



# Wetland Notes

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## Defining Wetland Boundaries

by John Zentner

### Introduction

Most wetland scientists would agree that wetlands are necessarily transition zones that do not lend themselves to accurate boundary delineations. Wetland boundaries are, in an ecological sense, nonexistent. However, the Army Corps of Engineers (the Corps) has been required to develop an easily used boundary methodology pursuant to their wetland regulatory responsibilities under Section 404 of the Clean Water Act, resulting in delineation manuals published in 1987 and 1989, and a draft manual in 1991.

### The 1987 Corps Wetland Delineation Manual

The 1987 Corps Wetland Delineation Manual (the 1987 Manual) established a criterion of seven to ten days of saturation within the root zone during the growing season as the primary hydrologic criterion defining wetlands. This criterion was based on two factors: (1) the appearance of identifiable changes in the upper layers of the soil after seven days of saturation and (2) the US Fish and Wildlife Service's (FWS) contention that plant communities shift after seven to ten days of saturation from communities dominated by upland plants to communities dominated by wetland plants. Although these factors are the underpinnings of the 1987 Manual (and much of the subsequent debate about wetland delineation) neither factor has been well analyzed.

Soil chemistry changes almost from the moment the soil is saturated as free oxygen is limited and reducing conditions predominate. After about seven to ten days of saturation, though, these changes first become observable as mottling and greyer colors in the soil. Such coloration satisfies the hydric soil criterion. Longer and shorter periods of saturation produce other changes that are not as easily discernible. Very long periods of saturation (years to decades) produce gleying, a distinct blue-grey coloration. In short, changes in soil chemistry due to variation in the period of saturation can result in a continuum of responses.

The Corps recognized that defining wetland boundaries would require independent confirmation through more  
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## Vernal Pool Monitoring Results: Inundation and Wetland Boundaries

Strawberry Creek (Sacramento County)

by John Zentner and Caitlin X. Cornwall

The 1991 Corps Wetland Delineation Manual, in its current draft form, proposes to redefine wetland boundaries by requiring a longer period of inundation (15 days of inundation or 21 days of saturation to the surface) than required in previous manuals. This revision was probably the single most important change in the criteria used to define wetlands, as the current methodology requires only seven to ten days of saturation within the root zone.

One of the consistent hallmarks of the discussion of inundation periods required to create wetlands has been the lack of supporting data (see article opposite). However, by comparing the periods of inundation of successful and unsuccessful wetland creation attempts, we can supply this data and begin to approximate wetland boundaries.

Vernal pools are low swales, or depressions (12 to 18 inches in depth), in terraces where water ponds for one to three months during the cool season and dries up during the early portion of the warm season. Because of their location on the dry end of the "wet spectrum" of wetlands, vernal pools should provide useful indicators of wetland boundary changes with different inundation periods. During two successive winters and springs (1991 and 1992), our firm analyzed hydrology and

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than one parameter. This is the essence of the “three-parameter” method developed by the Corps: To the extent that we identify a convergence of parameters (especially soil and vegetation) that have a common hydrologic base, we may have identified a readily usable boundary methodology.

The Corps therefore asked the US Fish and Wildlife Service (FWS)—the agency responsible for development of the wetland plant list—if it noticed any changes in plant communities after seven to ten days of saturation. Such changes would independently confirm the use of this period as an appropriate dividing line between wetlands and uplands. FWS responded that, indeed, vegetation shifts occur at that time such that communities dominated by upland plants were replaced by communities dominated by wetland plants.

The 1987 Manual subsequently established a criterion of seven to ten days of saturation within the root zone during the growing season as the primary hydrologic criterion defining wetlands. Although this convergence of observable soil and vegetation indicators is the basis of the 1987 Manual, to our knowledge no evidence supporting this convergence has been developed. In fact, current data seem to show that longer periods of saturation are required. This newsletter provides more evidence on our hypothesis (see the article on the Strawberry Creek vernal pools), but the important point here is simply that the convergence of parameters that the Corps thought had occurred may have been illusory.

### The 1989 Joint Federal Manual

The 1989 Joint Federal Manual (the 1989 Manual)—termed a “joint” manual because the four federal agencies with wetlands responsibilities were cosigners—incorporated a number of new criteria into the delineation process.

