

The soil is important: innovative
translocation technique for the
federally endangered San Diego
ambrosia (*Ambrosia pumila*):
preliminary results

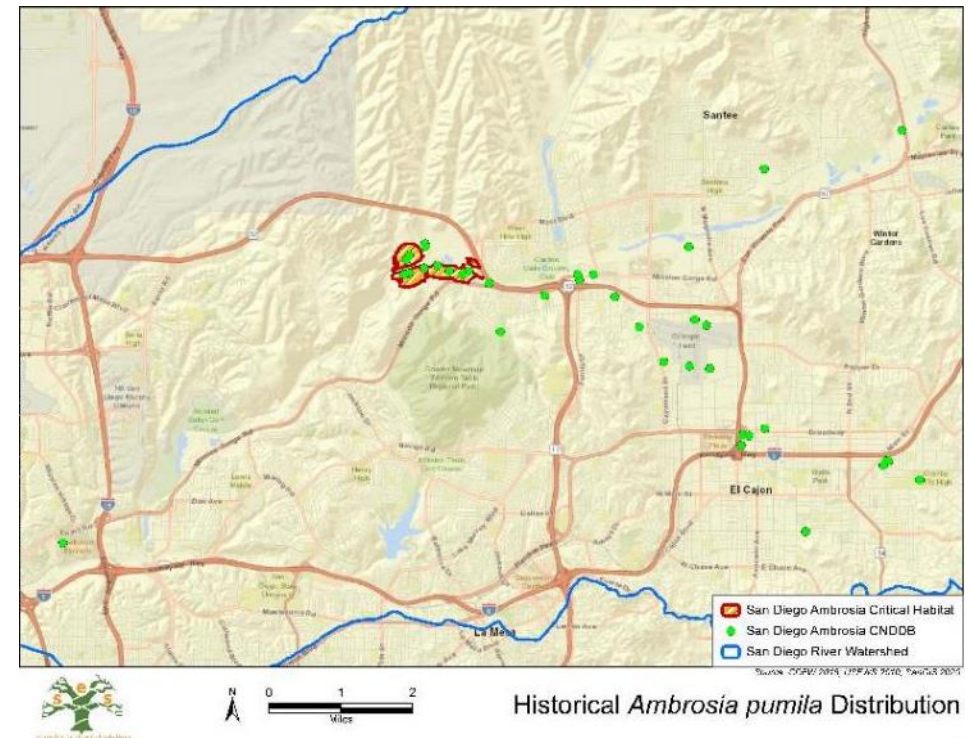
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SDMMP Managers Meeting 2024



schaefer ecological solutions
regenerating nature

San Diego Ambrosia (*Ambrosia pumila*)

- Federally endangered plant species
- Extant occurrences
 - mostly on private land in San Diego County (not protected - no federal nexus)
 - Conserved on public lands
- Threats due to habitat loss/fragmentation
- CDFW tracks population to inform potential state listing
- San Diego Management and Monitoring Program (SDMMP)
 - Rare plant surveys (IMG)
 - Future funding for genetic and translocation research



