

Origins of Invasive French Broom

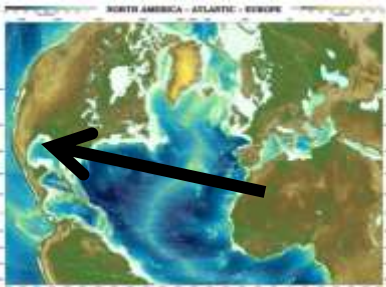
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Spatio-Temporal Stages of the Invasion Process

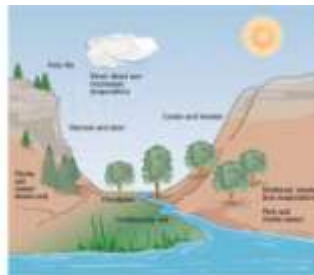
Transport

Species whose propagules are transported over long distances may become “casual” in a new region



Colonization

Abiotic factors determine whether propagules survive in the new habitat and affect growth rates



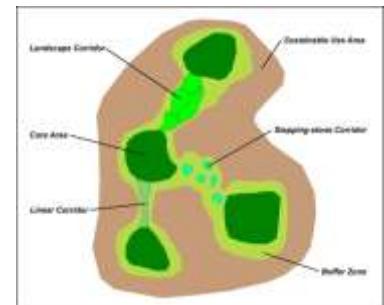
Establishment

Several processes create “biotic resistance” to establishment, suppressing non-native species’ reproductive rates



Landscape Spread

Spread rates depend on establishment, dispersal ability, habitat connectivity, etc



Hybridization and Invasion



Zebra + Donkey = Zeedonk (sterile)



Tamarix chinensis + *T. ramosissima* =
invasive *Tamarix* in the States (not sterile)

