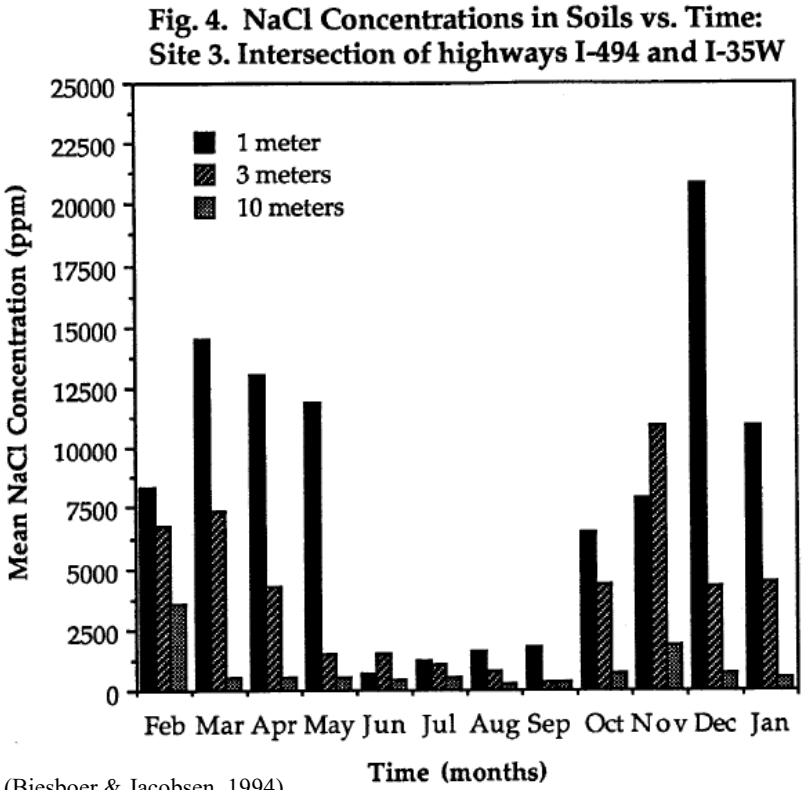
Optimization of Salt-Tolerant Roadside Turfgrass Seed Mixtures

Eric Watkins
University of Minnesota

What is the problem?

Photo Credit: Dwayne Stenlund, MnDOT

Road Salt Use in MN



(Biesboer & Jacobsen, 1994)

- Saline soil
- Soil degradation
- Tissue desiccation
- Ion toxicity

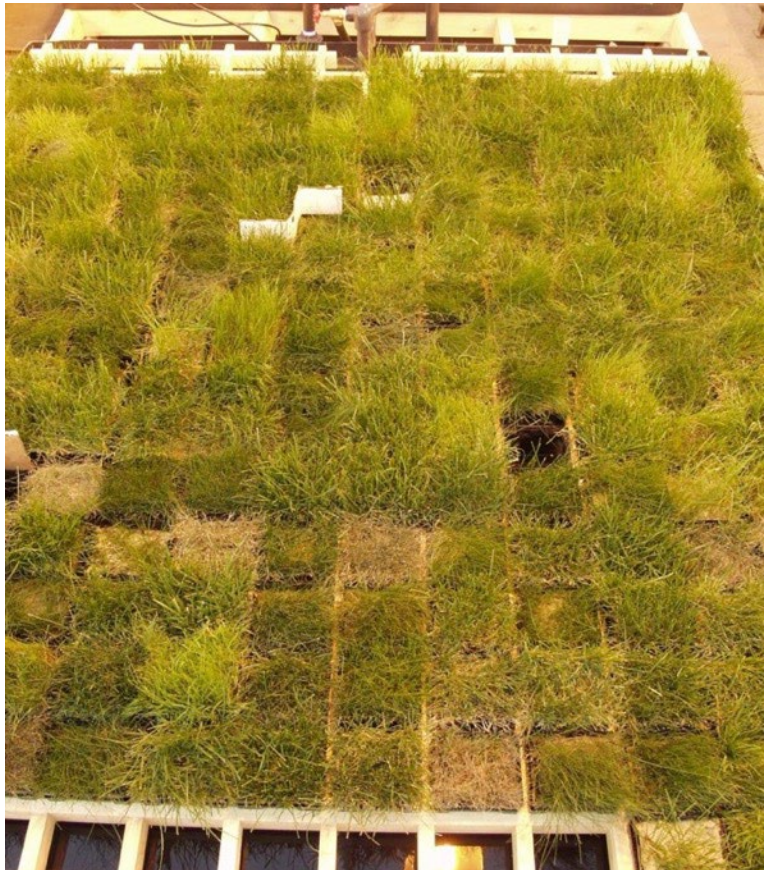
(Biesboer & Jacobsen, 1994; Kronzucker et al. 2013, Munns & Tester 2008)

