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FILE NO: 54752.001004

October 13, 2005

Mark Sudol, D. Env.
Chief, Regulatory Branch
U.S. Army Corps of Engineers
441 G Street, N.W.
Washington, D.C. 20314

Re: Request for Extension of Comment Period on the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region

Dear Dr. Sudol:

The Foundation for Environmental and Economic Progress (FEEP) recently became aware of the availability of the U.S. Army Corps of Engineers, Los Angeles District's Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual (Draft Supplement). The comment period currently ends November 3, 2005. FEEP respectfully requests that the comment period be extended to December 20, 2005 to provide time for a thorough review of the 105-page Draft Supplement and preparation of comments.

Sincerely,

Virginia S. Albrecht

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October 20, 2005

Our File Number: 0100-092105

VIA FEDEX AND E-MAIL

Ms. Katherine Trott
U.S. Army Corps of Engineers - Regulatory
HQUSACE - Attn: CECW-LRD
441 G Street, NW
Washington, DC 20314-1000
1987Manual@usace.army.mil

Re: Request for Extension of Comment Period on the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region

Dear Ms. Trott:

This firm represents the California Building Industry Association ("CBIA") and a coalition of homebuilders ("Homebuilders"). CBIA and the Homebuilders have engaged three of the leading firms for wetlands delineations in California—Gibson & Skordal LLC, Glenn Lukos Associates, and WRA, Inc.—to review the draft Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region ("Draft Supplement"). The comment period for the Draft Supplement is currently scheduled to end on November 3, 2005, and we write on behalf of CBIA and the Homebuilders to request an extension of the comment period.

The Corps has stated that the effect of the Draft Supplement on wetland delineations is intended to be neutral, but CBIA and the Homebuilders believe its application could significantly expand the extent and nature of areas delineated as wetlands. Any expansion of areas identified as wetlands has enormous economic implications for the regulated community Given the controversy surrounding the abandoned 1989 Wetland Delineation Manual on exactly this issue of expanding wetlands areas through changes in a technical manual, we believe it is important that the process for updating the 1987 Wetland Delineation Manual be open and transparent, grounded in sound science and fully understood. We will submit extensive comments on the technical issues in a subsequent letter, but we have grave concerns about the adequacy of the comment period for reviewing the Draft Supplement:

- A number of new indicators have been described for wetland hydrology; however, the Corps has not identified the scientific references or quantitative analyses to

substantiate why these indicators have been selected. In order to determine whether or not these indicators are truly indicative of wetland hydrology and to what extent they are found in wetlands and in uplands, a more thorough calibration with observed hydrology needs to be conducted. The current comment period does not allow for this testing to occur.

- The Draft Supplement proposes new indicators for hydric soils directly derived from the NRCS's "Field Indicators of Hydric Soils in the United States". The Corps' current policy precluded using these indicators other than as collaborative information. "Developing a Regionalized Version of the Corps of Engineers Wetland Delineation Manual: Issues and Recommendations" cites numerous issues relative to including these indicators within Regional Manuals. Absent a sound scientific basis for including these indicators, they must be evaluated in a broad range of sites in order to determine validity and whether their addition to the Draft Regional Guide is, in fact, neutral. This cannot be reasonably accomplished in the specified comment period.

- The Draft Supplement proposes a new hydrology criterion that has not been tested against jurisdictional delineations verified under the 1987 Wetland Delineation Manual. The commenting period does not include the appropriate time of year to measure wetland hydrology and to determine whether or not this new hydrology standard is "neutral" in its effect on the extent of jurisdictional wetlands. In addition, the new hydrology standard proposes new methods for monitoring the water table and/or inundation that need to be tested for their practicality and accuracy.

- The Draft Supplement comment period is during a time of year when hydrology and wetland vegetation indicators are difficult to observe, at least in California's Mediterranean climate. As a result, it will lead to incomplete analysis of these indicators and make it difficult for the public to comment on their usefulness.

- The period of time allowed for comment is insufficient to conduct meaningful field tests. The field data sheets and the commenting sheets are lengthy and complicated to fill out. In addition, gaining access to project sites can be time consuming. Additional time is needed for the public to conduct the field testing.

- The Corps has selected peer reviewers for the Draft Supplement. Those peer review comments by technical experts are important to inform the public on the potential problems with the proposed Draft Supplement. Without such technical review, it is not possible for the public to provide useful comments in agreement or disagreement with that technical review.

We therefore ask the Corps (1) to extend the comment period until July 1, 2006 to address these concerns and to provide sufficient time to review and provide technical comments on the Draft Supplement; (2) to allow for additional field testing and comments after the growing season; and (3) to hold regional hearings to give members of the public full and ample opportunity to express their concerns with the proposed changes to wetlands delineation criteria that would occur under the Draft Supplement.

Very truly yours,

Robert J. Uram

for SHEPPARD MULLIN RICHTER & HAMPTON LLP

W02-SF:FRU\61472411.1

cc: Mark Sudol, D. Env.

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October 20, 2005

Ms. Katherine Trott (CECW-LRD)
U.S. Army Corps of Engineers
441 G. Street, NW
Washington, DC 20314-1000

Re: Announcement of Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual
NMGF No. 10323

Dear Ms Trott,

In response to the Special Public Notice regarding the above referenced Announcement, the New Mexico Department of Game and Fish (Department) would like to comment on several issues vital to the delineation of wetlands in New Mexico. The Corps of Engineers has made significant strides to deal with difficult wetland situations in the Arid West. The following comments are based on a technical review of the Regional Supplement in order to provide information and suggest changes to improve the document. General and page-specific comments are presented in this letter. Methods referenced in this letter are presented in Appendix 1. Lang (2005), attached, presents supporting evidence.

General Comments

1. The Department believes that the use of aquatic invertebrates as a diagnostic environmental characteristic of wetlands in the arid West is a valid and overlooked tool. In the attached document, Lang (2005) summarizes the evidence for their use as wetland indicators and diagnostic environmental characteristics.

A. **Branchiopoda as a wetland *Diagnostic Environmental Characteristic*:** The scientific literature is replete with descriptive studies and empirical data supporting the argument posed by Lang (2005) here that aquatic invertebrates should be considered as a *Diagnostic environmental characteristic* along with hydric soils, hydrophytes, and hydrology. Among these taxa, the Branchiopoda (orders Anostraca, Notostraca, Laevicaudata, Diplostraca) epitomize obligate wetland species that are particularly indicative of temporary wetlands and waters nationwide. Their presence in ephemeral pools can be detected easily as free-swimming organisms in the wet phase and as cysts during the dry phase (see Appendix 1).

Due to their ubiquitous distribution throughout the United States (albeit sporadic across the landscape), the inclusion of these particular taxa as a *Diagnostic environmental characteristic* can serve as a reliable wetland indicator that would compliment well the traditionally used three factor approach for wetland identification. The application of this approach is not limited to "Problem Area wetlands" and "Atypical Situations" in the Arid West, but is applicable to other regional supplements as well. Moreover, where any life stage of large branchiopod crustaceans is detected in the absence of any one of the three accepted wetland characters (hydric soils, hydrophytes, hydrology), technical guidance documents (the Supplement and Manual) could even consider these crustaceans as a stand-alone wetland *Diagnostic environmental characteristic,* as the CE has indicated is acceptable in limited instances identified in the Manual*. The reliability of large branchiopod crustaceans as a diagnostic wetland characteristic can be reinforced by using indicators of Ordinary High Water Mark (OHWM), as is advocated in the Supplement for playas (see p. 81, 5e.), or by other criteria in Chapter 4 (Wetland Hydrology Indicators, Group B and Group C), Chapter 5 (Problematic Hydrophytic Vegetation, Problematic Hydric Soils [**Seasonally Ponded Soils;** soils ponded or saturated for ≥14 consecutive days; Supplement, P. 87]), Brostoff et al. (2001), and Lichvar et al. (2004).
(*Branchiopod crustaceans occur commonly in temporary waters of human-created depressions [e.g., roadside pools and ditches, 2-track tire ruts, dirt tanks, water catchments]. Use caution in such areas where life stages of these crustaceans may occur in man-made wetlands.)

B. **Other invertebrates as a wetland *Diagnostic Environmental Characteristic*:** Additional taxa of invertebrates may merit consideration as indicators of a wetland *Diagnostic environmental characteristic* for temporary waters. However, the designation of such species will require expertise of scientists from regions throughout the United States, who are familiar with the autecology and synecology of taxa in these diverse groups and seasonal habitats. It is recommend that the CE and EPA convene a panel of invertebrate experts to: (a) determine additional invertebrate species that should be considered as candidates for inclusion as a wetland *Diagnostic environmental characteristic* for temporary waters; (b) categorize these taxa according to their wetland indicator status (e.g., OBL, FACW, FAC; or some variant thereof); and (c) develop a reference list for technical guidance. A similar approach has been employed by the CE for hydrophytic plants and hydric soils.

C. **Using Aquatic Invertebrates to Identify and Delineate Temporary Pool Wetlands:** Research in the Prairie Pothole Region (PPR) has demonstrated that remains of invertebrates can be used to identify (Euliss et al. 2001) and delineate (Euliss et al. 2002) temporary pool wetlands, even when they are dry or intensively farmed, including wet areas that are often difficult to identify as wetlands using the standard criteria (i.e., hydric soils, hydrophytes, hydrology). Since invertebrate remains are deposited relative to maximum pool elevation in any given wet season, "invertebrate delineations" are considered less variable than among standard delineations based on hydric soils or hydrophytes (Euliss et al. 2002). Wetland dry phase sampling methods described by Euliss et al. (2001) for use in the PPR are cost-effective, and are advocated here to assess their application in "Problem Area wetlands" and "Atypical Situations" in the Arid West.

D. **Jurisdictional Wetland Definition:** Whether a wetland is considered jurisdictional by statute enacted through policy and regulation, or an ecological wetland based on biotic

components, abiotic factors and geomorphic setting, is secondary to the fact that both plants and animals occur in wetlands and waters of the United States. The federal definition of a wetland (i.e., "a prevalence of vegetation typically adapted for life in saturated soil conditions") is antiquated and does not incorporate current knowledge of the ecological role of invertebrates in wetlands. This definition excludes not only aquatic animal taxa typically adapted for life in saturated and unsaturated soil conditions, but as a result of the SWANCC decision, it now may be interpreted to exclude many isolated, non-navigable, intrastate waters that do not have a "significant nexus" or are not "adjacent" to other waters of the US. The concept that temporary waters (ephemeral pools and intermittent streams) in geographically isolated basins constrain their faunas (i.e., broad interpretation of the "Migratory Bird Rule", SWANCC) is exposed in the literature as being based on human perception with disregard for ecological functions and values of waters that are intrastate, non-navigable, and not tied to interstate commerce.

E. Contrary to the SWANCC decision that was based primarily on the "Migratory Bird Rule", plant and animal taxa characteristic of wetlands and water of the United States, just like water and water pollution that flows downhill to "adjacent" wetlands and "navigable waters", are biotic elements shared with geographically isolated wetlands and waters. It is acknowledged here that delineation of these waters in non-tidal areas is based on OHWM indicators, which is beyond the scope of the Arid West Supplement. Notwithstanding, at some point in the future it would behoove federal regulatory authorities to consider redefining the definition of a jurisdictional wetland (also beyond the scope of the Supplement) to include animal taxa as another key wetland feature. Such an operational definition could be: *"The CE and the EPA jointly define wetlands as: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils, and a prevalence of animals typically adapted for life in saturated and unsaturated soils. Wetlands generally include..."*

2. Since global warming is likely to reduce the duration and extent of hydrological saturation or inundation of wetlands, delineation manuals need to account for anticipated changes in hydrologic conditions and vegetation so that such habitats continue to receive protection. As water availability diminishes, reduced hydrologic support for hydrophytic vegetation will probably result in changes in plant composition to more drier site species, and currently-used indicators (e.g., OBL, FAC-wet) may no longer be able to identify these modified wetlands. Such wetlands in transition are still vital habitats that warrant protection. Being able to delineate these modified wetlands will likely require modified criteria that account for less hydrology (i.e., reduced water availability), fewer obligate wetland and facultative wet plant species, and possibly reduced development of hydric soil conditions in the long term. Such a transitional situation exists in arroyo riparian habitats in New Mexico. Perhaps those wetland types that are influenced by climatic fluctuations, including vernal pools, grassy playas, seeps, and springs, should be put in a special category with criteria that account for modified hydrology and vegetation. Under the current manual and supplement, such situations would probably fall under Problem Area wetlands or Atypical Situations.

Arroyo riparian habitats have been described in New Mexico, and plant community classifications for these habitats have been developed based on plant species presence. Analogous classifications could be developed for wetland types that are influenced by climatic

fluctuations, including vernal pools, grassy playas, seeps, and springs, where the existing delineation criteria no longer identify them as important wetland habitats. The intent of developing modified delineation criteria is to recognize and protect transitional wetlands with aquatic habitat value during their natural succession to upland, terrestrial habitats. Since global warming is expected to last for at least a century even under the most optimistic scenarios of greenhouse gas emission reductions, natural succession of wetlands to uplands will last for the foreseeable future.

Climate change, particularly global warming, is expected to modify plant phenology regardless of changes in wetland plant community composition. As air temperatures, then soil temperatures, increase, use of long-term records gathered at National Weather Service meteorological stations will give misleading data regarding actual air temperatures.

3. The linkage between indicators of Ordinary High Water Mark (OHWM) and wetland hydrology need to be identified and recognized as part of the wetland delineation process for the arid West. Delineation of ephemeral wetlands and those wetlands that only experience occasional inundation sufficient to support hydrophytic vegetation can benefit from use of OHWM indicators.

Page-specific Comments

Page 6, first full sentence: The NMED (2000) also estimated wetland land surface area in New Mexico as less than one percent.

Page 47, F.9 Vernal Pools: In ecological literature, the term "vernal pools" has been used historically in reference to seasonal or temporary pools that fill during the spring (Wiggins et al. 1980; see also definition of "vernal"), and more recently in reference to similar habitats in California (see Witham 1998, Eriksen and Belk 1999). Depending on geographical perspective, temporary pools have been given a plethora of names (e.g., prairie potholes, playa lakes, salt lakes, alkali flats, pocosins; see Tiner et al. 2002, Tiner 2003). Recommend changing the term "Vernal Pools" to either "Seasonal Pools" or "Temporary Pools." It is further recommended that federal authorities develop regional lists that standardize and characterize the use of "scientific" and colloquial names for temporary waters (i.e., ephemeral pools) in all Regional Supplements.

Page 49, Chapter 4—Wetland Hydrology Indicators, Introduction, first paragraph, last sentence: Based on the argument above, we suggest adding the term "aquatic invertebrates" or "invertebrates" (possibly "macroinvertebrates") as a wetland hydrology indicator (i.e., "Therefore, to the extent possible, wetland hydrology indicators are evidence of ongoing or recent flooding, ponding, or soil saturation or provide other evidence that hydric soils (insert comma) ~~and~~ hydrophytic vegetation (insert: ", and invertebrates") reflect contemporary site conditions.")

Page 50, Wetland Hydrology Indicators, first paragraph, second sentence: Again, based on presentation of scientific evidence in Lang (2005; attached) and General Comments 1.A-C above, recommend the following change. "Indicators in Group A are based on direct observation of the surface water or groundwater during a site visit (add: ", or direct observation of free-swimming or crawling invertebrates, crustacean cysts, insect eggs and head capsules, or early insect life stages (larvae, pupae, nymphs)."

Page 51, Table 4.1: Suggest adding invertebrates as a Group A Indicator.

Page 61, Indicator: B11—Aquatic invertebrates: A general comment here is that insects produce eggs, oviparous crustaceans produce cysts, and "dead eggs" will likely not be found (a dead embryo decomposes rapidly). Suggest rewording first sentence under "**General Description:**" to read, more or less, as: "Presence of live individuals, diapausing insect eggs or crustacean cysts, dead remains (e.g., snail shells, clam valves, chitinous exoskeletons, insect head capsules) of aquatic invertebrates, such as snails, clams, insects, ostracods, and other crustaceans on the soil surface." See Photo A and Photo B below.

Cautions and User Notes, second sentence: Some general comments here merit discussion. Exoskeletons of branchiopod crustaceans (clam shrimp, tadpole shrimp) will persist on the dried soil surface for of a temporary pool. As such, their presence is a reliable indicator of recent inundation. Cysts of branchiopod crustaceans will persist in the upper 1-2 centimeters of dried temporary pool sediments or deeper in mud cracks characteristic of Vertisol soils of temporary pools. The cyst bank remains viable for decades, and represents the propagules of the next generation lying "dormant" in wait of environmental stimuli (water, specific hydrochemical conditions) that will trigger a hatch. Accordingly, the cyst bank is reliable indicator of wetland hydrology, identification, and delineation.

Cysts of large branchiopods are morphologically distinct and generally much larger (200-350μ dia.) than those of other crustaceans (e.g. cladoceran, ostracods, copepods). Collection methods to determine the presence of large branchiopod crustaceans in temporary pool sediments are described in Appendix 1.

Photo A: Carapaces of tadpole shrimp (*Triops* sp.) and clam shrimp (*Leptestheria compleximanus*) in dried sediments of an ephemeral pool. Photo: Brian Lang.

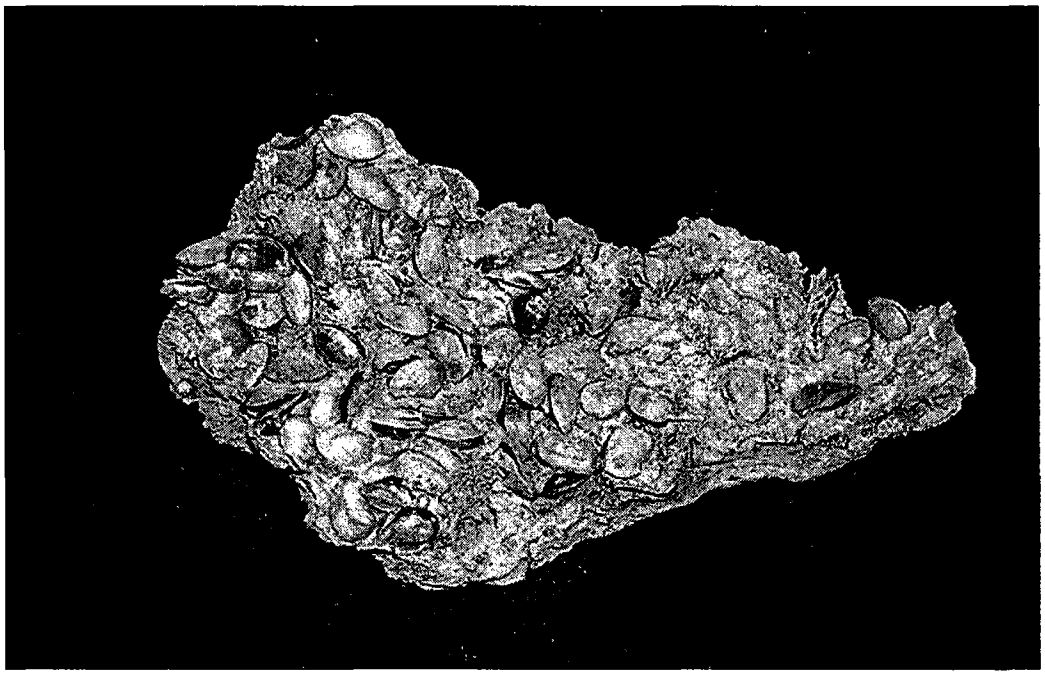

Photo B: Clam shrimp carapaces in dried ephemeral pool sediment. Photo: Marty Frentzel.

Page 79: Problematic Hydrophytic Vegetation: Indicators of wetland hydrology can properly include OHWM and use methods developed for arid playas (e.g., Lichvar et al. 2004). In the future under global warming and climate change, precipitation may not result in a "normal rainfall year". References to conditions under "normal years" may no longer be useful.

Pages 91-95, Wetlands that Periodically Lack Indicators of Wetland Hydrology: The presence of branchiopod cysts is a reliable indicator of wetland hydrology. Suggest adding this criterion under Procedure 3, pp. 92-95. Sampling methods are described in Appendix 1.

Pages 92-93: Precipitation patterns will probably change as a result of future climate change, and relying on 30-year weather records to determine "whether precipitation was normal" may no longer apply. This supplement should develop methods to account for long-term changes in precipitation patterns and water availability.

Pages 93-94: Predictions of the impacts of global warming on New Mexico include warmer winters, less snowpack, earlier snowmelt, and reduced springtime water availability. Such changes may result in the long-term absence of wetland hydrology indicators and shifts in the wetland plant community. As stated above, being able to delineate these modified wetlands will likely require modified criteria that account for less hydrology, fewer obligate wetland and facultative wet plant species, and possibly reduced development of hydric soil conditions in the long term.

Page 95: The Corps standard for monitoring frequency of hydrology indicators that uses a minimum frequency of 5 years in 10 (at least 50% probability) is not likely to be met in the future due to reduced water availability under global warming and climate change.

Thank you for the opportunity to review the Draft Arid West Regional Supplement. If you have any

questions, please contact Randy Floyd at (505) 476-8091 or by email at randy.floyd@state.nm.us or Brian Lang at (505) 476-8108 or by email at brian.lang@state.nm.us .

