

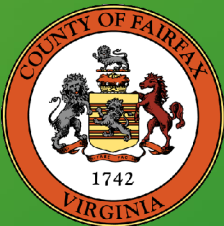


What is Stream Restoration Vegetation Success?

It Depends.

Meghan Fellows, Jonathan Witt, Chris Ruck

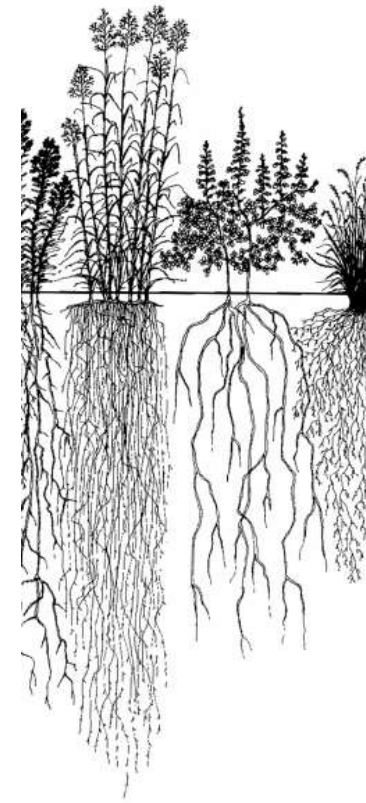
Department of Public Works and Environmental Services
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The role of vegetation

- Functioning ecosystems include multiple guilds of vegetation
 - Overstory vs. understory vs. herbaceous
 - Graminoid vs. forb
 - Annual vs. perennial
 - Male vs. female (e.g. *Acer negundo*, *Salix* sp., *Populus* sp.)
 - Native vs. non-native
 - N-fixers
 - Calcium sequesters
 - Carbon storage



Regulatory Target



- 80% Vegetation
- 100% Tree canopy at 10 years (assumed)
- Initial planting density

OFTEN:

stability as a surrogate for riparian 'health'



Functional Target



Ecological Lift

- Nutrient cycling
- Hydrology & Base Flow
- Energy transfer
- Downstream flooding
- Water quality
- Benthics
- Wildlife



Riparian Vegetation Measurements

- Woody biomass/canopy
- Woody survivorship and/or colonization
- Bare earth, Leaf litter (new and time to decay)
- Soil characters (nutrients, organic matter, bulk density)
- Coarse Woody Debris
- Floristic Quality Index and/or Plant Stewardship Index
- Fungus/Bacteria Ratio



What is a “Good” Measurement?

- Absolute Value
- Useful Indices, like IBI
- % of Potential (Analog)
- % of Reference



South Lakes, 2016

The Riparian Forest Vegetation Success Approach

- Before Restoration
- Restoration Adjacent
- Analog
- Reference
- Post-Restoration
- Still to come:
 - Pre/Post Same Site
 - Older Post-Restoration