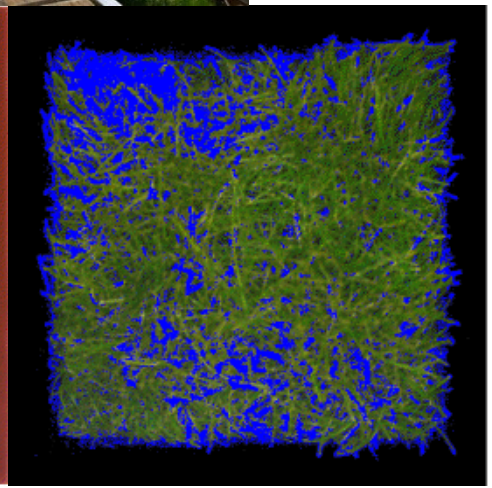
Extreme Stresses

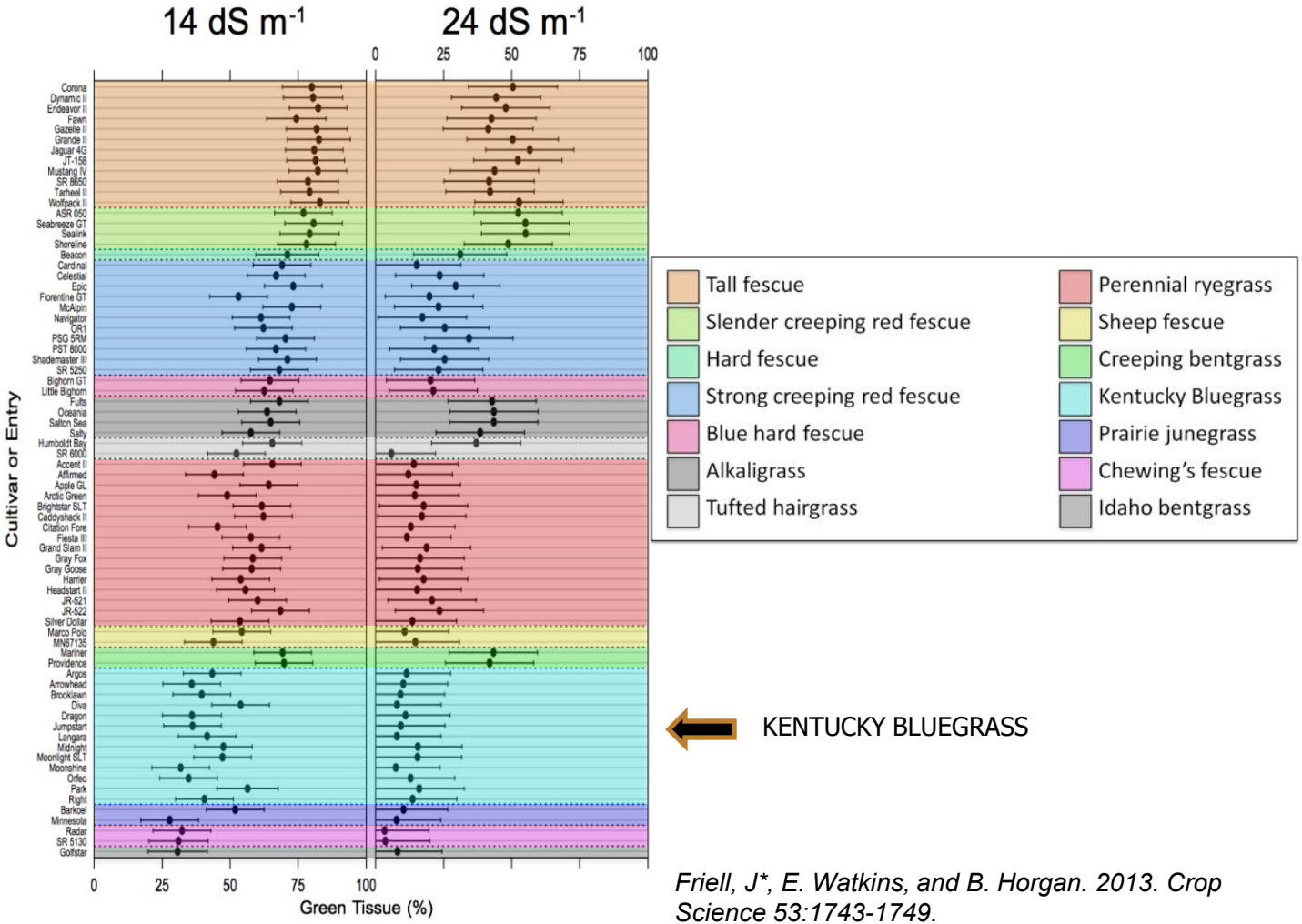
Identifying Solutions

- Turfgrass Species Selection
- Best Management Practices
- Economic Considerations

Project 1: Which species should we use?







KENTUCKY BLUEGRASS

Friell, J, E. Watkins, and B. Horgan. 2013. Crop Science 53:1743-1749.*

2010 MnDOT Specification

Grass Type	Acceptable Varieties	Minimum Percent by Mass	Maximum Percent by Mass
Alkaligrass	Fults, Salty	15	20
Red fescue	Dawson, Cindy	15	20
Park Kentucky bluegrass	Park	10	15
Improved Kentucky bluegrass	(Baron, Odyssey, Rugby 2, Shamrock, Limousine, Chateau)	20	30
Low maintenance Kentucky bluegrass	(America, Aquila, Caliber, Certified Park, Challenger, Impact, Kenblue, Nassau, Newport, Ram 1, Nugget)	20	30

2010 MnDOT Specification

Grass Type	Acceptable Varieties	Minimum Percent by Mass	Maximum Percent by Mass
Alkaligrass	Fults, Salty	15	20
Red fescue	Dawson, Cindy	15	20
Park Kentucky bluegrass	Park	10	15
Improved Kentucky bluegrass	(Baron, Odyssey, Rugby 2, Shamrock, Limousine, Chateau)	20	30
Low maintenance Kentucky bluegrass	(America, Aquila, Caliber, Certified Park, Challenger, Impact, Kenblue, Nassau, Newport, Ram 1, Nugget)	20	30

2012 MnDOT Specification (MNST-12)

