



Background

Roadside ditches directly receive road stormwater runoff, which carries contaminants from the road surface, such as spills, vehicles (oil, fuel, tires, brakes), and atmospheric depositions. Runoff can wash along the roadsides, picking up trash, bacteria, sediment, many different types of metals, organic chemicals from deicing and agricultural chemicals, and a set of emerging pollutants yet to be identified (Bannerman et al., 1993; Peter et al., 2018; Maestre and Pitt, 2006; Opher and Friedler, 2010; Herrera, 2008; Tian et al., 2021).

Ditches and their maintenance and vegetation choices represent an opportunity to improve stormwater quality by using plants that can quickly establish after maintenance or reconstruction will limit bank erosion and transport of sediments and associated pollutants.

Ditch maintenance is triggered by complaints from residents (overgrown with invasive plants) or when the jurisdiction determines the ditch has lost conveyance due to sediments or vegetation. Hundreds of miles of roadside ditches in Washington provide an opportunity to gain efficiency of maintenance workloads.

Objectives

The Objectives of this study are:

- 1) Quantify the percent establishment of plant blends/mixtures.
- 2) Quantify quality ratings of plant blends/mixtures.
- 3) Quantify the survival of plant blends/mixtures.
- 4) Identify planting blends for Washington ditches establish quickly and outcompete invasives.

| Blend ID | % of Blend By Weight | Species | Common Name |
|---|----------------------|-------------------------------------|---------------------|
| PT442 BES Grassy Swale Native Mix | 25% | <i>Hordeum brachyantherum</i> | Meadow Barley |
| | 15% | <i>Danthonia californica</i> | California Oatgrass |
| | 10% | <i>Elymus glaucus</i> | Blue Wildrye |
| | 10% | <i>Bromus carinatus</i> | California Brome |
| | 10% | <i>Festuca idahohensis</i> | Roemer's Fescue |
| | 10% | <i>Deschampsia cespitosa</i> | Tufted Hairgrass |
| | 5% | <i>Agrostis exarata</i> | Spike Bentgrass |
| | 5% | <i>Alopecurus geniculatus</i> | Water Foxtail |
| WSDOT Blend | 50% | <i>Lolium perenne</i> | Perennial ryegrass |
| | 40% | <i>Festuca rubra</i> | Creeping Red Fescue |
| | 10% | <i>Trifolium repens</i> | White Clover |
| WSU Blend 1 | 50% | <i>Festuca rubra</i> | Creeping Red Fescue |
| | 40% | <i>Festuca rubra ssp. commutata</i> | Chewings Fescue |
| | 10% | <i>Agrostis tenuis</i> | Highland Bentgrass |
| WSU Blend 2 | 50% | <i>Festuca trachyphylla/ovina</i> | Hard/Sheep Fescue |
| | 35% | <i>Trifolium fragiferum</i> | Strawberry Clover |
| | 15% | <i>Achillea millefolium</i> | Yarrow |
| WSU Blend 3 | 35% | <i>Festuca idahohensis</i> | Roemer's Fescue |
| | 35% | <i>Deschampsia cespitosa</i> | Tufted Hairgrass |
| | 30% | <i>Trifolium fragiferum</i> | Strawberry Clover |
| WSU Blend 4 | 70% | <i>Festuca rubra</i> | Creeping Red Fescue |
| | 15% | <i>Achillea millefolium</i> | Yarrow |
| | 15% | <i>Alopecurus pratensis</i> | Meadow Foxtail |
| WSU Blend 5 | 50% | <i>Agrostis gigantea</i> | Redtop Bentgrass |
| | 50% | <i>Agrostis tenuis</i> | Highland Bentgrass |
| WSU Blend 6 | 50% | <i>Festuca rubra ssp. molate</i> | Molate Red Fescue |
| | 40% | <i>Festuca rubra ssp. commutata</i> | Chewings Fescue |
| | 10% | <i>Agrostis gigantea</i> | Redtop Bentgrass |

