

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

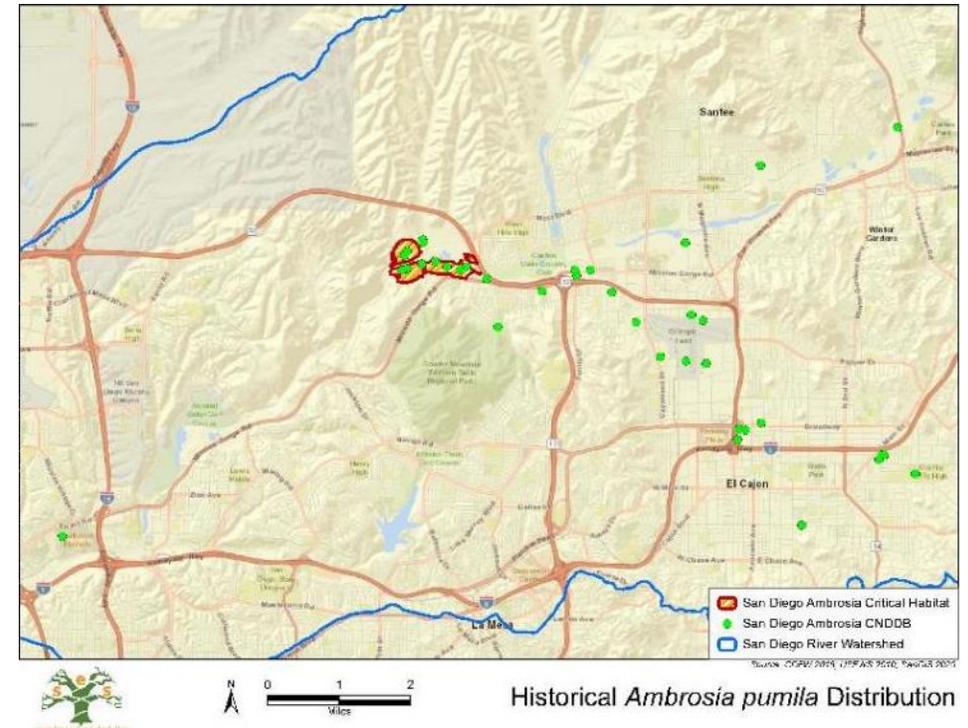
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SDMMP Managers Meeting 2024



**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



Soil Salvage



Plot Planted

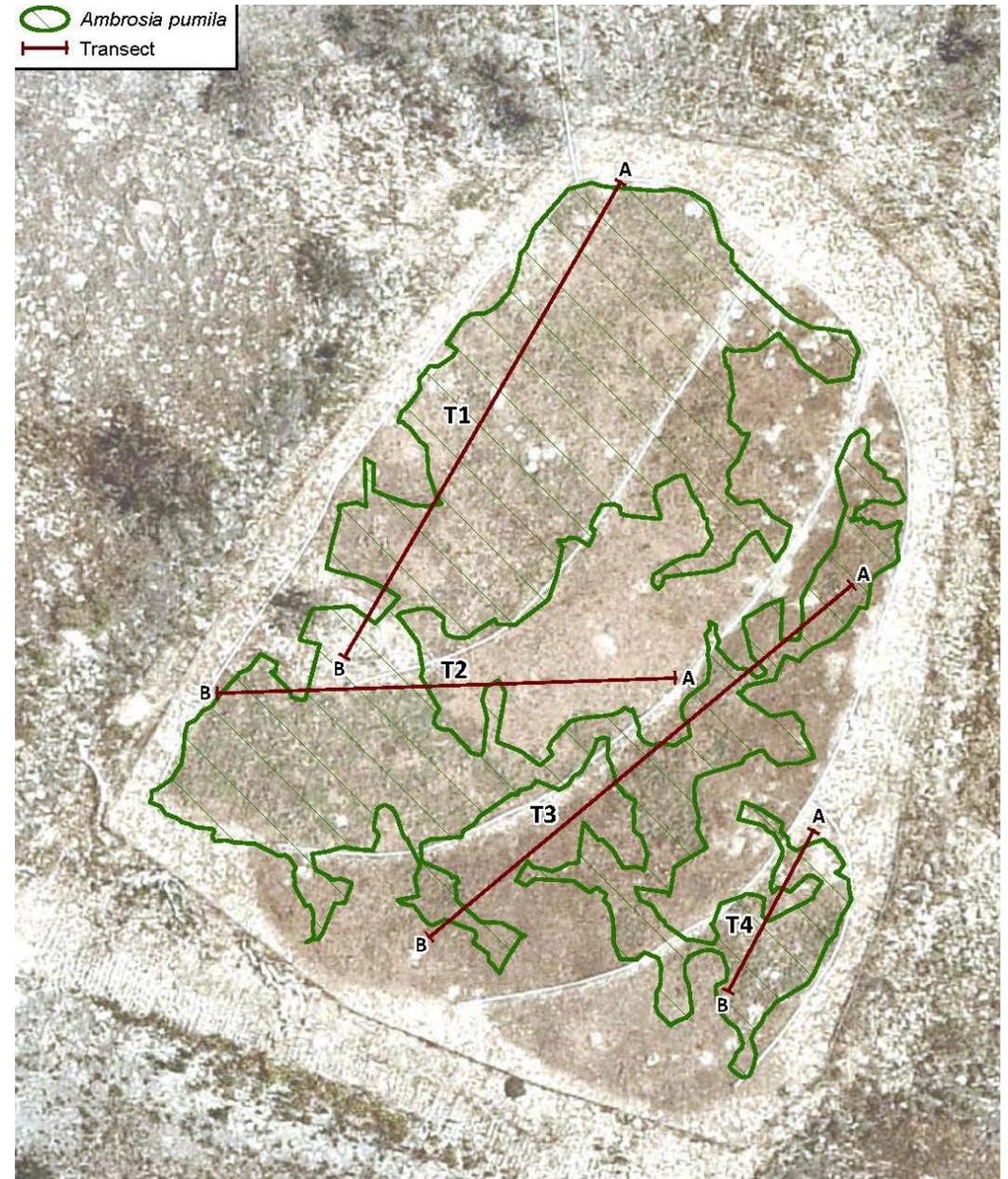
- Plot Planted Population
  - Growing into denser stands and merging with soil salvaged population
  - Still grey in color
  - Desiccating sooner than soil salvaged population
- No irrigation



