California State Water Board Wetland Review

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1. A three factor or parameter approach for defining wetlands is absolutely consistent with current scientific practice.

> The term should be "factors", not "indicators", to keep the discussion consistent with the National Research Council's definitions and usage. (p61-82).
>
> I discuss below how there is almost complete overlap between the definitions of wetland hydrology and hydric soils. This overlap has been the case since the publication of the 1987 manual if not before. And now the California discussion almost seems to make wetland vegetation an optional requirement, such that hydrology would appear to be single obligatory requirement. Hydrology of course is the driving factor for wetlands, as recognized later in the proposal, and should perhaps be recognized as such in the discussions and definitions, with soils and vegetation as indicative or predictive factors.

2. The phrase "saturated by groundwater or inundated by shallow surface water for a duration sufficient to cause *anaerobic conditions* within the upper substrate" is indeed consistent with scientific understanding of the drivers of wetland character.

> Anaerobiosis is the single most important defining characteristic of a wetland. Anaerobic conditions in a saturated environment is what makes a wetland a wetland. An oxygen-free condition is what governs the kind of vegetation that will grow in wetlands. Anaerobiosis does not occur under short periods of saturation; it is therefore indicative of significant periods of inundation and/or saturation. Anaerobiosis is a precursor to the reducing conditions that produce the redoximorphic features found in hydric soils.

3. Use of the phrase "hydric substrate conditions" *is* consistent with the scientific understanding of wetland characteristics, but is not necessarily any more illuminating than the phrase "hydric soil".

> While use of the term "substrate" rather than "soil" is not inconsistent with scientific understanding, it seems somewhat artificial to insist so strongly on avoiding the term *soil*. Soil, by one USDA definition, is any earthy material capable of supporting plants out of doors. Any substrate that has vegetation

growing on it is therefore s*oil*. Whether something can be defined as soil or not is not dependent on any particular arrangement of horizons or weathering features. *Entisols* are soils at the very end of the Keys to Soil Taxonomy; they are listed simply as "other soils," after all horizons and diagnostic features have been exhausted in the hierarchical keys . Most, but not all, of what the TAT refers to as substrate that is not soil. is, in fact, soil.

In addition, there has always been inherent overlap in the definitions of wetland hydrology and hydric soils. More than overlapping, the definitions are for all practical purposes coterminous. Hydric soils have hydric conditions. Hydric conditions are saturated conditions—conditions wet enough to create anaerobic conditions. And that is exactly the definition of wetland hydrology in the proposed wetland definition: *saturated by ground water or inundated by shallow surface water for a duration sufficient to cause anaerobic conditions within the upper substrate*.

Perhaps it would be more straightforward to simply recognize that wetlands are lands saturated or inundated for a duration sufficient to cause anaerobic conditions within X cm of the surface, and that under normal circumstances are dominated by hydrophytic vegetation and soils with redoximorphic features. Such a definition recognizes the "master variable" nature of hydrology, and that the *only* way we can determine the presence of that hydrology in most cases is by looking at indicators of hydrology, soils, and vegetation. There are circumstances, well documented in the Technical Reports, where soils with redoximorphic features, and/or vegetation may be lacking. These areas should be special cases—difficult to resolve areas, problem areas, special aquatic sites, etc. – that can be dealt with separately, by definition, without mucking up the definition wetlands.

4. The phrase is consistent with scientific understanding.

As discussed above, "anaerobic conditions within the upper substrate" is the same as saying "hydric conditions".

A requirement for a minimum hydroperiod of saturation/inundation is perhaps consistent with the mandates of regulatory precision, but in practice no one can make such a determination within the time limitations required for a regulatory determination in the field. A wetland with an average period of continuous saturation at the lower end of the requirement (e.g., 14 -15 days) will likely have weak diagnostic features, and would require better documentation than for wetlands with longer hydroperiods and more distinct features.