Sincerely,

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Literature Cited

Brostoff, W., R. Lichvar, and S. Sprecher. 2001. Delineating playas in the Arid Southwest. U. S. Army Corps of Engineers, Engineers Research and Development Center, Technical Report ERDC-01-4.

Eriksen, C. and D. Belk. 1999. Fairy shrimps of California's puddles, pools and playas. Mad River Press, Inc. Eureka, California.

Euliss, N. H., Jr., D. M. Mushet, and D. H. Johnson. 2001. Use of macroinvertebrates to identify cultivated wetlands in the Prairie Pothole Region. Wetlands 21(2):223-221.

Euliss, N. H., Jr., D. M. Mushet, and D. H. Johnson. 2002. Using aquatic invertebrates to delineate seasonal and temporary wetlands in the Prairie Pothole Region of North America. Wetlands 22(2):256-262.

Lang, B. 2005. Aquatic Invertebrates: The Missing Link in Jurisdictional Determinations of Waters of the United States. New Mexico Department of Game and Fish, Santa Fe.

Lichvar, R. G. Gustina, and R. Bolus. 2004. Ponding duration, ponding frequency, and field indicators: a case study on three California, USA, Playas. Wetlands 24(2):406-413.

New Mexico Environment Department. 2000. New Mexico 2000 wetlands conservation plan. New Mexico Environment Department, Surface Water Quality Bureau, Santa Fe, New Mexico. http://www.nmenv.state.nm.us/swqb/wetlandsplan-2000.html/

Tiner, R. W. 2003. Geographically isolated wetlands of the United States. Wetlands 23(3):494-516.

Tiner, R. W, H. C. Bergquist, G. P. DeAlessio, and M. J. Starr. 2002. Geographically isolated wetlands: a preliminary assessment of their characteristics and status in selected areas of the United States. U. S. Department of Interior, Fish and Wildlife Service, Northeast Region, Hadley, MA. http://wetlands.fws.gov/Pubs_Reports/isolated/report/htm

Wiggins, G. B., R. J. Mackay, and I. M. Smith. 1980. Evolutionary and ecological strategies of animals in annual temporary pools. Archiv für Hydrobiologie, Supplement 58:97-206.

Witham, C. W. 1998. Ecology, conservation, and management of vernal pool ecosystems- Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA. 285 pp.

Appendix 1. Field methods to collect and identify large branchiopod crustaceans in ephemeral pools under wet and dry periods.

In addition to the methods below, the USFWS has posted Interim Survey Guidelines for sampling procedures of vernal pool branchiopods (see http://www.fws.gov/ventura/es/protocols.html).

Wet Phase Sampling

1. Using a 25 cm^2 aquarium net (loose weave), sample all pool depths while rapidly sweeping the net side-to-side, occasionally reversing direction 180°. Large branchiopod crustaceans, especially fairy shrimp and tadpole shrimp, are acutely sensitive to slight changes in hydrostatic pressure, and will swim away from the wake produced while sampling. Reversing direction can result in higher catch rates, since the tail of the wake often induces flow behind the sampler, passively carrying shrimp into the trailing wake.

Sample effort should not only focus on open water habitat, but also include samples from in-pool debris around vegetation, rocks, submerged logs, or any surface that reflects light, such as trash (e.g. refrigerators, plastic bottles, cans, etc.). On hot sunny days of summer, these crustaceans may congregate in deeper holes and pockets within the basin where water temperatures will be cooler than in shallower habitats.

Sampling effort should focus on the collection of male fairy shrimp since most species-specific keys are based on diagnostic male antennal characters. References for identification are listed below.

2. Preserve specimens in 95% ethanol (undenatured). Within 16-24 hours after initial preservation, decant used ethanol and replace with fresh ethanol. Avoid preserving algae with voucher material. Snap-seal™ vials (300 ml; Corning No. 1730) are particularly suited for sampling and can be reused.

Dry Phase Sampling

1. Evidence of a pool hydroperiod of sufficient duration for large branchiopods to complete their life cycle is usually noted by cracked mud surfaces and sediment layering. Cysts of large branchiopods commonly reside with the upper 1-2 cm of dried pool sediments.

Using a mason's hand trowel (preferred) or flat-blade shovel, collect soil samples (upper 1-2 cm of soil horizon) randomly throughout the pool basin, as may be indicated by a recent high water mark, cracked mud, or drift line of biotic crust or floating debris. Particularly optimal areas for collecting cysts are small depressions or deep fissures (characteristic of vertisol hydric soils) within the pool basin where gravid, moribund female shrimp congregate during the waning phase of inundation (see photos p. 20 of this document).

2. Place soil sample (ca. 500-1000 ml) in a gallon zip-lock bag. If soil samples are slightly moist, then it is imperative the material is air dried soon after collection to prevent bacterial/fungal decay of cysts. Cysts are concentrated from the soil sample by sieving through a 0.5 mm mesh screen. Identification of cysts to species level using a stereozoom dissecting scope is possible for the anostracan genera *Eubrancipus* and a few *Branchinecta.* Most *Eulimnadia* clam shrimp can be identified to species level as well. Otherwise generic level identifications are feasible for the all other fairy shrimp (Anostraca), clam shrimp (Laevicaudata, Diplostraca), and tadpole shrimp (notostracan). References for identification are listed below.

3. Species-specific identifications are also possible by rehydrating cysts and rearing neonates to adults in aquaria. Requisites for successful incubation include aeration, light (12-hr. cycle), phytoplankton, and most critical, emulating the physicochemical environment of the source pool. This is particularly true for species with habitat affinities for saline and alkaline waters. For incubation methods see Wiggins et al. (1980), Euliss et al. (2001), and Weeks et al. (1997).

References for Large Branchiopod Cyst Identification

Belk, D. 1970. Functions of the conchostracan egg shell. Crustaceana, 19: 105-106.

Belk, D. 1989. Identification of species in the conchostracan genus *Eulimnadia* by egg shell morphology. Journal of Crustacean Biology 9(1): 115-125.

Belk, D., G. Mura and S.C. Weeks. 1998. Untangling Confusion Between *Eubranchipus vernalis* and *Eubranchipus neglectus* (Branchiopoda: Anostraca). Journal of Crustacean Biology 18(1):147-152.

Hill, R. E., & W. D. Shepard. 1997. Observations on the identification of California anostracan cysts. Hydrobiologia 359:113-123.

Martin, J. W. 1989. *Eulimnadia belki*, a new clam shrimp from Cozumel, Mexico (Conchostraca: Limnadiidae), with a review of Central and South American species of the genus *Eulimnadia*. Journal of Crustacean Biology 9(1): 104-114.

Martin, J. W. and D. Belk. 1989. *Eulimnadia ovilunata* and *E. ovisimilis*, new species of clam shrimps (Crustacea, Branchiopoda, Spinicaudata) from South America. Proceedings of the Biological Society of Washington 102: 894-900.

Mura, G. 1991. SEM morphology of resting eggs in the species of the genus *Branchinecta* from North America. Journal of Crustacean Biology 11(3): 432-436.

Mura, G. 1992. Pattern of egg shell morphology in Thamnocephalids and Streptocephalids of the New World (Anostraca). Crustaceana 62: 300-311.

Mura, G. 1992. Additional remarks on cyst morphometrics in anostracans and its significance. 2. Egg morphology. Crustaceana 63(3): 225-246.

Mura, G. 1993. Cyst morphology and hatching mechanisms in Anostraca. American Zoologist 33(5): 54A.

Shepard, W. D. & R. E. Hill. 2001. Anostracan cysts found in California salt lakes. Hydrobiologia 466: 149-158.

Aquatic Invertebrates: The Missing Link in Jurisdictional Determinations of Waters of the United States

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17 October 2005

Introduction

Indicators and procedures given in the Draft Arid West Regional Supplement (Supplement; USACE 2005) are designed to identify wetlands, as defined jointly by the Corps of Engineers (CE; Federal Register 1982) and Environmental Protection Agency (EPA; Federal Register 1980), for planning, inventory, management plans, and regulatory programs. While the determination that a wetland is subject to regulatory jurisdiction under Section 404 of the Clean Water Act (CWA) must be made independently of procedures described in this Supplement, the task of determining such authority invokes wetland identification based on the definition of a wetland and technical guidance established in the 1987 Corps of Engineers Wetlands Delineation Manual (Manual). Both the Supplement and the Manual are inherently tied to a regulatory process involving wetland determination based on identity, delineation and definition; thus, addressing one of these topics (wetland identification) alone would seem out of context with important issues related to the intent of the CWA to protect and restore the chemical, physical and biological integrity of the Nation's waters.

By considering only one key feature in the definition of a jurisdictional wetland, i.e., "a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1987), the regulatory framework fails to recognize that fauna, specifically aquatic invertebrates, are significant biotic organisms of waters of the United States that can be used to identify, delineate, and define a jurisdictional wetland. The Supplement (USACE 2005) has made laudable efforts to include invertebrates as an indicator of wetland *Hydrology*; their usefulness in delineating wetlands and waters of the United States, however, extends well beyond this basic level of consideration.

Aquatic invertebrates, like the other biotic component of an ecological wetland, i.e., *Vegetation*, are inextricably linked to wetland hydrology, soils, and vegetation—the three *Diagnostic environmental characteristics* currently used to identify and delineate a wetland (USACE 1987). While these characters can collectively or individually (under certain circumstance) identify a jurisdictional wetland, aquatic invertebrates until recently (Brostoff et al. 2001, Euliss et al. 2001, 2002; USACE 2005) have simply been ignored,

not only in regulations, policies and guidelines set forth by the CE and EPA that promulgate federal authority over waters of the United States, but also in language of the Clean Water Act (CWA) per se.

The New Mexico Department of Game and Fish (NMDGF) recommends that federal regulatory authorities (CE, EPA) strengthen language of the Supplement referring to invertebrates as indicators of wetland *Hydrology*, and also consider aquatic invertebrates as a fourth *Diagnostic environmental character* to identify, delineate, and define jurisdictional wetlands. Although these recommendations are particularly germane to the Arid West, where there occur an abundance of "Problem Area wetlands" and "Atypical Situations", such as ephemeral pools (playa lakes, alkali flats, salt basins [lakes and flats], vernal pools, rock pools, karst sinks, erosional depressions, etc.), and lotic waters (ephemeral streams [arroyos, washes], intermittent streams, perennial streams) in geographically isolated basins, it is demonstrated here that similar areas occur throughout the United States. Accordingly, information presented in this review is applicable to other regions of the country.

Background

Following the 2001 U. S. Supreme Court decision in *Solid Waste Agency of Northern Cook County v. U. S. Army Corps of Engineers* (SWANCC), agency regulatory staff (federal, state, and tribal) have been faced with a variety of intertwined legal and factual issues regarding whether particular waters of the United States are jurisdictional under the CWA (Kusler 2005). Wetland scientists responded to SWANCC with an out-pouring of papers in the professional journal *Wetlands* (Volume 23, Number 3, September 2003) that compile and make available scientific information for post-SWANCC policy development. Several states (Wisconsin, Indiana, Ohio) reacted to SWANCC by adopting legislation that requires a state permit if a wetland is not regulated by the CE, and others (New York, Illinois, Connecticut, North Carolina, South Carolina) are considering similar wetland legislation or administrative rule changes (Christie and Hausmann 2003).

Parenteau (2005) details a number of legal scenarios where questionable interpretations of SWANCC have resulted in "bad calls", some of which pertain to the Arid West region, including New Mexico. The apparent lack of CWA protection to intrastate, non-navigable waters in New Mexico prompted the NMDGF (2005) to consider wetlands (ephemeral pools, intermittent streams) in geographically isolated basins among the most threatened type of aquatic habitats in the state.

Recently, ecologists have defined isolated wetlands based on landscape setting by recognizing patterns of smaller wetland patches contained within a larger upland matrix (Leibowitz 2003). These wetlands have been variously described as "rare and highly dispersed habitats", "highly disjunct", "islands in a terrestrial landscape", and "not adjacent to another body of water" (see references in Leibowitz and Nadeau 2003). Tiner (2003) defined "geographically isolated wetlands" as "wetlands that are completely surrounded by upland (i.e., terrestrial plant communities or undrained hydric soils surrounded by non-hydric soils...)." While Tiner's definition avoids the need to characterize difficult-to-assess hydrologic or ecologic processes in the field, and appears

recommended as a practical operational approach (Leibowitz 2003), this definition is likewise partially implicit with the CE's three parameter approach for identifying and delineating a wetland, at least in terms of hydric soils and vegetation. As recognized in the Supplement (Chapter 5), "Problem Area wetlands" and "Atypical Situations" exist in naturally occurring wetland types that periodically lack the three commonly used wetland indicators. Aquatic invertebrates can fill this gap by serving, not only as a reliable indicator of wetland *Hydrology*, but also as a wetland *Diagnostic environmental character.*

Whereas most wetland ecologists would agree that there is no such thing as an isolated wetland (i.e., "everything is connected to everything else"; Tiner 2003), perhaps the term "isolation is best understood with respect to a specific process or organism [emphasis added] and not a generic property of a wetland." (Leibowitz 2003). From this perspective and in the context of this paper, a specific process refers to the interaction of hydrology and biotic expressions within the wetland isolation–connectivity continuum and an "organism" is considered a plant(s) or animal(s).

Invertebrates of Temporary Waters

Aquatic invertebrates of New Mexico, known to inhabit temporary wetlands and waters of geographically isolated basins, include diverse taxonomic groups in the Turberllaria, Annelida (Oligochaeta, Hirundinea), Hydracarina, Mollusca, Crustacea, and Insecta (Appendix1). This list (modified here) was developed by the New Mexico Department of Game and Fish (2003) in response to the federal proposed rulemaking on the Clean Water Act Definition of "Waters of the United States (Federal Register 2003). Its reference here is not intended as either an exhaustive faunal annotation for New Mexico, or as a representative listing for other states; rather, the list serves as a template for the consideration of animal taxa as a reliable wetland character. Notwithstanding, this taxonomic compilation is based on published faunal accounts (Sublette and Sublette 1967; Belk 1975; Cole et al. 1996; Metcalf and Smartt 1997; Jacobi et al. 2005, see references therein; Rogers et al. In Review), agency reports (Davis and Hopkins 1993; Davis et al. 1996a, 1996b; Lang and Rogers 2002), consultations with professional invertebrate biologists (university faculty, consultants, agency staff), and the author's knowledge and experience with mollusks and crustaceans of wetland habitats throughout New Mexico.

Similar faunal accounts of aquatic invertebrates that occur in isolated temporary wetlands and waters (ephemeral pools and intermittent streams) throughout the United States are published for: Californian vernal pools (Witham 1998, references therein; Eriksen and Belk 1999) and intermittent streams (Usinger 1956, Abell 1984); ephemeral pools (Belk 1977, 1992) and intermittent streams (Boulton et al. 1992, Clinton et al. 1996) in Arizona; playas of the Southern High Plains (Hall et al. 2004); intermittent streams in Texas (Snellen and Stewart 1979), Oklahoma (Miller and Golladay 1996) and Alabama (Feminella 1996); and ephemeral pools in Wisconsin (Schneider and Frost 1996). Comparisons of intra- and inter-continental patterns of invertebrate diversity in temporary waters can be found in Williams and Hynes (1976, 1977), Wiggins et al. (1980), Williams (1983, 1987, 1996, 1997), and Batzner et al. (2005). A global

perspective of the biodiversity of animal species in freshwaters is summarized in Leveque et al. (2005).

Adaptations to Life in Temporary Waters

"...we consider true 'freshwater' species [animals] *to be those that complete part or all of their life cycle in 'freshwater', and water-dependent species those that need 'freshwater' for food or that permanently use 'freshwater' habitats."* Leveque et al. (2005).

Faunal studies of temporary waters worldwide document the occurrence of invertebrate taxa with specific attributes that allow them to exploit seasonal habitats exclusively, or both permanent and temporary waters to complete various life history stages. A variable hydrologic regime selectively favors invertebrate assemblages dominated by habitat specialists ("extremophiles", Leibowitz and Nadeau 2003). Invertebrates occurring in temporary waters of geographically isolated wetlands have adopted diverse ecological strategies (physical, physiological, behavioral, life history) that support evolutionary evidence of adaptations to cope with harsh physicochemical environments of predictable and stochastic wet-dry periods (Wiggins et al. 1980; Williams 1987, 1997, 1996; Collinson et al. 1995; Eriksen and Belk 1999). The survival of invertebrates in temporary waters is constrained ecologically by physicochemical processes, life history characteristics, and biotic interactions; however, the relative importance of these constraints depends largely on habitat (hydroperiod) duration (Wiggins et al. 1980; Williams 1996, 1997; Schneider and Frost 1996). The three primary evolved strategies by which aquatic invertebrates survive in temporary waters are physiological tolerance, life history adaptation, and migration (Williams and Hynes 1976, 1977; Wiggins et al. 1980; Williams 1997; Eriksen and Belk 1999).

Physiological Tolerance

Physiological tolerance in aquatic arthropods usually involves some form of diapause, a cessation of normal development (optional, obligatory, or internally controlled) during the life cycle of an organism in which most physiological processes are suspended until initiated again in response to favorable external environmental stimuli (wet phase). Depending on the species, diapause in insects inhabiting temporary waters can occur at any life stage (as eggs, larvae, pupae, or adults). In general, egg diapause may occur when oviposition places eggs in pool or stream benthic substrata, where larvae break out of egg chorions but remain in a gelatinous egg-matrix within the dried sediments until the stimulus of surface water is received (Wiggins 1977, Wiggins et al. 1980, Stewart and Stark 2002). At more advanced ontogenetic stages (larva, pupa, adult), diapause may result from direct loss of water from the organism's body that is encased in a protective cover. The animal thus becomes dormant when dehydrated, but resumes growth when water is restored (Hinton 1960). Yet in other species (e.g., *Aedes* mosquitos) there appears to be a formal set of requisite criteria before growth can continue (reviewed by Danks 1987). Such a mechanism clearly appears to prevent premature growth due to "false-positive" environmental conditions.

A very different safety mechanism is well-documented in large branchiopod crustaceans (Anostraca, Notostraca, Laevicaudata, Diplostraca, Cladocera) and the Copepoda (see Wiggins et al. 1980, Pennak 1989, Eriksen and Belk 1999). Immediately following fertilization, embryonic development proceeds until the late gastrula stage with embryos encased by a multi-layered, membranous "shell" that is derived from previous molts. During the wet phase, the "shelled embryos" (cysts) are ejected to the water column, deposited in the substrate, or retained in the female's brood pouch until death. The cyst bank remains in the dried pool sediments awaiting favorable conditions during the next period of inundation. Cysts are thus analogous to the seeds of a flowering plant. Under natural conditions the diapausing cyst bank can lie dormant in basin sediments from one to 20 years, or longer, until the next period of inundation (Steiert 1995). Estimates of anostracan cyst longevity from laboratory studies ranged from 16 to 25 years (Belk 1998). The longest reported record is from brine shrimp (*Artemia*) cysts recovered from an oil core drill in Utah dated 10,000 years old that hatched when rehydrated (Browne 1993). The shortest period of reproduction (from cysts to reproducing adults to cysts) observed in the field is three days for the endemic Californian fairy shrimp, *Branchinecta mesovallensis* (D. C. Rogers, unpub. data).

In mollusks, physiological tolerance during inclement environmental conditions may simply be accomplished by hibernestivation—a period of rest or inactivity during unfavorable conditions existing through both hot and cool seasons (Maggenti and Garner 2005). Sphaeriid bivalves (fingernailclams, peaclams) and pulmonate gastropods burrow into moist substrata of seasonally or perennially astatic wetlands (Herrington 1962, Burch 1975). Similar behavioral response to desiccation is demonstrated by odonate nymphs (Delucchi and Peckarsky 1989) and leeches (Pennak 1989) that migrate downward to the hyporheic zone in intermittent streams and drying sediments of ephemeral pools. Paludal species of land snails (pupillids, succineiids, *Linisa texaniana*), with known habitat affinities for isolated wetland habitats (Burch 1962, Bequaert and Miller 1973, Metcalf and Smartt 1997), secrete a breathable, protective mucous membrane (epiphram) over the shell aperture to survive adverse conditions of summer and winter, as do aquatic snails (Wiggins et al. 1980).

Life History Adaptation

Life history modification is influenced by internal factors (e.g., physiology, behavior, morphology), which tend to restrict life history traits to genetically pre-determined ranges, and environmental factors (water loss, temperature, food, photoperiod, biotic interactions). In general, invertebrates of temporary waters exhibit traits of r-selected species (sensu MacArthur and Wilson 1967): high powers of dispersal (i.e., insects), rapid growth, short life-span, and small size (Wiggins et al.1980).

Community structure of temporary waters is influenced most by hydroperiod (Wiggins et al. 1980, Schneider and Frost 1996, Eriksen and Belk 1999) and may consist of diverse trophic levels (herbivores, omnivores, predators) and habitat specialists. Temporary waters support particularly distinctive invertebrate assemblages since hydroperiodicity confers specific advantages to particular taxa.