Hybridization and Invasion

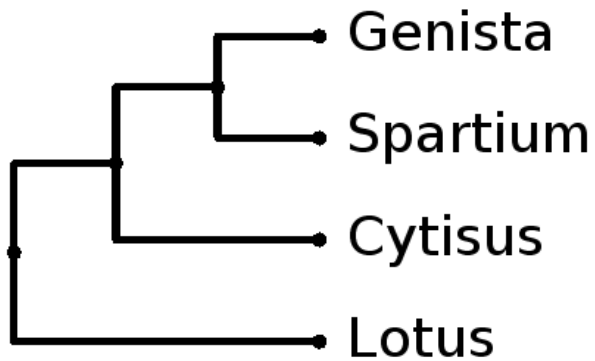


T. chinensis + *T. ramosissima* = invasive *Tamarix*



French Broom

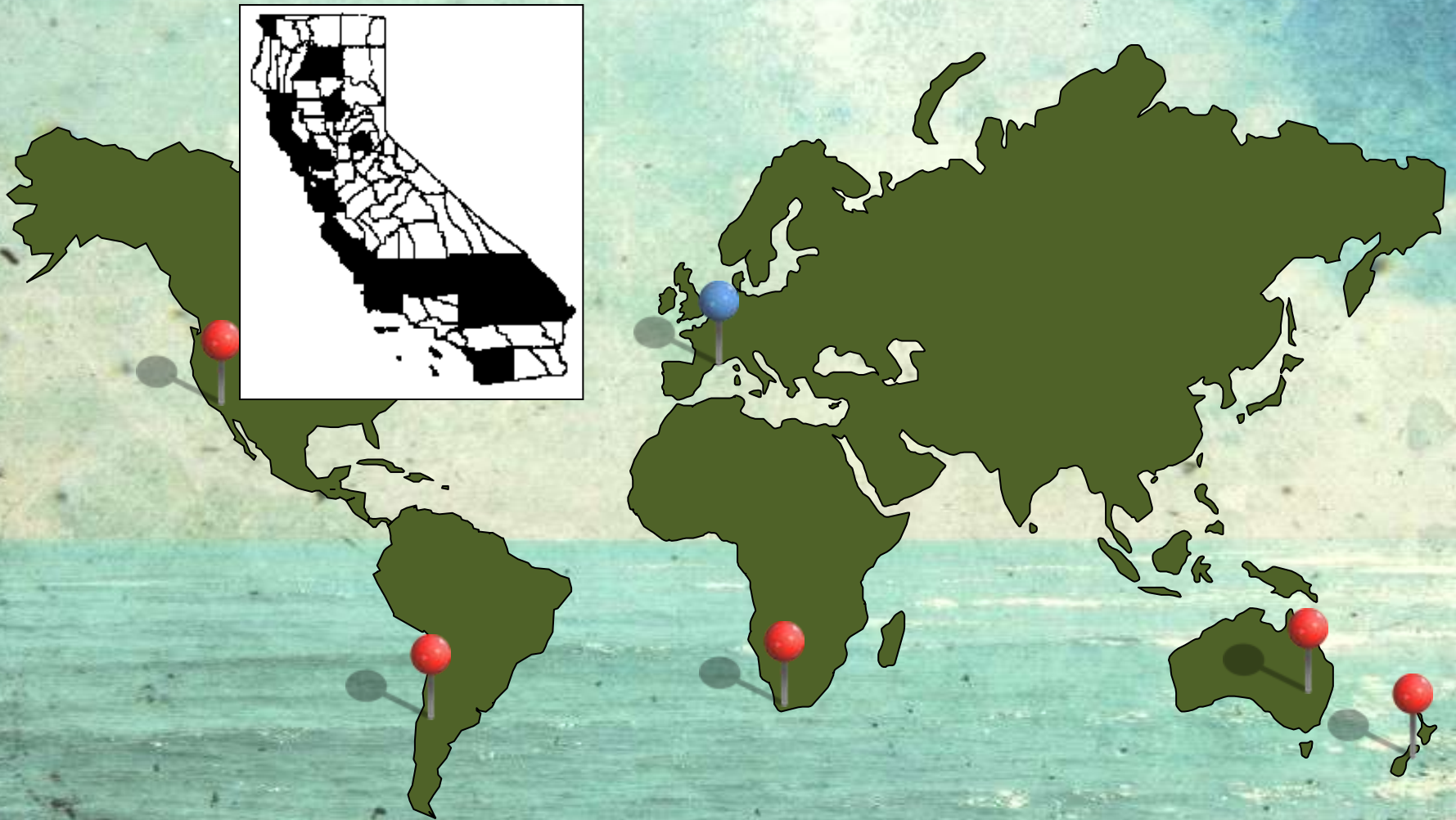
Evolutionary relationships
among invasive brooms



French broom characteristics



French Broom Distribution



Horticulture Connection: Sweet Broom

- Putative close relative of French broom
 - Evolutionary relationships unclear because it is sold under a variety of scientific names
- Common scientific names:
 - *Cytisus spachianus*, *Teline stenopetala* ssp *spachiana*, *G. spachiana*, and *T. canariensis*