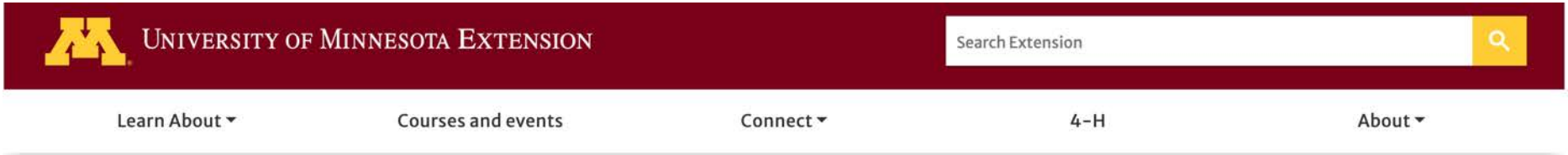
Common Name	Approve Varieties	%
Creeping red fescue (slender)	Seabreeze GT, Shorline, Sealink	20
Creeping red fescue (strong)	Cardinal, Celestial, Epic, McAlpin, ~~Navigator~~	20
Kentucky bluegrass	Bedazzled, Diva, Moonlight SLT, Shiraz	20
Hard, Sheep and/or Chewings fescue (minimum of two species, each making up at least 10% of the total mix)	*Hard fescue*: Beacon, Bighorn GT, Little Bighorn *Sheep fescue*: Marco Polo *Chewings fescue*: Radar, SR5130	40

Project 2: Best management practices

Seeding and Sodding Date

Project 3: Innovation and Education

Online education – Professionals & Residents



Roadside turfgrass installation and management

Event information

Location

Self-guided, online course

Contact

Eric Watkins, University of Minnesota Extension
ewatkins@umn.edu or 612-624-7496

This self-paced course is for contractors, maintenance operators and engineers from departments of transportation, city or county employees, or anyone seeking knowledge about roadside turfgrasses. The program covers the steps in establishing seed and sod on roadsides, as well as fundamental cultural practices for maintaining turfgrasses on roadsides. This program is applicable to any northern climate.

