

# CHARACTERIZING A REFERENCE SITE FOR THE ENDANGERED WILLAMETTE DAISY (*ERIGERON DECUMBENS*)



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12 April, 2018

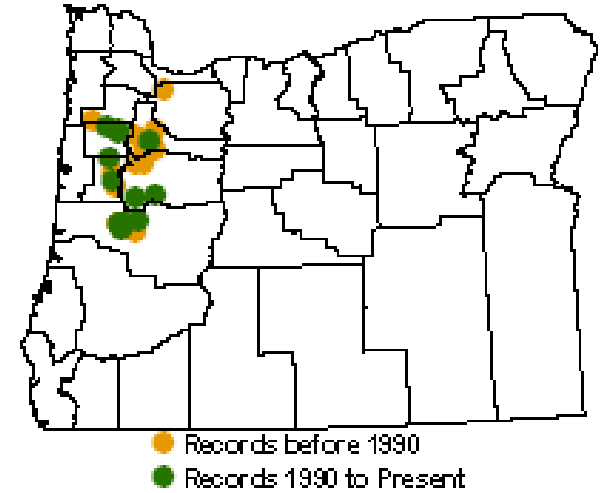


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# WILLAMETTE DAISY RANGE AND HABITAT



Willamette daisy range  
Source: USFWS

Willamette daisy occupies wet  
and upland prairie sites in Oregon's  
Willamette Valley



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# FISHER BUTTE IS A SEED SOURCE FOR SOUTH VALLEY RESTORATIONS

- We seek to understand Erigeron biology at this source site to inform both site management and restoration site selection
- Erigeron population survey
- Erigeron demography plots
- Plant community plots (Erigeron and Random)