French broom identity: Hypotheses



Genista monspessulana



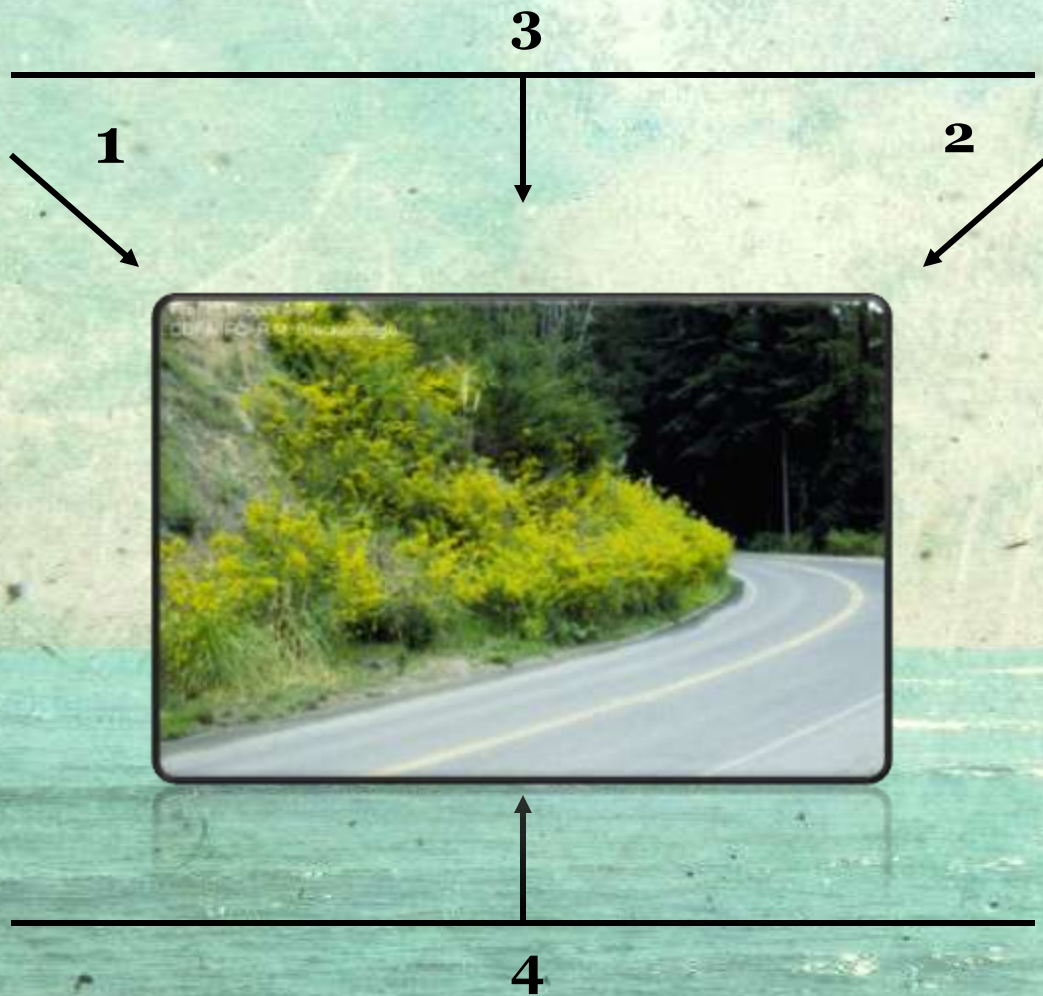
Sweet broom



Genista stenopetala



Genista canariensis



Phylogenetic Approach

Objectives:

1. Identify sources of invasive broom populations in CA
2. Determine whether hybridization between ornamental cultivars and invasive populations has occurred



Rationale:

- Species identity of invasive French broom is unknown
- Species identity of ornamental sweet broom is unclear
- Contribution of currently available ornamental brooms to invasive populations is unknown

Experimental Design

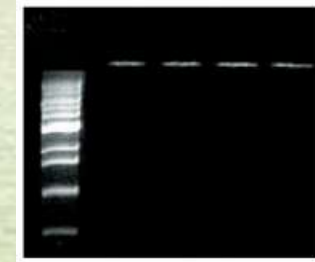


Sampling:

- >20 invasive populations throughout CA
- Collect sweet broom from >10 nurseries and landscape plantings

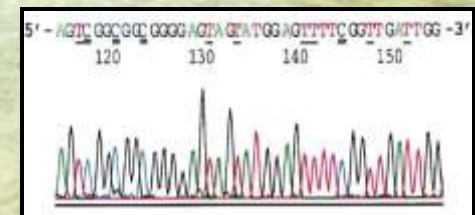
Data Collection:

- DNA extracted from each individual
- Sequence 4 DNA regions from each plant
 - 2 nuclear: ETS and ITS (+ 8 sequences per invasive or ornamental individual)
 - 2 chloroplast: *trnL-F* and tRNA-leu



