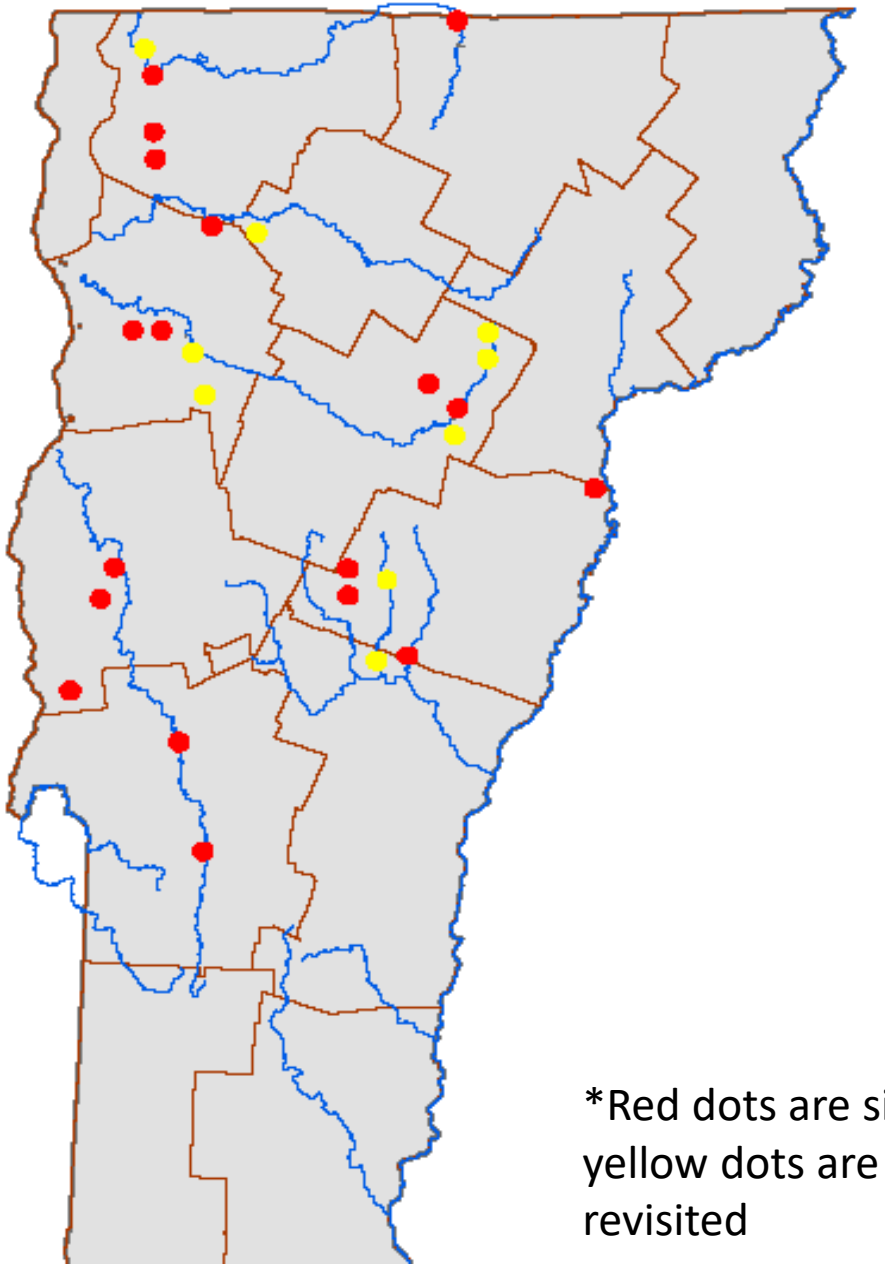
Riparian Habitat Restoration Monitoring **2018 Updates**

- To gain a more comprehensive understanding of the successes and failures of riparian buffer planting projects in Vermont

- Share monitoring results with the conservation community

- Develop monitoring capacity

- To inform our adaptive management process and improve overall project success



27 original sites across 7 watersheds in Vermont

Missisquoi, Lamoille, Winooski, Otter Creek, Lake Champlain Direct, White River, Connecticut

