



## *Flood Control and Riparian Restoration*

# Meeting Environmental and Drainage Requirements for Multi-objective Channels

California has had extensive and significant flooding over the past two centuries. In the mid-18th century, the new capital in Sacramento was 11 feet under water after a particularly serious deluge. During the heyday of development in California after World War II, flood control needs were met by excavating waterways (which had often already been channelized by farmers) into relatively narrow, trapezoidal channels (inset, Figure 1).

These channels were relatively inexpensive to build, required much less maintenance than levees, and confined flooding, thereby allowing other uses in the old floodplain. These channels have been described as highly efficient.

In the past three decades in California, though, environmental requirements have greatly modified objectives for flood control projects. As well as the measures of efficiency described above, local agencies have had to meet riparian restoration and similar goals.

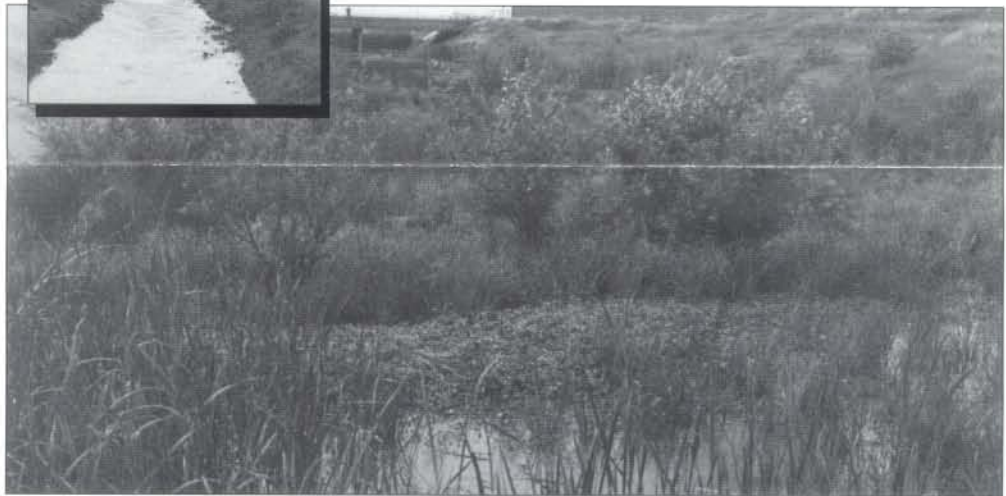
### **The Modified Trapezoidal Channel**

The first of these new multi-objective projects were simply expanded trapezoidal channels. That is, the width of the channel bottom was varied to meet the mitigation acreage requirements. The success of these projects varied considerably based primarily on maintenance needs. An expanded trapezoidal channel provides an excellent settling basin due to the greatly reduced channel velocity

experienced as flows move into channels that are often wider than the pre-construction "natural" channels. The expanse of new sediment, which is generally kept moist in the summer by runoff from nearby subdivisions, becomes an excellent growing medium for shrubby willows.



*Figure 1. Typical trapezoidal channel in photo (left) became a larger and often less efficient channel (below) to meet environmental concerns.*



In Sacramento, for example, the Strawberry Creek channel (downstream reach) was constructed in 1985 as an expanded trapezoidal channel. Although sediment loads in this system are relatively low, the channel bottom rapidly developed a forest of willows (Figure 1). The

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flood modeling assumed, however, that the channel would become relatively thick with willows and their growth has not become problematic.

Other communities were not so fortunate. Either through a miscalculation of the rate of growth or extent of willows, deferred maintenance or other factors, clearance of many of these trapezoidal channels became a pressing need. However, in those early days of wetland regulation, little attention was paid to maintenance needs in the permit negotiations. There had been no difficulty with getting maintenance permits in the past and local agency staff assumed that condition would continue. However, when wildlife agencies were asked to approve permits for the clearance of channels which now often had extensive willow woodlands, their reactions were almost uniformly negative.