Expanding beyond plot boundaries

# Results

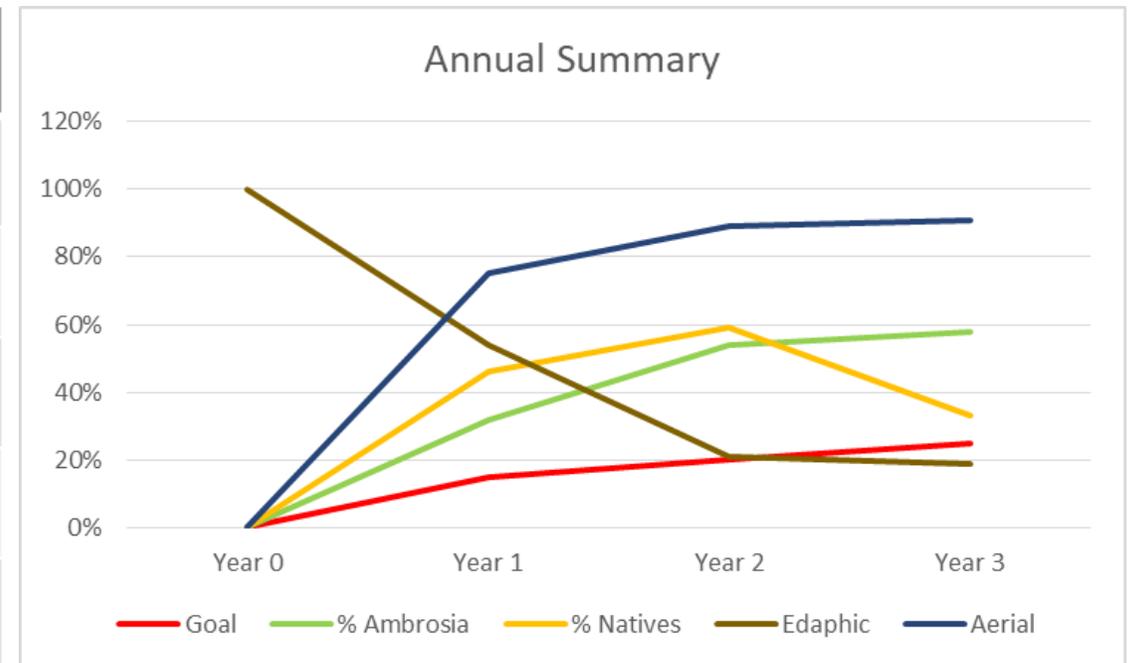
- Year 1 Stem Count (aerial stems)
  - April 2022: 5,000
  - June 2022: 7,000
  - Increase: 14% within 2 months
- Aerial cover:
  - Baseline: 0
  - Year 1: 75%
  - Year 2: 89%
  - Year 3: 91%
  - Increase: 16%



