

Vermont Bioengineering Projects

Restoring Living Shorelands

NALMS 2019

By Amy Picotte, Vermont Shorelands Program





2011 Lake Champlain Floods Cleared Shores Cause Bank Failure

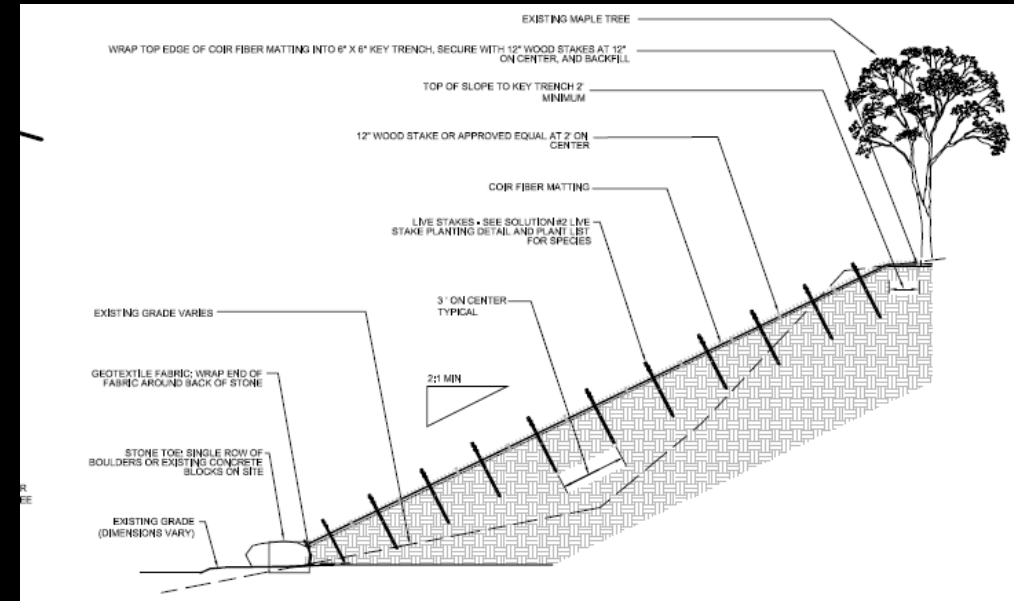


Photos by Britt Hazelton

Two adjacent properties on Malletts Bay, Lake Champlain

Live Staking on Lake Champlain

North West Regional Planning Commission
Lake Champlain Basin Program and VTDEC Lakes and Ponds Program

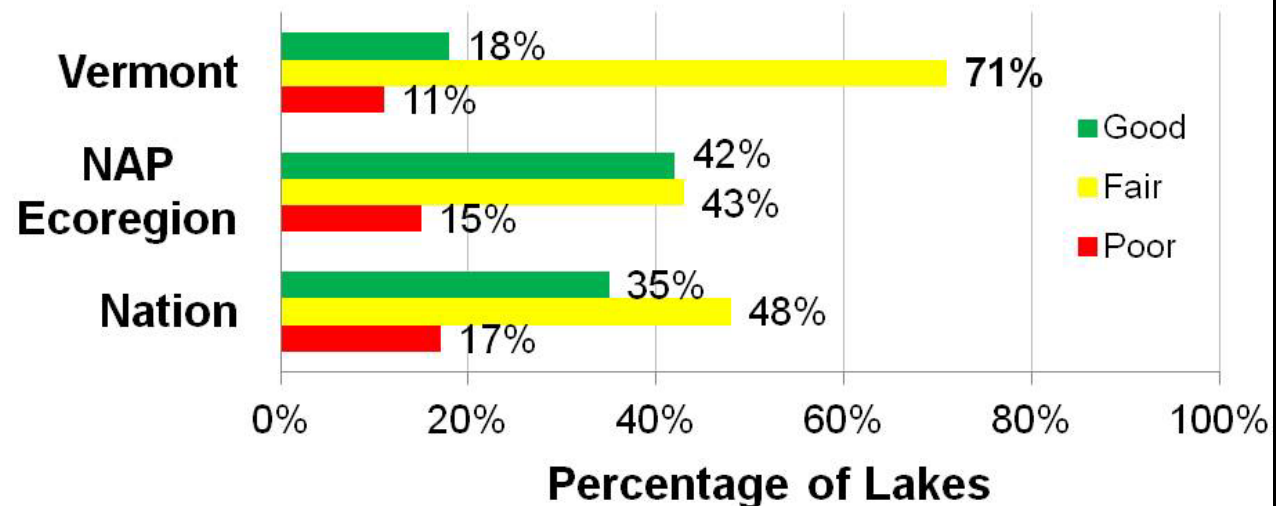


Project Designed by Lamoureux and Dickerson Engineers, Essex, VT



Vermont Ranked Worse than the Nation for Degraded Shallow Water Habitat Caused by Shoreland Development