### Compound Channel Design Evolves

The experience with these projects led consultants and local agency staff to begin contemplating more naturalistic channels that would be self-maintaining. Conceptually, these are channels with multiple terraces which mimic natural waterways. The low flow channel is kept relatively narrow and deep to provide capacity for heavier

materials such as sand and gravel. The overflow terraces are kept at an elevation that encourages wetland development (for mitigation) but discourages willow growth.

The Green Valley Creek project in the City of Fairfield is a recent example of this type of project. Green Valley Creek flows for approximately 12 miles from its origins in the hills above Fairfield to its outlet at Cordelia Slough. The City began development planning for an approximately 2 mile reach in the 1970's. At that time, the Creek retained a good fringe of native woodland along the upper half of the study reach and was habitat for winter spawning salmon.

The compound channel designed adopted by the City includes an overflow terrace parallel to the natural channel sufficient to hold significant storms (Figure 2). The overflow terrace is at the mean annual storm level, about 3 feet above the invert of the natural channel. This ensures that, once waters reach flood stage, they can siphon off to a broad floodplain where velocities slow considerably. Sedimentation is slight to nonexistent in the overflow terrace because most of the sediment is gravel and sand; the natural channel has enough capacity to retain this material. Growth of low terrace riparian species, such



as willows, that can greatly reduce capacity are almost nonexistent in the overflow terrace because the terrace is high enough to ensure that any seedlings that do reach the terrace do not receive enough summer moisture to survive. As importantly, the overflow terrace provides a highly suitable environment for the development of seasonal marshes and wet meadows, two types of wetlands requiring restoration under the wetland permits.

While these multi-objective channels require more land and are more costly than their earlier counterparts, the enhanced environmental benefits are often seen as adequate (if unmeasurable) compensation. Comparing Green Valley and other projects indicate that the basic issues are the same: where the sponsor is willing to incur the higher capital and land costs and has an appropriate design which considers the relevant factors, multi-objective channels can meet all appropriate criteria and assist the sponsor in permitting a flood control project. Even if significant additional maintenance costs occur, the size of these multi-objective channels generally makes the remedial actions less significant than remedial actions on trapezoidal channels, where sufficient room to expand the channel rarely exists absent very costly land purchases.

—John Zentner



*Figure 2: Green Valley Creek in Fairfield is a good example of a compound channel design.*

*During significant storms the water level of the natural creek channel (seen at the right in this photo) will rise and flow through wide cuts in the bank. It then spreads out across the broad overflow terrace where velocity is greatly diminished.*

## Eureka, California

# Successful Groundwater-Dependent Wetland Created at South Broadway

With the conclusion of the fifth (and final) year of monitoring, the South Broadway (Eureka) marshes were found to meet all required performance standards. This is a resounding conclusion to a project that began as one of the first mitigation banks in the State and whose success was likely to be challenged by site conditions.

The South Broadway marshes consist of 6.65 acres of marshes and riparian woodlands constructed at the southern edge of the City of Eureka as mitigation for 3.71 acres of fill. The project began as a mitigation bank by the City for development along its southern fringe. Permits for the project were required from the U.S. Army Corps

*The target species  
are established  
and new natives  
are moving in.*

of Engineers, the State Coastal Commission, and the City of Eureka. Zentner and Zentner was responsible for securing all permits and the restoration design. Permitting a mitigation bank is always difficult; in this case, the agencies