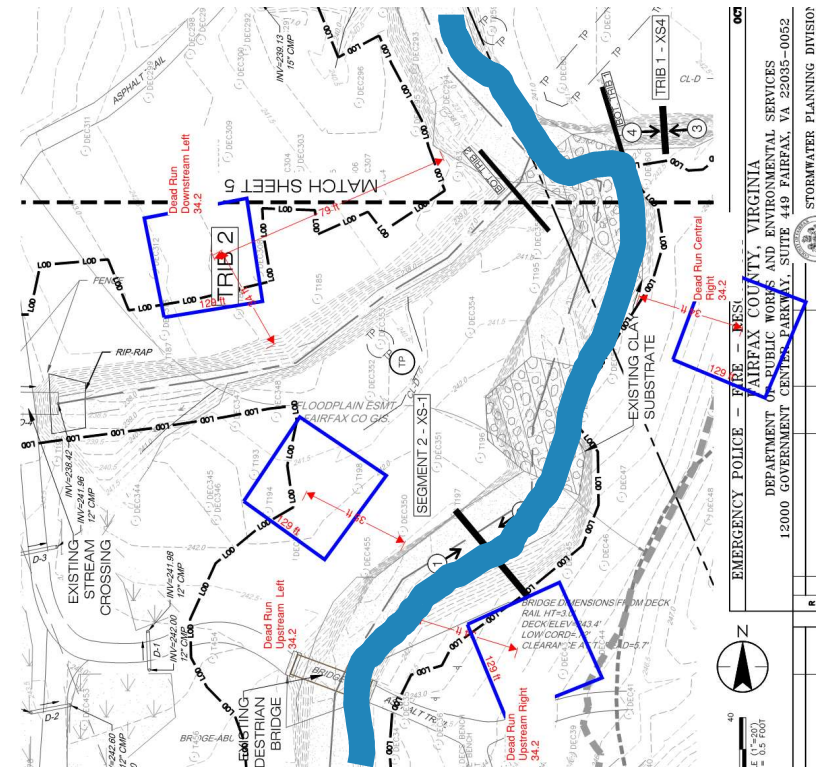
Metric Targets

Metric	Ecosystem Function	Target
Architecture/Layering	Direct (more layers intercept more water)	Shrub cover 50-75%
Coarse Woody Debris	Indirect (habitat feature)	CWD to ground cover, # patches is 90% of potential
Plant diversity	Direct (tolerant vs intolerant plant species)	High ratio of intolerant plant species, e.g. more rares, PSI greater than 10
Plant diversity	Direct (facultative wet plants vs. obligate)	High ratio of facultative (or greater) wet plants
Plant diversity	Direct (measure species; nativity)	No more than 35% NNI cover
Plant diversity	Direct (support greater number of insects)	PSI greater than 10
Woody biomass	Direct (larger = more canopy, more pollutant sequestration)	At ten years, number of woody stems >400
Woody canopy	Direct (more canopy = lower water temperature)	At ten years, 90-100%
Woody canopy	Indirect (shade)	At three years, streamside cover, 90-100%
Woody survivorship	Direct (perception of success)	85% Warranty success, no replanting needed

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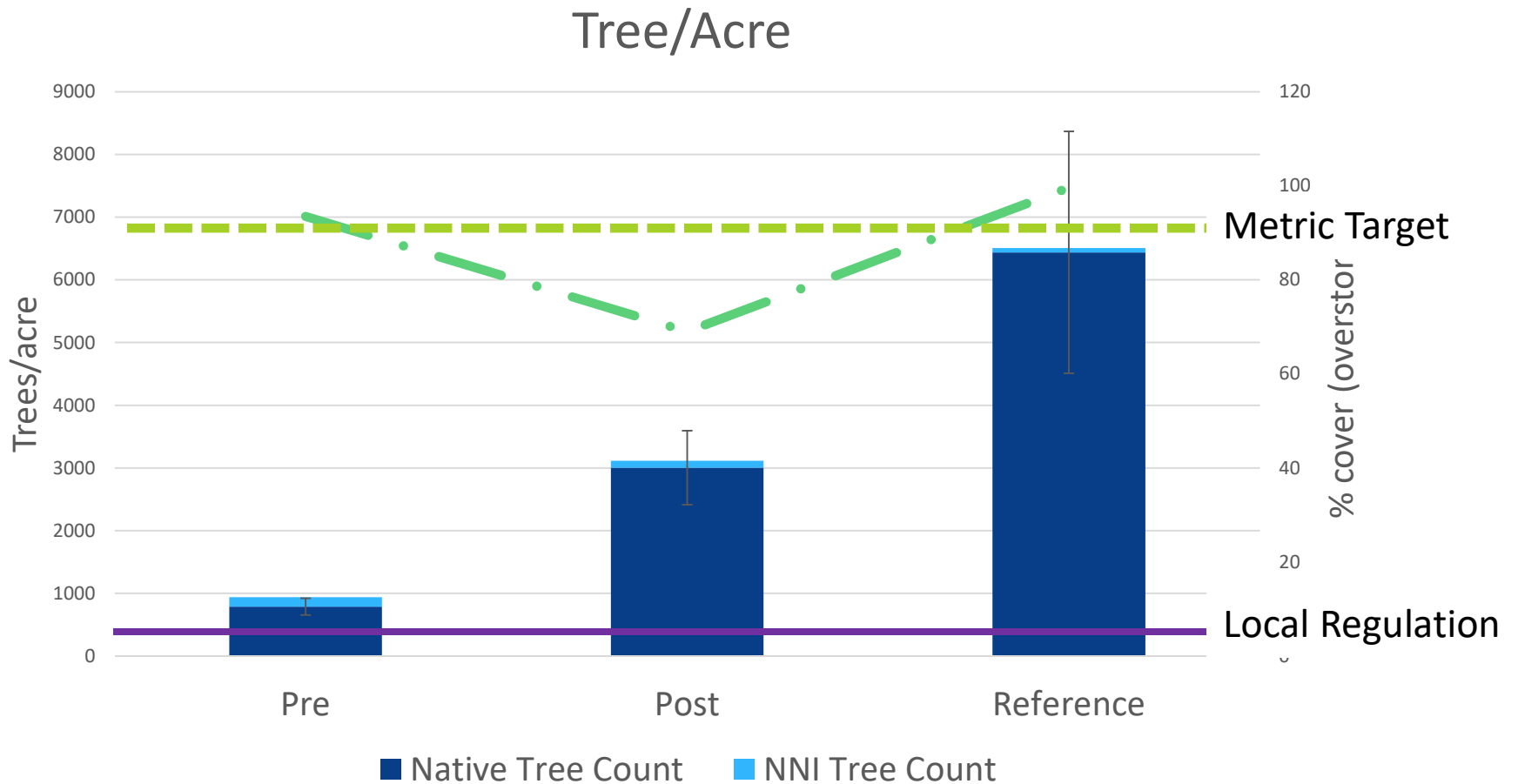
Example plot layout