Lakeshore Disturbance



EPA - 2007 National Lakes Assessment





The 2014 Shoreland Protection Act

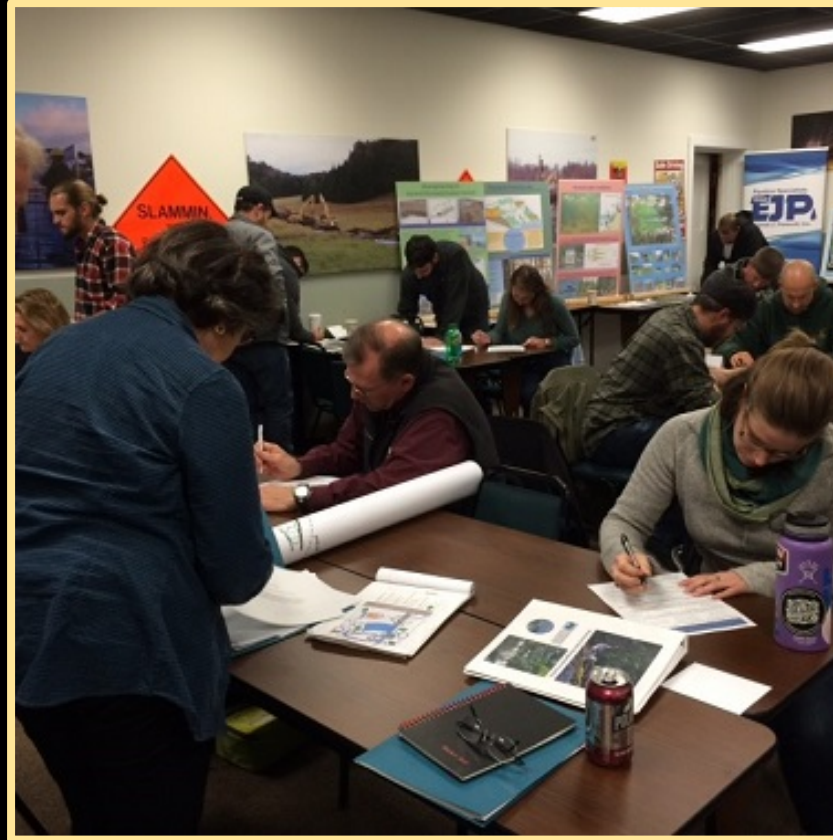
This

Not That

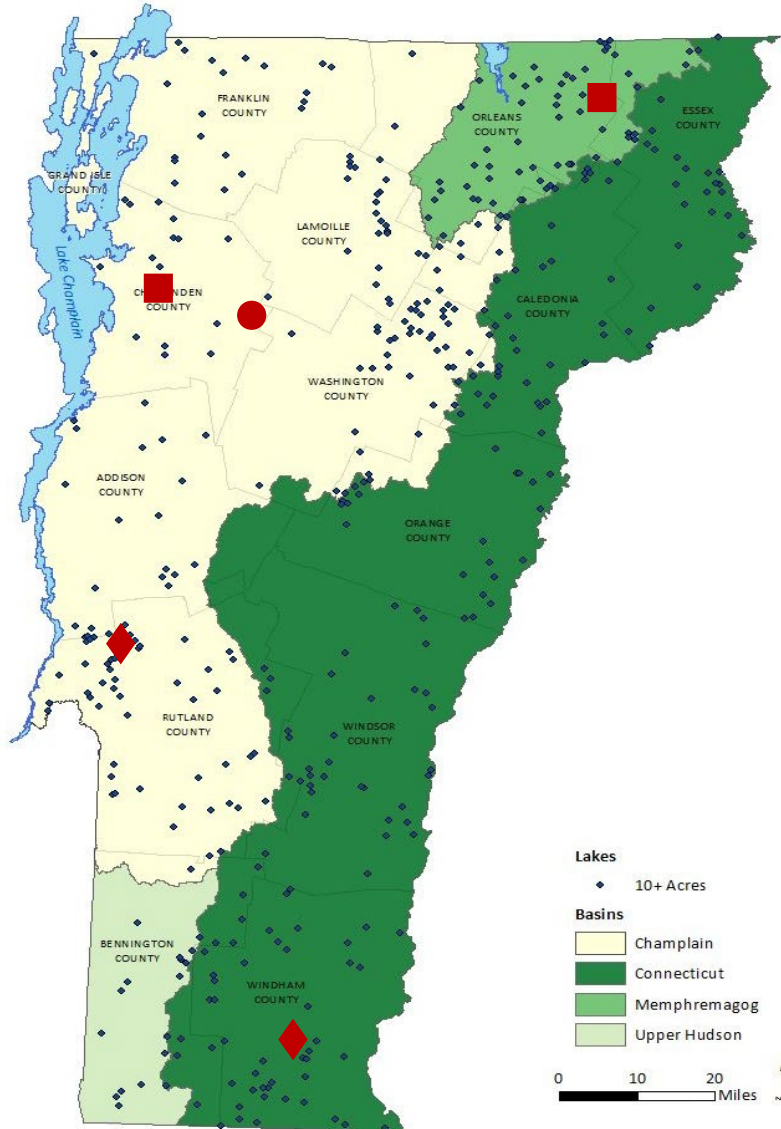
- Regulatory Permits for New Impervious Surface and Clearing
- The Voluntary Natural Shoreland Erosion Control Certification Program

Vermont Natural Shoreland Erosion Control Certification

Modelled after National Leaders and Experts in Bioengineering



Assessment of Five Bioengineering Installation Projects



Fiber Coir Rolls

- Lake Iroquois
- Island Pond (also Lift System)

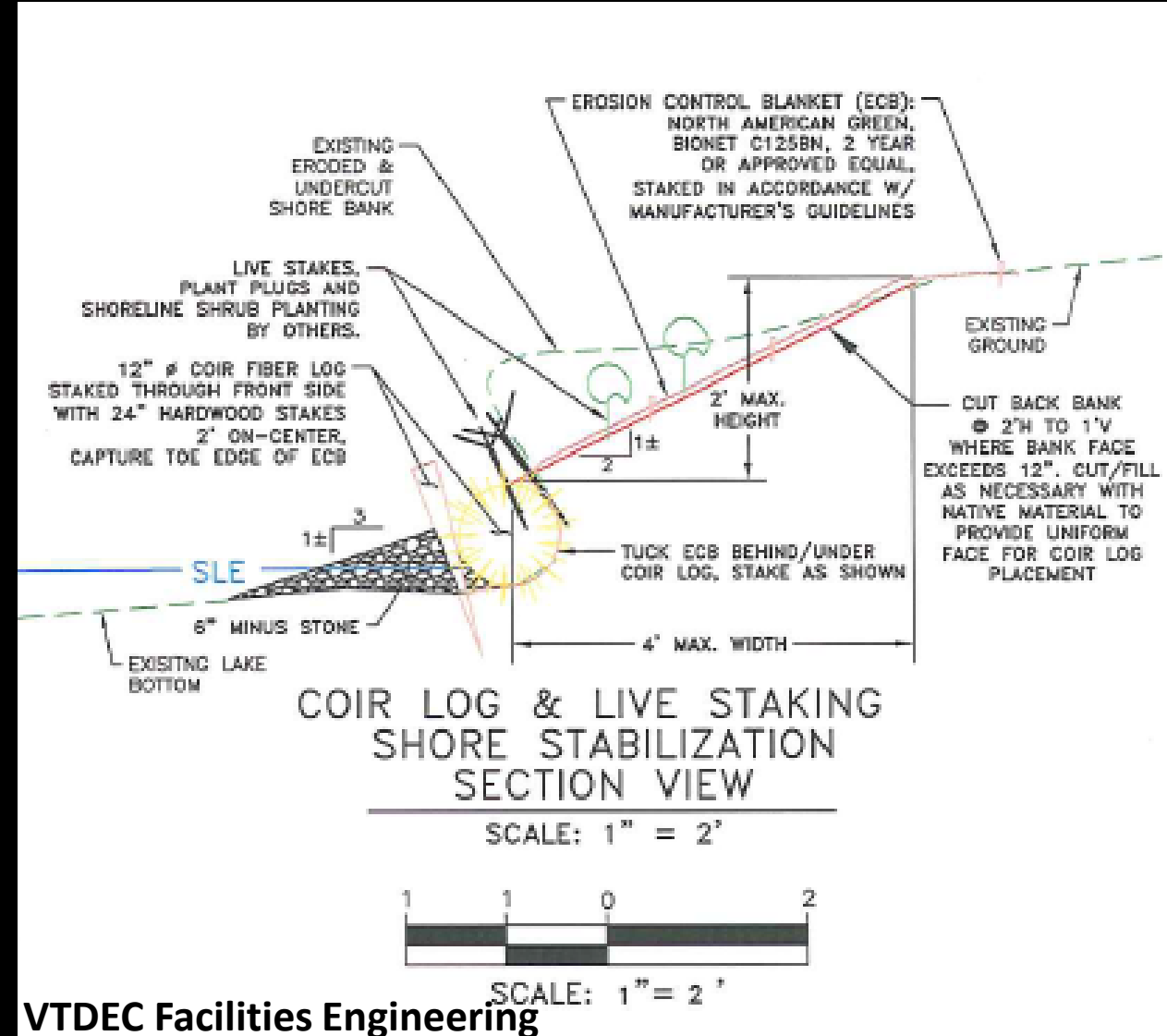
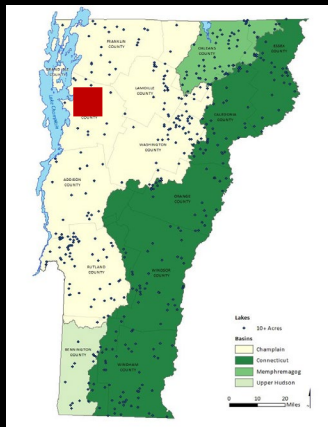
Encapsulated Soil Lifts