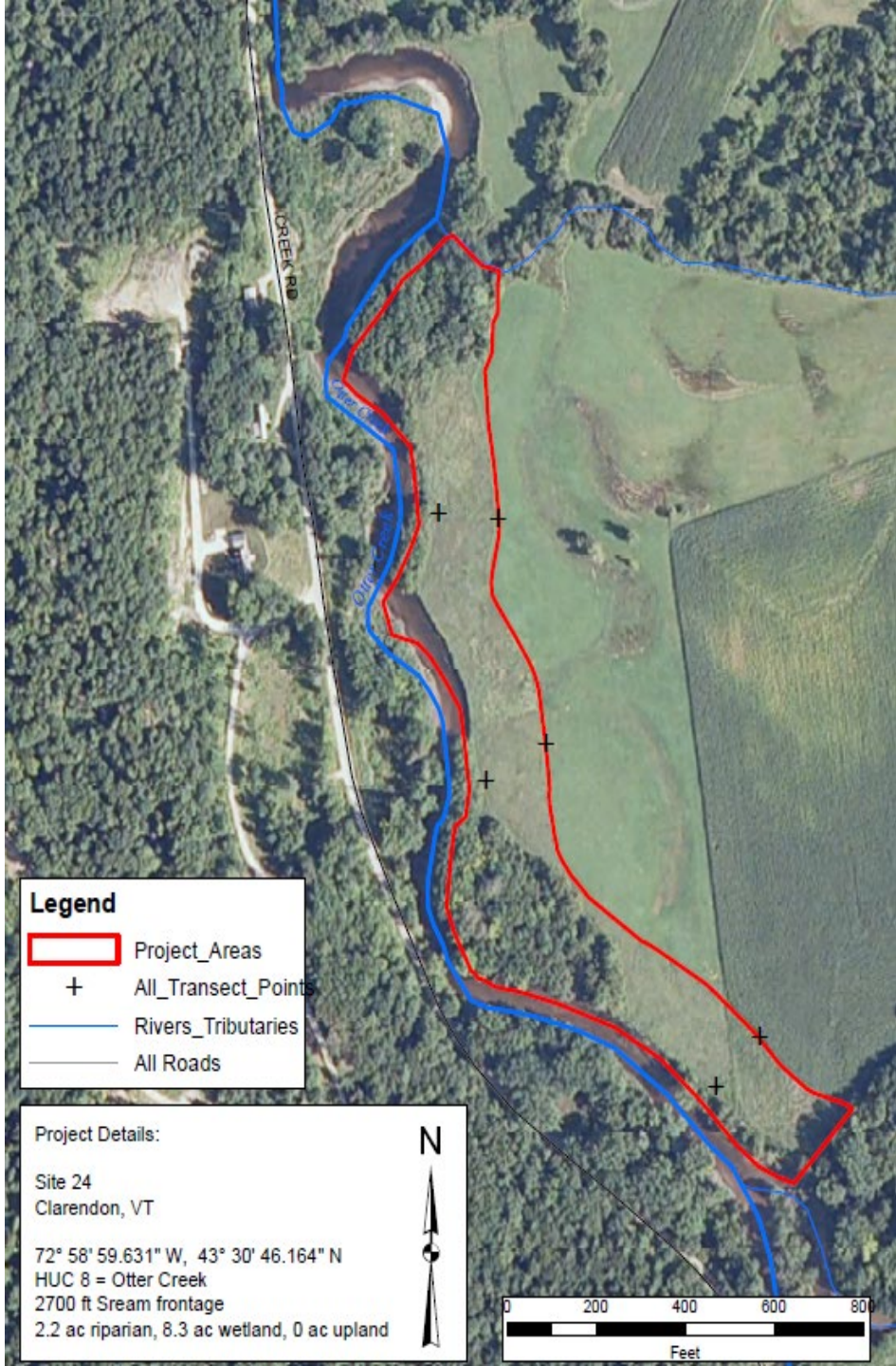
Revisited 18 of those sites in 2018

- **Worked with Leah to prioritize sites (avoided sites where activity had occurred since 2013 that would bias 2018 data)**

