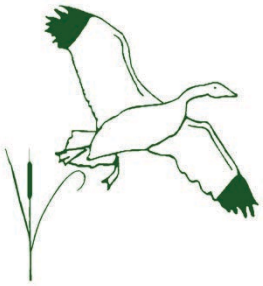
United States v. Brace et al., 17-cv-06, W.D. Pa. Expert Report: Rebuttal of "Ecological Functions and Connections of Wetlands and Waters at the Marsh Site, Waterford, Erie County, Pennsylvania", by Robert P. Brooks, Ph. D.

February 21, 2018

Prepared for:
The Kogan Law Group, P.C.
100 United Nations Plaza
Suite #14F
New York, NY 10017



By:
Ray L. Kagel, Jr. M.S., P.W.S. #2234
Kagel Environmental, LLC
Wetlands, Wildlife and Permitting Specialists
ray@kagelenvironmental.com
PO Box 597
Rigby, Idaho 83442
Phone (208) 745-0076
Cell (208) 313-3890

List of Exhibits

Exhibit #	
1	The Marsh Site as it appeared on May 10, 1975.
2	The Marsh Site as it appeared on May 11, 1983
3	Erie County ASC Committee Documents.
5	The Marsh Site compared to a nearby cultivated area, 1939-1975.
7A	Map showing the Marsh site has been planted in oats.
13	Memorandum of Agreement among EPA, USDA, USDI, DOD.
14	Sampling sites from the 1989-1990 and 2013 agency studies.
14A	Excerpt from NRC publication comparing wetland identification manuals.
14B	Statements of Policy, Title 25, Environmental Protection.
14C	Brooks' Sampling Sites.
15	Brooks' Reference Site Locations
16	Table of Comparisons between the Marsh Site and the Brooks Reference Sites
17	Soil taxonomy hierarchy triangle.
18	Path of Elk Creek to Lake Erie.
19	Upland areas interspersed with NWI mapped areas along Elk Creek.
20	Agricultural and developed lands in the Elk Creek drainage.
20A	Precipitation in the vicinity of the Marsh Site immediately before and on the day of the Brooks visit.
21	Soil texture triangle.
22	February 25, 2005 Memorandum to the Field, NRCS

REBUTTAL TO EXPERT REPORT

1. I, Ray L. Kagel, Jr., MS, PWS, have been designated as an expert witness for the defendants in the case of ***United States v. Brace et. Al.,* 17-cv-06, W.D. Pa**. I submit this report in rebuttal to the expert report prepared and submitted by Robert P. Brooks, Ph.D., of Brooks Consulting, of Port Matilda, PA on behalf of the United States in this matter.

BASIS (QUALIFICATIONS) FOR OPINION

2. As set forth in my curriculum vitae provided to the plaintiff on December 20, 2016, I am certified by the Society of Wetland Scientists as a Professional Wetland Scientist (#2234). Over the past 36 years, I have completed numerous wetland habitat evaluations, and wetland identifications. To date, I have performed approximately 3,500 wetland determinations since 1987 for purposes of the federal Clean Water Act (CWA) and the Food Security Act (FSA). jurisdictional determinations since 1987. I also have taught wetland identification and delineation courses on behalf of the U.S. Army Corps of Engineers (COE) and U.S. Environmental Protection Agency (EPA) based on the currently used 1987 Corps of Engineers Wetland Delineation Manual (1987 Manual). In addition, I was a training instructor for the first course that was taught to federal employees of the COE, EPA, U.S. Fish and Wildlife Service (FWS), and U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), based on the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989 Manual) which was withdrawn around January, 19993. As a former U.S. Army Corps of Engineers regulatory project manager and enforcement officer, I possess a strong knowledge of wetland laws and regulations, including the study, understanding, and application of jurisdictional determinations, permitting, and violation resolution pursuant to Section 404 of the CWA.

3. While employed with the USACOE, I also had specific training in the use of the National Food Security Manual (NFSM).

4. In my position as a senior regulatory project manager and wetland scientist with COE, I earned and was granted signature authority for issuing final and legally binding jurisdictional determinations of waters of the U.S., including wetlands, on behalf of the COE and the EPA. I also had responsibility for reviewing and approving, including signature authority, for executing final authorization for CWA Section 404 nationwide permit (NWP) applications. I was a federal regulatory project manager in three different COE Districts and COE Divisions spanning three major geographical areas across the United States: the east (Philadelphia, PA District), central (Omaha, NE District) and west (Walla Walla, WA District). My official duties and responsibilities included performance, review, and either approval or rejection of applications for CWA Section 404 and Rivers and Harbors Act (RHA) Section 10 NWPs, including making a determination of the limits of federal CWA and RHA jurisdiction associated with all permit applications. Additionally, my duties and responsibilities required that I personally perform wetland identification and delineation field studies, plus review, analyze, and either accept or reject wetland delineation studies and reports completed and submitted by professional wetland consultants and contractors. Wetland consultant reports submitted to the COE often required that I perform on-site (field) studies to verify that a wetland consultant employed acceptable methods, and correctly identified and interpreted wetland indicators or empirical evidence pertaining to wetland vegetation, wetland soils, and wetland hydrology. My federal authority and responsibility also included verifying that wetland delineation boundaries marked by non-governmental, as well as governmental wetland scientists, were properly and accurately established and mapped. As a federal wetlands expert, enforcement officer, and regulatory project manager, I made approximately 3,000 official wetland jurisdictional determinations on behalf of the United States, i.e. COE and EPA.

5. During my federal regulatory career, I was assigned and authorized to perform several hundred CWA Section 404 jurisdictional determinations for the location of the ordinary high water mark (OHWM) of lakes, reservoirs, rivers, streams, creeks, including jurisdictional canals and ditches.

I was also entrusted with the responsibility and authorization for making official regulatory determinations of "no jurisdiction" for waterways that I determined had an absence of an OHWM.

6. As a regulator with the COE, I served as an enforcement officer of the federal government for identifying alleged CWA Section 404 violations involving the discharge of dredged or fill material into jurisdictional waters and wetlands, including direct involvement in facilitating violation resolution on behalf of the government. In enforcement cases where the EPA was actively involved, the EPA often relied upon my in-depth knowledge, training, skill, and significant experience in wetland science for rendering the agency's official determination, identification, delineation, and location of subject wetlands for purposes of defining the legal limit(s) of federal CWA jurisdiction.

7. During the last six (6) years of my career with the COE in the Walla Walla, Washington District, the Chief of Regulatory Division, by authority of the District Commander, appointed me as the official point-of-contact (POC), commonly known as the appeals officer, for making final wetland jurisdictional determinations throughout the Walla Walla District which included the entire state of Idaho. I was therefore called to sites that were particularly complicated, complex, atypical, subject to challenge or disagreement, and/or sites that were involved in litigation such as alleged violations and enforcement actions. During the six years that I served as the POC for making final wetland jurisdictional determinations for the Walla Walla District of the COE, the EPA's Region 10 field office located in Boise, Idaho also deferred to and relied upon me as the final authority for identifying, delineating, and determining the limits of federally regulated wetlands in the state of Idaho.

8. My analysis of Dr. Brooks' expert report is based on my education, knowledge, skills, and experience, including all references I have cited above. My professional environmental consulting rate is $150/hour and for court testimony, depositions and preparation, my rate is $200/hour. For this rebuttal report I made a good faith flat fee estimate to Mr. Brace for $5,250

anticipating that I could complete it in approximately 35 hours. Preparation of the report actually required 182 hours. Since Mr. Brace lacks the financial resources of the United States which can pay Dr. Brooks for all the hours he worked, I have volunteered 147 hours of my time *pro bono.*

DR. BROOKS' CONSIDERATION OF THE BRACE SITE SHOULD HAVE TREATED THE MARSH SITE AS BEING UNDER THE FOOD SECURITY ACT.

9. Dr. Brooks' introduction references that the "United States brought a lawsuit against Mr. Robert Brace, Brace Farms, *et. al*. (collectively "Brace") under the Clean Water Act (CWA)". Brooks at 9. Pursuant to this action, Dr. Brooks was hired by the United States Department of Justice (DOJ), to assess and provide his expert opinion on the identification, conditions, and functions of wetlands on an approximate 20-acre tract of property referred to as the Marsh Site. Although Dr. Brooks stipulates that his review of historical reports, maps, and aerial photographs provide evidence that portions of the Marsh Site were actively farmed as early as 1939 and extending to [at least] 1968 (Brooks at 10), he does not include any references to the 1985 Food Security Act (FSA), although the Marsh Site is clearly an agricultural property.

10. Dr. Brook's evaluation is entirely based upon the Marsh Site not being an agricultural property, although it is my understanding that the alleged violation on the Marsh Site in 2012 is due to standard farming practices, not commercial or residential development. This is confusing in light of my experience both as a COE regulatory project manager and enforcement officer from 1987 to 1999, and as an active wetland consultant heavily involved in wetland determinations and permitting nationwide. In my experience, standard policy has been that an alleged wetland violation directly associated with an agricultural activity, performed on agricultural lands, and where the alleged violation was conducted for continued agricultural purposes (i.e. farming), the COE typically refers the matter to the USDA's Soil Conservation Service/Natural Resources Conservation Service (SCS/NRCS) office for making wetland determinations pursuant to "swampbuster" provisions under the 1985 FSA. However, in cases of a farmer conducting activities on agricultural lands where alleged unauthorized impacts to wetlands were for purposes

"other than" for agricultural, e.g. residential, commercial, industrial development, etc., the COE and/or EPA appropriately assumed lead federal agency responsibility for making wetland determinations pursuant to the CWA.

11. *The Clinton administration issued a wetlands policy on Aug. 23, 1993, which notes that NRCS, USACE, EPA, and FWS signed an interagency agreement to develop consistent administration of their wetland programs (White House Office on Environmental Policy, 1993). USACE and EPA amended their regulations so that land qualifying as prior converted cropland under the FSA would not be treated as wetland under CWA (58 Fed. Reg. 45, 007, 1993; 33 C.F.R. § 328.3 (a)(8); 40 C.F.R. §§ 110.1, 112.2, 116.3, 117.1, 122.2, 230.3). As a result, property designated by NRCS as prior converted cropland does not require a Section 404 permit regardless of the characteristics of the land.*[1]

12. In 1994, a MOA was signed by the USACE, USEPA, USDA, and USDOI. Several conditions listed within this MOA regarding wetlands should have been applied to all wetland delineations on Brace agricultural lands. (Exhibit 13). This MOA imposed legally binding conditions upon all signatory agencies covering any comprehensive report identifying the existence, conditions, and functions of alleged wetlands on the Marsh Site farm parcel, including historic perspectives. Several critical conditions of the 1994 MOA are germane to the Brace litigation, but the Brooks evaluation apparently overlooks them. For example, the MOA states that, "*in accordance with the terms and procedures of the MOA, wetland delineations made by the SCS (NRCS) on agricultural lands, in consultation with the FWS, will be accepted by EPA and the COE for purposes of determining Section 404 CWA wetland jurisdiction*." In addition, the MOA states that, "*EPA and the COE will accept SCS (NRCS) wetland delineations on non-agricultural lands that are either narrow bands immediately adjacent to, or small pockets among, agricultural lands*". I believe it is also noteworthy that the MOA clarifies that "*the SCS (NRCS) is responsible*

[1]Wetlands: Characteristics and Boundaries. Committee on Characterization of Wetlands, National Research Council. 1995. http://www.nap.edu/catalog/4766.html. Page 69.

for making wetland delineations for agricultural lands whether or not the person who owns, manages, or operates the land is a participant in USDA programs." The Brooks report also ignores several other germane conditions of the MOA, such as the requirement that, "For agricultural lands, the signatory agencies will use the procedures for delineating wetlands described in the National Food Security Act Manual (NFSAM)." Furthermore, the MOA states that, "*Delineations on agricultural lands must be performed by personnel who are trained in the use of the NFSAM. A final written wetland delineation made by the SCS (NRCS) pursuant to the terms of this MOA will be adhered to by all the signatory agencies and will be effective for a period of five (5) years from the date the delineation is made final. Circumstances under which SCS (NRCS) wetland delineations made prior to the effective date of this agreement will be considered as final for Section 404 purposes*." (Exhibit 13).

13. It is therefore my opinion that all alleged impacts resulting from agricultural activities undertaken in wetlands allegedly present on the Marsh Site agricultural lands, wherein such activities were undertaken solely for agricultural purposes, were clearly the responsibility of the USDA concerning the performing and certifying of wetland determinations pursuant to swampbuster provisions of the 1985 FSA, the 1994 MOA, and/or the 2005 Memorandum between the USDA and U.S. Department of the Army

14. Documents related to declaring the Marsh Site and surrounding Brace-owned farmland as either Prior Converted Wetland (PCC) or Commenced Conversion (Exhibit 3) strengthen my opinion that any alleged wetland violation on the Marsh Site should have been addressed by the SCS/NRCS and Swampbuster, as reflected in relevant applicable COE and EPA regulatory guidance and regulations.[2]

[2] RGL 90-07; 58 FR (1993)

DR. BROOKS CONCLUSION THAT THE MARSH SITE WAS PRIMARILY WETLAND HISTORICALLY, RESULTS FROM FLAWED ANALYSIS AND RELIANCE ON UNRELIABLE DATA.

15. Based upon historical aerial photography, Dr. Brooks made the scientifically unsupportable conclusion in his report that the Marsh Site was wetland, except for a rectangular strip along Sharp Road and another along Lane Road between 1939 and 1968. He does not clearly explain why he thinks it was a historic wetland, other than it "appears to be". Brooks at 10.

16. I believe Dr. Brooks was remiss in not reviewing photography from 1975 and 1983 that also appear to show that there were active farming practices on the Marsh Site. (Exhibits 1, 2, 5, 7A.)

17. Dr. Brooks states that in 1993, part of the Marsh Site "appears to be naturally vegetated consistent with occurrence of wetlands". Brooks at 10. He does not explain if or why the vegetation patterns are not also consistent with certain kinds of uplands.

18. Dr. Brooks correctly reports that the National Wetland Inventory (NWI) maps the entire area as wetland. However, he uses it as supporting data for his conclusion that the majority of the Marsh Site is wetland at numerous places in his report. However, the NWI does not purport to make any attempt to define jurisdictional wetlands and its use in delineating the extent of jurisdictional wetland extents is inappropriate. is inappropriate. In the National Research Council's 1995 publication, it states: "*Although the U.S. Fish and Wildlife Service (FWS) is responsible for developing maps for the National Wetland Inventory (NWI), the inventory does not have regulatory effect, and it was not intended or designed for use in delineation*."[3] In fact, the U.S. Fish and Wildlife Service (FWS) NWI Wetlands Mapper requires users to accept the following as a term and condition before use: "The map displays at this site show wetland type and extent using a biological definition of wetlands. **There is no attempt to define the limits of proprietary jurisdiction of any Federal, state, or local government, or to establish the**

[3] Wetlands: Characteristics and Boundaries. Committee on Characterization of Wetlands, National Research Council. 1995. http://www.nap.edu/catalog/4766.html. Page 66.

geographical scope of the regulatory programs of government agencies."[4] (Their emphasis.) The implication is that aerial photography and NWI findings should not be used to determine extent and location of regulated wetlands. KE has personally been on a number of sites where the NWI indicated wetlands and none actually were there, as well as the opposite; i.e., there actually are wetlands present but they are not mapped. Therefore, concluding the presence of *regulated* wetlands on the Marsh Site based upon the NWI map is not supported, scientifically or otherwise.

19. Dr. Brooks states that the entire Marsh Site is mapped as wetland by the National Wetlands Inventory, I believe it is irresponsible not to disclose the fact that NWI wetland maps are solely based on the single parameter for vegetation, and that the maps are frequently not ground-truthed, and that the wetland maps are often inaccurate.

20. Dr. Brooks reports that he considered prior wetland determinations conducted on Brace-owned agricultural lands in 1989 and 1990, including the Marsh Site. These determinations were made by a team led by the EPA[5]. Brooks at 10. These site visits investigated only a tiny part of the Marsh Site (Exhibit 14), with only a single sample (1c) actually located on the actual Marsh Site. Interestingly, in the Data Form for this particular location, there is a notation that the Data Form is missing[6], suggesting that the data was perhaps recorded from memory. Thus, this report yielded little to no information about presence and extent of jurisdictional wetlands on the Marsh Site. Also, those site examinations in 1989 and 1990 were conducted more than 25 years ago under the 1989 Manual, and the identification of jurisdictional wetlands has changed substantially since that time. In particular, the definition of "hydric soil" has evolved considerably. The state of the art for hydric soil identification is now Field Indicators of Hydric Soils in the United States,

[4] https://www.fws.gov/wetlands/data/Mapper.html
[5] Field Investigation – May 24, 1989, May 16-17, 1990, Potential Violation (Robert Brace), Erie County, Pennsylvania. Document pages CD-FRC0013977 to CD-FRC0014245. (1989-1990 Study.)
[6] 1989-1990 Study. CD-FRC0014013.

Version 8.1[7], whereas the first published version of this reference was not even issued until 1996, years after the 1989/1990 investigation. Very little site-specific vegetation, soil and wetland hydrology information relevant to this litigation was garnered in those years.

21. Brooks reports that the EPA-led team in 1989 and 1990 attempted to determine the existence and extent of wetlands "in and around" the Marsh Site where wetlands had been [allegedly] cleared, drained, and ditched." In my opinion, Dr. Brooks was remiss in not clarifying that the EPA does not regulate these agricultural activities pursuant to the CWA; I believe he should have mentioned that such activities are commonly within the purview of the 1985 FSA Swampbuster provisions.

22. Dr. Brooks falsely reports that the EPA team "*followed the methodology of the Corps of Engineers' 1987 Wetlands Delineation Manual*". Brooks at 20. However, the 1989-1990 study used the 1989 Manual, and states so in three separate places[8]. This is significant, as the assumptions allowed in the 1989 Manual were so liberal that Congress was overwhelmed with complaints by the regulated public, the 1989 Manual was subsequently dropped in January, 1993 and the 1987 Manual reinstated. When the 1989 interagency manual was withdrawn, and while proposed revisions were pending, USACE continued to use its 1987 Corps manual. In fact, "*Congress directed that USACE follow the 1987 Corps manual and that landowners who had delineations made under the 1989 interagency manual be given the opportunity to revise them according to the 1987 Corps manual (Energy and Water Development Appropriation Act of 1993, P.L. 102-377, 106 Stat. 1315, 1992)*"[9]. As far as I know, this opportunity was not offered to Mr. Brace. A comparison of the 1987 and 1989 (as well as other versions including the NFSAM) is shown as Exhibit 14A. Statements of particular interest are highlighted.

23. Brooks also was remiss in not reporting which federal wetland identification manual was used by

[7] Field Indicators of Hydric Soils in the United States. Version 8.1, 2017.
[8] 19899-1990 Study. Pages CD-FRC0013980, CD-FRC0013992, CD-FRC0014083.
[9] Wetlands: Characteristics and Boundaries. Committee on Characterization of Wetlands, National Research Council. 1995. http://www.nap.edu/catalog/4766.html. Page 71.

the agencies in 1989 and 1990 for making a wetland determination on the Marsh Site. In 1989 there were two significantly different federal manuals in use by the COE and EPA for delineating wetlands, and by 1990, a third was being tested (1991 Manual). In my opinion, development of three different federal wetland delineation manuals within the short span of time between 1987 and 1991, compounded by Pennsylvania Department of Environmental Resources/Protection's use of the 1989 Manual until 1996, (Exhibit 14B) is clear and convincing evidence that the federal agencies of the United States and the Commonwealth of Pennsylvania were in a state of flux, and there was uncertainty regarding how to determine when, where, and under what manual a wetland must be delineated. The agencies faced considerable complexity and uncertainty in choosing the appropriate manual for purposes of the CWA, and it is important to understand which manual was being utilized. (Exhibit 14A.)

24. In June 2013, another site visit by the COE, EPA and PADEP resulted in little reliable data concerning conditions at the Marsh Site. The visit was conducted during moderate to heavy rain, only three sites were sampled along the perimeter of the site (Exhibit 14), and soils data were not recorded for two of the three sites. The PADEP report (referenced by Dr. Brooks)[10] states that all the sites had hydric soils, but without documentation, I believe the points must be excluded from consideration. The heavy rain rendered any conclusions about hydrology irrelevant.

25. Dr. Brooks' reliance on information collected during these visits prior to his own site examination on October 16, 2017 is unwarranted due to a paucity of relevant data. I have seen no convincing data (facts) as to what the conditions were related to jurisdictional wetlands on the Marsh Site collected prior to Dr. Brooks' visit. Based upon the unsupported opinions and lack of reliable data, it is my opinion that it was *not* evident and certainly not definitive that *jurisdictional* wetlands existed on the Marsh Site prior to the 2012 disturbance, or even afterwards.

[10] Brace Site Visit. June 27, 2013. EPA document pages EPA0000502-EPA0000515.

DR. BROOKS' CONCLUSIONS CONCERNING CONNECTIONS BETWEEN ALLEGED JURISDICTIONAL WETLANDS ON THE MARSH SITE AND OTHER WATERS AND WETLANDS ARE UNSUBSTANTIATED BY DATA AND DO NOT REFLECT ACTUAL CONDITIONS DOWNSTREAM.

26. Dr. Brooks' report fails to provide any evidence or data that agricultural activities on the Marsh Site influenced water quality anywhere, although he alleges that prior to disturbance, the wetlands on the Marsh Site had the potential to trap and chemically transform pollutants carried from [water] runoff from adjacent upslope roads, lawns, etc. Besides lacking data to support his opinion, Dr. Brooks is assuming that functional, jurisdictional wetlands existed on the site historically despite a lack of reliable evidence of the same. Brooks also failed to demonstrate how farming activities on the Marsh Site impacted alleged historic wetlands or wetland bioremediation capacity.

27. Dr. Brooks opines "*wetlands on the Marsh Site and similarly situated wetlands in the vicinity, improve water quality for the receiving downstream waters, including Elk Creek and Lake Erie*." Brooks at 11,12, 37. Dr. Brooks does not show any evidence or data that the Marsh Site changes or has resulted in changed water quality anywhere.

28. Dr. Brooks reiterates many of the advantages of wetlands, and their importance, including flood storage. Brooks at 11. To that end he references a FEMA map that he indicates as proof that the Marsh Site provided flood storage. FEMA shows a Zone A flood hazard on the Marsh Site, which is a 100-year flood zone. Clearly, at least prior to disturbances in the Elk Creek channel, flood storage was a relatively infrequent function provided by any alleged wetlands in the area of the Marsh Site.

29. According to the land owner and others[11],[12], flooding was a very rare event prior to implementation of the 1996 Consent Decree Restoration Plan and improper installation during

[11] Deposition of Robert Brace, January 10, 2018.
[12] September 12, 2011 email from Todd Lutte to Brace Farms.

the 1980's of a culvert where Elk Creek exits the Brace property, and the cessation of beaver dam control. Correction of the culvert installation, elimination of the beaver dams, and substantial modification, if not, withdrawal of the Consent Decree Restoration Plan would be expected to reduce flooding significantly.

30. Dr. Brooks infers that Marsh Site disturbances are contributing to recent algal blooms on Lake Erie. Brooks at 12. Again, there simply is no evidence provided demonstrating that this is true. I believe his inference exceeds plausibility.

DR. BROOKS DOES NOT FOLLOW THE MANUAL FOR INTERPRETING CONDITIONS IN ATYPICAL SITUATIONS.

31. The term "atypical <u>situations</u>" (1987 Manual pg. 73), is "***only*** *used, when a determination has been already made that positive indicators of hydrophytic vegetation, hydric soils, and/or wetland hydrology could* ***not*** *be found due to effects of recent human activities or natural events.*" (Emphasis added.) I believe that Dr. Brooks fails to understand that his statement "due to site <u>alterations</u> of hydrology and vegetation" does not satisfy the COE definition for "Atypical Situations". It is my professional opinion that his use of the term "<u>alterations</u>" falls significantly short of, and does not equate to, the federal definition that atypical situations require. For an atypical situation to be present, human or natural disturbances and/or <u>alterations</u> must be essentially so devastating, that indicators are actually "<u>absent</u>" or "could <u>not</u> be found". For example, a farm field or pasture where the mature growth of herbaceous cover is recently mowed and windrowed for baling hay, constitutes a significant "alteration" to the vegetation. However, this vegetative alteration does not preclude a field investigator from reasonably identifying the species and relative abundance of extant plants that were recently altered.

32. On 16 October 2017, Dr. Brooks selected six (6) sampling points on the Marsh Site Exhibit 14C. Concerning Sample Point #1, Dr. Brooks makes the statement: "*Since atypical* ***circumstances*** (emphasis added) *occurred at Sample Point #1 due to site alterations of hydrology and*

vegetation, the presence of all three wetland indicators is not necessary to determine if the site is a wetland where a plausible explanation for an unconfirmed indicator is found." Brooks at 22. Dr. Brooks goes on to conclude that based upon aerial photography which he alleges to show standing water in the floodplain along Elk Creek in 2005 and 2011, it is his opinion that *"wetlands occur at Sample Point #1 at the present time*." First, Dr. Brooks misapplied the term atypical "situations" (1987 Manual pg. 73; Regional Supplement pg. 114) by erroneously substituting the term atypical "circumstances". Based upon my 31-years of professional experience, I do not believe that any of the federal wetland guidance publications use the term "atypical circumstances". The words "circumstances" and "situations" are not synonymous terms when used in federal wetland guidance publications. It is surprising to me that Dr. Brooks is not fully cognizant of this fact. Dr. Brooks does employ the correct term, "atypical situations", in Section 4.4, page 27 of his report.

33. Neither the 1987 Manual nor the Regional Supplement contain allowances covering Dr. Brooks' statement that since "*atypical circumstances occurred at Sample Point #1 due to site alterations of hydrology and vegetation, the presence of all three wetlands indicators is not necessary to determine if the site is a wetland where a plausible explanation for an unconfirmed indicator is found*." Brooks at 22. Dr. Brooks goes on to make the same statement concerning Sample Points #2 and #3.