This self-paced training is offered via the course management system, Canvas. Students are required to complete the course within one year of their registration. It takes approximately 30 hours to complete the course.

Course topics

- Roadside vegetation management in Minnesota
- Turfgrass selection for roadsides in the Northern US

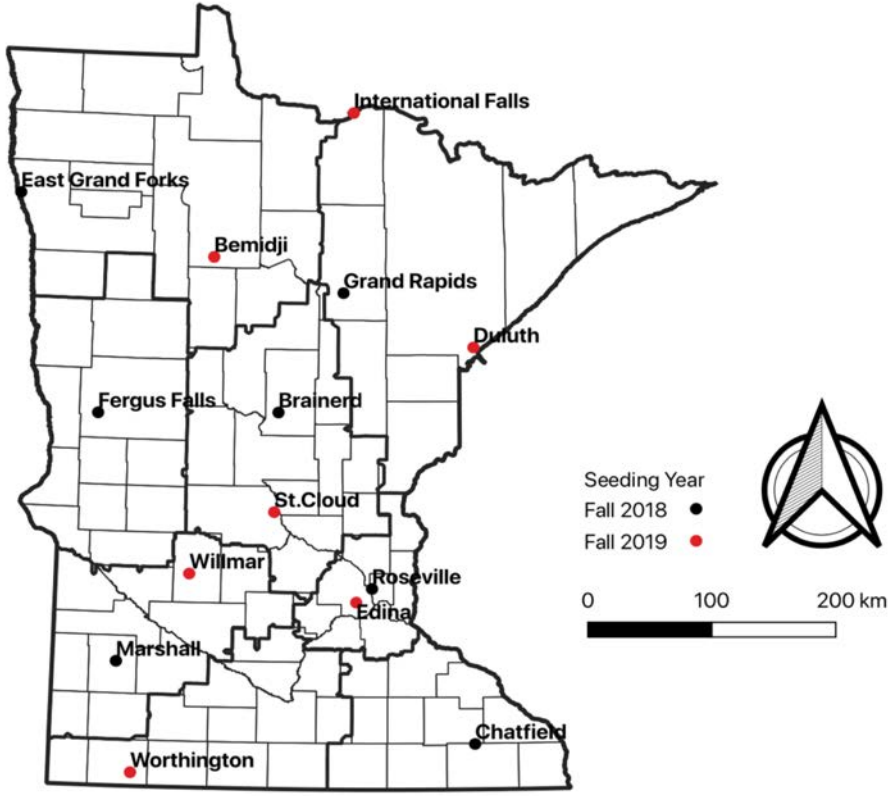
Project 4: Identify best germplasm for roadsides

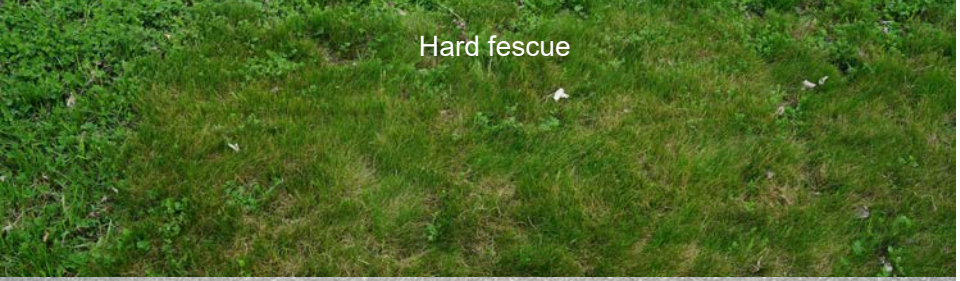
Project 5: Optimize mixtures Minnesota

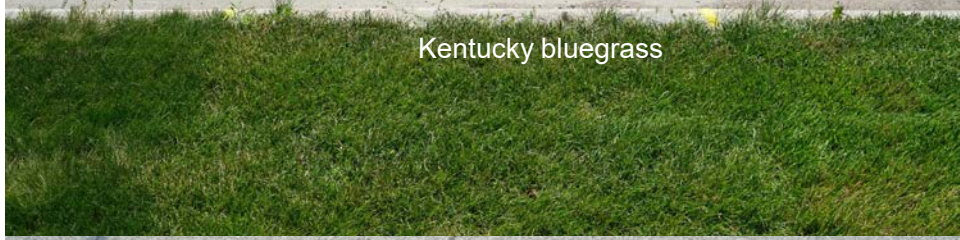
Saint Cloud, Fall 2019

Research site selection

- All 14 sites located alongside a road adjacent to the curb
- 6 monocultures, 30 mixtures, and 4 current roadside check mixtures
- Two seeding years




