



# White Water Ranch Pollinator Enhancement Study Design V.1

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Field protocol for Whitewater Ranch wildflower patch enhancement study

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## Questions

1. Can native, flowering plants succeed (germinate and flower within 1-3 years after seeding) in clearcuts with minimal site prep?
2. Is there an interaction between plant success and planting inside burn piles or outside burn piles?
3. Does intraspecific competition influence success?
4. Is there an effect of different site characteristics (slope, elevation, aspect, N:C ratio)?
5. Is there evidence of dispersal of seeds in subsequent years?

## Study area

2. ■ White Water Ranch ~1,700 acres of mid elevation slopes in the Cascades, along the McKenzie River (<https://g.page/whitewater-ranch?share>)

- Area was Doug fir plantations, most burned in the 2020 Holiday farm fire
- ~200 burn piles of varying size, easily accessible from roads, no map of locations

### Design considerations

- 3
  - Mimic possible methods of planting a industrial timber plantation would consider using (i.e., minimal site prep, no extensive weeding of plants that do not compete with saplings, no removal of unburned logs in burn pile, no individual seeding)
  - Assume canopy closure in 6 years after sapling planting in year 1, need plants to flower within 1-3 years
  - Split plot design in and out of the burnpile to address within/outside burnpile interaction (<https://www.statisticshowto.com/split-plot-design/>)
  - ideal: a control + all the seed species in each block, inside and outside the burnpile.
  - Would closely control for soil/other local conditions
  - Model
  - Number of germinated seedlings ~ species\*treatment + plot characteristics (slope etc.) + Block
  - Treatment = "within" or "outside of burn pile"
  - Block = random effect accounting for variation between plots not accounted for by fixed effects of plot characteristics
  - ½ m2 plots would be easy to nestle in the burn pile avoiding big bits of charcoal
  - Most burn piles will fit all 23 plots

### Pre-field prep

- 4 Order seeds for 50 0.5 m2 plots: 20 single species, 3 mixes  
Pre-weight seeds and put in coin envelopes, labeled with species 6 letter code.

Put each of the 23 pre-weighted baggies into a large gallon ziplock for each set + 1 control flag (i.e., no seeds)

Species	seeds/lb	target seeds/ft2	lbs/acre	plots in acres	lbs/plot	oz/plot
<i>Achillea millefolium</i>	1,418,947	40	1.23	0.0001	0.0002	0.0024
<i>Madia gracilis</i>	300,000	40	5.81	0.0001	0.0007	0.0115
<i>Potentilla gracilis</i> var. <i>gracilis</i>	1,417,460	40	1.23	0.0001	0.0002	0.0024
<i>Phacelia heterophylla</i>	559,172	40	3.12	0.0001	0.0004	0.0062
<i>Gilia capitata</i>	680,000	40	2.56	0.0001	0.0003	0.0051
<i>Lupinus latifolius</i>	31,000	40	56.21	0.0001	0.0069	0.1111
<i>Mimulus guttatus</i>	45,360,000	40	0.04	0.0001	0.0000	0.0001
<i>Iris tenax</i>	46,000	40	37.88	0.0001	0.0047	0.0749
<i>Collinsia grandiflora</i>	464,487	40	3.75	0.0001	0.0005	0.0074
<i>Collomia grandiflora</i>	121,715	40	14.32	0.0001	0.0018	0.0283
<i>Eriophyllum lanatum</i>	1,169,047	40	1.49	0.0001	0.0002	0.0029
<i>Geum macrophyllum</i>	760,037	40	2.29	0.0001	0.0003	0.0045
<i>Microsteris gracilis</i>	416,392	40	4.18	0.0001	0.0005	0.0083
<i>Potentilla glandulosa</i>	1,135,000	40	1.54	0.0001	0.0002	0.0030
<i>Lupinus rivularis</i>	28,917	40	60.26	0.0001	0.0074	0.1191
<i>Ligusticum apiifolium</i>	112,000	40	15.56	0.0001	0.0019	0.0308
<i>Lomatium utriculatum</i>	277,765	40	6.27	0.0001	0.0008	0.0124
<i>Lomatium dissectum</i>	28,499	40	61.14	0.0001	0.0076	0.1209
<i>Sidalcea campestris</i>	100,000	40	17.42	0.0001	0.0022	0.0344
<i>Sidalcea malviflora</i>	133,000	40	13.10	0.0001	0.0016	0.0259
Tough and tenacious mix	170,942	40	10.19	0.0001	0.0013	0.0201
Burn pile mix	217,934	40	8.00	0.0001	0.0010	0.0158
Disturbed Ground forbs only mix	224,814	40	7.75	0.0001	0.0010	0.0153