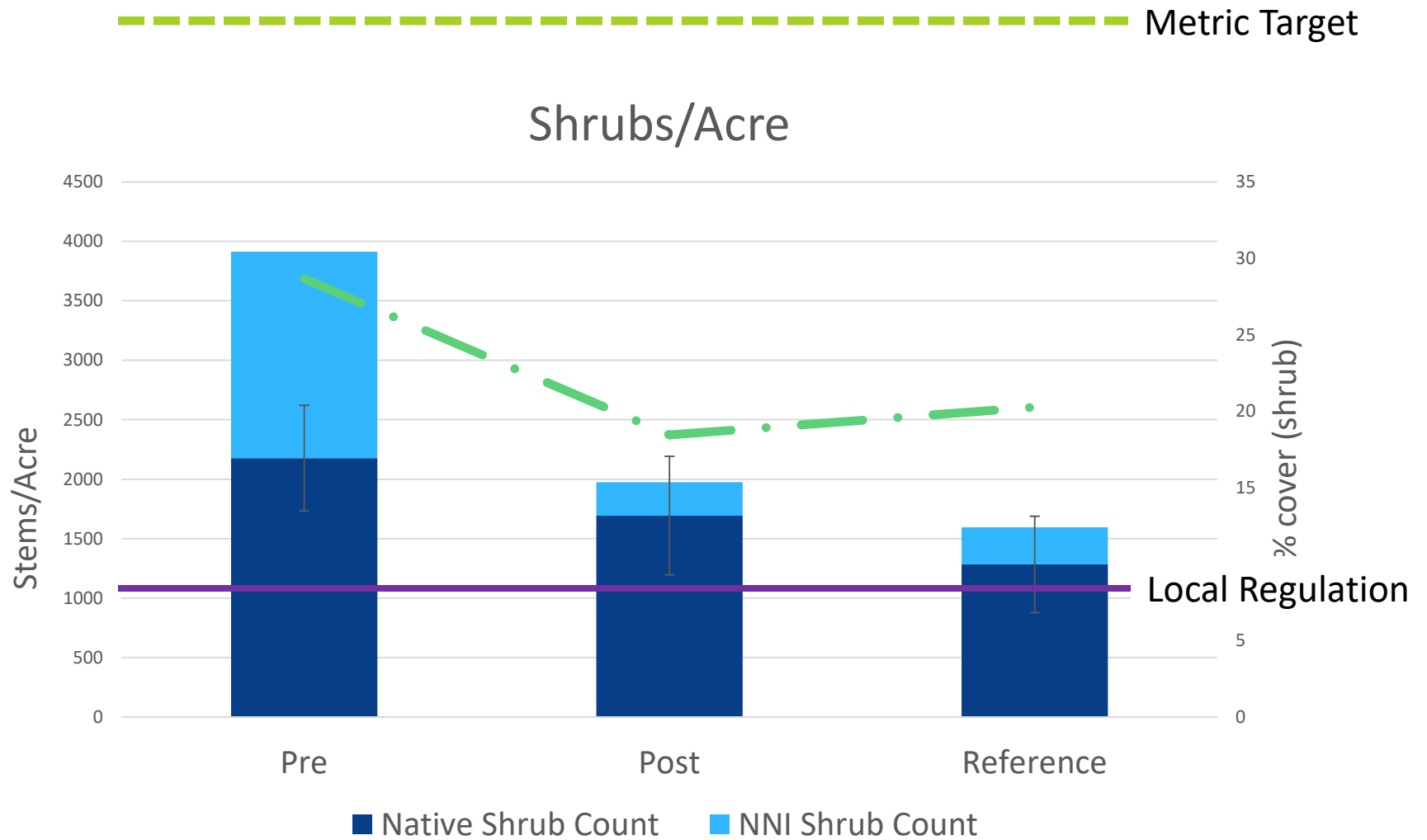
	Plots	Reaches
Pre Restoration	52	10
Post Restoration	27	6
Reference	15	3