One area in which our expanding knowledge base had led to more questions than answers was the hydrology parameter: Identifying seven to ten days of saturation in the soil's root zone during the growing season in a typical year is rarely practicable. Identifying a typical year was a major problem but not the only one. Defining the growing season still bedevils boundary analysis efforts. Additionally, it seems to many of us in the field that we are always attempting delineations or delineation reviews in the dry season with an applicant or agency in need of immediate results. Numerous hydrology indicators were developed between 1987 and 1989 (stained leaves, watermarks, algal mats, cattleprints, etc.) and shown to be not indicative of a typical year or seven to ten days of saturation. Consequently, the 1989 Manual allowed the presence of wetland soils to substitute for evidence of wetland hydrology.

One of the other problems frequently encountered in the field was ongoing or one-time removal or disturbance of

the vegetation. In many instances, this was simply due to a continuing farming operation. In other cases, it was clear that the landowner sought to eliminate wetlands. Completing a delineation was extremely frustrating in these circumstances. Accordingly, the 1989 Manual also allowed the presence of wetland soils to act as a substitute for finding a predominance of wetland vegetation when the site vegetation was disturbed.

These modifications resulted in some (although probably fewer than claimed) delineations where the presence of wetland soils alone was enough to define a wetland. For example, out of approximately 95 delineations completed by Zentner and Zentner between the introduction of the 1989 Manual and its replacement by its predecessor, the 1987 Manual, only one delineation was amended by Corps staff to include an area in which only the soils indicated the presence of wetlands. In that case, the vegetation had been largely removed during years of grazing, and the delineation was conducted in the fall after three years of drought. Other reports, however, have claimed that the use of this “one-parameter” method has created great hardship for landowners and expanded the area of Corps jurisdiction significantly. Theoretically, this is easy to imagine as many areas historically had wetland soils (most of the Central Valley for example). While the use of the “one-parameter” approach allowed by the 1989 Manual was not typical, there were signs that this strategy might become more common as new staff members joined the Corps.

### The Proposed 1991 Manual

It is useful to separate this review of the proposed 1991 Corps Wetland Delineation Manual (the 1991 Manual) into procedural and technical issues. The procedural issues involve the methods to be used to complete delineations, while the technical issues revolve around the modified hydrology criteria.

There is widespread agreement that the 1991 Manual is poorly written and confusing; It is probably not usable in the field in its current state. However, many of the contradictions and problems in the Manual can be resolved through judicious review of it and adoption of the comments developed by the reviewing agencies. As an example, the methodology proposed for use in defining vegetation dominance is extremely cumbersome. Also, problem area wetlands are described in the manual, but there is no provision for analysis of these sites. Soil analyses under the new manual would be more cumbersome due to revised methods, but appear to provide the same results as older methods.

One of the more criticized procedural issues concerns the burden of proof in identifying wetlands. An implicit presumption in the Federal Register version of the Manual (p. 40448) is that the burden is on the Corps. This led

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some of the agency reviewers to state that a specific area was not a wetland even when they were standing in water up to their knees because they did not have the desired three years of data on that site. While the burden of proof issue admittedly needs much more work, the reaction among many of the agency reviewers was to take the poorly worded concepts in the manual and then push them to their illogical extreme to make a point about the presumed wetland loss that would result from using the Manual.

There are two technical criteria differences between the 1989 and 1991 manuals. (1) The 1991 Manual espouses the use of a three-parameter approach, while the 1989 manual does not. The value of the three-parameter approach and the problems inherent in a one, or two-parameter approach have been discussed above. (2) The 1991 Manual proposes a hydrology criterion of 15 days of inundation or 21 days of saturation to the surface as opposed to seven to ten days of saturation in the root zone as in the 1987 and 1989 Manuals. The relative usefulness of the different periods of inundation or saturation as wetland indicators has not been debated in any objective way.

### Conclusion

In our view, wetland scientists must develop the best possible information on what types of wetlands occur during various inundation or saturation periods and the values of these different types of wetlands, and then stand aside while the political process makes its decision about which wetlands will be protected and to what extent. Arguments that the 1987 Manual is not a "policy" document that should be immune to the political process are absurd. The decision to forgo use of the hydrology criteria, for example, was essentially a policy decision not to spend further time trying to identify useful hydrology criteria but instead to allow reliance on soil criterion. In any case, with the 1991 Manual now on hold and no new regulatory guidance likely until after the election, the 1987 Manual provides the Corp's methodology. Now is a highly appropriate time to re-examine this Manual in the light of information generated about wetlands over the past five years. One fact is clear: There is a strong current in this country running against wetland regulation. Where we do not provide a clear basis for our recommendations on wetland boundaries or where those recommendations are not supported by common sense, we run the risk of losing the many gains we have made over the past decade.

