshold 1	Threshold 2	Threshold 3
Land Cover Change – Wetlands	%Positive minus %Negative Change in Wetland + Wetland Buffer	<5% change across County jurisdiction within any subbasins relative to baseline	5-10% change across County jurisdiction within 2 or more subbasins relative to baseline	>10% change across County jurisdiction relative to baseline
Land Cover Change – FWHCA riparian	%Positive minus %Negative Change in Stream + Lake + Marine Buffer	<3% change across County jurisdiction within any subbasins relative to baseline	3-5% change across County jurisdiction within 2 or more subbasins relative to baseline	>5% change across County jurisdiction relative to baseline

When the percentages in the Adaptive Management Thresholds were determined, uncertainty in the data influenced what percentages would be used.

Adaptive Management Threshold 2 triggers additional public outreach, enforcement, and mitigation actions; programmatic adjustments

Actions the County could take to respond to Adaptive Management Threshold 2

Critical Area Education & Outreach

- Highest priority: lakeside landowners (critical area and dock regulations)
- Other target audiences:
  - Residential property owners
  - Developers and contractors; Real estate professionals

More educated public can lead to increase in code enforcement referrals

Programmatic Adjustments

- Review/revise CAR regulations (underway)
- 2024 Comprehensive Plan (underway)
- Improve Critical Area Site Plan (CASP) availability
- Update Critical Area Monitoring and Adaptive Management Plan

Mitigation including Conservation and Restoration

- Acquire properties for conservation and implement the Land Conservation Initiative
- Continue habitat and salmon programs (restore fish passage, **restore salmon habitat**, conduct invasive plant removal and **riparian buffer planting**, and remove derelict vessels)
- Support the Sustainable Lands Strategy
- Continue beaver management efforts that leave beavers on landscape

Restoring salmon habitat and planting riparian buffers are very important to protect and restore functions and values.

Critical Area Permit Compliance

Permit Compliance

- 3 Studies – SWM study used different methodology than PDS studies
- The 3 studies included only a subset of all CASPs.
- SWM study year range was three-four times longer than PDS studies and evaluated over 9 times more acreage
- PDS studies identified specific types of impacts using aerial photos; SWM study used land cover change analysis without identifying specific types of impacts