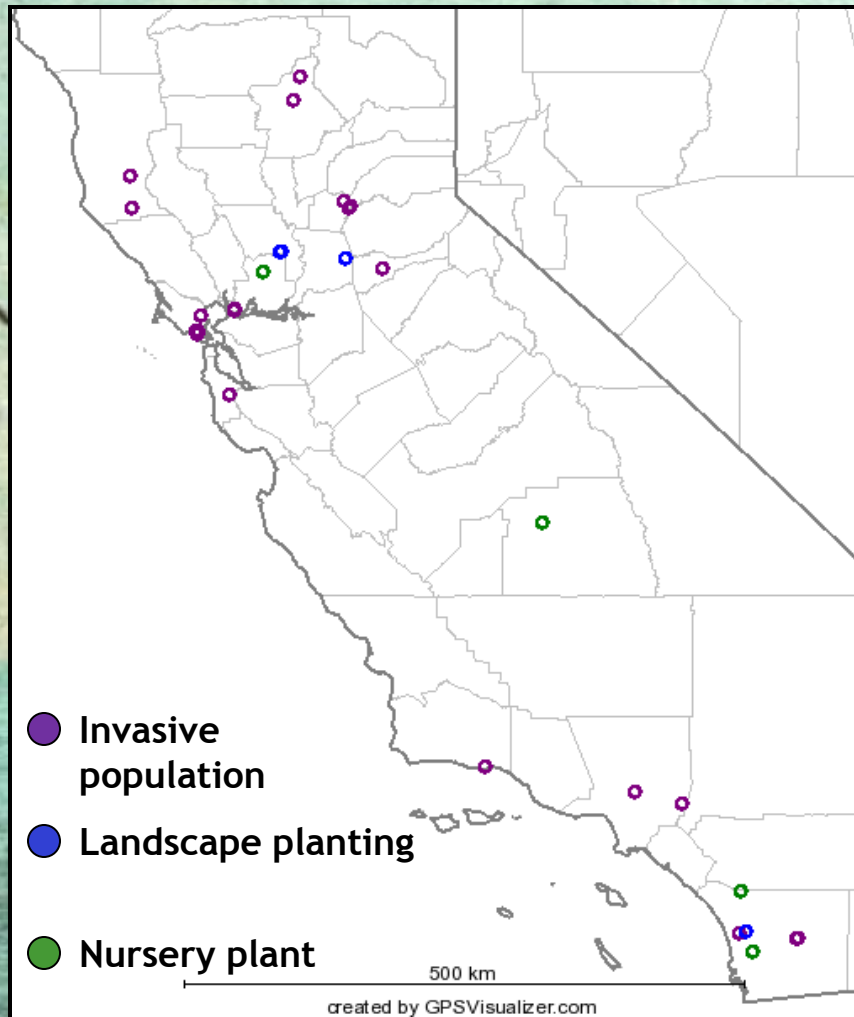
Data Analysis:

- Reconstruct relationships among organisms using Maximum parsimony and Bayesian analyses