- ◆ Lake Bomoseen
- ◆ Lake Raponda

Live Crib Wall

- Waterbury Reservoir

2015 Lake Iroquois – Fiber Coir Rolls



VTDEC Facilities Engineering



Brian Majka, GEI Consulting from Michigan Led Training

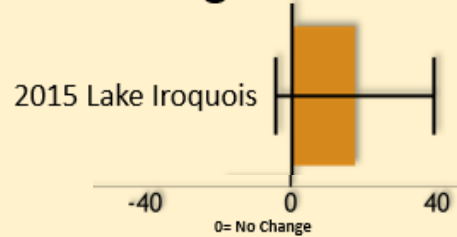


Visually Successful



Plant Results

Percent Change in Stem Count



- 18% Increase in Plant Species
- Didn't Fence First Year
- **Site Stabilized**

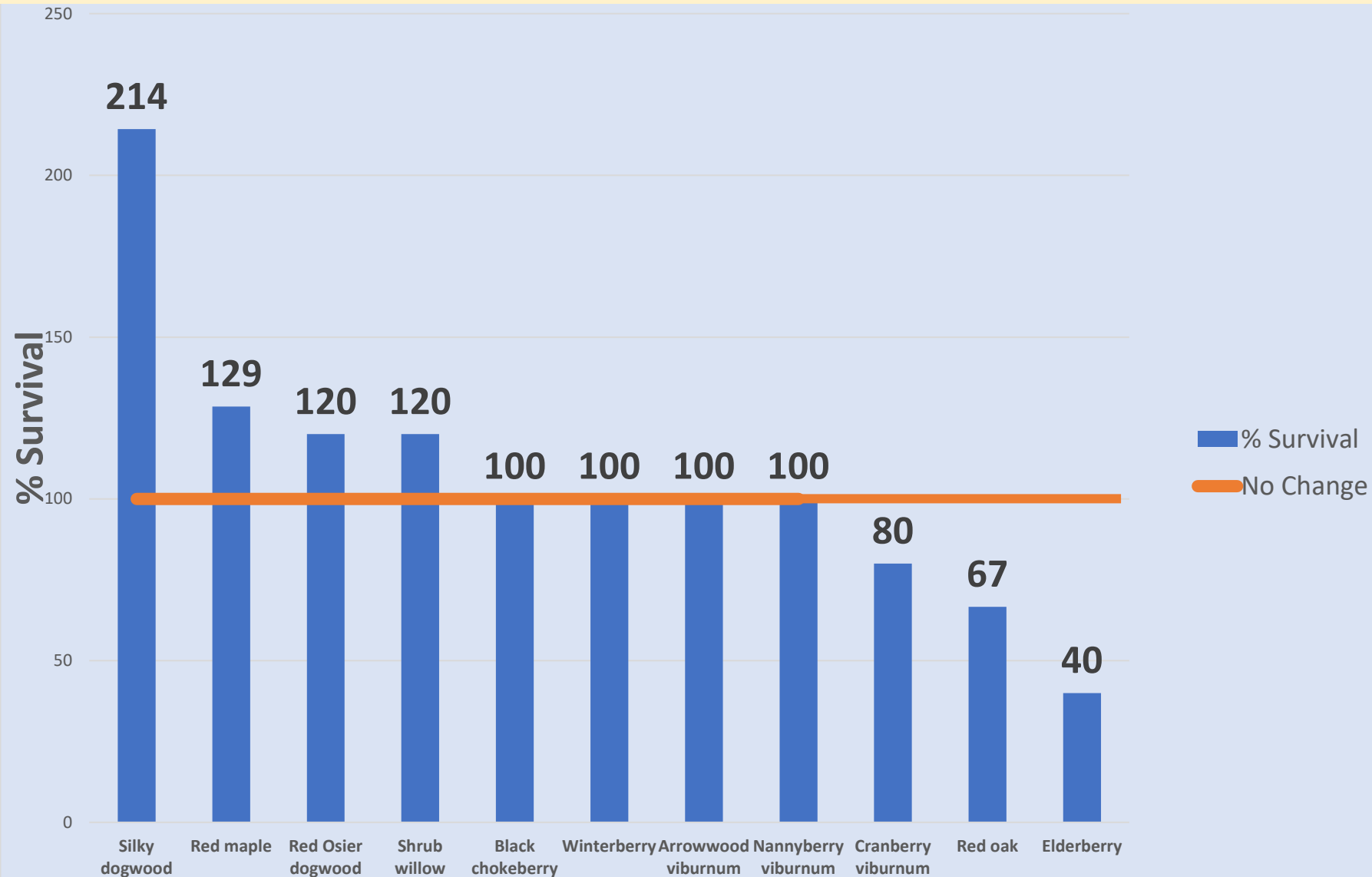
Top Growing Species

Silky Dogwood
Red Maple
Redosier Dogwood
Willows

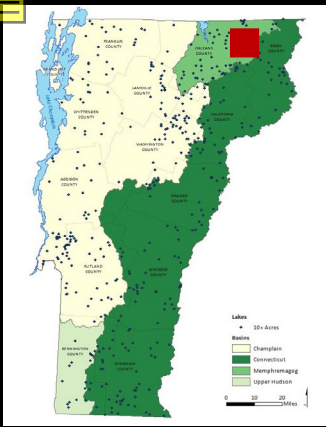
Poorer Performing Species

Elderberry

2015 Lake Iroquois – Fiber Coir Roll



2017 Island Pond Encapsulated Soil Lifts and Fiber Coir Rolls

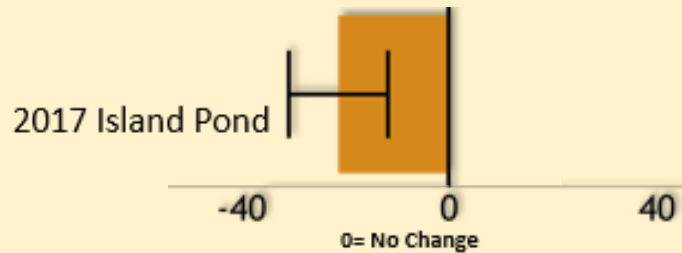


Natural Shoreland Erosion Control - Partners Training



Plant Results

Percent Change in Stem Count



- 25% Decrease in Plant Species
- Sandy Soils Susceptible to Ice Push
- Fencing Removed then Replaced
- **Project Stable**