Among the numerous invertebrates considered as obligate wetland specialists, the large Branchiopoda (i.e., Anostraca, Notostraca, Laevicaudata, Diplostraca) represent the quintessential taxa of temporary waters. Fairy shrimp, clam shrimp, and tadpole shrimp

enjoy a worldwide distribution and occur only in seasonally astatic, perennially astatic, or aestival waters (hydrologic terms per Eriksen and Belk 1999). Excluding the Cladocera (waterfleas), there are approximately 83 species of large branchiopod crustaceans in the United States; some 20 species are undescribed (D. C. Rogers, pers. com.). The greatest degree of endemicity (8 species) occurs in vernal pools of California (Simovich 1998). Rogers et al. (In Review) documented 28 species of large branchiopods in New Mexico.

Insects display remarkable ecological plasticity for diverse freshwater habitats. Many aquatic insects are eurytopic, occurring ubiquitously in permanent waters over the landscape, but representatives of most orders demonstrate seasonal use of temporary pools and intermittent streams for feeding, reproduction, and maturation. Examples are many but a few include: (1) three caddisfly families (Wiggins 1977) and numerous dipteran families (Wiggins et al. 1980, Williams 1996) are well-represented in temporary pools: (2) capniid and taeniopteryid stonefly nymphs survive drought in intermittent streams (Harper and Hynes 1970, Jacobi and Cary 1996); (3) odonate nymphs, coleopterans and hemipterans (corixids, notonectids) exploit temporary pools and intermittent streams as predators; (4) limnephilid and phyryganeid caddisflies inhabit lentic intermittent streams (Wiggins 1977); and (5) baetid, leptophlebiid and siplonurid mayflies occur in temporary pools (Dr. Luke Jacobus, Purdue University, pers. com.) and intermittent streams (Miller and Golladay 1996). Terrestrial coleopterans (i.e., rove beetles, Staphylinidae; ground beetles, Carabidae; tiger beetles, Cicindelidae) and shore bugs (Heteroptera: Saldidae) are often overlooked as a significant biotic components of vernal pools (Williams 1987), as are bees (Andrenidae) of playa lakes (Haukos and Smith 1992) and vernal pools (Thorp and Leong 1998).

Migration

Due to powers of flight coupled with mechanisms for locating and evaluating new bodies of water, active seasonal migration between temporary and permanent wetlands is observed primarily in insects. Adult coleopterans and hemipterans, over-wintering in permanent waters, will typically disperse in spring searching for newly formed temporary ponds, where eggs are oviposited and the young mature shortly before the dry phase to return to preferred winter habitats. While some limnephelid caddisflies fly from drying streams to hibernate in nearby caves and return to lay eggs when flow resumes (Bouvet 1992), adults of other species return to dry ponds, under high relative humidity, where they deposit their eggs in protected locations (Wiggins et al. 1980). In the absence of water, embryonic development proceeds and the larvae emerge when the pool refills. Active migration has also been observed in leeches that can move short distances between adjacent temporary pools (Williams 1996).

Passive migration is typical in inveterbrates that do not have the capacity for unassisted migration. Taxa may be transported externally or internally using other animals as phoretic agents. Avian phoresy results in inter-water movement by waterbirds when mud, harboring live mollusks (sphaeriid bivalves, pulmonate snails), crustacean cysts, insect eggs, amphipods and leeches, adheres to the bird's feet and feathers; the bird flies from one body of water and inoculates another water body. Mud on the hooves of rangeland livestock (cattle and horses) and wild ungulates, and on feet of carnivorous mammals, serves a similar role of passive external transport of invertebrates. Adult insects (newly-emerging odonates, beetles, hemipterans) departing from temporary ponds

frequently carry other invertebrates (e.g., water mites) attached to their bodies and/or limbs (Williams 1997). Cysts of branchiopod crustaceans pass unharmed through the guts of waterbirds, plethodontid salamanders, and anurans that migrate between temporary ponds (Eriksen and Belk 1999, Wiggins et al. 1980). Wind and surface waters may disperse crustacean cysts and insect propagules (eggs, reduction bodies).

Conservation Implications

Based on the evidences above, temporary wetlands and waters of geographically isolated basins support species and assemblages of aquatic invertebrates that clearly differ from those of permanent wetlands and waters. The cyclical hydroperiod of a temporary aquatic environment creates a unique habitat that is distinctive enough to support invertebrate taxa either not found in any other aquatic habitat type (i.e., perennial waters), or those that attain their greatest populations (e.g., branchiopods, coleopterans, hemipterans) in temporary waters (Wiggins et al. 1980, Williams 1997). In some instances, these taxa are considered obligate aquatic habitat specialists (i.e., large branchiopod crustaceans) that cannot persist outside of the abiotic environment of temporary waters, and yet other invertebrates that utilize both temporary waters (ephemeral pools, intermittent streams) and permanent waters (i.e., jurisdictional wetlands and waters) to complete significant periods of their life cycles (Wiggins et al. 1980, Williams 1996). Such habitat use provides evidence that seasonal migration of aquatic invertebrates between temporary and permanent waters represents an ecologically relevant link between jurisdictional waters and geographically isolated waters that currently may be considered non-jurisdictional under the CWA.

In terms of contributing to the country's overall biodiversity at genetic, species and ecosystem levels, geographically isolated wetlands and waters are of considerable importance (for topical reviews see Wiggins et al. 1980, Collinson et al. 1995, Williams 1997, King 1998, Simovich 1998, Semlitsch and Bodie 1998, Witham 1998, Smith and Haukos 2002, Hall et al. 2004, Leibowtiz 2003, Tiner 2003). The ecological role of temporary waters across the landscape should not be underestimated for resident and migratory waterbirds (Tiner et al. 2002, Smith 2003) and native herpetofauna (Anderson 1997, Semlitsch and Bodie 1998, Wissinger 1999, Tiner et al. 2002, Snodgrass et al. 2000) that require geographically isolated wetlands and waters for feeding (aquatic invertebrates as food), resting, and breeding habitats.

Obviously, any conservation strategy, as realized by planning, policy, or technical guidance documents, that aims to protect the full spectrum of freshwater species, biotic communities (plants <u>and</u> animals) and their habitats needs to expand its scope to identify, delineate, and define temporary waters by acknowledging that invertebrates, like hydrophytes: (1) are significant biotic components of all freshwater wetlands and waters (temporary or perennial); (2) are typically adapted for life in both saturated <u>and</u> unsaturated soil conditions; and thus, (3) are considered as reliable indicators of wetland *Hydrology* (Brostoff et al. 2001; Euliss 2001, 2002; USACE 2005) that merit consideration as a *Diagnostic environmental character* to designate wetland jurisdiction under Section 404 of the CWA.

Even in the absence of traditionally recognized wetland characters (hydric soils, hydrophytes, hydrology), as is common in aquatic habitats in the Arid West, invertebrate taxa, by virtue of adaptive ecological and physiological strategies, can be detected in dried soils of temporary wetlands (pools and streams). Ironically, it is the absence of water that is a life requisite for many obligate ephemeral pool species, especially the large Branchiopoda, which cannot complete their life cycle in a permanent aquatic environment.

Literature Cited

Abell, D. L. 1984. Benthic invertebrates of some California intermittent streams. Pp. 46-60, *In* "Vernal Pools and Intermittent Streams", eds. S. Jain and P. Moyle. University of California Press, Davis Institute of Ecology Publication 28, Davis, CA.

Anderson, A. M. 1997. Habitat use and diets of amphibians breeding in playa wetlands on the southern high plains of Texas. M. S. Thesis, Texas Tech University.

Batzner, D. P., S. E. Dietz-Brantley, B. E. Taylor, and A. E. DeBiase. 2005. Evaluating regional differences in macroinvertebrate communities from forest depressional wetlands across eastern and central North America. Journal of the North American Benthological Society 24(2):403-414.

Belk, D. 1975. Key to the Anostraca (fairy shrimps) of North America. The Southwestern. Naturalist 20:91-103.

Belk, D. 1977. Zoogeography of the Arizona fairy shrimps (Crustacea: Anostraca). Arizona Academy of Science, 12: 70-78.

Belk, D. 1992. Observations on the clam shrimps of Arizona. Journal of the Arizona-Nevada Academy of Science, 26:132-138.

Belk, D. 1998. Global status and trends in ephemeral pool invertebrate conservation: implications for Californian fairy shrimp. Pp. 147-150, *In* Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferrin Jr., and R. Orduff (Editors). California Native Plant Society, Sacramento, California. 285 pp.

Bequaert, J. C. and W. B. Miller. 1973. The Mollusks of the Arid Southwest: with an Arizona Checklist. University of Arizona Press, Tucson, AZ.

Boulton, A. J., C. G. Peterson, N. B. Grimm, and S. G. Fisher. 1992. Stability of an aquatic macroinvertebrate community in a multiyear hydrologic disturbance regime. Ecology 73(6):2192-2207.

Bouvet, Y. 1992. Adaptations physiologiques et comparmentales de *Stenophlax* (Limnephelidae) aux eaux temporaries, Pp. 117-119, *In* "Proceedings of the Second International Symposium on Trichoptera", M. I. Crichton, ed. The Hague.

Browne, R. A. 1993. Sex and the single brine shrimp. Natural History 5:34-39.

Brostoff, W., R. Lichvar, and S. Sprecher. 2001. Delineating playas in the Arid

Southwest. U. S. Army Corps of Engineers, Engineer Research and Development Center, Technical Report ERDC TR-01-4.

Burch, J. B. 1975. Freshwater Sphaeriacean clams (Mollusca: Pelecypoda) of North America. U. S. Environmental Protection Agency, Biota of Freshwater Ecosystems Identification Manual No. 3.

Burch, J. B. 1962. How to Know the Eastern Land Snails. 1962. W. C. Brown Company Publishers, Dubuque, IA.

Christie, J. and S. Hausmann. 2003. Various state reactions to the SWANCC decision. Wetlands 23 (3):653-662.

Clinton, S. M., N. B. Grimm, and S. G. Fisher. 1996. Response of ahyporheic invertebrate assemblage to drying disturbance in a desert stream. Journal of the North American Benthological Society 15(4):700-712.

Cole, R. A., M. R. Hatch, and P. R. Turner. 1996. Diversity of aquatic animals of New Mexico. Pp. 79-100, *In* "New Mexico's Natural Heritage: Biological Diversity in the Land of Enchanment". New Mexico Journal of Science 36.

Collinson, N. H., J. Biggs, A. Corfield, M. J. Hodson, D. Walker, M. Whitfield, and P. J. Williams. 1995. Temporary and permanent ponds: an assessment of the effects of drying out on the conservation value of aquatic macroinvertebrate communities. Biological Conservation 74:125-133.

Danks, H. V. 1987. Insect dormancy: an ecological perspective. Biological Survey of Canada Monograph Series No.1, Biological Survey of Canada, Ottawa.

Davis, D. R. and J. S. Hopkins. 1993. Lake water quality assessment surveys playa lakes 1992. Surveillance and Standards Section, Surface Water Quality Bureau, New Mexico Environment Department. Report NMED/SWQ-93/2.

Davis, D. R., J. S. Hopkins, and K. Casula. 1996a. Lake water quality assessment surveys playa lakes 1993. Surveillance and Standards Section, Surface Water Quality Bureau, New Mexico Environment Department. Report NMED/SWQ-95/2.

Davis, D. R., J. S. Hopkins, and S. J. Joseph. 1996b. Lake water quality assessment surveys playa lakes 1994. Surveillance and Standards Section, Surface Water Quality Bureau, New Mexico Environment Department. Report NMED/SWQ-96/3.

Delucchi, C. M. and B. L. Peckarsky. 1989. Life history patterns of insects in an intermittent and a perennial stream. Journal of the North American Benthological Society 8(4):308-321.

Eriksen, C. and D. Belk. 1999. Fairy shrimps of California's puddles, pools and playas. Mad River Press, Inc. Eureka, California.

Euliss, N. H., Jr., D. M. Mushet, and D. H. Johnson. 2001. Use of macroinvertebrates to identify cultivated wetlands in the Prairie Pothole Region. Wetlands 21(2):223-221.

Euliss, N. H., Jr., D. M. Mushet, and D. H. Johnson. 2002. Using aquatic invertebrates to delineate seasonal and temporary wetlands in the Prairie Pothole Region of North America. Wetlands 22(2):256-262.

Federal Register. 1980. Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material. U.S. Government Printing Office, Washington, DC, 40 CFR Part 230, 45:352-353.

Federal Register. 1982. "Title 33: Navigation and Navigable Waters; Chapter 2. Regulartory Programs of the Corps of Engineers." U.S. Government Printing Office, Washington, DC, 47(138):31, 810.

Federal Register. 2003. Advanced Notice of Proposed Rulemaking on the Clean Water Act Regulatory Definition of "Waters of the United States." U.S. Army Corps of Engineers, 33 CFR Part 328 and U. S. Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, and 401. 68(10):1991-1998.

Feminella, J. 1996. Comparison of benthic macroinvertebrate assemblages in a small stream along a gradient of flow permanence. Journal of the North American Benthological Society 15(4):651-669.

Hall, D. L., M. R. Willig, D. L. Moorehead, R. W. Sites, E. B. Fish, and T. R. Mollhagen. 2004. Aquatic macroinvertebrate diversity of playa wetlands: the role of landscape and island biogeographic characteristics. Wetlands 24(1):77-91.

Harper, P. P. and H. B. N. Hynes. 1970. Diapause in the nymphs of Canadian winter stoneflies. Ecology 51:425-427.

Haukos, D. A. and L. M. Smith. 1992. Ecology of playa lakes. U. S. Fish and Wildlife Service, Waterfowl Management Handbook, Fish and Wildlife Leaflet 13.3.7:1-7.

Herrington, H. B. 1962. A revision to the Sphaeriidae of North America (Mollusca: Pelecypoda). Museum of Zoology, University of Michigan, Miscellaneous Publications, No. 118.

Hinton, H. E. 1960. A fly larva that tolerates dehydration and temperatures of –280° to +120°C. Nature 186:336-337.

Jacobi, G. A. and S. J. Cary. 1996. Winter stoneflies (Plecoptera) in seasonal habitats in New Mexico, U.S.A. Journal of the North American Benthological Society 15(4):690-699.

Jacobi, G. A., S. J. Cary, R. W. Baumann. 2005. An updated list of the stoneflies (Plecoptera) of New Mexico, U.S.A. Entomological News 116(1):29-34.

King, J. L. 1998. Loss of diversity as a consequence of habitat destruction in California vernal pools. Pp. 119-123, *In* Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferrin Jr., and R. Orduff (Editors). California Native Plant Society, Sacramento, California. 285 pp.

Kusler, J. 2005. Draft "Waters of the U. S. after SWANCC." Association of State Wetland Managers, Inc.

Lang, B. K. and D. C. Rogers. 2000. Biodiversity survey of large branchipod Crustacea in New Mexico. New Mexico Department of Game and Fish, Completion Report submitted to the Bureau of Land Management under Assistance Agreement No. GDA000013, Task Order No. 001.

Leibowitz, S. G. 2003. Isolated wetlands and their functions: an ecological perspective. Wetlands 23(3):517-531.

Leibowitz, S. G. and T-L. Nadeau. 2003. Isolated wetlands: state-of-the-science and future directions. Wetlands 23(3):663-684.

Leveque, C., E. V. Balian, and K. Martens. 2005. An assessment of animal species diversity in continental waters. Hydrobiología 542:39-67.

Lichvar, R. G. Gustina, and R. Bolus. 2004. Ponding duration, ponding frequency, and field indicators: a case study on three California, USA, Playas. Wetlands 24(2):406-413.

MacArthur, R. H. and E. O. Wilson. 1967. The Theory of island Biogeography. Princeton University Press, Princeton, NJ.

Maggenti, A. R. and S. L. Gardner. 2005. Online dictionary of invertebrate zoology complete work. http://digitalcommons.unl.edu/onlinedictinvertzoology/2

Metcalf, A. L. and R. A. Smartt. 1997. Land snails of New Mexico: a systematic review. Pp. 1-69, *In* "Land Snails of New Mexico, eds. A. L. Metcalf and R. A. Smartt. New Mexico Museum of Natural History and Science, Bulletin 10.

Miller, A. M. and S. W. Golladay. 1996. Effects of spates and drying on macroinvertebrate assemblages of an intermittent and a perennial prairie stream.

Journal of the North American Benthological Society 15(4):670-689.

New Mexico Department of Game and Fish. 2003. Response to: Advanced Notice of Proposed Rulemaking on the Clean Water Act Definition of "Waters of the United States." NMGF Document No. 8241.

New Mexico Department of Game and Fish. 2005. Draft Comprehensive Wildlife Conservation Strategy. http://fws-nmcfwru.nmsu.edu/cwcs/default.htm

Parenteau, P. 2005. Bad calls: How Corps' Districts are making up their own rules of jurisdiction under the Clean Water Act. Vermont Journal of Environmental Law 6:1-12.

Pennak. 1989. Fresh-water Invertebrates of the United States: Protozoa to Mollusca. Third Edition. John Wiley and Sons, New York.

Rogers, D. C., B. K. Lang, and A. Maeda-Martínez. In Review. The large branchiopod Crustacea (Anostraca, Notostraca, Spinicaudata, Laevicaudata) of New Mexico, USA, and adjacent areas. Hydrobiologia.

Schneider, D. W. and T. M. Frost. 1996. Habitat duration and community structure in temporary pools. Journal of the North American Benthological Society 15(1):64-86.

Semlitsch, R. D. and J. R. Bodie. 1998. Are small, isolated wetlands expendable? Conservation Biology 12(5):1129-1133.

Simovich, M. A. 1998. Crustacean biodiversity and endemism in California's ephemeral wetlands. Pp. 107-118, *In* Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferrin Jr., and R. Orduff (Editors). California Native Plant Society, Sacramento, California. 285 pp.

Smith, L. M. 2003. Playas of the Great Plains. University of Texas Press, Austin, TX.

Smith, L. M. and D. A. Haukos. 2002. Floral diversity in relation to playa wetland area and disturbance. Conservation Biology 16:964-974.

Snellen, R. W. and K. W. Stewart. 1979. The life cycle of *Perlesta placida* (Plecoptera: Perlidae) in an intermittent stream in northern Texas. Annals of the Entomological Society of America 72:659-666.

Snodgrass, J. W., M. J. Komoroski, A. L. Bryan, Jr.,and J. Burger. 2000. Relationships among isolated wetland size, hydroperiod, and amphibian species richness: implications for wetland regulations. Conservation Biology 14(2):414-419.

Steiert, J. 1995. Playas: Jewels of the Plains. Texas Tech University Press, Lubbock, TX.

Stewart, K. W. and B. P. Stark. 2002. Nymphs of North American Stonefly Genera. Second Edition. The Caddis Press. Columbus, OH.

Sublette, J. E. and M. S. Sublette. 1967. The limnology of playa lakes on the Llano Estacado, New Mexico and Texas. The Southwestern Naturalist 12(4):369-409.

Thorp, R. W. and J. M. Leong. 1998. Specialist bee pollinators of showy vernal pool flowers. Pp. 169-179, *In* Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 Conference. C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferrin Jr., and R. Orduff (Editors). California Native Plant Society, Sacramento, California. 285 pp.

Tiner, R. W. 2003. Geographically isolated wetlands of the United States. Wetlands 23(3):494-516.

Tiner, R. W, H. C. Bergquist, G. P. DeAlessio, and M. J. Starr. 2002. Geographcially isolated wetlands: a preliminary assessment of their characteristics and status in selected areas of the United States. U. S. Department of Interior, Fish and Wildlife Service, Northeast Region, Hadley, MA. http://wetlands.fws.gov/Pubs_Reports/isolated/report/htm

United States Army Corps of Engineers. 1987. Corps of Engineers Wetlands delineation manual. Wetlands Research Program, Technical Report Y-87-1 (on-line edition).

United States Army Corps of Engineers. 2005. Regional supplement to the Corps of Engineers Wetlands Delineation Manual: Arid West Region. J. S. Wakeley, R. W. Lichvar, and C. V. Noble, eds. Draft Technical Report _ , U. S. Army Engineer Research and Development Center, Vicksburg, MS. 99 pp. + appendices.

Usinger, R. L. 1974. Aquatic insects of California with keys to North American Genera and California Species. University of California Press. 508 pp.

Wiggins, G. B. 1997. Larvae of the North American Caddisfly Genera (Trichoptera). University of Toronto Press, Toronto, Canada.

Wiggins, G. B., R. J. Mackay, and I. M. Smith. 1980. Evolutionary and ecological strategies of animals in annual temporary pools. Archiv für Hydrobiologie, Supplement 58:97-206.

Williams, D. D. 1983. The natural history of a neartic temporary pond in Ontario with remarks on continental variation in such habitats. Internationale Revue der gesamten Hydrobiologie 68:230-254.

Williams, D. D. 1987. The Ecology of Temporary Waters. Timber Press, Portland, OR.

Williams, D. D. 1996. Environmental constraints in temporary fresh water and their consequences for the insect fauna. Journal of the North American Benthological Society 15(4):634-650.

Williams, D. D. 1997. Temporary ponds and their invertebrate communities. Aquatic Conservation: Marine and Freshwater Ecosystems 7:105-117.