California Sampling

Populations Sampled



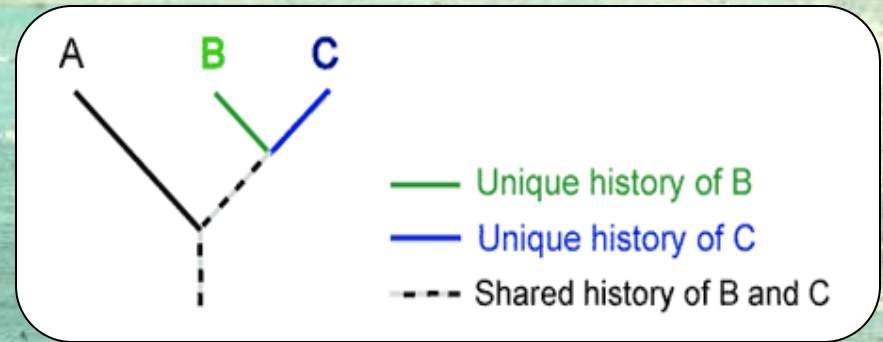
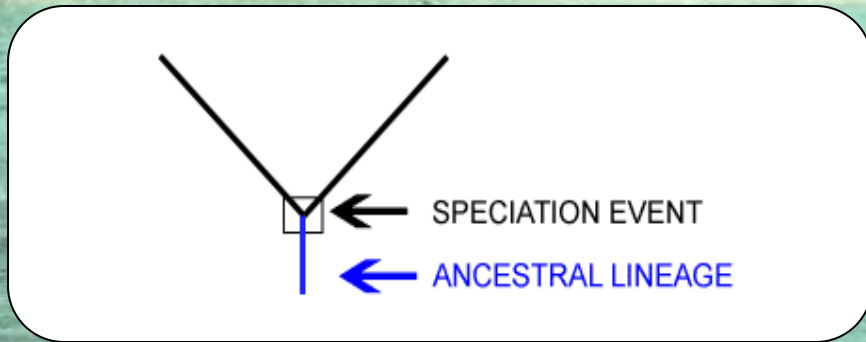
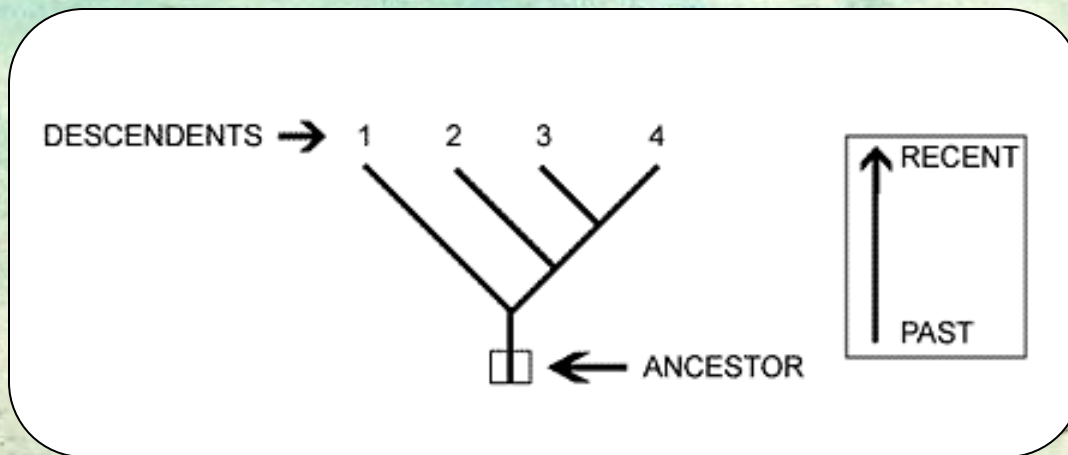
Total # of Invasive Populations: 23

Total # of Landscape Plantings: 7

Total # of Nursery Plants: 5

Methods: Molecular Phylogenetics

Phylogenetic trees show evolutionary relationships



Hypotheses and Expected Results

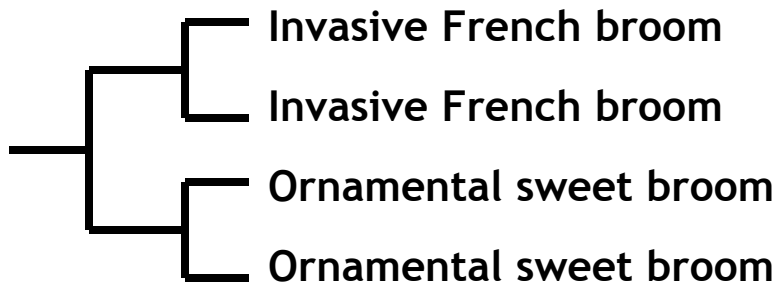
1.