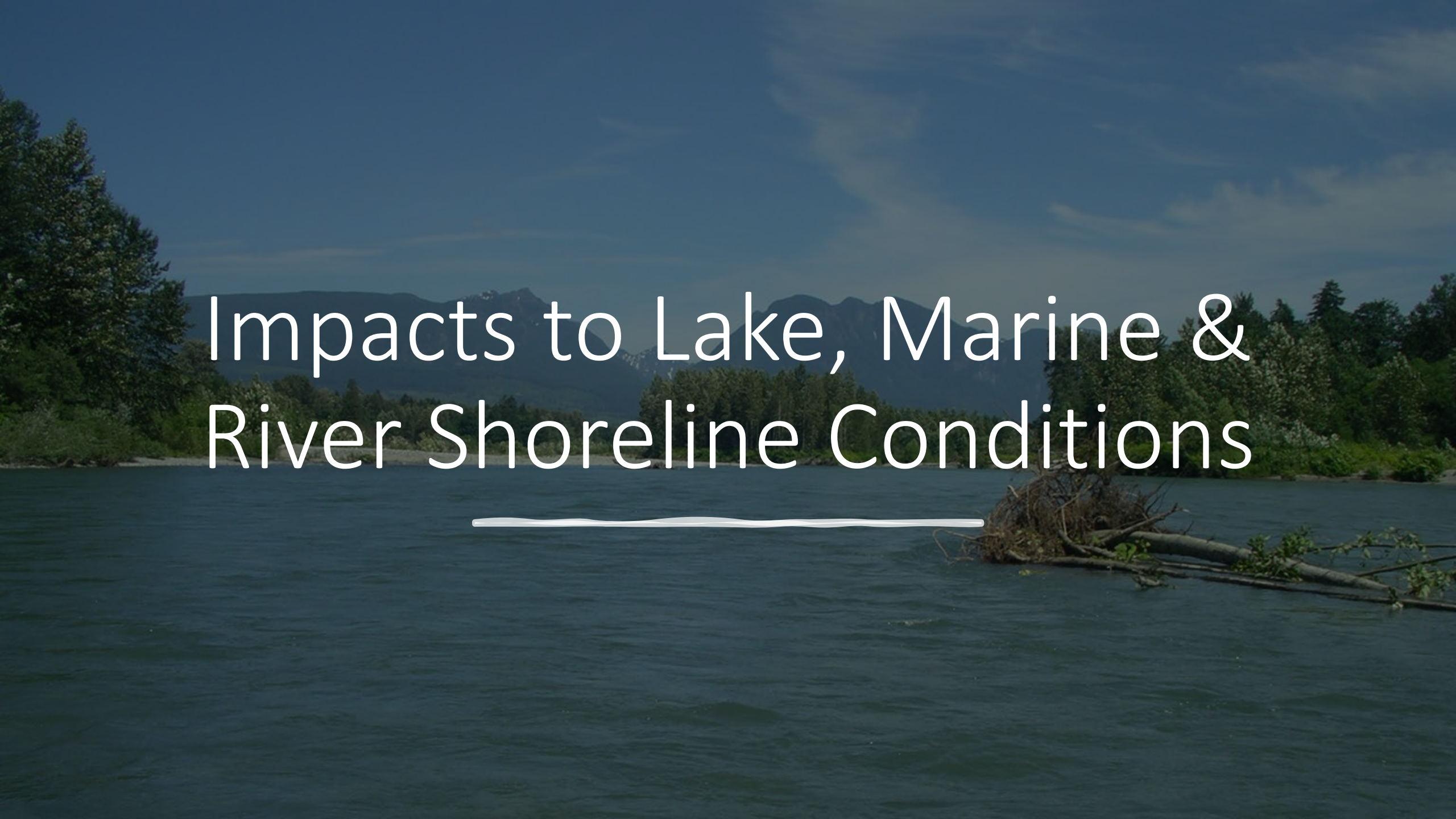
Results of Three Permit Compliance Studies

Study	Total Acres	Acres of CASPs impacted	Percent Change
SWM Study	3,066	116.5	-3.8%
2019 PDS Study	321.49	1.03	-0.3%
2020 PDS Study	1,948	14.9	-0.7%

Types of Impacts found in 2020 PDS Study

Impact Type	Total Acres Impacted
Clearing	**8.2**
Clearing & Grading	**5.5**
Junk/Garbage	**0.1**
Structures	**0.4**
Garden & Grading	**0.8**
Total	**15.0**

In general, property owners appear to protecting critical areas as individual intrusions are small to nonexistent. However, the cumulative impacts due to many small intrusions can harm functions and values.



Impacts to Lake, Marine & River Shoreline Conditions

Lake, Marine, & River Shoreline Changes

Rivers

Decreased bank armoring in Snohomish and Stillaguamish Rivers

Increased beneficial log jams and pools

Marine

Decreased bank armoring along marine shoreline

Where armoring increased, likely due to SMP requirements to ensure industries that need access to shorelines can continue to operate

Lakes

Increased bank armoring

Increased number and density of docks

Improved shoreline vegetation

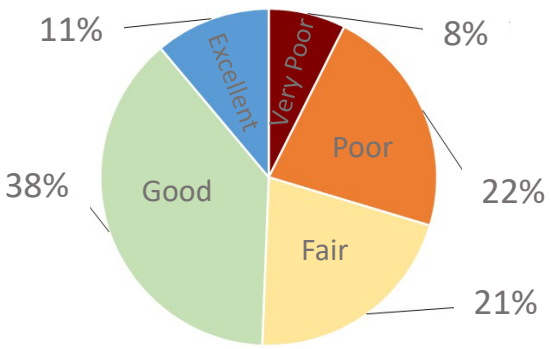
Recommend Public Outreach

Adaptive Management Threshold 1 triggered = outreach and/or enforcement and mitigation actions.