Williams, D. D. and H. B. N. Hynes. 1976. The ecology of temporary streams. I. The faunas of two Canadian streams. Internationale Revue der gesamten Hydrobiologie 61:761-787.

Williams, D. D. and H. B. N. Hynes. 1977. The ecology of temporary streams. II. General remarks on temporary streams. Internationale Revue der gesamten Hydrobilogie 62:53-61.

Wissinger, S. A., A. J. Bohonak, H. H. Whiteman, and W. S. Brown. 1999. Habitat permanence, salamander predation, and invertebrate communities. Pp. 757-790, *In* Invertebrates in Freshwater Wetlands of North America: Ecology and Management. Edited by D. P. Batzer, R. B. Rader, and S. A. Wissinger. John Wiley & Sons.

Witham, C. W. 1998. Ecology, Conservation, and Management of Vernal Pool Ecosystems- Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA. 285 pp.

Appendix 1. Aquatic invertebrate taxa that occur in temporary wetlands and waters in New Mexico. The * denotes obligate temporary water taxa.

			Temporary Wetland and Water Type			
			Intermittent		Ephemeral	
Phylum/(Class)	**Order**	**Family**	**Stream**	**Marsh**	**Pool**	**Common Names, Genera or Species**
(Turberllaria)	Tricladida	Planariidae	X	X	X	flatworms (*Dugesia*)
Annelida	Oligochaeta	Tubifidae	X	X	-	aquatic earthworms (*Tubifex*)
	Hirundinea	Glossiphonidae	X	-	X	leeches (*Glossiphonia*)
(Chelicerata)	Acari	Arrenuridae	X	X	X	water mites
Mollusca	Veneroida	Sphaeriidae	X	X	-	fingernailclams and pillclams (*Musculium*, *Pisidium*)
	Basommatophora	Lymnaeiidae	X	X	-	*Stagnicola*
		Physidae	X	X	-	*Physa*, *Physella*
		Planorbidae	X	X	X	*Gyraulus, Helisoma, Planorbella, Pecosorbis*
		Carychiidae	X	X	-	*Carychium exiguum*
	Stylommatophora	Pupillidae	-	X	-	paludal species of *Gastrocopta*, *Pupilla* & *Vertigo*
		Succineidae	X	X	-	*Oxyloma retusum*, *Succinea* spp.
		Polygyridae	X	X	-	*Linisa texasiana*
		Limacidae	X	X	-	slugs (*Deroceras laeve*)
Crustacea (Branchiopoda)						
	Anostraca*	Artemiidae	-	-	X	brine shrimp (*Artemia fransicana*)
		Branchinectidae	-	-	X	fairy shrimp (*Branchinecta mackini, B. packardi)*
		Chirocephalidae	-	-	X	fairy shrimp (*Eubranchipus bundyi*)
		Streptocephalidae	-	-	X	fairy shrimp (*Streptocehalus* spp.)
		Thamnocephilidae	-	-	X	fairy shrimp (*Thamnocephalus* spp., *Phallycryptus*)
	Notostraca*	Triopsidae	-	-	X	tadpole shrimp (*Lepidurus lemmoni, Triops* sp.)
	Laevicaudata*	Lycneidae	-	-	X	clam shrimp (*Lynceus brevifrons*)
	Diplostraca*	Cyzicidae	-	-	X	clam shrimp (*Cyzicus*, *Eocyzicus*)
		Leptestheriidae	-	-	X	clam shrimp (*Leptestheria compleximanus*)
		Limnadidae	-	-	X	clam shrimp (*Eulimnadia*)
	Cladocera	Daphnidae	-	-	X	water fleas (*Ceriodaphia*, *Daphnia*)
	(Platycopioida)					
	Calanoida	-	-	X	X	copepods
	Cyclopoida	-	-	X	X	copepods
	Harpacticoida	-	-	X	X	copepods
	(Ostracoda)	-	X	X	X	seed shrimp

Appendix 1. (*Continued*)

Phylum/(Class)	Order	Family	Temporary Wetland and Water Type: Intermittent Stream	Marsh	Ephemeral Pool	Common Names, Genera or Species
Insecta						
	Collembola	-	X	X	X	springtails Insecta
	Ephemeroptera	Baetidae	X	X	X	mayfies (*Baetis*)
		Leptophlebidae	X	X	X	mayflies (*Leptophlebia*)
		Siphlonuridae	X	X	X	mayflies (*Siphlonurus*)
	Odonata	Libellulidae	X	X	X	dragonflies (*Libellula,Pantala, Sympetrum, Tramea*)
		Lestidae	X	X	X	damselfies (*Lestes*)
		Coenagrionidae				damselflies (*Ischnura, Enallagma*)
	Orthoptera	Acrididae	X	X	-	pygmy molecrickets
		Acrydiidae	-	-	X	grouse or pygmy locusts
	Plecoptera	Capniidae	X	-	-	stoneflies (5 genera; Jacobi and Cary 1996)
		Taeniopterygidae	X	-	-	stoneflies (*Taeniopteryx*)
	Hemiptera	Corixidae	X	X	X	water boatman
		Notonectidae	X	X	X	back swimmers
		Belostomatidae	X	X	-	giant water bugs
		Gerridae	X	-	-	water striders
		Saladidae	X	X	X	shore bugs
	Neuroptera	Sisyridae	X	X	-	spongillaflies
	Megaloptera	Sialidae	X	X	-	alderflies
	Trichoptera	Limnephilidae	X	X	X	caddisflies (*Lenarchus, Lymnephilus*)
		Phryganeidae	X	X	X	caddisflies (*Ptilostomis*)
	Lepidoptera	?	?	?	?	aquatic butterflies & moths
	Coleoptera	Cicindelidae	X	X	X	tiger beetles (*Cicindela*)
		Dysticidae	X	X	X	predaceous diving beetles
		Gyrinidae	X	X	X	whirligig beetles
		Heteroceridae	X	X	X	mud beetles
		Hydraenidae	X	X	X	minute moss beetles
		Hydrophilidae	X	X	X	water scavenger beetles
	Diptera	Ceratopongidae	X	X	X	biting midges
		Chaoboridae	X	X	X	phantom midges
		Chironomidae	X	X	X	midges
		Culicidae	X	X	X	mosquitos
		Tabanidae	X	X	X	biting flies
	Hymenoptera	Ichneumonidae	X	X	X	parasitic wasps

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October 21, 2005

Mark Sudol, D. Env.
Chief, Regulatory Branch
U.S. Army Corps of Engineers
441 G Street, N.W.
Washington, DC 20314

Dear Dr. Sudol:

The American Farm Bureau Federation (AFBF) appreciates the opportunity to comment on the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual. We have the following concerns:

1. The regional supplement supersedes the Corps of Engineers 1987 Wetland Delineation Manual and expands federal jurisdiction on agricultural lands;
2. The regional supplement appears to ignore congressional intent because the corps has been directed by Congress to use the 1987 a manual; and
3. Because this document directly affects wetland jurisdiction for Section 404 permitting, AFBF believes that public comment and any agency decision on the draft supplement should wait until after the Supreme Court rules on *Carabell v. U.S. Army Corps of Engineers* and *Rapanos v. United States.*

Only after the Supreme Court decides the scope of the CWA's jurisdictional reach can the public give a thorough and fair review of the draft and make meaningful comments. Therefore, AFBF respectfully requests that this supplement and its comment period be suspended until after the Supreme Court clarifies the limits of federal jurisdiction over wetlands.

Sincerely,

Mark Maslyn
Executive Director
Public Policy

Cc: JP Woodley
Mark Rey
Ben Grumbles
Dale Hall

VALLEY ENVIRONMENTAL CONSULTING, LLC

October 24, 2005

Ms. Katherine Trott (CECW-LRD)
U. S. Army Corps of Engineers
441 G. Street NW
Washington, DC 20314-1000

Subject: Comments on Draft Arid West Regional Supplement to 1987 Manual, Special Public Notice September 2, 2005

Dear Ms. Trott:

Thank you for the opportunity to comment on the draft regional supplement. I find that the supplement is a major improvement to the 1987 Manual. I have a number of comments, most of which are directed to standardizing soil science terminology and to improving consistency and clarity.

Page 22, header "Organic Accumulation": Suggest revising the header to read "Organic Matter Accumulation".

Page 22, under header "Iron Reduction, Translocation, and Accumulation", lines 7 and 11: Suggest changing "*iron depletions*" to "*redox depletions*".

Page 23, fifth bullet, line 4: Suggest changing "loose" to "permeable".

Page 49, third paragraph, fourth line: Suggest revising "absence or" to "absence of".

Page 54, second paragraph, second line: Suggest inserting "saturated" between "the" and "capillary".

Page 55. Indicator B6 easily could be misused. Suggest strengthening the Cautions and User Notes to clarify that this indicator does not apply to many Vertisols. Perhaps a crack depth threshold needs to be specified, and/or that evidence of fine stratifications be present.

Page 58, second paragraph: For those biotic crusts that are the free-floating algae type, perhaps a percent cover threshold needs to be specified.

Page 68: Perhaps a threshold for the prevalence of the oxidized rhizospheres needs to be specified.

Page 73, first paragraph: Suggest revising the text to read: "...during a significantly drier-than-average year".

Page 76, header and in text: Instead of the term "aquitard", suggest using "restrictive layer".

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Page 76, second paragraph, first sentence: Suggest revising text to read: "... downward percolation of water and can produce a perched water table, generally in level or....."

Page 77, second paragraph, fourth line: Suggest inserting "also" between "indicator" and "may".

Wetland Determination Data Form, page 1, fourth line: Suggest changing "Local relief" to "land surface shape" and "none" to "linear". (See the Soil Survey Manual.)

Wetland Determination Data Form, page 2, profile description: 1) Suggest adding a column for the horizon nomenclature (e.g., Ap, E, Bt); and 2) Suggest reducing the number of rows for recording horizons to about five or six.

Wetland Determination Data Form, page 2, general comment: At least one of the wetland hydrologic indicator names on the form do not match the names presented in the main text (e.g., C2).

Thank you again for allowing me to comment on the supplement. The hydric soil and wetland hydrology indicators reflect what I have seen in the field over the past 15 years. I look forward to using the supplement.

Sincerely,

Joel Butterworth
President

NMA™
THE AMERICAN RESOURCE

October 27, 2005

Mark Sudol, Ph.D.
Chief, Regulatory Branch
U.S. Army Corps of Engineers
441 G Street, NW
Washington, DC 20314

Dear Dr. Sudol:

The National Mining Association (NMA) appreciates the opportunity to comment on the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual.[1] NMA is a trade association representing producers of most of America's coal, metals and industrial and agricultural minerals. NMA's members operate mines in a variety of different geographical locations across the country, many in extremely remote and arid regions. It is not uncommon for drainage features in these areas to rarely flow and, even then, only in response to a substantial storm event. Similarly, many sites cover vast amounts of acreage and are located in the vicinity of irrigation canals, drainage ditches, and similar water management systems. Clearly, NMA members welcome the opportunity to assist in the development of a clear and predictable methodology for determining the scope of federal Clean Water Act (CWA) jurisdiction.

In that regard, the Supreme Court recently granted certiorari in three important cases addressing CWA jurisdiction. At least two of these cases, *Carabell v. U.S. Army Corps of Engineers* and *Rapanos v. United States*, raise issues that will affect the limits of Corps jurisdiction under Section 404 of the CWA. Since any revisions to the 1987 Delineation Manual will have implications on which wetlands will qualify as Waters of the United States and subject to Corps jurisdiction, the Corps should cease any further work toward completion of the Arid West Regional Supplement and any of the other regional supplements until such time as the Supreme Court has ruled on the consolidated cases.

Please contact me at (202) 463-3240 or kbennett@nma.org should you have any questions.

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[1] See U.S. Army Corps of Engineers, Public Notice, Availability of the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual, http://www.spl.usace.army.mil/regulatory/Arid%20WestPN.pdf.

Sincerely,

Karen Bennett

Karen C. Bennett
Director, Water Quality
National Mining Association

cc: John Paul Woodley, Assistant Secretary of the Army, Civil Works
Ben Grumbles, Assistant Administrator, Environmental Protection Agency
Katherine Trott, U.S. Army Corps of Engineers, Headquarters
Bruce Henderson, U.S. Army Corps of Engineers, Los Angeles District

NMA Comments

Specific Problems with the Arid West Revision

- **Vegetation Indicators: Prevalence Test**

  Using the prevalence test to indicate wetland vegetation after the site has failed the dominance test is an unnecessary expansion of the vegetation indicators. The dominance test has been adequate in identifying wetland vegetation in the past and does not need a supplemental test to qualify marginal wetland sites. Problematic vegetation situations are discussed thoroughly enough in Chapter 5 to include indicator lacking sites.

- **Hydrology Indicators**

General: Primary/Secondary Indicators:

Nearly all of the hydrologic indicators of a wetland are classified as primary indicators. This leads to the conclusion that observation of drift deposits or sediment deposits are equally as important as observation of inundation or soil saturation, which is incorrect. Further separation needs to be made to differentiate between the hydrologic indicators, with fewer primary indicators and more secondary indicators. Indicators that should be returned to/remain secondary or discarded include: 1. Surface Soil Cracks, 2. Inundation/Saturation Visible on Aerial Imagery, 3. Water-Stained Leaves, 4. Aquatic Invertebrates, 5. Crayfish Burrows, 6. Oxidized Rhizospheres Along Living Roots, 7. Presence of Reduced Iron, 8. Recent Iron Reduction in Plowed Soils, and 9. Shallow Aquitard.

In addition, it seems the increase in primary hydrology indicators is a result of the numerous problematic wetland situations in the arid west (playas, saltflats, mudflats), which are already discussed in the problematic wetland situations chapter. Identification of numerous indicators is often required for accurate delineation and therefore, the site should not qualify on the presence of just one (proposed) primary indicator (Brostoff et. al 2001). These indicators do not need to be included on a global scale because they can easily be misinterpreted in nonwetland situations.

Indicator B6 (primary): Surface Soil Cracks:

Caution and User Notes: "This indicator is usually seen in fine sediments in seasonally ponded depressions, lake fringes, or floodplains. Use caution in areas of recent sediment deposition in nonwetlands."

Problems: In arid environments, surface soil cracks can form in almost any soil and are attributed to the drying out of a previously wet soil (Soil Survey Division Staff 1993). Therefore, after a rain event in an arid region, surface soil cracks could be widespread.

Possible Resolutions: Make a requirement limiting the area (e.g. "...*must* be seen in depressions, on lake fringes..."). Change to a secondary indicator. Reject it as an indicator altogether.

Indicators B7 & C8 (primary) Inundation / Saturation Visible on Aerial Imagery

Caution and User Notes: "Care must be used in applying this indicator because surface water may be present on a nonwetland site immediately after a heavy rain or during periods of unusually high precipitation, runoff, tides, or river stages. Surface water observed during the nongrowing season may be an acceptable indicator if experience and professional judgment suggest that wet conditions normally extend into the growing season."

Problems: The expression "immediately after a heavy rain" is vague. Areas can be saturated/inundated for several days after a rainfall depending on sediment, soil type, and topographical gradient. This does not mean that the site will meet the hydrology criteria of continuous saturation for 14 days in areas with high evaporation rates (Mitsch and Gosselink 2000).

Problems such as image resolution and imagery type can be problematic in delineating wetlands (WRP 1994). Delineations relying solely on black and white photos can be inaccurate due to complications such as parent material type, sediment size. Delineation becomes increasingly more accurate when supplemented with color infrared and satellite imagery (Mitsch and Gosselink 2000).

Other problems include: 1. there is no onsite visit required to validate the mapping attempts (Brinson 1993), and 2. allowing determination during the nongrowing season based on "best professional judgement" is too subjective.

Possible Resolutions: Give an exact time frame for a recent rainfall to have occurred that either rejects or accepts an aerial photo as valid (*e.g. at least 14 days after previous rainfall*). Specify what kind of "aerial imagery" (*e.g. infrared, black and white, Landsat*) and scale is required to make accurate wetland maps. Require an onsite visit. Change to a secondary indicator.

Indicator B11 (primary) – Aquatic Invertebrates

Caution and User Notes: "Shells and exoskeletons are resistant to tillage but may be moved by equipment beyond boundaries of the wetland. They may also persist in the soil for many years after dewatering. Use caution in areas containing relict ostracod shells and other remains, such as on historic lake terraces of the Great Basin."

Problems: The prior statement indicates that shells and exoskeletons can be moved from their original location, however, this can result from not only tilling, but both wind and water transport (Soil Survey Division Staff 1993). In addition, shells can remain in soils many years after the conditions that existed to sustain them.

Possible Resolutions: Change to a secondary indicator. Reject it as an indicator altogether.

Indicator B12 (primary) – Crayfish Burrows

Caution and User Notes: "...[crayfish] require at least periodic contact with water. Crayfish burrows are usually found near streams and ponds where the seasonal high water table is at or near the surface."

Problems: Crayfish burrows can be found in a variety of environments. Moreover, primary burrowers are capable of digging up to 3 meters deep to reach the water table depending on species (Pennack 1989). Therefore, crayfish burrows are not necessarily indicative of the present water table elevation.

Possible Resolutions: Change to a secondary indicator. Reject it as an indicator altogether.

Indicator D4 (primary) – Shallow Aquitard

Caution and User Notes: "An aquitard is a relatively impermeable soil layer or bedrock that slows down the downward infiltration of water and can produce a perched water table, generally in flat or depressional landforms. Potential aquitards include fragipans, cemented layers, dense glacial till, lacustrine deposits, and clay layers."

Problems: These types of deposits (fragipans, cemented layer, lacustrine deposits, clay layers) exist in all types of geomorphic settings, including hilltops, south facing slopes, and floodplains. They can differ in depth spatially and have been found to be laterally discontinuous (Jenkinson and Franzmeier, 1996). Moreover, the leakage through fragipans depends on the network of cracks, and vertical flow of up to 23% has been found (Day et al. 1998).

Possible Resolutions: Change to a secondary indicator.

Indicator C9 (secondary) – Mud Casts

Cautions and User Notes: "Mud cast generally occur on wet flats, in seeps, and on concave surfaces, such as depressions and swales, and should be clearly deeper and more pronounced in the wetland than in surrounding upland areas. Off-road vehicles, livestock, and human footprints all may form deep impressions in saturated soils."

Problems: Mud casts can be formed after a rain event in any topographic position (Brostoff et. al. 2001). If no other hydrologic indicators exist, the existence of mud casts does not constitute a wetland.

Possible Resolutions: Reject it as an indicator altogether.

Indicator B8 (primary) – Water-Stained Leaves

Caution and User Notes: "Staining occurs on leaves that are in contact with the soil surface while inundated for long periods. Water-stained leaves maintain their blackish or dark grayish colors when dry."

Problems: Water-stained leaves can form from water that is present during the nongrowing season. Although this indicator exists in the 1987 manual, it is designated as a secondary indicator. The Arid West Regional Supplement will be changing it to a primary indicator with no apparent justification. Technical information on the formation of water-stained leaves indicates that there are numerous influencing factors that lead to the formation of water stained leaves. Furthermore, there is no way of knowing the duration of inundation (WRP 1993).

Possible Resolutions: Keep the secondary indicator classification.

Indicators (primary) C4 Presence of Reduced Iron, C6 Recent Iron Reduction in Plowed Soils

Problems: These indicators are more indicative of hydric soil characterization than of hydrology. Therefore, they should either be moved to the identification of hydric soils chapter, or used as secondary indicators.

Possible Resolutions: Move indicators to hydric soils chapter. Change to secondary indicators.

References

Brinson, M.B., 1993. A hydrogeomorphic classification for wetlands. Wetlands Research Program Technical Report WRP-DE-4. U.S. Army Corps of Engineers.

Brostoff, W., R. Lichvar, and S. Sprecher, 2001. Delineating playas in the arid southwest: a literature review. U.S. Army Corps of Engineers.

Day, R.L., M.A. Calmon, J.M. Stiteler, J.D. Jabro, and R.L. Cunningham. 1998. Water balance and flow patterns in a fragipan using in situ soil block. Soil Sci. 163:517–528.

Jenkinson, B. J. and D. P. Franzmeier. 1996. Soil moisture regimes of some toposequences in Indiana. p. 49-68 In J. Wakely and S. Sprecher (eds.) Preliminary investigations of hydric soil hydrology and morphology in Alaska, Indiana, North Dakota, Minnesota, and Oregon.

Mitsch and Gosselink 2000. Wetlands. John Wiley and Sons. New York, New York. 920 pp.

Pennak, R. W. 1989. Fresh-water invertebrates of the United States: Protozoa to Mollusca. 3rd Edition. John Wiley & Sons, Inc., New York.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

WRP Technical Note WG-SW-2.1, 1994. Remotely sensed data: information for monitoring dynamic wetland systems. U.S. Army Corps of Engineers.