34. Dr. Brooks' statement "*a plausible explanation for an unconfirmed indicator*" (page 22) is not found anywhere in the federal wetland guidance publications. His statement is a specious extrapolation from the federal guidance publications. Occasional assumption of a parameter may be allowed when it is not possible to obtain sufficient information for determining the presence of a wetland parameter (vegetation, soils, hydrology) that is absent or cannot be found in atypical situations. This is not the same thing as Dr. Brooks statement and method. Federal guidance simply does not authorize a field investigator to make a wetland determination without all three wetland parameters, provided "***there is a plausible explanation for an unconfirmed indicator"***

"due to site alterations of hydrology and vegetation". (emphasis added).

35. Dr. Brooks appears to have devised his own protocol based upon the above unsupportable statement concerning a "plausible explanation" relevant to site alterations. Brooks at 22, 23. In fact, the authors of the Manual actually published a combined total of 42 pages of proper procedures and methodologies for making wetland determinations, and there are no examples, terms, conditions, or even suggestions, that allow or even marginally support Dr. Brooks' stated belief that the presence of all three wetlands indicators is not necessary to determine if the site is a wetland "***where a plausible explanation for the unconfirmed indicator is found***." (Emphasis added.)

DR. BROOKS DOES NOT FOLLOW MANUAL GUIDANCE CONCERNING WETLAND HYDROLOGY.

36. Dr. Brooks does not appear to be familiar with the legal requirements for wetland hydrology in the Regional Supplement, Chapter 5, Difficult [Atypical] Wetland Situations, which describes wetland hydrology as occurring in areas that are "*inundated, flooded, ponded, or have soils that are saturated with water*".[13] In fact, the Regional Supplement states "*under normal precipitation, and long periods during the growing season, wetlands are generally inundated (flooded or ponded), or saturated* (emphasis added) *at least 5 years in 10 over a long-term record.*" The 1987 Manual defines wetland hydrology as a term that "*encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season.*"[14] (Emphasis added.) Dr. Brooks mistakenly believes and erroneously determines that wetland hydrology is present even when the ground surface is never inundated, ponded, or flooded, and saturated soil conditions never reach closer than 12-inches from the surface. Brooks at 28.

[13]Regional Supplement, page 136.
[14] 1987 Manual, page 28.

37. For the purposes of wetland determinations, the 1987 Manual defines saturated soils as "*a condition in which all easily drained voids (pores) between soil particles in the root zone are temporarily or permanently filled with water to the soil surface* (emphasis added) *at pressures greater than atmospheric*."[15] Besides Dr. Brooks' erroneous understanding of wetland hydrology, he also contravenes that "saturation" means to the surface in order to have wetland hydrology.

DR. BROOKS' USE OF REFERENCE WETLAND SITES DOES NOT FOLLOW THE 1987 MANUAL OR REGIONAL SUPPLEMENT GUIDANCE.

38. Dr. Brooks failed to abide by the instructions clearly explained in the 1987 Manual and the Regional Supplement regarding procedures to be followed in atypical situations[16]. Dr. Brooks utilized wetland reference sites despite such Manual and Regional Supplement guidance to the contrary. In his report, Dr. Brooks also summarizes "Post-disturbance Characteristics of the Marsh Site Wetlands": "*On 16 October 2017, I used standard methods to assess the characteristics and locations of wetlands on the Marsh Site based on conditions on the ground with results of my desktop review. Despite fairly extensive human disturbances to the terrain and waters of the Marsh Site, all six Sample Points examined on that date still had characteristics common to wetlands, including the presence of hydrophytic vegetation, hydric soil characteristics, and some evidence of surface and subsurface hydrology*." Although he reported using standard (routine) methods (Brooks at 13), Dr. Brooks proceeded as if the Marsh Site was an "atypical situation" as defined in the 1987 Manual. After he described when and why the atypical situation should be used, and the implementation of reference sites (Brooks at 15), he ignored the Manual.

39. Based upon Dr. Brooks' own data, his utilization of these distant "reference" sites was inappropriate for delineation purposes since none of the three wetland parameters was missing.

[15] 1987 Manual, Appendix A, page A11.
[16] 1987 Manual, Section F, page 73.

In other words, Dr. Brooks failed to properly invoke the "atypical situation" procedures of the 1987 Manual since he concluded that all three 1987 Manual wetlands parameters were present during his October 16, 2017 wetland determination. Dr. Brooks appears to have employed his own "atypical situation" procedures to avoid the need that one or more wetlands parameters must be missing.

40. It is intuitively important for wetland scientists and investigators to understand and abide by the instructions given in the Corps 1987 Manual and applicable Regional Supplement, *especially* in atypical situations. These federal manuals admonish that wetland determinations in atypical situations should "*only* (emphasis added) *be used when a determination has already been made in Section D or E that positive indicators of hydrophytic vegetation, hydric soils, and/or wetland hydrology could not be found due to effects of recent human activities or natural events*."[17] Dr. Brooks actually reports finding positive indicators of wetland vegetation, hydric soils and wetland hydrology at each of his sample points on the Site, making the use of reference sites unnecessary and unadvised since Dr. Brooks indicates no parameters were missing.

41. Even if Dr. Brooks had found that wetlands on the Marsh Site were so severely altered by either human or natural disturbances that one or more of the three wetland factors were completely absent of wetland indicators, he failed to meet accepted requirements for applying the term "reference areas and reference wetlands" as defined in the 1987 Manual and/or Regional Supplement[18].

42. Dr. Brooks reported that he sought similarly situated wetlands to those alleged on the Marsh Site along tributaries of Elk Creek "where access would not be an issue". Brooks at 12. Since the National Wetland Inventory map(s) (NWI) used by Dr. Brooks for locating possible wetlands clearly indicate the potential existence of similarly located wetlands in the vicinity of (e.g.

[17] Ibid.
[18] Regional Supplement, pages 140, 120- 122, 124, 125, 127.

adjacent/neighboring) to the Marsh Site along Elk Creek, it is difficult to believe that the limited access he needed would be denied to Dr. Brooks by mere fact "access to private land" might be an issue. He does not document any actual access issues. It appears that Dr. Brooks simply chose to select reference wetland sites that are clearly not in the vicinity of the Marsh Site, rather than bother to ask any neighboring landowner for permission to access their property to examine a wetland.

43. The 1987 Manual, uses deliberate and cautionary terms like "*circumstantial evidence*", "*may sometimes be obtained*", "*probably similar*", etc., in regard to utilization of reference areas that are actually immediately adjacent and have the same topographic position, soil type, and hydrology as the subject area.

44. In a departure from accepted methods, Dr. Books surprisingly selected sites as reference wetlands located inordinately long distances away from the Marsh Site, and in different watersheds (Exhibit 15). Distances from the Marsh Site ranged from 3-32 miles (Exhibit 16). Of the five reference sites selected by Dr. Brooks, two are actually farther away from the Marsh site than the Marsh Site is from Lake Erie. It is simply not possible to draw scientifically reliable conclusions, or even reasonable inferences, by a comparative evaluation of wetland characteristics, functions, and services on wetlands separated from the Marsh site by such long distances and in different watersheds.

45. I believe that Dr. Brooks evidently accepts that the 1989 and 1990 EPA Team used the Marsh Site as a reference area (adjacent, contiguous, bordering, nearby, etc.) to compare alleged impacted wetlands on a "Consent Decree Area" located between 65 and 600 feet away, while at the same time he selected "reference sites" for comparison to alleged wetlands on the Marsh Site that are located between 3 and 32 miles away.

46. The Federal 1987 Manual and Regional Supplement guidance rationally instructs that reference wetlands must satisfy several important conditions in order to make scientifically valid

comparisons between the "normal circumstance" wetland characteristics of highly altered wetlands, and the unaltered reference site wetland. In addition to his inappropriate use of reference sites, Dr. Brooks misapplied some of the critically important conditions that must apply to reference wetland sites at times when they are actually justified. On pages 76, 79, and 81 of the 1987 Manual, and pages 116, 117, 120, 121, 124, 125, and 127 of the Regional Supplement, language is found that sets forth conditions that apply for selection of a reference site.

47. Using adjacent vegetation or hydrology as circumstantial evidence is permissible under methods for atypical situations in the 1987 Manual and the Regional Supplement, if the adjacent area is in the same topographic position, has the same soils and hydrology of the altered area.[19] The use of reference areas with different soil types and miles away in different watersheds does not make scientific sense, and is not mentioned as an acceptable technique in either the 1987 Manual or the Regional Supplement.

48. The 1987 Manual emphasizes that "*circumstantial evidence of the type of plant communities that previously occurred may* ***sometimes*** (emphasis added) *be obtained by examining the vegetation in adjacent areas*." In my professional experience, use of the term "adjacent", is interpreted as being juxtaposed by being physically bordering, contiguous, or at least nearby and neighboring. In my opinion, these descriptive terms (and the plain meaning) for defining "adjacent" are reasonably applied to a nearly identical [wetland] site located within distances as little as just a few feet or yards, to possibly nearby areas that might be several hundred feet to even several hundred yards away. In a rare circumstance, use of a comparative reference site might still be considered "adjacent", even if it is as far as half a mile away, if that is the only site that is available. However, plausibility ceases when the distance reaches a mile or more from the subject parcel, or if the reference site is in a different watershed. This interpretation and application of the term "adjacent" used for comparative wetland characteristics is congruent with the 1987

[19] 1987 Manual, p. 76.

Manual, which states the following: "*If adjacent areas have the same topographic position, soils, and hydrology as the altered area, the plant community types on the altered area were probably similar to those of the adjacent area*."

49. The same conditions apply for utilizing reference sites to evaluate hydric soils. In the case of atypical sites where a hydric soil determination cannot be made due to the disturbance-related absence of indicators, the 1987 Manual provides very clear instruction and definition for reference site selection if one must be used: "*As an alternative, examine an undisturbed soil of the same soil series occurring in the same topographic position in an* ***immediately*** (emphasis added) *adjacent area that has not been altered*."[20] I believe the 1987 Manual's instruction to use a reference site with undisturbed soil, in an "immediately adjacent" area, excludes wetland areas which are located 3 to 32 miles away, especially when disjointed by non-wetland woods, pastures, residential homes, farmlands, roads, and highways, or by different watersheds.

50. Dr. Brooks makes the surprising and purely speculative statement that, "The five reference wetlands (Brooks at 31, Brooks Figures 37-46) provide indications of how the structure and function of Marsh Site wetlands would appear if alterations of hydrology and vegetation had not occurred in 2012." This is purely supposition, if not, speculation, as the reference areas simply do not have enough features or characteristics in common with the Marsh Site to be considered representative of the site in an undisturbed state. Notwithstanding the fact that Dr. Brooks contravened federal guidance for employing reference areas, his choice of reference wetlands is simply neither rational nor scientifically grounded due to distance, topographic position, and soil characteristics.

51. The reference wetlands selected by Dr. Brooks were not similar to the Marsh Site. Besides being exceedingly far away (in terms of physical distance) from the Marsh Site, all were in different watersheds (Exhibits 15, 16). This membership in different watersheds alone precludes the

[20] 1987 Manual. Part IV, page 79.

reference sites from being considered as examples of being "similarly situated". Nonetheless, Dr. Brooks erroneously refers to the "*Marsh Site wetlands and other similarly situated wetlands in the **Elk Creek** watershed*" (emphasis added) numerous times throughout his report.

52. Dr. Brooks' reference sites #220, #221 and #222 also differ in important characteristics (other than watershed membership) from the Marsh Site (Exhibit 16). Although the soils are hydric at each, the reference sites all have different soil types than the Marsh Site, as well as from each other. The major soil type at the Marsh Site is mapped as Canandaigua mucky silt loam. It is primary soil type is of the Canandaigua series, a Typic Endoaquoll, which is in the order Mollisols. The major soil series underlying Reference Site #220 is Carlisle muck. The Carlisle series is a Typic Haplosaprist, which is a very organic soil in the order Histosols. Reference Site #221 is underlain by Frenchtown silt loam, 3 to 8 percent slopes, and the major component series is Frenchtown, a Typic Fragiaqualf from the order Alfisols. Reference Site #222 is mapped as Holly silty clay loam, and the Holly series is a Typic Fluvaquent of the order Entisols. Clearly, these soils do not have similarity to each other, much less to the Marsh Site, as they are all in different Orders, which is the first taxonomic category to which soils are assigned (Exhibit 17). Comparing these differing soils orders is like comparing differing orders of mammals, e.g. *Cetecea* (whales) to *Lagomorpha* (rabbits). They simply have very little in common other than being "soils", just as whales and rabbits have very little in common other than they both give live birth to their young and nurse them on milk.

53. For the reasons stated above, it is my opinion that not only did Dr. Brooks fail to follow standard and accepted Federal 1987 Manual guidelines by his unwarranted and unsupported use of reference wetland sites, his use of "reference wetlands" located expansive distances of 3-miles away and greater from the Marsh site, cannot reasonably represent "adjacent wetlands." Dr. Brooks simply is not able to justify the use of reference wetlands, or in particular, the wetland sites he chose.

54. Dr. Brooks also did not provide any of the required long-term hydrological monitoring data for any of his reference sites. In atypical situations where human or natural alteration to hydrology characteristics have caused such disturbance that indicators of wetland hydrology are absent on the subject site. The 1987 Manual and Regional Supplement again provide instruction regarding how to properly use a reference site for comparative information[21]. In order to interpolate hydrology from a reference site, the requirement is that "*landscape setting, topography, soils, and vegetation are substantially the same as those on* ***nearby*** (emphasis added) *wetland reference areas with* ***known hydrology***". (Emphasis added.) The Regional Supplement goes on to indicate that the reference site should have wetland hydrology documented through long-term monitoring, which Dr. Brooks did not report.

DR. BROOKS' CONCLUSIONS THAT DISTURBANCES TO THE MARSH SITE IMPACTED CONNECTIVITY TO DOWNSTREAM WETLANDS AND WATERS ARE NOT REASONABLE OR RATIONAL.

55. Dr. Brooks states that, based upon aerial photographs, NWI mapping, and reports about previous site visits, "it is evident that wetlands with continuous surface connections existed on the Marsh Site prior to the disturbance in 2012". Brooks at 13. Firstly, there is no way to determine from aerial photographs and NWI mapping the presence of *jurisdictional* wetlands, which are the only legally relevant wetlands. Secondly, previous site visits did not investigate the majority of the Marsh Site, so the specific conditions that existed there are simply unknown. Finally, the sampling that was done in 1989 and 1990 was more than 25 years ago, and the identification of jurisdictional wetlands has changed substantially since that time. In particular, the definition of "hydric soil" has evolved significantly. The state of the art for hydric soil identification is now Field Indicators of Hydric Soils in the United States, Version 8.1[22], whereas the first published version of this reference was not even issued until 1996, years after the previous investigation. Based upon these facts, it is my opinion that it was *not* evident or indisputable that *jurisdictional*

[21] Regional Supplement, pages 127, 140.
[22] Field Indicators of Hydric Soils in the United States. Version 8.1, 2017.

wetlands existed on the Marsh Site prior to the 2012 disturbance.

56. Dr. Brooks states that his Figure 2 shows the portion of the Marsh site "post disturbance" with the approximate wetland boundaries highlighted by red hatching. Brooks at 47. However, this Figure (2) does not reveal *what* the alleged disturbance is or *where* the disturbance is. The approximate wetland boundaries in that figure (and associated narrative) also lack any and all reference as to when the delineated wetland boundaries were established, who or what agency performed the wetland identification and delineation, and what wetland manual(s) and methodologies were employed for identifying the wetland areas. Dr. Brooks also fails to provide information concerning whether the wetland boundaries were approved via a jurisdictional determination by the Corps, or whether a certified determination was issued by the USDA SCS/NRCS (which should be the designated lead federal agency with responsibility for issuing wetland determinations on agricultural lands). At a minimum, any "expert" report which opines to the "existence, conditions, and functions of wetlands" previously delineated and mapped, must include the reference to the author of the mapped wetlands, and where the wetland identification field Data Forms can be examined [reviewed]. Since Dr. Brooks' failed to provide any reference for understanding the etiology for his Figure 2 wetland delineation boundaries, there is no scientific or other basis for accepting the veracity of the red hatched wetland boundaries.

57. In his report, Dr. Brooks did not show any <u>data</u> or other evidence demonstrating that the areas he identified as wetlands on the Marsh Site are connected by a continuous surface hydrologic flow to Elk Creek.

58. Dr. Brooks correctly does not refer to Elk creek as a Traditionally Navigable Water (TNW), but he states that the creek "flows directly" into Lake Erie which <u>is</u> a TNW. Brooks at 15 and others. According to my research and analysis, the Elk Creek center-line channel [thalwag] distance between the nearest point of the Marsh Site and Lake Erie is 30.75 miles (Exhibit 18); but, rather than "flow directly" as reported by Dr. Brooks, there are at least nine (9) distinct breaks where

the creek channel flows beneath the land surface, plus the channel is joined by at least 74 tributary creeks, streams, natural and artificial drainage ditches, etc. The nine breaks from surface flows of Elk Creek account for a total of 741 linear feet where the creek does not constitute a "direct flow" i.e. surface connectivity, as interpreted by the U.S. Supreme Court in *Rapanos v EPA*.[23] In the plurality decision, I believe that Justice Scalia definitively ruled that CWA jurisdictional wetland connectivity requires a "*continuous surface hydrologic connection to the nearest TNW*", which in this case would be Lake Erie. Lake Erie is located nearly 31-miles from the Marsh Site via Elk Creek.

59. In addition to the erroneous opinion that wetlands identified on the Marsh Site satisfy the SCOTUS ruling on what constitutes a continuous surface hydrologic connection to Lake Erie, Dr. Brooks reports that he evaluated "whether wetlands on the Marsh Site, either alone or in combination with similar wetlands in the region, significantly affect the chemical, physical and biological integrity of Elk Creek and Lake Erie." Brooks at 9. Dr. Brooks' findings and conclusion of "important contributions, ecological health, condition, etc.," falls substantially below the "significant nexus" threshold that he cited as the target and purpose of his evaluation. In other words, Dr. Brooks failed to actually demonstrate and/or provide evidence that wetlands on the Marsh Site *significantly* affect the chemical, physical, **and** biological integrity of the nearest TNW, Lake Erie, even if considered in combination with similarly situated lands in the region. In my opinion, to conclude there is a "significant nexus," is simply unjustified after careful review of the subject relationships and factors, as well as undertaking some sort of quantitative analysis[24]. For example, in keeping with the purpose of the CWA (which is to protect and maintain the nation's water quality, i.e. clean water), I believe that it is not plausible that an

[23] *Rapanos v. EPA*, 547 U.S. 715, 126 S. Ct. 2208 (2006).
[24] Kagel Environmental has devised and successfully used an inert dye-tracing test to quantitatively measure the potential for significant, or even measurable, nexus of wetlands with downstream TNWs. Other chemical tracing methods exist, and still others have used inert objects such as ping pong balls or painted corks to measure connectivity.

alleged unauthorized discharge of such a benign pollutant as native farm soil into wetlands that may occur on the Marsh Site, could have a true, factual, and measurable (quantifiable) impact on Lake Erie, a distant waterbody so expansive that it covers approximately 10,000 square miles in surface area, and is listed as the fourth (4^{th}) largest lake in the United States. Common agricultural activities that may technically result in a discharge of soil into a wetland on the Marsh Site farm, cannot possibly have a *significant* effect on the chemical, physical, and biological integrity of such a huge body of water as Lake Erie, especially in consideration of the compelling additive fact that the lake is located nearly 31-miles away.

60. Dr. Brooks' refers to "similarly situated wetlands" adjacent to Elk Creek, which are in fact areas significantly disjointed more than 3.8 miles (20,092 feet) of non-wetland (i.e. upland) sections of creek banks downstream of the Marsh Site. This 3.8 miles consists of a minimum of 24 sections of definitive upland breaks between wetlands along the banks of Elk Creek from the Marsh Site to Lake Erie. Each of those upland interruptions exceed 100 linear feet, ranging from 126 feet to 1,884 feet, with an average distance of 837-linear feet. Each of these upland breaks create a physical separation between any wetlands that otherwise might be considered immediately adjacent, i.e. geo-topographically connected, to each other.

61. Additionally, there are at least 176 non-wetland (upland) properties occurring and disrupting wetland continuity that are not geo-topographically connected to Elk Creek, but are within a perpendicular distance of 300 feet or less from the creek channel (Exhibit 19). These wetlands can reasonably be considered adjacent in terms of neighboring or being nearby Elk Creek. The convex polygonal area of the adjacent 176 non-wetland parcels that occur within 300 feet or less of the Elk Creek channel is approximately 409 acres. Dr. Brooks also failed to identify or discuss that interspersed with wetlands that are reasonably considered adjacent to Elk Creek, there are also a minimum of 337 privately owned residential properties and structures, including houses, apartments, mobile homes, garages, and shops, paved and unpaved driveways, parking areas, lawns, and landscaped yards, etc., which create indisputably significantly vast areas of uplands.

In my expert opinion, these huge upland gaps in wetlands adjacent to Elk Creek which are created by the presence of literally hundreds of residential houses and private property developments, effectively eliminate any reasonably plausible [aquatic/ecological] association of a wetland on the Marsh site with Lake Erie, located some 31-miles away (Exhibit 20). I believe Dr. Brooks did not consider or report the effects that these numerous areas of human disturbance have on downstream waters in his analysis. Without considering these human disturbance areas, it would be easy to overestimate the importance of an agricultural disturbance on the Marsh Site upon any characteristic of Lake Erie.

62. In addition to the above, Dr. Brooks apparently did not take into account the effects of approximately nineteen (19) commercial, industrial, and/or educational developments that are also neighboring (i.e., within approximately 300 feet of) Elk Creek. These include at least two sewage waste water treatment plants located approximately 1.4-miles and 4.4 miles upstream of Lake Erie and only 150 feet from the channel of Elk Creek (Exhibit 18). Clearly, the presence of these properties, including sewage treatment plants, so close to Elk Creek could also have serious implications for water quality downstream of the Marsh Site.

63. Dr. Brooks did not reveal or acknowledge that according to aerial photography and satellite imagery, the Marsh Site is located within an area of obviously intensive agricultural use (Exhibit 20). The Marsh Site is surrounded by three primary roads (Sharp Road, Greenlee Road, Lane Road); the total land area enclosed by these roads is approximately 80 acres. Within the entire [approximate] 80-acres there is only one observable lawn which is associated with a single-family residence. The distance between this potentially upslope lawn and the nearest point of any wetland reported by Dr. Brooks on the Marsh Site, is minimally 1,213 linear feet. The land between that residential lawn and the alleged Marsh Site wetlands is an expanse of actively cropped farmland. The next closest upslope lawn to a Marsh Site wetland is 2,014 linear feet, also separated by areas of cropped farmland, including Lane Road. Dr. Brooks assertion that the previously undisturbed wetlands on the Marsh Site provided important bioremediation to

"pollutants carried by runoff from adjacent upslope roads and lawns" is simply not supported. There is absolutely no scientific or other reasonable basis for Dr. Brooks' conclusion that the subject wetland performs important bioremediation services (functions) from some unidentified pollutant that could be carried in runoff water from a nearly level, single family residential lawn, located more than 1,200 linear feet away, and separated by actively cropped farmland, including a creek channel that is lower in elevation than the alleged Marsh Creek wetland.

64. Regarding upslope roads, only two are considered as adjacent or neighboring: Lane Road to the south and Sharp Road to the west of the Marsh Site. The third road bordering the eastern side of the 80-acres of agricultural lands is Greenlee Road. In my opinion it is not reasonably possible for pollutants carried in runoff from Greenlee road to interact with any wetland identified by Dr. Brooks on the Marsh Site. Any runoff from this road would be trapped by adjacent borrow ditches, interrupted by vast stretches of cropland averaging more than a thousand feet from any subject wetland, and/or collected in the channel of Elk Creek which also precludes runoff from reaching an identified subject wetland west of the creek. Consequently, the only "upslope" roads that Dr. Brooks could reasonably allege as being a substantial source of pollutant laden runoff reaching wetlands on the Marsh Site would be Lane Road and/or Sharp Road.

65. In consideration of all the extremely influential factors including, but not necessarily limited to extensive distance, disjointed wetlands, lack of surface flow continuity, the presence of numerous tributaries joining Elk Creek downstream, adjacent creek side residential and commercial developments, adjacent agricultural developments, road and highway developments, as well as immense acreages of uplands located along the 31-mile distance between the Marsh Site and Lake Erie, it is also my professional belief that it is not even plausible to conclude that wetlands on the Marsh Site have a "significant effect on the physical, chemical, and biological integrity of the nearest TNW, the fourth largest (10,000 square mile) lake in the United States. It is important to note that in his page 9 introductory statement regarding his opinion of **significant effect** on physical, chemical, and biological integrity, Brooks only concluded that Marsh Site headwater

wetlands make "**important contributions** to the ecological health, condition, and integrity of Lake Erie." In my opinion the SCOTUS term "**significant effect**" is a much higher bar than "**important contribution**", and "physical, chemical, and biological" are terms significantly more precise than "ecological health". Similarly, it is my opinion that any ecological functions and/or services of wetlands on the Marsh Site, regardless of farming related pre- or post- disturbances, would not and could not have any measurable adverse effects on the water reaching Lake Erie via Elk Creek.