Functions & Values

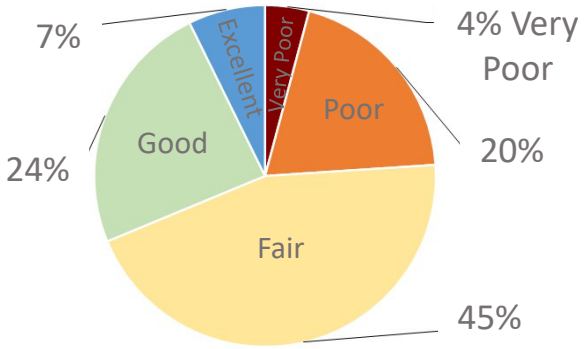
Status of Indicators of Stream Functions and Values

Stream Bugs



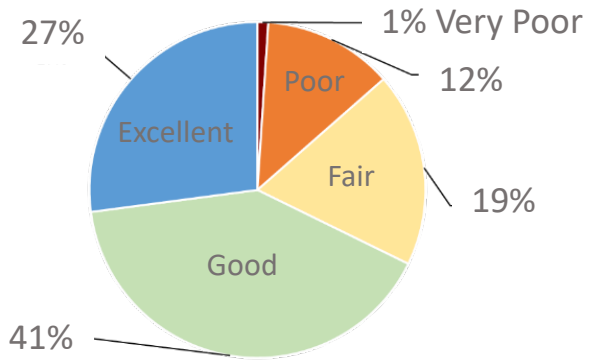
49% of stream miles are in excellent or good condition for stream bugs

Habitat



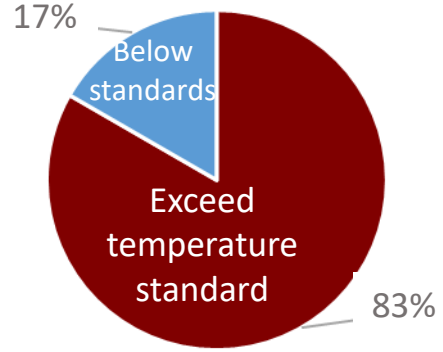
31% of stream miles are in excellent or good condition for habitat