## 5 Pre label and number flags with plot numbers and 6 letter codes

### Field checklist

- 6
  1. Field desks with pencils and datasheets on "rite in the rain paper"
  2. Flagging tape
  3. Pre numbered and labeled WHITE pin flags (2 per plot\*23 plots) (non-white flags will attract pollinators, which will distort the pollinator visitation observations and hummerbirds can be dangerous)
  4. Garmin gps \*2 (charged)
  5. Extra AA batteries
  6. Walkie talkies for each car
  7. 6 inch rebar stakes for center markers

8. Metal tree tags for center markers
9. Zip ties for adding metal tags to rebar stake
10. Pre-weighted seeds
11. Bags of vermiculite
12. Compasses for slope estimation
13. Quart Ziplocks (for soil samples)
14. Auger (for soil samples)



For each crew member

1. Plastic bowls for mixing vermiculite and seeds
2. Small rakes to level ground
3. 0.5 m quadrat
4. Bright orange field vests or regular vests
5. Silver sharpies for writing on flags

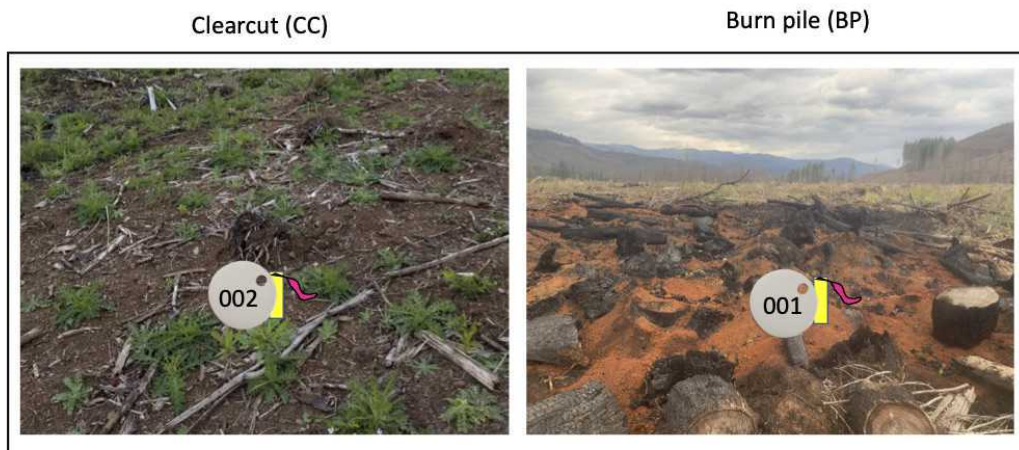
Plastic buckets for carrying planting kit for each crew member

Check list personal:

1. Waterproof boots and rain gear (top and bottom)!
2. Lunch
3. Water
4. Cell phone
5. Sunscreen!
6. Field hat
7. Sunglasses (optional)

#### Planting protocol

- 7 Locate burn pile. We have enough seed so that we can plant in basically any pile we can find. Add a rebar stake, label with block 1:50 metal tag with a zip tie. Mark with more flagging so we can find it again.