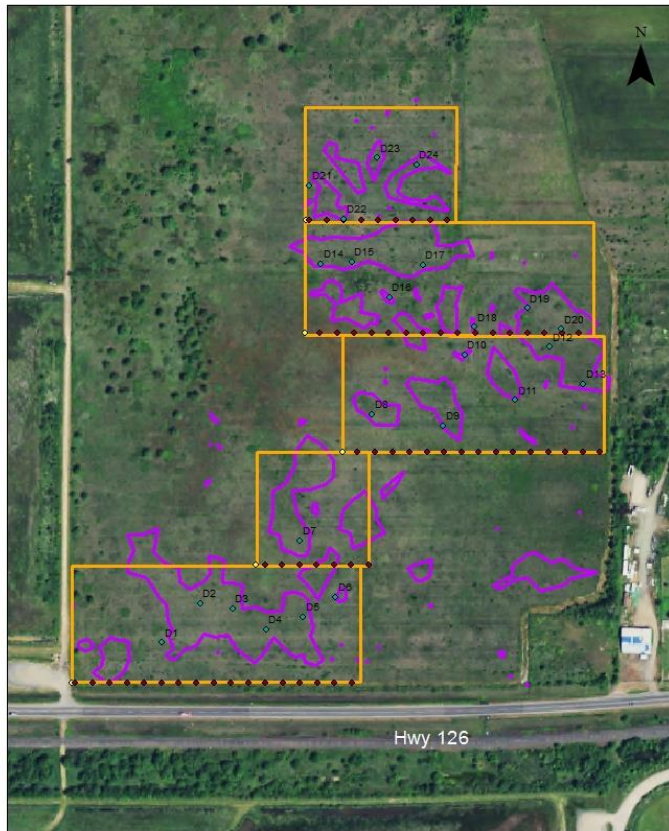




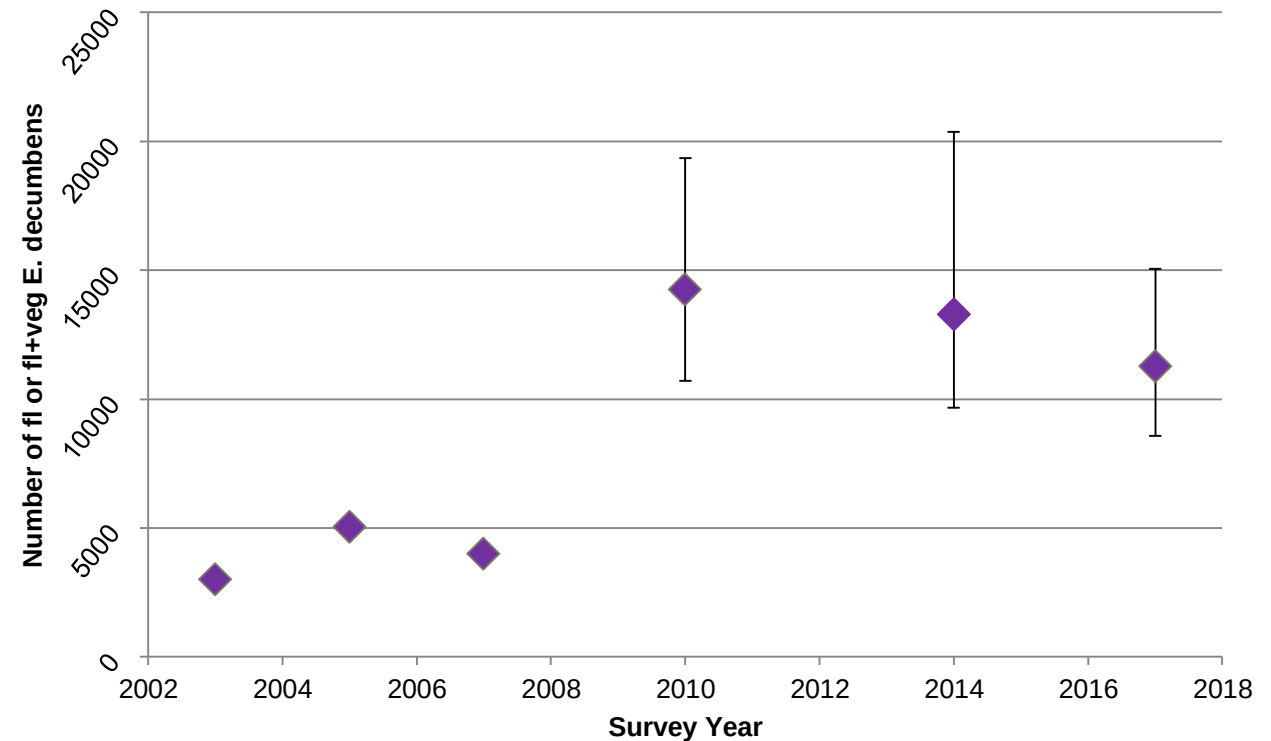
# VARIOUS METHODS WERE USED TO ESTIMATE POPULATION SINCE 2003

Erigeron decumbens Sample Area, Plots, and Patches

- ERDE 2015-2017\_Demography\_plots
- ERDE\_Patches\_2014
- ERDE\_Macroplots\_2017

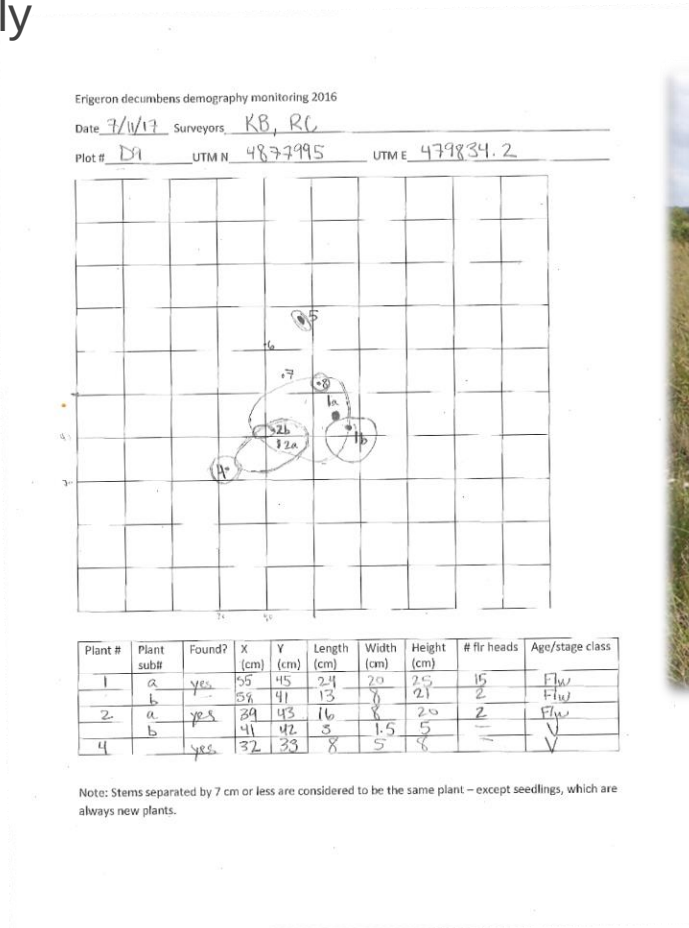


*Erigeron decumbens* population of flowering plants (2003-2007) or flowering plus vegetative plants (2010-2017) at Fisher Butte RNA, Fern Ridge. Vegetative plants accounted for 10-30% of total plants. 90% confidence intervals.



# 24 DEMOGRAPHY PLOTS ESTABLISHED AT FISHER BUTTE IN 2015

- Plots are 1m<sup>2</sup> and located on randomly selected occupied meters of population sampling transects
- Every year we relocate every plant
- We map each plant on a grid
- We measure height and crown length and width and count flowering heads
- We search for new seedlings/plants
- 2017 was year three of the study