REVIEW OF BROOKS DATA

66. Beginning on page 21 of his report Dr. Brooks provides several narrative paragraphs summarizing his observations, analysis, and conclusions based on site data he collected and recorded at this Sampling Point on an approved US Army Corps of Engineers WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region – Version 2.0 (Data Form). For purposes of conducting site specific wetland determinations in the field, the investigator must fill out one Data Form for each Sampling Point selected on a given site. Each Data Form is 3-pages in length and developed by the COE to provide a field investigator with standardized lists of approved indicators that determine or aid in determining wetland parameters of hydrology, soil, and vegetation. Data Forms provide the agency with official written records documenting each sampling point characteristics and conditions regarding extant hydrology, soil, and vegetation observed, assessed, summarized, and recorded by the investigator on the date of the field investigation. Most importantly, the Data Form documents the investigator's determination whether or not the sampling point is, or is not a wetland.

In addition to providing an important tool for the investigator to document and summarize indicators for hydrology, soils, and vegetation he or she uses when making a wetland determination at each sampling point, Data Forms provide a record of basic and important information such as the project name and location, sampling date, name of the investigator,

topographic features, climatic/hydrologic conditions, and whether or not vegetation, soil, or hydrology at the sampling point is significantly disturbed, naturally problematic, and if the investigator considers normal circumstances to be present.

Most COE Districts have developed, adopted, and published minimum standards and/or verification checklists for submitting wetland identification, delineation, and determination reports. Although wetland report minimum standards and requirements among the approximately 41-COE Districts are not necessarily the same for each District, all the COE Districts do require, and rely upon, completed Data Forms that are approved for use in accordance with the appropriate Regional Supplement. In other words, in comparison to wetland report narratives that provide general discussions of wetland study findings, conclusions, and determinations, etc., the approved Wetland Determination Data Forms are the primary e.g. controlling documentation whenever onsite inspections are required in accordance with Section D., Section E., and Section F., of the 1987 Manual, as well as Chapters 2 – 5 in the Regional Supplement.

67. Dr. Brooks reported that vegetation and hydrology were significantly disturbed and normal circumstances were not present for each of the six sampling points.

SAMPLING POINT #1

68. Dr. Brooks' Data Form for his Sampling Point #1 is found on pages 83, 84, and 85 of his report. His Data Form is dated 10-16-17 (the day he conducted his field study), and records that climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed; he also reported "Normal Circumstances" are not present. The 1987 Manual clarifies (pg.4-User Notes) that *Normal Circumstances are defined as soil and hydrologic conditions are normally present regardless of vegetative alterations. The determination if "normal circumstances" exist in a disturbed area depends upon an evaluation of the extent and relative permanence of alterations of wetland hydrology and hydrophytic vegetation in consideration of the purpose and cause of the physical alterations to hydrology and vegetation*."

Dr. Brooks documented in the "Remarks" section of the Data Form's Summary of Findings (Brooks at 83) that "*alterations to hydrology and vegetation in 2012; see expert report.*" Unfortunately, Dr. Brooks failed to provide the requisite *evaluation extent and relative permanence of alterations of wetland hydrology and hydrophytic vegetation* in 2012.

69. Dr. Brooks marks "yes" for each of the wetland parameters, i.e., hydrophytic vegetation, hydric soils and wetland hydrology. However, immediately next to his remarks, he has written in what appears to be "*w/ qualification*". He does not explain what the "qualification" is, which seems extremely important since it could mean that Dr. Brooks is calling the sample site a wetland, when it would otherwise be an upland.

70. Dr. Brooks documented in the "Remarks" section of the Data Form's Summary of Findings that "*alterations to hydrology and vegetation in 2012; see expert report.*" Although Dr. Brooks records "*see expert report"* on the Data Form as noted above, he provides no citation, reference, or information identifying the author of the "expert report" or the date it was written, released or published, leaving the reader to question what (if anything) is relevant about the unidentified report.

71. Dr. Brooks makes nonsensical notations and remarks in the section on HYDROLOGY and Wetland Hydrology Indicators on the Data Form for Sampling Point #1. For example, Dr. Brooks checked <u>two</u> Primary Indicators (only one is required for wetland hydrology). The primary indicators are "<u>Oxidized Rhizospheres</u> on living roots", and "<u>Other</u> (explained in Remarks)". However, in the Remarks to explain "Other", Dr. Brooks wrote "*No hydro [hydrology] indicators here, except for* ***a few*** *oxidized rhizospheres.*" (Emphasis added.) It makes no sense to document two (2) primary wetland hydrology indicators, with one being "other", which is explained in the Remarks as "no hydrology indicators here" except for the first indicator.

72. The fact that Dr. Brooks remarks "***a few*** *oxidized* rhizospheres" would call also into question his using them as an indicator of wetland hydrology. Dr. Brooks also documented that he did not

observe any surface water, sub-surface water table, nor even soil saturation within 18-inches of the surface. In my opinion it is unlikely, and probably inaccurate for Dr. Brooks to state that wetland hydrology is present despite no observations of water or saturation in his soil pit, especially in light of the only other indicator being less than convincing as he records it. Dr. Brooks also did not identify any hydrology Secondary Indicators. Interestingly, he reported that topographic relief of sample site is convex with a greater than 2% slope. This is a land form not usually thought to be conducive to retaining water.

73. On his Data Form for Sample Point #1, Dr. Brooks identifies six (6) plant species. Four of the six species are hydrophytes, and the two dominants species are both hydrophytes, i.e. facultative-wet (FACW). Even though he completed the Dominance Test worksheet showing that dominant wetland plant species exceeded 50% of the vegetation at this Sampling Point, Dr. Brooks inexplicably failed to mark either yes or no to the conclusory question asking is "Hydrophytic Vegetation Present?"

74. Dr. Brooks substantially erred, e.g. failed, to comply with federal guidance found in the 1987 Manual (pg.68) and Regional Supplement (pg.19) whereby suggested plot sizes used to identify and quantify herbaceous vegetation range from a radius of just 1.64 feet from the sample point (soil pit), to a radius of as much as 5 feet (1.5 meters) from the sample point. Despite these explicit standard dimensions, Dr. Brooks documents that he used a sample plot size with a 3-meter (9 feet 10-in.) radius in his evaluation of the herbaceous vegetation.

75. Dr. Brooks was remiss in not reporting a substantial precipitation events that could influence his 16 October 2017 onsite wetland study (Exhibit 20A), and explaining if and how it affected his analysis. Nearby precipitation data reported an average of 1.85-inches of precipitation in the area on the six days prior to and including the day of Dr. Brooks visit. Precipitation events such as these must be taken into account when making a determination of wetland hydrology. Of the nearly 2 ¼ inches of rainfall at the closest weather gauging station (Erie 5.6 SW, ~ 7 miles away)

that fell during the week prior, approximately 0.44 inch of rain fell the day before of his inspection.

76. Dr. Brooks failed to answer a simple yes or no to a determination for hydrophytic vegetation on the Data Form for Sample Point #1, although he nonetheless circled "yes" on the Data Form where the SUMMARY OF FINDINGS asks if Hydrophytic Vegetation Present.

77. Dr. Brooks inappropriately used a plot size for evaluating vegetation twice as large as federal guidance standards.

78. I believe Dr. Brooks demonstrates a lack of understanding of established methods and procedures for sampling and determining the parameter for hydrophytic vegetation.

79. Dr. Brooks demonstrates that he lacks knowledge on how to properly describe a soil profile, is unfamiliar with standard terms for soil textures, and is unskilled in identifying hydric soil indicators. On the field Data Form for Sample Point #1 in the section on SOIL, he records the presence of a Restrictive Layer encountered at a depth of 18" (bottom of the pit) and describes the Restrictive Layer Type as "Some stone chips". In my 31-years of professional experience, I have never encountered, heard, or even read that a wetland or soil scientist considered "stone chips" to be a restrictive layer. The term "Restrictive Layer" as it relates to wetland hydrology is used to describe a layer that is restrictive to water passage, not difficulty in digging. I also believe that by documenting just "some stone chips" as the presence of a restrictive layer, is so beyond reasonable or legitimate plausibility that his statement alone is evidence that Dr. Brooks seriously lacks understanding of important edaphic terms.

80. Even if it was possible that stone chips formed a restrictive layer at a depth of 18-inches, since he reports all his soil sampling pits were only dug 18-inches deep, it is inexplicable how Dr. Brooks could know that stone chips (or anything else) form a "restrictive layer" at 18-inches unless he attempted to dig his soil pit(s) deeper.

81. Dr. Brooks demonstrated a lack of knowledge and understanding of the identification and description of hydric soils on Sample Point #1. The Data Form offers a list of twenty (20) Hydric Soil Indicators, plus another eleven (11) Indicators for Problematic Hydric soils. Dr. Brooks selected two (2) indicators, "Loamy Gleyed Matrix" (F2), and "Depleted Matrix" (F3), from the first list of 20 in his determination that hydric soils are present at this Sampling Point. Dr. Brooks' determination of a "Loamy Gleyed Matrix" is scientifically invalid based upon his Data Form. Dr. Brooks records that the soil [matrix] color has a hue of 10YR, a value of 6, and a chroma of 2, (10YR6/2) from 0-13" deep. From 14-18" he records the matrix color changes to 10YR6/1. However, none of these colors recorded by Dr. Brooks are found in "Gley" pages in the Munsell Color Book. In my opinion. anyone qualified to perform wetland determinations should be keenly aware that the soil indicator for Loamy Gleyed Matrix" requires a gleyed matrix color within the sampled [18"] soil profile.

82. Dr. Brooks uses unaccepted terms for describing soil texture. For example, he reports that the texture of the soil between 14-18" has a "very slight grit." However, in soil science there is no such textural term as "grit" or "slight grit". Soil textures, along with all indicators for hydric soils are defined by the USDA and National Technical Committee on Hydric Soils. Textures are strictly defined according to the Soils Textural Triangle (Exhibit 21). Since the word "grit" does not exist as a recognized term for describing soil texture, I believe Dr. Brooks is unfamiliar with standard and accepted edaphic terms.

83. Dr. Brooks makes the point of remarking that he determined "soil texture by touch". In my educational and professional training and experience in soil science, I'm unaware of any alternative method or procedure available to a field investigator for determining soil texture other than by touch.

SAMPLING POINT #2

84. The Data Form for Sampling Point #2 is found on pages 86, 87, and 88 of the Brooks report.

Similar to the Data Form for Sampling Point #1, Dr. Brooks documents that he conducted his wetland determination study on October 16, 2017 (at the very end of/or past the growing season) and records that climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed. He also reported "Normal Circumstances" are not present. In the overall SUMMARY OF FINDINGS, Dr. Brooks records a "Yes" for the presence of Hydrophytic vegetation; "Yes" for the presence of Hydric Soil; "Yes" for the presence of Wetland Hydrology. In response to the final determination question: "Is the Sampled Area within a Wetland?" Dr. Brooks records "Yes".

85. Dr. Brooks checked one (1) Primary Indicator under the section on HYDROLOGY and Wetland Hydrology Indicators. The hydrology indicator Dr. Brooks selected, was the last on the list which simply says "Other (Explain in Remarks)". In his explanation under "Remarks", Dr. Brooks erroneously records that his "Other" Primary Hydrology Indicator, is based on "histosols present." This basis for hydrology determination is another example of Dr. Brooks' apparent significant lack of understanding, experience, and/or professional qualifications for identifying, delineating, and making jurisdictional wetland determinations. In my opinion, even a novice wetland investigator with basic wetland identification training should understand that the presence of a "histosol" is a Hydric Soil Indicator. A "histosol" is not a Hydrology Indicator.

86. Dr. Brooks actually records under Field Observations (HYDROLOGY) that there was no surface water, no [subsurface] water table, and no saturation to the bottom of the soil pit (18"). Thus, he actually had NO legitimate hydrology indicators.

87. Dr. Brooks made several errors under the VEGETATION section on the Data Form for Sample Point #2. He again reports in the "Remarks" section that his plot size for sampling all extant vegetation is a "3-meter radius". This is double the size of the 1.5-meter radius plot size prescribed in the 1987 Manual and Regional Supplement. He also errs by leaving blank, the spaces where Total Cover percentages are to be totaled in order to complete the worksheet for

Dominance Test and Prevalence Index.

88. Dr. Brooks demonstrates his lack of understanding in the use and application of the 50:20 rule for determining dominant plant species by his failure to recognize as dominant species all four (4) plant species recorded under the Sapling/Shrub Stratum. He indicated that none of the four sapling/shrub species are dominants, and therefore they are excluded from the Dominance Test worksheet. Dr. Brooks makes a similar error for the four (4) plant species identified in the Herb Stratum, but here Dr. Brooks includes a plant as being a dominant when in fact it is not. Consequently, he erroneously calculates the total percentage of dominant species that are hydrophytes at this Sampling Point. Dr. Books incorrectly recorded that the total number of **all** dominant species is 3, but the correct number is actually 6. Dr. Brooks also incorrectly records that the number of hydrophyte dominant species is 2, but the correct number is actually 5. Finally, Dr. Brooks failed to mark either "yes" or "no" for the final question which asks is "Hydrophytic Vegetation Present?" He did however, mark "yes" for the presence of hydrophytic vegetation on under SUMMARY OF FINDINGS.

89. Dr. Brooks again incorrectly described the soil profile on the Data Form for Sample Point #2, demonstrating a lack of knowledge and/or understanding on standard soil profile description and standard terms for soil textures. Dr. Brooks reports that the soil at this location meets two (2) Hydric Soil Indicators: Histosol (A.1) and Black Histic (A.3). Use of either of these indicators is incorrect based upon his Data Forms. To begin, he records that from 0-8" in depth, the soil Matrix Color is "black histosol". "Black histosol" is not a recognized soil color. According to the federal "*Field Indicators of Hydric Soils in the United States*" Version 8.1 (2017), a Histosol (A.1) is an organic soil that occupies 16-inches or more of the upper 32-inches of soil. Dr. Brooks records that only 8 inches, or ½ the minimum required depth of an organic layer for a "Histosol" is "present." Organic soil materials have organic carbon contents (by weight) of 12 to 18 percent

or more, depending on the clay content of the soil sample[25]. In his report narrative, Dr. Brooks reports that a laboratory analysis of this soil sample had "high organic matter of 31.8%", but he failed to report the "weight of organic carbon content" as a percentage of the soil. The 1987 Manual does allow that organic soils can be determined by percentage of organic matter depending on the clay fraction of the soil. However, since Dr. Brooks failed to correctly describe any soil textures at this sample point, and his *Table 3 – Analytical Results from Soil Samples from Marsh Site* (Brooks at 26) only analyzed soil samples from 6-8 inches of depth and fails to include mineral analyses, it is not possible to ascertain the percentage of the clay fraction. Textures of organic soils include "muck" (sapric soil material), "mucky peat" (hemic soil material), and "peat" (fibric soil material). However, Dr. Brooks neglected to describe the soil texture as sapric, hemic, or peat. As a matter of fact, he failed to provide any soil textures anywhere on the Data Form.

90. In general, organic soil textures typically require the investigator to use a 10X or higher power magnifying loop to aid in determining the degree of decomposition of plant roots and detritus for the determination if the organic texture is sapric, hemic, or fibric. It is also vital for determining if a fine root is living, and if the root channel lining is actually a redox feature or simply red/brown root material. Therefore, a 10X loop is considered standard equipment carried by experienced wetland investigators. Since Dr. Brooks does not report whether he used a magnifying loop, his declared soil findings are suspect.

91. Dr. Brooks also critically erred in reporting that the soil meets Hydric Soil Indicator "Black Histic" (A.3), because a "Black Histic" is defined as "*peat, mucky peat, or muck 8-inches or more thick that starts at a depth of less than 6-inches from the surface;* ***has a hue of 10YR or yellower, value of 3 or less, and a chroma of 1 or less****; and is underlain by mineral soil material with a chroma of 2 or less.*" (Emphasis added.) Since Dr. Brooks neglected to record any soil colors

[25] Keys to Soil Taxonomy. Twelfth Edition, 2014. Page 3.

(hue, value, or chroma) for the organic layer, a determination of "Black Histic" cannot be made using the definition established by the National Technical Committee on Hydric Soils and published in the Field Indicators of Hydric Soils in the United States, Version 8.1 (2017), which further renders his declared soil findings as suspect.

SAMPLING POINT #3

92. The Data Form for Sample Point #3 is found on pages 89, 90, and 91 of the Brooks report. As with his previous Data Forms, Dr. Brooks documents that he conducted his wetland determination study on October 16, 2017 (at the very end of/or past the growing season) and records that climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed; he also reports "Normal Circumstances" are not present. In the overall SUMMARY OF FINDINGS, Dr. Brooks records a "Yes" for the presence of Hydrophytic vegetation; "Yes" for the presence of Hydric Soil; "Yes" for the presence of Wetland Hydrology. In response to the final determination question: "Is the Sampled Area within a Wetland?" Dr. Brooks records "Yes". This is particularly interesting, as in the Remarks section under HYDROLOGY, Dr. Brooks has written "*middle of upland area (as designated)*". In fact, Sampling Point #3 is located in the area shown as uplands by Dr. Brooks (Exhibit 14C, Brooks Figures 2, 3). In short, Dr. Brooks has indicated on the Data Form that Sampling Point #3 is a wetland, although it is located in an area he designated as upland. **Clearly there are serious problems with Dr.** Brooks' reportage of data.

93. In the Remarks: Dr. Brooks makes the same (verbatim) comment as he does on the first two Data Forms: "*Alterations to hydrology and vegetation in 2012; see expert report.*" As in the case of his recording of Sampling Point #1, Dr. Brooks provides no citation, reference, or information identifying the author of the "expert report" or the date it was written, released or published, leaving the reader to question to what he is referring.

94. Under the section on HYDROLOGY and Wetland Hydrology Indicators, Dr. Brooks only checks

one (1) Primary Indicator and did not check any from the list of Secondary Indicators. The single indicator he selected is Oxidized Rhizospheres on Living Roots (C3). Dr. Brooks determined that wetland hydrology is present at Sampling Point #3 based solely on this single Indicator. First, based upon Dr. Brooks demonstrated lack of understanding of hydric soil identification, I am not confident that Dr. Brooks can reliably identify an oxidized rhizosphere, particularly with regard to presence on a living root or a dead root. Considering that under Field Observations, Dr. Brooks recorded Sample Point #3 had no surface water present, no [subsurface] water table present, and no saturation present, I doubt the veracity of a determination that this Sampling Point has wetland hydrology. In my opinion and experience, when a site exhibits absolutely no field observations of water or saturation within a soil pit, there are no primary or secondary hydrology indicators but Oxidized Rhizospheres (ORZ's) along living roots, a wetland investigator should not make a definitive determination for wetland hydrology; these data are too limited and it is easy to overestimate actual hydrology.

95. An experienced wetland scientist should understand that ORZ's can form in just a single year growing season when there are alternating periods of wetting and drying of the soil. Once formed, it is possible for these fragile features to remain in the soil almost indefinitely unless the soil is subjected to plowing, freeze-thaw, summer desiccation of clayey soils, or bioturbation caused by varied fauna digging in the soil and churning up ORZ's in the process. According to the primary author of the 1987 Manual, Mr. Charlie Newling, M.S., PWS, (personal communication), ORZs can be used to help determine if a soil can be considered hydric. However, since they can persist in the soil for decades after a soil has been drained or otherwise no longer has wetland hydrology, ORZs are not to be depended upon as a wetland hydrology indicator, unless a living root caused them to form is present and in place. In the absence of living roots, e.g. dead roots, the ORZ's are considered to be relict, i.e. they describe conditions that occurred in the past and are no longer present. Since Dr. Brooks has revealed numerous examples of misunderstanding and/or misapplication of hydric soil science, I have reasonably sound justification to doubt his skill in

determining a living root from a dead root, and I seriously question his ability to reliably identify an ORZ from a relict ORZ.

96. Dr. Brooks identifies and lists five (5) plant species within the Herb Stratum on the Data Form for Sampling Point #3. He recorded that three (3) of the five are dominant hydrophytes. In the Sapling/Shrub Stratum, he lists one (1) plant species (Red-Osier Dogwood) but erroneously indicates that it is not a dominant. I believe Dr. Brooks' erred in not understanding that a single plant species with 10% absolute cover in a stratum is a dominant plant, again evinces that Dr. Brooks lacks understanding of the 50:20 Rule and how to correctly apply it for determining the presence of hydrophytic vegetation using the Dominance Test. Consequently, he erroneously calculates the total percentage of dominant species that are hydrophytes at this Sampling Point by incorrectly recording that the total number of all dominant species is 3, when in fact it is 4. Dr. Brooks also again uses the inappropriate plot size for identifying herbaceous plants species by including all plants within a 3-meter radius of the soil pit rather than within the correct sampling area of just a 1.5-meter radius. He also failed to abide by the explicit instruction printed at the top of the Data Form which directs the investigator: "Use scientific names of plants."

97. Dr. Brooks records in Remarks under HYDROLOGY "*Pockets of elderberry and willow, [pockets] of quaking aspen – a bit higher elev*". Notably, he does not record any quaking aspen (*Populus tremuloides*) in the vegetation section of the Data Form. Quaking aspen is an upland species (FACU indicator).

98. Dr. Brooks provides a reiteration of his clear lack of knowledge and/or understanding of how to properly describe a soil profile on the Data Form #3. He again demonstrates that he is unfamiliar with standard terms for soil textures, is unable to properly fill out the Data Form, and incapable of making accurate hydric soil determinations. Dr. Brooks fails to identify any of the listed Hydric Soil Indicators as the reason for the soil being hydric. He also fails to answer either yes or no at the bottom of the page where it asks is "Hydric Soil Present?" He does, however, provide a

description of the soil sample color between 0-6" (5YR5/1), and between 6-18" (10YR6/2 and 10YR4/4).

99. Although Dr. Brooks also fails to correctly describe soil textures where it is requested as part of the Soil Profile Description for Sample Point #3, he curiously writes at the bottom of the page in the "Remarks", "*Oxidized Rhizospheres in upper 6"* and *"Not gritty, 1.5" ribbon – texture by touch.*" These remarks are meaningless since he already states that Oxidized Rhizospheres are his sole indicator for hydrology, and because this is not a listed hydric soil indicator. His description of the soil as "not gritty" and use of the phrase "texture by touch" offers additional evidence that Dr. Brooks is unfamiliar with acceptable standard language used by wetland scientists and soil scientists for describing soil texture. "Not gritty" is not an accepted soil texture descriptor, and "texture by touch" is needlessly redundant since "touch and feel" is always required for describing texture of a soil.

SAMPLING POINT #4

100. The Data Form for Sample Point #4 is found on pages 92, 93, and 94 of the Brooks report. As with his previous Data Forms, Dr. Brooks documents that he conducted his wetland determination study on October 16, 2017 (at the very end of/or past the growing season), climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed. He also reports that "Normal Circumstances" are not present. In the overall SUMMARY OF FINDINGS, Dr. Brooks records a "Yes" for the presence of Hydrophytic vegetation; "Yes" for the presence of Hydric Soil; "Yes" for the presence of Wetland Hydrology. It is important to note that in his response to the final determination question: "Is the Sampled Area within a Wetland?" Dr. Brooks also records "Yes".

101. Dr. Brooks notes on the Data Form for #4, next to HYDROLOGY, "*none, except oxid. hydrosph*." I believe his abbreviation of "oxid. hydrosph." means "oxidized hydrosphere". The definition of "Hydrosphere" is the "*water on or surrounding the surface of the earth, including the water*

of the oceans and the water in the atmosphere."[26] However, it is plausible that he meant "*oxid. rhizosph*." or oxidized rhizospheres, since he marked that wetland hydrology indicator. Again, Dr. Brooks shows his unfamiliarity with accepted terminology and evaluation. Dr. Brooks determined that wetland hydrology is present at Sampling Point #4, based solely on this single Indicator. Again, based upon Dr. Brooks demonstrated lack of understanding of hydric soil identification, I am not confident that Dr. Brooks can reliably identify an oxidized rhizosphere as a definitive indicator of wetland hydrology, particularly with regard to presence on a living root or a dead root. As with the other points, under Field Observations (HYDROLOGY), Dr. Brooks recorded that no surface water, no [subsurface] water table, and no saturation were present. Based upon this, I doubt that this Sampling Point has wetland hydrology. In my opinion and experience, when a site exhibits absolutely no field observations of water or saturation within a soil pit, and there are no primary or secondary hydrology indicators other than Oxidized Rhizospheres (ORZ's) along living roots, a wetland investigator should not make a definitive determination for wetland hydrology. The data are too limited and it is easy to overestimate actual hydrology, e.g., inundation, ponding, flooding, or at least soil saturation at the surface for at least 14-consecutive days during the growing season may not actually be present.

102. Dr. Brooks identifies and lists four (4) plant species within the Herb Stratum on the Data Form for Sampling Point #4. He recorded that one (1) of the four is a dominant hydrophyte. His Total Cover calculation does not reflect the sum of the individual percentages of cover he listed for the species, which implies either carelessness or misunderstanding of what the Total Cover calculation should be. Dr. Brooks does not record a plot size on this form, but in his report narrative (p.21) he indicates all his plots were 3-meters radius, which is inappropriate and contrary to accepted standards for the herb stratum. Again, he did not follow the explicit instruction printed at the top of the Data Form which directs the investigator: "Use scientific names of plants."

[26]http://www.dictionary.com/browse/hydrosphere?s=t

103. Dr. Brooks again demonstrates a lack of knowledge and/or understanding of how to properly describe a soil profile on Data Form #4. He provides more evidence that he is unfamiliar with standard terms for soil textures, is unable to properly fill out the Data Form, and incapable of making accurate hydric soil determinations. Dr. Brooks selected two (2) indicators, "Loamy Gleyed Matrix" (F2), and "Depleted Matrix" (F3). Dr. Brooks' determination of a "Loamy Gleyed Matrix" is scientifically invalid based upon his Data Form. From 8" to 18" of depth, Dr. Brooks records that the soil [matrix] color has a hue of 10YR, a value of 4, and a chroma of 1, (10YR4/1) with 20% redox features of color 2.5YR4/6. Again, none of these colors recorded by Dr. Brooks are found in "Gley" pages in the Munsell Color Book, and thus it is simply an invalid conclusion.