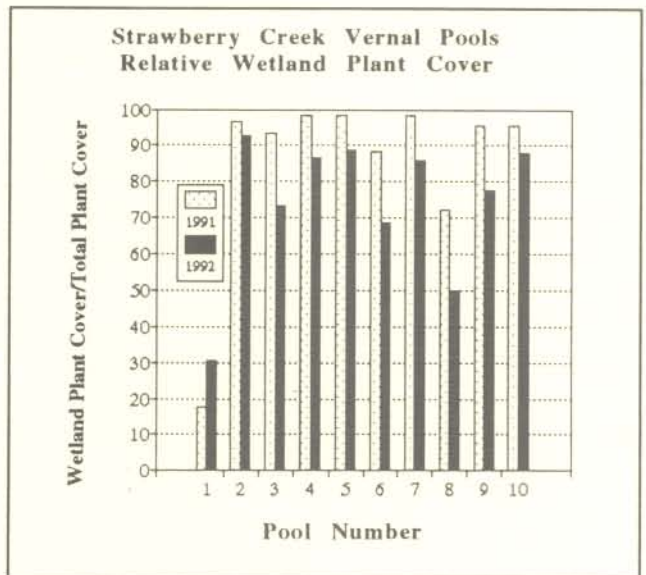


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vegetation data from a vernal pool creation project in the lower reach of Strawberry Creek in Sacramento County, California. Ten pools had been created on a narrow terrace adjacent to the Creek by our firm during the spring of 1990 for M. J. Brock, Inc.

All pools were sampled weekly for water depth from late January through May. Pool vegetation was analyzed through the use of whole-stand relevés. Data collection and analysis used Braun-Blanquet cover classes as described by Mueller-Dombois and Ellenberg (1974). Plants were categorized as either "wetland species" or "upland species." Indicator status was based on a listing for Region O (California) in the "Corps of Engineers Wetlands Delineation Manual" (Environmental Laboratory, 1987). Species that were identified as OBL, FACW+, FACW-, FAC+, FAC, or FAC- in the Army Corps' list were considered wetland plants, while species identified as FACU+, FACU, FACU-, NI, and unlisted species were considered upland species.

For both 1991 and 1992, nine vernal pools (90%) showed a clear predominance of wetland species, while one pool did not (Figure 1). The unsuccessful pool was dominated by weedy upland species. On average 76% of total cover was provided by upland species. The unsuccessful pool also had inundation periods of 40 days or fewer for each year, while the pools with high wetland plant cover all had 50 days or more of inundation (average of 72 days). These data all point to a crucial inundation period of about 45 days, much greater than the seven to ten days of soil saturation now used in the 1987 Corps Wetland Delineation Manual or the 15 days proposed in the draft 1991 Corps Wetland Delineation Manual. Research at other sites and of other wetland types is needed to verify these data. ■