# 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
<b>Delta</b>	<b>+26</b>	<b>-13</b>	<b>-35</b>



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

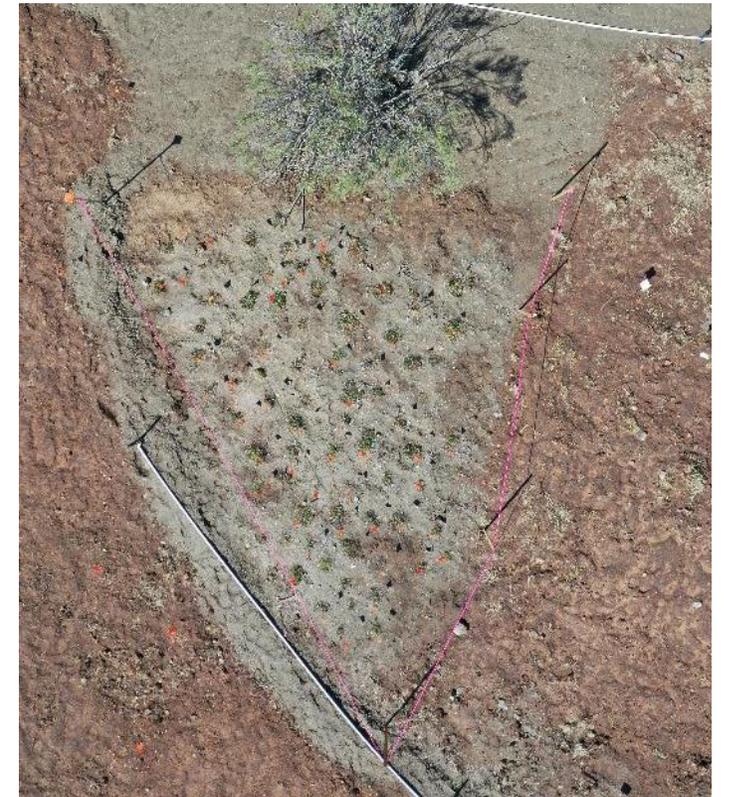
\*\* 2024 wet winter resulted in significant increase in invasive species

# Drone Comparison 2021



Overview

Plot Planted Population



# Drone Comparison 2022



Overview

Plot Planted Population

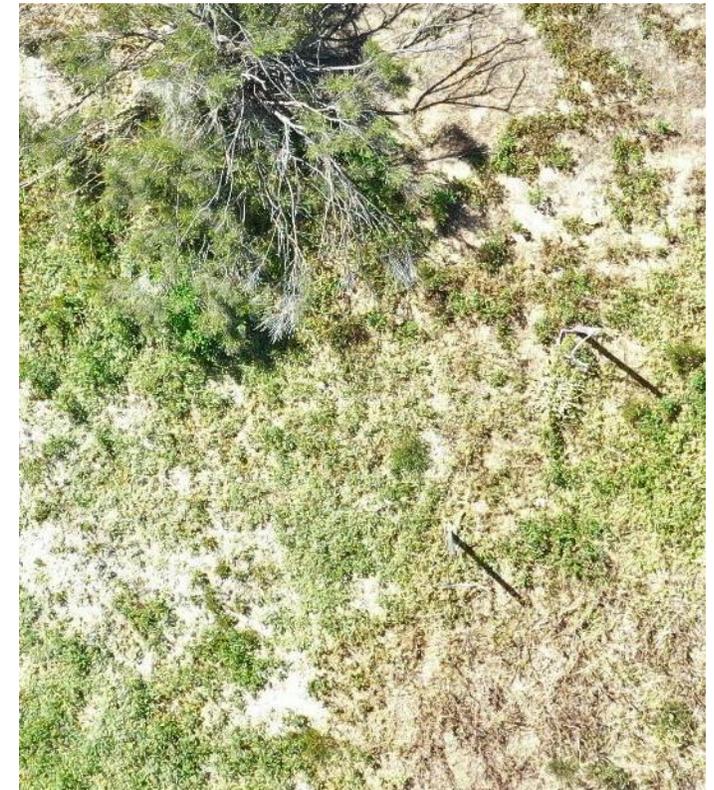


# Drone Comparison 2023



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

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