Top Growing Species

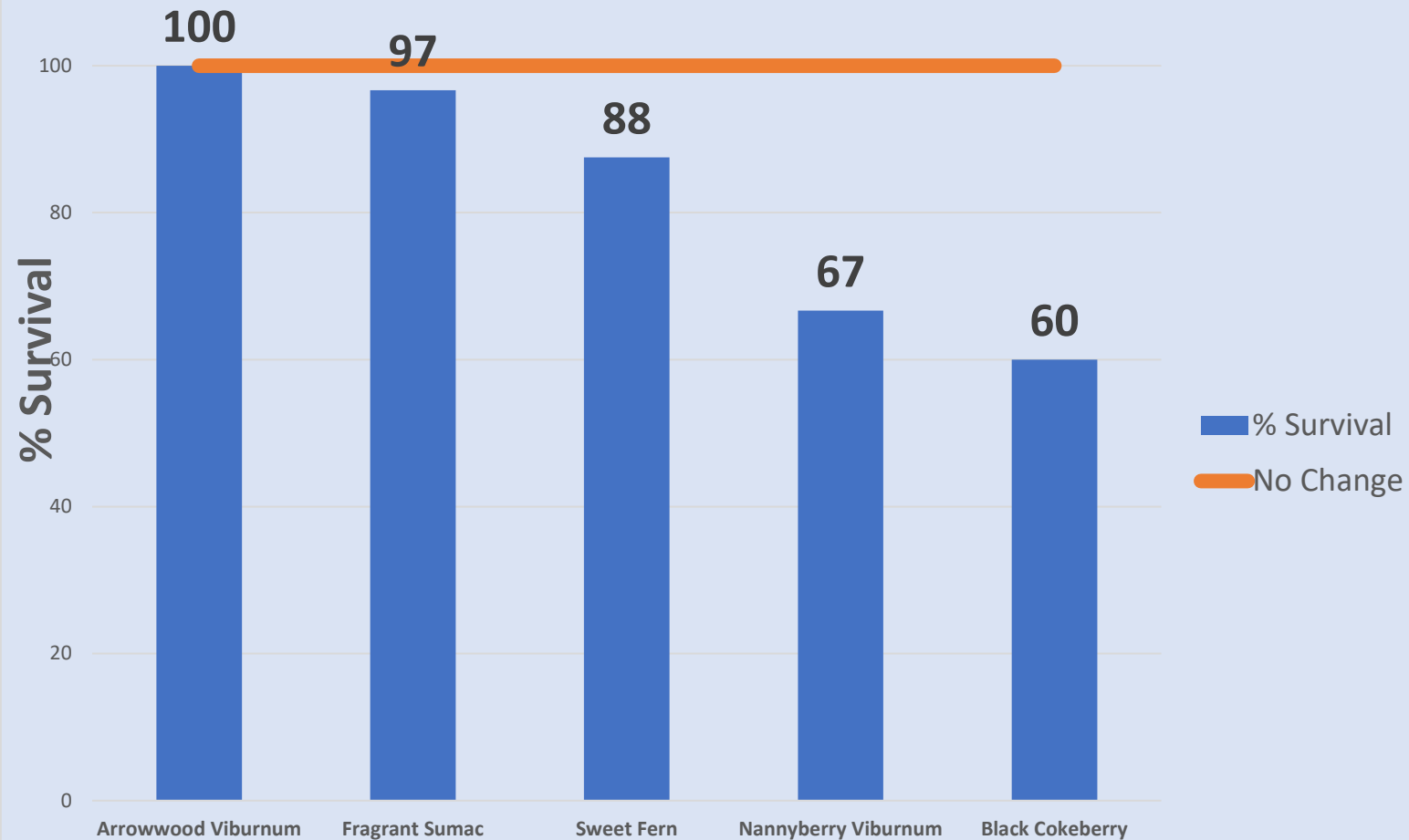
Arrowwood Viburnum

Low Grow Fragrant Sumac

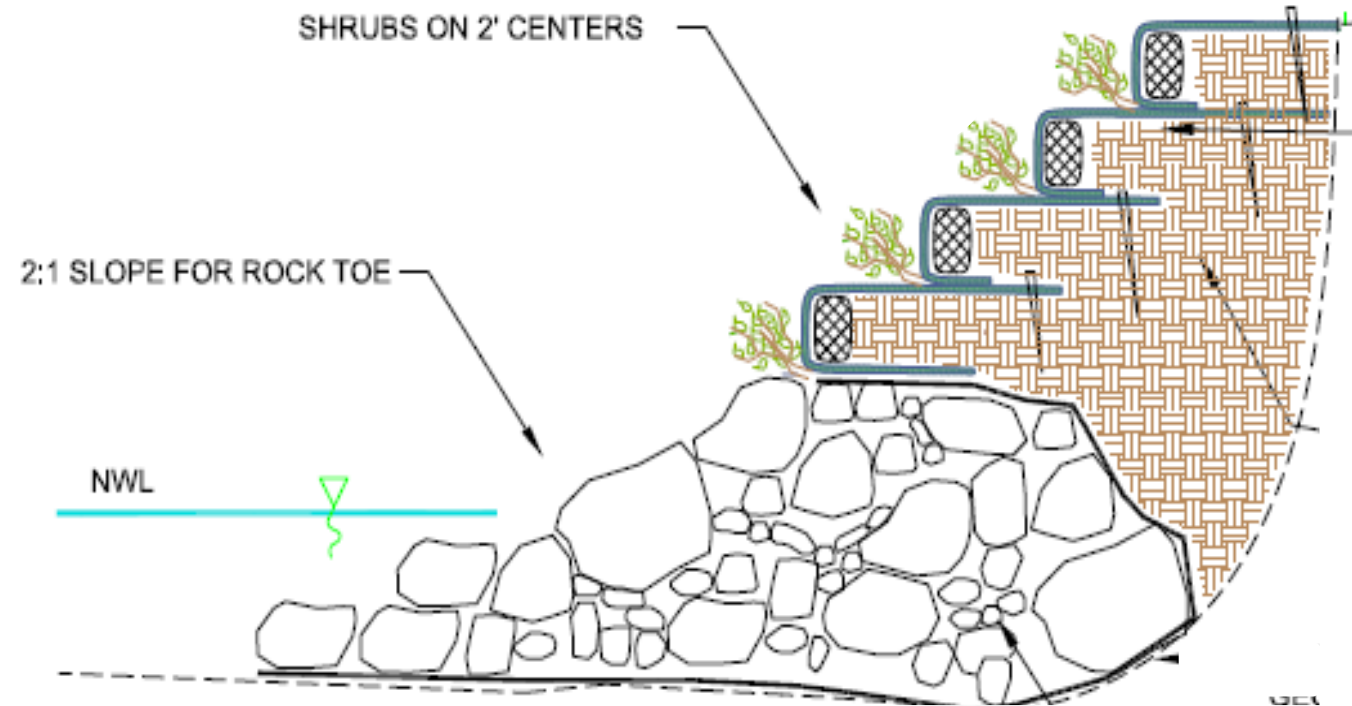
Poorer Performing Species

Herbaceous plants have been slower growing

2017 Island Pond – Fiber Coir and Lift System



2017 Lake Bomoseen - Encapsulated Soil Lifts

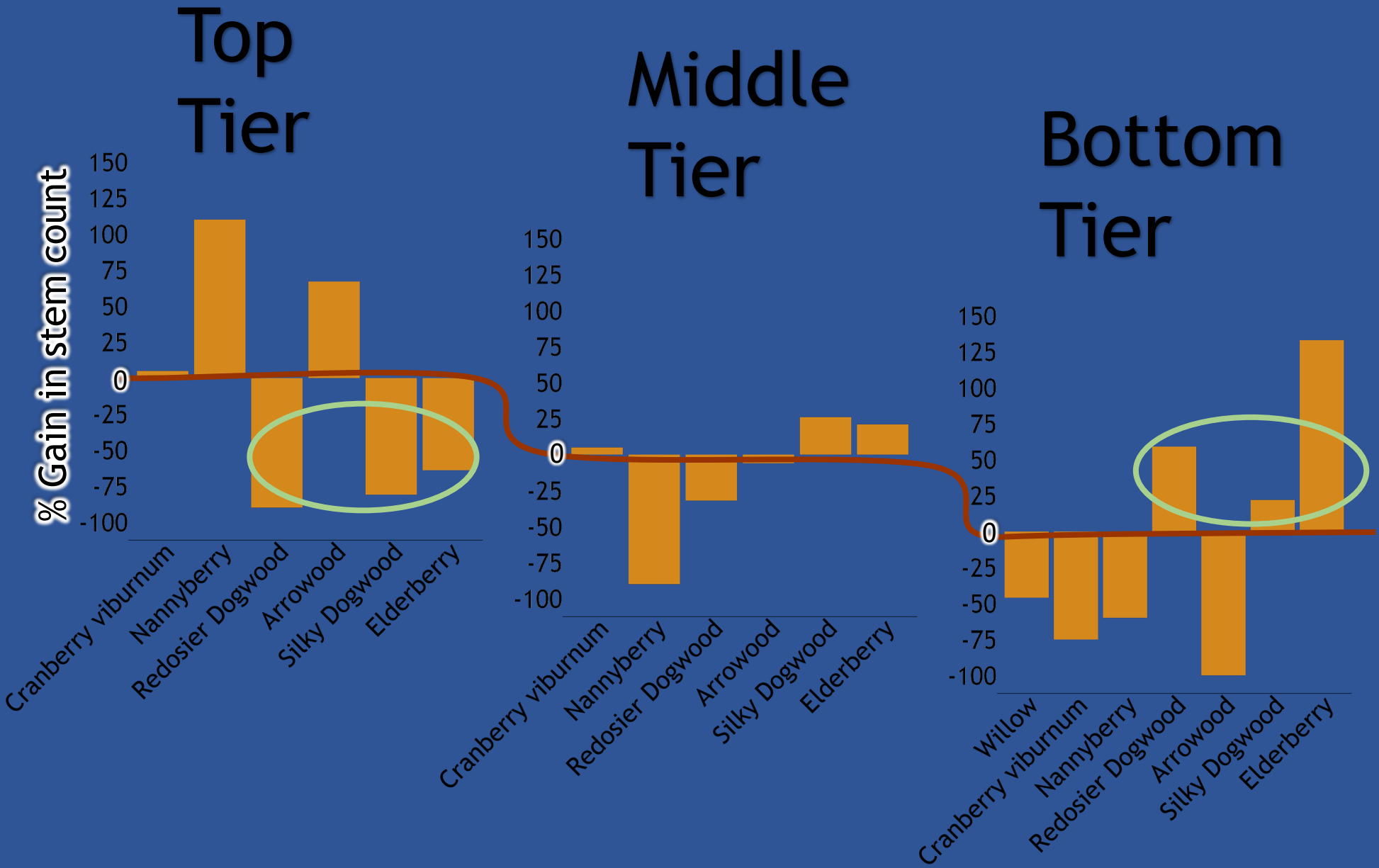


Natural Shoreland Erosion Control - Partners Training





Lake Bomoseen





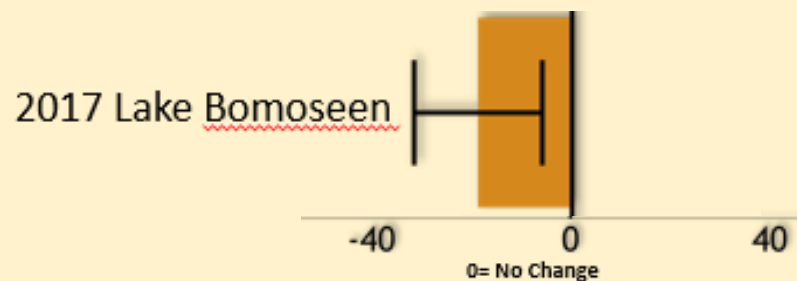
Lake Bomoseen

Natural Plant Mortality and Cultural Plant Mortality



Plant Results

Percent Change in Stem Count



- 15% Decrease in Plant Species
- Beaver and People Damages
- Japanese Knotweed Introduction
- **Project Stable**