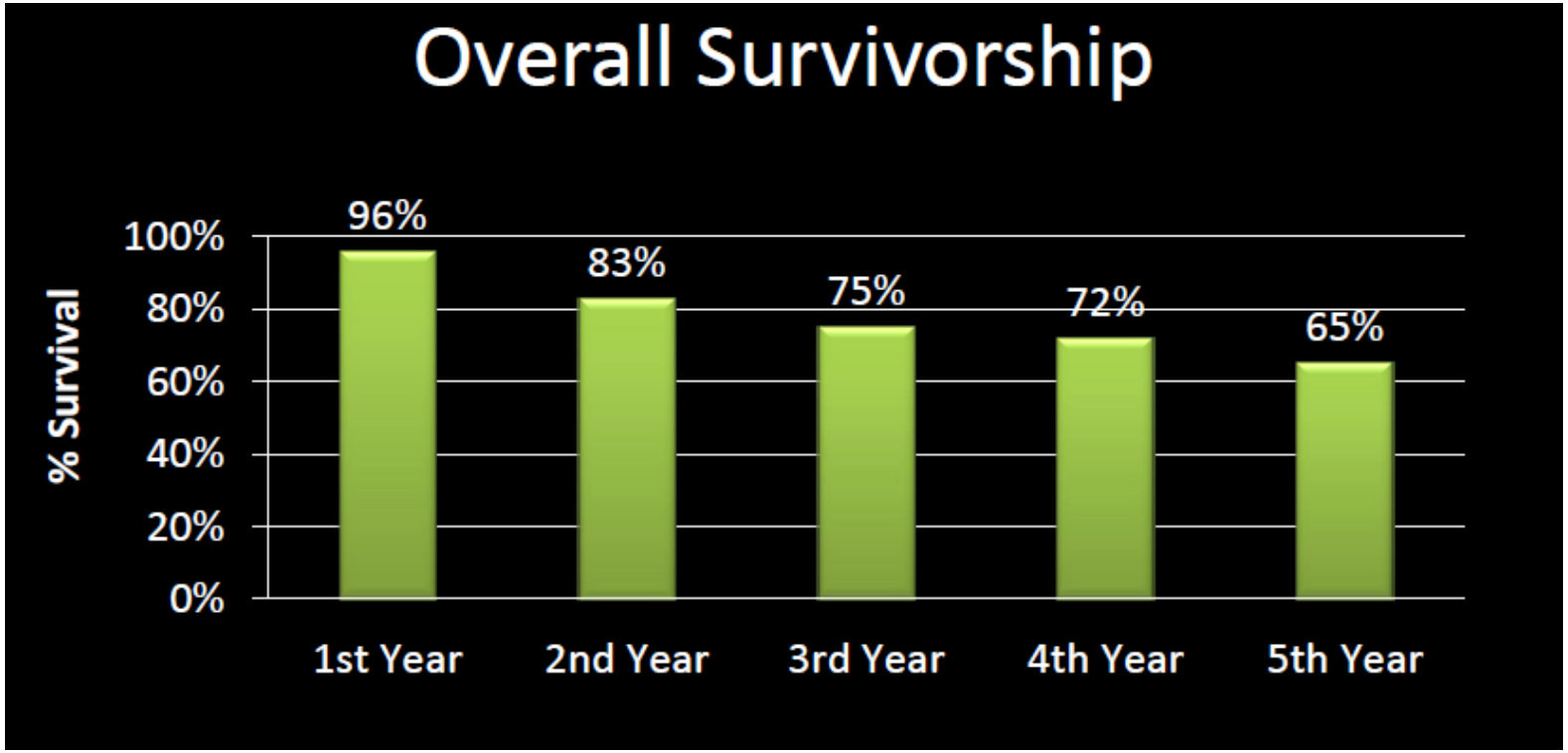
*Red dots are sites revisited in 2018, yellow dots are all other original sites not revisited

Recap of Protocol

- Established transects
  - At least 3 transects per site
  - >200 feet apart, evenly distributed throughout the site
  - Perpendicular to the watercourse
- Visit every tree within 10’ of either side of the transect
- GPS every tree and take photo point
- Collect tree data variables
  - Species
  - Height
  - Condition
  - Prior land use (corn, hay, pasture, fallow)
  - Plant Material Type
  - Tree protection (mat, tube)
  - Browse and girdling
  - Competing vegetation



Where we left things in 2013:



And in **2018** overall survivorship was

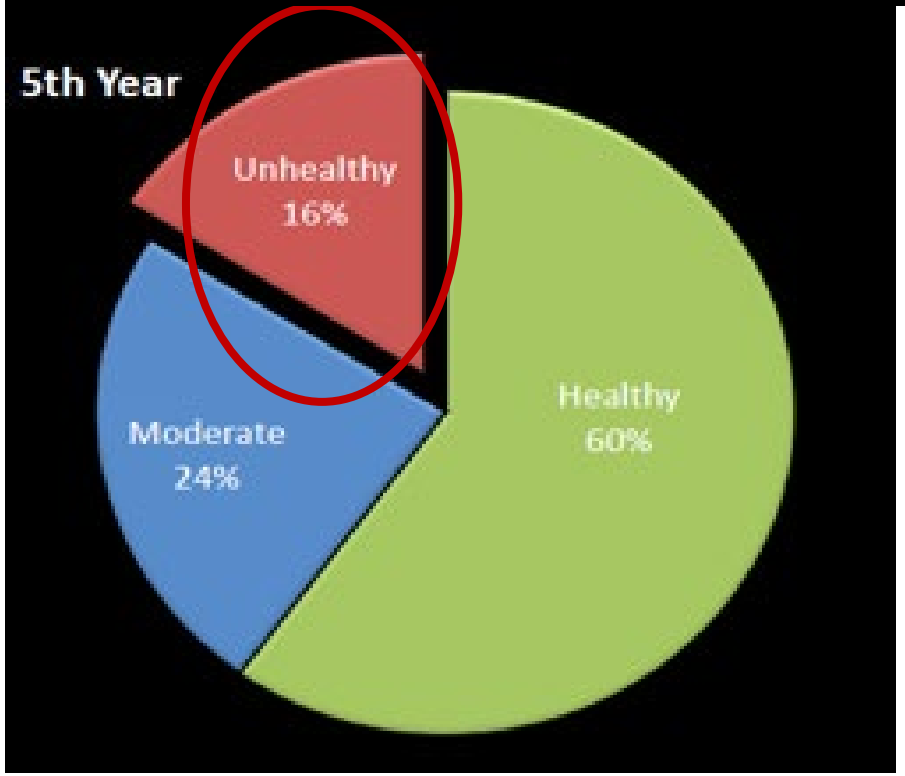
48%

Takeaway?

