

**Shipley-Skinner Reserve – Riverside County Endowment  
2003-2004 Final Report  
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**Environmental Factors Affecting Establishment of *Arundo donax* in Southern California  
Riparian Systems**

*Background and Summary:*

Three field sites were identified in southern California. All three sites are situated in riparian areas whose vegetation can be characterized as mixed *A. donax* and native riparian species (e.g. *Salix lasiolepis*, *Baccharis salicifolia*, *Platanus racemosa*). The Riverside site, along the Santa Ana River, is located at 33° 58.121N, 117° 26.105W in Riverside County; the Oceanside site, along the San Luis Rey River, is located at 33° 15.334N, 117° 17.471W in San Diego County; the Aliso site, along Aliso Creek, is located at 33° 33.718N, 117° 43.017W in Orange County. At each site, five permanent 25-m transects were established perpendicular to the watercourse. Transects were at least 10 m apart. Five 1.5m x 0.5 m plots were randomly placed along each transect.

One hundred *A. donax* rhizomes were harvested from each site in early April 2003. These were brought back to the lab and inventoried for size/volume, fresh weight, and number of buds. After inventory and cold storage (4 C) for two weeks, rhizomes were planted back into their respective field sites. Four rhizomes were planted (April 22 and 24) and marked in each field plot, for a total of 20 per transect and 100 per site. Every effort was made to preserve the existing litter layer and surrounding vegetation cover.

Sites were visited weekly until all *A. donax* sprout emergence was complete. Bimonthly measurements of soil volumetric water content, soil temperature, and PAR at ground level were recorded. Seasonal measurements of percent understory cover, percent overstory cover, and plot species composition were conducted. Climate data was downloaded monthly (NOAA) from nearby weather stations for all three sites.

*Results to Date:*

When analyses of variance were performed on the abiotic variables monitored in the field, sites were found to differ significantly ( $p \leq 0.05$ ). The Riverside site had the highest air temperature and lowest humidity of all three sites, but it had the lowest PAR values and the greatest soil moisture. The two other sites were not significantly different from each other in terms of air temperature and PAR values, but they were both significantly cooler and brighter than the Riverside site.

Biotic variables were found to differ among sites as well. Analyses of variance revealed that *A. donax* shoot emergence was slowest, but growth rate and maximum shoot height were greatest at the Riverside site (the two other sites were not significantly different from one another). Initial volume for rhizomes from the Riverside site was greater than that of the two other sites. The Orange County site had the greatest diversity of resident plant species per plot, and the greatest number of forbs per plot. The Riverside site had the greatest number of trees per plot. Though not yet empirically quantified, destructive shoot herbivory by rodents probably was a factor in decreasing shoot survival at the Oceanside site, and, to a lesser extent, the Riverside site.

In an attempt to yield the list of variables that best explain the emergence and growth response of *A. donax* across all sites, multiple regression analysis was performed (only individual variables with  $p \leq 0.05$  are reported here). Shoot emergence timing was slowed by cool soil temperatures and expedited by large initial rhizome volume; shoot height was negatively correlated with soil temperature and positively correlated with soil moisture; shoot survival was positively correlated with soil moisture.

*Implications:*

Results from the first year of this experiment suggest that *A. donax* performance is highly dependent on site characteristics. It may be possible to determine sites of potential invasion by taking an inventory of environmental variables such as soil temperature and soil moisture, and by monitoring the size and apparent vigor of incoming rhizomes.

The observation of shoot herbivory by rodents for this species has not been reported elsewhere. Herbivory of nascent shoots connected to large parent clones was observed, but did not seem to negatively impact the vigor of the clone as a whole. However, when newly establishing rhizomes were attacked, they usually did not survive.

*Work to be Completed:*

A second repetition of this experiment was initiated in March 2004, and will be monitored for one year. This repetition includes rodent exclosures that were placed around each of the planted rhizomes.

*Presentations and Abstracts Published:*

Quinn, L. and J. S. Holt. 2003. Environmental correlates of invasion by *Arundo donax*. Proc. Invasive Plants in Natural and Managed Systems Conference, Ft. Lauderdale, FL, p. 72.

*Financial Report:*

The remaining balance in this fund as of 6/30/04 is \$4,213.51. We have funds remaining for the salary of the Assistant II who accompanies Lauren to field sites, and funds remaining for travel to field sites by UC vehicle. These will be expended during 2004-05 as the experiment is completed. We have also reserved funds for soil analysis, which will be conducted this summer.