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# THREE YEARS DEMOGRAPHY OF DATA – WHAT WE’VE LEARNED SO FAR

- Seedling recruitment and survival varied
- Reproduction varied
- 2016 to 2017 was cooler and wetter and 2017 had reduced seedling recruitment and flowering
- More years of data needed for population modeling

| Year | Seedlings | Veg | Repro | Heads |
|------|-----------|-----|-------|-------|
| 2015 | 146       | 70  | 72    | 992   |
| 2016 | 199       | 91  | 80    | 1186  |
| 2017 | 40        | 110 | 53    | 348   |

| Seedling survival | # found Y0 | # relocated Y1 | # relocated Y2 |
|-------------------|------------|----------------|----------------|
| 2015              | 146        | 26             | 12             |
| 2016              | 199        | 8              | NA             |
| 2017              | 40         | NA             | NA             |





# THREE YEARS OF DATA – CHALLENGES

- Relocating plants year after year is difficult
- Defining an individual is difficult: initially we used 7 cm rule, in 2017 we began measuring base areas individually as sub plants
- Data from another site or two would improve applicability to species recovery



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# D15 2015

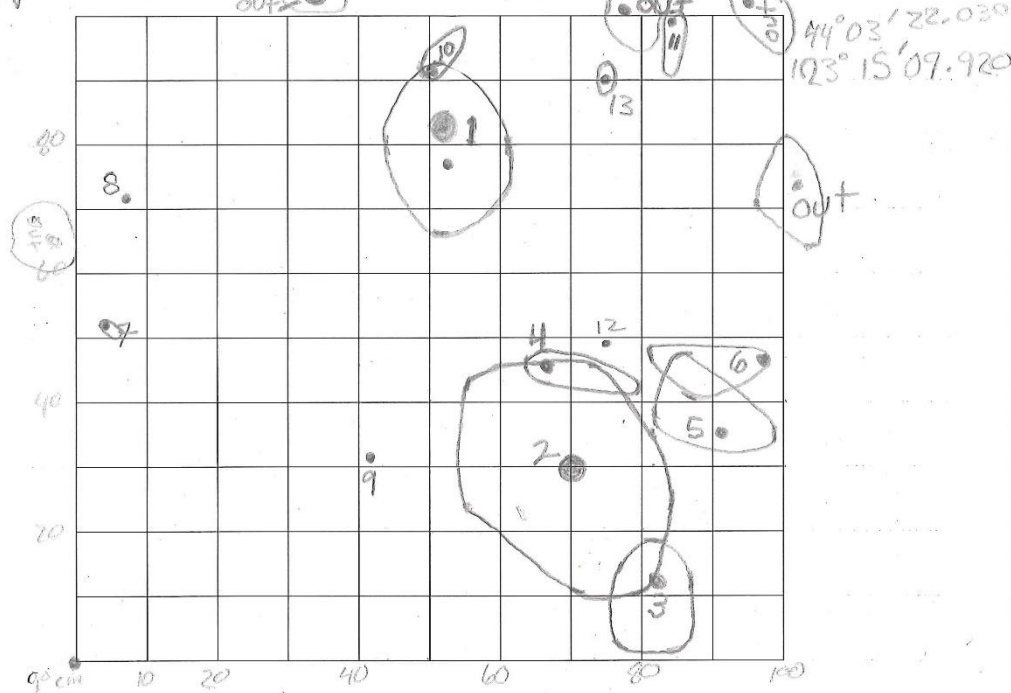


Erigeron decumbens demography monitoring (DRAFT)

Date 7/2/15 Surveyors RT, CA

Site Fisher Butte RNA Transect 42 (43m on MP4) 64 D15

ED  
12/8/15



| Plant no. | Length (cm) | Width | Height | # flr heads | Age/stage class |
|-----------|-------------|-------|--------|-------------|-----------------|
| 1         | 24          | 20    | 25.5   | 2           | repro           |
| 2         | 33          | 29    | 21     | 20          | repro           |
| 3         | 17.5        | 10    | 20     | 2           |                 |
| 4         | 12          | 3     | 14     | 2           |                 |
| 5         | 15          | 9     | 15     | 4           |                 |
| 6         | 14          | 7     | 8      | 7           |                 |
| 7         | 5           | 4     | 5      | 1           | veg             |
| 8         | 3           | 2     | 5      | 1           | veg             |
| 9         | 7           | 5     | 6      | 1           | veg             |
| 10        | 7           | 2     | 8      | 1           | veg             |
| 11        | 9           | 4     | 19     | 2           | repro           |
| 12        | .8          | .1    | 1.0    | 1           | seedling        |
| 13        | 2.5         | 1     | 7      | 1           | veg             |

Age/stage classes: Add definitions...Seedling, vegetative, reproductive, others? merged