Water Quality



68% of stream miles are in excellent or good condition for water quality

Temperature



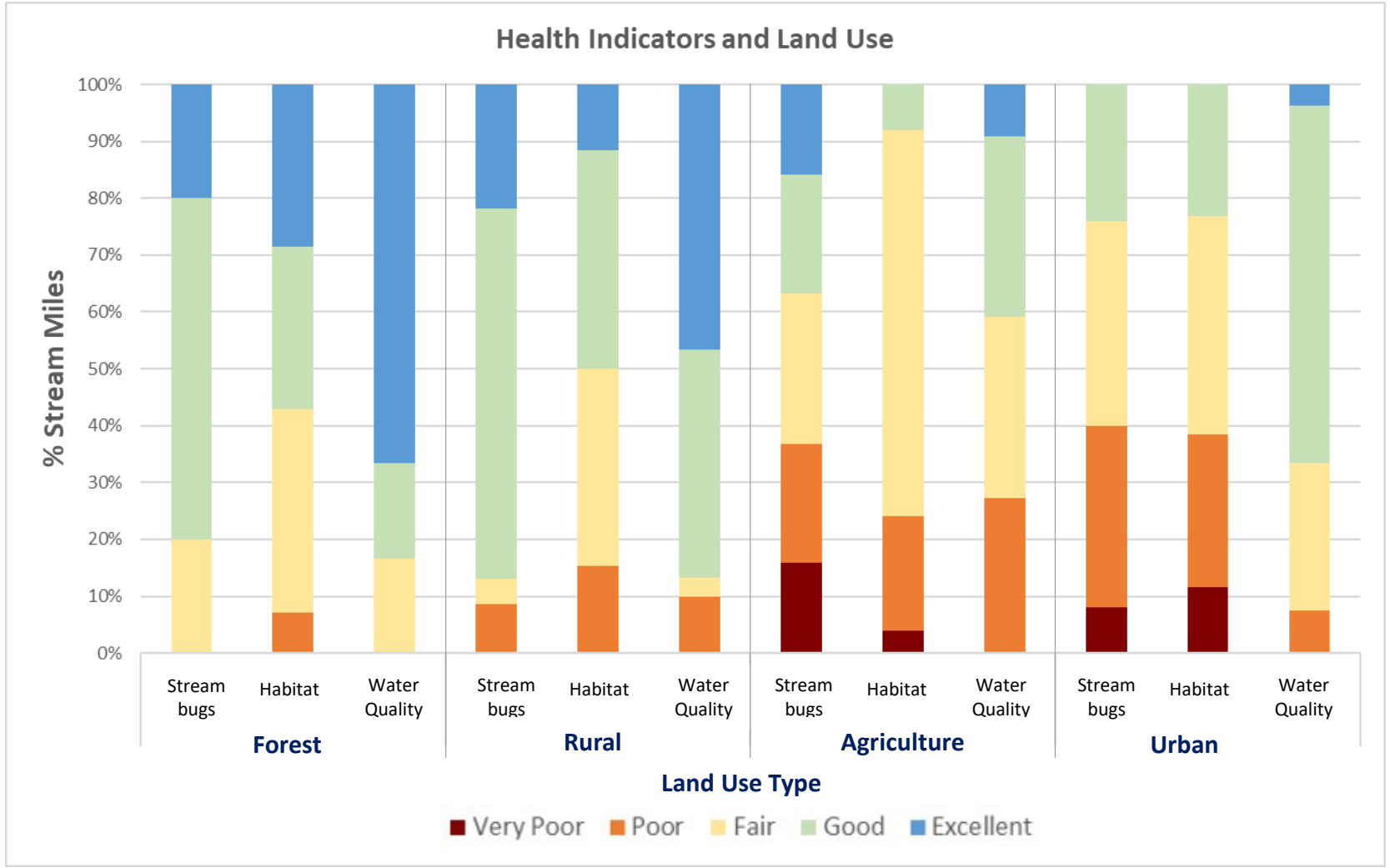
17% of sites did not exceed the 7-day temperature standard

Buffer Condition impact these indicators of functions and values. These are baseline data, over time new data will show how things are changing.

Based on data collected between 2018 and 2022 by the County's State of Our Waters monitoring program (≈100 sites)

Land Use Impacts to Stream Functions and Values

Land Use impacts these indicators of functions and values.
Agricultural and urban land use settings have worse conditions.