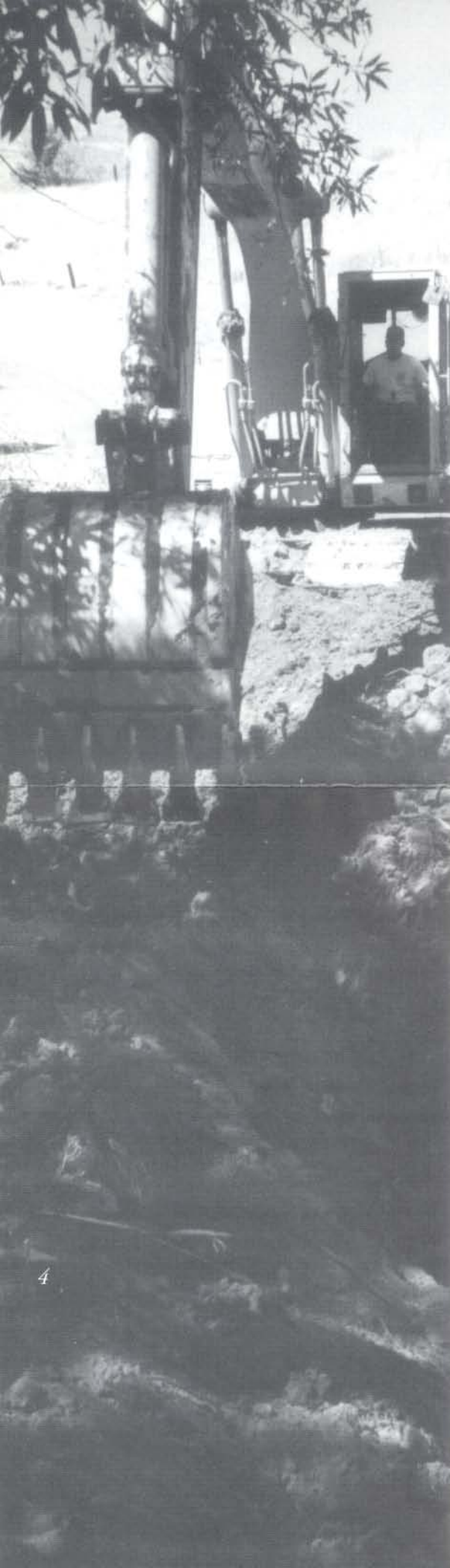
raised a number of questions about the potential for success of a groundwater-driven, constructed wetland.

The mitigation site is a sandy spit alongside the Elk River. We completed three experimental wetland basins on-site and used these to define depth to groundwater and other conditions. Construction then consisted of grading and excavating eight large basins three to four feet deep. Top soil and vegetation from wetlands at the fill site were transplanted to these basins. The basins were then planted with native riparian species and mulched by RCAA, a Eureka-based contractor.

The hydrology performance standard requires that the constructed marshes have a hydroperiod similar to nearby reference wetlands. Results from all five years of monitoring showed the created basins function similarly to the reference wetlands with the deeper basins holding water year-round or near year-round and the shallower ponds drying down in late spring or early summer.

Marsh vegetation was assessed annually at 25 sample points in the eight basins. The performance standards are

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# THE TULLOCH RULE

## Focus on Incidental Fallback

In August 1993, the Army Corps of Engineers (Corps) issued final regulations implementing, among other changes, a revised definition of "discharge of dredged material" to conform to the settlement reached in an action entitled *North Carolina Wildlife Federation, et al. v. Tulloch*, a case involving the ditching and draining of pocosin wetlands without any Clean Water Act Section 404 permits. The revised definition was intended to clarify that mechanized land-clearing, ditching, channelization, and other excavation activities result in discharges of dredged material when performed in waters of the U.S., and that these activities are regulated under Section 404 when they have the effect of destroying or degrading waters of the U.S., including wetlands. As a result of the *Tulloch* rule and subsequent regulations, activities previously excluded from the reach of Section 404, such as aggregate extraction in waters of the U.S., now required the appropriate permit from the Corps.

*Clarifying the effect of this ruling on mining and engineering in California*

In January, 1997 the U.S. District Court for the District of Columbia invalidated the *Tulloch* Rule in an action filed by the American Mining Congress against the Corps. In response, the Corps and EPA issued guidance addressing this invalidation of their regulatory authority over activities in waters of the U.S. involving "incidental fallback" (defined as "the incidental soil movement from excavation, such as the soil that is disturbed when dirt is shoveled, or the back-spill that comes off a bucket and falls back into the same place from which it was removed").