Tree numbers are doing great

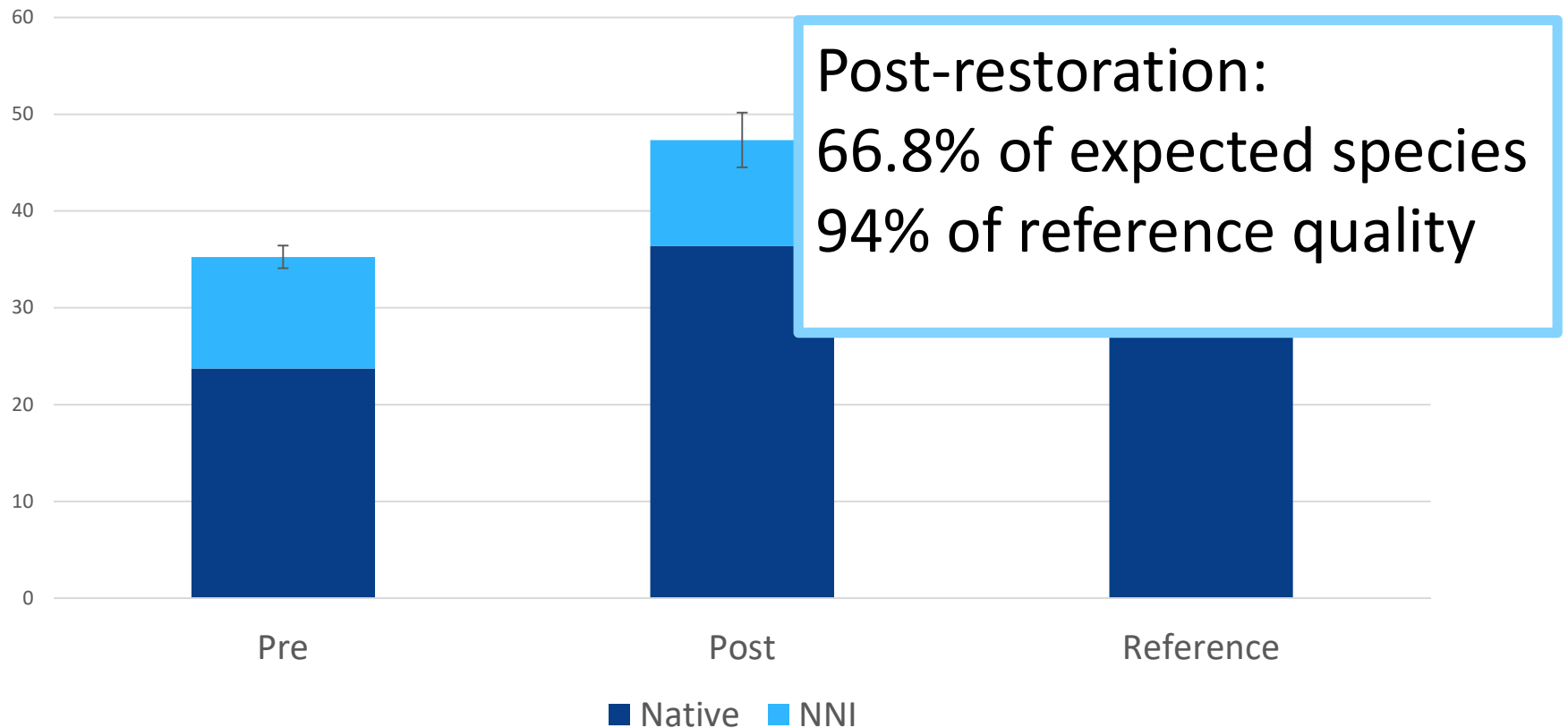


Shrubs Decline



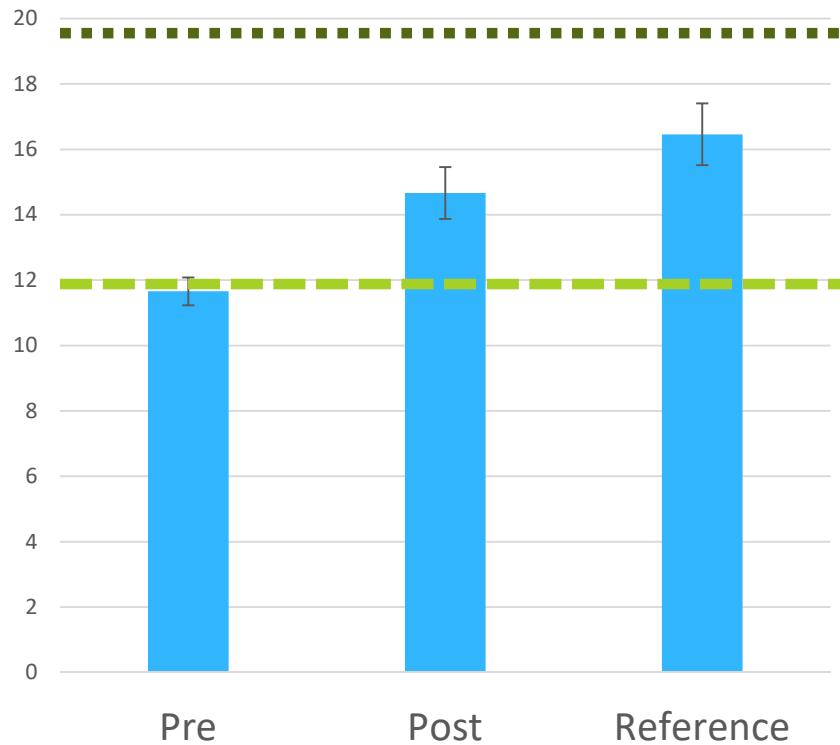
Native species post-construction