WRP Technical Note HY-DE-2.1, 1993. Synthesis of literature on the use of water-stained leaves in the delineation of wetlands. U.S. Army Corps of Engineers.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N. Monroe Street • Spokane, Washington 99205-1295 • (509) 329-3400

November 2, 2005

Ms. Katherine Trott
U.S Army Corps of Engineers, HQ
441 G Street Northwest
Washington DC 20314

Dear Ms. Trott,

Thank you for the opportunity to comment on the Special Public Notice regarding the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual (Proponent – USACE). The Washington State Department of Ecology has reviewed the documents and has the following comments;

Water Quality Program

Any operation which would generate a waste discharge or have the potential to impact the quality of state waters, must receive specific prior authorization from Department of Ecology as provided under Chapter 90 48 RCW, Chapter 173-216 WAC, Chapter 173-220 WAC, Chapter 173-200 WAC and Chapter 173-201A WAC.

Wetlands Program

The supplement defines "A vegetation stratum for sampling purposes is defined as having >= 5% total plant cover during peak of the growing season. [Comment: This can only be determined during the peak of the growing season; it will be impossible to determine during the dormant season]

The supplement also states that: "A water table within 12 inches of the surface observed during the non-growing season may be an acceptable indicator (of wetland hydrology) if experience and professional judgment suggest that wet conditions normally extend into the growing season." [Comment: Relying on "experience and professional judgment" often results in disagreements between professionals, whether regulators or consultants. Observable and measurable criteria would be better.]

Sincerely,

Arthur Buchan, M.S.
SEPA Coordinator
Washington Department of Ecology
Eastern Regional Office
4601 N Monroe Street
Spokane, WA 99205-1295
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E043-562

Review of the Draft Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region

PREPARED FOR: Ms. Katherine Trott, U.S. Army Corps of Engineers

PREPARED BY: Denny Mengel and Jay Lorenz, CH2M HILL, Boise, Idaho and Portland, Oregon

COPIES: File

DATE: November 3, 2005

Thank you for the opportunity to review this Draft Regional Supplement for the Arid West Region. The project is an ambitious one and your product is of high quality.

Overall, we agree with the document and proposed methodology. We didn't see a lot of new material or ideas in Chapter 2, 3, and 4. The approach seems to be the same as the existing 1987 Manual with applicability to arid and non-arid regions, but has much more detail. We think the added detail really improves execution of the process you have to go through during a delineation. This information will be useful to the practitioner. We particularly liked the expanded soil section with the detailed discussions and photos of hydric soil characteristics. Pointing out the many hydric soil characteristics over and beyond the ones typically thought of (gleying, concretions, mottles, etc.) is a good reminder to folks of what they should be looking for.

The hydrology chapter was also useful due to the expanded discussion of primary and secondary indicators. The photos are a nice touch, as they serve to illustrate concepts discussed in the text.

We appreciated the guidance concerning plants. This is a tough area. If the definition of hydrophytic plants is those plants that are adapted to life in saturated soils—then doesn't it follow that plants growing in hydric soils and that meet wetland hydrology criteria are wetland plants regardless of what the USFW Service rating is? Sometimes we get into a circular argument about whether the plant community is a wetland plant community. We think your proposal helps to give delineators some flexibility in interpreting the vegetation characteristics.

We found Chapter 5 to be the most useful and innovative part of the document. It gets to the heart of the issues we must deal with on a daily basis in the arid west. We appreciate the systematic way you lay out the options to identify wetland characteristics and the flexibility to interpret what you are seeing without being bound by a rigid set of guidelines. For example, on pages 85-86, you give the delineator some options to evaluate when you find

wetland hydrology and soil, but no hydrophytic vegetation. The incorporation of being able to use a reference site or technical literature to build your case will be beneficial.

Our specific comments are as follows:

- We are not sure of the purpose of the first paragraph on Page 88. You discuss the differences between hydric soil indicators developed in natural versus irrigation induced wetlands. Why does this distinction need to be made? Current regulatory direction considers irrigated wetlands adjacent to a canal that is considered a tributary to a Water of U.S. to be jurisdictional. Does it matter in that case how the hydric soil features developed?
- One of the "problem" areas that was not discussed in Chapter 5 was intermittent and ephemeral streams. These are often other waters and technically not wetlands. However, there are many, many places in the arid west where gulches and gullies are the only potential jurisdictional water. Although the manual refers to wetlands, there are references to OHW in the context of playas and riparian wetlands. Can the manual be expanded a little more to include other (potentially) regulated waters—those gullies on hillsides that flow through winter wheat fields or sage brush communities where there appears to be a bank; may or may not have a bed (gravel deposits); most likely does not have hydric soil or hydrophytic vegetation; and may or may not have an eroded channel all the way (continuous) to a well recognized stream. These intermittent/ephemeral gullies that transport surface water, occasionally, may often make a difference on whether an interior wetland has the surface water connectivity that would make a wetland isolated or adjacent (understanding that the Supreme Court may be helping us with this very soon). Sometimes there are springs at the head of the gully. The spring may be perennial, but with water that infiltrates down stream—ending the wetland. The spring may flow into a gully that has surface flow to a navigable water during a rain storm or spring melt. Again, having guidance on in the manual on intermittent streams would help us make decisions about whether the spring is isolated. We are discussing the Clean Water Act after all, and if a canal can transport a contaminant, shouldn't an ephemeral channel be able to do the same?
- Based on the above point, please consider changing the title of the manual to *Wetlands and Other Waters of the Interior Arid West*. We believe this would be most helpful and make this a truly regional manual.

In closing, you have prepared a document that will make delineating wetlands in the arid west easier. Thank you for your efforts.

United States Department of the Interior

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In Reply Refer to:

AESO/FA
22410-2006-FA-001

November 3, 2005

Ms. Katherine Trott
National Advisory Team for Wetland Delineation
Regulatory Branch
U.S. Army Corps of Engineers
441 G Street, N.W.
Washington, DC 20314-1000

Dear Ms. Trott:

The Arizona Ecological Services Field Office of the U.S. Fish and Wildlife Service has received Public Notice 200501975-BAH,with comment period ending December 5, 2005, announcing the availability of the Draft Arid West Regional Supplement to the Corps of Engineers Wetland Delineation Manual, August, 2005. We thank you for the opportunity to review the Draft Supplement and offer the following comments for your consideration.

We agree with you that wetland delineation procedures are in need of improved accuracy and efficiency, particularly in the arid southwestern United States. The draft supplement contains a lot of technical information and methods to be used in the field during wetland delineation efforts. Though much of this information is grounded in sound science and multi-agency collaboration, we believe the methods described in the manual should be ground-tested prior to adoption. Our primary concern is whether or not the manual will delineate riparian ecosystems as jurisdictional wetlands.

The lack of section 404 jurisdiction over riparian ecosystems has been a persistent issue in the southwestern United States. In 1993 our field office prepared a Riparian Issue Paper (enclosed) that addressed the need to regulate riparian ecosystems as jurisdictional wetlands. While the statistics and contacts in that paper are outdated, the underlying ecological and biological concepts supporting the need to regulate riparian ecosystems as jurisdictional wetlands are still applicable.

We recommend that the Draft Supplement be ground-tested in Arizona, and modified if necessary, to ensure that it captures cottonwood-willow gallery forests, mesquite bosques, and other ecosystems that provide ecological wetland functions. Those methods should then be formalized into Corps regulations regarding the delineation of wetlands and supercede the 1987 Manual for application in Arizona.

We again thank you for the opportunity to review the subject Public Notice. The enclosure is posted on our webpage at http://www.fws.gov/arizonaes/. If you have any questions regarding this matter, please contact Mike Martinez (x224).

Sincerely

for Steven L. Spangle
Field Supervisor

Enclosure

cc (w/o enclosure):
District Engineer, Los Angeles District, Army Corps of Engineers, Los Angeles, CA
Chief, Regulatory Branch, Army Corps of Engineers, Phoenix, AZ
Regional Administrator, Environmental Protection Agency, San Francisco, CA
Supervisor, Project Evaluation Program, Arizona Game and Fish, Phoenix, AZ

W:/MikeMaritnez/SupplementDelineation:jsh

RIPARIAN ISSUE PAPER

LACK OF FEDERAL SECTION 404 CLEAN WATER ACT PROTECTION OF RIPARIAN AREAS IN THE ARID AND SEMI-ARID SOUTHWEST

Submitted by Arizona Ecological Services Office
US Fish and Wildlife Service
October 1993

ABSTRACT

Under the authority of the Clean Water Act (Act), jurisdictional waters of the United States are determined by the presence of adjacent wetlands as delineated by the Corps of Engineers Wetlands Delineation Manual (Manual). If adjacent wetlands are lacking, then jurisdictional waters are determined by the ordinary high water mark. However, southwestern riparian areas currently lack Federal protection under authority of the Act because they do not: (1) regularly meet all three criteria for adjacent wetlands specified in the Manual; and (2) they are frequently not protected by the Army Corps of Engineers ordinary high water (OHW) mark determination. The OHW is the line along a bank that is created by fluctuating water levels.

Jurisdictional delineations based upon OHW determinations are of concern because they are not based upon a specific flood year event; therefore, the geographic boundaries of a given delineation may vary significantly depending upon the volume of the flood event occurring prior to the determination. In addition, unless an OHW determination is made after a large flood, much of the Southwest's riparian habitat is considered non-jurisdictional. Due to this lack of Federal protection for southwestern riparian habitats, the chemical, physical, and biological integrity of many of the streams and rivers in this region is not being adequately maintained and protected.

Scientific data indicate riparian habitats in the Southwest function as wetlands which protect the integrity of the Nation's waters. In addition, southwestern riparian areas conform with the term "waters of the United States" as defined in the Environmental Protection Agency's Section 404(b)(1) Guidelines and the Army Corps of Engineers' Regulations.

Several recommendations are made for implementing Federal protection for this valuable habitat in the Southwest.

RIPARIAN FUNCTIONS

Extensive scientific data indicate southwestern riparian areas provide the necessary functions to meet the objective of the Clean Water Act (Act) to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Thus, these riparian areas should receive appropriate protection as provided through Section 404 of the Act for jurisdictional wetlands based upon their functional importance.

Although there are many definitions for riparian systems, we have chosen to use the terminology utilized for the U.S. Fish and Wildlife Service's National Wetland Inventory maps which have been expanded in Arizona to include riparian areas. For the purposes of this issue paper we define riparian systems as habitats or ecosystems that are associated with bodies of water or are dependent upon the existence of perennial or intermittent surface or subsurface water drainage. They include the aquatic ecosystem and the transitional area between the aquatic and terrestrial ecosystems, encompassing both vegetated and non-vegetated areas. Riparian plant communities include mixed broadleaf species (i.e. ash, alder, sycamore, boxelder, etc.), cottonwood-willow associations, salt cedar, and mesquite.

Southwestern riparian areas provide functions associated with wetland areas influenced by a longer, less variable hydroperiod which protect the chemical and physical integrity of our Nation's waters (i.e. ground water recharge and discharge, floodflow alteration, sediment stabilization, nutrient retention/transformation, and production export). For example, a recent functional assessment of the Verde River riparian corridor in Arizona indicated that all of these functions occurred in at least 50% of each reach when the river supported riparian habitat characterized by broad dense stands of multi-strata riparian vegetation (Sullivan and Richardson 1993).

By increasing water retention time and lateral recharge into the floodplain, riparian vegetation plays an important role in enhancing spatial and temporal aspects of groundwater recharge and discharge (Stromberg 1991 unpubl.). Riparian areas contribute to floodflow alteration by reducing flow velocity (Buer et al. 1988) and increasing surface roughness (Lisle 1988). Southwestern riparian areas provide sediment stabilization by trapping fine sediment and organic debris, add root strength to bed material, and reduce local shear stress through added roughness (Groeneveld and Griepentrog 1985, Lisle 1988, and Buer et al. 1988).

Nutrient cycling in riparian ecosystems can control nutrient transport and influence water quality. Riparian ecosystems, particularly those supporting broad, multi-strata stands of riparian vegetation, provide buffer zones between terrestrial and

aquatic ecosystems where excessive nutrients and sediments from adjacent upland areas may be trapped and assimilated before they reach sensitive aquatic environments (Brinson et al. 1981, Lowrence et al. 1984, and Rhodes et al. 1985). In addition, particulate organic material deposited in surface waters from the adjacent riparian areas provides a critical source of nutrients for a substantial portion of the aquatic biota (Lamberti et al. 1988) and maintains an important food base for the aquatic and terrestrial food chain.

Southwestern riparian areas also contribute significantly to the biological integrity, including biodiversity, of our Nation's waters. Riparian areas are renowned for their species abundance and diversity (Brown et al. 1977, Rosenberg et al. 1991). Breeding birds have higher densities in cottonwood-willow forests than in any other habitat in the Southwest, with values often exceeding those in mesic regions (Brinson et al. 1981). For example, Carothers and Johnson (1970) found breeding bird densities in some cottonwood stands along the Verde River in central Arizona in excess of 1,000 pairs per 100 acres. They also found that 19 species (56.4% of total nesting birds) nesting in the cottonwood areas of the Verde Valley have natural habitats limited to riparian vegetation. Many of these species are neotropical migratory birds. In addition, 60 percent of the vertebrate species inhabiting three National Forests along the Verde River can be found along the river and in the immediate environs (Forest Service 1981).

Riparian ecosystems provide important habitat for many threatened, endangered, and candidate species including bald eagle, peregrine falcon, ferruginous hawk, southwestern willow flycatcher, Mexican garter snake, lowland leopard frog, Huachuca water umbel, and other plants. Numerous neotropical migratory birds are dependent upon this habitat type including flycatchers, vireos, warblers, orioles, tanagers, grosbeaks, and buntings. Similarly, these areas provide important migratory and wintering habitat for a diversity of waterfowl, wading birds, shorebirds, and other wetland wildlife. Riparian areas are often critical components of cold and warm water fisheries, ensuring critical water temperature regulation, habitat configuration and complexity, and directly and indirectly sustaining key food chain components.

THREATS TO RIPARIAN AREAS

A significant amount of the riparian habitat throughout the West has been degraded or destroyed by human activity leaving only fragmented remnants of decreased quality habitat. Primary threats include grazing, increased urbanization, sand and gravel operations, water diversions, and other water resource manipulation practices. As a result of this significant habitat modification and loss, the Nature Conservancy considers the

cottonwood-willow gallery riparian forest to be globally endangered and the rarest forest type in North America (Stromberg 1992, unpubl.). As riparian habitat is lost throughout the region, the functional capability of these areas decreases on both a small and large scale, resulting in a corresponding increased threat to the integrity of our waters.

APPLICABILITY TO EXISTING FEDERAL CLEAN WATER ACT REGULATIONS

Southwestern riparian areas also conform with the term "waters of the United States" as defined in the Environmental Protection Agency's (EPA) Section 404(b)(1) Guidelines (Guidelines) and the Army Corps of Engineers (Corps) Regulations (Section 320.4(b)(2) (Corps Regulations). However, not all riparian areas are currently protected under Section 404 either by OHW determinations or the Wetlands Delineation Manual (Manual). The definition of "waters of the United States" includes:

(1) waters which are used in interstate or foreign commerce,
(2) waters whereby the use, degradation or destruction of which could affect interstate or foreign commerce including:
    (i) waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    (ii) from which fish are or could be taken or sold in interstate or foreign commerce.

As indicated above, southwestern riparian areas provide valuable habitat for many migratory waterfowl and neotropical birds. These species contribute to the economy of this region, not only through hunting of waterfowl, but they also contribute significantly to ecotourism. For example, birding contributes significantly to Arizona tourism, particularly in the southeastern portion of the State where birders can observe species whose range is otherwise limited to Mexico. The Nature Conservancy (TNC) indicated that ecotourism (e.g. bird watching, recreation, and support services) contributed approximately $1.6 million to the Sierra Vista economy located in southeast Arizona between July, 1990 and June, 1992 (Crandall et al. 1992). Thus, loss or destruction of riparian areas not only adversely impacts the quantity and quality of wildlife habitats but also detrimentally influences interstate and foreign commerce.

Loss of riparian areas could also have a detrimental effect on water quality through loss of sediment stabilization, floodflow alteration, increased water temperature, and loss of habitat through alteration of channel morphology, thus adversely impacting fisheries.

Additional criteria within the EPA's Guidelines and the Corps Regulations which support protection of southwestern riparian areas through Section 404 include the following:

Guidelines - Section 230.1

- "The guiding principle [of these Guidelines and when discharge of dredged or fill material should be controlled] should be when the degradation or destruction of special aquatic sites may represent an irreversible loss of valuable aquatic resources."

  Although riparian areas are not specifically defined as a special aquatic site in the Guidelines, there is sufficient scientific evidence which indicates that removal of riparian areas could have an irreversible impact on aquatic resources. As discussed above, the aquatic system is dependent upon riparian habitat for cover, food production, temperature moderation, bank stabilization, habitat configuration and complexity, and sediment and pollutant filtration. The status of Arizona's native fish community shows that the decline of the native fish population mirrors that of the riparian community. It is estimated that a significant portion of the native riparian areas along Arizona's major watercourses have been lost, altered, or degraded as a result of man's activities. In addition, of Arizona's 32 native freshwater fishes, 3% are already extinct, 56% are listed as endangered or threatened, and an additional 34% are being considered for listing as endangered or threatened. This decline is attributed to loss of water quantity and adjacent riparian habitat. The data indicate that we can not risk losing more of our southwestern riparian habitat, if we are to maintain these aquatic resources.

- Section 230.10 4(c) - No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States. These include:
  (2) "Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wildlife dependent on aquatic ecosystems; or
  (3) Significantly adverse effects of the discharge of pollutants on aquatic ecosystem diversity, productivity, and stability. Such effects may include, but are not limited to, loss of fish and wildlife habitat or loss of the capacity of a wetland to assimilate nutrients or purify water."

  Removal or degradation of riparian habitat will decrease the rate of nutrient retention/transformation and sediment/toxicant retention provided by the riparian vegetation, thus, increasing the movement of pollutants into and within the aquatic ecosystem and decreasing the rate of nutrient removal/transformation. High nutrient or pollutant levels in the aquatic ecosystem may also directly result in decreased habitat quality for aquatic species and indirectly

for other wildlife dependent on aquatic ecosystems.

Corps Regulations - Section 320.4(b)(2)

- "Wetlands considered to perform functions important to the public interest include:
  (i) Wetlands which serve significant natural biological functions including food chain production, general habitat and nesting, spawning, rearing, and nesting sites for aquatic or land species; ...
  (iii) Wetlands the destruction or alteration of which would affect detrimentally natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, current patterns, or other environmental characteristics; ...
  (v) Wetlands which serve as valuable storage areas for storm and flood water;
  (vi) Wetlands which are ground water discharge areas that maintain minimum base flows important to aquatic resources and those which are prime natural recharge areas;
  (vii) Wetlands which serve significant water purification functions; and
  (viii) Wetlands which are unique in nature or scarce in quantity to the region or local area."

  As discussed above, southwestern riparian areas provide all of these functions associated with wetlands. The EPA has also identified riparian wetlands of the arid and semiarid West as inland wetlands (EPA 1988). The increasing importance of riparian habitat in the Southwest is also evident at the regional and state level. For example, symposiums with a wetland and riparian ecosystem emphasis are held at a minimum annually in the region. These are supported by all major Federal agencies and many national conservation organizations.

LACK OF PROTECTION FROM WETLAND'S MANUAL CRITERIA

Although scientific data indicate southwestern riparian areas function as wetlands in protecting our Nation's waters and there is sufficient evidence that this habitat type conforms with the term "waters of the United States," these riparian areas are frequently not protected under Section 404 because they do not regularly meet all three criteria specified in the Manual.

In contrast to eastern riparian areas, southwestern riparian areas are characterized by highly variable hydrologic patterns and geomorphic characteristics which reduce the potential for formation of hydric soils. Hydrologic conditions of the Southwest are typified by extreme events and have large temporal and spatial variation. Magnitude and intensity of inundation, rather than duration of inundation, are the most relevant hydrologic criteria that affect ecosystem biodiversity. Riparian

areas are seasonally inundated with water, but due to the variable hydrologic regime, many areas are only inundated for a short duration. Riparian ecosystems of the Southwest are also water limited, maintained by influent (losing) streams, whereas riparian ecosystems of eastern and other more mesic areas are nutrient limited, occurring along effluent streams, i.e. streams that gain water from the adjacent water table (Johnson and Carothers 1982). These hydrologic conditions frequently do not satisfy the hydrology, as well as hydric soil criteria, in the Manual.