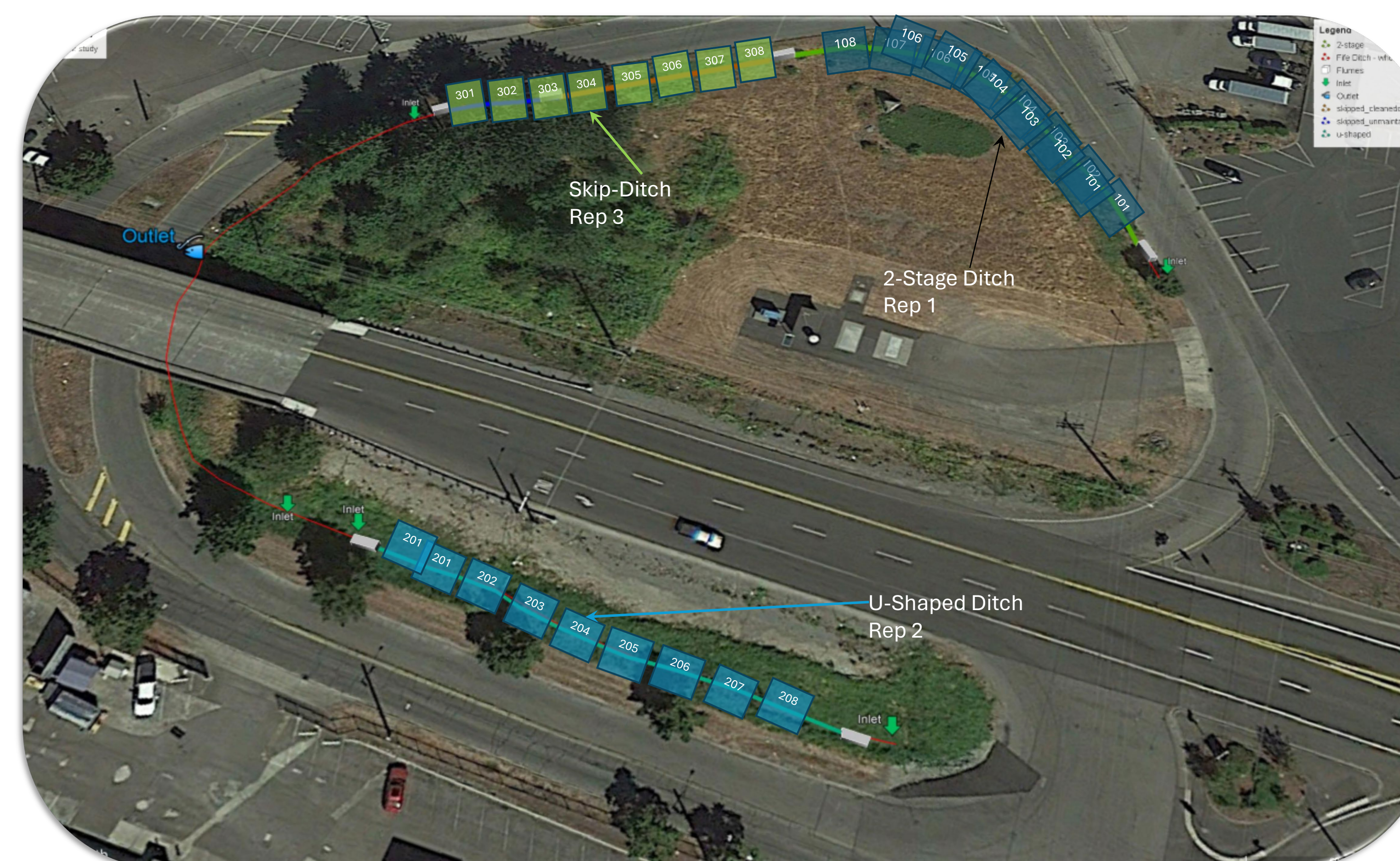
Experimental Design

Three sites were chosen in Washington State, one in Fife, one in Pierce County on 78th street, and one in Pullman at the Grass Breeding and Ecology Farm. The Fife site was the first to be planted, on October 6, 2021, with Pullman and 78th street planted the year after. Each trial was composed of 3 replicates of each blend.

The information from the Fife site was used to adjust the number of blends at the 78th Ave and Pullman sites. Blends 3 and 4 were removed from 78th Ave and Pullman due to their poor performance in Fife, and blend 5 was removed from the Pullman plots due to the potential for those species to interfere with breeding activities at the Grass Breeding and Ecology farm. The 78th Ave site was planted on September 27, 2022, and the Pullman site was planted on September 21, 2022.