104. Dr. Brooks again fails to correctly describe soil textures where it is requested as part of the SOIL Profile Description for #4. Instead, under Remarks: he writes "*Soil fairly uniform in color & texture…One 2x3" chunk of 10YR5/1 w/ same reddish mottles…Texture by touch – 2"+ ribbon – smooth, no grit –below 8"…same above 8" – part histosol but probably silt loam*" Again, these remarks are meaningless and it is impossible to determine what he means. Soil that is "fairly uniform in color and texture" would imply that the soil was all of the same color, but he clearly records different colors on the form. His description of the soil as "smooth, no grit" and use of the phrase "texture by touch" confirms that Dr. Brooks does not know hydric soil description. "Smooth, no grit" is not an accepted soil texture descriptor, and I have never heard these words used to describe a soil texture in my 36 years of professional experience in soil science. Also, "texture by touch" is needlessly redundant since "touch and feel" is always required for describing soil texture in the field.

105. Most alarming of Dr. Brooks' soil remarks is that above 8", the soil is "*part histosol, but probably silt loam*". A soil is not "part histosol" any more than somebody is "part pregnant". Dr. Brooks finally makes use of an accepted soil texture descriptor in "silt loam", but unfortunately, silt loam has little in common with a histosol, including texture. Dr. Brooks (correctly) appears confused

and uncertain in his soil description.

SAMPLING SITE #5

106. The Data Form for Sample Point #5 is found on pages 94-96 of the Brooks report. As with his previous Data Forms, Dr. Brooks documents that he conducted his wetland determination study on October 16, 2017 (at the very end of/or past the growing season), climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed. He records that "Normal Circumstances" are not present. In the overall SUMMARY OF FINDINGS, Dr. Brooks records a "Yes" for the presence of Hydrophytic vegetation; "Yes" for the presence of Hydric Soil; "Yes" for the presence of Wetland Hydrology. In response to the final determination question: "Is the Sampled Area within a Wetland?" Dr. Brooks records "Yes".

107. Dr. Brooks notes on the Data Form for Remarks: under HYDROLOGY, "*No evidence of flooding above bank (despite heavy rainstorm 18 hrs before)…slight indication of oxidized rhizospheres. Soil saturated and water accumulating in bottom of soil pit*." He then checks Saturation (A3) and Oxidized Rhizospheres on Living Roots (C3) as wetland hydrology indicators. Dr. Brooks also checks "yes" to Surface Water Present?, followed up with the remark "*in ditches & soil pit near bottom of soil pit even with ditch level*". There are several problems with Dr. Brooks' wetland hydrology data. First, marking surface water as "yes" is not warranted when there is not surface water at the actual sampling site. A nearby ditch does not count as a positive indicator of hydrology at an actual separate site. Secondly, although Dr. Brooks marked yes a water table being present, he did not indicate the depth where it was found, which is important for evaluating hydrology. Finally, it appears that Dr. Brooks indicated that saturation was found from 0 to 18" of depth, but this seems highly unlikely. Soils have a "capillary fringe" where the subsurface layer in which groundwater seeps up from a water table by capillary action to fill pores, i.e., saturate the soil. I believe a capillary fringe of 18" whereby the soil is saturated, could only be

found in rare circumstances of clay soil or soil with mostly hemic/peat content such as is found in bogs. In my professional experience, it is very rare for a soil to be saturated to the surface when the water table is below 12" of depth, even in an actual wetland.

108. Dr. Brooks also selected Oxidized Rhizospheres on Living Roots as an additional wetland indicator, although he records "slight indication of oxidized rhizospheres" under remarks. In my professional experience, when it comes to identifying wetlands, a "slight indication" usually is not reliable. Also, it is unclear what a "slight indication" actually means. Does it mean a single rhizosphere or a low percentage? This amorphous language is not quantitative, or even qualitative, and is not helpful in understanding what Dr. Brooks actually observed.

109. Dr. Brooks lists four (4) plant species within the Herb Stratum, and three (3) in the Sapling/Shrub Stratum on the Data Form for Sampling Point #4. Again, his Total Cover calculations do not reflect the sum of the individual percentages of cover he listed for the species, which implies either carelessness or misunderstanding of what the Total Cover calculation should be. It is particularly interesting that he records total cover as being 60%, when the contributing species are 30%, 5%, trace and trace for cover. Dr. Brooks does not record a plot size on this form, and he did not follow the explicit instruction printed at the top of the Data Form which directs the investigator: "Use scientific names of plants."

110. Dr. Brooks again demonstrates a lack of knowledge and/or understanding of how to properly describe a soil profile on Data Form #5. He provides more evidence that he is unfamiliar with standard terms for soil textures, is unable to properly fill out the Data Form, and incapable of making accurate hydric soil determinations. Dr. Brooks selected Histosol (A1) as an indicator, despite the fact that his "histosol" (organic?) layer is 12" in depth, and must be 18" in depth to actually qualify as a true histosol.

111. Dr. Brooks again fails to correctly describe soil textures where it is requested as part of the SOIL Profile Description for #5. He uses the unrecognized "sticky, no grit" description as a texture.

He does not describe the texture of the histosol, which would be fibric, hemic or sapric, indicating the amount of breakdown of the organic matter.

112. Although Dr. Brooks indicated a water table and saturation under HYDROLOGY, in the Remarks under SOIL, he records "slight seepage bottom (18") of the pit, in direct contradiction to his entries under HYDROLOGY.

SAMPLING SITE #6

113. The Data Form for Sample Point #6 is found on pages 97-99 of the Brooks report. As with his previous Data Forms, Dr. Brooks documents that he conducted his wetland determination study on October 16, 2017 (at the very end of/or past the growing season), climatic/hydrologic conditions are normal for this time of year, but the vegetation and hydrology are significantly disturbed. He records that "Normal Circumstances" are not present. In the overall SUMMARY OF FINDINGS, Dr. Brooks records a "Yes" for the presence of Hydrophytic vegetation; "Yes" for the presence of Hydric Soil; "Yes" for the presence of Wetland Hydrology. In response to the final determination question: "Is the Sampled Area within a Wetland?" Dr. Brooks records "Yes".

114. Dr. Brooks marked hydrology indicators High Water Table (A2) and Saturation (3) for sample site #6, as well as the usual Oxidized Rhizospheres on Living Roots (C3). He marked the Water Table as present, and remarked that it was "about 12" inches deep. Although Dr. Brooks apparently had a measuring stick (visible in photos), he evidently did not use it to determine the water table depth in a more exact manner.

115. Dr. Brooks lists five (5) plant species within the Herb Stratum, although not with the prescribed scientific names. He was evidently not able to identify at least two species. He recorded another species as "fox sedge or similar", which is unacceptable if it is to be used in a determination of hydrophytic vegetation. Not all sedges are wetland plants, and although sedges are sometimes

difficult to identify (particularly late in the year), where so much is at stake for the defendant, such sloppiness is not acceptable.

116. At Sample Point #6, he did not attempt a total cover calculation for his vegetation strata. Subsequently, he did not correctly identify the correct number of dominants using the 50:20 rule, and designated two species as dominants that actually were not dominants. Dr. Brooks' inability to perform the vegetation calculations correctly raises more questions about his training (or lack of) in wetland delineation.

117. Dr. Brooks again demonstrates a lack of knowledge and/or understanding of how to properly describe a soil profile on Data Form #6. He provides more evidence that he is unfamiliar with standard terms for soil textures, is unable to properly fill out the Data Form, and incapable of making accurate hydric soil determinations. Dr. Brooks selected two (2) indicators, "Loamy Gleyed Matrix" (F2), and "Depleted Matrix" (F3), at this Sampling Point. Dr. Brooks' determination of a "Loamy Gleyed Matrix" is scientifically invalid based upon his Data Form. Dr. Brooks records that the soil [matrix] color has a hue of 10YR, a value of 5, and a chroma of 1, (10YR5/1) to the bottom of the 18" pit. 10YR5/1 is simply not a gley color, and it is not understandable how Dr. Brooks believes it is. Under indicator F2, Loamy Gled Matrix, the *Field Indicators of Hydric Soils in the United States*[27] clearly states: "*Gley colors are not synonymous with gray colors. They are the colors on the gley color pages of the Munsell color book (Xrite, 2006) that have hue of N, 10Y, 5GY, 10GY, 5G, 10G, 5BG, 10BG, 5B, 10B, or 5PB and value of 4 or more.*" If Dr. Brooks' color recordings are accurate, this is simply not a gleyed soil of any type.

118. Dr. Brooks again fails to correctly describe soil textures where it is requested as part of the SOIL Profile Description for Sample Point #6. He reports "*texture by touch*", although he does use the official soil texture descriptor "clay" for the lower soil horizon extending from 7" to 18" of depth.

[27] Version 7.0, 2010, page 20.

119. Although Dr. Brooks indicated a water table and saturation under HYDROLOGY, in the Remarks under SOIL, he records "slight seepage bottom (18") of the pit, in direct contradiction to his entries under HYDROLOGY. This simply does not make sense, e.g., slight seepage at 18" of depth, a water table at/about 12" of depth, and inference that glistening on the wall of the soil pit from 0-7" is "saturation" are all incongruent.

CONCLUSIONS

120. It is beyond my ken why Mr. Brace's farm was not evaluated in the context of the Food Security Act, as his properties have clearly been used for past, current and future agricultural purposes, and I understand that he has exemptions under Swampbuster provisions, as shown in the documents in Exhibit 3, and in light of the 1994 MOA and subsequent 2005 Memorandum between USDA and USCOE regarding wetland determinations (Exhibit 22).

121. Although it appears to be lost in the long history of Mr. Brace's history with the regulatory agencies, Mr. Brace can only be held responsible for ***jurisdictional wetlands***, the only legally relevant wetlands. I believe Dr. Brooks should have performed his wetland study pursuant to the 1994 MOA and/or the 2005 Memorandum to the Field (Exhibit 22), both of which clarify agency responsibility for conducting wetland determinations on agricultural lands when the purpose of activities are for continued agriculture.

122. Dr. Brooks never comes out and states what he determined as the extent of jurisdictional wetlands on the Marsh Site. In my opinion, Dr. Brooks' report does not provide a reliable or accurate determination of historic or present wetlands on the Marsh Site. Unless Dr. Brooks believes there are jurisdictional wetlands on the Marsh Site, all of his other reporting into this matter is moot.

123. Dr. Brooks reports that he was paid $150 per hour by the United States as an "expert" to assess, discuss, and opine about wetlands regarding a lawsuit brought by the government concerning an alleged violation on agriculture lands under the Clean Water Act (CWA), against a farmer, Mr.

Robert Brace. Brooks understands that the Marsh Site (owned by the farmer), is, and has been, solely subject to agricultural activities performed in since at least 1939, he fails to acknowledge, or even mention the word "wetland(s)" regarding the legally controlling Food Security Act (FSA), and "Swampbuster" provisions of the 1985 FSA.

124. Although Dr. Brooks claims many laurels as a "Wetland Scientist", a careful review of his Curriculum Vitae does not reveal that he possesses a background which includes passing a standard or advanced 40-hour wetland delineation training course, a hydric soils identification course, or "real life" regulatory experience in making either CWA or FSA determinations.

125. In view of the above, and my professional experience and past signature authority for making official [approved] Section 404 CWA wetland jurisdictional determinations, it is my opinion that Dr. Brooks failed to follow standard and accepted federal 1987 Manual/Regional Supplement guidelines in various manners while conducting his evaluation of the Marsh Site, particularly to the application of the term "Atypical" situations or the proper implementation and selection of reference sites.

126. Dr. Brooks substantially demonstrated that he simply is not familiar with standard hydric soil identification, indicators, or terminology. A rudimentary familiarity with these is absolutely necessary for a hydric soil determination made by a "wetland scientist" to be considered valid. Dr. Brooks' demonstrated lack of experience and technical skill is indefensible for him to be labelled an "expert" witness in this case. I believe that Dr. Brooks would significantly benefit by taking a hydric soil identification class/workshop, such as is offered at North Carolina State[28] and taught by Dr. Mike Vepraskas, leader of the National Technical Committee on hydric soils.

127. Dr. Brooks also showed a complete lack of understanding of how to determine if a plant species is a dominant in the plant community using the prescribed 50:20 rule[29]. I would suggest a good

[28] https://projects.ncsu.edu/mckimmon/cpe/opd/soils/
[29] Regional Supplement, page 20.

basic wetland delineation course such as that taught by the Wetland Training Institute[30] to bring his education up to date in the 50:20 rule, the Prevalence Index, and indicators of Hydric Soils and Wetland Hydrology.

Dr. Brooks' failure to identify plants by scientific names, or in several cases even by common names, raises the question of his botanical skills. Botanists skilled in "keying out" species are not difficult to find, particularly in the university setting (which I understand Dr. Brooks has very recently been a part of), and it is surprising that he did not involve the services of one to greatly improve his accuracy of hydrophytic plant community identification. Kagel Environmental, LLC regularly employs botanists with demonstrated skill in keying out plants in order to ensure that when we say a vegetative community is hydrophytic, or it is not, we are accurate and can defend our findings. Without the more exacting determination of plant species, it is difficult to be confident that Dr. Brooks' conclusions on wetland vegetation are reliable and/or valid.

128. Dr. Brooks fails to be definitive and/or provide empirical data in support of his opinions regarding historical perspectives of the Marsh Site using aerial photographs. Instead, he consistently employs the ambiguous word "appears". For example: "appears to have been a wetland historically"; "appears to have been partially channelized"; "appears much straighter"; "appears to have been cropped".

References Used

Corps of Engineers Wetlands Delineation Manual, 1987. Wetlands Research Program Technical Report Y-87-1 (on-line edition).

Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Version 2.0, January, 2012.

Wetlands: Characteristics and Boundaries. Committee on Characterization of Wetlands,

[30] https://www.wetlandtraining.com/course-information-2018/

National Research Council. 1995. http://www.nap.edu/catalog/4766.html.

RGL 90-07; 58 FR (1993).

https://www.fws.gov/wetlands/data/Mapper.html

Field Investigation – May 24, 1989, May 16-17, 1990, Potential Violation (Robert Brace), Erie County, Pennsylvania.

Field Indicators of Hydric Soils in the United States. Version 8.1, 2017.

Field Indicators of Hydric Soils in the United States. Version 7.0, 2010.

Report, Brace Site Visit. June 27, 2013. EPA document pages EPA0000502-EPA0000515.

Deposition of Robert Brace, January 10, 2018.

September 12, 2011 email from Todd Lutte to Brace Farms.

Rapanos v. EPA, 547 U.S. 715, 126 S. Ct. 2208 (2006).

http://agacis.rcc-acis.org/?fips=42049

http://agacis.rcc-acis.org/?fips=42039

http://www.dictionary.com

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

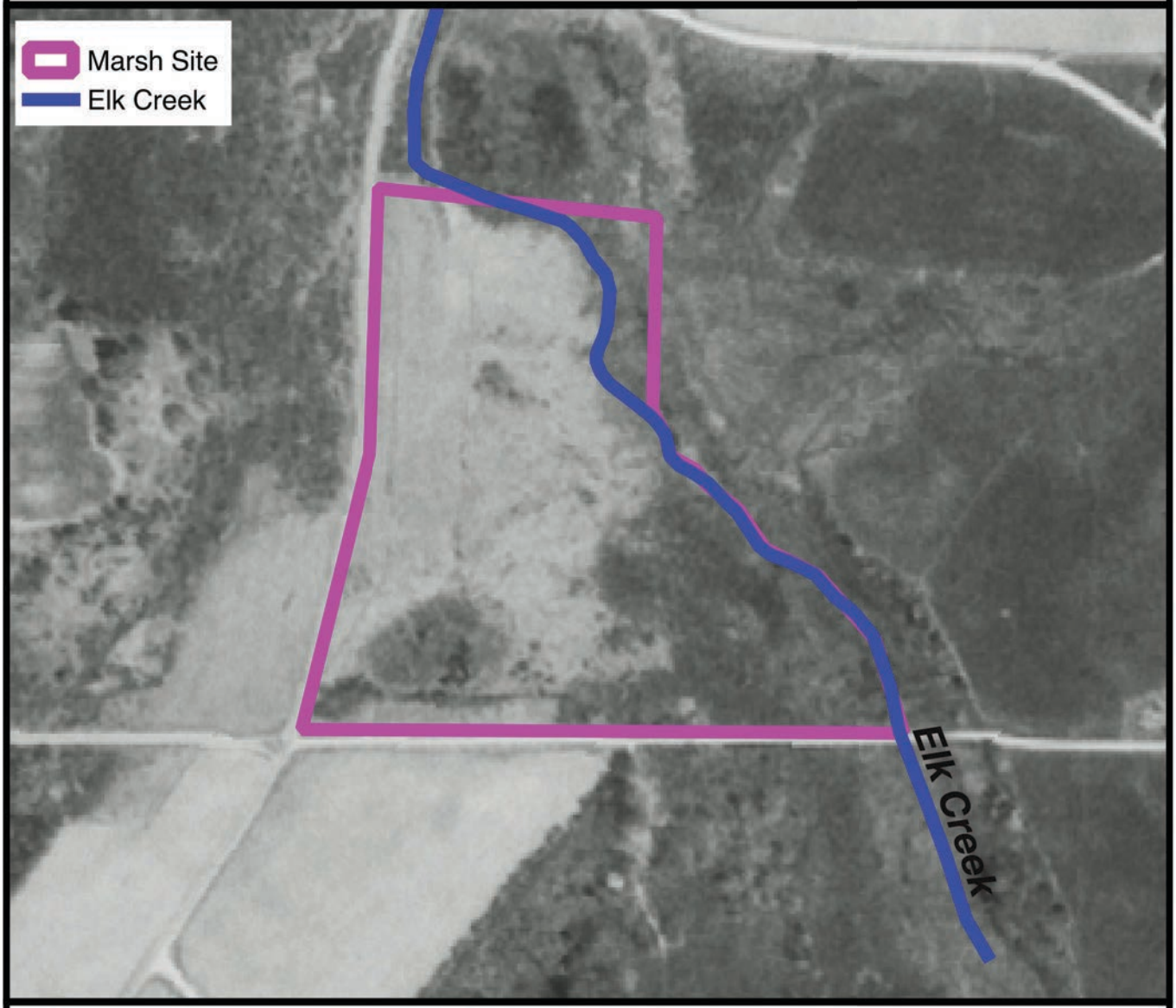


Exhibit 1. The Marsh Site as it appeared on March 10, 1975. More than 50% of the property appears to be cleared.

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

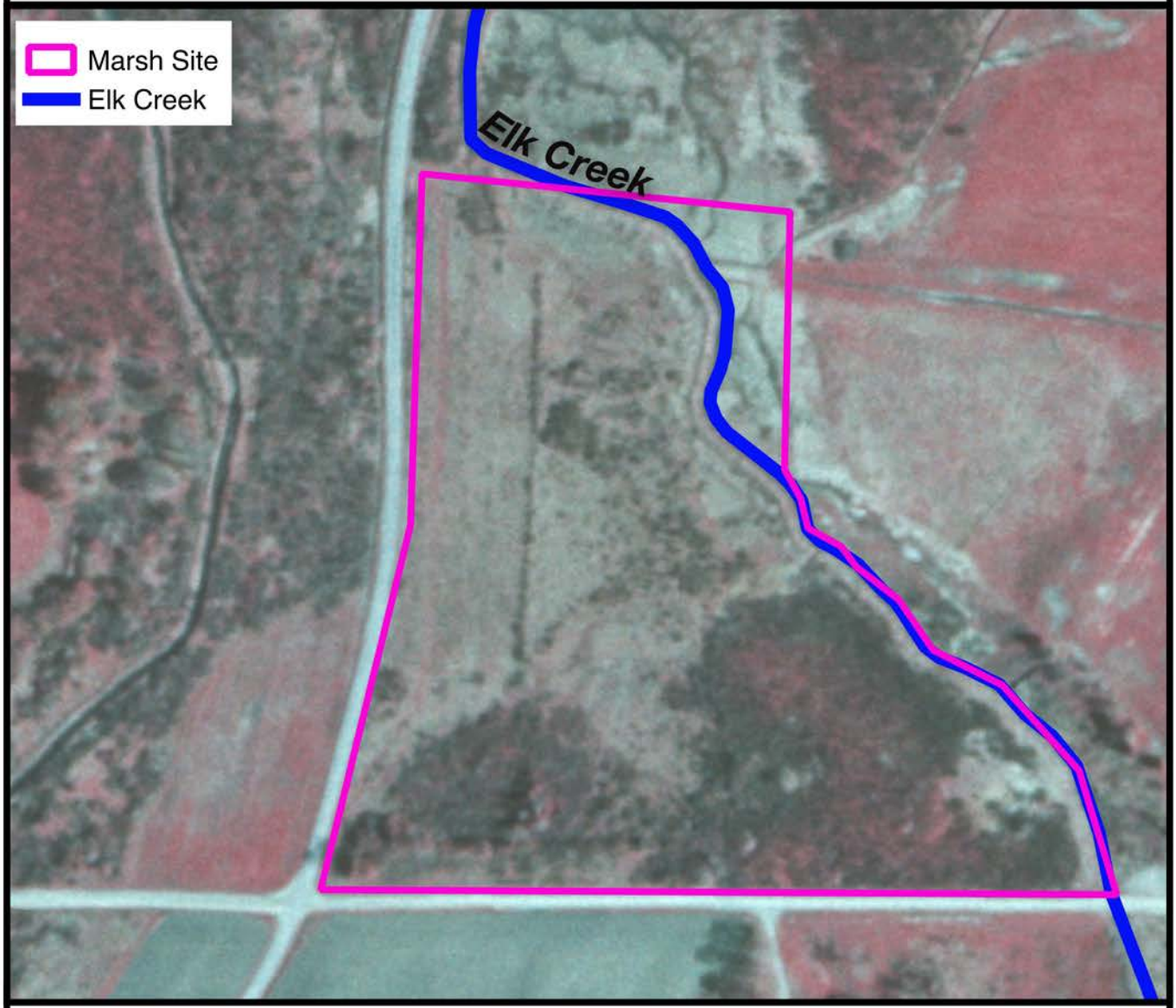


Exhibit 2. The Marsh Site as it appeared on March 11, 1983 using Color Infrared (CIR) photography.