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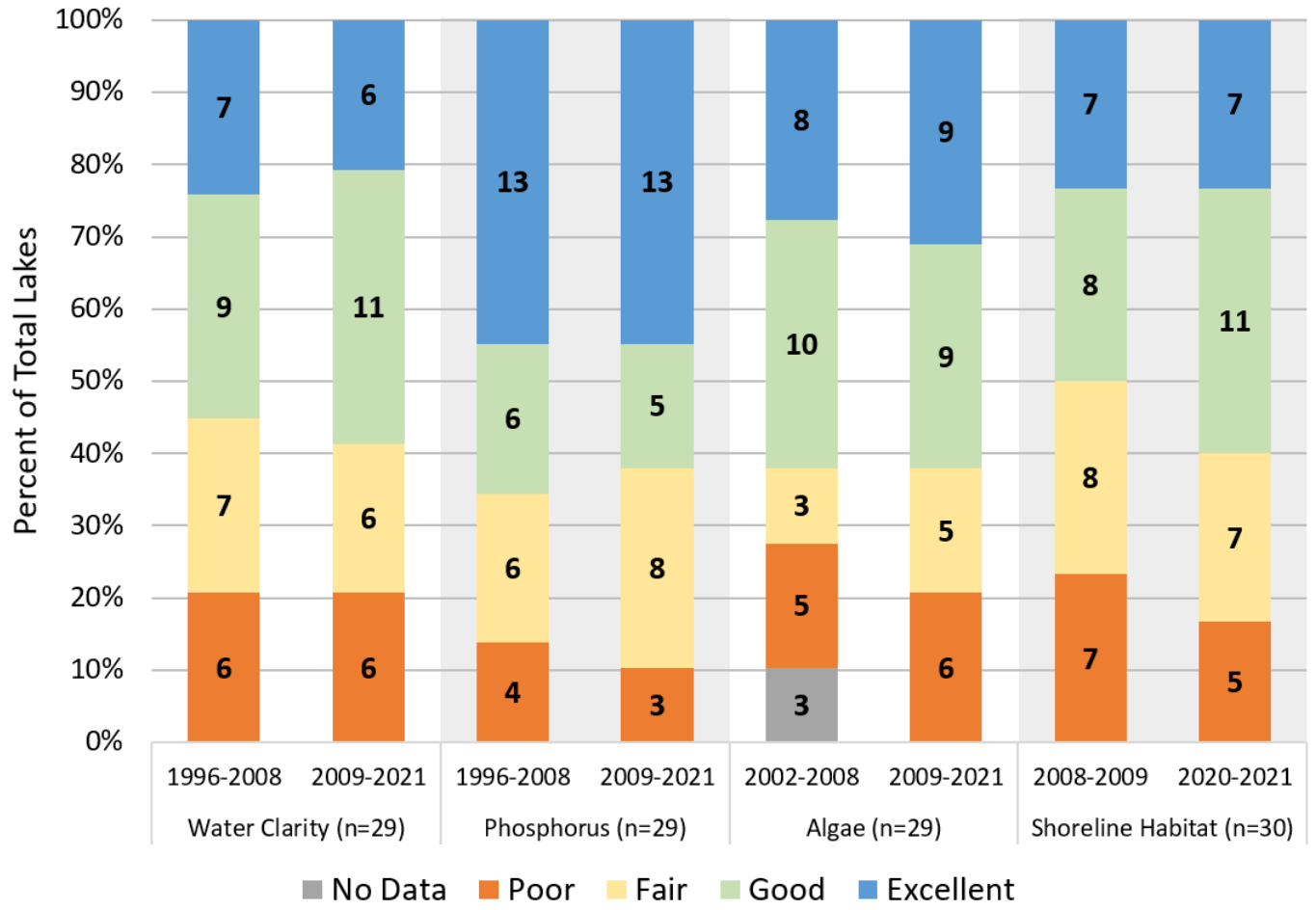
Trend of Lake Indicators of Functions and Values

Lake health indicators have changed little over time. This is expected as it takes decades to see large scale changes in lake water quality. There has been some improvement in phosphorous pollution, likely due to ban on phosphorous in fertilizers.



Based on data collected from 29 to 30 lakes with public access between 1992 and 2021 by the County's Lake Volunteer monitoring program

Has there been a "Net Loss" in Functions and Values?

"Net loss" incorporates positive conservation and restoration actions in addition to negative impacts

Likely been a loss of functions and values based on buffer changes, but there is no accepted approach to calculating "Net Loss".

Loss due to implementation of CAR alone can't be quantified separately but is likely to be minimal compared to losses caused by other stressors and unpermitted activity.

The loss of functions and values is confounded by cumulative impacts from upland development, climate change, groundwater withdrawals, and other stressors (some external to County jurisdiction).

Between 2009 and 2021, the County implemented many positive actions that could offset "loss" from CAR implementation. Benefits to functions and values would also accrue from non-County sponsored improvements.

County Positive Action	Amount
Acquisition for Conservation	4,101 acres
Salmon habitat restoration improvements	458 acres
Stream habitat opened newly accessible through fish passage improvements	68 miles
Invasive plant removal and/or native planting	897 acres

Conclusions

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