An initial % establishment rating was taken 1 month after the installation of each site (late October-early November). The second rating period occurred in early spring (mid-late March of the year following planting), with % crop and turfgrass quality ratings being taken. The third rating was taken in mid-late Summer (August) and comprised % cover and turfgrass quality. The fourth rating was a species inventory of each plot, which occurred in late Fall (November). At the Fife site, environmental conditions between the ditch walls versus the flat top area were so great that ratings were broken down into each area. This was not necessary for 78th Ave or Pullman.

Photos below illustrating the renovation process in 2021 and 2022 and second ratings in 2022.



Google. (n.d.). [City of Tacoma]. Retrieved 4/26/2022 from <https://www.google.com/maps/@47.2438024,-122.405245,2146m/data=!3m1!1e3>

Results

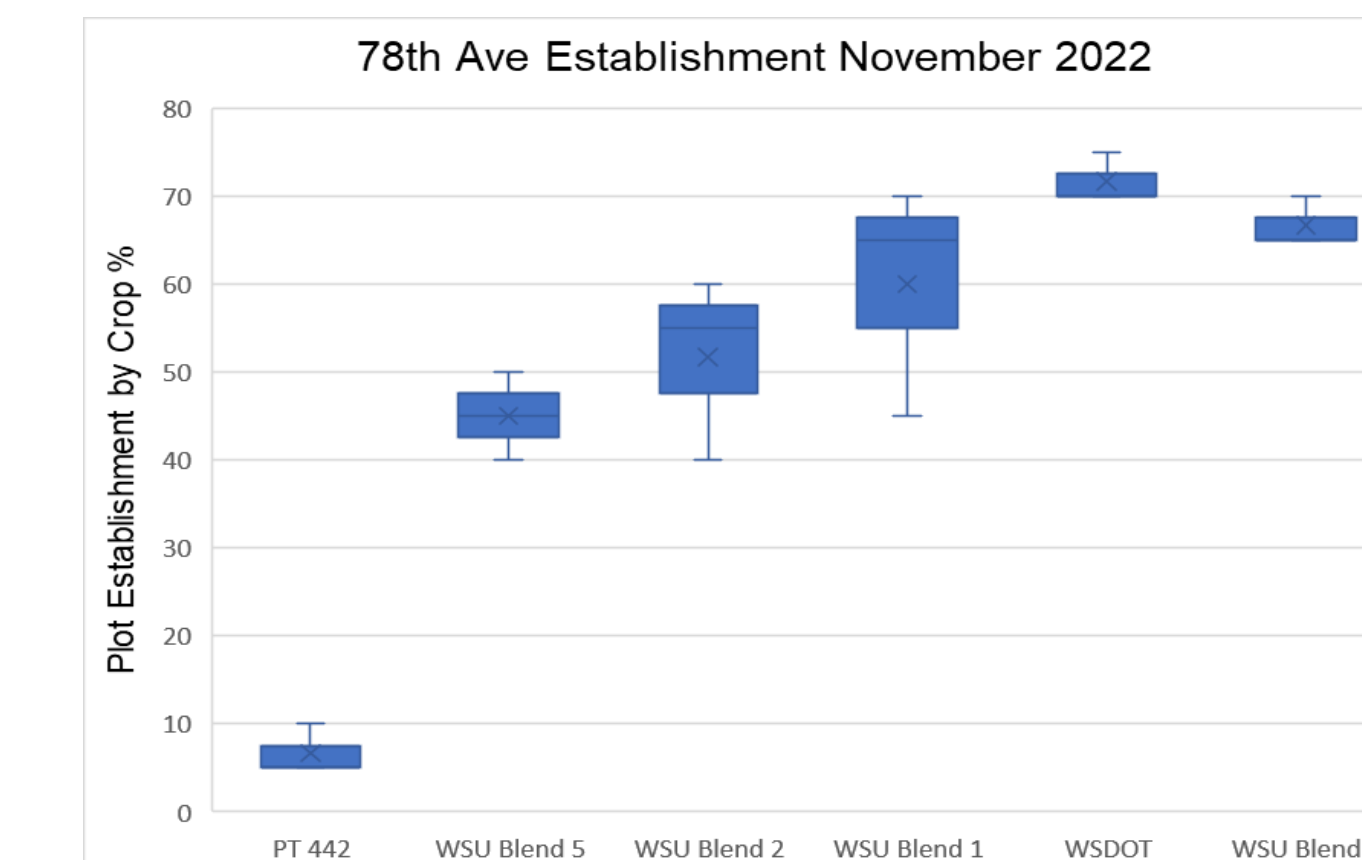


Fig. 1. 78th Ave Establishment rating

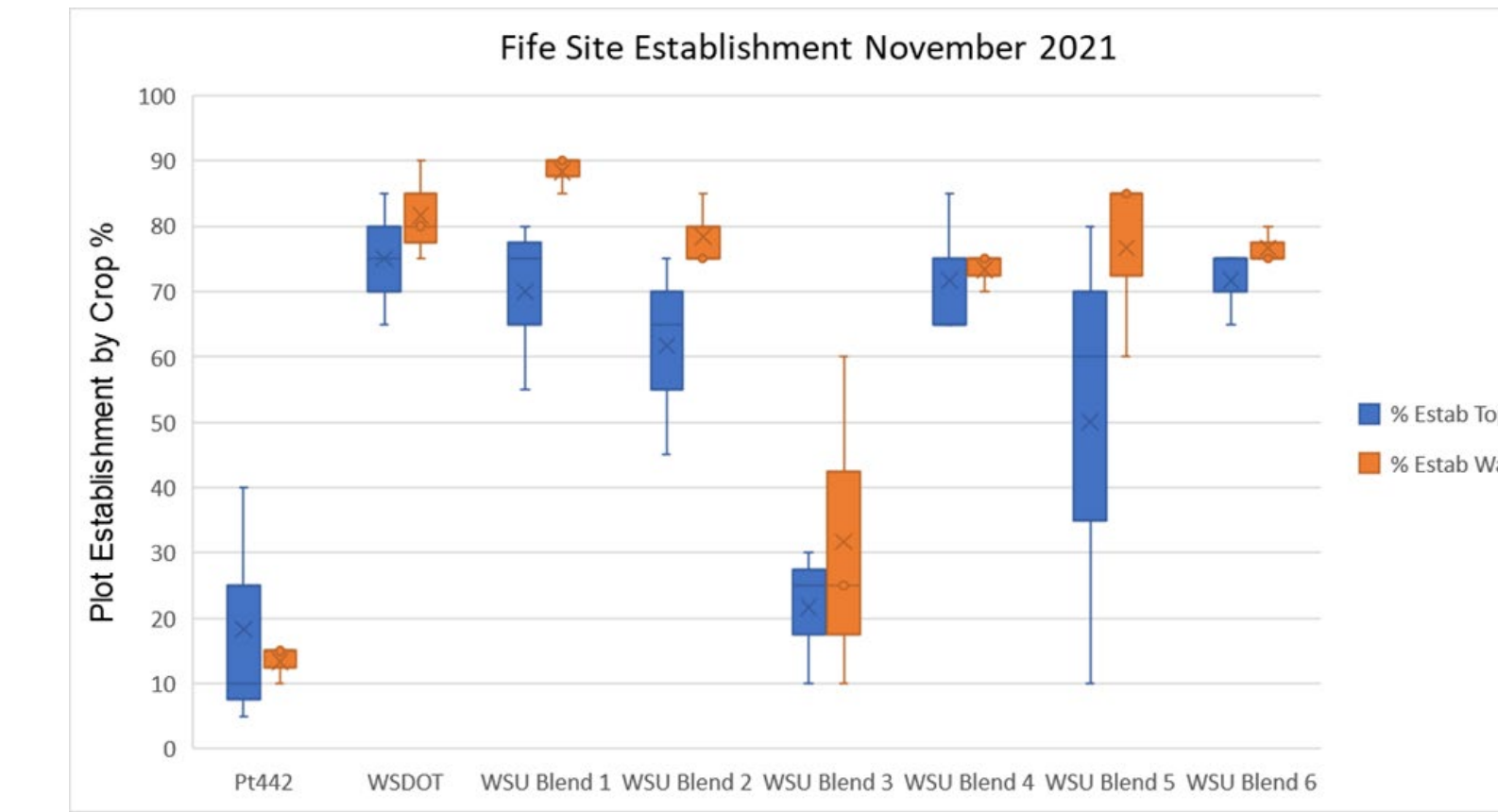


Fig. 2. Fife Establishment rating

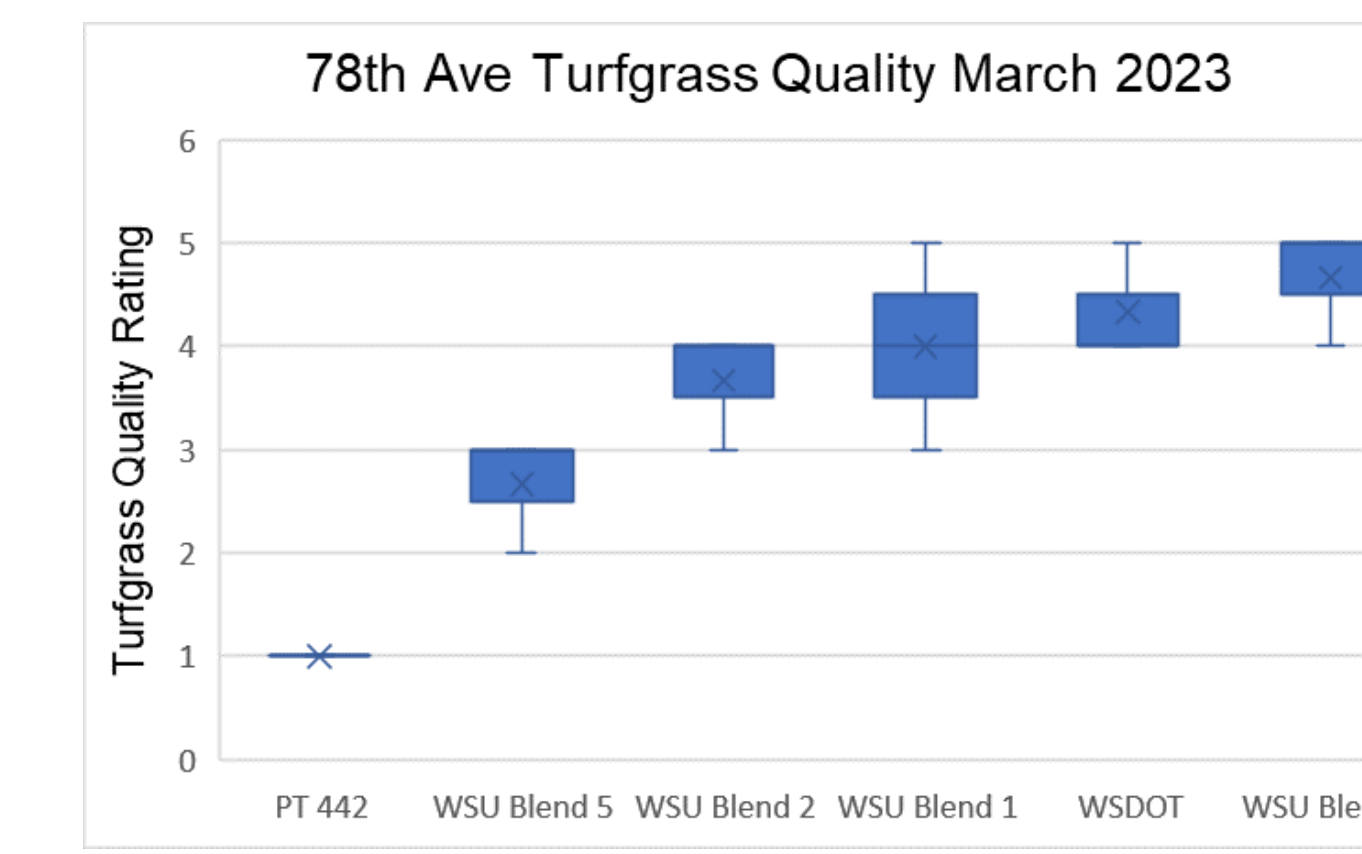


Fig. 3. 78th Ave Turf Quality rating. 1=dead, 9=ideal