Hard fescue

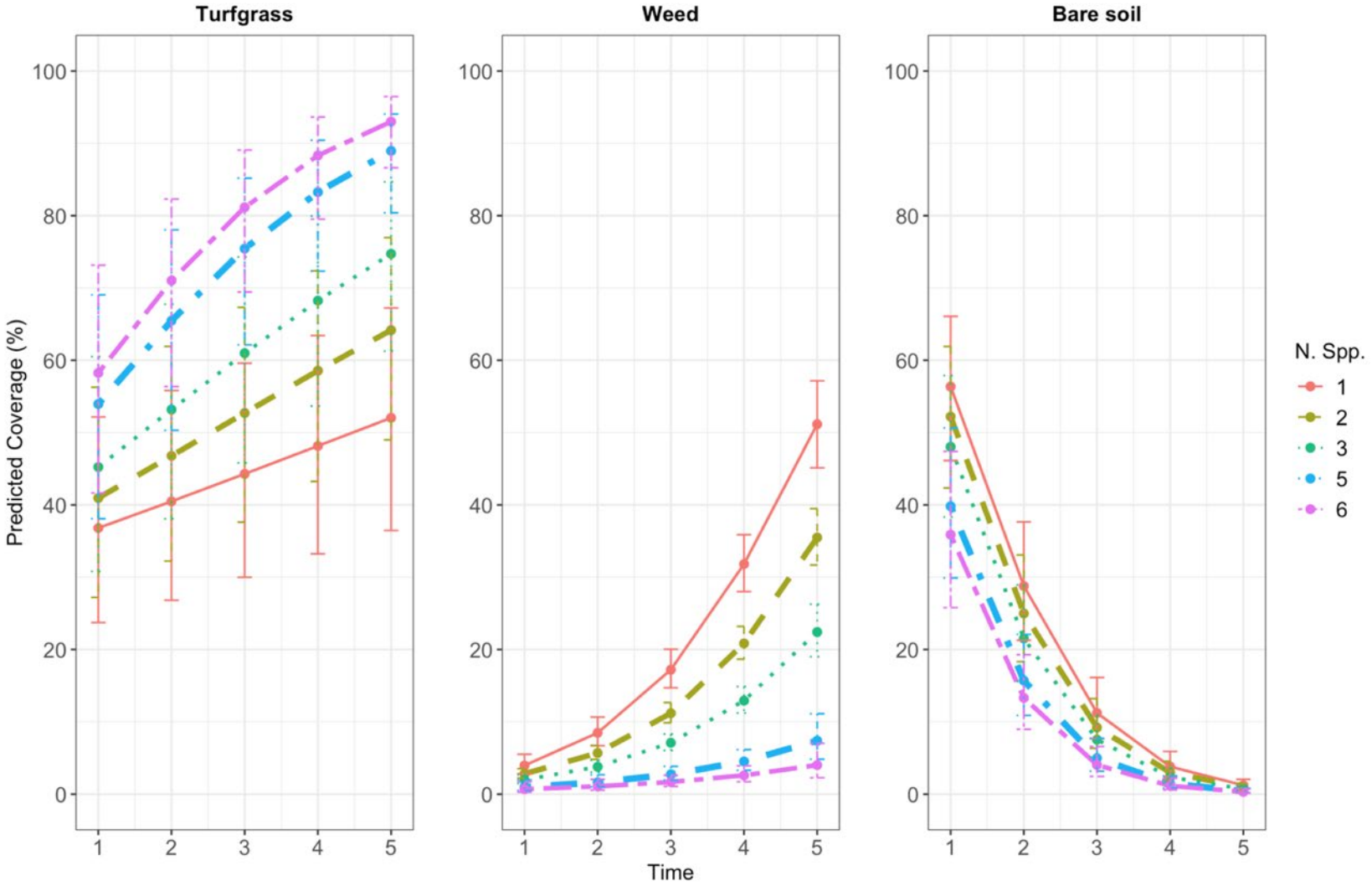

Kentucky bluegrass


Tall fescue


Slender creeping red fescue


Buffalograss


Alkaligrass


Turfgrass
Weed
Bare soil
Predicted Coverage (%)
Time
N. Spp.
1
2
3
5
6

What did we learn?

