Potential for Augmentation Biological Control of *Arundo Donax*

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Arundo donax (Giant Reed)

- Warm-climate grass native to India and Mediterranean region.
- Introduced into California in 1820's for erosion control.
- High growth rate and ability to rapidly colonize after disturbance increases it invasive potential.
- Reproduces primarily by vegetative reproduction through rhizome fragments.

Arundo donax

- Little is known (published) about this species:
  - Basic ecology
  - Reproductive biology
  - Insect communities and food webs (both in the US and its native range).

- However, it is the greatest threat to riparian systems in coastal Southern California (Bell 1997).

Potential for biological control

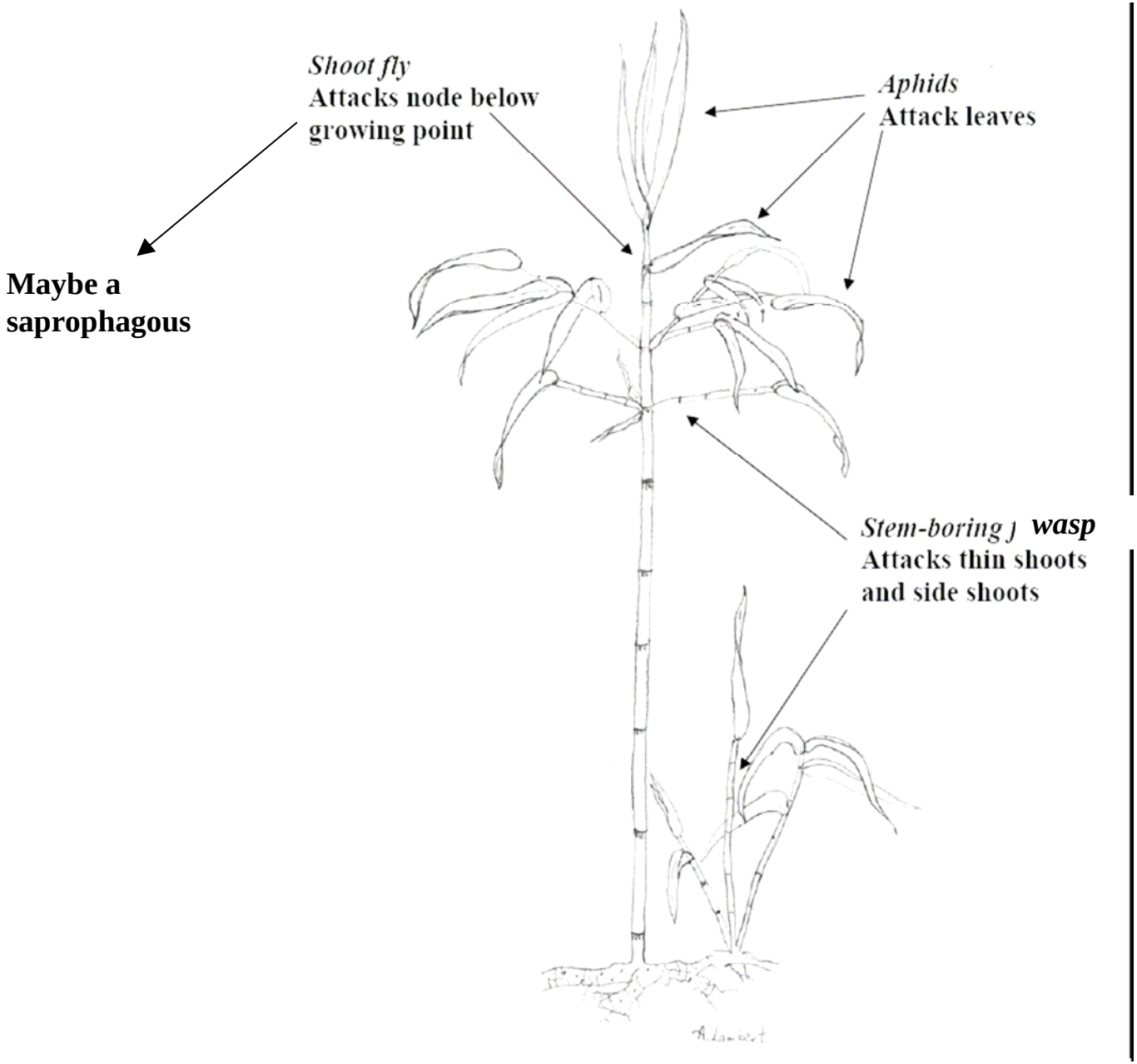
- No relatives in North America – closest *Phragmites australis*.
- Cost-benefit.
- Foreign exploration for agents has begun in coordination with USDA-ARS (A. Kirk).
- Several host specific agents found.
  - Scale insect
  - Shoot flies
  - Stem boring wasp
  - Several spp. Fungi

Research Questions

- How does *Arundo* invasion alter ecosystems?
  - Biodiversity and species composition (native survival)
  - Plant growth/percent cover
  - Decomposition/nutrients
  - Light
  - Soil moisture
  - Insect populations/diversity
- What insect herbivores (native and non-native) are associated with *Arundo* in southwest US?