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

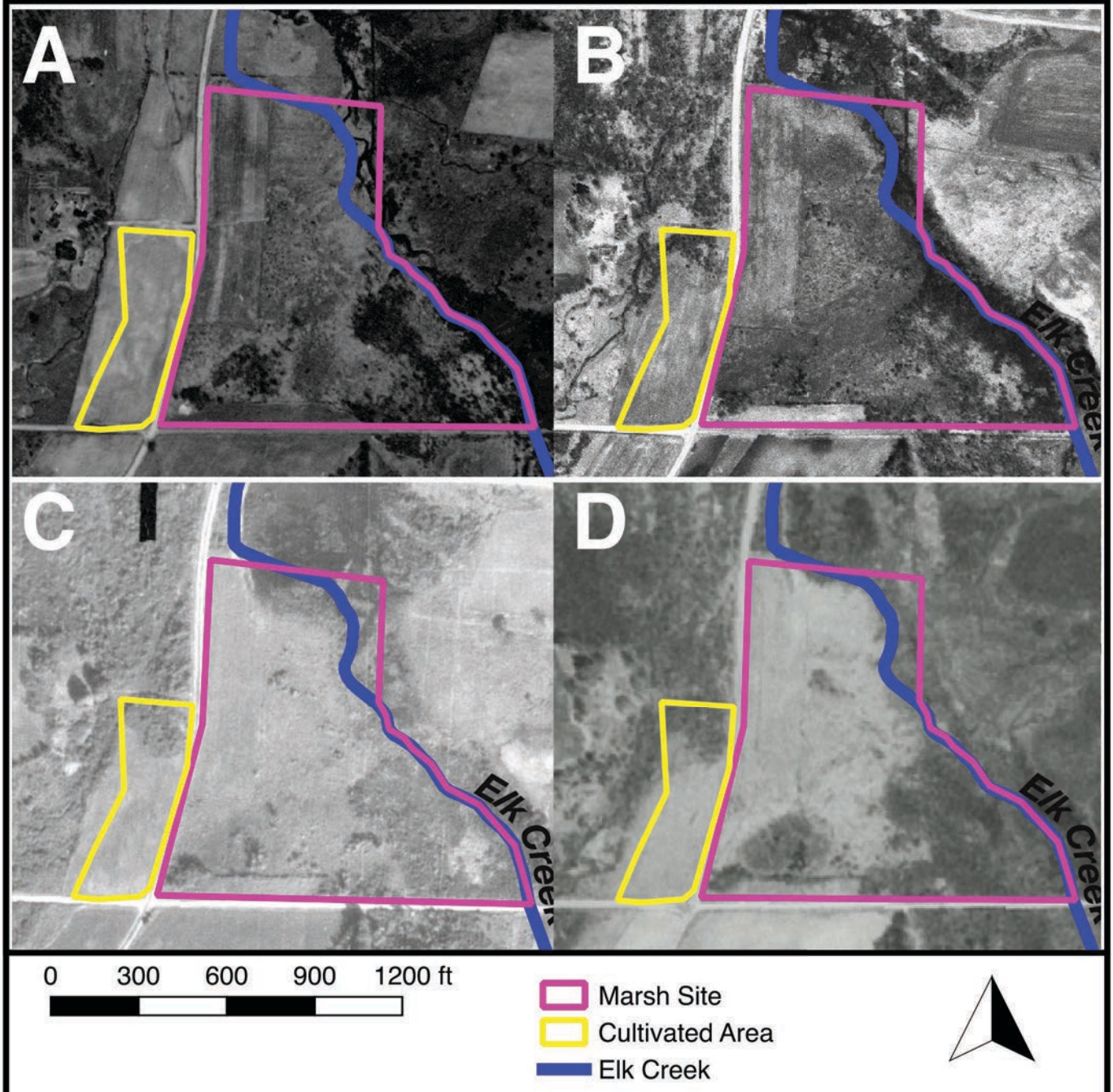
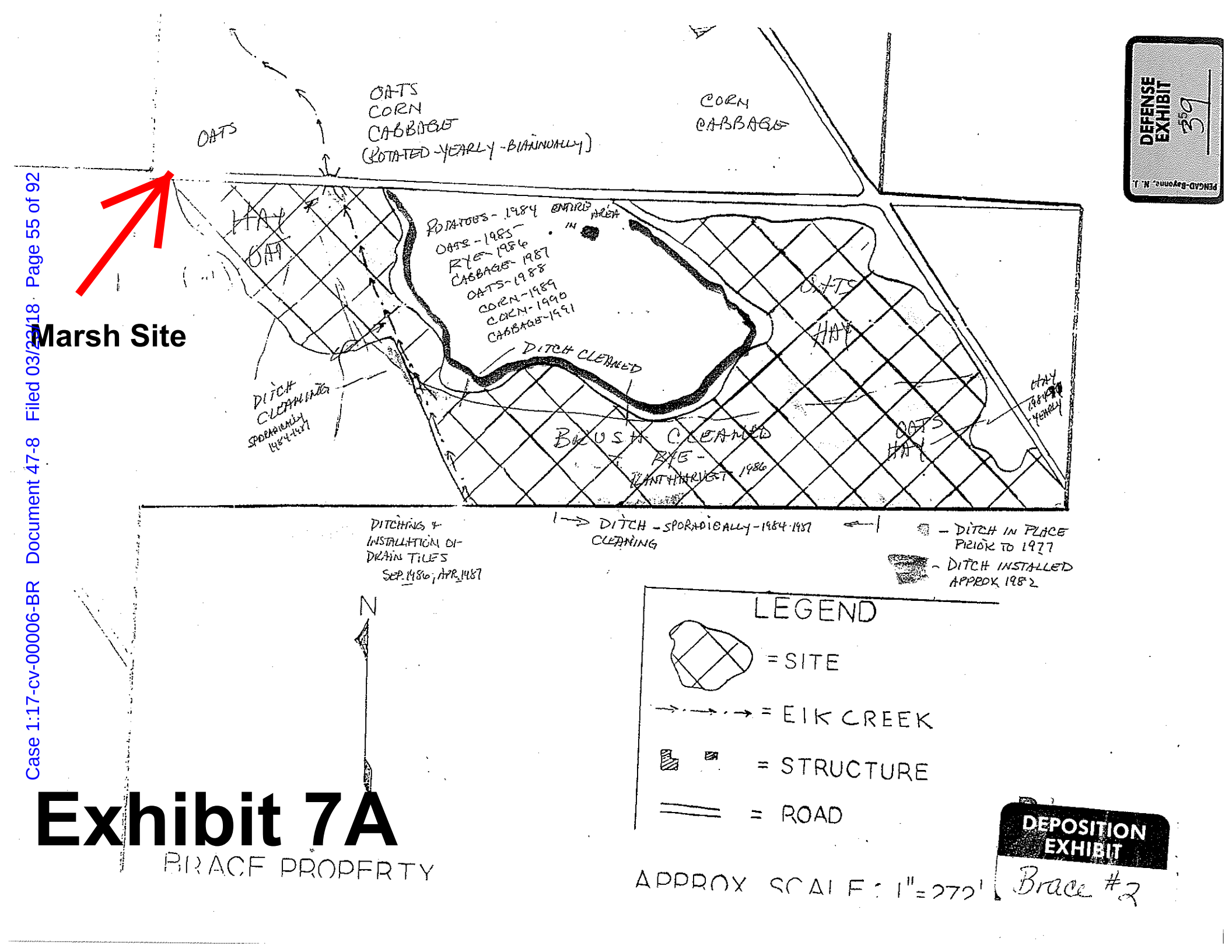


Exhibit 5. The Marsh Site (outlined in pink) and the nearby cultivated area (outlined in yellow) referred to in Exhibit 4, as they appeared on May 1, 1939 (A), April 29, 1965 (B), October 9, 1968 (C) and May 10, 1975 (D). The yellow outlined area appears to be cultivated regularly from 1939 to 1975.



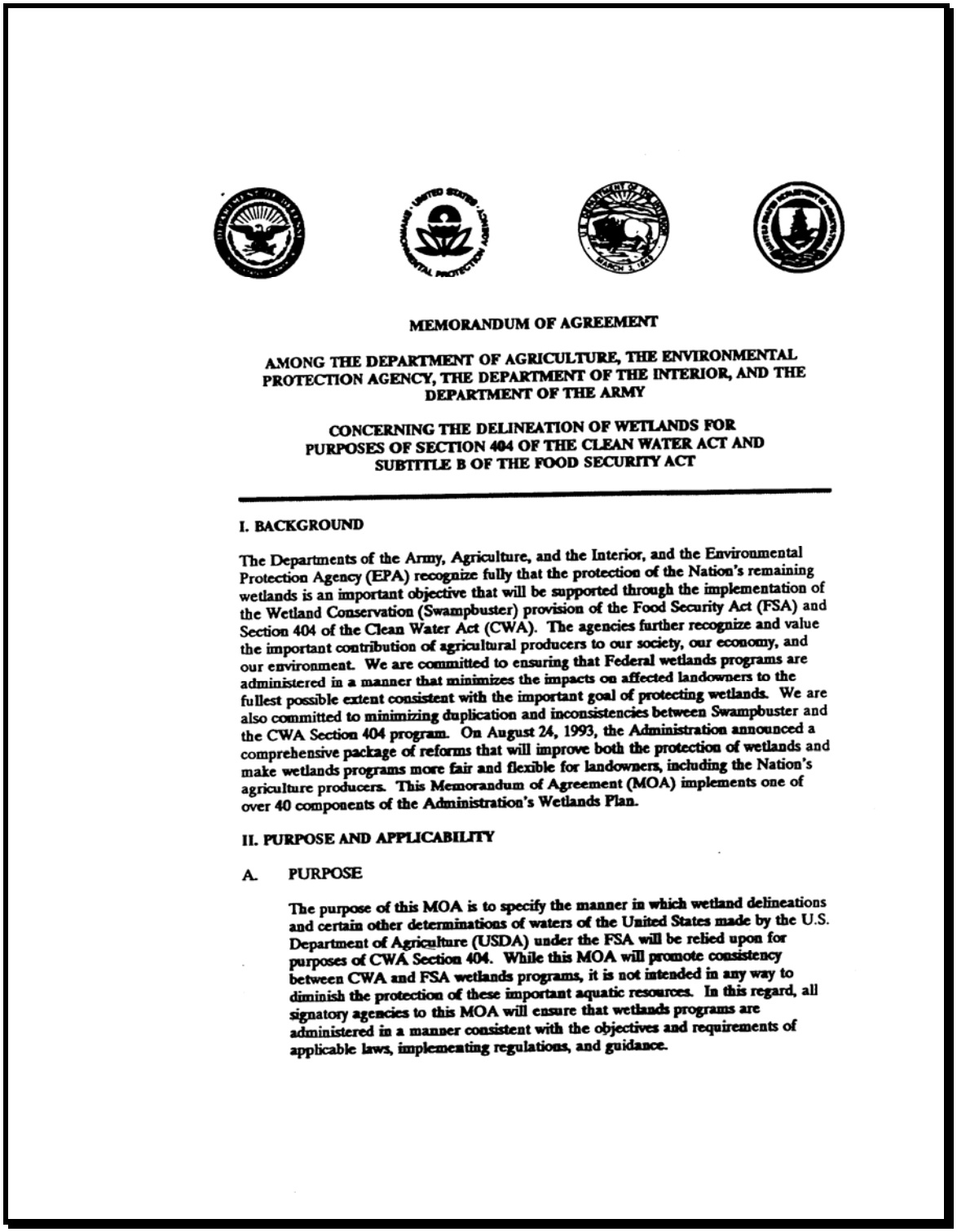
DEFENSE EXHIBIT 257

Exhibit 7A

BRACE PROPERTY

DEPOSITION EXHIBIT Brace #2

527.12 Memorandum of Agreement among EPA, USDA, USDI, DOD



MEMORANDUM OF AGREEMENT

AMONG THE DEPARTMENT OF AGRICULTURE, THE ENVIRONMENTAL PROTECTION AGENCY, THE DEPARTMENT OF THE INTERIOR, AND THE DEPARTMENT OF THE ARMY

CONCERNING THE DELINEATION OF WETLANDS FOR PURPOSES OF SECTION 404 OF THE CLEAN WATER ACT AND SUBTITLE B OF THE FOOD SECURITY ACT

I. BACKGROUND

The Departments of the Army, Agriculture, and the Interior, and the Environmental Protection Agency (EPA) recognize fully that the protection of the Nation's remaining wetlands is an important objective that will be supported through the implementation of the Wetland Conservation (Swampbuster) provision of the Food Security Act (FSA) and Section 404 of the Clean Water Act (CWA). The agencies further recognize and value the important contribution of agricultural producers to our society, our economy, and our environment. We are committed to ensuring that Federal wetlands programs are administered in a manner that minimizes the impacts on affected landowners to the fullest possible extent consistent with the important goal of protecting wetlands. We are also committed to minimizing duplication and inconsistencies between Swampbuster and the CWA Section 404 program. On August 24, 1993, the Administration announced a comprehensive package of reforms that will improve both the protection of wetlands and make wetlands programs more fair and flexible for landowners, including the Nation's agriculture producers. This Memorandum of Agreement (MOA) implements one of over 40 components of the Administration's Wetlands Plan.

II. PURPOSE AND APPLICABILITY

A. PURPOSE

The purpose of this MOA is to specify the manner in which wetland delineations and certain other determinations of waters of the United States made by the U.S. Department of Agriculture (USDA) under the FSA will be relied upon for purposes of CWA Section 404. While this MOA will promote consistency between CWA and FSA wetlands programs, it is not intended in any way to diminish the protection of these important aquatic resources. In this regard, all signatory agencies to this MOA will ensure that wetlands programs are administered in a manner consistent with the objectives and requirements of applicable laws, implementing regulations, and guidance.

Exhibit 13

527.12 Memorandum of Agreement among EPA, USDA, USDI, DOD (page 2)

B. APPLICABILITY

1. The Administrator of EPA has the ultimate authority to determine the geographic scope of waters of the United States subject to jurisdiction under the CWA, including the Section 404 regulatory program. Consistent with a current MOA between EPA and the Department of the Army, the Army Corps of Engineers (Corps) conducts jurisdictional delineations associated with the day-to-day administration of the Section 404 program.

2. The Secretary of the USDA, acting through the Chief of the Soil Conservation Service (SCS), has the ultimate authority to determine the geographic scope of wetlands for FSA purposes and to make delineations relative to the FSA, in consultation with the Department of the Interior, Fish and Wildlife Service (FWS).

III. DEFINITION OF AGRICULTURAL LANDS

For the purposes of this MOA, the term "agricultural lands" means those lands intensively used and managed for the production of food or fiber to the extent that the natural vegetation has been removed and cannot be used to determine whether the area meets applicable hydrophytic vegetation criteria in making a wetland delineation.

A. Areas that meet the above definition may include intensively used and managed cropland, hayland, pasture land, orchards, vineyards, and areas which support wetland crops (e.g., cranberries, taro, watercress, rice). For example, lands intensively used and managed for pasture or hayland where the natural vegetation has been removed and replaced with planted grasses or legumes such as ryegrass, bluegrass, or alfalfa, are considered agricultural lands for the purposes of this MOA.

B. "Agricultural lands" do not include range lands, forest lands, wood lots, or tree farms. Further, lands where the natural vegetation has not been removed, even though that vegetation may be regularly grazed or mowed and collected as forage or fodder (e.g., uncultivated meadows and prairies, salt hay), are not considered agricultural lands for the purposes of this MOA.

Other definitions for the purposes of this MOA are listed below in Section VI.

IV. ALLOCATION OF RESPONSIBILITY

A. In accordance with the terms and procedures of this MOA, wetland delineations made by SCS on agricultural lands, in consultation with FWS, will be accepted by EPA and the Corps for the purposes of determining Section 404 wetland jurisdiction. In addition, EPA and the Corps will accept SCS wetland delineations

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

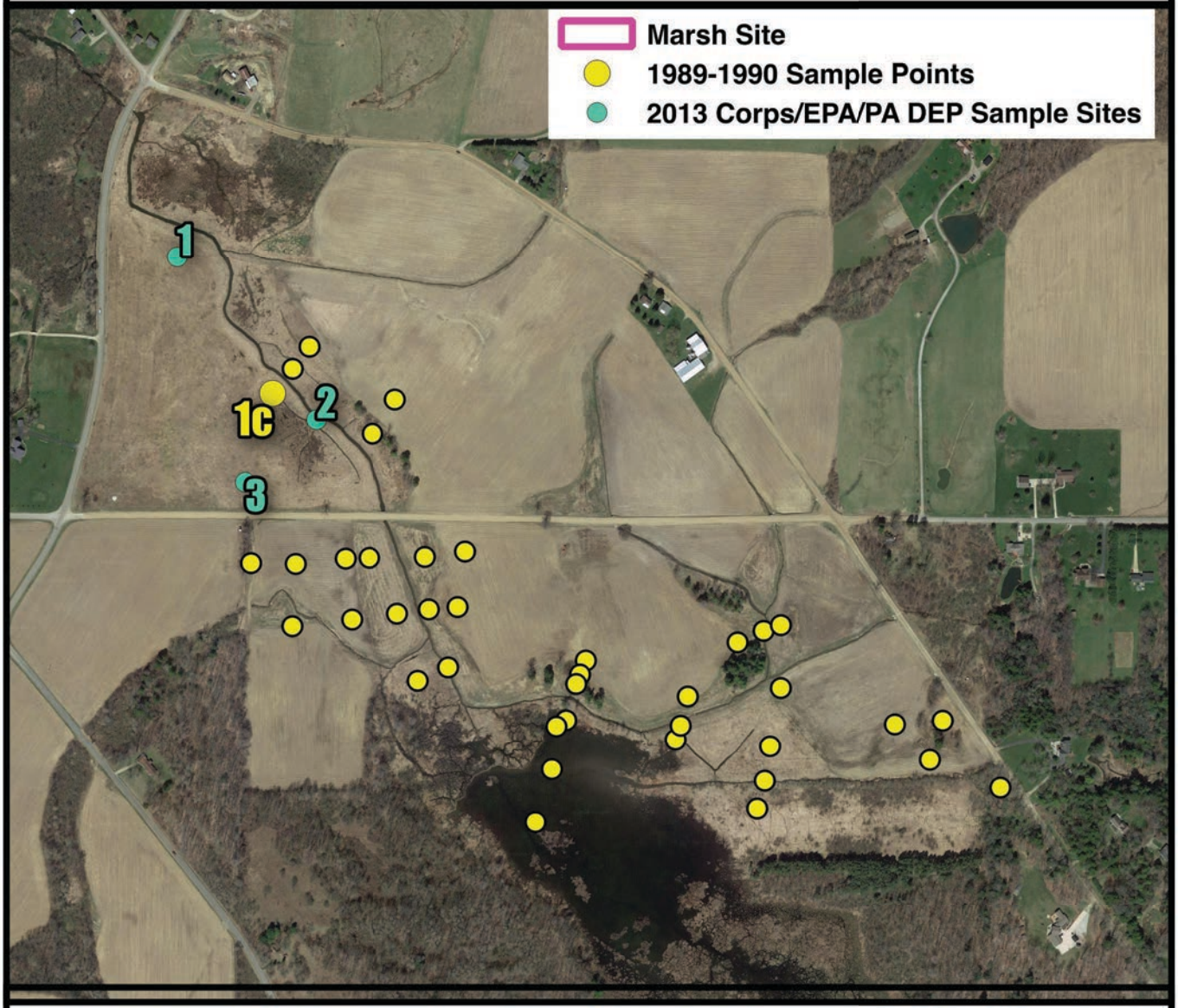


Exhibit 14. Sample points from the 1989-1990 Field Investigation by the EPA. A single point, 1c, was located on the actual Marsh Site. In 2013, three points (labeled) were sampled around the perimeter of the Marsh Site during conditions of moderate to heavy rain.

NFSAM and its own regulations. The 1991 proposed revisions, which followed the 1989 interagency manual, also generated considerable public and serious scientific criticism. The controversy resulted in continued use of the 1987 Corps manual, and a congressional mandate that the National Academy of Sciences conduct a study, as described in Chapter 1.

COMPARING THE FEDERAL MANUALS

Table 4.1 lists some features of the 1987 Corps manual, the 1989 interagency manual, the 1991 proposed revisions, and NFSAM. Each manual applies a three factor definition of wetland, yet each does so differently. Many of the differences among the manuals seem minor, but they can be significant in the field.

The 1987 Corps manual gives criteria and lists indicators for hydrology, hydric soils, and hydrophytic vegetation. Delineators must test hydrology, vegetation, and soils, but indirect indicators may be used to show that criteria are satisfied. Only for routine determinations affecting an area of less than 5 acres (about 2 ha) and in special cases, such as disturbed wetlands where vegetation has been removed, can evidence on specific criteria be omitted, however. The 1987 Corps manual is supplemented with USACE guidance letters and memoranda addressing specific issues pertinent to wetland delineation.

The 1991 proposed revisions require strict proof of hydrology, vegetation, and soils with separate field evidence. For example, hydrophytic vegetation or hydric soils cannot be used as indicators of hydrology.

TABLE 4.1 Comparison of Manuals

Characteristic	1987 Corps Manual	1989 Interagency Manual	1991 Proposed Manual	1993 NFSAM Manual
Factors	3	3	3	3
Allowable combinations	Show each separately; use fewer than three only for special cases (disturbed sites) or very strong evidence of two	Strong evidence of two sufficient to support the third	Show each separately	Show each separately

NFSAM requires independent assessment of hydric soil, hydrology, and hydrophytic vegetation. Because few NFSAM delineations are done in the field, however, it can be misleading to compare NFSAM's field requirements with those of the other manuals that require field delineations. NFSAM also incorporates by reference the field office technical guides, which provide specific information. For example, field indicators of hydric soils appear not in NFSAM, but in the technical guides maintained in NRCS field offices.

Hydrology

The manuals differ in their treatment of hydrology, as shown in Tables 4.2 and 4.3.

Hydrologic Evidence

The 1987 Corps manual establishes saturation thresholds as a percentage of growing season, which is defined by frost-free days. The manual also lists classes of hydrologic regimes that range from permanently inundated to intermittently or never saturated. The 1987 manual requires that saturation be to the surface. The surface can be dry, however, even though an area is considered saturated to the surface, because the critical water table depth is 12 in. (30 cm). The rationale is that capillary action saturates the upper surface of the soil above

TABLE 4.2 Comparison of Manuals: Hydrology

Characteristic	1987	1989	1991	NFSAM
Hydrologic threshold	Inundation or saturation at surface for >12.5% or 5-12.5% of growing season with other evidence	Inundation or saturation at surface for at least 7 days of growing season	Inundation at surface (15 days; saturation at surface (21 days during growing season	Inundation at surface for 15 days for most areas; 7 days for potholes, playas, or pocosins
Critical depth	Root zone (12 in.; 30 cm)	0.5 to 1.5 ft (15-46 cm); depending on soil	Surface	Surface
Growing season	Frost-free days, based on air temperature	Biological zero (41°F; 5° C) 20 in (50 cm) below. soil surface; soil temperature zones estimated	Three weeks before to 3 weeks after last killing frost	Biological zero, estimated from frost-free days

the water table (Letter to Honorable Owen Picketts from Lt. Col. R.O. Buck, Assistant Director of Civil Works, Atlantic Region, Feb. 2, 1994) (Chapter 5).

TABLE 4.3 Comparison of Manuals: Hydrology

Characteristic	1987	1989	1991	NFSAM
Periodically inundated, saturated to surface	Y	Y	Y	Y
Consider other factors (precipitation, stratigraphy, topography, soil permeability, plant cover)	Y	Y	Y	Y
Classification of hydrologic regime	Y	N	N	N
Minimum saturation, inundation 5% of growing season	Y	N	N	N
Indirect indicators of wetland hydrology allowed	Y	Y	Y	Y
Minimum saturation, inundation 7 days during growing season	N	Y	N	Y
Depth of water table differs by soil type, permeability, and drainage class	N	Y	N	N
Hydric soils, hydrophytic vegetation indicate wetland hydrology	N	Y	N	N
Minimum 15 days of inundation, 21 days of saturation to surface during growing season	N	N	Y	
Primary, secondary indicators indicated	N	N	Y	N

The 1989 interagency manual requires soil saturation or inundation to the surface for a fixed number of days rather than for a percentage of the growing season; critical depth is allowed to differ with soil type. The 1989 interagency manual notes that water is the overriding influence on vegetation and soils because of anaerobic conditions that occur when soil is saturated with water. Unlike the other manuals, NFSAM applies hydrologic thresholds separately to each of its wetland classes; thresholds can differ among classes.

All of the manuals allow the wetland hydrology criterion to be satisfied by specific indicators, some of which do not involve data on water (Table 4.4). Each manual, however, treats hydrology and its indicators differently. Only the 1991 proposed revisions divide the indicators into primary indicators, which are sufficient to determine wetland hydrology, and secondary indicators, which require some type of corroborative evidence. However, areas where the vegetation criterion is not met but wetland hydrology and hydric soils are present are termed "problem areas" and caution is advised. The 1989 interagency manual and the 1991 proposed revisions also allow plant adaptations to indicate hydrology as well as hydrophytic vegetation, as in the 1987 Corps manual. , but does not allow wetland delineation to be

based on soils alone. The 1991 proposed revisions require direct evidence of duration of flooding or saturation.

TABLE 4.4 Comparison of Manuals: Hydrologic Indicators (P, Primary; S, Secondary)

Characteristic	1987	1989	1991	NFSAM
Recorded data on water depth	Y	Y	Y[a]p	Y
Visual observation of inundation	Y	Y[b]	Y P	Y
Visual observation of saturation	Y	Y[b]	Y P	Y
Watermarks	Y	Y	Y	
Drift lines	Y	Y	Y S	
Sediment deposits	Y	Y	Y S	
Drainage patterns (with caution)	Y	Y	N	
Observation of drainage, if any	N	Y	N	Y
Oxidized channels (rhizospheres) with living roots	N[c]	Y	Y[b] P	
Water-stained leaves	N	Y	N	
Scoured areas	N	Y	Y S	
Plant morphology adaptations	N[d]	Y[e]	Y[f] P S	
Hydric soil characteristics	N	Y	N	
Aerial photographs	N	Y	Y[g] P	
Sulfidic material	N[h]	N	Y[b] P	

[a] Minimum of 3 years of data collected during years of normal rainfall and correlated with long-term records.
[b] With caution.
[c] The use of oxidized rhizospheres is now accepted under the 1987 manual.
[d] Used as indicator of hydrophytic vegetation.
[e] See list of adaptations in text.
[f] Early spring or wet season, minimum of 5 years' data, evidence of inundation or saturation in most years.
[g] Some indicators are used as primary indicators others as secondary indicators, see text.
[h] Indicator of hydric soils.

NFSAM uses the 1987 Corps manual's hydrology indicators. Additional indicators recognized by NFSAM include long-term stream gauge records, rainfall runoff and water budgets, long-range analysis of water tables by means of models, and analysis of drainage systems with scope-and-effect equations. Most NFSAM delineations are based on soil maps and photographs (Chapter 8). For field delineations, the form for entering hydrologic data in a routine wetland delineation form requires information about observed water, rainfall regime, water marks, drift lines, waterborne sediment, water-stained leaves, adaptations in plant morphology, the presence of oxidized rhizospheres, or other information similar to that provided by the indicators listed in the 1987 Corps manual.

Growing Season

Each manual uses growing season as the appropriate period for evaluating hydrology, but they define it differently.

The 1987 manual defines growing season as the portion of the year when soil temperatures at 19.7 in. (50 cm) below the soil surface are higher than biological zero (41° F; 5°C), but it allows approximation from frost-free days. Delineators who apply the 1987 manual most commonly use air temperatures derived from local weather records to determine the growing season. The 1989 interagency manual uses biological zero at 20 in. (50 cm) below the surface to determine growing season, but it also provides growing-season estimates by soil taxonomic temperature category and generalizes soil temperatures over large geographic areas on the basis of the growth of particular crops. Although the beginning and end of the actual growing season can vary by several weeks within a given temperature region or from site to site, the use of the temperature regions does allow the delineator to work with a fixed growing season and decreases the need for site-specific temperature information.

The 1991 proposed revisions do not use biological zero; they define the growing season as an interval extending from 3 weeks before to 3 weeks after the frost-free period as determined by use of local weather information. NFSAM defines growing season in the same way that the 1987 Corps manual does. Most frequently, the office delineations conducted by NRCS use aerial photographs taken well after the onset of the growing season.

Hydrophytic Vegetation

Under the definitions applied by all manuals, wetlands must have a prevalence of vegetation typically adapted for life in saturated soil. Interpretation of this characteristic requires identification of wetland species, establishment of thresholds for determining whether wetland species are prevalent, and a means of evaluating the contribution of species that occur in wetlands and in uplands. Table 4.5 compares the treatment of vegetation by the manuals.