More turfgrass species in a mixture results in more coverage over time

Turfgrass spatial stability is greater with more species

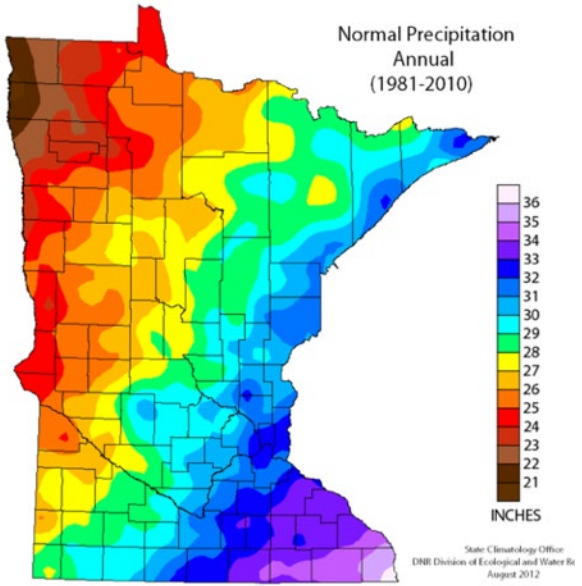
Weed coverage is increasing over time, but more species results in less weed coverage

Different mixtures for different regions?

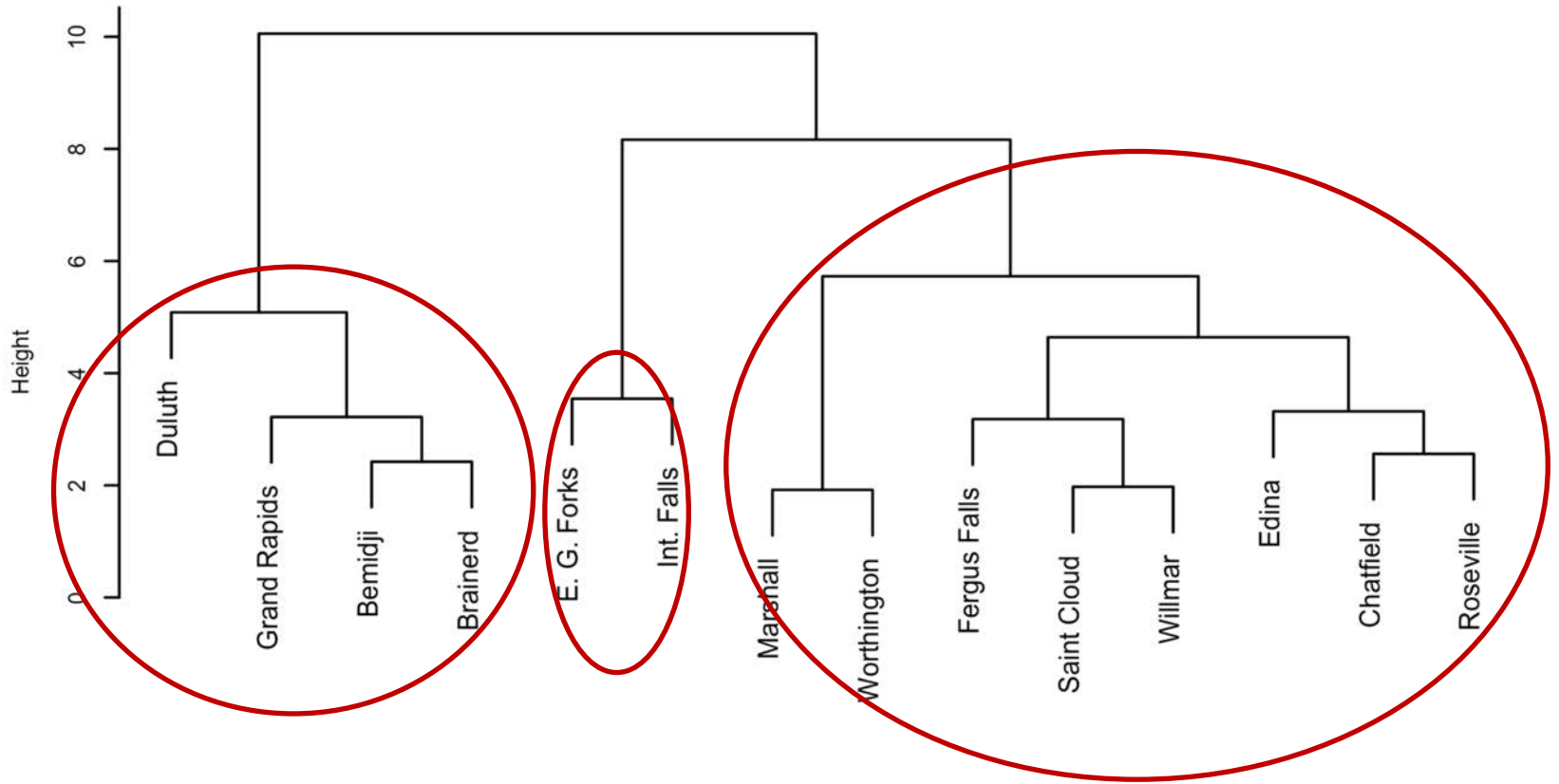
MnDOT currently recommends a few statewide turfgrass mixtures and we know there are differences in climate and soils along roadsides in the state