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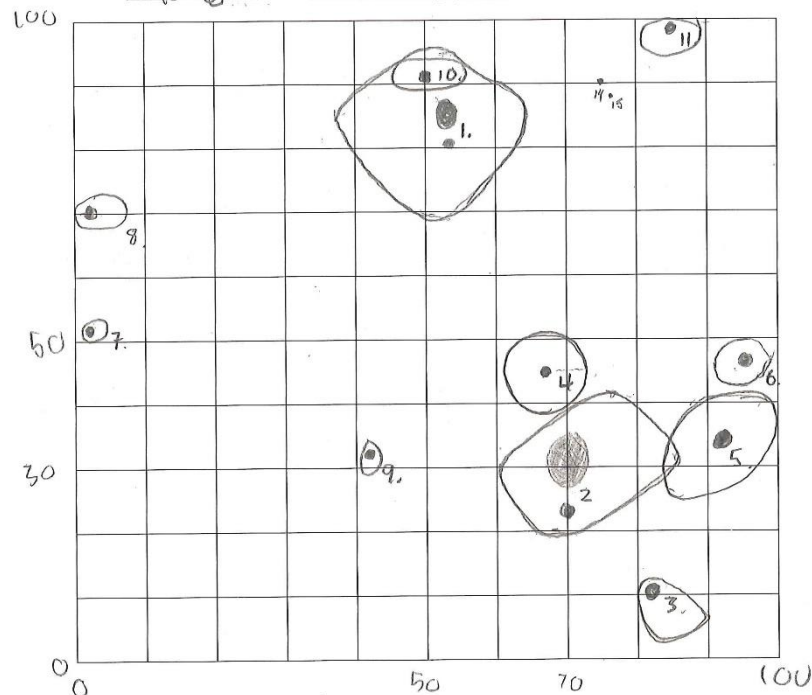
# D15 2016

LRH7

Erigeron decumbens demography monitoring 2016

Date 6/22/16 Surveyors RT, KF, GW

Plot # D15 UTM N 4878137 UTM E 479754.7



| Plant # | Found? | X (cm) | Y (cm) | Length (cm) | Width (cm) | Height (cm) | # flr heads | Age/stage class |
|---------|--------|--------|--------|-------------|------------|-------------|-------------|-----------------|
| 1       | yes    | 52     | 82     | 27          | 20         | 27          | 7           | Reproductive    |
| 2       | yes    | 70     | 30     | 26          | 15         | 24          | 36          | Reproductive    |
| 3       | yes    | 82     | 10     | 9           | 8          | 15          | 3           | Reproductive    |
| 4       | yes    | 66     | 45     | 12          | 9          | 12          | 0           | Vegetative      |
| 5       | yes    | 92     | 35     | 12          | 8          | 17          | 0.5         | Reproductive    |

Note: Stems separated by 7 cm or less are considered to be the same plant – except seedlings, which are always new plants.



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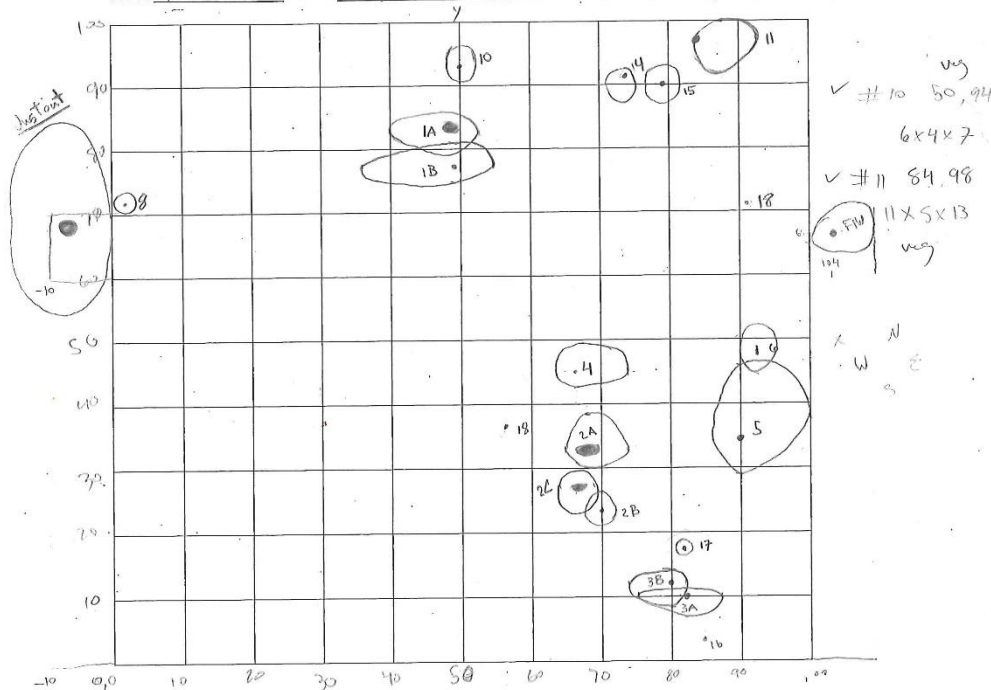
# D15 2017

LRCF

Erigeron decumbens demography monitoring 2016

Date 7/14/2017 Surveyors JS, RC

Plot # D15 UTM N 4878137 UTM E 479754.7



| Plant # | Plant sub# | Found? | X (cm) | Y (cm) | Length (cm) | Width (cm) | Height (cm) | # flr heads | Age/stage class |
|---------|------------|--------|--------|--------|-------------|------------|-------------|-------------|-----------------|
| 1       | A          | yes    | 48     | 84     | 11          | 6          | 14          | 0           | Vegetative      |
| 1       | B          | yes    | 49     | 77     | 24          | 9          | 22          | 1           | Reproductive    |
| 2       | A          | yes    | 68     | 32     | 12          | 11         | 17          | 6           | Reproductive    |
| 2       | B          | yes    | 70     | 24     | 6           | 5          | 13          | 2           | Reproductive    |
| 2       | C          | yes    | 66     | 18     | 7           | 7          | 16          | 2           | Reproductive    |

Note: Stems separated by 7 cm or less are considered to be the same plant – except seedlings, which are always new plants.