What is our target? Do we think we've improved that number since 2008?

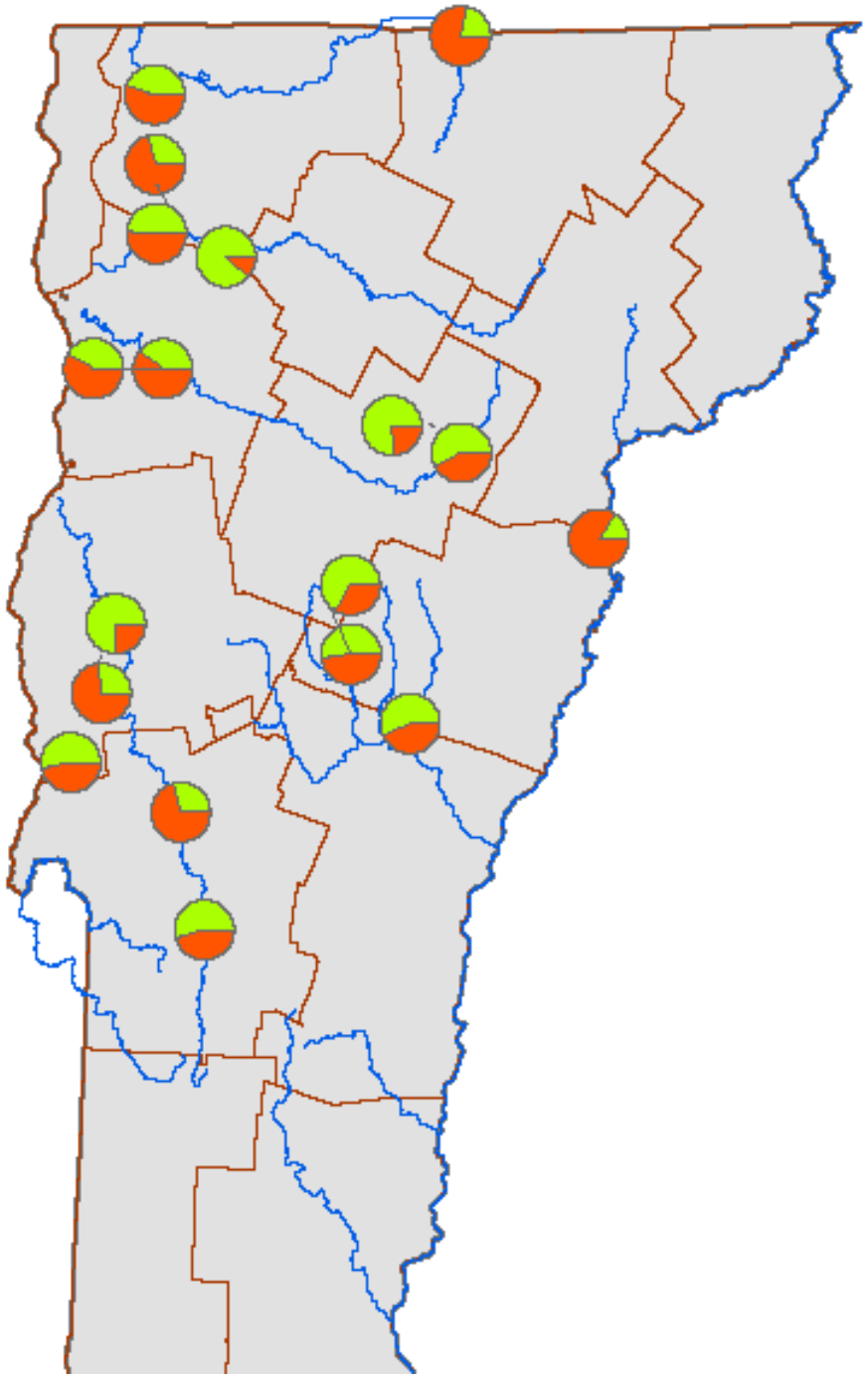
Also from 2013:

- If the 16% of unhealthy stems decline and become dead - survivorship will = 49%



Takeaway?