# Comparing Bird Use at a Natural and Artificial Coastal Wetland

## The Bayside Business Park Marshes in Fremont

by John Zentner and Caitlin X. Cornwall

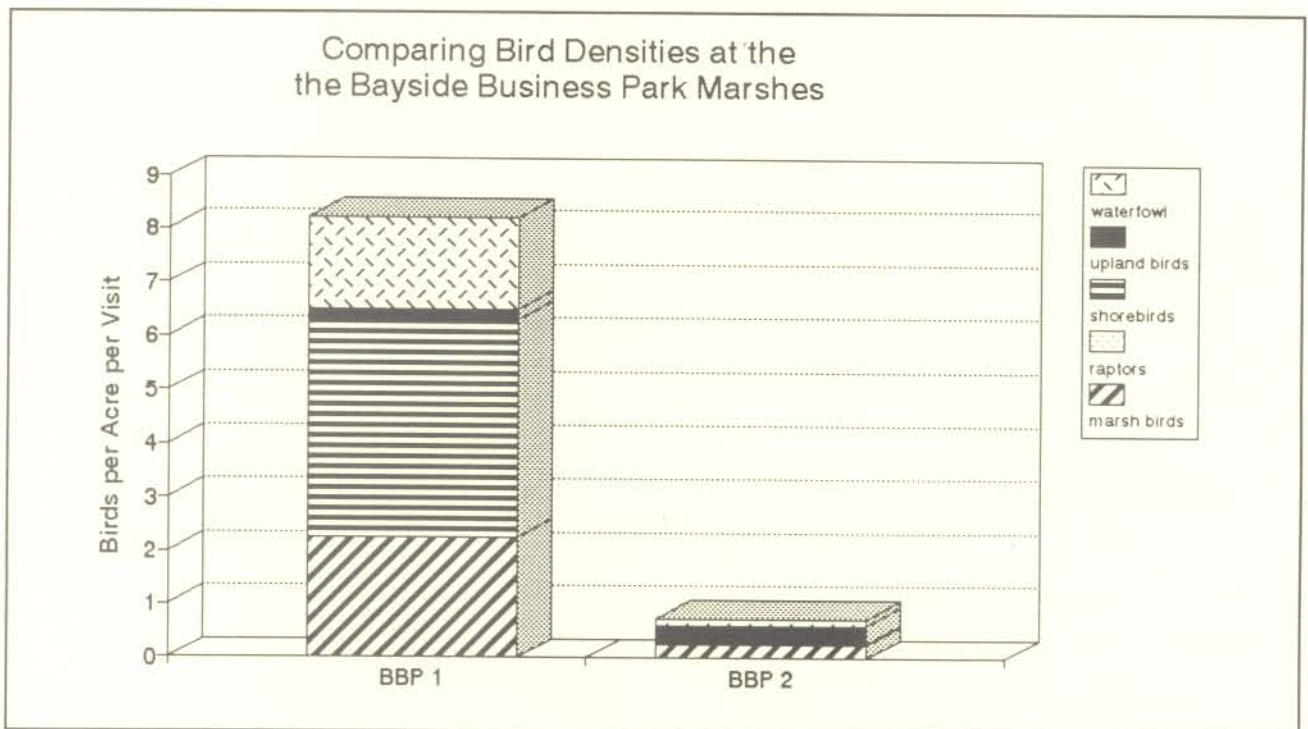
The Bayside Business Park site in Fremont, California consists of two separate properties: the northern site, Bayside Business Park I (BBP 1), which now contains about 260 acres of coastal wetlands dominated by open water with a fringe of salt marsh, and the southern site, Bayside Business Park II (BBP 2) which consists of approximately 160 acres of nontidal salt marsh mixed with grasslands. Both sites were historically part of the tidal wetlands of South San Francisco Bay, and both sites were diked from Bay action in the 1930's. Prior to a wetland restoration project in 1987 at BBP 1, both sites were similar in character (diked nontidal salt marsh mixed with annual grasslands), although BBP 1 is larger than BBP 2. The wetland restoration project in BBP 1, undertaken by the site owners as mitigation for on-site fill, resulted in the excavation of the existing diked salt marsh and uplands to levels 10 to 12 feet below the pre-construction levels. The excavation of channels to local tidal creeks resulted in the flooding of the wetlands and the creation of a large estuary surrounded by a fringe of marshland.

Zentner and Zentner performed bird counts on both the BBP 1 and BBP 2 sites over two years to examine and compare water-dependent bird use after completion of the restoration project. A total of 87,722 birds were seen

at BBP 1. The BBP 1 site hosts large flocks of gulls (57% of all birds on site), probably due to an adjacent landfill and the expanse of open water at BBP 1. Eliminating the gulls from the analysis, BBP 1 supports primarily shorebirds (43,445 birds or 50% of the remaining), significant numbers of American coots (22,748 or 26% of the non-gull total), waterfowl (18,323 or 21% of the non-gull total), and a few raptors and upland species. In contrast, 2,702 birds were seen at BBP 2. The number of species present is more than twice as high at BBP 1 as at BBP 2 (a ratio of 110 to 49), although several months, notably May and June, had similar species use. The primary reason for the smaller differences in species numbers between the sites during these months is the dominance of upland birds at BBP 2 (1,430 birds or 53% of the total) and their predominance during the early summer. Factoring out the gull population and allowing for differences in site size and number of census visits, bird density is ten times greater at BBP 1 (Figure 2).