On June 25, 1997, the Court granted a stay of the District Court decision, effectively revalidating the *Tulloch*, or excavation, rule. As a result of this latest decision, a "discharge of dredged or fill material" includes incidental fallback (a redeposit of dredged material) from excavation. A Section 404 permit is required for such activities undertaken in waters of the U.S.

Exceptions contained in the 1993 regulations continue to apply:

1. Activities that involve only the cutting or removing of vegetation above the ground where the activity neither substantially disturbs the root system nor involves mechanized pushing, dragging, or other similar activities that redeposit excavated soil material.
2. Any incidental addition of dredged material that does not have the effect of destroying or degrading waters of the U.S., provided prior confirmation of the inconsequential effect of such activity has been obtained from the Corps.

An expedited decision on the *Tulloch* appeal is expected with a ruling anticipated in early 1998.

## Other regulatory news

### Delineator Certification Program

Due to a lack of funds, the Corps no longer is pursuing a delineator certification program. If funding becomes available in the future, the Corps may resurrect the program.

### Clarification of Use of NWP 26 for Stream Impacts

In the Q's & A's prepared by the Corps in January 1997, the Corps attempted to clarify the application of the 500 linear foot limitation now contained in NWP 26 for impacts to streambeds. The limitation is intended to restrict the use of NWP 26 for perennial waterways, however, the Corps in its discretion may authorize greater than 500 linear feet of impact to intermittent streams under NWP 26 if impacts are otherwise considered minimal by the Corps. Look for differing interpretations by the San Francisco and Sacramento Corps districts.

### Phase-Out of NWP 26

Corps District offices are in the process of gathering information on activities authorized by and impacts associated with current use of NWP 26 in connection with its phase-out by December of 1998. The Corps is scheduled to issue a proposed rule by February 1998. We understand the Corps is currently circulating an internal draft.

### NAHB Lawsuit

The National Association of Home Builders has filed suit against the Corps claiming the Corps gave inadequate notice of its proposed phase-out of NWP 26, the 500 linear foot limitation for stream impacts in NWP 26, and the prohibition against stacking of certain NWPs. In an October 27, 1997, ruling, the court ordered further public comment on these three items. We will continue to report on significant developments in future issues.

### State Water Board Certification of Class 2 NWPs

The State Water Board has not as yet completed its review of "Class 2" NWPs - those that may be conditionally certified - and individual Section 401 certifications are still required for these NWPs (2, 3, 12, 15, 18, 19, 27, 31, 33, 35, 37, 40). The CEQA process must be completed before the Board can issue final rules. The Class 2 NWPs will therefore be certified (or not) as the CEQA process is completed for each one. The Board had hoped to certify one or two by year-end, however no action has yet been taken by the Board. (Class 3 NWPs [7, 8, 13, 14, 16, 17, 21, 23, 25, 26] will not be certified as a group and will continue to require individual certifications.)

—Mara Bresnick

## California Enacts "Take" Authorization

Effective January 1, 1998, the California Department of Fish and Game (DFG) can issue "incidental take" authorizations for projects affecting state-listed endangered or threatened species. The new law includes the following conditions:

- Impacts must be minimized and fully mitigated.
- Mitigation must be "roughly proportional" to the impact.
- Applicant must ensure adequate funding for mitigation and monitoring.
- Take permits cannot be issued if they would jeopardize the continued existence of the species.
- Generally, a state take permit will not be required if species impacts are covered by a U.S. Fish and Wildlife Service biological opinion (or incidental take permit).

Existing Section 2081 authorizations will continue to be valid if approved prior to April 1, 1997 or if DFG determines they conform to new guidelines. DFG will be adopting regulations to implement the new law. Another new law will exempt accidental take of species (except fish) that occur on a farm or ranch in the course of routine agricultural activities. This law also directs DFG to adopt regulations by July 1, 1998, that authorize voluntary programs to encourage habitat for state-listed species on these lands.