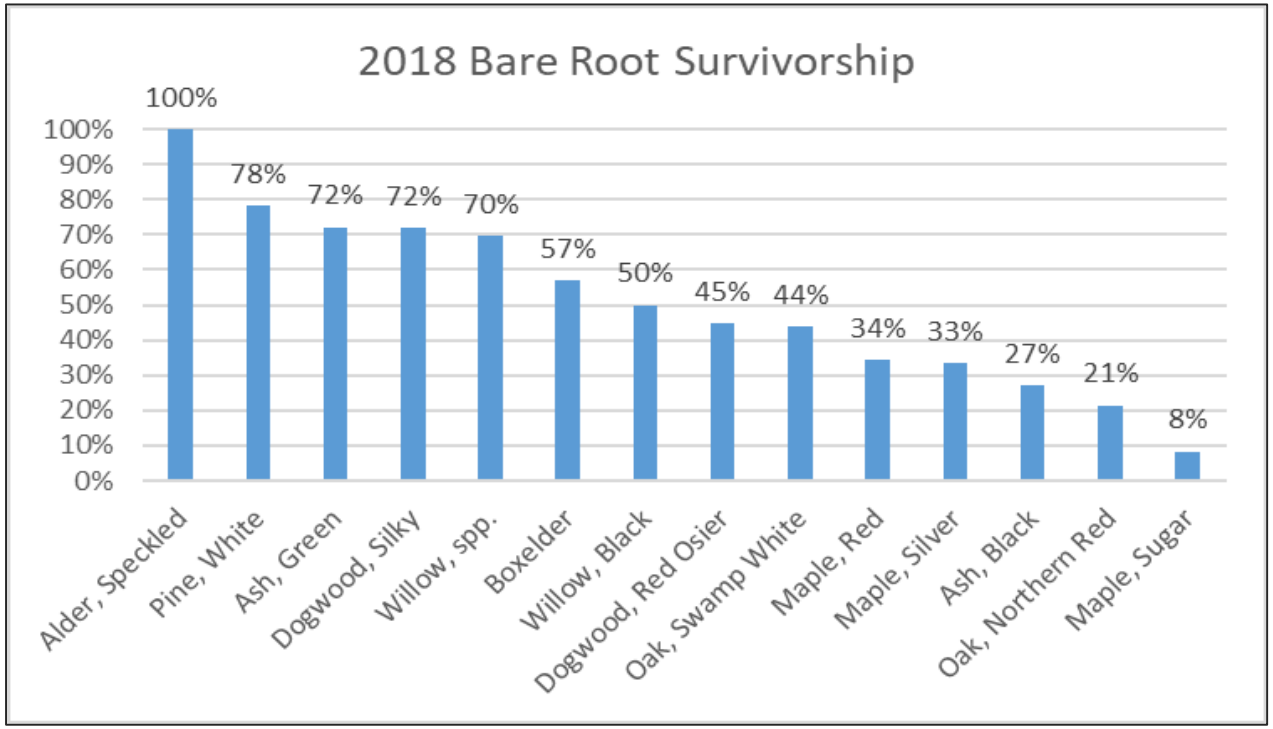
Predictions in 2013 forecasted 2018 survivorship→
don't need to wait until 10th year to start making management decisions based on mortality



Survivorship is highly variable across sites → need to consider site-specific conditions

Any geographic trends? Can't really say, but interesting to think about average rainfall, location within watersheds, distribution of invasive pressure…

Different challenges in different parts of the state?



Species	Alive	Dead	Total
Alder, Speckled	10	0	10
Ash, Black	3	8	11
Ash, Green	31	12	43
Boxelder	8	6	14
Dogwood, Red Osier	25	31	56
Dogwood, Silky	54	21	75
Maple, Red	37	71	108
Maple, Silver	25	50	75
Maple, Sugar	2	22	24
Oak, Northern Red	3	11	14
Oak, Swamp White	14	18	32
Pine, White	29	8	37
Willow, Black	13	13	26
Willow, spp.	30	13	43

only kept species with greater than 10 individuals

How have different species fared?

Used only **bare root** for species comparison because it was the most robust dataset (738 individuals)