The bottom line here is that we are forced to rely on diagnostic features or indicators of wetlands; we can make no precise determination of how long a wetland is wet, particularly at the shorter end of the range of wetland hydroperiods. There is not enough evidence, and perhaps there never can be,

to be able to associate a specific type, distinctness, and quantity of particular soil redoximorphic features with specific wetland hydroperiods. But we can be confident that many prominent iron pore coatings in a soil is almost certainly associated with more than 2 weeks saturation, just as a stand of obligate plants is surely an indicator of extended inundation or saturation. It is at the lower end, where redoximorphic features are faint and few, and the vegetation is just on the wet side of facultative, that we have serious troubles and where error is unavoidably greatest.

We have a requirement for specific hydroperiod, but it is well to recognize the uncertainty that accompanies that requirement. I think the California definitions do about as good as could be expected with this issue.

5. The statement is consistent with scientific understanding.

Why not just set up categories akin to the Special Aquatic Sites as defined in the Clean Water Act, for those areas that normally lack vegetation, such as tidal flats or river bars?

For facilitating on-the-ground practice, special areas that consistently lack vegetation should be indentified and classified, with diagnostic indicators to facilitate their identification.

6. The definition is consistent and reflective of current scientific practice.

As discussed above, (1) and (2) are synonymous. It would be simpler to keep (1), and then declare that under normal circumstances, indicators of hydrology, soils, and vegetation consistent with (1) will be present in a wetland. A definition along these lines would be much more consistent with the overall tendency of the TAT to remove absolute requirements for soil and vegetation indicators.

7. The procedural clarifications have a basis in sound scientific knowledge, but the TAT has made this issue more convoluted than it needs to be.

The primary issues that the TAT seems to be struggling with are the lack of soil and vegetative indicators when wetland hydrology otherwise appears to be present. Hydric soils have never been defined in terms of their indicators (e.g., redoximorphic features). They have always been defined in terms of criteria—which just happen to be the same criteria as wetland hydrology (saturation leading to anaerobic conditions).

In Table 1of Staff Report No. 1, it is specified that the hydric substrate must *exhibi*t hydric conditions. It should be noted that a soil could very well have hydric conditions (i.e., be anaerobic) without exhibiting *any* visible redoximorphic features (iron ped coatings etc.). While this might be uncommon, it is not a rare occurrence. The presence of visible Fe and/or Mn redoximorphic features requires a redox potential much lower than that required for loss of molecular oxygen. These redox features are thus excellent indicators of persistent anaerobic conditions, but those conditions could exist without the redox potential descending to the level of Fe reduction. The conditions for "redox buffering" at levels above those required for Fe reduction, but below that for O_2 reduction are many and are well documented in the literature (in several of the citations included in the reviewer package, including the textbook by Mitcsh and Gosselink). By definition, any soil with anaerobic *conditions* (not necessarily i*ndicators*) is a hydric soil.

Overall these definitions will make little difference in terms of field delineation. But having a simple and consistent definition might be helpful, and it appears that such arriving at such a definition has been a driving force of the TAT.

8. The proposed terminology is consistent with USACE definitions and scientific understanding, but is more straightforward and simpler than the USACE definitions.

9. It is difficult to assess the validity of this proposition.

There is no question that false positive wetland identifications are more likely during wet periods (of whatever duration) and that false negatives are more likely during dry periods. Clearly, greater protection of wetland resources would occur where the error of false negatives is minimized at the expense of greater error for false positives.

The difficulty of operationalizing a "validity" period for making wetland delineations might limit its implementation. How far off the norm would a period have to be to potentially invalidate a wetland call? How long of a period would have to be looked at? There are abnormally wet or dry cycles that may last years or even decades. The TAT did a good job of addressing these issues, but they did not, in my opinion, resolve how such a policy could be consistently applied.

In my opinion, based on experience mainly in Texas, but including substantial time with so-called problem or difficult-to-resolve areas, a competent and experienced wetland scientist can make a fairly accurate assessment and delineation of wetlands even in times of prolonged drought.