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# NEXT STEPS: ERIGERON RESPONSE TO BURNING

17 PLOTS WERE BURNED IN FALL 2017, 7 LEFT UNBURNED



*Photos from left to right - Prescribed fire at Fisher Butte: a) the BLM interagency fire crew sets the fire. b) D7 (unburned) on Nov. 6, 2017. C) D12 on Nov. 6, 2017 – four weeks after prescribed fire.*

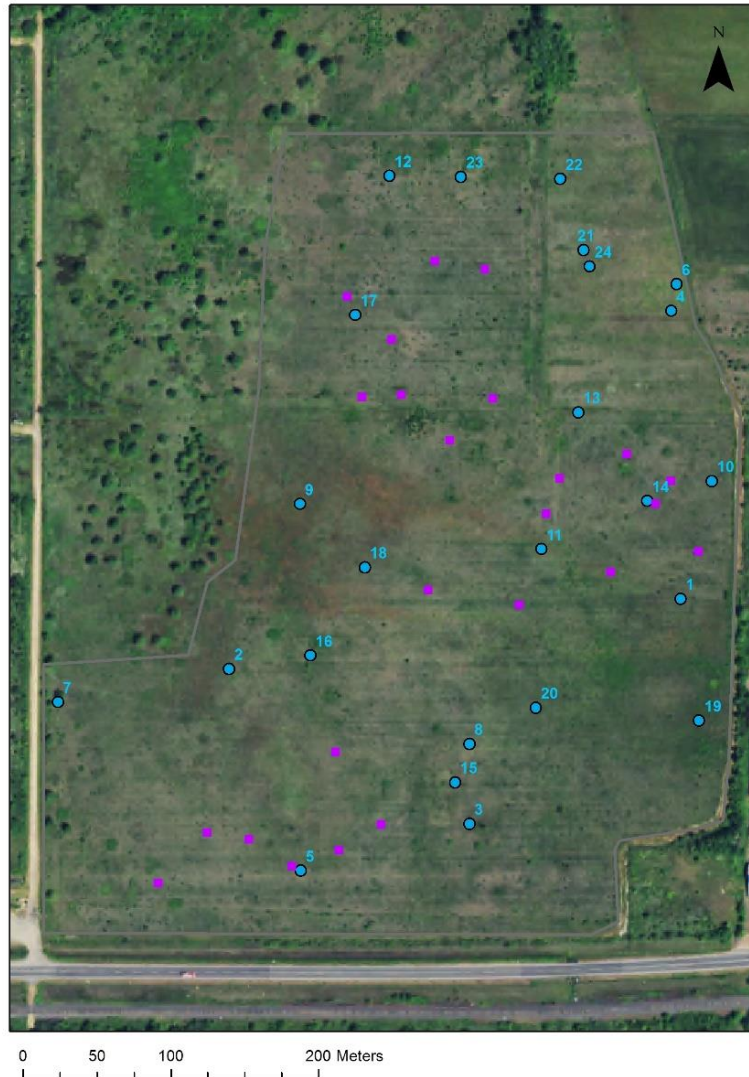


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# WE MEASURED PLANT COMMUNITY IN 2016

ERDE\_area\_random\_veg\_plots\_1m2\_2016



- Percent cover of all vascular plant species was visually estimated in the 24 Erigeron demography plots and in 24 randomly located plots in prairie habitat at Fisher Butte
- Questions:
  - What is the plant community in locations with Erigeron (demography plots)?
  - How does this community compare to the overall site (randomly located plots)?