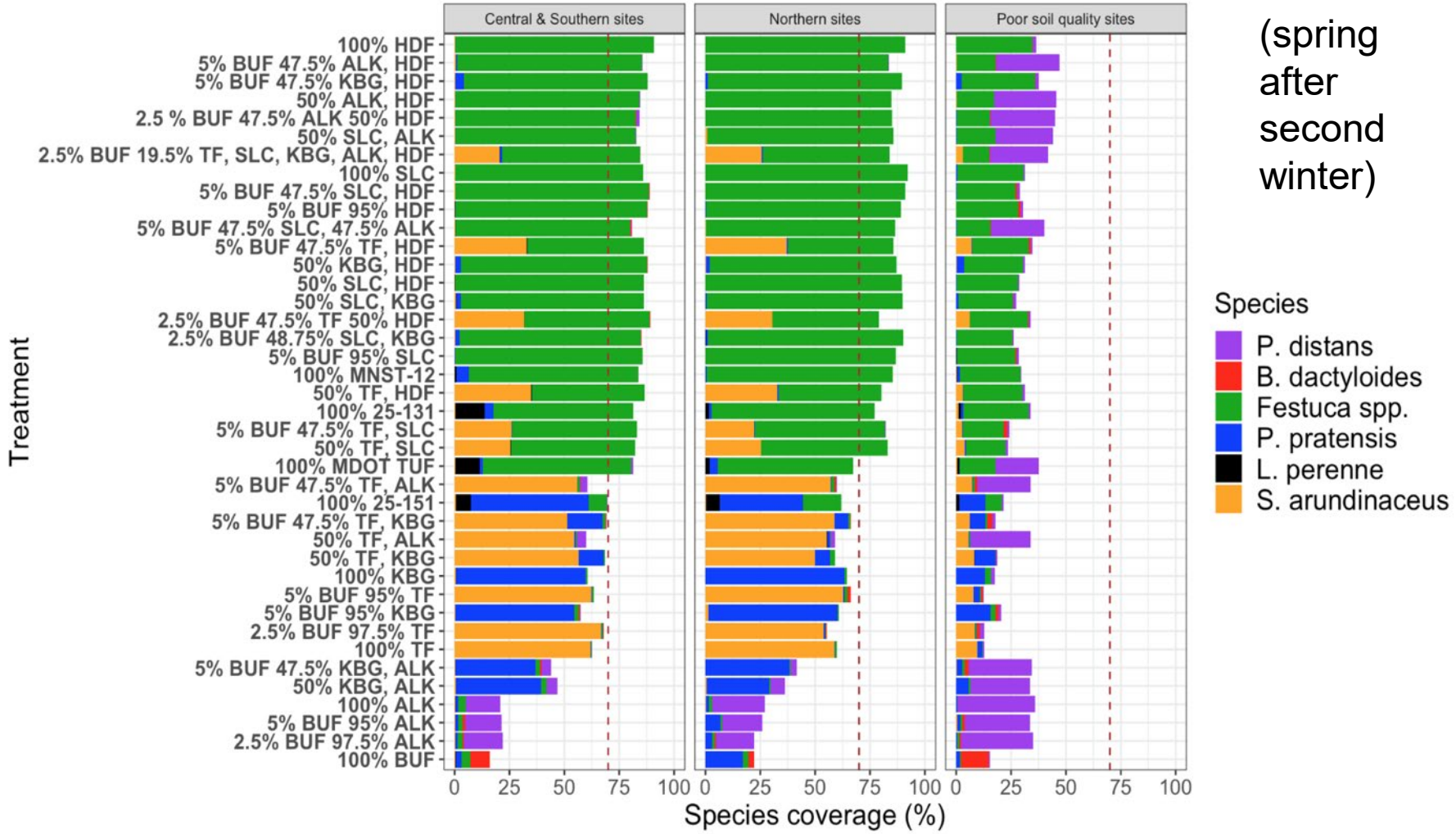
Different roadside studies have tested different mixtures by region and elevation historically