Insect Sampling for *Arundo* herbivores present in US

- Sample *Arundo* populations throughout California and Southwestern US using a standardized sampling protocol.
- Record stem density, stem morphology, habitat type.
- Visually search outside of stem for insects, then dissect stem and search for internal feeders.
- Evaluate insect feeding habits, plant use, quantify damage.


Shoot fly
Attacks node below growing point
Aphids
Attack leaves
Maybe a saprophagous
Stem-boring j *wasp*
Attacks thin shoots and side shoots

Insects found so far…

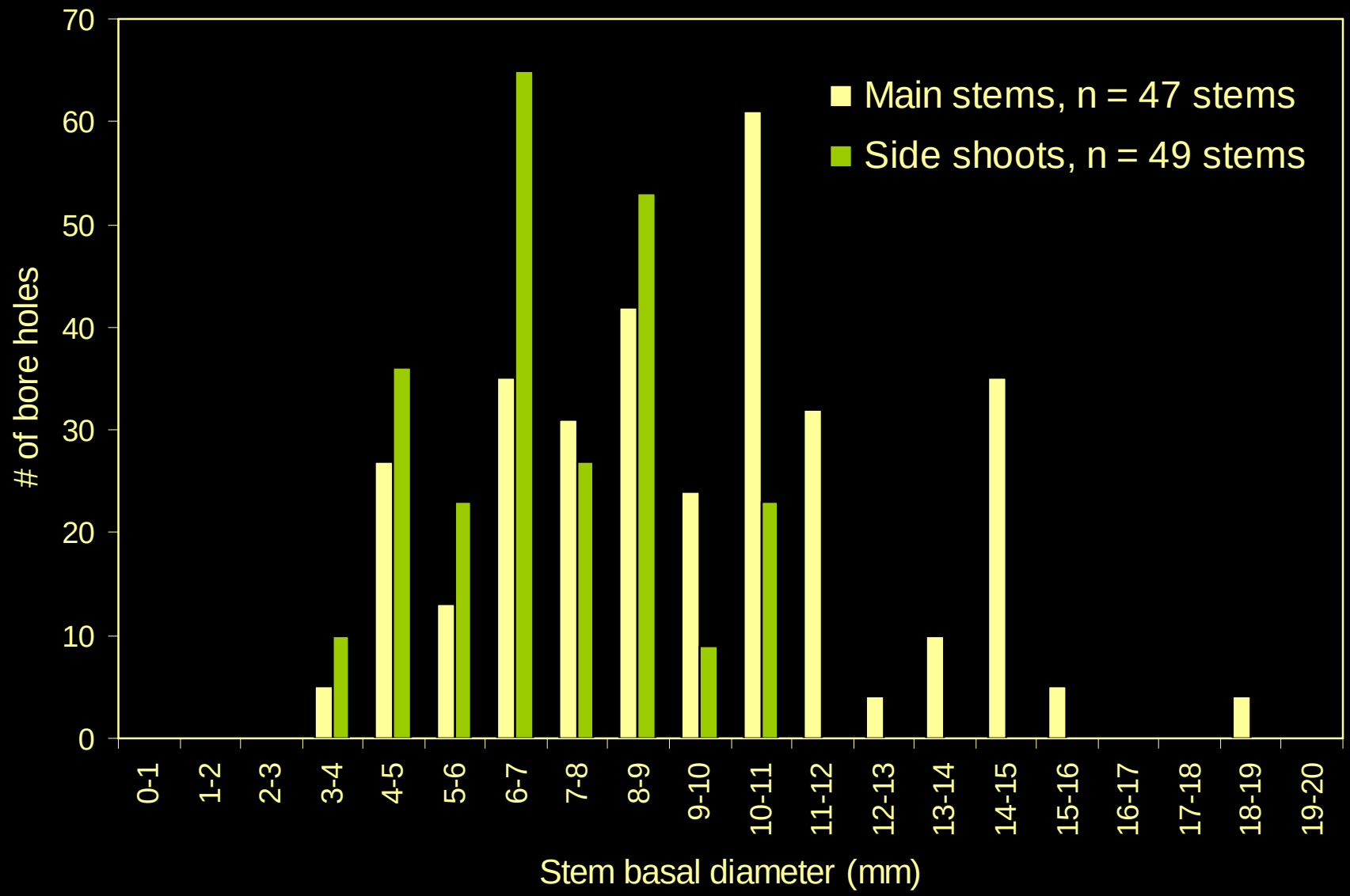
- Aphids (*Melanaphis donacis*)
  - Kill apical leaves.
  - Cause chlorosis and discoloration of leaves.
  - Facilitate sooty mold colonization.

Insects found so far…

- Shoot fly - Chloropidae
  - Kills apical stem, causes ‘witches broom’ and stem death.