Species Count

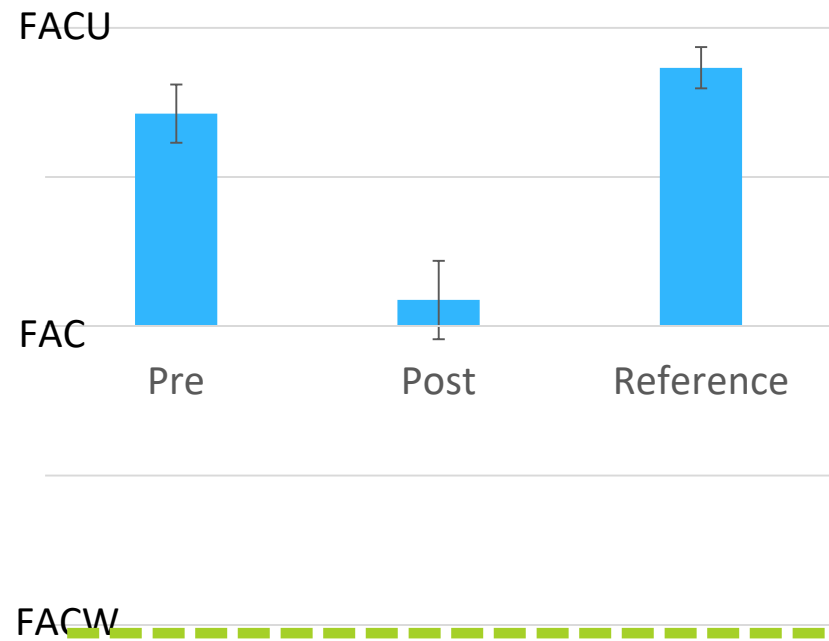


Species Indices

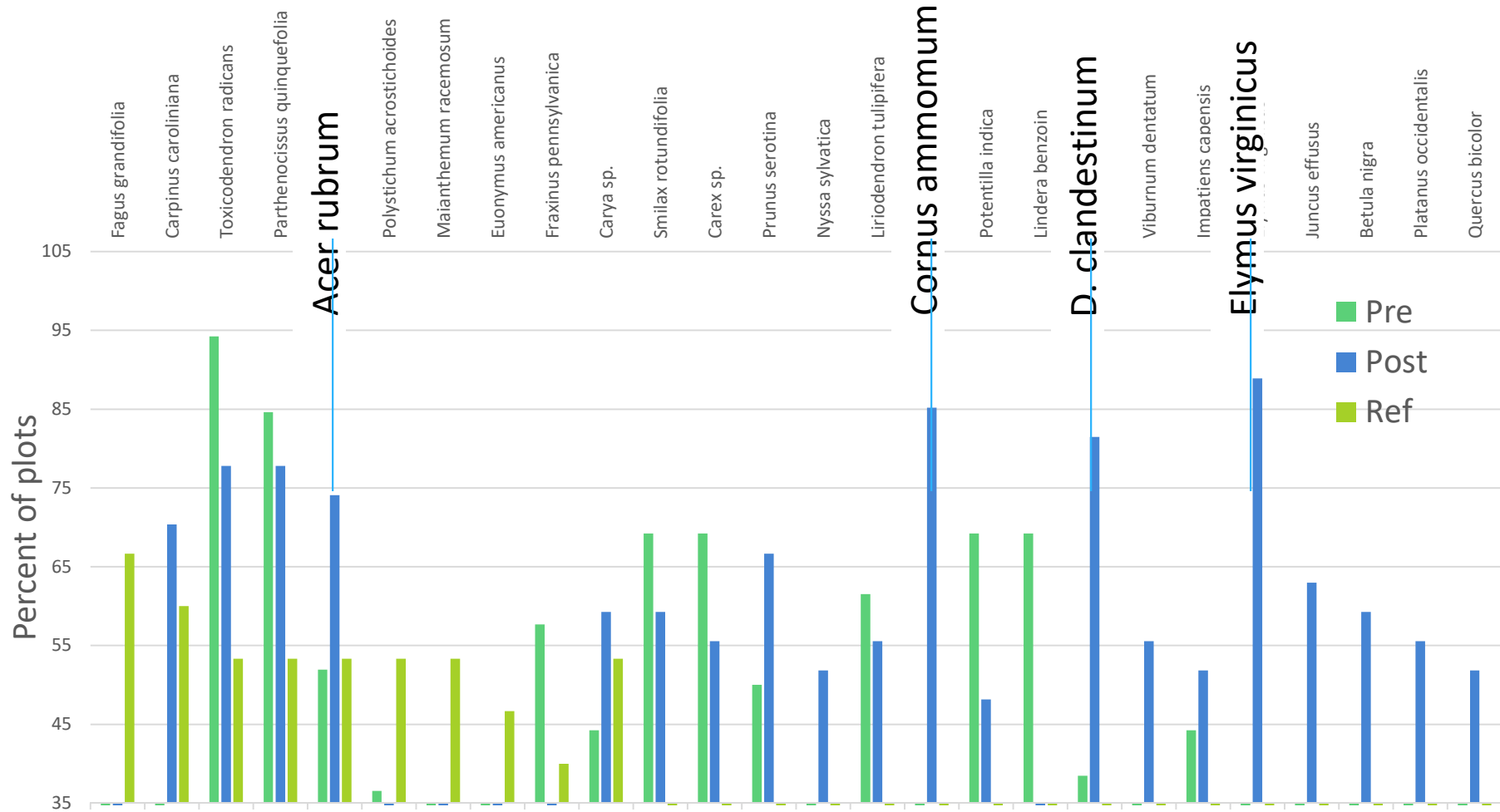
Plant Stewardship Index (modified FQI)



