

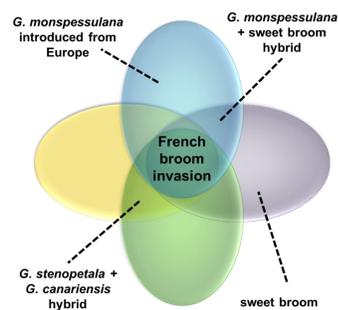
# Inferring the complex origins of horticultural invasives: French broom in California

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## Introduction

Investigating the origins of invasive populations provides insights into the human and evolutionary factors underlying invasions and informs management decisions. Invasive species introduced for horticultural purposes often have complex origins typified by multiple introductions of species, cultivars, and genotypes, as well as interspecific and intraspecific hybridizations in introduced ranges, that influence the success of different management options. In California, the horticulturally introduced French broom complex is highly invasive. Invasive populations have been hypothesized to include *Genista monspessulana*, other *Genista* species, ornamental sweet broom, and hybrids between these.

### Hypothesized origins of the invasive French broom complex in California



## Objective

To determine the identity and origins of invasive French broom populations in California.

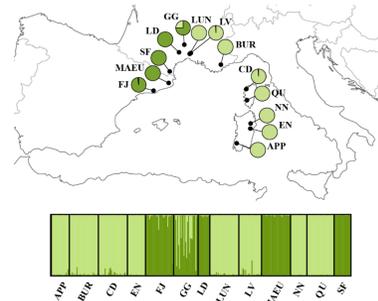
## Methods

- We sampled and genotyped 1060 plants from 29 invasive CA populations, 13 populations of *G. monspessulana* in Europe, 14 ornamental sweet broom plants, and 12 plants of other *Genista* species from the *monspessulana* clade.
- Genetic diversity and population structure of native, invasive, and ornamental plants were characterized based on variation at 12 nuclear microsatellite loci.
- Microsatellite data were analyzed using F-statistics and Bayesian assignment (STRUCTURE) and Approximate Bayesian Computation (ABC) analyses.

## Results

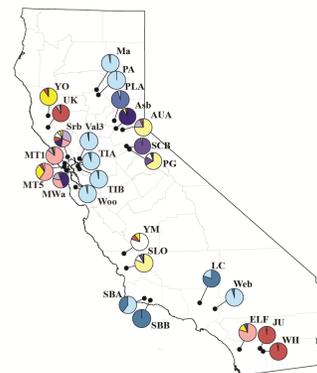
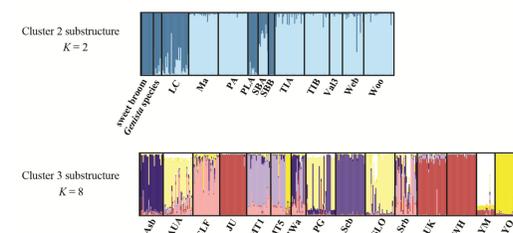
Three genetic clusters (gene pools) best explained the uppermost hierarchical level of genetic structuring across the 1060 individuals of native, invasive, and ornamental broom plants sampled and genotyped.

*Genista monspessulana* plants from the native range assigned to two subclusters within Cluster 1 according to their geographic origins in Europe.

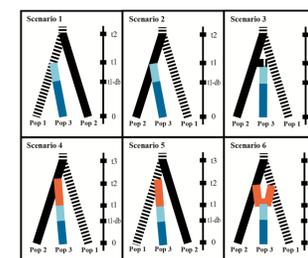


## Results Continued

Invasive plants from California populations assigned to Clusters 2 and 3, each of which had *K* subclusters.



An ABC analysis of six different hypotheses for how ornamental brooms contribute to invasive populations found scenario 4, with invasive French broom derived from an unsampled population coalescing with ornamental sweet broom, to be the most highly supported.



## Conclusions

- Multiple closely related species have been sold as ornamental French broom in California, which has led to an invasive complex that is genetically very different from native *G. monspessulana*.
- CA invasive populations consist of two main groups: (a) populations with plants that are closely related to *G. canariensis*, *G. stenopetala*, and ornamental sweet broom; and (b) populations that are more closely related to each other and not closely related to sweet broom.
- Interspecific hybridization and admixture between Clusters 2 and 3 were detected but their role in plant invasiveness is unknown.
- Some invasive French broom may be derived from a population that was not sampled in this study but that branches from ornamental sweet broom.
- Biological control may have limited success against invasive French broom in California.



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