Ornamental sweet broom does contribute to invasive broom populations

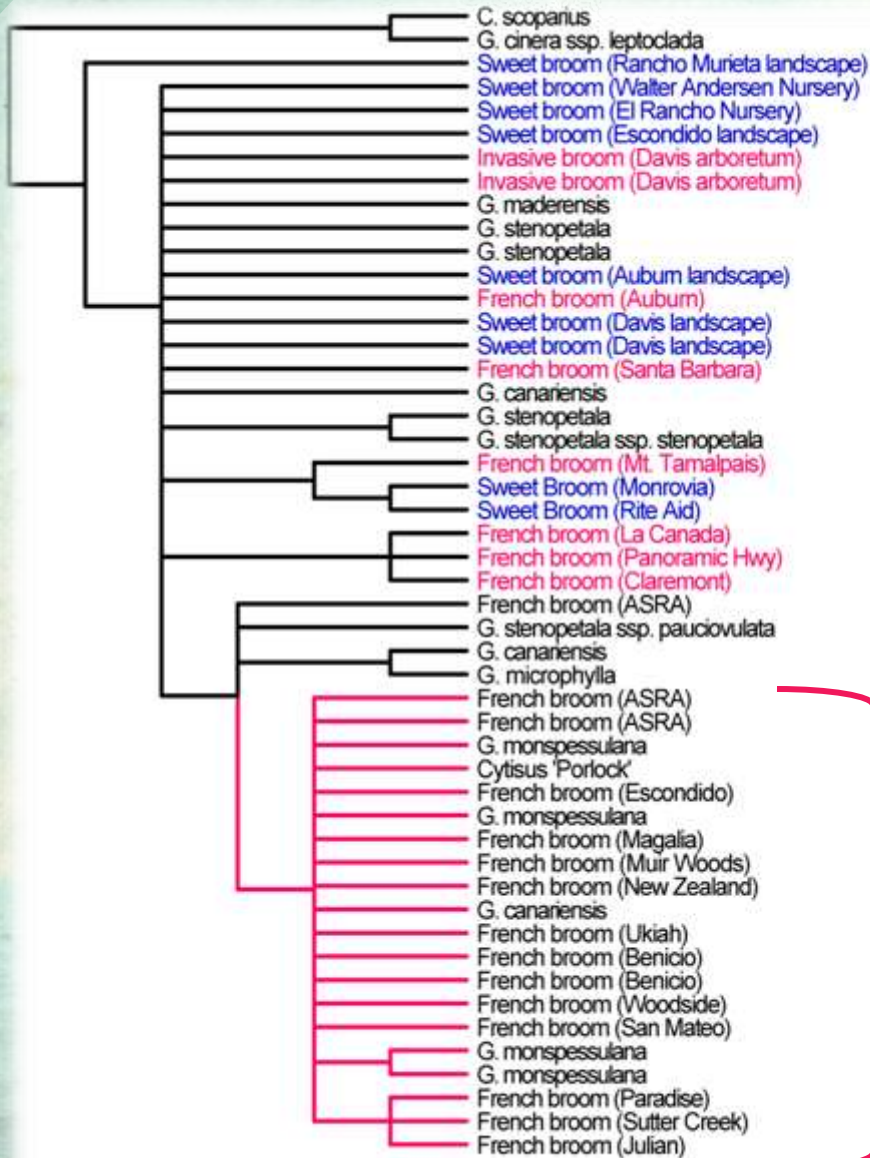
Alternatively

2.