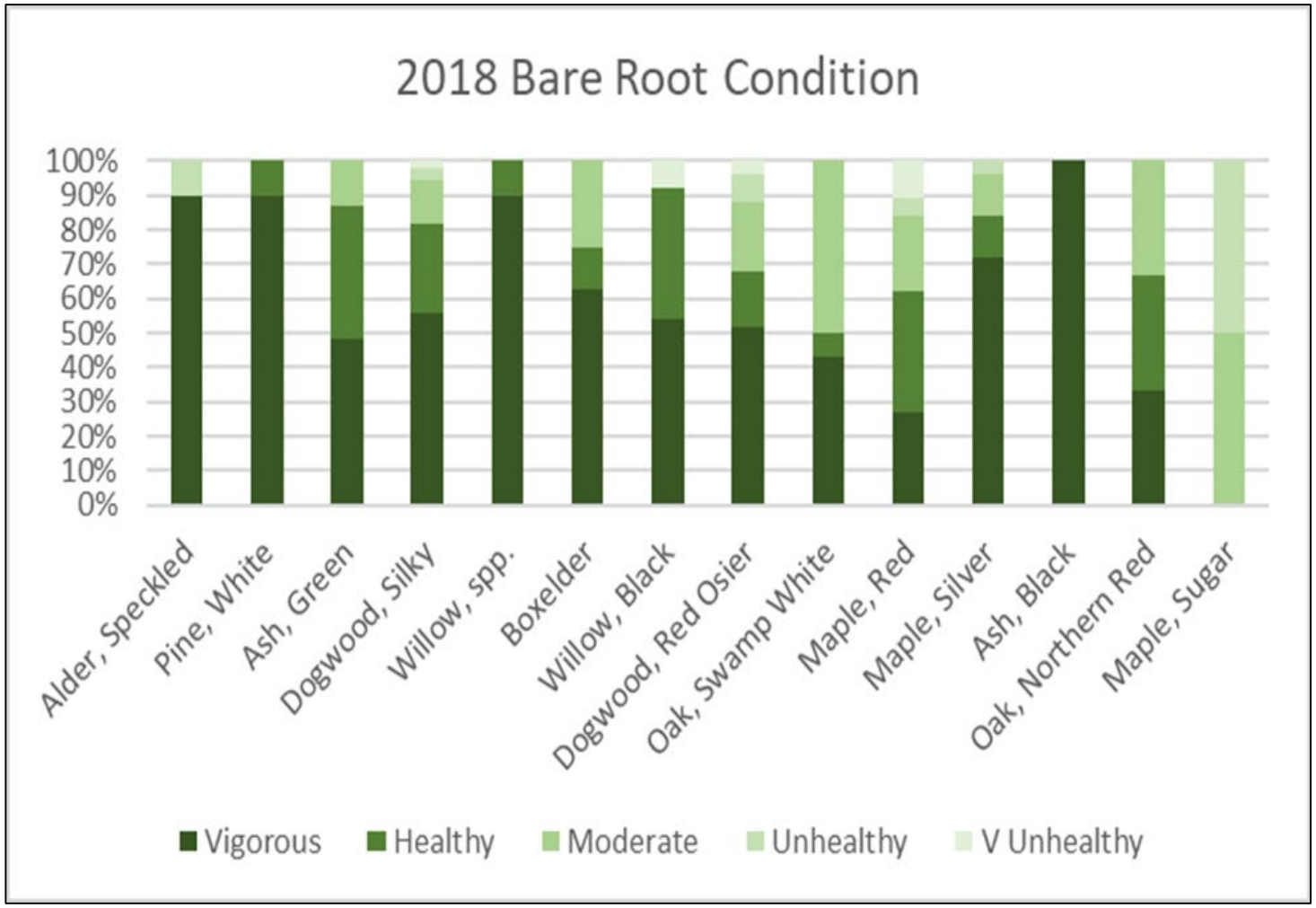
Takeaways:

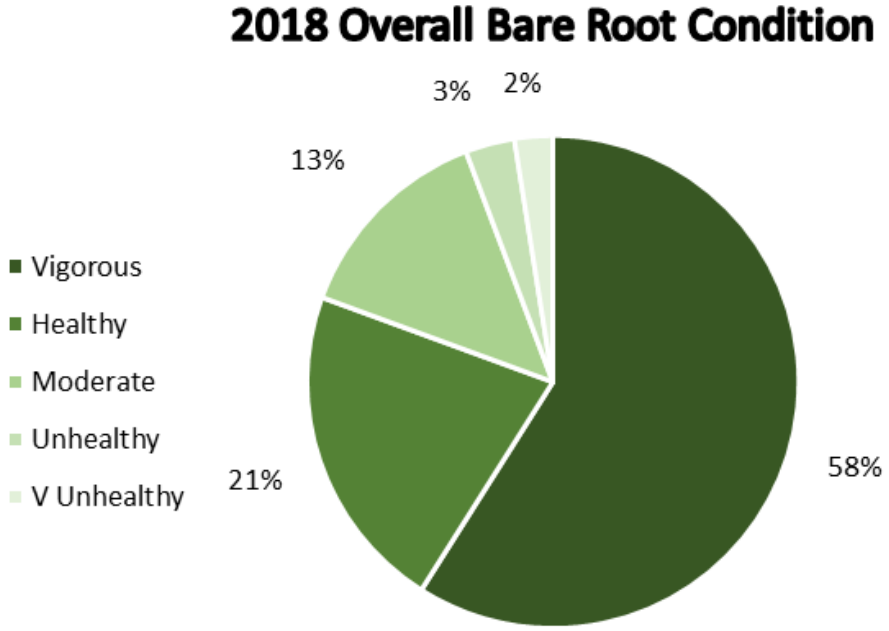
- Importance of shrub component
- Focus on early-successional
- White pine is very versatile
- Consider “sprouters and unpalatables”

Limitations:

- Relatively limited sample set
- Going back in time 10 years with what we were planting and planting strategies

And what about condition?





Sites are stabilizing→ only 5% in the "unhealthy" range (compared to 16% in 2013) and 79% in "healthy" range (compared to 60% in 2013)

May still see a decline in survivorship for some species…

“unhealthy”

“vigorous”

How does growth compare?