Insects found so far…

- Gall wasp (Eurytomidae) – *Tetramesa romana* currently being evaluated by USDA for biocontrol potential?
  - Rearing
  - Host range testing

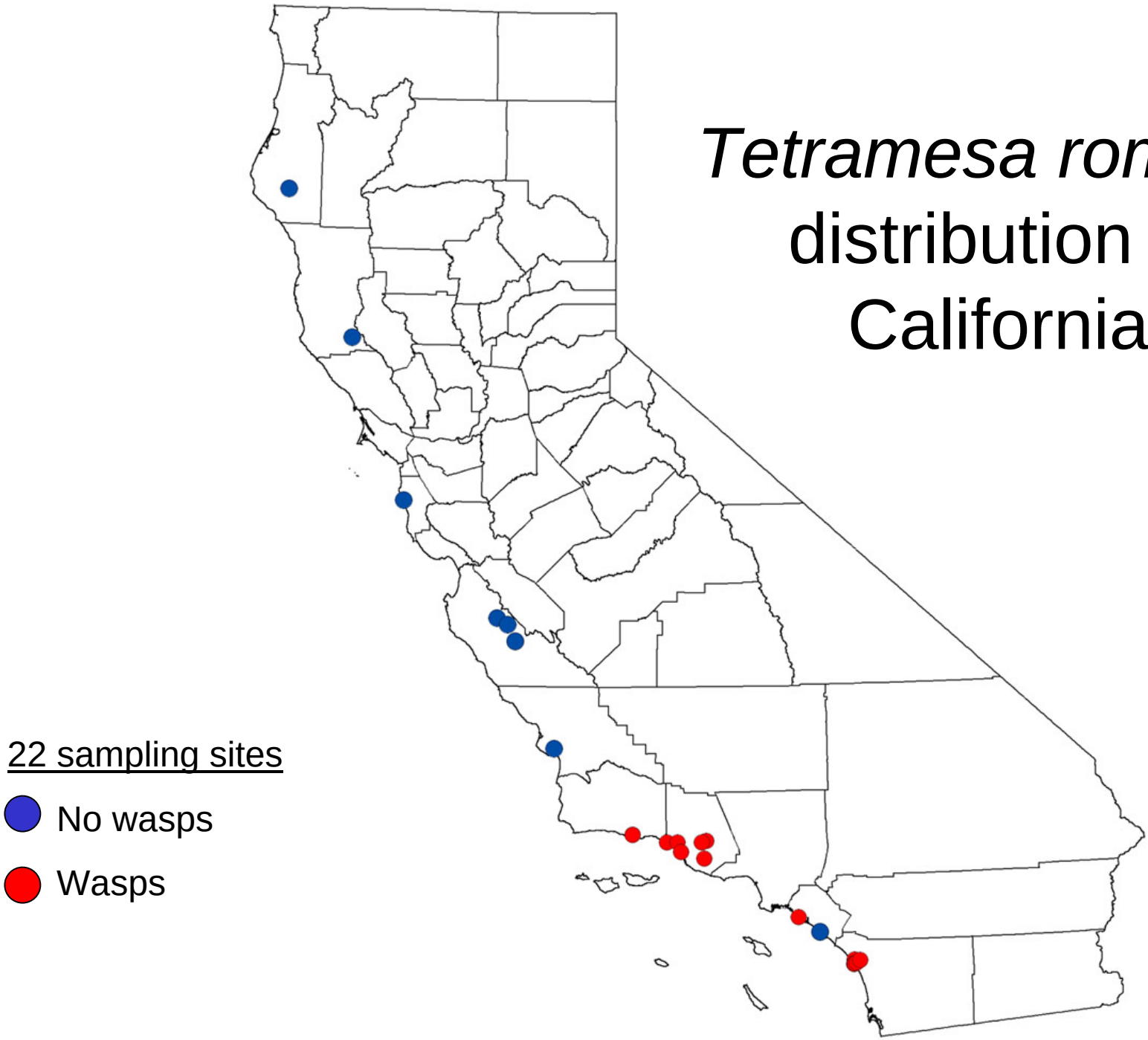

70
60
50
40
30
20
10
0
# of bore holes
Main stems, n = 47 stems
Side shoots, n = 49 stems
0-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-13
13-14
14-15
15-16
16-17
17-18
18-19
19-20
Stem basal diameter (mm)

Infestation and Damage

Stems – 20.6 ± 23.0%
Side shoots – 33.3 ± 30.7%
Patchily distributed within systems

Can cause stem death, but kill mostly side shoots.

Tetramesa romana distribution in California



Potential for Augmentation BC

- Wasp damage limited to thin stems and side shoots.
- Currently evaluating biomass reduction in infested stems.
- Excellent opportunity for host range testing in the field.
- Can wasps be redistributed? **35ºN**
- Complement other BC Herbivores?
- Facilitate pathogen attack?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