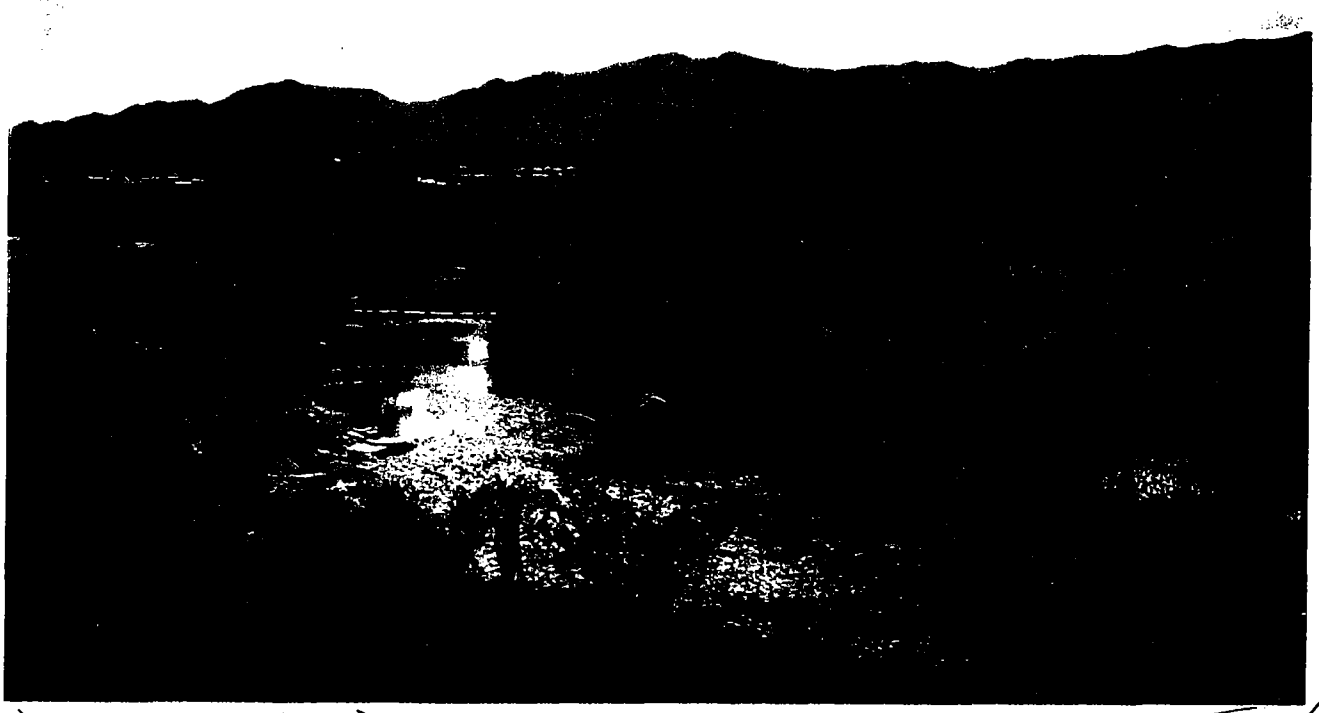
Southwestern riparian areas are predominantly supported by Entisol soils. These are young, alluvial sandy soils, often of recent deposition, with low organic matter and clay content. They are frequently of coarse texture, have low water holding capacity, and they lack well defined horizons or typical hydric soil characteristics. These soil conditions, coupled with low periodicity flooding, significantly reduce the potential for hydric soils to form.

Similar to palustrine forested swamps and bottomland hardwoods in the southeastern United States, riparian areas function as the transition zone between the drier uplands and the water. Although southwestern riparian areas lack soil and hydrology wetland characteristics of more mesic areas, they are typically dominated by obligate and facultative wetland vegetation species (i.e. Fremont cottonwood (*Populus fremontii*), narrow-leaf cottonwood (*P. angustifolia*), Arizona alder (*Alnus oblongifolia*), Goodding willow (*Salix gooddingii*), Arizona sycamore (*Platanus wrightii*), Box elder (*Acer negundo*), Arizona walnut (*Juglans major*), Arroyo willow (*S. lasiolepis*), Sandbar willow (*S. exigua*), and seep willow (*Baccharis glutinosa*)) as defined by the Fish and Wildlife Service in the "National List of Plant Species that Occur in Wetlands" (Reed 1988). Thus, indicating that these areas are dominated by vegetation typically adapted for life in saturated soil conditions. However, presence of these saturated soil conditions may not always be readily apparent.

Establishment of riparian tree species follows an orderly progression from creation of a favorable seedbed in the moist soils adjacent to the active channel, to nursery-bars, to mature stands on aggraded benches. These aggraded benches may be five feet or more above the active channel but the root crowns remain near the water table. Although these species germinate in jurisdictional waters, by the time they reach maturity they are located on aggraded terraces which are physically outside the active channel but remain dependent upon hydrologic conditions within the floodplain. Therefore, dominant vegetation species within the riparian ecosystem are unified by their dependence on seasonal or perennial surface or subsurface waters throughout their life cycle.

Figure 1 depicts a typical cottonwood-willow riparian corridor along the Verde River in central Arizona which often lacks jurisdictional wetlands as these areas frequently do not support evidence of all three criteria. Although this area is dominated by seep willow, Fremont cottonwood, and Goodding willow, it does not support hydric soils due to the predominance of Entisols.

Evidence of the presence of wetland hydrology (i.e. in this area, stream gage data and drift lines) extends to the outer edge of the first terrace. However, due to the highly variable hydrologic characteristics of the Southwest, the first terrace may not consistently provide sufficient evidence of wetland hydrology over time. As indicated in Figure 1, none of the riparian habitat supporting mid-age to mature woody riparian vegetation would be determined to be jurisdictional wetlands or waters of the United States because these areas typically lack the required soil and hydrology characteristics discussed in the Manual. However, these areas continue to support vegetation which is dependent upon and adapted to saturated soil conditions and which provides important functions for maintaining the integrity of the region's waters.



Area typically lacking wetland soil and hydrology criteria and above OHW.

Area below OHW but lacking wetland soil criterion.

Area typically lacking wetland soil and hydrology criteria and above OHW.

Figure 1 - Cottonwood-Willow Forest and Mesquite Bosque in the Southwest

LACK OF PROTECTION FROM ORDINARY HIGH WATER DETERMINATIONS

The ordinary high water (OHW) mark is the line along a bank that is created by fluctuating water levels. Field indicators to determine OHW include scour lines, shelving, changes in the character of soil, the presence of litter and debris, and the destruction of terrestrial vegetation. Jurisdictional delineations based upon OHW determinations are of concern in Arizona, because they are not based upon a specific flood year event; therefore, the geographic boundaries of a specific delineation may vary significantly depending upon the volume of the flood event occurring prior to the determination. For example, jurisdictional delineations made succeeding a small flood year event (e.g. 2-year flood event) will be significantly lower than a delineation made succeeding a 50 or 100 year flood event. An OHW determination is only valid for three years unless a major event alters the channel geomorphology; therefore, the Corps is also not restricted from making multiple determinations along a given water body over the course of several floods for different projects. There is also inconsistency within the Corps as to where the OHW mark occurs along a given waterbody. Thus, the extent to which the chemical, physical, and biological integrity of the adjacent waters is maintained through protection of riparian habitat will be influenced by the volume of the most recent flood event relative to when the determination is made. This problem is exacerbated by an inconsistency within the Corps regarding where jurisdictional limits would occur for a given water body at a set point in time.

The OHW line in Figure 1 indicates that the second terrace, dominated by obligate and facultative wetland species, is also not protected by this determination.

RECOMMENDATIONS

We recommend several alternatives for implementing Federal protection for riparian habitat in the Southwest:

(1) develop a Regional Manual;
(2) work with the EPA and the Corps to develop more clearly defined criteria for determining ordinary high water; or
(3) within the context of the Manual, define this habitat type as a wetland that is an exception to the three criteria or as a problem wetland.

Development of a Regional Manual for the Southwest, inclusive of the riparian areas as defined by the National Wetland Inventory maps for Arizona, would provide Federal regulatory criteria for delineating riparian areas along perennial and intermittent streams which, by performing as functional wetlands, would meet the objective of the Act to maintain the chemical, physical, and biological integrity of our Nation's waters. Although non-

regulatory approaches, such as Advanced Identifications, could be adopted for riparian areas, we are concerned that these areas would continue to be inadequately protected without Federal regulation.

In accordance with the Corps Regulations, OHW determinations are made for jurisdictional delineations when adjacent wetlands are not present. We recommend that the Service work with the Corps in developing further guidelines for making OHW determinations based on specific flood return event(s) which provide adequate protection of southwestern riparian areas, such that the objective of the Act is met.

The proposed 1991 Manual references wetlands (e.g. prairie potholes, playas, vernal pools, and pocosins) that are exceptions to the three criteria. We recommend that a similar approach be adopted for southwestern riparian areas. The problem wetlands recognized in the proposed 1991 Manual are characterized by high seasonal and annual variance in water availability, as is true for southwestern riparian areas. In addition, prairie potholes and playas are associated with arid and semiarid regions.

The 1991 Manual states that "wetland hydrology [of playas] is best characterized by examining hydrological indicators over a multi-year period." Such an approach should be taken with southwestern riparian areas. Examination of hydrologic characteristics over a time period of up to 10 years would reveal that many riparian areas would meet the hydrologic criteria of the Manual.

Southwestern riparian areas are more constant from the vegetation criteria than some of these other problem wetlands, such as vernal pools. Vernal pools, for example, are frequently characterized by a seasonal flux of wetland vegetation, ranging from obligate wetland species to facultative upland depending upon the time of year. The highly variable hydrology of prairie potholes also results in the invasion of facultative, facultative upland, and upland plant species. In contrast, southwestern riparian areas are typically characterized by a constant feature of obligate or facultative wetland species. Because southwestern riparian areas perform as functional wetlands and meet the objective of the Act, as due these problem wetlands, regional criteria should be developed for this habitat type.

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LITERATURE CITED

Brinson, M.M., B.L. Swift, R.C. Plantico, and J.S. Barclay. 1981. Riparian ecosystems: their ecology and status. U.S. Fish and Wildlife Service FWS/OBS-81/17, Washington, D.C.

Brown, D.E., C. H. Lowe, and J.F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona. Pages 201-211 in R.R. Johnson and D.A. Jones (tech. coords.), Importance, preservation, and management of riparian habitats: a symposium. USDA Forest Service General Technical Report RM-43, Fort Collins, CO.

Buer, K., D. Forwalter, M. Kissel, and B. Stohler. 1988. The Middle Sacramento River: Human Impacts on Physical and Ecological Processes along a Meandering River. In Proceedings of the California Riparian Systems Conference. Sept. 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110.

Carothers, S.W., and R.R. Johnson. 1970. A Summary of the Verde Valley Breeding Bird Survey. In Arizona Game and Fish Department Land & Water Projects Investigations Central Arizona Project, Project FW-16-10, Job 1, Progress Report 7-1-70 to 6-30-71.

Crandall, K., Leones, J., and Colby, B.G. 1992. Nature-based Tourism and the Economy of Southeastern Arizona: Economic Impacts of Visitation to Ramsey Canyon Preserve and the San Pedro Riparian National Conservation Area. Dept. of Ag. and Res. Econ. Univ. of Tucson, AZ.

Environmental Protection Agency. 1988. America's Wetlands - Our Vital Link Between Land and Water. Office of Wetlands Protection, Office of Water, Washington, D.C. OPA-87-016.

Forest Service. 1981. Upper Verde, Chino Valley Ranger District, Prescott National Forest. Zane Grey and Upper Recreation Requisition Composite Plans. U.S. Department of the Interior, Bureau of Conservation and Recreation Service, Pacific Southwest Region.

Groeneveld, D.P., and T. E. Griepentrog. 1985. Interdependence of Groundwater, Riparian Vegetation, and Streambank Stability: A Case Study. In Riparian Ecosystems and their Management: Reconciling Conflicting Uses. First N. Am. Riparian Conf. April 16-18, 1985. Tucson, AZ. USDA Forest Service General Technical Report RM-120.

Lamberti, G.A., S.V. Gregory, L.R. Ashkenas, R.C. Wildman, and A.D. Steinman. 1988. Influence of Channel Geomorphology on

Retention of Dissolved and Particulate Matter in a Cascade Mountain Stream. In Proceedings of the California Riparian Systems Conference. Sept. 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110.

Lisle, T.E. 1988. Channel-dynamic Control on the Establishment of Riparian Trees after Large Floods in Northwestern California. In Proceedings of the California Riparian Systems Conference. Sept. 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110.

Lowrence, R., J. Fail. Jr., O. Hendrickson,, R. Leonard Jr., and L. Rasmussen. 1984. Riparian Forests as Nutrient Filters in Agricultural Watersheds. BioScience 34(6):374-377.

Reed, P.B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Southwest (Region 7). U.S. Fish and Wildife Service Biol. Rep 88(26.7).

Rhodes, J., C.M. Skau, D. Greenlee, D.L. Brown. 1985. Quantification of Nitrate Uptake by Riparian Forests and Wetlands in an Undisturbed Headwaters Watershed. In Riparian Ecosystems and their Management: Reconciling Conflicting Uses. First N. Am. Riparian Conf. April 16-18, 1985. Tucson, AZ. USDA Forest Service General Technical Report RM-120.

Rosenberg, K.V., R.D. Ohmart, W.C. Hunter, and B.W. Anderson. 1991. Birds of the Lower Colorado River Valley. University of Arizona Press, Tucson.

Stromberg, J. 1992. Cottonwood-willow Forest Element Stewardship Abstract. Prepared for The Nature Conservancy, Western Regional Office. Unpublished.

Stromberg, J. 1991. Draft Sonoran Riparian Cottonwood-willow Forests. Prepared for Environmental Defense Fund. Center for Environmental Studies, AZ State Univ., Tempe, AZ.

Sullivan, M.E. and M.E. Richardson, 1993. Functions and Values of the Verde River Riparian Ecosystem and an Assessment of Adverse Impacts to these Resources: A Supporting Document for the Initiation of the Verde River Advanced Identification. U.S. Fish and Wildlife Service. Phoenix, AZ.

U.S. Environmental Protection Agency (EPA). 1988. America's Wetlands - Our vital link between land and water. Office of Wetlands Protection, Office of Water, Washington D.C. OPA-87-016.

CENTER FOR BIOLOGICAL DIVERSITY

VIA ELECTRONIC MAIL AND U.S. MAIL

December 5, 2005

Katherine Trott (CECW-LRD)
U.S. Army Corps of Engineers
441 G Street, N.W.
Washington, D.C. 20314-1000
Email: 1987Manual@usace.army.mil

Re: Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual
Public Notice No: 200501975-BAH

Dear Ms. Trott,

The Center for Biological Diversity ("Center") submits these comments on the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual ("Draft Arid West Regional Supplement") prepared by the Army Corps of Engineers ("Corps"). The Center is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has over 15,000 members throughout the western United States. These comments incorporate by reference the comments submitted by the California Native Plant Society.

The Center is particularly interested in the criteria used to delineate wetlands in the arid west because many rare, threatened, endangered, and special status species are found in wetland areas or are dependent on wetland areas for their continued survival and recovery. The Draft Arid West Regional Supplement represents a step forward in the delineation of wetlands in arid climates where there may be large variations water availability in different seasons and where extended droughts make wetland delineation particularly difficult.

As the Draft Arid West Regional Supplement notes many types of wetlands in the arid west are not easily discerned. For example, in desert areas, normally perennial springs and marshes may disappear in particularly dry years or during extended droughts and even riparian corridors may be difficult to delineate during the dry season. *See* Draft Arid West Regional Supplement at 6, 82. Moreover, wetland areas that have been disturbed by natural events such as fires and floods, or human impacts from grazing, farming, and extensive off-road vehicle use,

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December 5, 2005

Our File Number: 0100-092105

VIA FEDEX AND E-MAIL

Ms. Katherine Trott
U.S. Army Corps of Engineers - Regulatory
HQUSACE - Attn: CECW-LRD
441 G Street, NW
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1987Manual@usace.army.mil

Re: Comments on the Draft Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region

Dear Ms. Trott:

This firm represents the California Building Industry Association ("CBIA") and a coalition of homebuilders ("Homebuilders"), including AKT Development, Brookfield Homes, Lennar Communities, and Pulte Home Corporation. CBIA and the Homebuilders have engaged three leading firms for wetlands delineations in California—Gibson & Skordal LLC, Glenn Lukos Associates, and WRA, Inc.—to review the draft *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* ("Regional Supplement"). We compliment the Corps for undertaking this task. It is clear that much hard work was put into the Regional Supplement. Nevertheless, our team found serious flaws in the document, which we believe misses the mark for a regional supplement. Contrary to its title, the Regional Supplement is neither regional nor a supplement. Instead, like the abandoned *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* ("1989 Manual"), it is a stand-alone delineation manual with revised criteria and indicators that do not address regional issues. The changes to the Corps' 1987 *Wetlands Delineation Manual* ("1987 Manual") are not based in science and have not been subject to adequate notice and comment. This is particularly troubling because use of the revised criteria will alter wetland boundaries, notwithstanding the Regional Supplement's stated intent. We found more than 30 instances in the document that could result in an expansion of wetland jurisdiction. Arguably, all of these changes are not regionally specific and could be equally applicable to the entire country. Our concerns are described in more detail in the enclosed report, "Comments on the Draft Arid West Regional Supplement to the 1987 Wetland Delineation Manual."

These issues warrant the immediate withdrawal and complete revision of the Regional Supplement. We believe the existing 1987 Manual works well in most cases, both in the "arid west" region and in other parts of the country. Rather than producing a stand-alone replacement manual, the Corps should integrate the changes needed to address specific regional conditions into the 1987 Manual as a separate section or as annotations, similar to the online edition of the 1987 Manual. These changes should be subject to full notice and comment rulemaking under the Administrative Procedure Act, consistent with congressional directive in response to the 1989 Manual, and the Corps should provide adequate time for field testing and review of the scientific evidence in the record.

We thank the Corps for the opportunity to comment on the Regional Supplement, but believe its procedural and substantive deficiencies must be addressed as described in the enclosed report. Please do not hesitate to contact me if you have any questions about these comments.

Very truly yours,

Robert J. Uram/sel

Robert J. Uram

for SHEPPARD MULLIN RICHTER & HAMPTON LLP

W02-SF:FRU\61475572.3

cc: Mark Sudol, D. Env.
Tony Bomkamp, GLA
Mike Josselyn, WRA
Tom Skordal, Gibson and Skordal LLC

COMMENTS ON THE DRAFT ARID WEST REGIONAL SUPPLEMENT TO THE 1987 WETLAND DELINEATION MANUAL

Prepared for:

California Building Industry Association
and
AKT Development
Brookfield Homes
Lennar Communities
Pulte Home Corporation

December 5, 2005

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This report presents the comments of the California Building Industry Association ("CBIA") and a coalition of homebuilders, including AKT Development, Brookfield Homes, Lennar Communities, and Pulte Home Corporation, on the draft *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* ("Regional Supplement"). It is organized in two sections. The first section provides an overview of the significant flaws identified in the Regional Supplement and a list of actions we believe need to be undertaken to remedy the problems. The second section includes a table with detailed comments on the Regional Supplement.

The Regional Supplement is a stand-alone delineation manual with revised criteria and indicators that do not address regional issues. The changes it proposes to the Corps' 1987 *Wetlands Delineation Manual* have not been supported by scientific data or subject to adequate notice and comment. Contrary to the Regional Supplement's stated intent, use of the Regional Supplement's criteria and indicators will expand wetland boundaries. This report identified more than 30 examples of instances in the Regional Supplement that could result in an increase in wetland jurisdiction.

The Corps should immediately withdraw and completely revise the Regional Supplement. Rather than producing a stand-alone replacement manual, the Corps should integrate the changes needed to address specific regional conditions into the existing 1987 *Wetlands Delineation Manual* as a separate section or as annotations, similar to the online edition. Changes to existing standards and methodology should be grounded in generally accepted scientific principles and field verified. The revised Regional Supplement should be promulgated in compliance with the Administrative Procedure Act, and the Corps should provide adequate time for field testing and review of the full administrative record.

OVERVIEW OF SIGNIFICANT FLAWS

1. The Regional Supplement Is Neither Regional Nor A Supplement.

In 1995, the National Academy of Sciences recommended that wetland delineation methods be adjusted to account for regional differences. *See* National Research Council, Wetlands: Characteristics and Boundaries (1995). The Corps purports to have followed this recommendation in developing the Regional Supplement. In the Introduction, it observes that "[r]egional differences in climate, geology, soils, hydrology, plant and animal communities, and other factors . . . cannot be considered adequately in a single national manual." Regional Supplement, at 1. The Regional Supplement was intended to address these issues by focusing on "regional wetland characteristics" and presenting "wetlands indicators, delineation guidance, and other information that is specific to the Arid West Region." *Id.*

However, very little of the Regional Supplement addresses regional wetland characteristics that are specific to the arid west. The only information tailored to the region appears in the first chapter, which contains a very brief description of the arid west region, its three subregions, and a few of the types of wetlands that may be present therein. This discussion is very general and provides no information that helps delineate wetlands. The Regional Supplement misses opportunities to offer helpful guidance on regional issues. For instance, the Corps' 1987 *Wetlands Delineation Manual* ("1987 Manual") provides limited information on problematic hydric soils such as mollisols. Given the prevalence of mollisols in the arid west, the Regional Supplement could have provided more discussion on these problem soils and the relevant indicators. It does not. Instead, it repeatedly offers general guidance that could be applied with equal validity in or outside the arid west region. For example, Chapter 3 has an extended discussion of soil sampling. Nothing in this section addresses regional issues or explains why these sampling techniques are required for the region's wetlands. In fact, as described more completely in the table of detailed comments, the Regional Supplement does not place any of the new or revised indicators within the context of the region's wetlands, and few, if any, of the new indicators and methods to identify indicators appear to address wetland characteristics that are specific to the region.