Wetland Plant Species

The manuals differ somewhat in the wording of their definitions of wetland vegetation, but their meanings are quite similar: The 1987 Corps manual describes hydrophytic vegetation as follows:

> the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

TABLE 4.5 Comparison of Manuals; Vegetation

Characteristic	1987	1989	1991	NFSAM (field determinations)[a]
Use of Hydrophyte List[b] to determine indicator status (OBL, FACW, FAC, FACU, UPL) of plant species	Y	Y	Y	Y
Use of + and - to modify indicator	Y	N	N	Y
Hydrophytic vegetation; >50% of the dominant species OBL, FACW, or FAC[c]	Y	Y[d]	N	N
Hydrophytic vegetation; prevalence index[e] less than 3.0 using all species present[c]	N	Y[d]	Y[f]	Y
Other indicators of hydrophytic vegetation allowed (morphologic adaptations, documentation from technical literature, physiologic adaptations)	Y[e, g]	N[h]	N[h]	N
FAC-neutral option	Y	N[i]	N[j]	N

[a] Most NFSAM determinations are not made in the field. NFSAM incorporates the 1987 USACE Manual for field delineation matters that it does not address specifically.
[b] OBL, obligate; FACW, facultative-wet; FAC, facultative; FACU, facultative-upland; UPL, upland species.
[c] Where OBL, 1.0; FACW, 2.0; FAC, 3.0; FACU, 4.0; UPL, 5.0.
[d] If the hydric soil is present and wetland hydrology is verified, vegetation is assumed to be hydrophytic even if the vegetation criterion is not met. Such areas, however, are considered to be problem area wetlands and appropriate cautions are advised.
[e] Weighted average. A single number that summarizes quantitative data about a large number of species within a community and gives weight to each species' contribution to the final number in terms of an assigned value.
[f] Listed specific exceptions to this criterion.
[g] See text for list of adaptations.
[h] Some morphologic adaptations are used as indicators of hydrology.
[i] Although the FAC-neutral test is not explicitly listed as an option, one vegetations indicator (see footnote *c*) can be considered a type of FAC-neutral test.
[j] Sought comments of the use of this option and several variants of it.

The 1989 interagency manual uses the following wording:

> macrophytic plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

The 1991 proposed revisions define hydrophytic vegetation as

> plants that live in conditions of excess wetness. For purposes of this manual, hydrophytes are defined as macrophytic plant life growing in water or on sub

> merged substrates, or in soil or on a substrate that is at least periodically anaerobic (deficient in oxygen) as a result of excessive water content.

NFSAM uses the FSA definition (16 U.S.C. §3801(a)(9)), which states that hydrophytic vegetation is

> plants growing in water or in a substrate that is at least periodically deficient in oxygen during the growing season as a result of saturation or inundation by water.

Notwithstanding the differences among these definitions, all of the manuals rely on one FWS publication, the National List of Plant Species that Occur in Wetlands (P.B. Reed, 1988)—commonly called the Hydrophyte List—for identification of hydrophytic species and assignment of indicator status. The Hydrophyte List divides plants into five fidelity categories, by their wetland indicator status, that reflect "the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetland versus nonwetland" (P.B. Reed, 1988, p. 8) (Chapter 5). The categories are as follows:

- OBL, obligate wetland plants, which almost always occur in wetlands (estimated probability >99%) but can occur rarely elsewhere (estimated probability <1%).
- FACW, facultative wetland plants usually occur in wetlands (estimated probability >67-99%) but also occur elsewhere (estimated probability 1-33%).
- FAC, facultative plants have a similar likelihood of occurring in wetlands and nonwetlands (estimated probability 33-67%).
- FACU, facultative upland plants sometimes occur in wetlands (estimated probability 1-33%) but more often in nonwetlands (estimated probability >67-99%).
- UPL, obligate upland plants occur rarely in wetlands (estimated probability <1%).

Determining Prevalence

The manuals differ in the indicators and specific criteria they set up for determining whether a site contains a predominance or prevalence of hydrophytic vegetation (Table 4.5). The 1987 Corps manual does not use the term "criterion" for vegetation but refers instead to "diagnostic environmental characteristics":

> The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described in the following definition of wetlands: 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 to support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

According to the 1987 Corps manual,

> any one of the following is indicative that hydrophytic vegetation is present:

a. More than 50 percent of the dominant species are OBL, FACW, or FAC on lists of plant species that occur in wetlands.
b. Other indicators, specifically: (1) visual observation of plant species growing in areas of prolonged inundation and/or soil saturation; (2) morphological adaptations; (3) technical literature, including taxonomic references, botanical journals, technical reports, technical workshops, conferences, and symposia, and the wetland plant data base of the National Wetland Inventory [currently the Hydrophyte List]; (4) physiological adaptations; and (5) reproductive adaptations.

In the case of the "other indicators" listed under (b) above, the 1987 Corps manual notes that "additional training and/or experience may be required to employ these indicators." Under the methods section, the 1987 Corps manual further specifies that for on-site inspections of areas of more than 5 acres (2 ha), if morphologic or physiologic adaptations are used to indicate hydrophytic vegetation, two or more of the dominant species must have these adaptations.

The 1989 interagency manual allows alternative criteria to show that wetland vegetation is present:

> An area has hydrophytic vegetation when, under normal circumstances:
>
> (1) more than 50 percent of the composition of the dominant species from all strata are obligate (OBL), facultative wetland (FACW), and/or facultative (FAC) species, or
> (2) a frequency analysis of all species within the community yields a prevalence index value of less than 3.0 (where OBL = 1.0, FACW = 2.0, FAC = 3.0, FACU = 4.0, and UPL = 5.0).
>
> CAUTION: When a plant community has less than or equal to 50% of the dominant species from all strata represented by OBL, FACW, and/or FAC species, or a frequency analysis of all species within the community yields a prevalence index value of greater than or equal to 3.0, *and* hydric soils and wetland hydrology are present, the area also has hydrophytie vegetation. (Note: these areas are considered problem area wetlands.)

The 1989 interagency manual states that wetland vegetation can be indicated by any of the following evidence:

1) OBL species comprise all dominants in the plant community; or
2) OBL species do not dominate each stratum, but more than 50 percent of the dominants of all strata are OBL, FACW, or FAC species (including FACW+, FACW-, FAC+, and FAC-); or
3) A plant community has a visually estimated percent coverage of OBL and FACW species that exceed the coverage of FACU and UPL species; or
4) A frequency analysis of all species within the community yields a prevalence index value of less than 3.0 (where OBL = 1.0, FACW = 2.0, FAC = 3.0, FACU = 4.0, and UPL = 5.0); or

5) A plant community has less than or equal to 50% of the dominant species from all strata represented by OBL, FACW, and/or FAC species, or a frequency analysis of all species within the community yields a prevalence index value of greater than or equal to 3.0, *and* hydric soils and wetland hydrology are present. (*Note*: In other words, if the hydric soil and wetland hydrology criteria are met, then the vegetation is considered hydrophytic. For purposes of this manual, these situations are treated as disturbed or problem area wetlands because these plant communities are usually nonwetlands.)

The 1991 proposed revisions set up a single prevalence index threshold as an indicator of hydrophytic vegetation:

> An area meets the hydrophytic vegetation criterion if, under normal circumstances, a frequency analysis of all species within the community yields a prevalence index value of less than 3.0 (where OBL = 1.0, FACW = 2.0, FAC = 3.0, FACU = 4.0, and UPL = 5.0).

Specific wetland types that do not meet this requirement are listed as exceptions, including prairie potholes, playas, and vernal pools. Comments were sought on additional exceptions.

The 1991 proposed revisions do not give specific field indicators, although the methods section (Part III) refers to indicators of hydrophytic vegetation. As in the 1989 interagency manual, some adaptations of plant structure and morphology are used as indicators of hydrology but not of hydrophytic vegetation; physiologic and reproductive adaptations are not used as indicators.

For field delineations, NFSAM uses the numerical prevalence index in a manner similar to that of the 1991 proposed revisions. NFSAM also cross-references and incorporates by reference the hydrophytic indicators from the 1987 Corps manual.

Because both the 1987 Corps manual and the 1989 interagency manual refer to "50% of the dominant species" as a threshold for determining whether hydrophytic vegetation is prevalent, the term "dominant species" must be defined and methods must be established for measuring dominance and selecting dominant species. The 1987 Corps manual (pp. 16-17) defines "dominant species" in the section on characteristics and indicators as those that "contribute more to the character of a plant community than other species present, as estimated or measured in terms of some ecological parameter or parameters." In the methods section, dominant species are "those that have the largest relative basal area (overstory), height (woody understory), number of stems (woody vines), or greatest areal cover (herbaceous understory)." That is, a measure of dominance is established for each stratum, or layer, of the vegetation. For routine determinations, the measure of dominance is estimated visually and dominant species are determined subjectively. For comprehensive determinations, however, dominant species are selected by ranking the species in each stratum in descending order of dominance based on the appropriate measure for that stratum. The three species

of highest rank from each stratum are selected as the dominant species if four strata are present. If only one or two strata are present, the five species of highest rank are selected. Thus, in the case of a plant community with four strata, 12 species (the three top-ranked in each layer of the vegetation) are selected as dominants. If 7 or more (more than 50%) of these dominant species are OBL, FACW, or FAC, then the community is predominantly hydrophytic according to the 1987 manual's "50% rule." In the case of a plant community with only two strata, 10 species are selected as dominants, and at least 6 must be OBL, FACW, or FAC if the community is to be classified as predominantly hydrophytic.

The 1989 interagency manual also ranks species in each stratum in descending order of the value of the dominance measure used for that stratum, but it selects dominant species differently:

> For each stratum (e.g., tree, shrub, and herb) in the plant community, dominant species are the most abundant plant species (when ranked in descending order of abundance and cumulatively totaled) that immediately exceed 50 percent of the total dominance measure (e.g., basal area or areal coverage) for the stratum, plus any additional species comprising 20 percent or more of the total dominance measure for the stratum.

For each stratum, all of the species are ranked in descending order of abundance. The abundances for all species in the stratum are totaled, and the cumulative abundance is then computed for each species on the list. Two thresholds are identified: 50% of the total, and 20% of the total. The dominants are species whose abundances fall above the 50% mark on the cumulative abundance list for the stratum, plus any other species that individually account for 20% or more of the total abundance. For example, if the herb layer contains one species with 90% cover, two species with 40% cover, one species with 20% cover, and one species with 10% cover, the total abundance (dominance measure) for this layer would be 200%, 50% of the total would be 100%, and 20% of the total would be 40%. Only the first three species would be considered dominants. This procedure is repeated for each stratum. The numbers of dominant species in all strata are totaled to obtain the total number of dominant species. If the herb layer had 3 dominant species, the shrub layer had 2 dominant species, and the tree layer had 3 dominant species, then the entire plant community would have 8 dominant species. If 5 or more (more than 50%) of these species are OBL, FACW, or FAC, then the community is predominantly hydrophytic according to the 1989 interagency manual's "50% rule." Like the 1987 Corps manual, the 1989 interagency manual uses visual estimates of dominance for routine determinations, and it establishes more detailed and quantitative methods for measuring dominance in comprehensive determinations. The method of selecting dominant species, however, is the same for all determinations. The 1989 interagency manual identifies five strata (tree, sapling, shrub, woody. vine, herb) for which dominant species should be selected, plus a moss layer for some types of wetlands.

The 1989 interagency manual's method of selecting dominant species became acceptable for use under the 1987 Corps manual through the issuance of a regulatory guidance letter (RGL) by USACE in March 1992. The same RGL authorizes the use of five strata for determinations of dominant species, as did the 1989 interagency manual. Both the 1987 Corps and 1989 interagency manuals allow the same species to be considered dominant in more than one stratum.

The 1991 proposed revisions do not define dominant species, because all species are considered in calculating the prevalence index—the only indicator used for hydrophytic vegetation. NFSAM applies the methods of the 1987 Corps manual for routine determinations in the field. For comprehensive determinations, NFSAM uses the prevalence index, which does not require selection of dominant species.

Treatment of FAC Species and FACU-Dominated Wetlands

The manuals differ in their treatment of FAC and FACU species in determining whether the vegetation is hydrophytic. The differences affect wetland determinations most significantly where independent evidence of hydrology, vegetation, and soils is required. Areas that satisfy the criteria for hydrology and for soils can have plant communities dominated by FAC or FACU species. If FAC or FACU species are not treated as hydrophytic, regardless of evidence on hydrology and soils, such areas would not be classified as wetlands.

Discussion of this issue has focused on the "FAC-neutral test," which eliminates consideration of FAC species from determinations of prevalence. According to the 1987 manual, this option can be adopted by individual USACE districts if the district questions the indicator status of a facultative species and provides documentation to the USACE representative on the regional plant list panel (Chapter 5). Guidance issued by USACE in March 1992 on the use of the 1987 Corps manual provides that the FAC-neutral test may be used to help clarify a delineation where evidence of wetland hydrology or soils is weak, but it may not be used to exclude areas that otherwise qualify as wetlands.

The 1989 interagency manual does not use the term "FAC-neutral test." One field indicator of hydrophytic vegetation, however, could be interpreted as a FAC-neutral test. The primary way that the 1989 interagency manual handles FACand FACU-dominated wetlands, however, appears as number 5 in the list of field indicators of hydrophytic vegetation. This indicator specifies that where 50% or fewer of the dominant species are OBL, FACW, or FAC (where FAC or FACU species dominate), the vegetation is hydrophytic only if hydric soil and wetland hydrology criteria are met. Furthermore, the 1989 interagency manual treats these areas as disturbed or problem area wetlands and outlines special procedures for their evaluation.

The 1991 proposed revisions use only the prevalence index, which incorporates all species, for vegetation determinations. However, the authors of the

revisions sought comments on six variants of the FAC-neutral test. FAC and FACU-dominated wetlands are treated as "exceptions to the three criteria"; they are wetlands that fail to satisfy all the criteria for hydrology, soils, and vegetation. The only named exceptions to the three criteria were pocosins, playas, prairie potholes, vernal pools, and three types of conifer swamps dominated by FACU species: white pine bogs of the Northeast and northern Midwest, eastern hemlock swamps and bogs in the Northeast, and tamarack bogs. The first four were included because they are "widely recognized wetlands that fail to meet the hydrology criterion." The possible exceptions on which comments were sought included pitch pine lowlands in the Northeast, jack pine and white spruce in evergreen-forested swamps in the northern Midwest, lodgepole pine bogs and muskegs in the Northwest and Alaska coasts, sugar maple and paper birch swamps and bogs in the upper Midwest, and longleaf pine wet savannahs of the Southeast. Other wetlands dominated by FAC and FACU species would be excluded under the 1991 proposed revisions.

NFSAM does not specifically address wetlands dominated by FACU species. When field delineations are done, the delineator uses all species, including FAC and FACU, in calculating the prevalence index. NFSAM incorporates by reference the 1987 Corps manual for vegetation, but the NRCS relies on a prevalence index that uses all species.

Hydric Soils

Each manual uses the definitions of hydric soils established by the National Technical Committee for Hydric Soils (NTCHS):

> A hydric soil is a soil that in its undrained condition is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

The third edition of "Hydric Soils of the United States," issued in 1991, modifies the definition by deleting the reference to hydrophytic vegetation. The manuals, however, continue to use the 1985 NTCHS definition. There are some differences between the manuals with regard to methods of identifying hydric soils (Table 4.6).

The field indicators of hydric soils are essentially the same in all of the manuals, and include: organic soils, histic epipedon, sulfidic material, aquic or peraquic moisture regime, reducing conditions, soil color, high level of organic matter at surface, streaking by organic matter, and organic pan. Correlation between the presence of wetland hydrology and the occurrence of hydric soil characteristics is well established, but the period of inundation or saturation required to produce them is less well understood (Chapter 5). According to all three manuals, hydric soils can be inferred if hydrologic observations indicate that threshold durations have been reached. In most cases, the 1987 Corps and

1989 interagency manuals require field identification of hydric soils for any delineation. Where there is strong evidence of wetland vegetation and hydrology, the 1987 Corps manual authorizes a wetland delineation without field verification of hydric soils. For these two manuals, the characterization of the plant community comes ahead of soils or hydrology.

TABLE 4.6 Comparison of Manuals: Soils

Characteristic	1987	1989	1991	NFSAM
Soil definition	NTCHS	NTCHS	NTCHS	NTCHS
Field verification	Field evidence only	Field evidence, maps with field verification	Field evidence only	Field evidence, maps
Evidence for hydric soils	Assumes soil is hydric where OBL or OBL and FACW species with same abrupt boundary	Seven-day flooding demonstrates hydric soils[a]	15 days' inundation[a] 21 days' saturation only[a]	Seven-day flooding or 14 days' saturation at or near surface[b]

[a] Number of days saturated during the growing season.
[b] "Saturated to the surface" is when the water table is within 0.5 ft of the surface for coarse sand, sand, or fine sandy soils, or 1.0 ft of the surface for all other soils (NFSAM, 1994).

NFSAM gives criteria for hydric soils (Chapter 5) and also refers to "The Field Indicators of Hydric Soils in the United States", a field office technical guide, for evaluation of soils in the field. NFSAM relies heavily on soil maps (Chapters 5, 8). Soils are assessed first, and then hydrology is determined from aerial photographs.

Special Situations: Disturbed Areas, Problem Areas, Exceptions

Each manual takes a different approach to special cases (Table 4.7). The 1987 Corps manual separates "atypical situations" and "problem areas." Atypical situations involve alterations that obscure indicators of vegetation, soils, or hydrology. Alterations include discharge of dredged or fill material; fires, avalanches, volcanic activity, or changing river courses; and artificial wetlands. This manual also stresses the need to assess normal circumstances for an area. For example, if impounded water has become a normal circumstance, the area affected may be considered wetland. Methods to be used for site investigations in atypical situations also are given separately for vegetation, soil, and hydrology.

TABLE 4.7 Comparison of Manuals: Special Cases

Characteristic	1987	1989	1991
Disturbed areas	Areas subject to filling, removal of vegetation, levee or dam, construction wetlands newly created by human action or natural events	Areas that would have been classified as wetlands prior to disturbance	Same as 1989
Problem areas	Wetlands on drumlins, seasonal wetlands, prairie potholes, vegetated flats	FACU-dominated: evergreen-forested wetlands; wetlands on glacial till; variable seasonal wetlands; interdunal swale wetlands; river bars; vegetated flats; caprock limestone wetlands; newly created wetlands; wetlands on Entisols, red parent material, Spodosols, Mollisols	Newly created wetlands; wetlands on glacial till; mosaics; cyclical wetlands; vegetated flats; interdunal swale wetlands; springs and seeps; drought-affected wetlands
Exceptions	None listed	None listed	Pocosins, playas, prairie potholes, vernal pools, white pine bogs, eastern hemlocks, tamarack bogs, others as proposed

Problem areas, as described in the 1987 manual, are those for which application of the criteria is difficult, at least seasonally. Four categories are considered (Table 4.7). The 1987 manual requires them to be evaluated for wetland functions.

"Atypical situations" in the 1957 manual are "disturbed areas" in the 1989 interagency manual. These areas have been modified by human activities or natural events. The methods of site investigation of disturbed areas are the same as for atypical areas in the 1987 Corps manual, with two additional methods for characterizing hydrology. The 1989 interagency manual identifies a greater number of problem areas than does the 1987 Corps manual (Table 4.7). Both manuals provide detailed procedures for delineating problem wetlands.

The 1991 proposed revisions describe "disturbed wetlands" as those that

would have met the criteria for hydrology, soils, and vegetation before their disturbance. The 1991 proposed revisions do not describe atypical wetlands, but they do describe atypical hydric soils (Table 4.7). The revisions use the same methods for site investigations of atypical wetlands that appear in the 1989 interagency manual, but they include more descriptive methods for ground water investigations. The 1991 proposed revisions list some types of wetlands as exceptions and problem areas (Table 4.7). Wetlands that are exceptions, as well as the problem area wetlands, are subject to more detailed procedures than are other wetlands.

For field delineations, NFSAM identifies "disturbed areas" as those in which the soils, vegetation, or hydrology have been altered so as to make standard wetland identification unreliable. NFSAM refers to and incorporates by reference the section of the 1987 Corps manual that addresses atypical situations for procedures to be followed when soils, vegetation, or hydrology have been disturbed.

Regulatory treatment of special situations illustrates very well the distinction between identification and boundary setting for wetlands on one hand and jurisdiction on the other. The reference definition of wetlands given in Chapter 3 makes no exclusions of wetlands on the basis of origin. The definition applies equally to ancient wetlands as well as wetlands of recent origin, to natural as well as artificial wetlands, and to wetlands created by intent as well as those created by accident. For reasons that are quite understandable in a sociopolitical context, the jurisdictional treatment of wetlands is much more complex.

Differences Resulting from Application of the Manuals

Comparisons among the manuals have produced many claims regarding the differences in results that can arise from their use. The manuals sometimes provide inconsistent guidance on the same subject. Also, each manual is organized differently, so comparisons among them can be misleading. It is difficult to ascertain whether the degree to which differences in delineation results occur because of misapplication of a manual or because of actual differences among manuals.

The office delineation method used by NFSAM does not lend itself to extensive comparison with other manuals. Wetland delineations conducted with office methods are susceptible to errors that do not affect field delineations (Chapter 8).

After field testing the 1991 proposed revisions and the 1987 and 1989 manuals, a four-agency team in the Pacific Northwest concluded that the 1991 proposed revisions would result in an overall reduction exceeding 50% of the acreage delineated as wetland under the 1989 and 1987 manuals. This was primarily because of the limited number of acceptable indicators of hydrology (personal communication, Oct. 29, 1991 to Larry Vinzant from Thomas Yocom, Robert A. Leidy, Nancy A. Dubbs, and Mary Butterwick). In the Mississippi Valley, scien

tists commenting on the 1991 proposed revisions indicated that 30% of the bottomland hardwood wetlands in Louisiana would cease to be delineated as wetlands if the 1991 proposed revisions were adopted. This estimate was based on field testing by USACE (Lower Mississippi Valley Division) and the Coalition to Restore Coastal Louisiana. Significant interannual variations in flooding and saturation were cited as reasons that much of the bottomland hardwood forest would fall to meet the hydrologic requirements (personal Communication, Dec. 13, 1991 to Gregory Peck, EPA, from James G. Gosselink and G. Paul Kemp, Coalition to Restore Coastal Louisiana). A study by the Environmental Defense Fund and the World Wildlife Fund suggests that the hydrologic requirements of the 1991 proposed revisions would result in exclusion of approximately 50% of the remaining wetlands in the United States. Substantial areas of bottomland hardwood forest, northeastern and midwestern bog areas, 23% of the Everglades National Park, and 80% of the Great Dismal Swamp in Virginia and North Carolina would be dropped.

As a general matter, it seems certain that less area would be delineated as wetland under the 1991 proposed revisions than under the 1989 or 1987 manuals. The difference results primarily from the proposed requirement that hydrology, soils, and vegetation be documented separately, and from the limitations on indicators that can be used for each, especially hydrology. The 1987 and the 1989 manuals are the most similar of the group. Where there is a difference between the two, it generally results in less area delineated as wetland under the 1987 Corps manual than under the 1989 interagency manual. This is explained mainly by a broader and more flexible array of indicators in the 1989 interagency manual.

Exhibit 14B.

STATEMENTS OF POLICY

Title 25—ENVIRONMENTAL PROTECTION

DEPARTMENT OF ENVIRONMENTAL PROTECTION

[25 PA. CODE CH. 105]

Identification and Delineation of Wetlands; and Status of Prior Converted Cropland in this Commonwealth

The Department of Environmental Protection (Department) amends § 105.451 (relating to the identification and delineation of wetlands—statement of policy). The amendment refers to the methodology used to identify and delineate wetlands. The Department adds § 105.452 (relating to status of prior converted cropland—statement of policy) to exclude prior converted cropland from jurisdiction under the Department's Wetland Protection Program contained in Chapter 105 (relating to dam safety and waterway management).

A. *Effective Date*

These statements of policy will take effect upon final publication in the *Pennsylvania Bulletin*.

B. *Contact Persons*

For further information, contact Kenneth R. Reisinger, Chief, Division of Wetlands Protection, Bureau of Dams, Waterways and Wetlands, P. O. Box 8554, Rachel Carson State Office Building, Harrisburg, PA 17105-8554, (717) 787-6827; or David Gromelski, Assistant Counsel, Bureau of Regulatory Counsel, P. O. Box 8464, Rachel Carson State Office Building, Harrisburg, PA 17105-8464, (717) 787-7060. Persons with a disability may use the AT&T Relay Service by calling (800) 654-5984 (TDD users) or (800) 654-5988 (voice users). These policies are available electronically through the Department's web site (http://www.dep.state.pa.us).

C. *Statutory Authority*

These statements of policy are amended and added under the authority of the Dam Safety and Encroachments Act (act) (32 P. S. §§ 693.1—693.28) and by other affected statutes administered by the Department, including The Clean Streams Law (35 P. S. §§ 691.1—691.1001); the Solid Waste Management Act (35 P. S. §§ 6018.101—6018.1003); the Surface Mining Conservation and Reclamation Act (52 P. S. §§ 1396.1—1396.31); the Pennsylvania Sewage Facilities Act (35 P. S. §§ 750.1—750.20); and the Oil and Gas Act (58 P. S. §§ 601.101—601.605) which authorize the Department to permit, inspect and otherwise regulate structures or activities described as dams, encroachments or water obstructions in wetlands.

D. *Summary and Purpose of the Amendment to § 105.451*

This amendment will provide consistency among State and Federal agencies that are involved in the permitting of activities affecting wetlands while at the same time providing the necessary protection of this Commonwealth's wetland resources. The amendment refers to the methodology used to identify and delineate wetlands.

The Department is authorized and has the duty under the act to permit, inspect and otherwise regulate structures or activities-labeled dams, encroachments or water obstruction-in wetlands. "Wetlands" is defined in regulations promulgated under the act, at § 105.1 (relating to definitions), as follows:

> "Areas that are inundated or saturated by surface water or groundwater 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 soil conditions, including swamps, marshes, bogs and similar areas."

This definition, as used by the Department, is identical to the definition of "wetlands" used by the United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (USACOE). However, the Department uses a different manual than the Federal agencies to determine how the definition is to be applied in identifying and delineating wetlands.