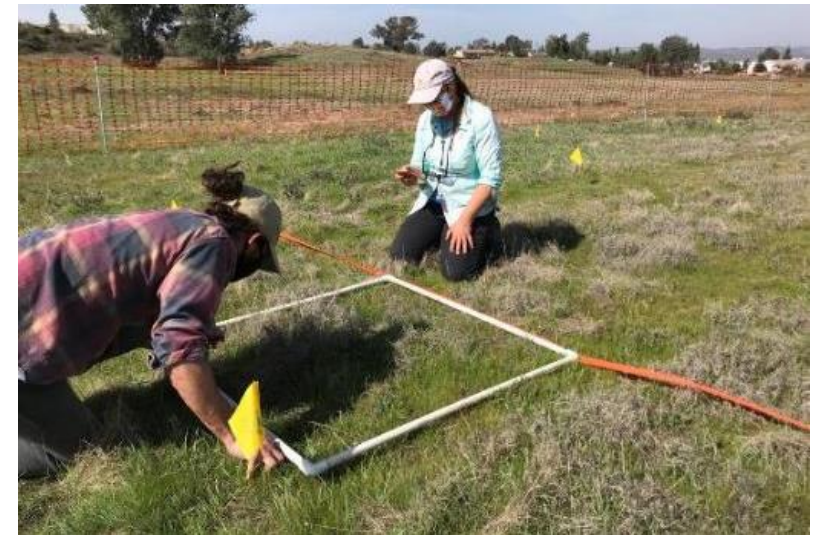
Biology of San Diego Ambrosia

- Clonal plant; spreads through rhizomes
- Rhizomes may spread over 30 meters in one growing season
- Wind pollinated, but vegetative reproduction outweighs sexual reproduction
- Loss of genetic diversity (genetics are poorly understood)
- Likes moisture-holding clays
- Occurs on high terraces along seasonal wetlands
- Thrives on soil moisture during wet season
- Drought tolerant during the dry season (dormant)



Project Background

- Project near Gillespie Field Airport in El Cajon
- Impacts two extant populations
- Plant Count
 - Flagging
 - Divided site into belt transects
 - Counted all stems within 1-meter quadrat
 - Not all segments had full coverage
 - Large populations 25,000+ stems
 - Small population 2000+ stems
- Translocation Methods
 - Traditional: plot transplantation (mostly unsuccessful)
 - Experimental: soil salvage



Preparation

- Previous translocations
 - Methods
 - Success (most not successful)
- Nursery trial
 - Salvaged three clones with rhizomes
 - Buried them upside down and covered them
 - Re-emergence within two weeks
- Receiver Site Identification
 - Conducted GIS-based constraints analysis
 - Soils and vegetation communities (no shade)
 - Hydrology/wetlands adjacency
 - Adjacency to known populations
 - Land ownership



Site Preparation

- Hanson Pond Receiver Site
 - Managed by Endangered Habitat Conservancy (EHC)
 - Site of former plot translocation (unsuccessful)
- Preparation
 - Soil tests on receiver, donor, and control sites to determine receiver site suitability
 - Large scale invasive species control (receiver site only)
 - Excavation of four “segments” to receive salvaged soil
 - Deep watering of receiver site (donor site was saturated)



Soil Salvage

- Equipment
 - Excavator (skid loader)
 - Truck with hydraulic lift
 - Backhoe (at receiver site)
- Soil Salvage
 - Excavate strips 18" deep (thick)
 - Carefully slide on truck bed
 - Layer each strip on truck bed
 - No need to cover for moisture retention
 - Multiple trucks reduce equipment down time



Plot Salvage

- Equipment
 - Shovels
 - Flats/Pots
 - Cover for moisture retention
- Plot Salvage
 - Excavate each individual plant with roots/rhizomes
 - Plant in pots and/or flats
 - Load on truck and cover with tarp to retain moisture during transport



Translocation

- Soil Salvage
 - Slide out of truck while truck is moving to create an even spread
 - Distribute soil (backhoe)
 - Tamp down (backhoe)
- Plot Salvage
 - Separate plot from soil salvage
 - Unload each pot/flat
 - Plant in native soil 0.5 meter on center
- Temporary irrigation system
 - Watering in by hand upon planting
 - Deep water irrigation 3x/week



Five-Year Post-Restoration Monitoring

- Drone Flights
 - Baseline
 - Annual (growing season)
- Initial Monitoring
 - Flag plant emergence
 - GPS population boundary
 - Conduct Plant Count
- Qualitative monitoring
 - Year 1: monthly
 - Years 2/3: quarterly
- Quantitative monitoring
 - Line-intercept transects
 - Quadrats on either side (5 m)



Year 1

- Soil Salvage Population
 - Emergence in soil salvage population immediate
 - Healthy green in color
 - Long lasting into dormant season
 - Flowering
 - Not effected by gophers
- Plot Planted Population
 - Initially, emerging very sparsely
 - Grey color
 - Desiccating 2 to 4 weeks before soil salvage population
 - Sparsely flowering



Soil Salvage (above)
Plot Planted (below)