Ornamental sweet broom may not be contributing to invasive broom populations

Chloroplast Results



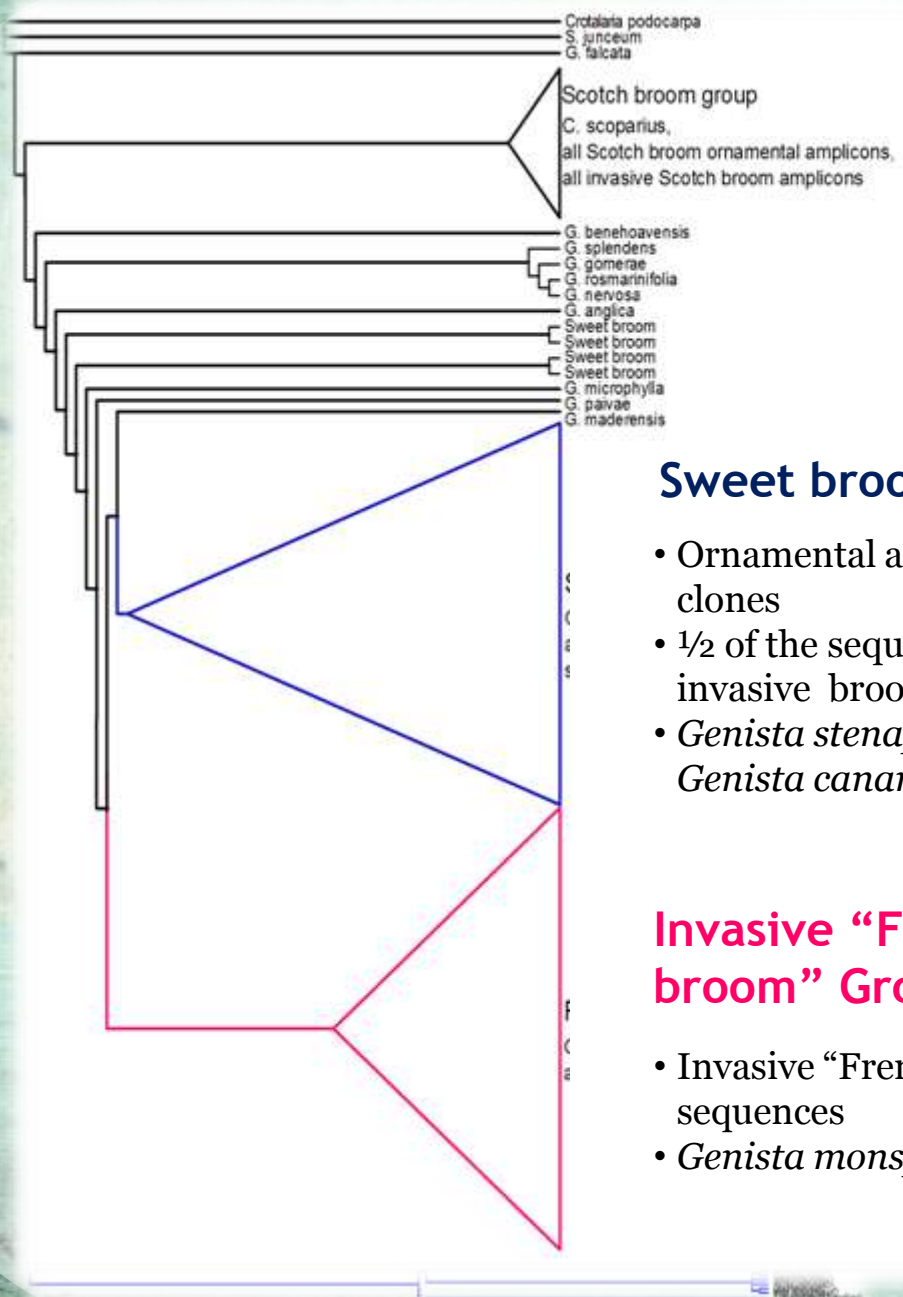
Sweet broom

- All ornamental and landscape sweet broom
- Some invasive brooms from urban invasions
- *G. canariensis*
- *G. stenopetala*

Invasive "French Broom" Group

- Invasive "French Broom"
- *Genista monspessulana*
- *Genista canariensis*

ITS Results (nuclear region)



Conclusions

Ornamental Brooms:

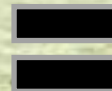
- Ornamental sweet broom most likely contributes via hybridization to invasive broom populations
- At least 2 different things are sold as Sweet Broom:
 1. *G. stenopetala*
 2. *G. stenopetala* and *G. canariensis* hybrid

Invasive French broom:

Most of the invasive French broom in CA is *G. monspessulana*



sometimes



Next Steps

1. What are the cultivated sources and introduction history of invasive French broom populations in natural and urban areas of California?

Trace the origins and spread of invasive populations by characterizing genetic structure in the native and introduced range

2. Do French broom populations have similar patterns of genetic diversity, introduction, and structure in California and Australia?

Trace the origins and spread of invasive populations by characterizing genetic structure in the native and 2 introduced ranges

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