Top Growing Species

Elderberry

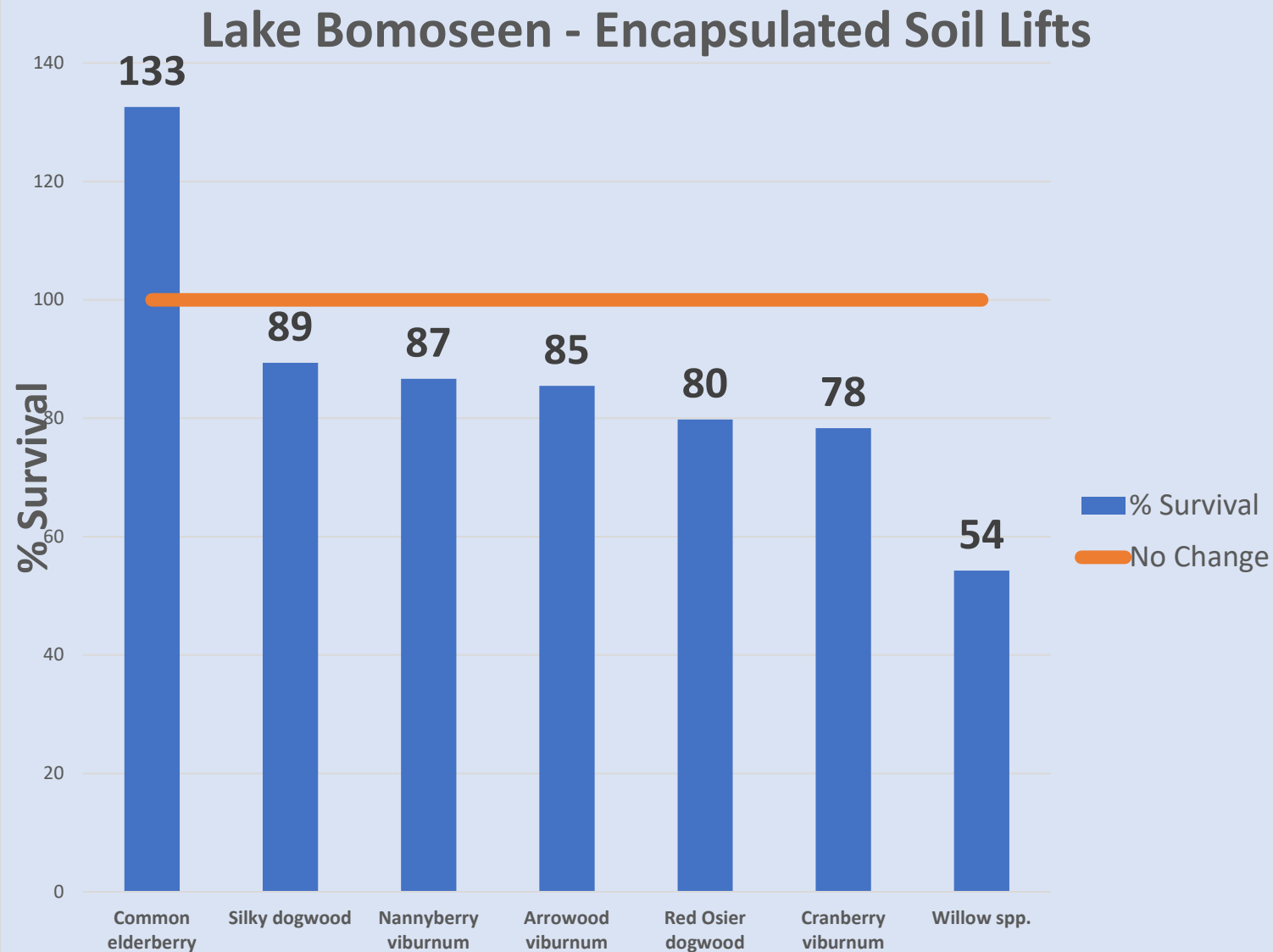
Silky Dogwood

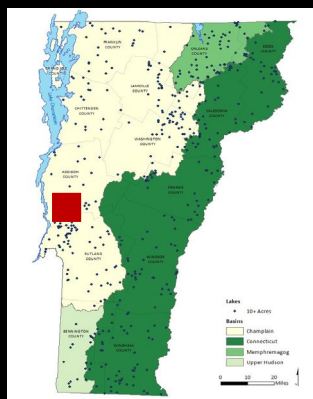
Nannyberry Viburnum

Poorer Performing Species

Willow

2017 Lake Bomoseen-Encapsulated Soil Lifts





2018 Lake Raponda – Encapsulated Soil Lifts

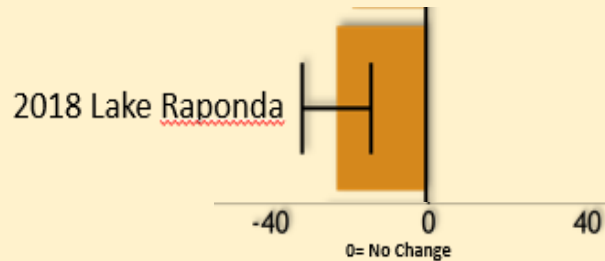


Natural Shoreland Erosion Control - Partners Training



Plant Results

Percent Change in Stem Count



- 18% Decrease in Plant Species
- Delayed Fencing
- **Project Stable**

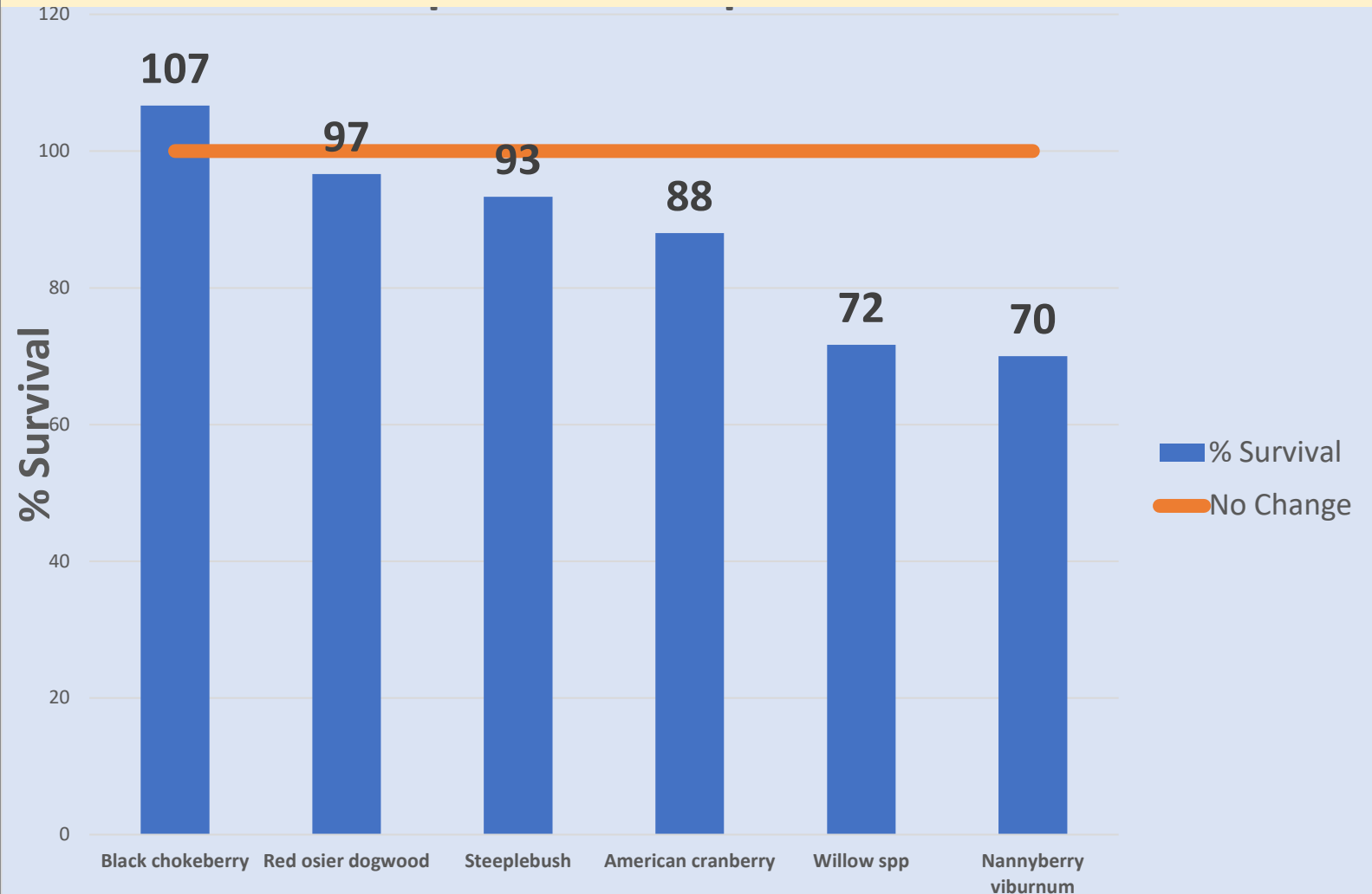
Top Growing Species

Black Chokeberry
Redosier Dogwood
Steeplebush

Poorer Performing Species