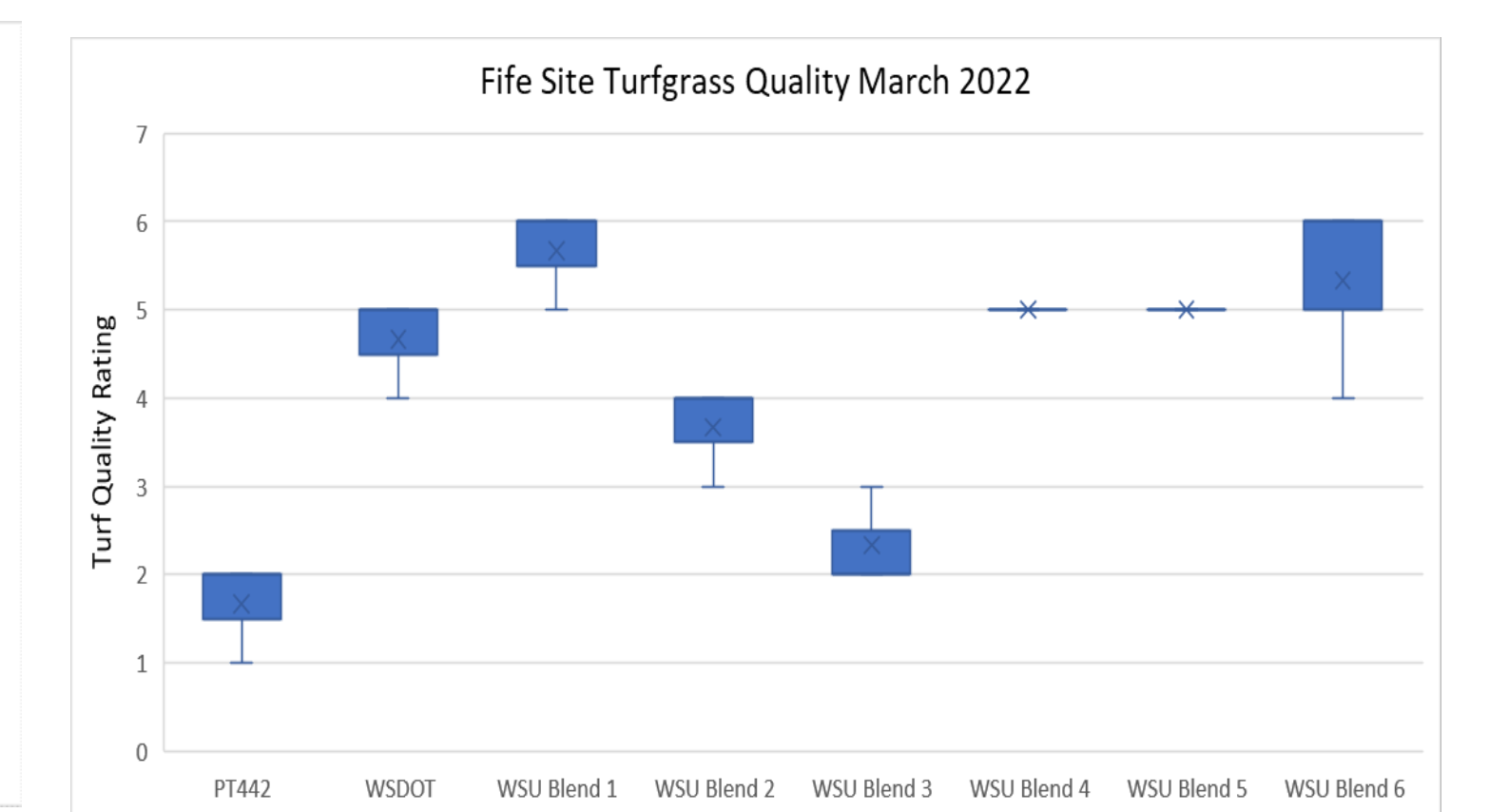


Fig. 4. Fife Turf Quality rating. 1=dead, 9=ideal

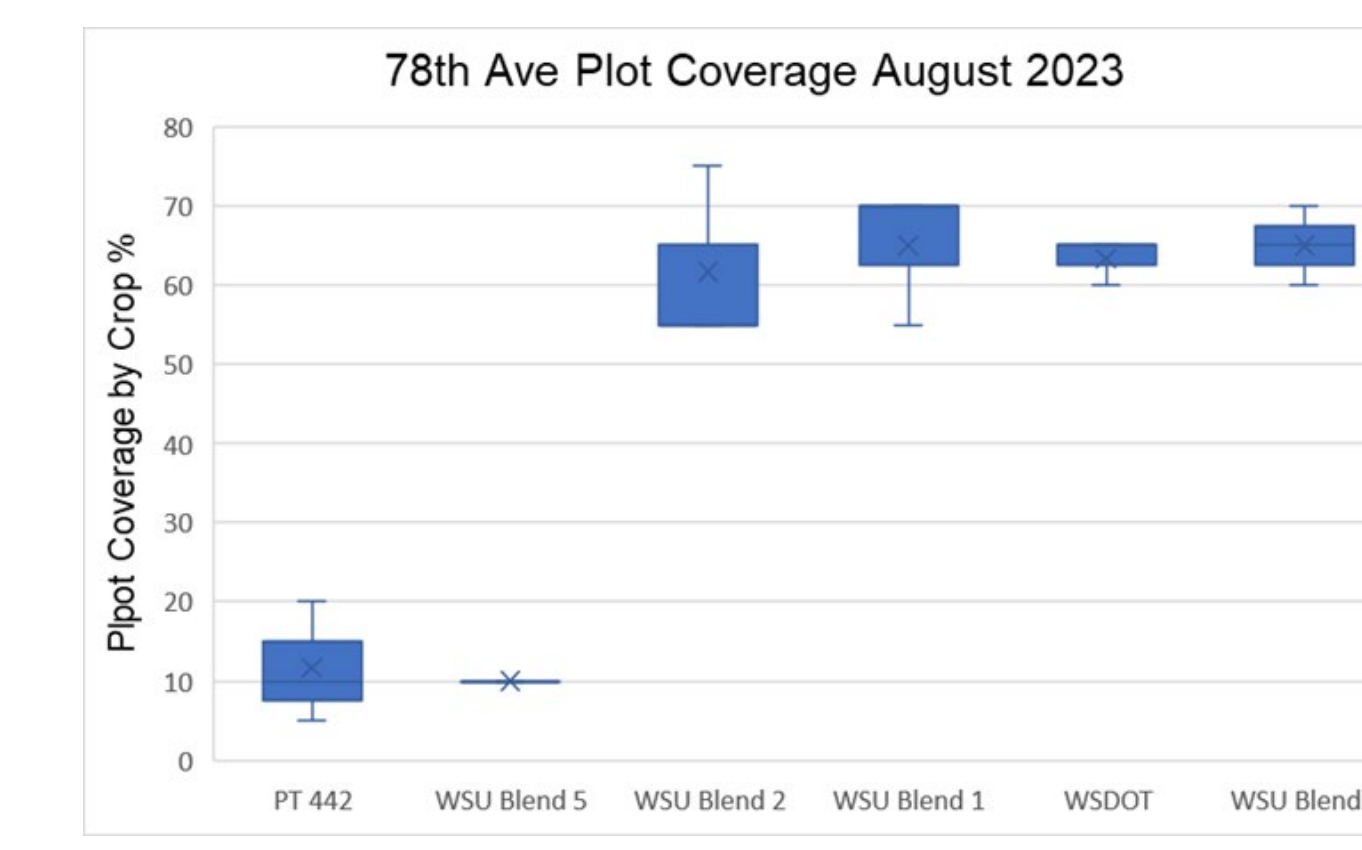


Fig. 5. 78th Ave Percent Cover rating

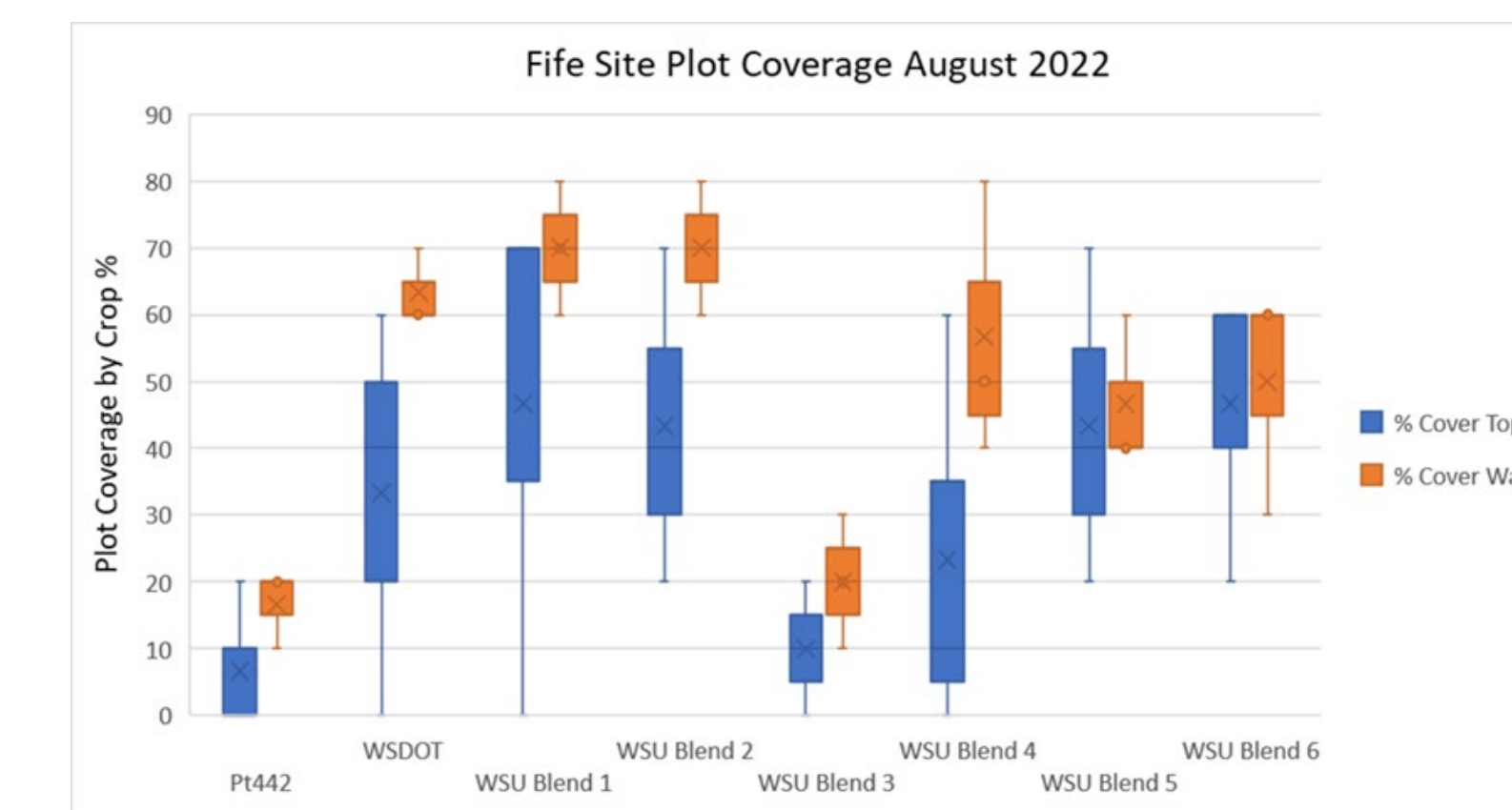


Fig. 6. Fife Percent Cover rating

Discussion

The **WSDOT blend** is recommended as a fast-establishing utility blend that could be planted in many environments, especially those requiring fast germination. WSU blend 2 could be a good choice for sites with slower growth requirements.

WSU blend 2 would be good for areas with shade and drought and where slow growth is preferred.

WSU blends 1 and 6 could each be interchangeable with the WSDOT blend and are recommended for most environments, including shade.

WSU blend 5 is recommended for use in full sun, primarily where other bentgrass species have already dominated the site.

The **PT-442** native blend was not a good candidate for this type of planting. The weed and environmental pressure was too great for the native species to establish and grow. PT-442 is recommended for native sites with little weed competition and minimal disturbance.

Acknowledgments

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