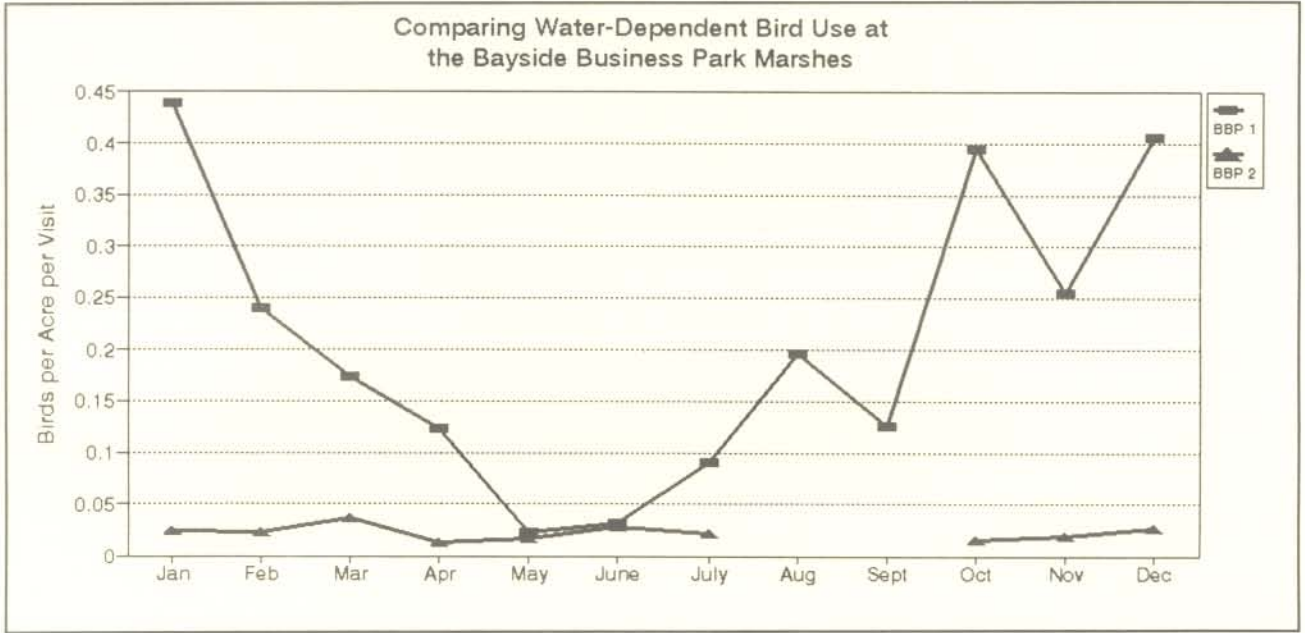
Water-dependent bird use shows even more significant differences between the two sites. Waterfowl were the most common water-dependent birds at BBP 2 (425 seen, or 16% of the total) but were well below the numbers found at BBP 1. Marsh birds and shorebirds showed similar results. Overall, water-dependent bird use reflects these same trends (Figure 3).

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These results more clearly illustrate the differences in bird use between a diked salt marsh/upland and an open-water-dominated tidal wetland over a two-year period (in a drought) than any revelation about bird use in constructed wetlands. However, in California, as elsewhere, significant pressure is exerted through wetland regulations to mitigate with like-kind wetlands. While this goal is often important, other restoration options, such as maximizing wildlife habitat, flood storage or other wetland functions, might provide greater values. Bird use is generally considered to be one of the more significant values of the diked salt marshes that ring San Francisco Bay and the former estuaries of southern California. If

BBP 1 had been restored to its preconstructed form (a diked salt marsh), bird use would be significantly lower than in the non-like-kind estuary created on the site. However, the absence of regional goals and management strategies severely restricts our ability to choose options other than in-kind, as no allowance for such a choice has been developed by agencies or other authorities. Regional goals necessarily imply a process of consensus-building to determine wetland values and the permitting implications of those values. While such a process may appear daunting, the potential results, as illustrated by the example in this article, are worth the effort. ■



## Wetland Classes Offered

Zentner and Zentner is offering free classes in wetland delineation and regulation to professional groups of 15 or more. The half-day class focuses on providing the tools for participants to be able to evaluate wetland delineations, mitigation plans, and federal and state wetland permit processing issues. The first two hours cover Army Corps of Engineers Section 404 and Section 10 jurisdictions, the basis for the Federal Clean Water Act and the roles of the various agencies involved in implementation of the Act, processing of wetland permits, and wetland mitigation policies and examples. The second two hours involve field work in mapping wetland boundaries. At the end of the class, participants should have an understanding of the methods used in defining wetlands and of federal and state wetland permit processing. Please call Kellie Berry at (916) 442-5620 or Bill Halleck at (510) 947-6888 for further information. ■