### Recent Species Listings of Note

- Spring-Run Chinook salmon as a candidate species by the California Fish and Game Commission.
- West Coast steelhead by the National Marine Fisheries Service:

*Endangered* - From Malibu Creek in Southern California to the Santa Maria River.

*Threatened* - Santa Maria to Pajaro Rivers and from Soquel Creek to the Russian River.

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80% cover with at least 9 species. Average plant cover increased from 51% in 1993 to 85% in 1994, then decreased to 69% in 1995. The decrease in vegetation cover was probably the result of an increase in standing water resulting from the extended wet season of that year. Average plant cover was back up to 85% in 1996 and increased to 88% in 1997. A total of 32 species were observed on site in 1997.

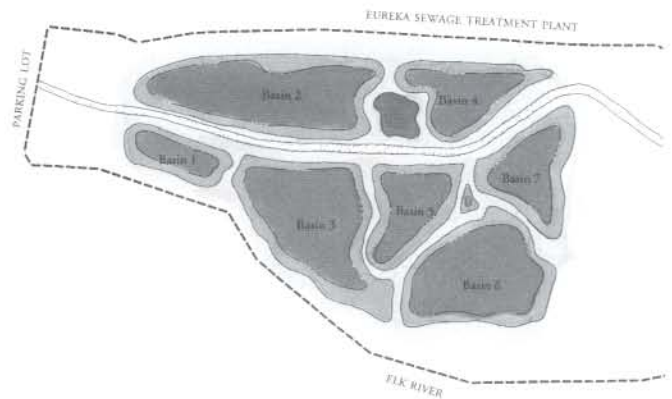
The performance standards require that at least 1,293 plants be installed on the site and that 80% of these (1,034) must survive in vigorous condition and be taller than 60 inches. By the third year (1995), 1,941 trees were classified as vigorous and 1,131 of those trees were greater than 60 inches, thereby meeting the performance standard two years early. The trees are doing extremely well with the majority of healthy trees 20 feet or more in height with some reaching at least 30 feet tall.

### Native Species Returning

After five years of monitoring, the restoration at South Broadway has met the performance standards and is considered successful. The target species for much of the work, slough sedge (*Carex obnupta*), is now well-established as the dominant species. New native species are also appearing on the site; for example, the native sedge *Carex cusickii* (no common name) was found for the first time on the site in 1997. Also in 1997, the red-legged frog (*Rana aurora ssp. draytonii*), a federally listed threatened species, has established a population in the southernmost wetland.

The most striking visual change after five years is the development of dense riparian fringes dominated by alder (*Alnus rubra*) and arroyo willow (*Salix lasiolepis*) around the basins, which until about 1996 were quite open. These riparian edges provide good cover for wildlife and make the project almost indistinguishable from the reference sites.

The accurate determination of groundwater depths prior to construction and the use of salvaged wetland topsoil which provided for rapid development of cover by the target species resulted in a successful mitigation project that not only meets performance standards but supports new native species and a threatened amphibian.



The south Broadway site is comprised of eight seasonal marsh basins with associated woodland fringe.



Top photo: Looking north at Basin 2 in August, 1993.

Bottom photo: Same location as above in July 1997 clearly shows the riparian fringe that has developed around each of the basins.

—Z & Z Staff

## Ecological Monitoring of Construction Leads to Success

The construction season has ended and we again reflect on the importance of sound ecological monitoring in the success of construction projects. If the design and permitting phase demonstrates an intent to mitigate for losses and restore the environment, the construction and ecological monitoring phase gives the project a push in the right direction. During construction, issues arise that require quick decisions which can effect the success or failure of a project years later as it approaches the end of the monitoring phase. We don't expect equipment operators and construction foreman to fully understanding the technical functions of the various environmental elements on a site. The ecological monitor (EM) has the expertise coupled with understanding of plan elements and can make a big difference at that crucial point by steering the project along with decisions that may improve overall project success. Our experience on two projects this fall demonstrate how it works.