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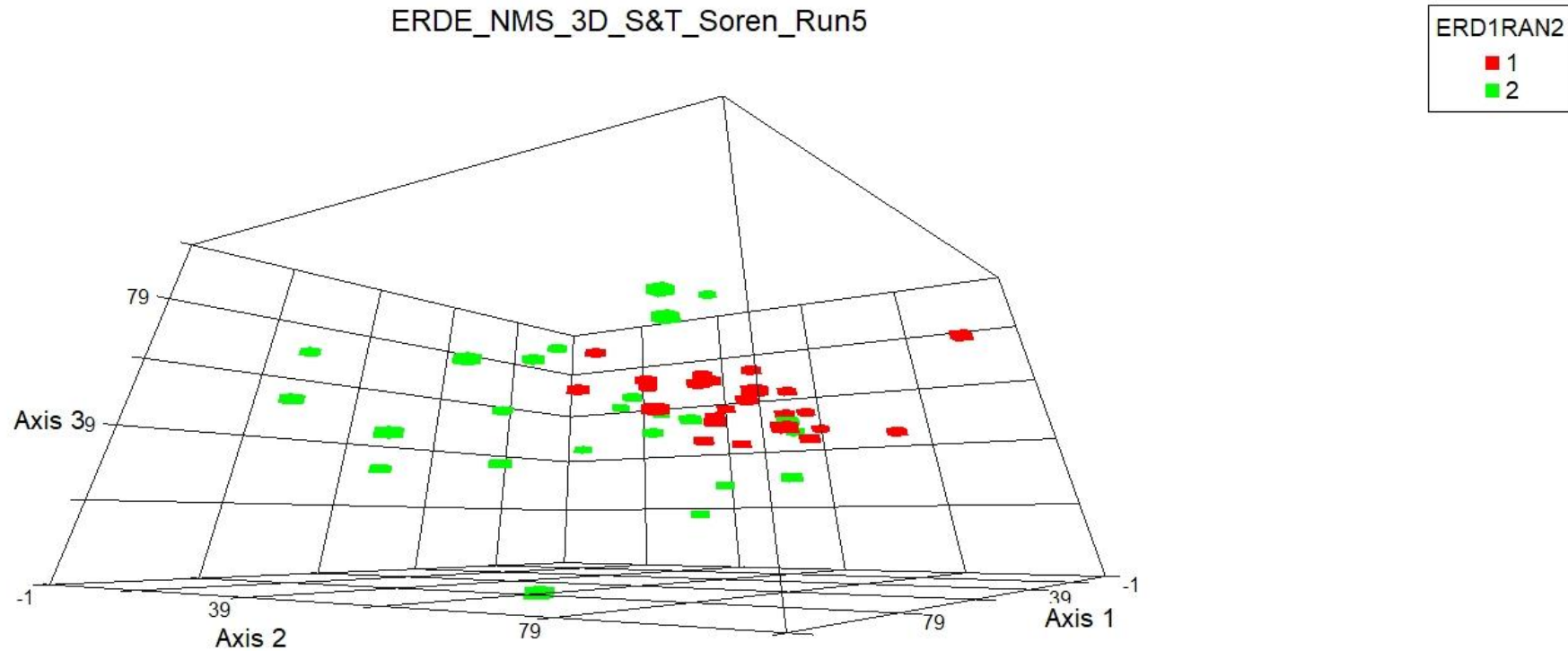


# WE USED PC-ORD (MJM SOFTWARE) FOR DATA SUMMARY AND ANALYSIS

- Nonmetric Multidimensional Scaling (NMS)
  - NMS is a multivariate permutation-based ordination technique
  - To visualize plots in species space and look for patterns and groupings
- Multi-response permutation procedure (MRPP)
  - MRPP is a multivariate permutation-based tool for significance testing between groups
- Indicator Species Analysis (ISA)
  - ISA is a multivariate permutation-based tool that assesses “the degree to which a species indicated a group based on its consistency and distribution of abundance.” –Peck 2010



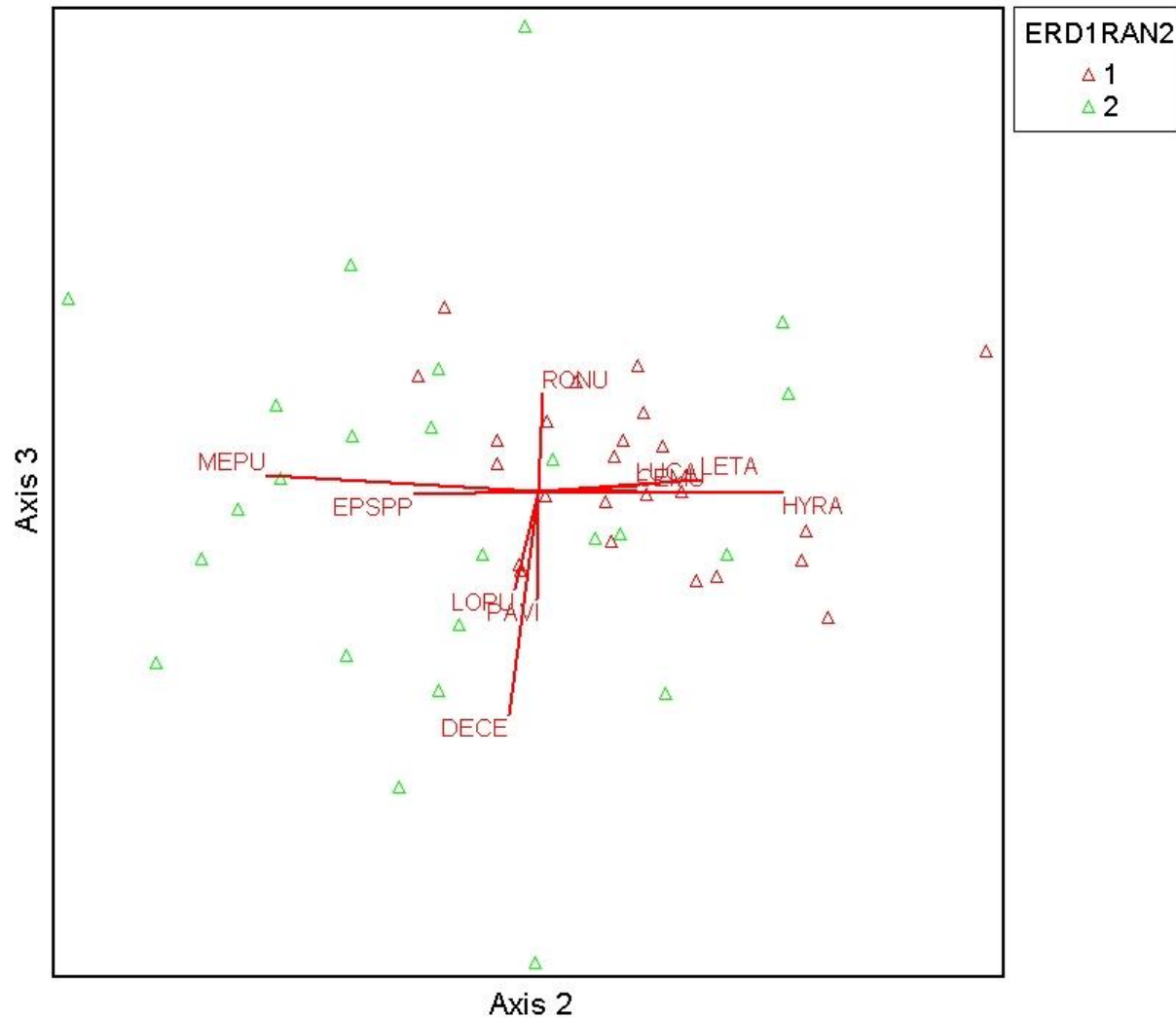
# NMS REVEALED ERIGERON PLOTS GROUPED TOGETHER (RED)