2011

12 ft 3 in

2018

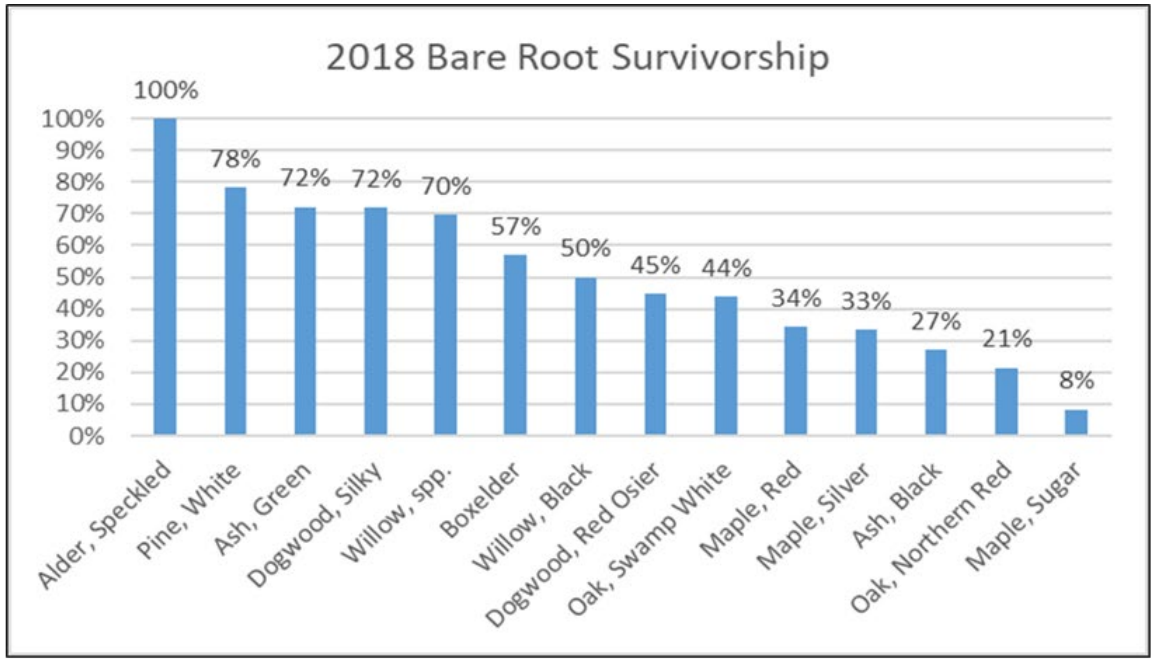
28 ft

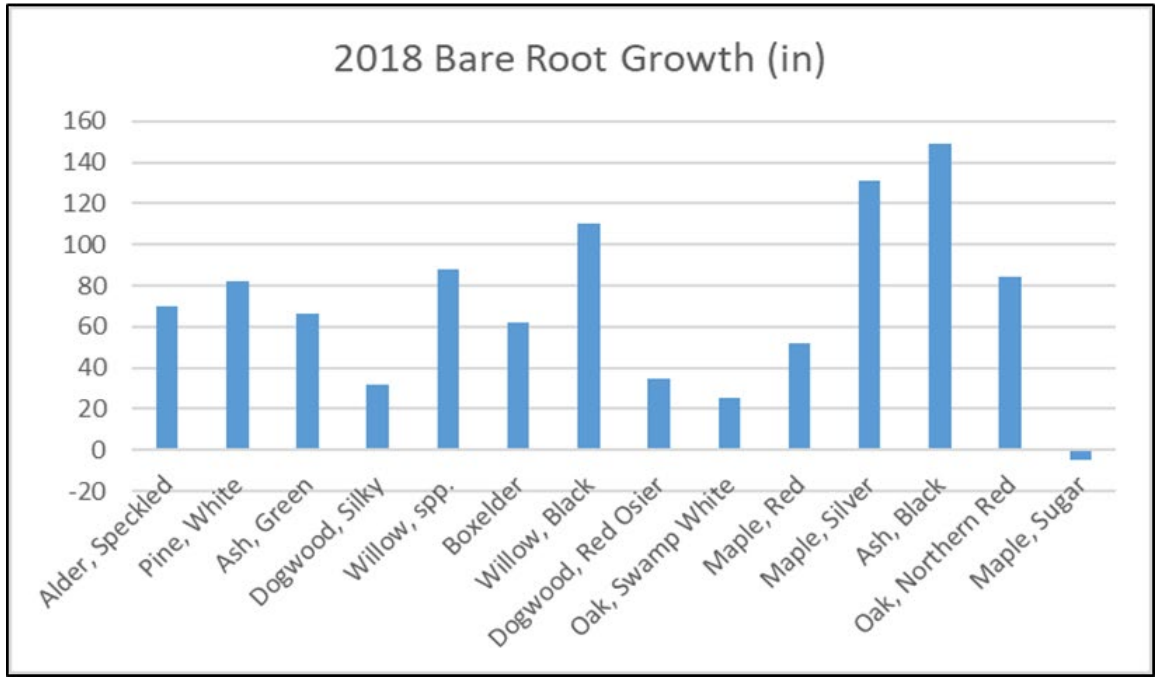
2013

10 ft 2 in

2018

26 ft 5 in





Shrub-form species → 9’ 6” average (almost full height for some species)
Tree-form species → 11’ 9” average

