
Levee Revegetation With Native Grasses (1998)

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Earthen levees and dikes border thousands of miles of rivers, canals, and drainage systems throughout California's Central Valley. Vegetation management on these structures typically consists of costly spraying, disking, and burning to prevent any vegetation from establishing. Where vegetation is allowed to grow on levees and dikes, it generally becomes dominated by annual weedy species.

Native perennial grasses, sedges, and rushes as well as associated forb species have potential value for revegetating and managing levees. An established stand will keep out unwanted weeds while stabilizing banks and slopes with deep penetrating root systems. A number of levee revegetation projects have been initiated in California, but few have been reported and all are in the early stages of development.

This is a preliminary report on a ten acre revegetation project on a medium size levee (ten feet high) in Yolo County. The project is a joint effort between Rominger Brothers Farming and Hedgerow Farms. After three years, we are observing some very encouraging trends in vegetation establishment.

The Revegetation Process

The levee, located north of Woodland on County Road 99E, abuts 250 acres of rice production on one side and a large drainage canal on the other. Historic management of the levee and perimeter field berms consisted of annual disking and application of herbicides to control weeds. Typical levee weeds include Foxtail barley (*Hordeum jubatum*), Wild oats (*Avena fatua*), Ripgut brome (*Bromus diandrus*), Annual rye grass (*Lolium multiflorum*), Yellow starthistle (*Centaurea solstitialis*), Short-pod mustard (*Hirschfeldia incana*), Prickly lettuce (*Lactuca cerriola*), Indian sweetclover (*Melilotus indica*), and others.

Fortunately for us, this historic "clean farming" provided a planting site with a relatively low weed seed bank. Following spring and summer disking, we seeded the site in the fall of 1994 with a 10 ft. Truax drill run lengthwise along the levee. The slope is relatively

gentle (5 to 1), and was therefore not a problem for the tractor or drill. The soil type of the surrounding farmland, from which it is presumed the levee was constructed, consists of Sacramento clay, Capay silty clay, and a small area of Sycamore silty clay loam.

We used different seeding mixes on the upper and lower portions of the levee, reflecting the moisture gradient. The lower area, in addition to being more moist, was also subject to inundation during the flooding of 1996 and 1997. The species content and approximate seeding rates of the two mixes are listed in the accompanying tables. We sprayed 2-4 D in the springs of 1995 and 1996 to control broadleaf weeds during establishment.



Image by John Anderson

Stand of Creeping wildrye at the base of a Yolo County levee

Preliminary Results

We first evaluated the site in May of 1997, three-and-one-half years after seeding. Evaluations to date have been subjective observations without formal data collection, but vegetation trends are readily apparent. The grass establishment is excellent; all species that were seeded are present at least somewhere on the levee.

We have observed four distinct zones of establishment (see illustration). Zone 1, adjacent to the rice crop, was subject to prolonged flooding in 1995 and 1996. Zone 2, midway up the slope was subject to

short duration flooding. Zone 3 represents the upper portion of the levee. It does not flood and becomes quite dry during the summer. Finally, Zone 4 is the steeper south-facing dry slope adjacent to the slough. The lower portion of this slope experienced erosion during the high water in 1995.

Creeping wildrye, the Rio variety, was seeded at less than one pound per acre (due to low seed availability), but there are very healthy patches of it scattered in all four zones. Meadow barley dominates Zone 1, along with patches of Creeping wildrye. In the intermediate flood area (Zone 2), Blue wildrye and Yolo Slender wheatgrass are well represented. The upper xeric portion of the levee is dominated by Purple and Nodding needlegrass, both of which are already producing substantial quantities of seed. Blue wildrye is also doing well in this zone. In the eroded areas of Zone 4, plants are now establishing from the seed of adjacent upslope (Zone 3) plants.

Weeds in 1997 were sparse and consisted of isolated patches of mustard, Prickly lettuce, and Yellow starthistle (we did not use any broadleaf herbicide in that growing season). Foxtail barley, Annual ryegrass, and Ripgut brome were found along the levee road edges. The native forb spikeweed (*Hemizonia pungens*) was prevalent on the lower slopes.

Additional tasks could have been performed, including a prescribed spring burn to kill weed species germinating, a prescribed spring burn to kill weed species before seed maturation, and seeding additional desirable forbs such as *Lotus purshianus*, *Trifolium tridentatum*, *Trifolium fucatum*, *Eschscholzia californica*, and *Lupinus succulentii*.

Other native species appropriate for Zones 1 and 2 and other wet edge areas along levees are the sedges and rushes. Once established, they can keep out the unwanted aquatic edge weeds while providing bank protection and wildlife habitat. Species such as *Carex barbarae*, *C. praegracilis*, *Juncus balticus*, *J. xiphioides*, *J. effusus* and *Eleocharis macrostachya* are being used increasingly and commercial seed and transplant sources are becoming available.

In summary, native perennial grasses now dominate the site. Based on other sites we have watched over the past eight years, the long term success of this project appears to be certain.

The benefits of the revegetation, however, go beyond the successful establishment of native species. Of particular interest to the landowner and the neighboring farmers is the fact that there was no erosion during the flood events of 1997. In addition, essentially no management was performed over the 96-97 growing season and yet there are very few weeds. The levee is aesthetically pleasing to look at, pleasant to walk in, and it provides good habitat for wildlife. Furthermore, the site exhibits no evidence of increased ground squirrel activity, an important levee management concern.

The Road Ahead

The practice of using natives to restore disturbed landscapes is a relatively new art and the information needs are great. Projects such as the one described here need to be monitored for at least 8-10 years to document sustainability and vegetation changes. We need to consider the effects of different soils, slopes, hydrology, and management regimes to determine which species will persist and self-propagate over time. We also need to document the use of revegetated areas by wildlife, including ground nesting birds, rodents, reptiles, and insects in order to demonstrate the value of this approach. Equally important is the development of cost-effective management techniques that meet the functional requirements of the structure. Mowing, burning, selective herbicides, and even grazing will all be part of the program.

It is going to require considerable effort to change the current management techniques. While successful projects such as this one help promote the benefits of revegetation using natives, we need more vegetation managers in the field. Managers need training in the appropriate plants to use on a given site, the techniques to get the plants established, and methods to control weeds during the establishment period and beyond. Workshops and field days offered by the Yolo County Resource Conservation District go a long way towards filling this training need.

Suggested upper levee (xeric) seeding mix

Species	Common Name	live seeds/lb. (approx.)	Rate (lb./acre)
<i>Nassella pulchra</i>	Purple Needlegrass	50,000	8
<i>Nassella cernua</i>	Nodding Needlegrass	100,000	6
<i>Elymus glaucus</i>	Blue Wildrye	110,000	8
<i>Leymus triticoides</i>	Creeping Wildrye	99,000	<3

Suggested lower levee (mesic) seeding mix

Species	Common Name	live seeds/lb. (approx.)	Rate (lb./acre)
<i>Elymus glaucus</i>	Blue Wildrye	110,000	7
<i>Elymus trachycaulus majus</i>	Yolo Slender Wheatgrass	65,000	6
<i>Leymus triticoides</i>	Creeping Wildrye	99,000	<3
<i>Hordeum brachyantherum</i>	Meadow Barley	60,000	8

illustration by Paul Robins