The Corps also labels the document a "supplement." It states that the Regional Supplement is "designed for use with the current version of the [1987 Manual] and all subsequent versions." *Id.* However, given the structure of the Regional Supplement, it is not clear how the two can be used together effectively. The Regional Supplement is comprehensive and contains information that, in many cases, is redundant or only slightly different from the 1987 Manual. In other areas, there are substantial changes and alterations to definitions, criteria, and indicators. Where there are such differences, the Corps clearly states that the Regional Supplement "supersedes" the 1987 Manual. *Id.* However, the areas in which the Regional Supplement supersedes the 1987 Manual are not expressly identified. The lack of integration of the Regional Supplement with the 1987 Manual will create confusion for the public in trying to understand what elements are to be used from each of the manuals and will further complicate the basis on which disputed delineations are decided during the Corps appeal process. At a minimum, the Corps should provide a table that compares the definitions, criteria, and indicators

used in the 1987 Manual and subsequent clarifications (i.e., Williams 1992 and Studt 1991), on the one hand, and the Regional Supplement, on the other hand, to provide the public with a better understanding of the changes being made in the Regional Supplement.

Although labeled a supplement, the Regional Supplement is, in its current form, a stand-alone delineation manual. The standard should be that the Regional Supplement and any other regional manual supplement the 1987 Manual and subsequent clarifications to the 1987 Manual. The Regional Supplement should focus on wetland types that are unique to the arid west and provide guidance for delineating these areas. Because the Regional Supplement fails to do either, we urge that it be withdrawn, and in its place the Corps should provide an additional section to the 1987 Manual or a series of integrated annotations under relevant criteria similar to the online version of the 1987 Manual. This would reduce the ambiguity of the relationship between the Regional Supplement and the 1987 Manual and ensure that the Regional Supplement truly supplements the 1987 Manual with region-specific information.

2. The Regional Supplement Expands Wetland Boundaries.

The Corps states that the intent of the Regional Supplement is "not to change wetland boundaries." *Id.* However, many of the new and revised indicators and criteria will clearly result in changes to wetland boundaries, and these changes almost always will increase the size of delineated wetlands. For example, the Regional Supplement changes the hydrology standard by significantly reducing the period of time for continuous saturation or inundation in areas with a 365-day growing season from 18 days in the 1987 Manual to 14 days. Regional Supplement, at 9, 85 & 87. The use of the 14-day saturation/inundation period in these areas will certainly result in an expansion of wetlands jurisdiction in comparison to the 1987 Manual.

Another example of the likely expansion results from the lack of cautionary language in the Regional Supplement on the use of FAC dominated wetlands. Under the 1987 Manual, the three-parameter wetland test was a sliding scale based on the relative reliability of various indicators. If one parameter was less reliable or ambiguous, such FAC-dominated plant communities for hydrophytic vegetation, more reliable indicators of hydric soil and wetland hydrology were required. These cautions and guidance have been largely omitted from the Regional Supplement. Without this cautionary language, FAC-dominated areas are more likely to be delineated as wetlands under the Regional Supplement particularly since the minimum hydrology criterion is proposed to be only 14 days. Indeed, under the Regional Supplement, an area with a little as 5 percent vegetation cover could be considered a wetland, an apparent policy change that would result in additional areas being designated as wetlands rather than as "other waters." Because such barren areas would now be defined as "special aquatic sites" under the proposed supplement, this would also lead to an increase in Corps work load since many Nationwide Permit conditions are more restrictive when dealing with wetlands compared to "other waters". The Regional Supplement also proposes that areas that fail the hydrophytic vegetation test may nevertheless be wetlands. However, it does not address places that may have hydrophytic vegetation, such as FAC-dominated communities, that are non-wetlands. Because the purpose of a delineation manual is to delineate wetlands, it is understandable to concentrate on indicators that can be used to identify wetlands. In many cases, it would be equally helpful to

have indicators or other diagnostic tools that identify non-wetland uplands. The Regional Supplement provides virtually none.

A number of the 1987 Manual's secondary indicators (for which 2 are required) have been shifted to primary indicators (for which only 1 is required) in the Regional Supplement. This shift will result in areas being delineated as wetlands that previously would not have been under the 1987 Manual. The Regional Supplement occasionally uses the same indicator for different parameters. For example, the presence of reduced iron is used in the Regional Supplement as an indicator for both hydric soils and hydrology. *See* Regional Supplement, at 85. This effectively collapses the three-parameter test into a two-parameter test. Given that hydrophytic vegetation is assumed in certain circumstances, as noted above, some areas may be delineated as wetlands solely on the presence of hydric soils. Similar provisions were present in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* ("1989 Manual"), which used a wetland hydrology indicator for different soil types that coincided with the hydric soil criteria (1989 Manual, at 6) and assumed hydrophytic vegetation criteria was met even if the indicators for hydrophytic vegetation was not satisfied if the hydrology and hydric soils criteria had been satisfied (1989 Manual, at 5), and these issues contributed to the controversy that halted the Corps' implementation of the 1989 Manual.

In total, we found more than 30 instances where changes in indicators or methodology in the Regional Supplement will result in an expansion of wetland jurisdiction. As explained in the table of detailed comments, these include changes in the following indicators: growing season, the +/- indicators for FAC plant communities, a stepwise procedure for identifying wetland vegetation, the 50/20 rule, the prevalence index, morphological adaptations of upland plant communities, surface water, high water table, saturation, surface cracking, aerial imagery, water stained leaves, biotic crust, drift deposits, and oxidized rhizospheres. If the Regional Supplement truly is not intended to alter wetland boundaries, these issues must be addressed.

3. The New or Revised Criteria Do Not Appear To Be Scientifically Based.

The Corps states that its "intent is to bring the manual up to date with current knowledge and practice in the region." Regional Supplement, at 1. However, a number of new indicators are proposed with no scientific evidence to support their use. For example, Table 4-1 in the Regional Supplement introduces several new indicators for wetland hydrology. The Corps has not identified the scientific references or quantitative analyses to substantiate why these indicators have been selected. Presumably, the new indicators have been added to address particular situations, but these have not been documented for the public to review. In order for the public to understand that these new indicators are reliable, the indicators should be scientifically tested to determine that they are indicative of wetland hydrology (both frequency and duration). A number of new indicators, including use of aerial imagery and a new approach to including non-hydrophytic plant communities as wetlands, have not been previously tested.

Similarly, the Regional Supplement proposes new indicators for hydric soils directly derived from the NRCS's "Field Indicators of Hydric Soils in the United States". The

Corps' current policy precludes using these indicators other than as collaborative information. Including them as "stand alone" indicators will change the current policy of using them only collaboratively with other indicators. "Developing a Regionalized Version of the Corps of Engineers Wetland Delineation Manual: Issues and Recommendations" cites numerous issues relative to including these indicators within regional manuals. The Corps has not explained why these indicators are being used. Absent a sound scientific basis for including these indicators, they must be evaluated in a broad range of sites in order to determine validity and whether their addition to the Regional Supplement is, in fact, neutral.

The lack of scientific basis for the new and revised indicators is particularly troubling given the potential expansion of wetlands jurisdiction that could result from the use of the Regional Supplement. The Corps should provide the scientific basis, including citations to published literature and technical reports, for any new or revised indicator or methodology in the Regional Supplement. Without this, the public has no ability to evaluate scientific basis for the proposed changes. No revisions to indicators should be made or new indicators introduced unless and until they have been tested and verified as reliable in a transparent, peer-reviewed process.

4. The Regional Supplement Has Not Been Subject To An Adequate Public Outreach Program.

We believe that the changes in the Regional Supplement will significantly expand the extent and nature of areas delineated as wetlands. Any expansion of areas identified as wetlands has enormous economic implications for the regulated community and should be undertaken through a transparent process and with a thorough public outreach program. That has not happened here. In fact, what little public outreach that has been done is misleading. The public notices and their introductions suggest that the Regional Supplement is merely a technical clarification that does not represent a change in policy and will not result in a change in wetland boundaries. We believe this clearly is not the case.

The Corps announced the availability of the draft Regional Supplement through a public notice and posting on its district offices' websites on September 2, 2005, with a 60-day comment period that was subsequently extended to conclude December 5, 2005. No notice in the Federal Register was published, and no public meetings have been held. Other than the one-page public notices available on the Corps' websites, no meaningful discussion of the Regional Supplement has been provided by the Corps. The draft Regional Supplement is being peer reviewed by a "panel of independent scientists" concurrently with the public comment period; the panel's report was not provided for public review, although according to the Corps, it will be available upon request. Recently, the Corps HQ office has indicated that it will not be available before the close of the public comment period. Without this report, it is not possible for the public to assess the issues raised in the technical peer review.

The Corps did not release results of its field testing or, as noted above, provide the scientific basis for most of the changes to wetland criteria and indicators. Because it appears that the Regional Supplement's new indicators could expand wetland boundaries, the results of the

Corps' field testing should be made available for public review. The comment period does not provide adequate time for the public to conduct its own field testing, the results of which are among the information solicited by the Corps in its public notice. More importantly, it is not held at an appropriate time of year to measure wetland hydrology and to determine whether or not the new hydrology standard is, in fact, neutral in its effect on the extent of jurisdictional wetlands.

Absent a change in plan, none of these issues will be addressed prior to the implementation of the Regional Supplement. According to the public notices, the Corps intends simply to issue "[a]nother public notice . . . announcing the publication of the final supplement and the implementation date of that supplement."

The Corps' failure to conduct an adequate public outreach program is troubling given the Congressional reaction to the Corps' attempt to implement the 1989 Manual. In adopting the 1992 Energy and Water Development Appropriations Act, Congress limited the Corps' use of funding to adopt or implement the 1989 Manual or "any subsequent manual not adopted in accordance with the requirements for notice and public comment of the rule-making process of the Administrative Procedure Act." The source of the funding being used to develop, adopt, and implement the Regional Supplement is not clear, but Congressional desire for the rule-making process to be open, fair, and transparent—notwithstanding the Corps' belief that the delineation manuals present technical, not policy issues—is clear. As noted earlier, the changes proposed in the draft Regional Supplement are not regionally specific and appear to be an effort to revise the 1987 Manual while avoiding the rule-making procedures required by the Administrative Procedure Act. This is particularly true with the adoption of a new hydrology standard that is referenced by the draft Regional Supplement and published in a technical report by the Corps of Engineers (ERDC TN-WRAPP-05-2, June 2005) that completely changes the hydrology criteria as used in the 1987 Manual. No discussion of scientific basis for this change is provided in the draft Regional Manual and it is not even addressed until the very last page of the draft. The process that the Corps is using to adopt the Regional Supplement is even more troubling given the apparent similarity of the changes to the 1987 Manual that would result from implementation of the Regional Supplement and of the 1989 Manual. Because of the substantive nature of the changes being made and the Congressional directive on adoption of a new delineation manual, the Corps must follow the Administrative Procedure Act to adopt the Regional Supplement.

5. The Corps Should Withdraw The Regional Supplement And Prepare A Revised Supplement That Is Truly Regional And Subject To APA Rulemaking.

These flaws and those outlined in the table of detailed comments are fundamental and warrant the immediate withdrawal of the Regional Supplement. The Corps should publish a Notice of Rulemaking in the Federal Register regarding its intent to prepare a revised Regional Supplement and, in so doing, revise the 1987 Manual. In the revised Regional Supplement, it should address the technical errors and prepare a revised Regional Supplement that is both regional and supplemental to the existing 1987 Manual. The revised Regional Supplement should focus on wetland characteristics that are specific to the arid west region and should be

integrated directly into the 1987 Manual, just as the Corps has updated the 1987 Manual in its online edition. Any change to criteria or indicators should be based on sound scientific principles that are generally accepted in the scientific community and are published in peer-reviewed journals or in validated technical reports. These revisions need to be field tested against all of the sites used to test the 1987 Manual, and it should be peer reviewed. The revised Regional Supplement should be revised, if needed, to address issues raised by the field testing and the peer reviews. The Corps should then release a draft of the revised Regional Supplement by publishing a notice in the Federal Register, and the results of the field testing and report of the peer reviewers should be available for public review. It should hold multiple public hearings to present the changes to the regulated public and to solicit feedback. The Corps should provide adequate time, including at least a full wet season, to evaluate the regional criteria and indicators. The Corps should release the final revised Regional Supplement only after publishing another Federal Register notice responding to public comments on the draft and explaining how those comments were addressed in the final.

DETAILED COMMENTS ON THE REGIONAL SUPPLEMENT

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
1	1	Use of Manual	Document states that it supersedes the 1987 Manual and therefore becomes the *defacto* new manual. Substantial changes in the supplement change indicators; alter the definitions and criteria contained in the 1987 Manual. This will result in substantial confusion to the regulated public and the consulting industry. The standard should be that any Regional Supplement *supplements* the 1987 Manual and subsequent clarifications to the 1987 Manual. For instance, the 1987 Manual contains many cautions on the use of FAC dominated wetlands; but these are not contained in proposed Regional Supplement and in fact, tend to expand on areas dominated by the FAC manual. The Regional Supplements should focus on those wetland types and indicators that are unique to the Arid West and provide guidance to delineating these areas with appropriately validated indicators. We suggest that the Regional Supplement be provided as an additional section to the 1987 Manual. The lack of integration of the 1987 Manual with the Regional Supplement makes it confusing for the public to understand what elements are to be used from each of the Manuals. In many cases, the proposed Regional Supplement contains information which is redundant or slightly different from the 1987 Manual.	Substantial Revision Required.
			Will the Regional Supplement include or supersede the clarifications to the 1987 Manual that were issued in 1992 (i.e. Williams 1992 and Studt 1991)? If so, why are these clarifications no longer valid?	Technical error +Bias error
			The supplemental manual is not supported by new scientific studies and little research is referenced to support the proposed changes. The Regional Supplement should be based on sound science; not just assumptions and	Clarification needed

[1] Effect is indicated as follows: **Technical error** means that the proposed Manual is incorrect and needs to be revised to reflect corrections discussed in comment. **Bias Error** means that the proposed Manual is not neutral compared to the 1987 Manual in terms of the extent an area meeting the criteria for a wetland. A "+" means that the proposed Manual would indicate greater extent of wetlands and a "-" means it would indicate a lesser extent of wetlands. **Clarification needed** means that the proposed Manual needs further discussion related to the questions raised in the Comment. Substantial Revision Required means that the proposed Regional Manual should be reorganized.

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
			conjecture. While Regional Supplements can and should contain regional indicators that may vary from the 87 Manual, they should not alter actual criterion (diagnostic environmental factors) for each of the three parameters.	
			For clarification purposes, the Corps should provide a table that compares the indicators used in the 1987 Manual to the new Regional Supplement and which indicators are being added and which deleted from the 1987 Manual. Only then can a clear understanding of the implications of the Regional Supplement be understood.	Substantial Revision Required
			The stated intent of the Regional manual is to "bring the manual up to date with current knowledge and practice in the region and not to change wetland boundaries". The Regional Supplement presents very little information (other than general descriptions) that is specific to the region, clearly changes wetland criteria, would substantively modify current delineation practices within the region and will significantly modify wetland boundaries. It appears that much of the discussion in the proposed Regional Supplement is focused on changing the 1987 Manual across the entire country.	Substantial Revision Required
1	1	Definition of wetlands	Supplement provides a truncated definition of wetlands as stated in 33 CFR 328.3. Should provide the full regulatory definition so it is clear that hydrology is a key component of the definition. If, indeed, if the proposed Regional Supplement only supplemented the 1987 Manual rather than superseded the 1987 Manual, then repetition of definitions would not be required.	Clarification needed
1	2	Boundary of the arid west	The boundary excludes a portion of the San Francisco peninsula and places it in the Pacific Northwest. This small area would be delineated based on a separate regional manual even though it is more closely related geographically, climatically and botanically to conditions on the eastern side of the peninsula. The Regional Supplement should include this area.	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
1	5-6	Description of wetlands in arid west	This section describes natural wetlands primarily and does not deal with many of the wetland types that are also present in the region, but are man-made features. Only limited references are provided and the description provided does not really provide any useful information for the Arid West. The wetlands that are typical of the Arid West should be more thoroughly described so that their context to the indicators proposed by the Regional Supplement is better understood.	Clarification needed
			In addition, many of the wetland types referenced (e.g., vernal pools and seeps) are typically isolated and pursuant to SWANCC are not regulated by the Corps. As written, the Regional Supplement gives the tacit impression that all of these wetland types are "jurisdictional" when many are not. A note to the user should be added to clarify this issue.	Clarification needed
			The only man-made wetland discussed are "irrigated wetlands"; however, other man-made wetlands such as farmed wetlands, drainage ditches, stock ponds, depressions on construction fills should also be discussed. The discussion on types of irrigation is irrelevant to whether or not irrigated wetlands are subject to Corps jurisdiction. At the very least, Corps policy that exempts irrigated wetlands from regulation under Section 404 and what is required to demonstrate that exemption should be cited in this section (see guidance from Sacramento District).	Clarification needed
2	8	Discussion on halophytes and phreatophytes	Good discussion on these species; some examples should be given of species that qualify as potentially misleading wetland plant indicators. This should also be discussed more thoroughly in the chapter on wetland vegetation as a "caution to users".	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	9	Growing season discussion	This discussion more properly belongs in the section on hydrology, not hydrophytic vegetation since the concept of growing season is not used to determine whether or not a plant is a wetland indicator but is used to determine whether or not the hydrology criterion is met.	Substantial Revision required
			The proposed Regional Supplement also adopts a new hydrology standard (Corps 2005) that provides a growing season definition that is not consistent with some of those described in this section. (See further discussion below on this new hydrology standard).	Substantial Revision required.
			Two procedures are provided to determine the start of the growing season. The second is the actual the definition of the growing season. The definition should take precedence unless data are collected to demonstrate a different growing season (as provided in the 1987 Manual). Since both the beginning and ending dates for the growing season are "needed to evaluate certain wetland indicators," it would be helpful if the Regional Supplement provided methodology(s) for estimating the end of the growing season.	+ Bias error Technical error Clarification needed
			The first proposed alternative procedure does not have any scientific references to support it use as a substitute. While some of the indicators listed directly relate to soil temperature, others may equally depend on other factors and as a result not be a valid indication of growing season.	Substantial Revision Required
			In addition, under the 1987 Manual, a longer growing season will necessarily result in a longer duration of inundation or saturation necessary for hydrology to be present for a positive wetland determination; however, the new hydrologic standard that appears to be proposed by the Corps (2005) states that only 14 days are necessary for wetland hydrology to be met. The Regional Supplement should clearly state what the duration of inundation/saturation standard is and how it is consistent with the 87 Manual and subsequent guidance (Williams 1992 and Studt 1991). It would appear obvious that a lengthening of the growing season and shortening of the duration for saturation and/or inundation (as proposed by Corps (2005)) would result in an increase in areas that would meet the hydrology criteria.	Substantial Revision Required + Bias error

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	9	Discussion of FACU species	The Corps continues to use the outdated 1988 plant list and it should be referenced that newer lists are being developed that may have a more accurate wetland designation. The Regional Supplement should state how members of the public can obtain the most current approved list. However, just as some FACU dominated communities may be wetlands; some FAC and FACW communities may not. Examples should be given of both. The Regional Supplement should be balanced to indicate that both situations may occur because of the difficulty of getting the plant lists updated. In addition, procedures for the public to make changes to the classifications of some plants are lacking.	Clarification needed
2	10	Wetland Plant indicator lists	A more through discussion of how the plant lists were developed should be provided in this Regional Supplement. In addition, if the Corps is relying on the US FWS for its plant classification, the Corps and FWS should provide the public with a means to propose changes to the listing classifications based on new scientific information. Of course, if the proposed Regional Supplement truly was only a supplement to the 1987 Manual, then this discussion would not be needed. The Regional Supplement appears to only focus on changes of FACU and UPL to wetter classifications and not vice versa. The designation of FACU and UPL is established by experts who have reviewed the list and the Regional Supplement appears to abandon this peer review process.	Clarification needed Not a Regional issue
2	10	Use of (+ and -) indicators	The use of FAC+ and FAC- indicator status should be allowed since they provide a more precise estimate of the reliability of various species as wetland vegetation indicators. Why would the Regional Supplement preclude use of more precise information in preference to more generic information? While the use of FAC+ would alter few determinations, use of the FAC- status could be a determining factor in numerous delineations. Therefore, eliminating its use would clearly not be a neutral change. It should be noted that if these indicator statuses are used, it would require modifying the prevalence index formula.	Clarification needed +Bias error Not a Regional issue