### Red Top Road - Fairfield

*At Red Top Road the plans call for construction of a park and ride lot and other facilities. Mitigation included construction of 2 small and 1 large wetland basin with connections to the adjacent creek. The basins involved some very subtle grading concepts that were difficult to understand on the engineering drawings. We were actually building 2 basins in 1 in all cases. When clarification was warranted our onsite ecological monitor offered guidance that lead to the project moving ahead smoothly. We also worked closely with the landscape contractor to make the best of what was a poor growing season for their suppliers. The project is off to a great start.*



### Detention Basin 57 - Martinez

*A local developer in need of wetland mitigation acreage found it at this flood control basin in Contra Costa County. Our detention basin design was approved by flood control staff and the regulatory agencies in spring of 1997 and construction began in August.*

*The basin design included relocation and extension of a short reach of existing creek and construction of a broad terrace to collect excess runoff and meter it out through 2 new drainage structures. As construction began our EM recognized that a minor adjustment to the planned creek alignment could lead to improved wildlife habitat and possibly expanded flood capacity. After agency review and approval, the shift was made as grading got underway.*

*Weeks later, construction at the nearby home sites began to be slowed by large volumes of bedrock uncovered during rough grading. A plan was presented by the EM which lead to a large number of boulders being incorporated into the new creek channel. These are already beginning to look like they have been there for years. In the spring, these rocks will provide added cover for fish and other wildlife. Offsite rock disposal costs have been sharply reduced as a result of this plan.*

—Pete Shandera

## WETLAND NOTES

Wetland Notes is published twice a year by Zentner and Zentner, a Land Planning and Restoration firm with offices in Emeryville and Sacramento, California.

This newsletter provides summaries and opinions on matters affecting wetlands, endangered species and related land use issues. We recommend readers seek specific professional advice concerning facts and circumstances on any specific project before applying the information presented in this newsletter.

For more information, please contact John Zentner at (510) 596-2698, or Mara Bresnick at (916) 442-5620.

### Mailing List Update

Let us know if you are moving or know of others who may find Wetland Notes to be of interest. Please fax any address changes or additions to (510) 596-2698.

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***“Yet it is evident that in our daily lives nature must be thought of not as a luxury to be made available if possible, but as a part of our inherent indispensable biological need”.***

—Frederick Law Olmsted, in *Caring for the Earth*, by J.E. Todd (1982)

## **HGM Analysis for Central Valley Streams: a new methodology to resolve value issues**

Zentner and Zentner is presently completing a hydrogeomorphic (HGM) assessment for Morrison Creek, Sacramento County, and a regional guidebook for HGM assessments on second order streams in the Central Valley. HGM is a relatively new wetland evaluation method. Unlike previous approaches, it uses reference wetlands to identify a specific set of functions for a wetland class

*Comparing wetlands to define values and restoration concepts*

and defines the capability of a specific wetland to provide those functions.

HGM is an extremely useful tool in that it: (1) compares a specific wetland to reference wetlands already judged to be highly functional; (2) makes this comparison through

objective standards; and (3) provides a quantified result for these comparisons. Previous assessment methodologies either were limited in terms of the functions reviewed (only wildlife, for example) or could not provide a quantified result.

A regional guidebook provides the models for an HGM assessment of a specific wetland class. The regional guidebook identifies the appropriate reference wetlands and their characteristics and functions and develops and calibrates the assessment models for the wetlands based on these functions.

No HGM assessment has yet been completed for any Central Valley stream and these reports will help scientists and decision-makers objectively value riparian resources. Wetland issues in streams of the region are complex and often subject to conflicting agency mandates. A relatively objective evaluation method will help resolve permitting and management issues.

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