The Department until now used the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (1989 Interagency Manual). The EPA and the USACOE use the 1987 *Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1)* with the guidance provided by the USACOE, Major General Arthur E. Williams' memorandum dated 6 March 1992, *Clarification and Interpretation of the 1987 Manual*. Permit applicants have been required to provide wetland delineations using two different methods, even though both methods are based on a similar three-parameter approach and result in very similar wetland delineations in this Commonwealth.

With this amendment, the Department will adopt the same methodology for identifying and delineating wetlands used by the Untied States Army Corps of Engineers which is the *1987 Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1)* with guidance provided in the 6 March 1992 USACOE memorandum entitled *Clarification and Interpretation of the 1987 Manual* and any subsequent changes, as part of the Department's permitting program under Chapter 105 and other applicable regulatory programs.

Summary and Purpose of the Addition of § 105.452

This statement of policy will exclude areas identified as prior converted cropland from jurisdiction under the Department's Wetland Protection Program contained in Chapter 105. This will provide consistency among State and Federal agencies that are involved in the permitting of activities affecting wetlands while at the same time providing the necessary protection of this Commonwealth's wetland resources.

The definition of "wetlands" in § 105.1 is identical to the definition of wetlands used by the EPA and USACOE. However, the Federal agencies do not include prior converted croplands as waters of the United States under the Clean Water Act. Waters of the United States are defined, in pertinent part at 33 U.S.C.A. § 328.3(a)(8), amended August 25, 1993, by notice at 58 FR 45036, as follows:

> "Waters of the United States do not include Prior Converted Cropland. Notwithstanding the determination of an area's status as Prior Converted Cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act justification remains with EPA."

This policy excludes areas identified as prior converted cropland as defined in the *National Food Security Act Manual* (180-V-NFSAM, 3rd Edition, March 1994) from

jurisdiction under the Department's Wetland Protection Program. According to that definition, "prior converted cropland" are wetlands that were drained, dredged, filled, leveled or otherwise manipulated, including the removal of woody vegetation, before December 23, 1985, and have not been abandoned for the purpose of, or to have the effect of, making the production of an agricultural commodity possible, and an agricultural commodity was planted or produced at least once prior to December 23, 1985. Abandonment is the cessation of cropping, forage production or management on prior converted cropland for 5 consecutive years, so that:

- Wetland criteria are met.

- The area has not been enrolled in a conservation set-aside program.

- The area was not enrolled in a State or Federal wetland restoration program other than the Wetland Reserve Program.

Prior converted cropland may also be considered abandoned if the landowner provides written intent to abandon the area and wetland criteria are met.

Under this statement of policy, the Department will recognize prior converted croplands as a normal circumstance as the term is used in the definition of wetlands and will not regulate prior converted cropland under the Commonwealth's Wetland Protection Program. This is consistent with USACOE regulations that specify that waters of the United States do not include prior converted cropland. This policy change does not affect the existing Chapter 105 exemption for plowing, cultivating, seeding and harvesting for the production of food fiber and forest products or the waiver for maintenance of field drainage systems. See § 105.12(a)(7) and (8) (relating to waiver of permit requirements). These waivers and exemptions remain unchanged and in effect.

E. *Benefits and Costs; Paperwork Requirements—§ 105.451*

Because there will be only one accepted method to delineate wetlands, a reduction in time, effort and paperwork in preparing permit applications is expected. This change will require minimal staff retraining as the two methods currently used at the State and Federal levels are very similar in nature. This change will not result in an increase in paperwork or cost to the Commonwealth.

Benefits and Costs; Paperwork Requirements—§ 105.452

In acknowledging prior converted cropland as "normal circumstances" and therefore not wetlands, the State program is consistent with the Federal agencies in not regulating agricultural lands that meet the definition of prior converted cropland. This change will not result in an increase in paperwork or cost to the Commonwealth.

JAMES M. SEIF,
Secretary

(*Editor's Note*: The regulations of the Department of Environmental Protection, 25 Pa. Code Chapter 105, are amended by amending a statement of policy at § 105.451 and by adding a statement of policy at § 105.452.)

Fiscal Note: 7-502 remains valid for the final adoption of the subject regulations.

Annex A

TITLE 25. ENVIRONMENTAL PROTECTION

PART I. DEPARTMENT OF ENVIRONMENTAL PROTECTION

Subpart C. PROTECTION OF NATURAL RESOURCES

ARTICLE II. WATER RESOURCES

CHAPTER 105. DAM SAFETY AND WATERWAY MANAGEMENT

Subchapter M. STATEMENTS OF POLICY

WETLANDS

§ 105.451. Identification and delineation of wetlands—statement of policy.

(a) This section sets forth the policy of the Department as to the methodology to be used for the identification and delineation of wetlands.

(b) The use of some delineation method is necessary in order to administer, implement, enforce and determine compliance with the act, The Clean Streams Law (35 P. S. §§ 691.1—691.1001), the Solid Waste Management Act (35 P. S. §§ 6018.101—6018.1003), the Surface Mining Conservation and Reclamation Act (52 P. S. §§ 1396.1—1396.31), the Pennsylvania Sewage Facilities Act (35 P. S. §§ 750.1—750.20), the Oil and Gas Act (58 P. S. §§ 601.101—601.605) and other applicable statutes administered by the Department and regulations promulgated under these statutes.

(c) The Department adopts and incorporates by reference the 1987 *Corps of Engineers Wetland Delineation Manual (Technical Report Y-87-1)* along with the guidance provided by the United States Army Corps of Engineers, Major General Arthur E. Williams' memorandum dated 6 March 1992, *Clarification and Interpretation of the 1987 Manual* and any subsequent changes as the methodology to be used for identifying and delineating wetlands in this Commonwealth. The 1987 *Corps Wetland Delineation Manual*, Publication No. ADA 176734 is available from the National Technical Information Service (NTIS), Springfield, VA 21161, or telephone: (703) 487-4650. Copies of the Supplemental Guidance issued by the Corps concerning use of the 1987 Manual, (that is, the October 7, 1991, Questions and Answers, and the March 6, 1992, Clarification and Interpretation Memorandum) as well as the Administration's Wetlands Plan of August 24, 1993, may be obtained by contacting the regulatory branch of a local Corps District, or the EPA Wetlands Hotline at (800) 832-7828. For more information, contact Pennsylvania Department of Environmental Protection, Bureau of Dams, Waterways and Wetlands, Post Office Box 8554, Harrisburg, Pennsylvania 17105-8554, telephone (717) 787-6827.

§ 105.452. Status of prior converted cropland—statement of policy.

(a) This section sets forth the policy of the Department as to the status of prior converted cropland in this Commonwealth.

(b) The use of some procedure for determining wetlands is necessary in order to administer, implement, enforce and determine compliance with the act, The Clean Streams Law (35 P. S. §§ 691.1—691.1001), the Solid Waste Management Act (35 P. S. §§ 6018.101—6018.1003), the Surface Mining Conservation and Reclamation Act (52 P. S. §§ 1396.1—1396.31), the Pennsylvania Sewage Facilities Act (35 P. S. §§ 750.1—750.20), the

Oil and Gas Act (58 P. S. §§ 601.101—601.605) and other applicable statutes administered by the Department and regulations promulgated under these statutes.

(c) Naturally occurring events may result in either creation or alteration of wetlands. It is necessary to determine whether alterations to an area have resulted in changes that are now "normal circumstances" of the particular area. The Department recognizes "prior converted cropland," as defined in the *National Food Security Act Manual* (180-V-NFSAM, Third Edition, March 1994), as "normal circumstances" as the term is used in the definition of wetlands in § 105.1 (relating to definitions). These prior converted croplands are not regulated as wetlands under the Commonwealth's Wetland Protection Program contained in this chapter. Prior converted cropland is defined in the *National Food Security Act Manual*, as wetlands that were drained, dredged, filled, leveled or otherwise manipulated, including the removal of woody vegetation, before December 23, 1985, and have not been abandoned, for the purpose of, or to have the effect of making the production of an agricultural commodity possible, and an agricultural commodity was planted or produced at least once prior to December 23, 1985.

(1) Abandonment is the cessation of cropping, forage production or management on prior converted cropland for 5 consecutive years, so that:

(i) Wetland criteria are met.

(ii) The area has not been enrolled in a conservation set-aside program.

(iii) The area was not enrolled in a State or Federal wetland restoration program other than the Wetland Reserve Program.

(2) Prior converted cropland may also be considered abandoned if the landowner provides written intent to abandon the area and wetland criteria are met.

(d) This policy change does not affect the exemption for plowing, cultivating, seeding and harvesting for the production of food, fiber and forest products or the waiver for maintenance of field drainage systems found at § 105.12(a)(7) and (8) (relating to waiver of permit requirements).

[Pa.B. Doc. No. 96-142. Filed for public inspection February 2, 1996, 9:00 a.m.]

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

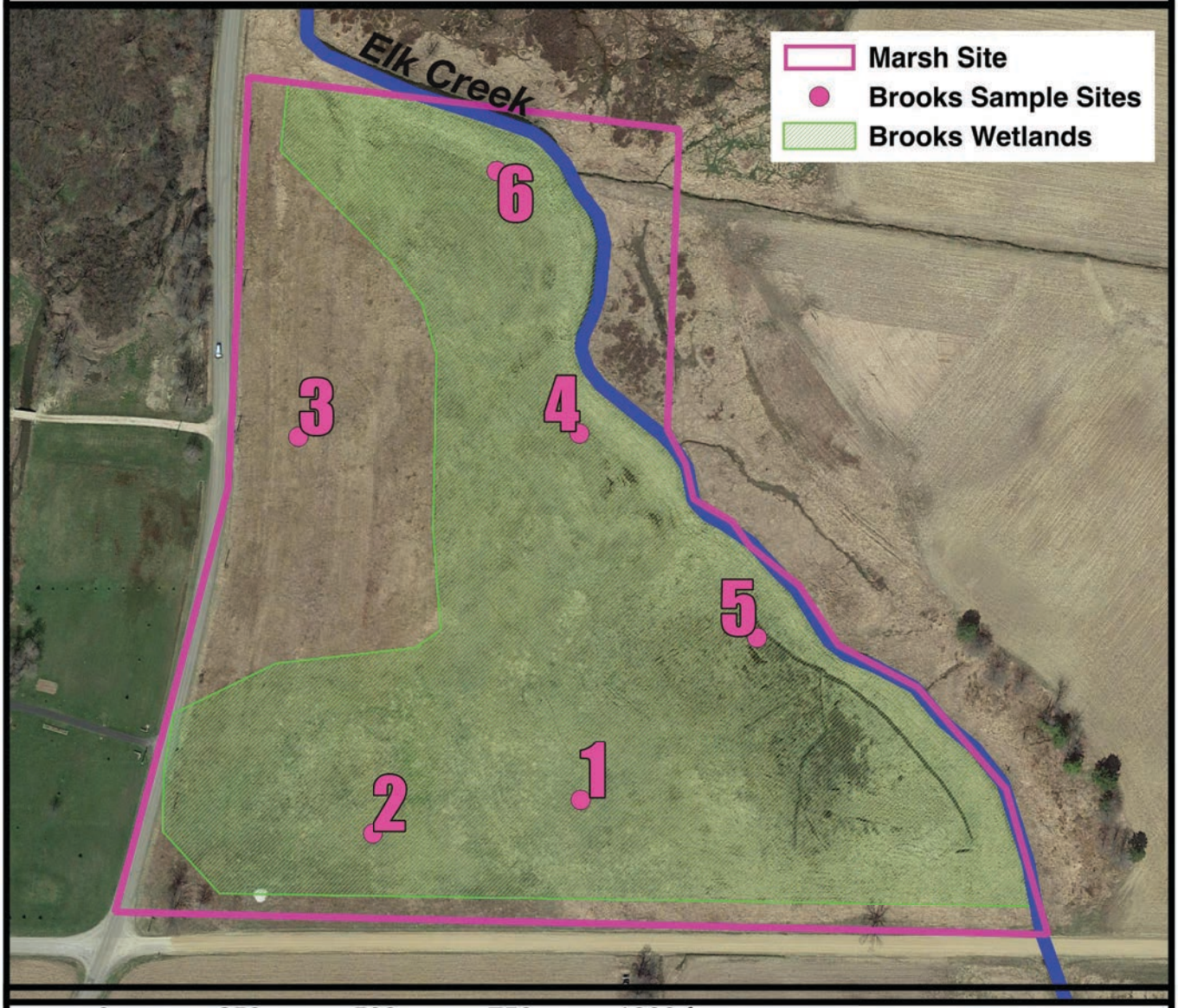


Exhibit 14c. Brooks sample points from October, 2017, as well as delineated wetlands from Brooks Figure 2. Although Brooks indicated on data forms and in his report that all six sampling points were "wetland", sample site #3 is actually located in an area shown as upland by Brooks.

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

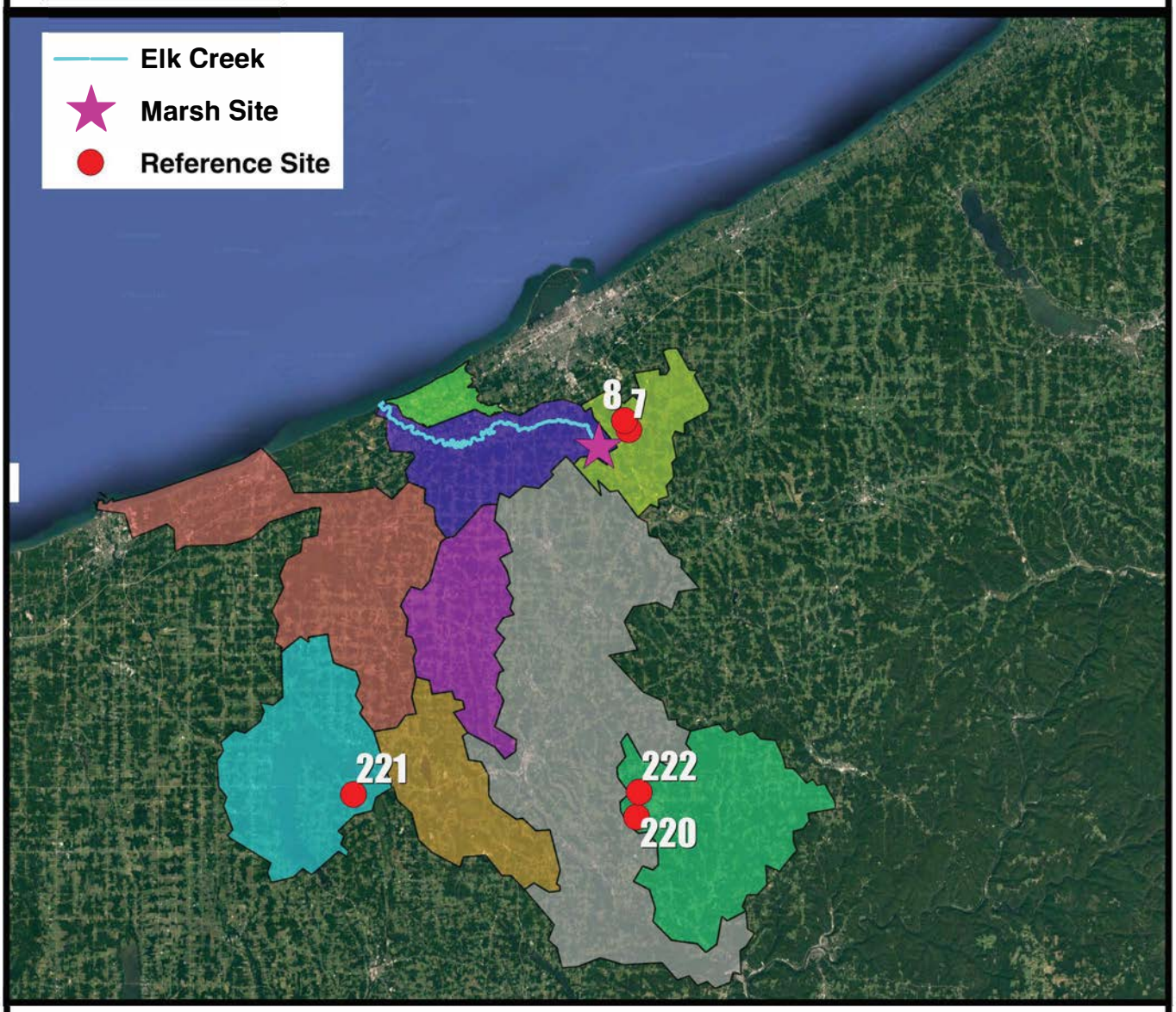


Exhibit 15. Location of Brooks Reference Sites relative to the Marsh Site. Reference sites are labeled by number. None of the reference sites are in the same watershed as the Marsh Site.

Kagel Environmental, LLC
Wetlands, Waters & Wildlife Consulting

Exhibit 16. Characteristics of the Brook's Reference Sites and the Marsh Site.

Reference Site	Lat/Long	Elevation (NAD83)	NWI Designation	Soil Type	Watershed	Distance from Marsh Site (mi)
7	41.999, -80.002	1211	PFO1E	Canandaigua mucky silt loam	LeBoeuf Creek	~2.7
8	Same as 7*? (42.0099, -80.00863?)	1237	PFO/SS1E	Canandaigua mucky silt loam	LeBoeuf Creek	~2.8
220	41.56811, -79.9800	1319	PFO1E edge	Braceville gravelly loam, 3 to 8 percent slopes	Conneaut Outlet	~31
221	41.58786, -80.40367	1076	None	Frenchtown silt loam, 3 to 8 percent slopes	Pymatuning Reservoir-Shenango River	~33
222	41.59611, -79.97683	1332	None	Holly silty clay loam	Sugar Creek	~27
Marsh Site	41.979752, -80.045999	1230	PFO1/SS1A	Canandaigua mucky silt loam	Elk Creek	NA

*Dr. Brooks lists the exact same lat/longs for Reference Areas 7 and 8 in his text. The lat/long listed for Site 8 was derived by overlaying the image from Brooks' Figure 37 on Google Earth. Site 8 was then pinned according to the location shown.

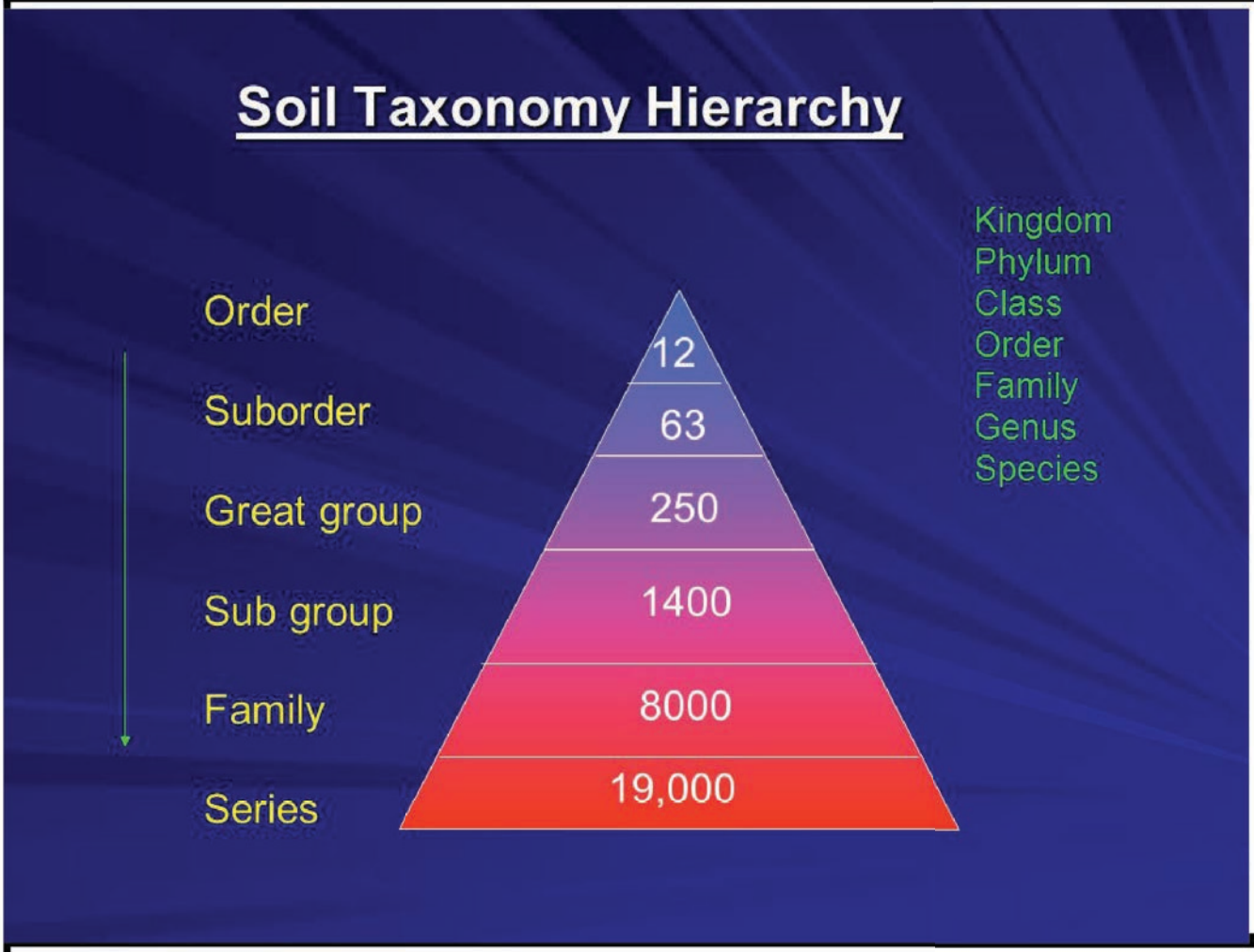


Exhibit 17. Soil taxonomy hierarchy triangle. Order is the first major division. Soil series of different orders will be substantially different.

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

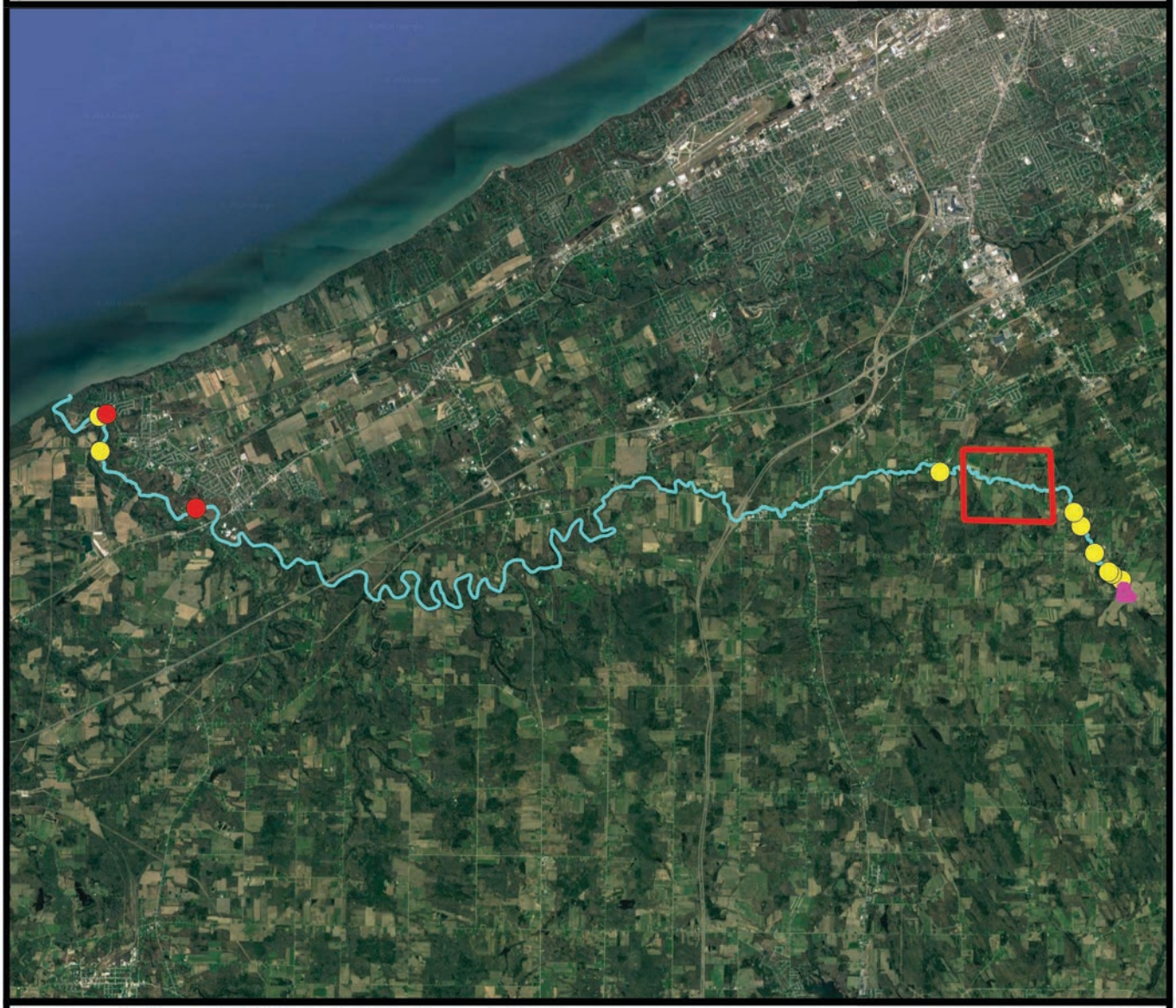
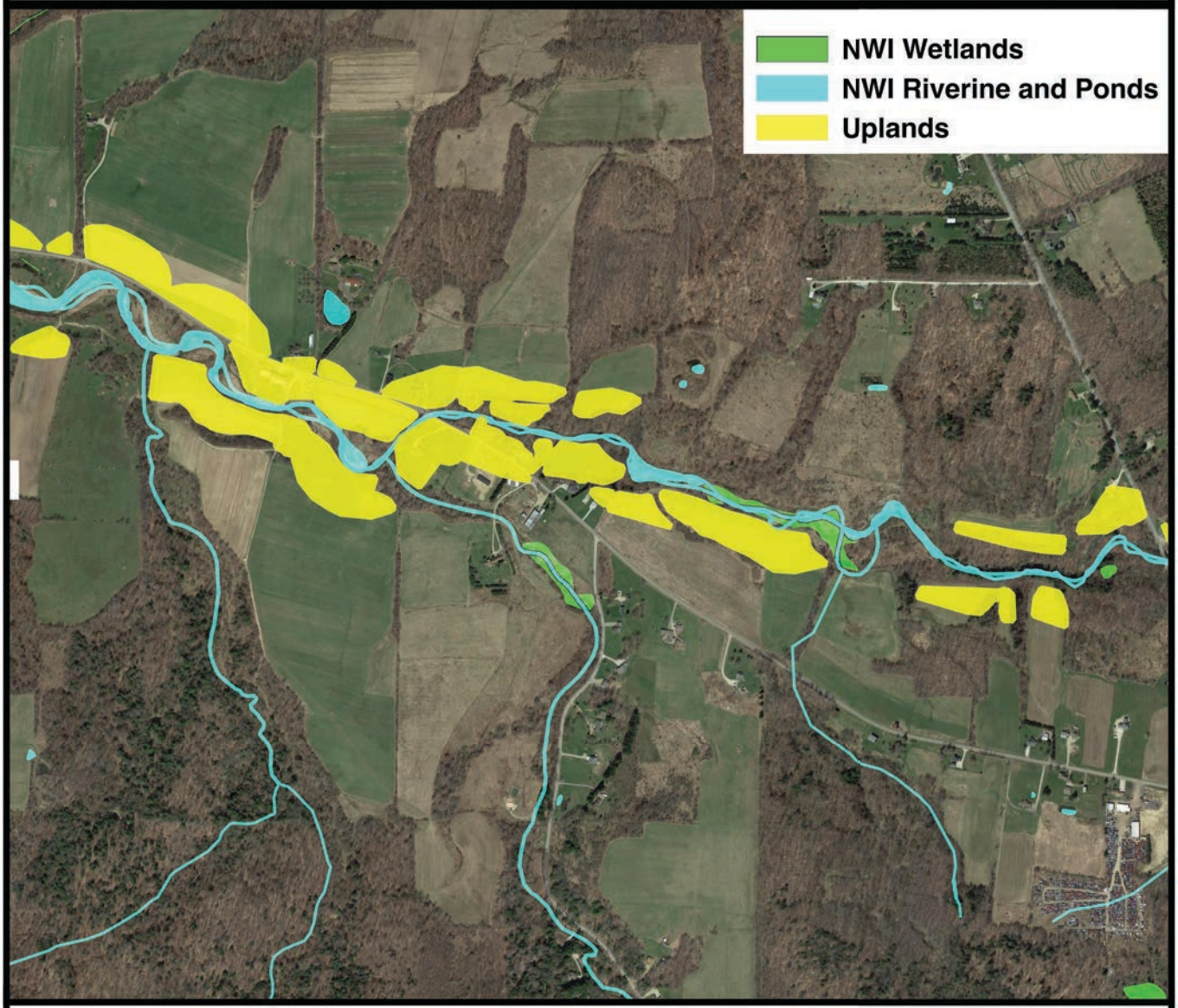


Exhibit 18. Path of Elk Creek from the Marsh Site to Lake Erie. The yellow circles represent breaks in surface connectivity, and the red circles are water treatment plants.