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	10	Species area curves	There is nothing in this discussion that relates to specific regional issues and should not placed in this Regional Supplement. In addition, plant sampling techniques are much better covered in the scientific issues. It should be stated that the routine method and use of the 50/20 rule does not require analysis of a species area curve since one is only looking for dominant species, not rare species. It may be applicable to the prevalence index; however, rare species have little influence on the final score.	Substantial revision required. Not a Regional issue
2	10-13	Plot size and strata	There is nothing in this discussion that relate to specific regional issues. The Corps provides extensive discussion of plot size; however, little explanation of the number of plots required. The discussion on strata is not significantly different from the 1987 Manual. The standard practice is a paired plot procedure in which one sample plot is taken in the uplands and one in the wetlands and then these two plots to be used to determine the wetland boundary. The Corps should explain this clarify this practice.	Substantial revision required. Not a Regional issue
2	10	Random samples	The description of plot and sample size implies that a completely random sampling methodology must be used in comprehensive determinations. The 87 Manual provides for a stratified random sampling methodology, not a "completely random sampling methodology."	Clarification needed Not a Regional issue
2	14	Corps Manual definition of hydrophytic vegetation	This definition is not the same as the definition in the 1987 Manual. Why has it been changed? What are the implications of this change?	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	14	Failing of wetland hydrophytic test	The Regional Supplement explains the situation for the failure of the hydrophytic vegetation test for sites, which may actually be wetlands. However, it should also be stated that some places that may have hydrophytic vegetation may actually be non-wetlands and there should be procedures to determine that wetland classified species, particularly FAC species, are non-wetland indicators. In addition, there should be a discussion, as there is in the 1987 Manual, that communities dominated by FAC species must also have strong indicators of wetland hydrology and hydric soils to be considered as wetlands. Because a delineation manuals' purpose is to delineate wetlands, it is understandable that the concentration is on indicators that can be used to identify wetlands. However, in many cases, it would be equally helpful to have indicators or other diagnostic tools that identify non-wetlands (uplands). One could argue that the if any of the hydrophytic vegetation tests fail, then the area should be considered an upland and this possibility should be discussed in the Regional Supplement. The 87 Manual and subsequent guidance contain repeated cautions regarding the relative reliability of various indicators (e.g. FAC-dominated plant communities) and the need to have more reliable indicators of hydric soil and wetland hydrology indicators in these cases. The cautions and guidance have been largely omitted from the Regional Supplement.	Clarification needed + Bias Error Not a Regional issue

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	15	Procedure for use of wetland indicators	The stepwise procedure appears to favor a finding of positive wetland vegetation even if the plant community fails both the dominance test and the prevalence index. In other words, it adds a fudge factor for morphological adaptations to be added to the mix. When examining the morphological adaptations used in the 1987 Manual, these features are almost exclusively observed on OBL and FACW species [note: *Lolium perenne* (FAC) routinely develops adventitious roots in areas that are inundated for a prolonged period] and therefore it is not likely that the third step would ever be applicable. The 87 Manual points out that morphological adaptation would rarely be used. We are not aware of instances where FACU or UPL species exhibit these morphological adaptations. The Regional Supplement should site such examples. If it is likely that FACU or UPL species would exhibit these morphological adaptations, we suggest that the indicator status is probably in error and it would be more appropriate to change the indicator status than to require this evaluation as a standard part of routine delineation. The prevalence index is similar to the 50/20 rule except that it is more sensitive to differences in cover and considers a larger component of the plant community. In theory, the prevalence index would be a more accurate measure of the degree to which the plant community is adapted to inundation and/or saturated soil conditions. Studies by the Corps (Wakely and Lichvar 1997) support this. Given this, it would appear that the 50/20 rule should only be used for rapid vegetation determinations where the dominant species are all FACW and OBL or all FACU and UPL, with the prevalence index used as the standard in all other situations. Morphological adaptations should be dropped from the standard procedures.	+ Bias Error Not a Regional issue
2	16	Use of 50/20 rule	The usual practice is the placement of dominant species on the datasheet. Often these lists include species of less than 20% cover. The adoption of the 50/20 rule appears to diminish the use of other species which may be used to determine whether the hydrophytic vegetation parameter is met.	Bias Error Not a Regional issue

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
2	17	Calculation of prevalence index	The standard for hydrophytic vegetation cited is not the same as that used by Wakely and Lichvar (1997) and that recommended by the Interagency Committee for Wetland Delineation (1989). The standard proposed in the Regional Supplement is ≤3.0 while the standard used in these references cited are <3.0. No rationale is provided for this change. Furthermore, the NRC report (1995) contains a figure that shows that for prevalence indices greater than 2.5 may only be wetlands if there are strong indicators of hydrology and hydric soils. The figure from that report should be included in this Manual so that it is clear that not all areas with a prevalence index of less than 3 are wetlands. It has also been shown that PIs may vary seasonally and some cautions should be given when using these indices, especially in marginal situations.	+ Bias Error Not a Regional issue
2	19	Morphological adaptations	The 1987 Manual provides a list of morphological adaptations that are typically found on obligate and FACW species. The Regional Supplement describes adaptations but does not provide any examples of these adaptations for species in the Arid West. To avoid controversy over what FACU and UPL species may have morphological adaptations, a list should be provided in an appendix to the Regional Supplement and the list should be supported by scientific evidence that such morphological adaptations are a result of adaptation to saturated soils. For example, some species may produce adventitious roots in response to temporary ponding that is not sufficient to meet the wetland hydrology criteria. In addition, many plant communities (wetlands and uplands) in the arid west have shallow root systems in order to adapt to infrequent rainfall events. Such systems are not morphological adaptations to saturated soils only.	+ Bias Error Not a Regional issue
3	22	Cautions	The 1987 Manual has limited discussion of problem hydric soils, such as Mollisols. Given the prevalence of mollisols in the arid west, more discussion should be provided in the Manual on these problem soils and the indicators that are to be used for them.	Clarification needed
3	22-24	Discussion of soil sampling	These are not issues related to regionalization of the 1987 Manual and are more general guidance that should be considered as clarifications to the 1987 Manual. There is no discussion on why a soil pit should be dug deeper than 20 inches since all the indicators used to determine a hydric soil are above this depth. Would the presence of redoximorphic features below 20 inches be used to indicate a hydric soil?	Clarification needed Not a Regional Issue
3	24	Munsell colors	Is the Regional Supplement only stating that only Munsell colors are to be used and other manufacturers of color charts will not be accepted?	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
3	25 +	Use of hydric soil indicators	The Regional Supplement includes NRCS hydric soil indicators that heretofore were only allowed to be used as collaborative information. Since they could not be used as definitive indicators without other collaborative information, it is imperative that their inclusion be based on actual testing and verification in the Arid West Region. Use of these indicators without collaborative indicators will not be neutral. Because of this, it is imperative that their inclusion be based on testing results covering a broad range of conditions.	Substantial revision needed
			These indicators also present a more complicated procedure and one that will require rigorous training of the environmental consultant community and the Corps staff. Will the procedures in the 1987 Manual still be available—or will the procedures used in the Regional Supplement take precedent? If so, what time frame does the Corps have to train its staff in the use of these indicators when making wetland determinations?	Clarification needed
			Is the Corps abandoning the criteria for the hydric soils as a basis for determining a hydric soil (i.e. criteria 1, 2, 3, and 4) as listed in the 1987 Manual or are these indicators additive to the Regional Supplement indicators? What about other indicators in the 1987 Manual used for hydric soils? Are these indicators being discontinued or are they being assumed to be equivalent to some of the hydric soil indicators? The Regional Supplement should show a comparison table for the old indicators and the new indicators.	Clarification needed
3	48	Use of soil surveys	This is not a regional issue and is not required in a supplement to the 1987 Manual.	Not a Regional issue
4	49	Lack of wetland hydrology indicator	The statement that a site may lack an (or any) indicator of wetland hydrology and still have wetland hydrology runs counter to the requirement that all three parameters be demonstrated as present for any area to meet the regulatory wetland definition. This statement should be eliminated from the Regional Supplement as it clearly sets forth a two parameter approach. If a site lacks wetland indicators, the only way to establish wetland hydrology would be to monitor the site to determine whether it satisfies the wetland hydrology criterion.	+ Bias Error

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
4	50	Shifts of current secondary indicators to primary indicators	The Regional Supplement shifts a number of current secondary indicators (for which 2 are required) to primary indicators (for which only 1 is required). This shift can be presumed to bring areas that currently do not have wetland hydrology into wetland conditions. This shift does not have to be field tested as it is a change that does not result in a "neutral" condition with the current 1987 Manual. A study by Nobel, Martel and Wakely (2005) surveyed District Offices to obtain their opinion as to the percent of the time various potential hydrology indicators are evident in wetlands. This study is flawed because it did not examine the percentage of time that the potential hydrology indicators are also found in non-wetlands (uplands). In order to be considered reliable, a particular indicator should be found in wetlands at a greater frequency than in uplands within similar topographic and landscape positions. For instance, direct precipitation is 100% correlated with wetlands but is also 100% correlated with uplands. Although it is 100% correlated with wetlands, it obviously would not be a reliable wetland indicator. Ideally, a study or series of studies should be conducted to determine the percentage of the time these indicators are found in wetlands and uplands occupying similar topographic positions. Those indicators that are not more frequently found in wetlands should not be used as wetland hydrology indicators. Those that are somewhat more common in wetlands that uplands should be used as secondary wetland hydrology indicators. Only those that correlate strongly to wetlands should be used as primary wetland hydrology indicators. In addition, any proposed wetland hydrology indicators that do not imply frequency and duration should only be used as secondary wetland hydrology indicators. Only those indicators that imply frequency and duration should be used as primary wetland hydrology indicators. While in many minimally altered sites, the vegetation and/or soil parameters may correct for unreliable hydrology indicators, this is not the case in many disturbed sites, where the reliability of indicators of the vegetation and/or soil parameters is compromised.	+ Bias Error Substantial revision required. Not a Regional issue only.

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
4	56	Aerial imagery	This type of observation can be very misleading and requires an expert familiar with aerial photo-interpretation to make this determination. In addition, the caution must state that inundation must be observed in the growing season. Finally, reference to the use of the WETS method should be given when making these types of observations. This is a new primary indicator that has not been tested scientifically.	+ Bias Error
4	57	Water stained leaves	Synthesis of Literature on Use of Water-Stained Leaves in the Delineation of Wetlands (WRP Technical Note HY-DE-2.1, 1993) concluded that the presence of water stained leaves was not reliable enough to use as a primary indicator of wetland hydrology.	Technical error +Bias error
4	58	Biotic crust	This indicator does not provide any consideration of duration and may form in areas with short duration or non-continuous periods of ponding. In addition, it can form on areas where sediment settles over hard surfaces such as paved areas and construction sites. These cautions in using these indicators in areas without hydric soils or hydrophytic vegetation need to be added. The degree of algal matting necessary to meet the duration of wetland hydrology should be described.	+ Bias Error
4	63	Water marks	Water marks can be used as an indicator of the OHW for "water"; however, it is difficult to determine the length of time based on a number of water marks that may be present. Well developed water stains only are present where inundation is common on an annual basis and the duration is prolonged.	+ Bias Error Clarification needed
4	64	Sediment deposits	This indicator does not imply frequency and duration and as such should not be used as a primary indicator of wetland hydrology. Some sediment deposits may be a function of rain splatter and should be explained as such. Sediment deposits commonly are a result of short duration events that do not occur on an average annual basis (5 years in 10).	Clarification needed
4	65	Drift deposits	See above comment. This indicator can result from infrequent flood events and it should not be used as a primary indicator. It needs to be found in conjunction with some other indicator that provides a measure of duration.	+ Bias Error
4	66	Drainage patterns	The photograph provided could also be a result of wind blowing across the surface of the meadow.	+ Bias Error

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
4	68	Oxidized rhizospheres	This indicator is a secondary indicator in the 1987 Manual and is raised to a primary indicator in the Regional Supplement. This will result in an expansion of the areas that will be considered as meeting wetland hydrology. Oxidized rhizospheres (OR) can be observed in many non-wetland conditions. It should be stated that the percentage of roots that have OR must be 50% of the live roots present or some other percentage that is justified by the scientific literature. The presence of a few ORs should not be used as a primary indicator as they may form from micro-soil saturation unrelated to wetland conditions. The clarifications to the 1987 Manual state that OR should be "reasonably abundant". A caution should be added that if OR's are also found in nearby upland areas, they should not be counted as an indicator for wetland areas.	+ Bias Error
4	69	Presence of reduced iron	This is a hydric soil indicator in the 1987 Manual and if it continues to be used for hydric soils, it should not be used as a hydrologic indicator as it results in a two parameter delineation procedure, not three parameters as required in the 1987 Manual and the Corps definition of wetlands. If the Regional Supplement supersedes the 1987 Manual, this will lead to a change in the wetland boundary.	+ Bias Error Not a Regional issue
4	71	Muck surface	This is a hydric soil indicator. (see comment above)	+ Bias Error
4	72	Saturation on aerial photography	This indicator should not be used unless field verification confirms that the signature observed in the aerial photography indeed indicated saturation, not some other factor such as a darker soil inclusion. In the central valley of California there are several non-hydric dark soils that occur as inclusions within a lighter soil type. On an aerial photograph, this darker soil inclusion could, and has been, misinterpreted to imply saturation to the surface. Additionally, the timing of the aerial photograph should be correlated to rainfall and growing season to avoid misinterpretation.	Clarification needed
4	73	Dry season water table	What is meant by the dry season? This period needs to be defined in order for the indicator to be used. Measurements also need to be defined as occurring within the growing season. How is duration determined with this indicator?	Clarification needed
4	74	Salt deposits	This indicator does not necessarily correlate to frequency and duration. Salt leaching is commonly observed in non-hydric plant communities (e.g. greasewood- cheatgrass). Also, historic irrigation practices can leave salt deposits on the surface in non-wetlands. Salt deposits can arise from salts washed in from outside areas and may not be indicative of saturated or inundated conditions of sufficient duration to meet the hydrologic parameter.	+ Bias Error

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
4	75	Mud casts	Mud casts or depressions vary in depth considerably from site to site based on soil characteristics. This indicator provides no quantitative measure or comparison. As a result, it can be interpreted very differently by various observers and should be examined in upland areas as well. It may also be an indicator of livestock concentration in a particular area.	+ Bias Error
4	76	Shallow aquitard	This indicator does not consider variation in rainfall patterns, slope, or landscape position. As a primary indicator it does not have any relationship to duration or frequency of soil saturation and should not be used as the sole indicator of wetland hydrology. Within the Central Valley of California, there are soils with shallow aquitards less than 12" inches from the surface (e.g. Exchequer) that are clearly uplands. While wetlands may occur as inclusions, they are always a small fraction of the total. This is a classic example of an indicator that correlates equally or more with uplands and should not be used as a wetland hydrology indicator, not even as a secondary indicator.	+ Bias Error Technical error
4	77	FAC-Neutral	Since the FAC-neutral test and the prevalence index are very similar and both are measures of hydrophytic vegetation and since the prevalence index has been proposed as a vegetation indicator, the FAC-Neutral test should not be used as a wetland hydrology indicator.	Technical error
5	79	Temporal shifts	The Regional Supplement needs to be clear that the seasonal occurrence of wetland vegetation must also be concurrent with the presence of wetland hydrology. Some upland species germinate during wet conditions, but are not readily identifiable until the dry season and need to be included in the wet condition analysis. Some annual upland and wetland plants that are present in the spring months die back in the dry season leaving only perennial species which may or may not be indicators of the wetter periods of the year.	Clarification needed
5	80	Vegetation standard of 5% cover	The Regional Supplement provides no justification for the use of 5% areal cover as a determination that the site is to be classified as a "wetland" as opposed to an "other water". The 5% cover does not represent a condition of dominance by wetland vegetation and, in fact, demonstrates a dominance of either open water or unvegetated flat. The Regional Supplement needs to provide a justification as to why an area with as little as 5% cover should be considered a "wetland" and appears to be a policy decision that has not been provided for public review. In a mixture of vegetation cover how does one determine the portion that should be considered "waters" versus "wetlands" when the cover is extremely low. No practical guidance is provided in the Regional Supplement.	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
5	82	Riparian areas	Many riparian areas are not "wetlands" as the plants are phreatophytes even they are classified as wetland species. The Manual should issue a caution on this condition and have a procedure whereas known phreatophytes can be excluded from the list of dominant species. It should be clarified that hydric entisols that do not exhibit hydric soil indicators are not normally encountered in riparian areas with well-developed riparian plant communities. The problem is normally observed in very young surfaces with early successional plant communities.	Clarification needed
5	83	Use of NWI maps	A caution to users should be provided in the Regional Supplement that NWI maps have a disclaimer that they are not to be used to determine Section 404 jurisdictional areas.	Clarification needed
5	83	Grazing effects	Grazing may alter the plant community composition present at a particular site, but does not change the hydrophytic nature of the vegetation. The elimination of vegetation as part of the three parameters needed to delineate the wetland boundary is in error as we are unaware of any examples where vegetation in grazed areas cannot be used.	+ Bias Error
5	83	Table 5-1	Please provide references for the findings shown in Table 5-1.	Clarification needed
5	83	Managed plant communities	This section appears to relate primarily to agricultural activities which represented activities which are not regulated by Section 404. In addition, many agricultural practices represent the long-term "normal circumstance" for the property. This issue goes beyond that of the Arid West and needs to be addressed nationwide. By reducing the number of parameters needed to determine the presence of jurisdictional wetlands, the reliability of the remaining criteria used should be higher than the minimum.	+ Bias Error Not only a Regional issue

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
5	84	Vigor and stress on planted crops	This procedure is stated as being difficult to measure and variable from species to species. The Regional Supplement does not provide any examples of species or documented studies that can be used to distinguish between events that cause temporary stress and those that relate to duration that is considered representative of wetland hydrology. Quantitative measures of plant vigor and stress are not provided and it is expected that there are many levels of stress from slight to death of the plant. There are also other stressors (e.g. high soil salinity, poor fertilizer application) that may result in decreased growth. In irrigated areas, low plant vigor is associated with areas that are not sufficiently irrigated. As such, this procedure is vague and difficult to apply to specific situations.	+ Bias Error
5	85	Early season germination of upland species	The Regional Supplement provides no examples or specific wetland types where this condition may occur. We are not familiar with examples of where this condition occurs. If FACU and UPL species out-compete wetter species than the definition of a wetland as provided in the Corps regulations is not met, i.e. hydrologic conditions which bring about the dominance of hydrophytes. By definition, a wetland is a site where wetland plants out-compete upland species. This procedure appears to be identifying areas that would not normally meet the Corps wetland definition and is therefore not "neutral" in its application.	+ Bias Error
5	85	FACU and UPL dominated communities	The Regional Supplement introduces a new approach to including non wetland plant communities as wetlands using a new hydrology standard that has not been previously tested. It also results in a one or two parameter procedure. Because of how it is defined and without limited factors, this two parameter approach could be applied to many sites where it is not appropriate.	+ Bias Error Substantial revision required.
5	85	New hydrology standard	Without any reference or scientific support, the Regional Supplement describes a new hydrology standard in paragraph 3a that significantly reduces the period of time for continuous saturation in areas with a growing season of 365 days. The use of the 14 day period of saturation or inundation needs to be justified and will certainly result in an expansion of jurisdiction compared to the 1987 Manual.	+ Bias Error Not a Regional issue only Substantial revision required
5	86	Problematic Hydric soils	Whenever one parameter such as hydric soil is eliminated or cannot be observed, it should be cautioned that more reliable vegetation and hydrology indicators must be observed.	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
5	87	Recently developed wetlands/seasonally ponded soils	Use of 14 days of inundation, flooding, or saturation is a hydrology standard that has not been used by the Corps previously. It is now also being applied as an indicator for hydric soils which reduces the wetland parameters used to delineation a wetland to two rather than three.	+ Bias Error
5	87	Seasonally Ponded Soils	Many clay soils (e.g., vertisols) that exhibit 'shrink/swell' characteristics limit or preclude formation of redox concentrations due to the constant mixing associated with shrink swell.	Clarification needed
5	88	Red Parent Material	This indicator is identified as a test indicator by the NRCS. The most recent annual minutes of the NTCHS indicate that this indicator is still a test indicator. There is not documentation indicating that it has been tested and proved valid in the Arid West Region. Unless and until that occurs this indicator should not be adopted. The technical description implies that all soils with a hue of 7.5YR or redder are considered to be red parent material. Is that so and, if so, that should be clearly stated. The underlying assumption of this indicator is that red parent material may obscure or otherwise prevent identification of a reduced matrix and/or redox concentrations. There are numerous examples where wetlands occurring as inclusions within soils that normally have a hue 7.5YR have observable depleted matrices with visible redox concentrations. In these cases, it would appear that the underlying assumption is invalid and the indicator should not be used.	Clarification needed Possible technical error +Bias error
5	92	Site visits during the dry season	Regional Supplement states that if site visit during dry season determines that site has hydrophytes and hydric soils, then the site is a wetland. This statement should be deleted as it is suggests that wetland hydrology need not be examined or can be assumed. This assumption may be wrong when indicators are weak or marginal.	+ Bias Error
5	94	Below normal snowpack	See comment above. In addition, the Manual should also explain that periods of higher than normal snowpack may indicate create wetland hydrology conditions when in fact, they do not normally occur.	Clarification needed

CHAP	PAGE	TOPIC	COMMENT	Effect[1]
5	95	Corps (2005) standard	This is the first official citation to a new hydrology standard that is substantially different than the 1987 Manual in both the place of measurement and the duration of inundation and saturation. The Regional Supplement makes no distinction between the 1987 Manual and subsequent guidance provided by HQ and this new standard. No scientific evidence or support is provided for this new standard which is likely to increase the extent of wetland determinations.	+ Bias Error Substantial revision and review required.