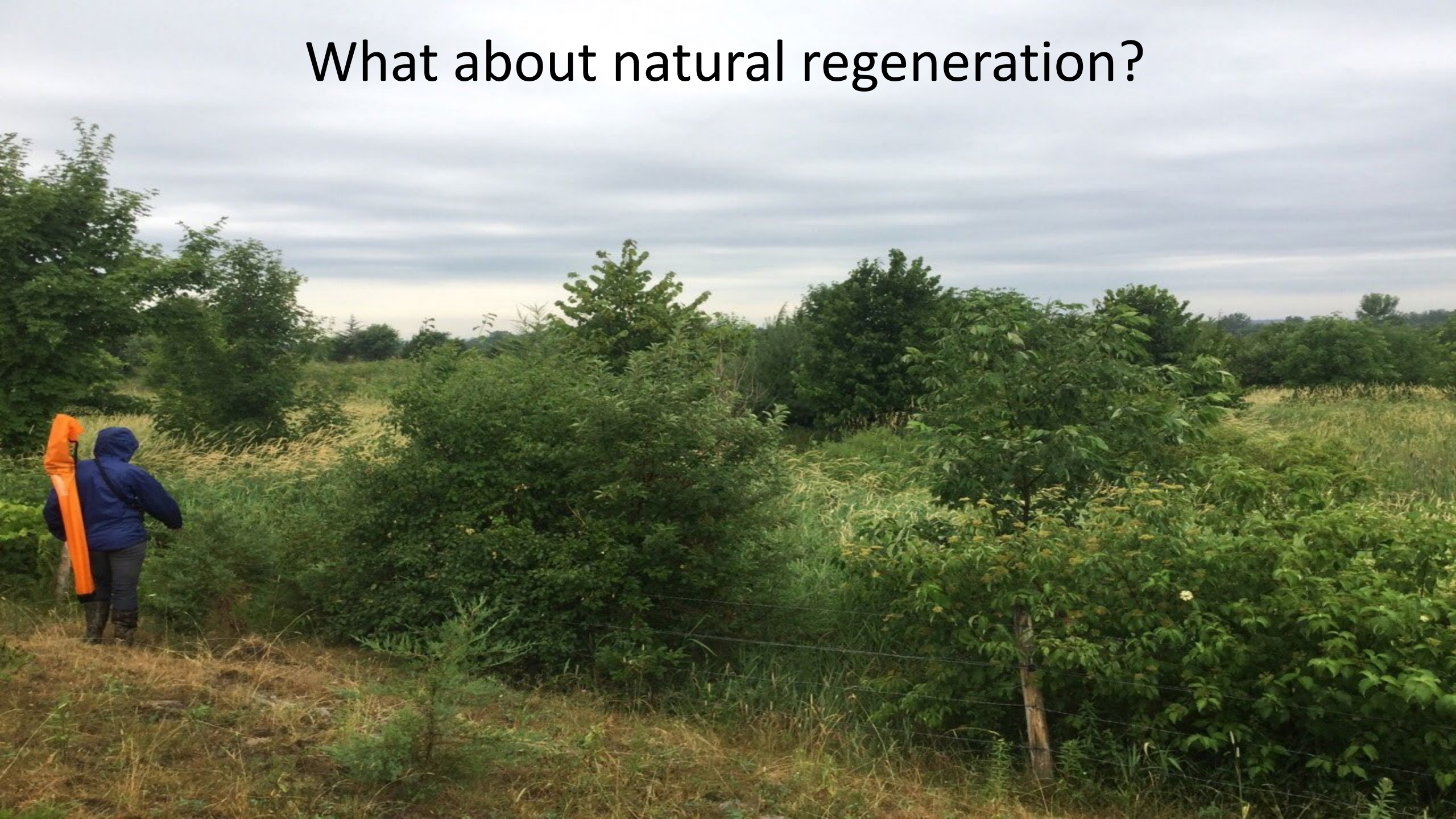
Management Implications

- Still important to focus on pioneer / early successional species
- Adapt species selection to specific site conditions
- Tree protection? We've stopped using brush mats and blue tubes… are other forms working?
- Merit to less diverse planting plans with emphasis on high-performing species (those with >70% survivorship)
- Balled + burlap, container stock, tublings did not out-perform bare root long-term

Future Assessment and Stewardship

- In terms of replicating this protocol, more general site assessments could be just as valuable with regards to adaptive management
- Don’t need to wait 10 years → stewardship decisions can be made in the first few years after planting

What about natural regeneration?



Remarkable natural regeneration on former corn ground

- Site preparation trials to try imitating this


08/09/2011

For other land use types, natural regeneration could account for 5-10% of stem density across all sites

- **More on edges**
- **More on floodable, dynamic sites where you have natural disturbance regime**

…can't count on natural regeneration on old hay or pasture sites to bolster stem density, at least in the short-term


Not yet seeing dominate vegetation composition change, although improvement in structural diversity and other habitat features
How can we practically / cost-effectively encourage a more rapid change in condition? Do we need to?

Questions?

Other monitoring updates to share?