The more difficult the situation, the more attention must be paid to details of the landscape, soils, and vegetation. The error will no doubt be greater during dry periods, but should be substantially less than 10% of what otherwise would be delineated under wetter conditions, if accomplished by a competent scientist.

10. Describing the landscape position in detail and assessing the water source of a given wetland is completely consistent with sound science.

An understanding of local and regional geomorphology and the nature of inundation and saturation regimes (e.g., in soil terms, is it epi or endo saturation? Do the wetlands saturate from below or from the surface? Is it a perched water table?) will go a long way toward dealing with the problem or difficult-to-resolve areas.

11. Developing statewide ecological regions (presumably with descriptions of wetland types associated with each region, and descriptions of the geomorphic setting and the nature of the wetland hydrology of each type) and supplemental delineation guidance would be consistent with sound science, if in fact not *required* by sound science.

The comment above under No. 10 could be repeated here. More and better descriptions of specific regional types of wetlands throughout the state can only improve the likelihood of their correct identification and delineation, particularly for difficult-to-resolve areas. Defining those difficult-to-resolve areas in advance leaves much less to the judgment of individual delineators.

12. Describing an additional "aquatic support area" beyond the jurisdictional wetland boundary following the USACE 1987 Manual is not inconsistent with sound science, but how consistent it might be with state law is beyond the scope of this review.

Wetlands are regulated because they are essential to the aquatic integrity of our nation's waters. Wetlands are no doubt part of the aquatic system, but they are also part of larger watersheds that impact and influence the integrity of the wetlands themselves and therefore of the rest of the nation's waters. Watershed managers should definitely be interested in protecting any watershed contributing runoff (or groundwater) to wetlands, including the areas defined in the TAT memorandum as "aquatic support areas". The aquatic support areas would likely have more influence on the wetlands than contributing areas higher in the landscape. If there is a potential for greater management or regulatory intervention, then the requirement for mapping this additional area might be justified in the California context.

One of the fallacies of the CWA 404 regulations of wetlands is that it has always taken a very narrow approach to wetlands. Wetlands do not exist in isolation (even so-called isolated wetlands!): they are part of a larger landscape and ecosystem. We currently mitigate only the loss of the wetland

itself, and not the larger functioning landscape that has been destroyed. Absent a mandate for holistic watershed management, such a narrow approach may be the only legal recourse for regulating state and national waters at the moment. The recommendation to delineate (but not regulate?) aquatic support areas is thus admirable and consistent with the larger goal of integrated watershed management, and I hope feasible for California.

The Bigger Picture

It is important to remember that wetlands are by definition *transition* zones between areas that are wholly aquatic and areas that are wholly terrestrial in their nature. By definition, a transition zone does not have an easily definable boundary. The lack of an easily definable boundary is inherently in conflict with a regulatory system that by definition must rely on the ability to identify precise boundaries in terms of what is in or out of regulatory jurisdiction. There is perhaps no easily resolution to this conflict, but it should always be kept in mind. Given the often "fuzzy" nature of wetland boundaries, incorporating some kind of buffer zone might not be a bad idea.

This second comment is perhaps somewhat outside of the specified bounds of this review, but given the push for accurate delineations that are protective of the resource that appear to drive this entire review process, it might be important to recognize a simple issue of human nature. One tends to play the tune one is paid to play. A wetland delineator who relies on developers for business is not going to consistently draw wetland boundaries that are on the drier side of the "fuzzy" boundary discussed above. This does not mean the delineator is in any way unethical; just that there is a geographic range, that of course varies with wetland type, within which a boundary could be competently defended. Delineators paid by developers will consistently delineate their boundaries near the lowest possible edge of that boundary. These "tighter" delineations will add up to significant losses in potential mitigation over time. It might be worthwhile to consider in the future a system where the Water Board pays delineators, charging fees of course to developers and other permitees. In my own experience, I tend to draw lines higher on the landscape when paid by an environmental group than by a developer. I would like to think that my range of variation is less than that of other consultants, but I know the tendency to move the line is there, particularly when indicators are less than prominent.