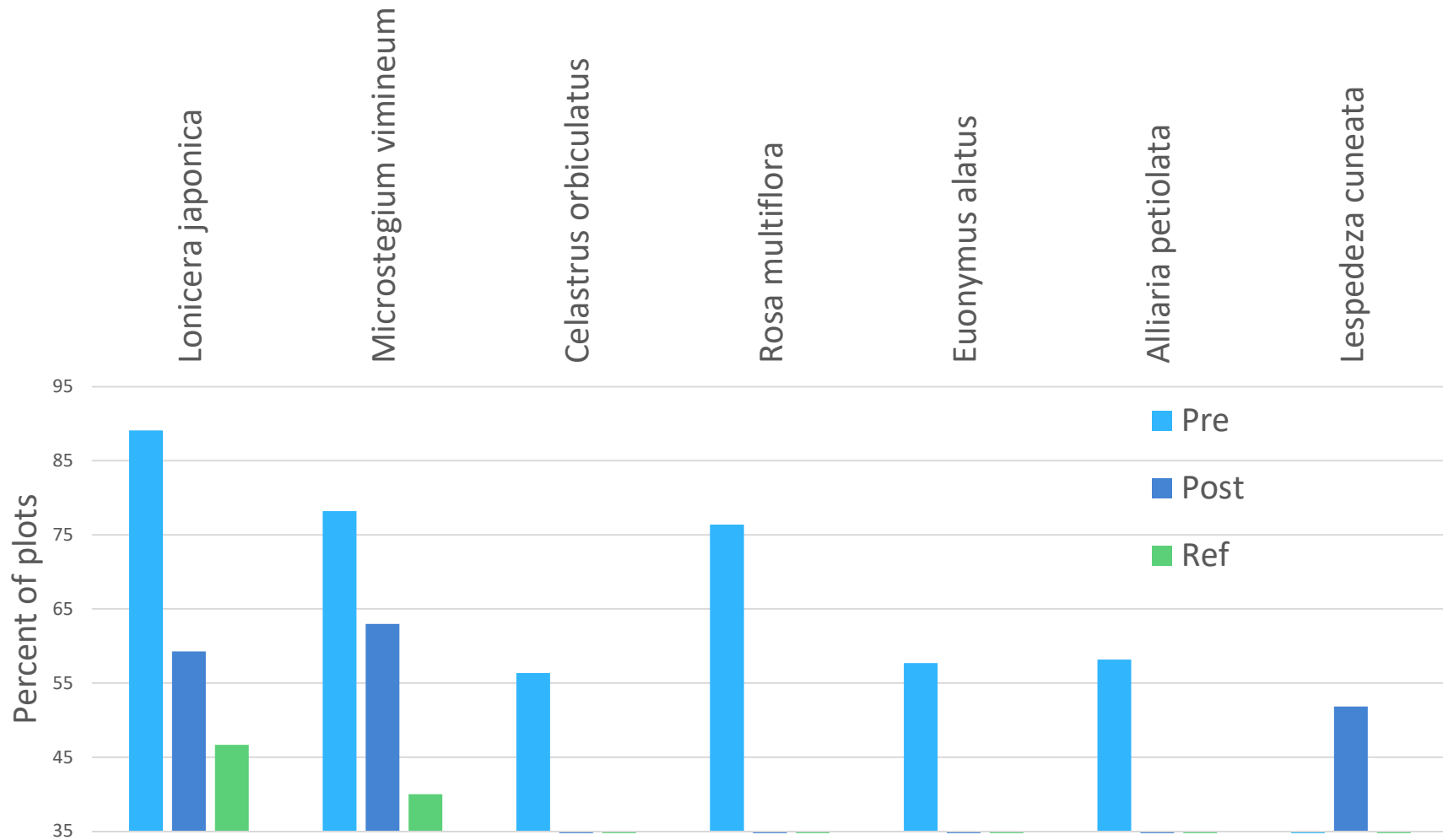
National Wetland Indicator_indexed



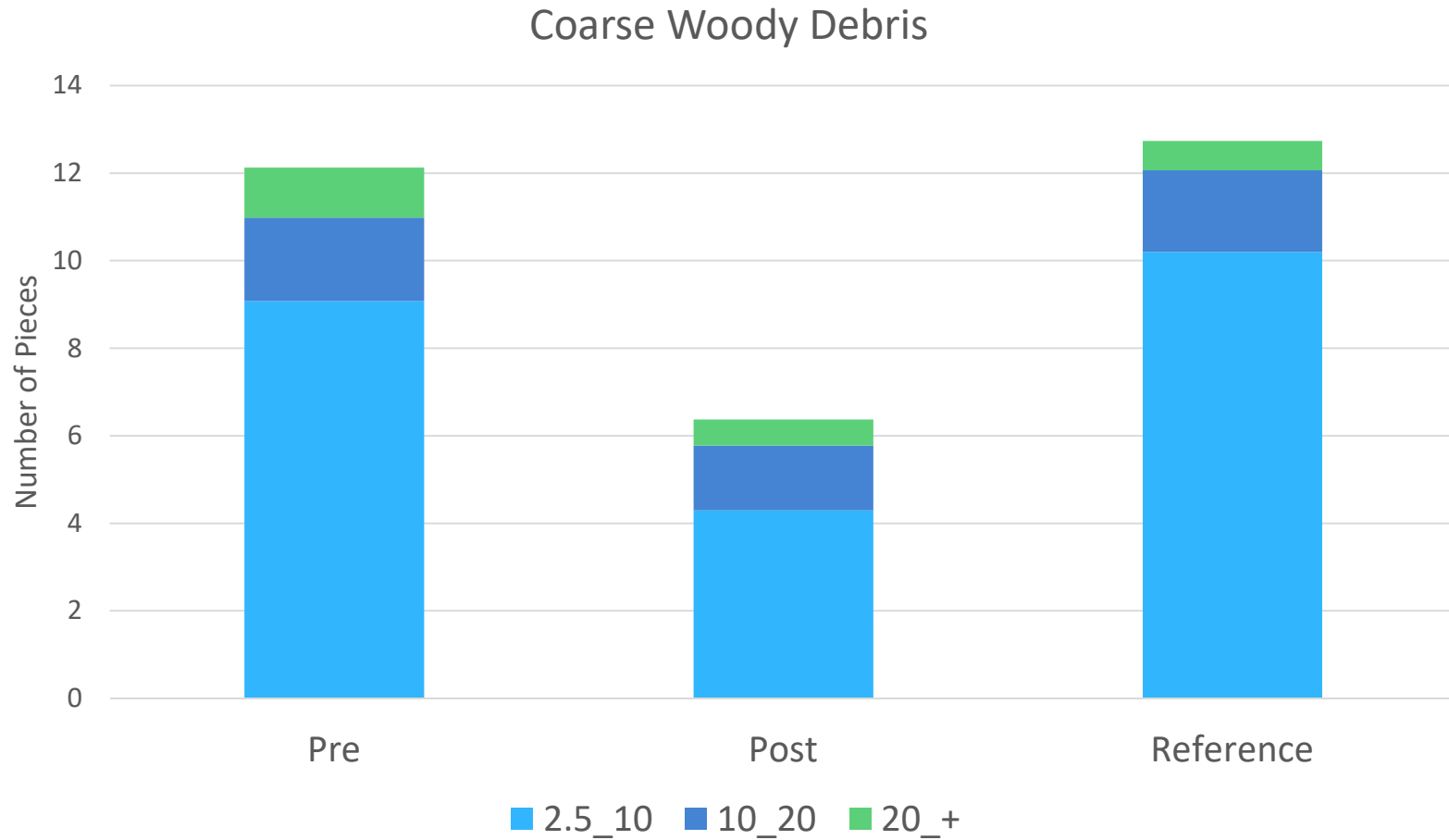
Native Occurrence



Non-Native Occurrence

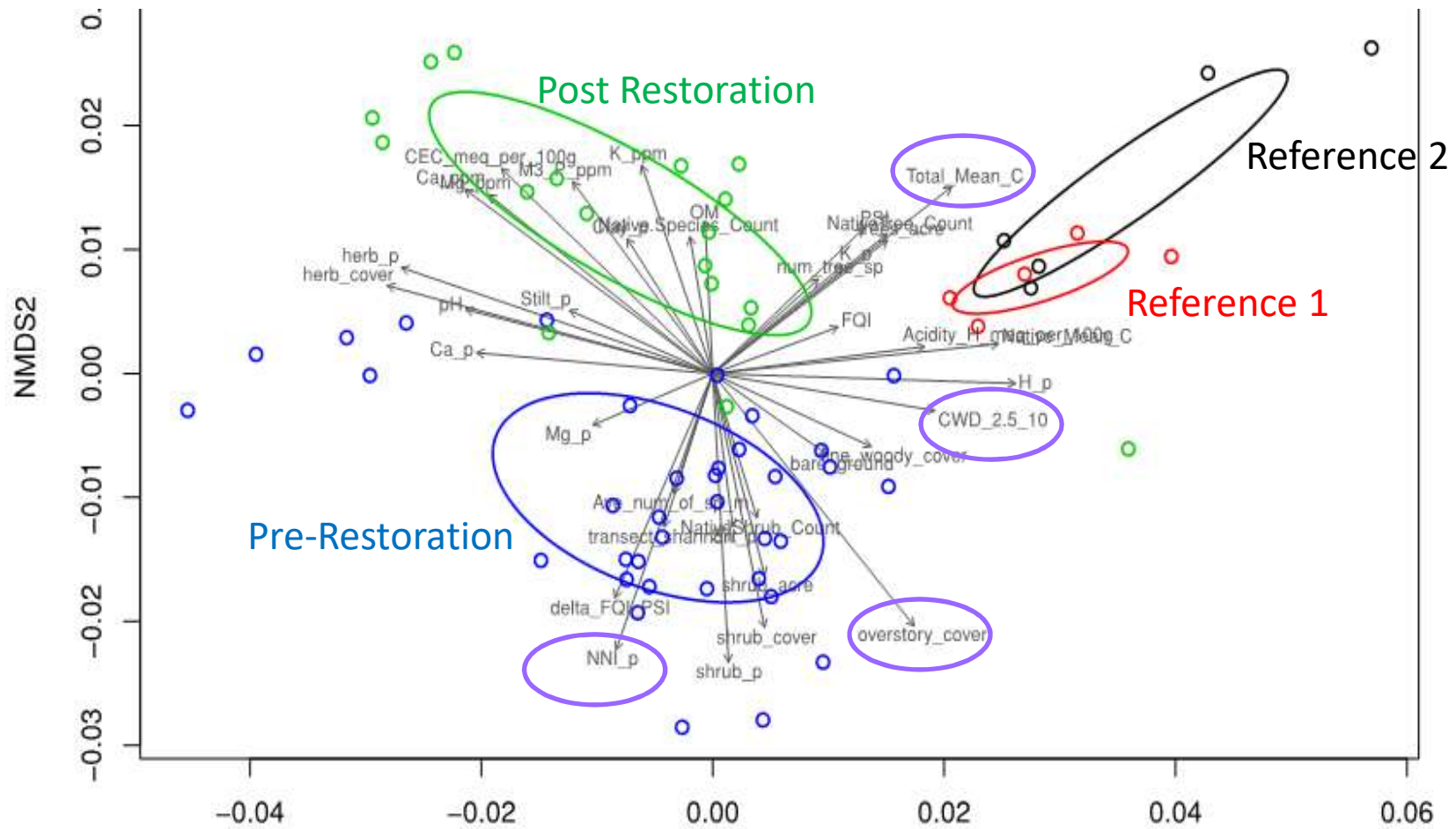


Floodplain - Coarse Woody Debris



Stream Restoration Vegetation Success

Sites are distinct



What will make riparian vegetation “successful”?

Indicators of restoration “success”

- Distinctively riparian
- Remain forested for at least 40 years (easements)
- Low invasive species cover
- Generate CWD and leaf litter
- Quality should be a significant % of potential riparian area quality
- Strong community stewardship



Hollin Hills neighborhood, 2016

Stream Restoration Vegetation Success

Assistants, Interns and Field Junkies



Additional Information

For additional information, please contact

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4-years post restoration most different