Years 2, 3

- Soil Salvaged Population
 - Emergence beyond boundary
 - Rhizome extension up to 25 meters
 - Healthy green
 - No affected by invasive species or gophers
- Plot Planted Population
 - Growing into denser stands and merging with soil salvaged population
 - Still grey in color
 - Desiccating sooner than soil salvaged population
- No irrigation



Soil Salvage



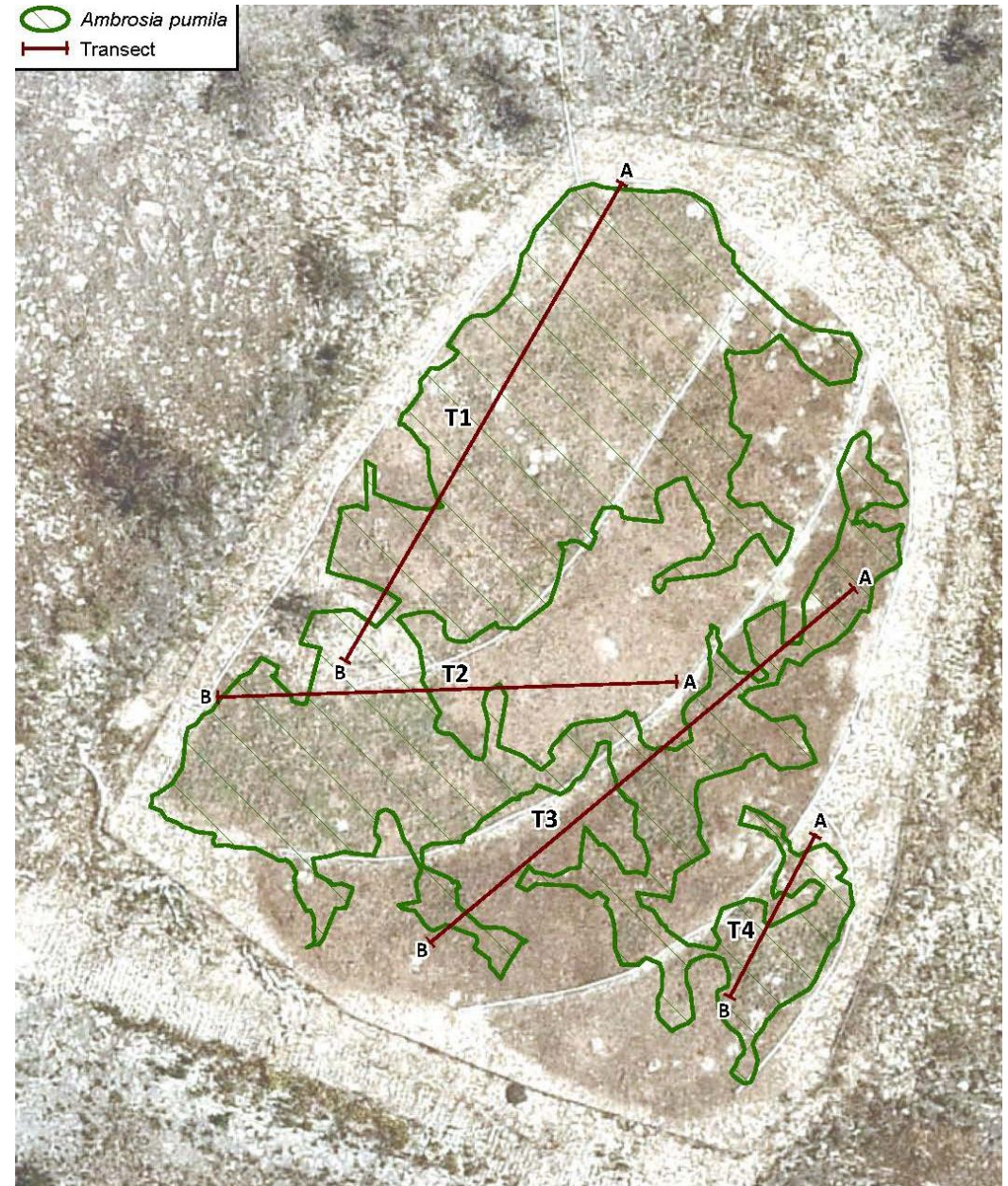
Plot Planted



Expanding beyond plot boundaries

Results

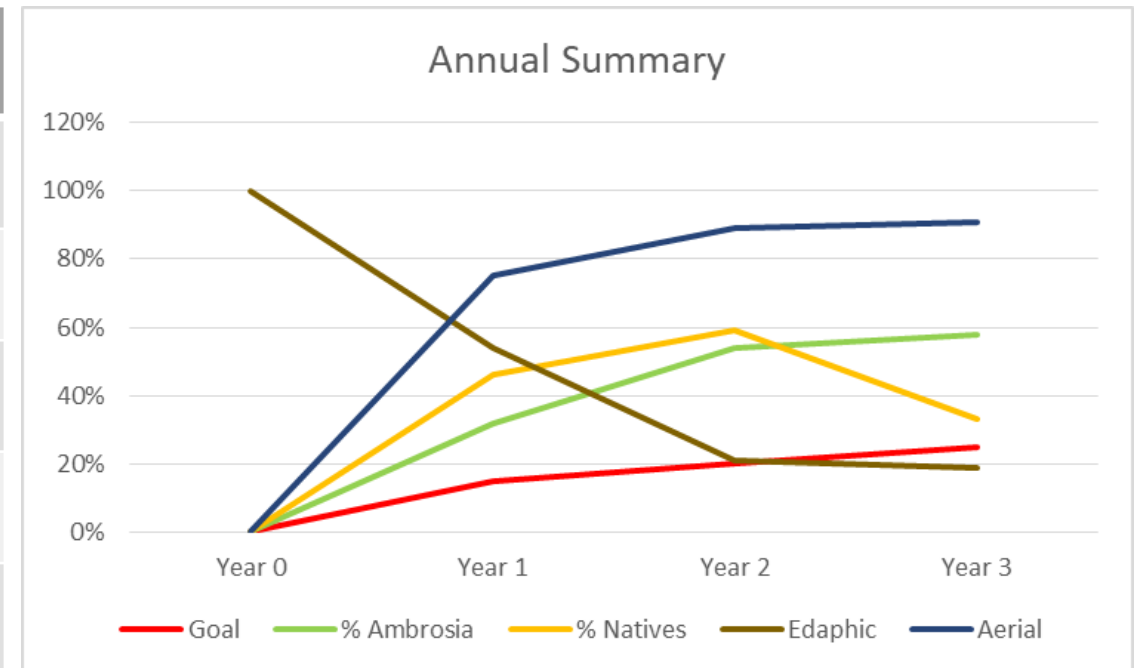
- Year 1 Stem Count (aerial stems)
 - April 2022: 5,000
 - June 2022: 7,000
 - Increase: 14% within 2 months
- Aerial cover:
 - Baseline: 0
 - Year 1: 75%
 - Year 2: 89%
 - Year 3: 91%
 - Increase: 16%



Results

- Cover (transects/quadrats)
 - Increase from Year 1 to Year 2:

| Year | Percent Cover | | |
|--------------|---------------|------------|------------|
| | Ambrosia | Native* | Edaphic |
| Year 1 | 32 | 46 | 54 |
| Year 2 | 54 | 59 | 21 |
| Year 3 | 58 | 33** | 19 |
| Delta | +26 | -13 | -35 |



*Native cover include: *Distichlis spicata*, *Croton setiger*, *Halocarpa virgata* ssp. *elongata*