Should MnDOT specify different mixtures based on region/climate?



Soil & Weather Cluster Dendrogram





Time = 4 (spring after second winter)

Table 6.1 Recommended turfgrass seed mixtures for different seeding clusters in the state of Minnesota. PLS = pure live seed, PLW = pure live weight.

Seeding cluster [a]	Species type	Scientific name	Common name	PLS (%)	PLW (%) [b]
North	Cool season	*Puccinellia distans*	Weeping alkaligrass	0.20	0.07
North	Cool season	*Poa pratensis*	Kentucky bluegrass [c]	0.20	0.10
North	Cool season	*Schedonorus arundinaceus*	Tall fescue	0.05	0.13
North	Cool season	*Festuca brevipila*	Hard fescue	0.35	0.41
North	Cool season	*Festuca rubra* ssp. *littoralis*	Slender creeping red fescue	0.20	0.30
Central/southern	Cool season	*Puccinellia distans*	Weeping alkaligrass	0.10	0.03
Central/southern	Cool season	*Poa pratensis*	Kentucky bluegrass [c]	0.20	0.08
Central/southern	Cool season	*Schedonorus arundinaceus*	Tall fescue	0.10	0.23
Central/southern	Cool season	*Festuca brevipila*	Hard fescue	0.40	0.40
Central/southern	Cool season	*Festuca rubra* ssp. *littoralis*	Slender creeping red fescue	0.20	0.26
Poor soil quality	Cool season	*Puccinellia distans*	Weeping alkaligrass	0.30	0.06
Poor soil quality	Cool season	*Poa pratensis*	Kentucky bluegrass [c]	0.05	0.01
Poor soil quality	Warm season	*Buchloe dactyloides*	Buffalograss	0.05	0.47
Poor soil quality	Cool season	*Festuca brevipila*	Hard fescue	0.30	0.20
Poor soil quality	Cool season	*Festuca rubra* ssp. *littoralis*	Slender creeping red fescue	0.30	0.26

[a] Additional research is recommended to improve the development of the seed mixture for the poor soil quality cluster, since this mixture is based only on what species we tested, and from evaluating historical Minnesota roadside turfgrass literature and personal field observations, other species are likely applicable and beneficial.

[b] Weight ratios were calculated by collecting standard seed weight from my calculations and other sources (Beard, 1973; Engelhardt, 2016; Hollman et al., 2018; USDA plant fact sheet).

[c] Kentucky bluegrass seed weight can vary by a factor of almost three times depending on the cultivar and seed lot (Christians et al., 1979).

More to come….

Field data collection is ongoing

Data-driven decision management tool that incorporates economics and agronomics

Recommended a process for incorporating the newest and best turfgrasses in future roadside recommendations

roadsideturf.umn.edu

University of Minnesota Roadside Turf Research and Education

The average driver on a Minnesota highway may occasionally notice when roadside turfgrass is (or is not) well-managed and attractive-looking, but they may not realize how much effort goes into establishing and maintaining that vegetation. There are many critical functions of roadside vegetation.

Why is healthy and living roadside turfgrass important?

- Increases visibility and safety when mowed
- Preserves water quality by absorbing runoff
- Protects from erosion
- Produces cooling effects
- Reduces dust

This site showcases some of the roadside research conducted by the University of

For more on the University

www.turf.umn.edu blog and research info

Acknowledgements - Funding

Local Road Research Board

Minnesota Department of Transportation

Acknowledgements - People

Dominic Christensen

Jon Trappe

Andrew Hollman

Kristine Moncada

Gary Deters

Ryan Schwab

Thank you

www.turf.umn.edu
@UMNturf