Elk Creek
Marsh Site
Elk Creek Breaks
Water Treatment Plant

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting



1000 0 1000 2000 3000 4000 ft

Exhibit 19. Example of upland areas within 300 ft of Elk Creek interspersed with NWI mapped wetlands. Right, overview of Elk Creek drainage. The red square indicates the area zoomed above.

Kagel Environmental, LLC

Wetlands, Waters & Wildlife Consulting

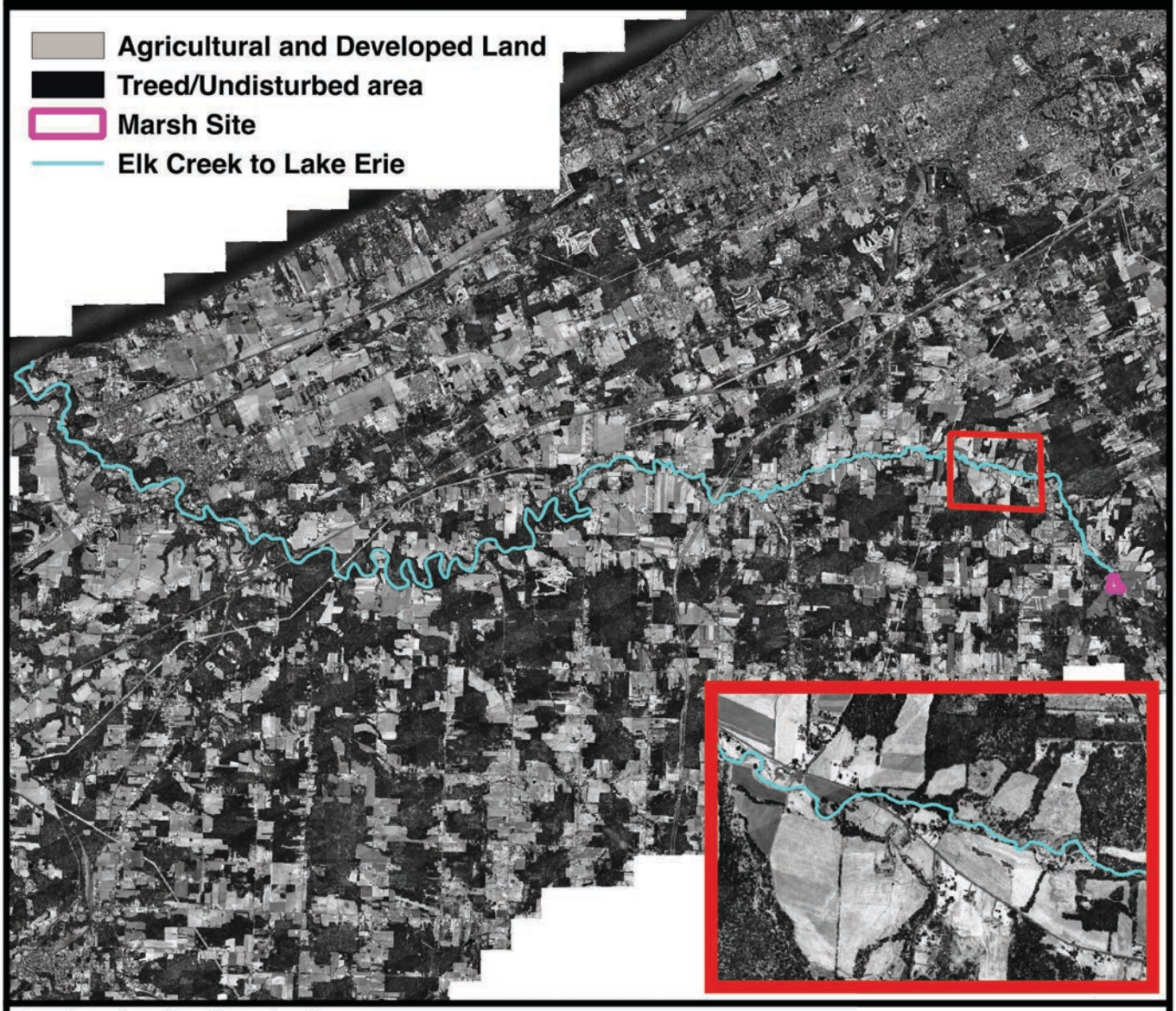


Exhibit 20. Abundance of agricultural lands and development surrounding Elk Creek between the Marsh Site and Lake Erie. Dark colored areas consist largely of treed areas. Light to medium gray areas are mostly agricultural fields or areas that have been developed for residential or commercial use. The red box indicates area of the zoomed inset.
Black and white photograph is 2015 SeaGrant Intensity image downloaded from the Pennsylvania Spatial Data Access site.

Kagel Environmental, LLC
Wetlands, Waters & Wildlife Consulting

Exhibit 20A. Precipitation for the Six Days Preceding and Day of the Brooks Visit.

Distance from the Marsh Site	~7 miles	~10 miles	~11 miles	~20 miles	~23 miles	~26 miles	~30 miles	
Date	Erie 5.6 SW	Erie Int. Ap.	Union City Filtration Plant	Saegertown	Springboro	Meadville	Titusville	AVERAGE
10/9/17	1.06	1.05	0.77	0.62	0.92	0.81	0.76	0.86
10/10/17	0.13		0.22		0.13	0.21	0.08	0.11
10/11/17		0.41	0.02		0.03	0.02		0.07
10/12/17	0.58		0.98	0.32	0.84	0.31	0.50	0.50
10/13/17					0.01			none
10/14/17								none
10/15/17		0.42						0.06
10/16/17	0.44		0.24	0.31	0.04	0.24	0.49	0.29
TOTAL	**2.21**	**1.88**	**2.23**	**1.25**	**1.97**	**1.59**	**1.83**	**1.85**

Sources: http://agacis.rcc-acis.org/?fips=42049 (Erie County), http://agacis.rcc-acis.org/?fips=42039 (Crawford County)

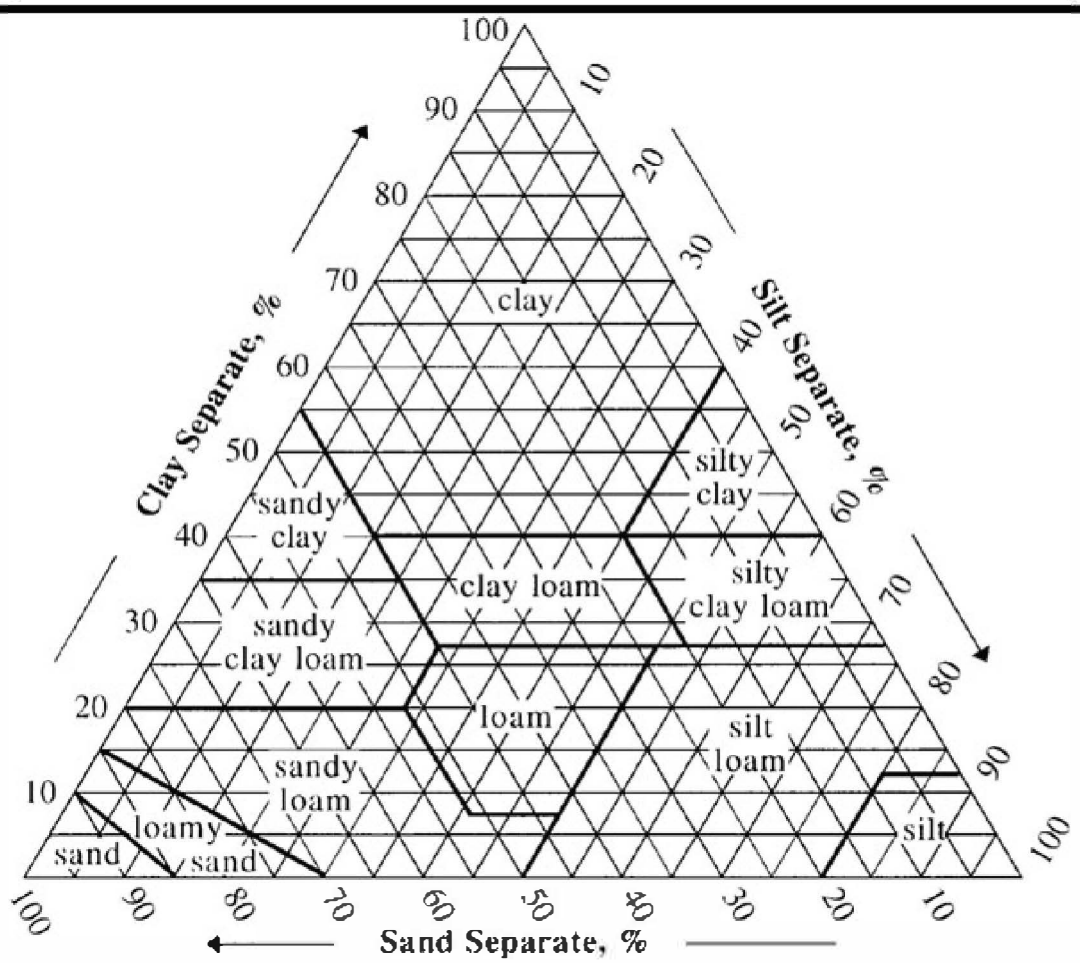


Exhibit 21. Soil textural triangle.

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs14

Kagel Environmental, LLC
Wetlands, Wildlife and Permitting Specialists
ray@kagelenvironmental.com
susan@kagelenvironmental.com

177E Main St; Box 597
Rigby, Idaho 83442
Phone (208) 745 0076
Cell (208) 313-3890
Fax (208) 441-4382

Ray L. Kagel, Jr., M.S., PWS #2234

Professional Expertise

- Execution of routine and complex wetland delineations, and forensic analysis of alleged wetland violations; 1972 Clean Water Act & 1985 Food Security Act.
- Preparation and implementation of wetland mitigation and restoration work plans.
- Assistance with comprehension of and compliance with federal Section 404 Clean Water Act laws and regulations, including 1985 Food Security Act Swampbuster.
- Preparation of Section 404 and Section 10 permit applications and After-The-Fact (ATF) authorizations for discharges in regulated waters and wetlands.
- Interpretive analysis of aerial photography, soil surveys, topo surveys, and National Wetland Inventory (NWI) mapping.
- Preparation and implementation of wildlife and fisheries management plans.
- Preparation and analysis for natural resources surveys, including endangered species.
- Design and construction management of stream and riverbank stabilization projects including design of bio-engineered structures for fisheries in fluvial habitats.
- Recognized as an Expert Witness in Wetland Science and Federal Wetland Regulations in the following jurisdictions: Idaho Federal District Court, Mississippi Federal District Court, New York State Federal District Court, Utah Federal District Court, Idaho State Court.

Professional Positions

2007-Present	Ray Kagel Jr., M.S., PWS, Consulting Wetlands and Wildlife Scientist and Principal, Kagel Environmental, LLC, Rigby, Idaho.
1999-2008	Ray Kagel Jr., M.S., Consulting Wetlands and Wildlife Scientist and Principal, Lone Goose Environmental, LLC, Rigby, Idaho.
1991-1999	Environmental Resource Specialist (Regulatory Project Manager), U.S. Army Corps of Engineers, Idaho Falls, ID (Walla Walla District).
1989-1991	Environmental Resource Specialist (Regulatory Project Manager), U.S. Army Corps of Engineers, Bismarck, ND (Omaha District).
1987-1989	Environmental Resource Biologist (Regulatory Project Manager), U.S. Army Corps of Engineers, Philadelphia, PA (Philadelphia District).

- Walla Walla District POC (Point- Of-Contact) and Final COE and EPA Authority for rendering contested or complex wetland jurisdictional determinations for the entire state of Idaho.
- Instructor of wetlands identification and delineation for the COE, EPA, NRCS and USFWS employees in the 1987, 1989, and 1991 (revised) Federal Manuals for Identifying and Delineating Jurisdictional Wetlands.
- Administration and enforcement of Section 404 and Section 10 Permitting Programs, including NEPA compliance.

- Review permit applications for compliance with NEPA and EPA 404 (b)(1) Guidelines, perform routine and comprehensive wetland determinations, review design, assess and approve river and stream bank stabilization and riparian habitat enhancement projects.
- Preparation of biological evaluations and effect determinations for listed plant and animal species & critical habitat(s) pursuant to the Endangered Species Act.
- Signature authority for approved waters of the U.S. (including wetlands) federal Jurisdictional Determinations, including signature authority for Section 404 Nationwide Permit authorizations for discharging dredged of fill material into U.S. Waters & Wetlands.

1986 Consulting Wildlife Biologist, Hutchinson Island (7,000-acre coastal island), SC, and Camp Brian Farms (10,000-acre hunting plantation), Moorhead City, NC. Design, development, implementation, and day-to-day management of comprehensive wildlife, waterfowl, and wetlands management plans.

1983-1986 Wildlife Biologist, Montana Department of Fish, Wildlife, and Parks, Bozeman, MT.

1980-1984 Graduate Research Assistant, Mississippi State University, Starkville, MS. Performed cutting-edge research defining previously unknown diurnal whitetail buck movements and home range size in MS and AL. Collection and identification of wetland & upland plants with important food and habitat value to wildlife and migratory waterfowl in MS, AL, LA, and TX.

Education

M.S. Wildlife & Fisheries Ecology, graduated 1984, Mississippi State University, Starkville, MS. Research emphasis in ungulates and waterfowl/wetlands management

B.S. Forest & Recreation Resources, graduated 1975, Clemson University, Clemson, SC.

Certifications

2016 Hydric Soils (Vepraskas), North Carolina State University, Raleigh, NC
2015 Problematic Wetland Delineations, Wetland Training Institute, Portage, WI
2013 Professional Wetland Scientist - Certification #2234 (Society of Wetland Scientists), Madison, WI
2006 River Restoration, Portland State University, Portland, OR
1996 Fluvial Geomorphology (Rosgen/Leopold), Pagosa Springs, CO
1993 River Restoration, Corps of Engineers, Coeur d'Alene, ID
1992 Hydric Soils (Sprecher), Corps of Engineers, Portland, OR
1989 Environmental Laws & Regulations, Corps of Engineers, Huntsville, AL
1988 Wetlands Delineation, Corps of Engineers (Roberts), Kalamazoo, MI

Presentations

1987-1999	Numerous presentations to stake holders concerning Clean Water Act 404 and Section 10 permitting and wetland identification in NJ, DE, PA, WA, ND and ID on behalf of, and representing the U.S. Army Corps of Engineers.
2006	Idaho State Bar Association. "Wetlands: The Good, the Bad and the Ugly. Sun Valley Idaho, Continuing Education 3 credit course.
2012	Basics of Wetland Identification and Section 404 Permitting Requirements, 1-day workshop sponsored by United Seed Co., Des Moines, IA
2012	"Pebble Mining Proposal and EPA 404-C Authority" Seminar sponsored by Iliamna Development Corporation, Lake Illiamna, AK
2012	"Sackett vs. EPA, and Other Violation Cases", Governor's Luncheon, Anchorage, AK
2012	"Sackett vs. EPA, and Other Violation Cases", Heritage Foundation, Washington D.C.
2013	"Update on Pebble Mining Proposal and EPA 404-C Authority", Lake Illiamna and Dillingham, AK
2013	Oral Comments concerning the Pebble Mine and EPA Public Hearings, and personal presentation to EPA Regional Administrator, Lake Illiamna and Dillingham, AK.
2013	"U.S. Army Corps of Engineers Section 404 Wetlands and Section 10 Waters Permit Processing." Personal Presentation for U.S. Senator Charles (Chuck) Grassley, DeWitt IA
2014	"Wetland Identification for Contractors and Section 404 permitting." One-day workshop at annual Manatt Family of Businesses Best Practices Meeting.
2015	"Challenging Sites in Wetland Identification Encountered by Kagel Environmental." Wetland Training Institute: Problem Sites in Wetland Identification. Aldo Leopold Foundation Center, Portage, WI
2016	Wetlands: Current Status & Issues – Wyoming Assoc. Conservation Districts

Additional Teaching

1989	Instructor with Dr. James Wakely and Dr. James Teaford, 1st Inter-Agency Wetland Identification Course, 1989 Federal Wetland Delineation Manual, Bismarck ND
1994	Instructor, Regulatory IV Wetland Identification and Delineation (1987 Manual), U.S. Army Corps of Engineers, Idaho Falls, ID
2017	Course instructor and field assistant to Mr. Charles Newling, 40-hour Basic Wetland Delineation by Wetlands Training Institute, Idaho Falls, ID

Selected Consulting Projects

2017	Acquest Development, Amherst, NY. Deposed by U.S. DOJ in preparation for trial of client's alleged 100-acre federal Clean Water Act wetlands violation. Deposition answers resulted in the DOJ's decision to enter into settlement talks rather than proceed to trial.

2016	Deposed in preparation for wetland violation trial (to be rescheduled), Idaho State District Court.
2014-2016	Johnson, Andy, Ft. Bridger, WY. KE is expert witness for Mr. Johnson's alleged federal Clean Water Act violation. EPA and DOJ offered our client a settlement with no penalty or fines with a no-fault consent decree, and withdrew the violation, based upon expert analysis and final wetlands consulting report completed by KE.
2008-2016	Snell & Wilmer, Salt Lake City, UT. Numerous wetland delineation projects and several cases of isolation determination for developer clients.
2015-2016	High-profile 2,500-acre wetland delineation project for proposed new state prison site in Salt Lake County, Utah.
2011-2016	Lipsitz Green Scime Cambria, LLP, Buffalo, NY. Snell and Wilmer, Salt Lake City, UT. KE completed Forensic analysis of 95-acre alleged wetland violation, Amherst, NY. All criminal charges related to wetland violations of the Clean Water Act dropped in 2014.
2012	Law Office of Raphael M. Scheetz, Cedar Rapids, IA: Following KE's learning of a criminal guilty plea and imposition of a 14-month prison sentence in federal court for an alleged wetland violation, KE helped the client find new counsel (Mr. Scheetz), and then conducted forensic wetland assessment. The federal judge approved withdrawal of the client's guilty plea, and EPA ultimately withdrew all charges against KE's client.
2011-2012	Rich and Henderson, P.C., Easton MD: KE performed forensic analysis of 80-acre alleged wetland violation, Federalsburg, MD establishing that alleged violation was significantly less than alleged. Settled in client's favor, September 2012.
2011-2012	Session Law Firm, Kansas City, MO. Defense of a VFW post against wetland violation allegations. KE's forensic analysis indicated EPA & COE erred in wetland delineation and no violation occurred. EPA's Administrative Compliance Order terminated, September 2012.
2010-2015	Amodio Stanley & Reeves LLC, Anchorage, AK. Defense of client against allegations of filling a wetland. EPA/COE alleged client filled 3.5 acres of wetlands; KE successfully corrected alleged violation calculation to less than 0.3 acre of wetland filled, and penalty reduction from $117,000 plus restoration of 3.5 acres to just $22,500 and restoration of only 0.3 acre. EPA accepted KE's restoration plan and work completed in 2013. EPA Administrative Compliance Order terminated, December 2015.

2009 – 2010	BHW Law and Jim Seibe Law: Expert defense witness for federal criminal trial, disputed wetland destruction. KE conducted forensic analysis of alleged violation site, data analysis, report and court exhibit preparation, plus 3-days federal court testimony. Analysis of prosecution exhibits, extensive document research into application of wetland regulations and provided direction as to best countermeasures of prosecution's case. Jury rejected EPA/COE wetland delineation in favor of KE wetland study and Defendant acquitted on all federal charges, U.S. District Court, Coeur d'Alene, ID.
2009-2012	Chantelle and Mike Sackett (Pacific Legal Foundation), Priest Lake, ID. Forensic analysis in disputed wetland violation. Case was argued in the U.S. Supreme Court January 9, 2012 with a unanimous decision in favor of KE's clients, the Sacketts, June 2012.
2008 – 2009	Thomsen-Stephens Law Offices, PLLC (J. Michael Wheiler). Unpermitted bank protection project and alleged wetland violation. KE's forensic wetland study and [404] expertise resulted in client's ability for a *misdemeanor* settlement rather than *felony* case first threatened by DOJ & U.S. Attorney.
2006 – 2009	Thomsen-Stephens Law Offices, PLLC (J. Michael Wheiler). Violation of wetland permitting conditions in a manner that could affect Endangered Chinook Salmon. KE performed forensic analysis of alleged violation and prepared expert report detailing that effects of violation on wetlands were minimal. Analysis of prosecution exhibits and provided opinion as to validity and best countermeasures. KE's expertise provided information whereby client got reduction from 3 years in a federal penitentiary to 6 months house arrest and simple restoration of the site. KE negotiated terms of restoration with federal agencies including USACOE, EPA, NOAA, USFWS and Idaho DNR, then provided final restoration plan satisfying all agency requirements.
2005-2006	Atkin Law Offices, P.C., Salt Lake City. Unpermitted work in intermittent stream. Expert Witness for trial sentencing phase of federal conviction in U.S. District Court, Pocatello, ID. Sentence was reduced from 8 years in a federal penitentiary to 3 years when EPA conceded to Mr. Kagel's testimony that it was impossible to determine presence and/or location of wetlands after the actual violation, and any environmental impacts were minimal.
2006	Idaho Bar Association. Develop and teach 3-hour continuing education course to the Real Property Section on Wetlands Issues and Regulations pertaining to the Federal Clean Water Act, July 2006, Sun Valley, Idaho.
2007-present	Forensic analysis of various other alleged wetland violations in California, Ohio, Iowa, Illinois, South Carolina, New York, Arkansas, Missouri, Mississippi, Wyoming, Utah, Alaska and Idaho.

Professional Organizations and Memberships

Society of Wetland Scientists
The Wildlife Society
North American Moose Foundation
National Wildlife Federation
Rocky Mountain Elk Foundation
Quality Deer Management Association
Pope & Young Club
National Rifle Association
The Aldo Leopold Foundation

Notwithstanding the relatively small amount of testimony in the last four years, Kagel Environmental, LLC has been retained as experts in a number of litigated matters and have provided reports and rendered opinions therein, including but not limited to our work as experts for Michael and Chantell Sackett in the landmark U.S. Supreme Court case of Sackett v. U.S. Environmental Protection Agency, 132 S.Ct. 1367 (2012). Most of the legal matters in which KE becomes involved are settled before reaching trial.

Extensive References Available Upon Request