San Francisco Estuary Invasive Spartina Project

Preserving Native Wetlands

2003 San Francisco Estuary Invasive Spartina Project Monitoring Program

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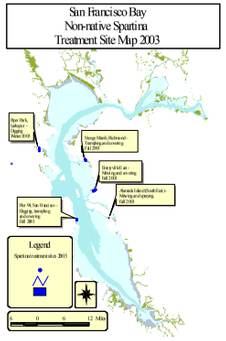
Abstract:

The 2003 Invasive *Spartina* Project Monitoring Program was designed to provide (1) updated information on new-found populations of non-native *Spartina* (cordgrass) in the estuary; (2) information on the extent of spread since 2000-1; (3) a review of current field and aerial photo interpretation mapping and monitoring methods; and (4) determination of control efficacy at sites treated in 2002-3. Change in area of non-native *Spartina* was mapped at a subset of 28 sites stratified across the estuary by subregion (latitude) and site type (marsh type). The average increase in area between 2001 and 2003 for all species of non-native *Spartina* in the Estuary was 244%. *S. alterniflora* hybrids were found to be spreading at the greatest rate of 317%. Based on these results, the net acreage of *S. alterniflora* hybrids bay-wide may now be as high as 1960 acres. The rate of spread was greatest near the original introduction sites. We found greatest spread in Site Type I (e.g. tidal marshes or former diked baylands) and Site Type II (e.g. mudflats) and less rapid in Site Type III (e.g. creeks and sloughs) and Site Type IV (e.g. urbanized marsh). The spread of *S. densiflora* was 52%, and *S. patens* apparently decreased by 84%. The field measurements were on average 170% higher than the aerial photo interpretation measurements. Genetic testing found no new invasion sites. Treatment site monitoring indicated that manual methods of *Spartina* control – digging or covering with geo-textile fabric – were effective at removing or killing the smaller populations of *Spartina* species.

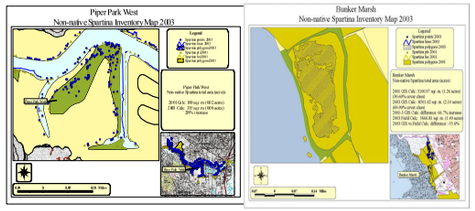
Methods:

The change in area of non-native *Spartina* was mapped at 28 randomly selected monitoring sites stratified across the San Francisco Estuary (Estuary) by Subregion (latitude), Site Type (groupings of Marsh Type), and Marsh Type. Non-native *Spartina* monitoring locations were mapped using field and aerial photo interpretation methods. In the field, plants were mapped with a GPS unit (Trimble GeoExplorer III) as points, lines or polygons with a given cover class. At a sub-set of sites, plants or infested areas were also digitized in ArcView ™. Data were analyzed using Systat™, summarized and presented as maps and summary graphs of change in area cover or percent change.

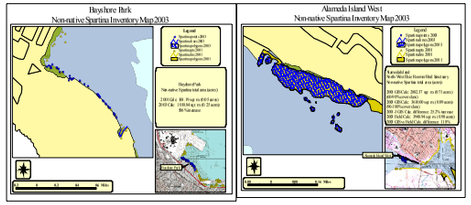


Inventory Site Types Examples:

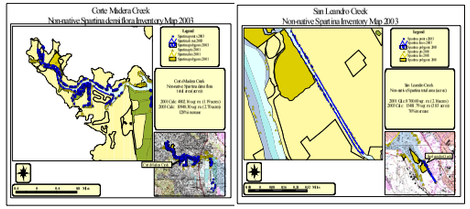
Site Type I: tidal, backbarrier & former diked marshes



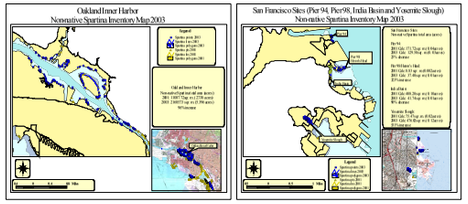
Site Type II: fringing tidal marsh, estuarine beaches & mudfltas



Site Type III: major/minor tidal sloughs, channel & creeks



Site Type IV: urbanized marsh, rock, rip-rap, docks & marinas



Summary Results:

- The Inventory Monitoring Program revealed that the highly invasive non-native *Spartina* species is spreading exponentially in the Bay Estuary. The average percent increase in area between 2000 and 2003 for all species of non-native *Spartina* in the Estuary was 244%. *S. alterniflora*-hybrids are spreading at the greatest rate of 317% increase. Based on the 317% increase for *S. alterniflora*-hybrids since 2001, the bay wide non-native *Spartina* acreage calculation from 2001 of 470 acres (ISP 2001 data) may now be as high as 1960 acres. Their rate of spread is greatest in the Central Bay, near the original introduction sites. Spread was greatest for marsh habitats, Site TypesI (tidal, micro tidal, former diked baylands, and back barrier marshes) and II (fringing tidal marsh, mudflats and estuarine beaches), when compared to creeks or slough and urbanized habitat. *S. densiflora* spread to a lesser degree (52% increase in area) which is likely the result of its growth habit. It is a ceaspitose species that forms bunches. It spread less vegetatively and more by seed. *S. densiflora* spread the most in Site Type I where seed was likely deposited with the tide on the high marsh plane. *S. patens* was determined to have reduced in cover, however this is likely due to error associated with the monitoring techniques.
- Field mapping calculations were compared to those utilizing remote sensing/aerial photo interpretation. The field mapping calculations were on average 170% higher than the aerial photo interpretation mapping calculations. However, the photo interpretation calculations are based on percent cover class of a digitized polygon. The cover classes are relatively broad. The monitoring methods also included the use of the polygon tool for mapping small populations, and smaller *Spartina* species in the field. However, the GPS units that were being used had an error of 3 meters and this error can greatly affect the results when mapping a small populations or species such as *S. patens* or *S. densiflora*.
- Genetic monitoring or surveys of possible new sites found no new locations, just spread or newly found clones of non-native *Spartina* in some of the already known outlying sites such as Point Reyes, Bolinas Lagoon or in the area of San Rafael's Loch Lomond Marina.
- The teatment site monitoring indicated that manual methods of *Spartina* control (digging or covering with geo-textile fabric) are effective at removing or killing the smaller populations of *Spartina* species. However, care must be taken to ensure that the entire plant or plants are completely dug out or covered. Where divots remain after removal, native plantings should take place to reduce chance of continued invasion of susceptible habitat by non-natives. Large areas invaded by *S. alterniflora* and its hybrids will require large-scale eradication methods and follow-up to avoid re-growth and continued spread of hybrid *Spartina* by pollen.

Recommendations for improved monitoring

- Rely more heavily on field mapping rather than GIS.
- GPS units with improved sub-meter accuracy are recommended for improved data quality and would allow for mapping *Spartina* more precisely and efficiently as points, lines and polygons.
- Increase the number of percent cover classes to more precisely estimate total cover and change over time for both large infestation sites where aerial photo interpretation is used as well as for large meadows or clusters that are mapped as polygons in the field.