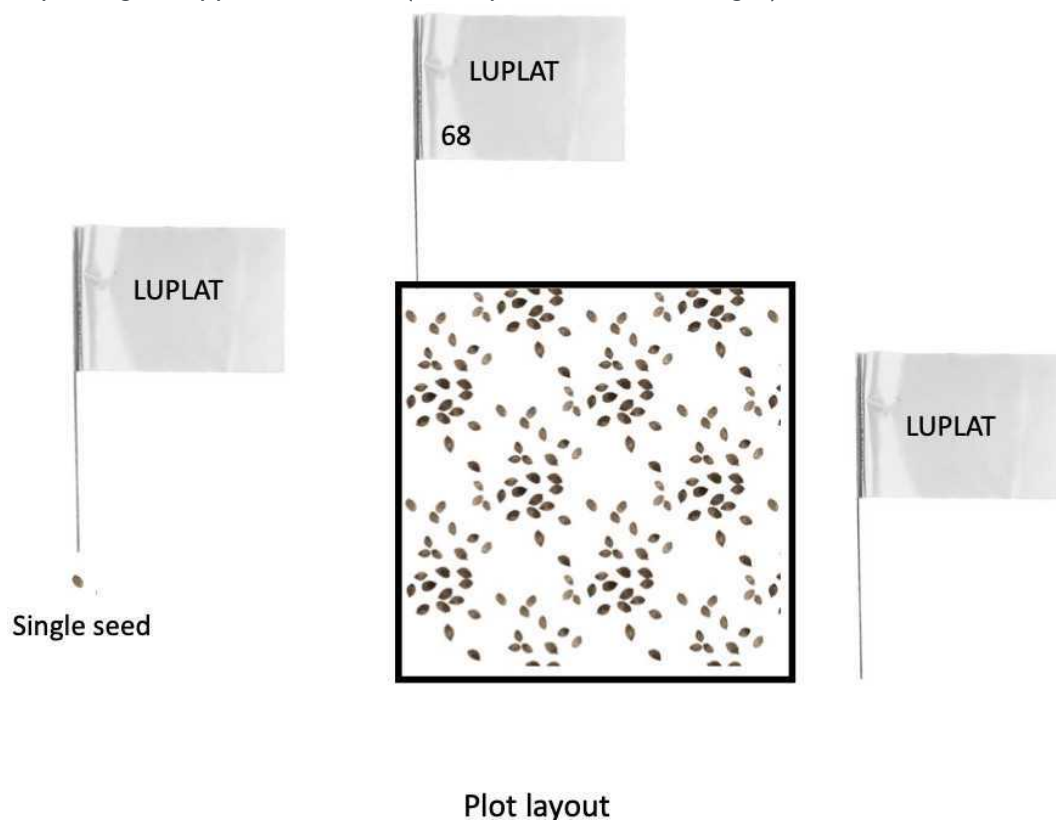


Block #1

Plot centers marked in a urn pile and adjacent clearcut.

- 8 Randomly distribute the seeds and their corresponding pre-labeled flags + 1 control flag among the crew, each person preps their seed planting kit (flags, seeds, rake, vermiculite)
- 9 Add GPS point, label it with 1:50 (gps will take elevation estimate)
- 10 Measure the slope with the compass, record on the data sheet
- 11 Take auger sample, put into a ziplock, label with block number + BP

- 12 Start with the burn pile, find areas without large pieces (i.e., log size) for charcoal (see photo below), place 0.5 m quadrat.
- 13 Give the plot a gentle rake (including for the control)
- 14 Put pin flags in opposite corners (i.e., top left and bottom right)



0.5 meter quadrat and single seed

- 15 Select one of the sets of pre-labeled flags from our kit
- 16 Find a bag of seed of the correct species, mix it with vermiculite in our bowl, spread evenly within the quadrat

- 17 Reserve one seed and plant it above the plot all by itself (at least 6 inches from the plot). Mark with a flag (which has its 6 letter code already). (this is to measure intraspecific competition, we will see if it works).
- 18 Repeat for all the plant species
- 19 After you finish the burnpile:  
Pace out 5 big steps, repeat outside the burn pile. Do not plant within 3 ft saplings, they will be herbicided.
- 20 Repeat the plating steps above, vigorous raking may be needed because it is the second season since the fire.
- 21 No not plant the single seed outside the plot (too many completing species to measure intraspecific competition without significant weeding)