Restoring seasonal wetlands and adjoining buffers in central California.

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A number of years ago, we consulted on a seasonal wetland and upland buffer site in Santa Clara County which had been "restored" using a native seed mix. After spending about $40,000 on seed and another $40,000 on an irrigation system to promote seed germination, the landowner was justifiably concerned when non-native grasses and forbs dominated the site. We've seen a number of sites like this over the past 30 years and each has raised a number of questions.

The Take Home

- Native seasonal wetlands in central California and their adjoining transition zones are generally dominated by perennial sedges, rushes and grasses that do not germinate readily from seed in natural or restored landscapes.
- Container plants are the best option for creating native cover but can be very expensive.
- "Plugs" are the smallest form of container plant available and provide an attractive compromise for restoring native seasonal wetlands and the adjoining transition zones.

Seasonal wetland dominants

The dominant native plants in seasonal wetlands and their adjoining transition zones in central California are typically perennial graminoids, that is, grass-like plants, such as Santa Barbara sedge (*Carex barbarae*), field sedge (*Carex praegracilis*), Baltic rush (*Juncus balticus*) and creeping wild rye (*Elymus triticoides*). Glen Holstein (2004) has an excellent article on the ecology of these landscapes in the Species and Communities Profiles volume of the Estuary Goals Project. These are plants that typically grow slowly but extensively in appropriate habitat through vegetative spread, *e.g.* subsurface rhizomes. This trait makes them useful for habitat restoration projects as they both provide native cover and can gradually overcome the highly competitive non-native annuals that typically dominate seasonal wetlands and their adjoining lands today.

View One shows a seasonal wetland and transition zone in Central California. The green block in the center background is a field of creeping wild rye four years after restoration; note the absence of non-native annuals, which dominate the block of land in the center foreground.

View One
Block of creeping wild rye (center background) behind unplanted transition zone (center foreground) dominated by non-native annual grasses; four years after planting.

Seeding native graminoids

Unfortunately, the native seasonal wetland and transition zone species are typically either very slow to germinate in the field or have such low germination rates that for all practical purposes seeding is not successful, that is, the seeding does not result in native cover greater than 10 to 20% after two to three years. The only place that I personally have seen these species germinated directly in the field and survive to produce good native cover (greater than 30% absolute cover) is John Anderson's Hedgerow Farms in Yolo County, which was the result of controlled (agricultural) conditions.

As John would probably note, aside from the low germination rate of the species listed above, the second significant problem is competition from non-native annuals, which germinate early, grow rapidly and suppress many of the natives. John's solution (see his *Direct Seeding of Native Grasses in the Sacramento Valley and Foothills* available from

the Hedgerow farms website) is to deplete the seedbed in these sites through a combination of fire and herbicides starting a year or so before restoration. From my experience, these are difficult conditions to implement in a typical habitat restoration project. Homes or other structures may be too close to safely use fire and a full year is rarely available to prepare a site--typically it must be done in one to two months. More significantly, after grading to create seasonal wetlands and transition zones, the weed seedbank of fields is usually still too great to be readily controlled. This is especially apparent when seeding is the primary or only restoration method as it eliminates the potential to use pre-emergent herbicides—one of the most effective tools for controlling weedy annual grasses and forbs (the subject of a future article).

Container plants

Container plants come in many sizes. One of their major advantages is that after planting, the restoration site can be treated with a pre-emergent herbicide to stop germination of non-native annuals. On the other hand, container plants are generally very expensive for restoring large landscapes (see *Wetland and Riparian Woodland Restoration Costs* by Jeff Glaspy, Devin Schenk and I in the September 2003 edition of *Ecological Restoration* for a cost comparison).

Plugs are the smallest form of containerized plants currently available. Through very recent technological advances, we've been able to grow normally poorly germinating graminoids in plug trays, which allows them to then be planted directly into restoration sites at relatively high densities (*i.e.* on one-foot centers) at reasonable costs.

View Two shows the same field as in View One, but from a different direction, immediately after planting. Note the plug spacing and size. Our experience has been that once these plants are established they can spread throughout appropriate habitat and dominate the landscape, providing a successful native restoration project (greater than 50% cover by natives) within a typical 4- to 5-year monitoring and performance standard timeframe.

View Two
Just planted (with plugs) transition zone and seasonal wetlands. View is slightly to the north of View One and the unplanted field appears in the right foreground.

Summary

In our experience, restoring native-dominated seasonal wetlands and their adjacent uplands by seeding alone is rarely successful due to: (1) the low germination rates in the field of the target species and (2) competition from non-native annuals. Using container plants resolves these problems as the plants are already germinated and the restorationist can use a pre-emergent herbicide to reduce competition from the annuals. Container plants are more expensive than seed but using plugs, the smallest container plant available, offsets this cost disadvantage. Plugs are still more expensive than seeding but the benefits, in terms of producing native cover, usually outweigh the additional costs. Plug planting with weed suppression appears to be one of the best strategies for producing native-dominated systems in seasonal wetlands and transition zones over the long term.

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