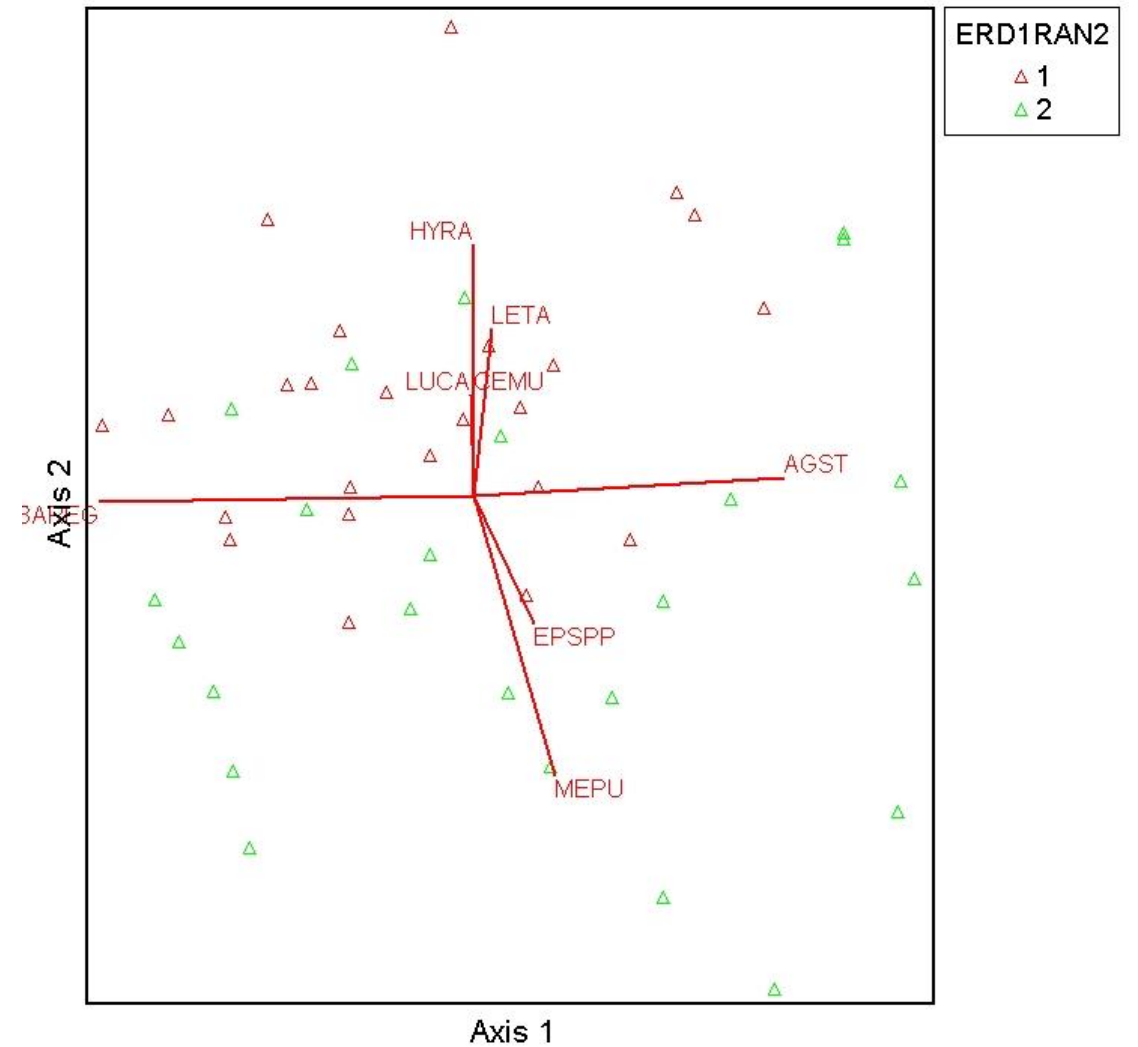


# SPECIES OVERLAY AND 2D DISPLAY OF 3 AXES

ERDE\_NMS\_3D\_S&T\_Soren\_Run5



ERDE\_NMS\_3D\_S&T\_Soren\_Run5



# MRPP CONFIRMED A SIGNIFICANT DIFFERENCE BETWEEN GROUPS

- Chance-corrected within-group agreement,  $A = 0.03479469$
- Probability of a smaller or equal delta,  $p = 0.00009577$
- ISA revealed 11 species significantly associated with group 1 (ERDE) and 4 with group 2 (random)





# ISA REVEALED 15 SPECIES SIGNIFICANT AT $P < 0.05$

## Species associated with ERDE plots:

Anthoxanthum odoratum  
Castilleja tenuis  
Centaurium muehlenbergii  
Hypericum perforatum  
Hypochaeris radicata  
Juncus bufonius  
Leontodon taraxacoides  
Luzula campestris  
Prunella vulgaris  
Sisyrinchium sp.  
Toxicoscordion venenosum



## Species associated with Random Plots:

Deschampsia cespitosa  
Epilobium spp  
Mentha pulegium \*  
Plagiobothrys figuratus

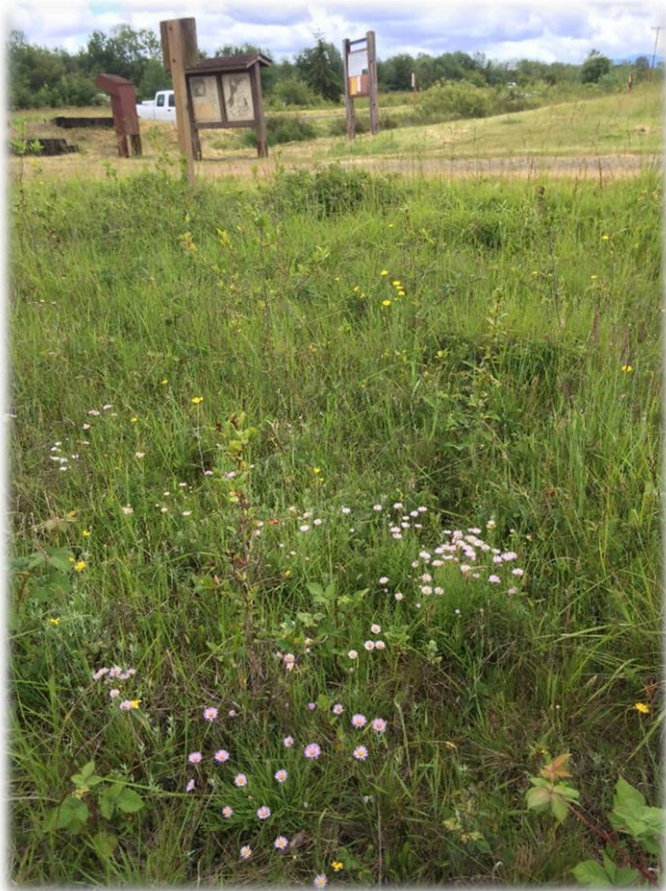
\* Mentha was only significant for the raw data run



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***Erigeron decumbens*** is associated with the drier, more upland portions of this site. These microhabitats are also weedier, with non-native grasses and forbs dominating.





# PLANTING SITE SELECTION AT SOUTH MARSH





# COMING SOON

- Monitor demography plots every year and analyze data in a few years
- Population transects every few years
- Demography plots to compare restored population to reference site
- Pollinators
- Continue to learn from our monitoring and restoration efforts





# WHAT HAPPENS TO ERIGERON IN WINTER?



*Photos from left to right - Winter re-green at Fisher Butte: a) green leaves on Oct. 25, 2017. b) Post fire re-green in D10 on Nov. 6, 2017 - four weeks after fire.. C) A new set of leaves emerging on Jan. 9, 2018 – unburned area.*





## THANKS TO:

- USACE and Fern Ridge staff for monitoring and support
- Tom Kaye, Denise Giles-Johnson of Institute for Applied Ecology for sample design and analysis support
- Leanna VanSlambrook for *Erigeron decumbens* plant production
- Walama Restoration for planting at South Marsh
- Interagency Burn Crew