Nannyberry Viburnum (did well at Bomo site)

2018 Lake Raponda - Encapsulated Soil Lifts





Live Crib Wall at Waterbury Reservoir



2018 – Just Installed

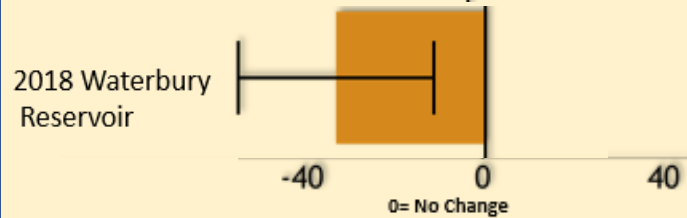
Live Crib Wall at Waterbury Reservoir



2019 – one year later

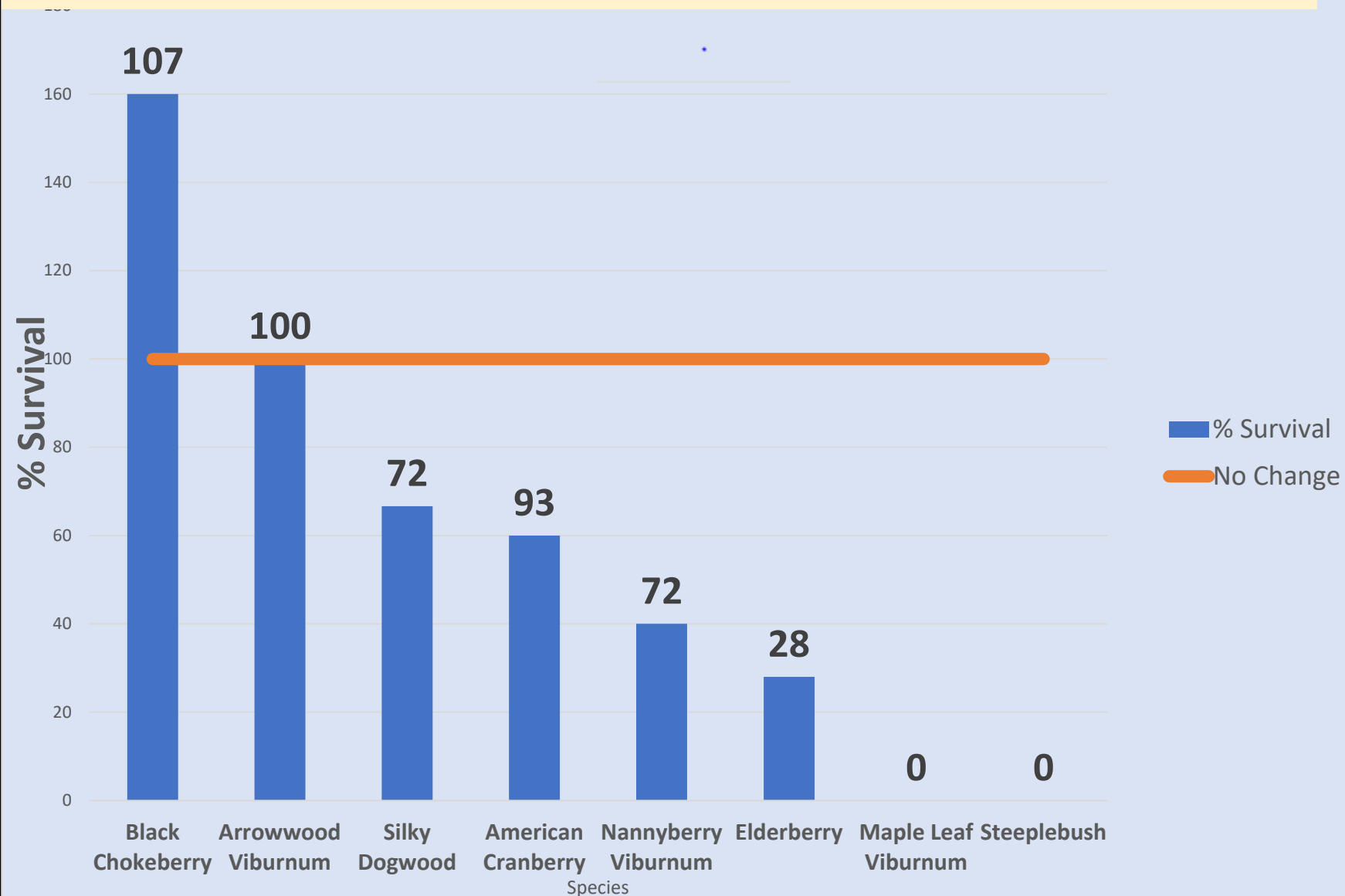
Plant Results

Percent Change in Stem Count



- 30% Decrease in Plant Species
- Reservoir Level Changes
- Popular Backcountry Site Hard to Water Regularly
- No Fencing Used
- **Site Stabilized**

2018 Waterbury Reservoir - Live Crib Wall



LESSONS LEARNED from Vermont Bioengineering

Are These Nature-Based Solutions to Restore Living Shorelands Working?