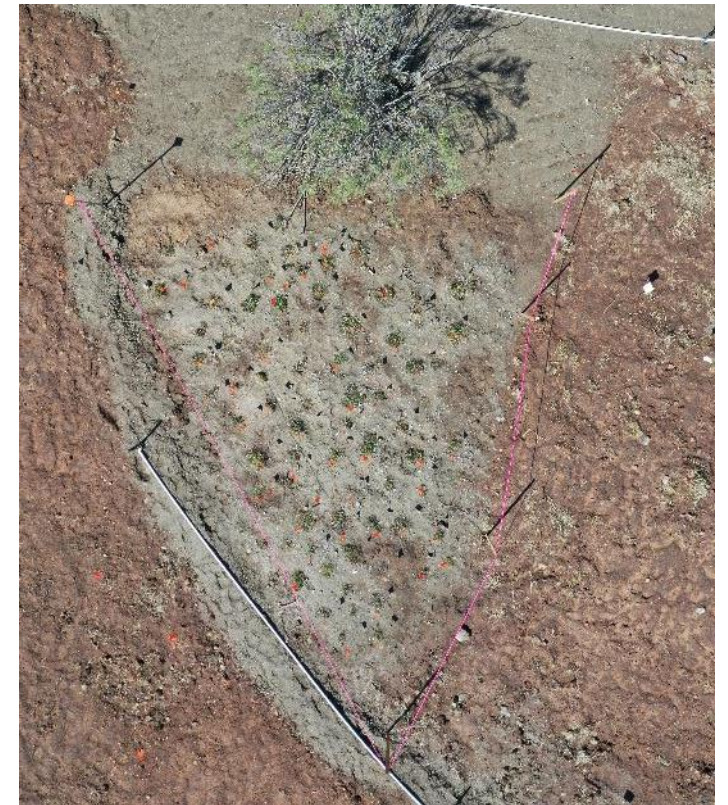
** 2024 wet winter resulted in significant increase in invasive species

Drone Comparison 2021



Overview

Plot Planted Population



Drone Comparison 2022



Overview

Plot Planted Population

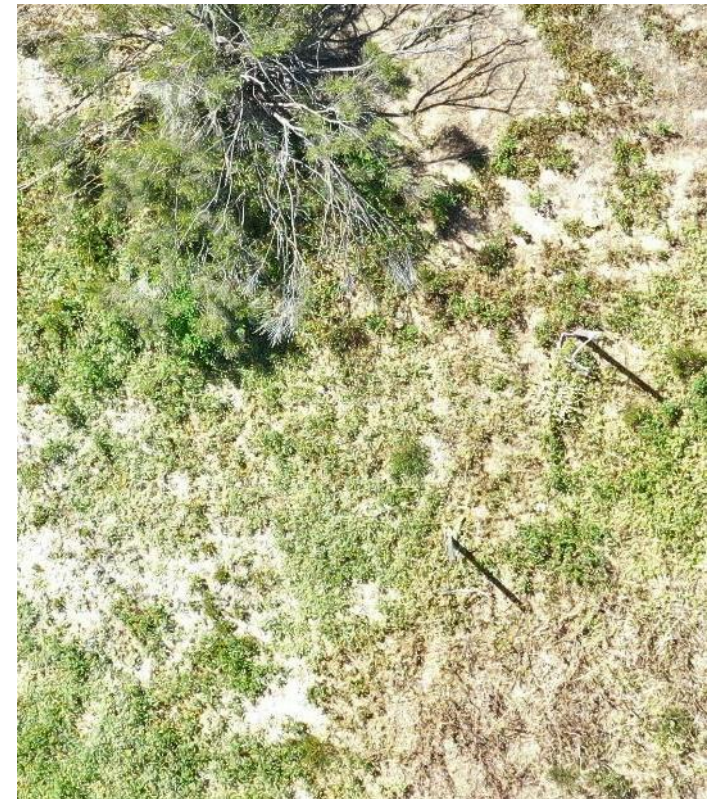


Drone Comparison 2023



Overview

Plot Planted Population



Drone Comparison 2024



Overview

Plot Planted Population



Conclusion

- Cover
 - Year 3: cover 58% (edaphic 19%)
 - Year 3: goal 25%
- Expansion
 - Year 2, 3: beyond plot boundaries
 - Rhizome expansion up to 25 m
- Irrigation
 - Year 2: none (August rains)
 - Year 3: so far none (test)
- Soil
 - Red clay more suitable than extant
 - Nutrients/Water holding capacity
 - Mixing by gophers
- Management
 - Continue to remove non-native and dense native species (i.e. *Amsinckia*)
 - Continue to irrigate as needed through Year 3, then stop
 - Monitor for two more years
 - Experiment with mowing
 - Take soil samples in Year 5



Acknowledgements

- Chris Manzuk/Michael Beck (EHC): conservation and management
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