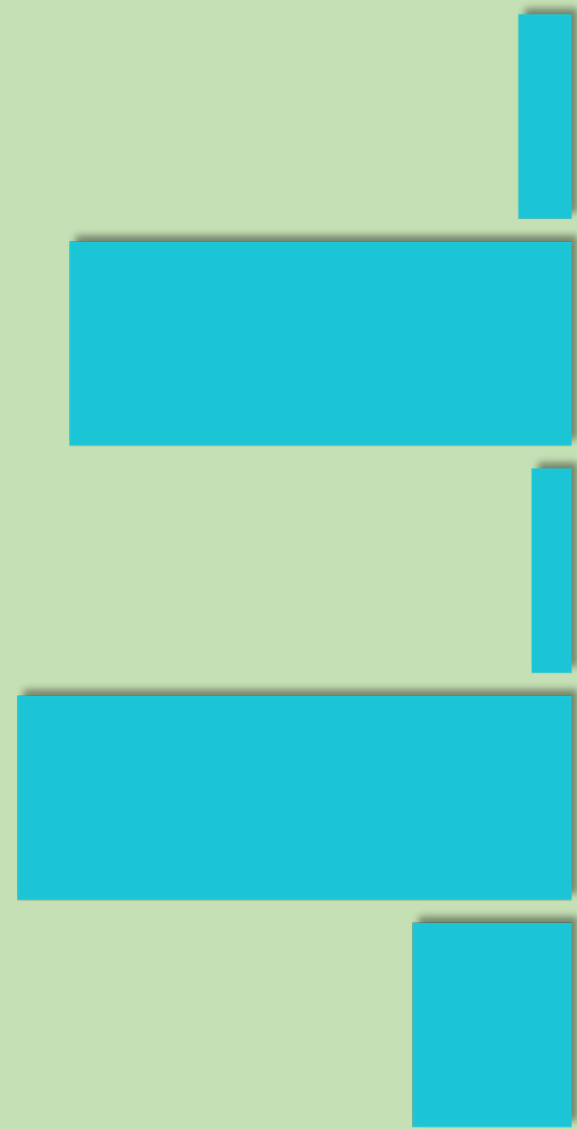
Mallards on Lake Raponda



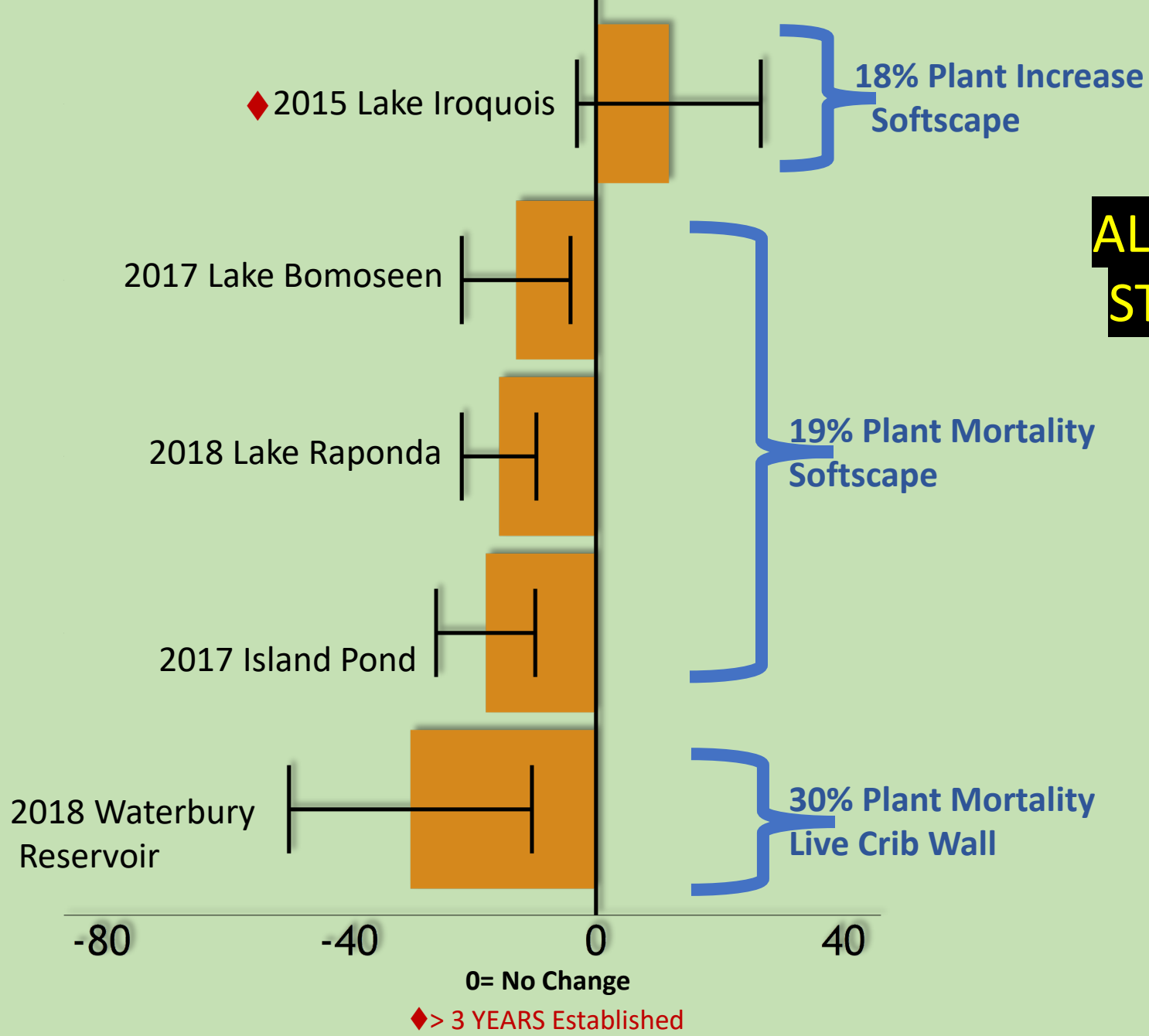
Mergansers on Maidstone Lake by Rebecca Scott



Effective Fetch



Percent Change in Stem Count



ALL SITES
STABLE!

Average distance wind can travel (km) over water to the site weighted by direction of the fastest 5-second wind gust (daily) in February to May of 2019

Summary - Lessons Learned

- ✓ Plan for 20% Plant Mortality
- ✓ Plan for Replacement Plantings
- ✓ Simplify Planting Selections
- ✓ Use Clean Soils
- ✓ Use Wildflower Seed
- ✓ Signage Is Important
- ✓ Install Temporary Fencing (Sand Fence)
- ✓ **Use Biodegradable Jute ECB Instead of Geotextiles**





Vermont Bioengineering Projects

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Nov 12, 2019 ~ NALMS