ATTACHMENT 12

VICKSBURG DISTRICT'S COMMENTS ON PONDBERRY DRAFT BIOLOGICAL OPINION

DEPARTMENT OF THE ARMY
VICKSBURG DISTRICT, CORPS OF ENGINEERS
4155 CLAY STREET
VICKSBURG, MISSISSIPPI 39183-3435

REPLY TO
ATTENTION OF:

APR 30 2007

Planning, Programs, and
Project Management Division
Environmental and Economic
Analysis Branch

Mr. Ray Aycock
Field Supervisor
U.S. Fish and Wildlife Service
6578 Dogwood View Parkway
Jackson, Mississippi 39213

Dear Mr. Aycock:

I refer to the draft Biological Opinion (BO) concerning the potential effects to the endangered plant pondberry (*Melissifolia Linderia*) from implementation of the Yazoo Backwater Area Reformulation Project provided to Mr. Gary Young of my staff on March 14, 2007.

I thank you and Mr. Will McDearman for your effort during this 15-month formal consultation under Section 7 of the Endangered Species Act. The degree of professionalism exhibited by the staffs of both agencies in resolving difficult issues was commendable. There is agreement that changes in backwater flood duration and frequency will change wetland hydrology of identified locations in the project area. The disagreement between our agencies is, given all the data, what level of impact the change in backwater wetland hydrology will have on pondberry. Although our agencies have come to different conclusions concerning the data, it is not uncommon in science to have disagreement among scientists and technical personnel over the interpretation of data and conclusions.

Based on data provided in our 2005 Biological Assessment and developed during the consultation, the U.S. Army Corps of Engineers, Vicksburg District, maintains that changes in backwater flood duration and frequency, at the most, will have only a slight impact for the following reasons:

a. The historic trend of backwater flood duration indicates that most pondberry has persisted in areas without wetland hydrology sustained by backwater flooding for the last 50 to 75 years.

b. The presence of pondberry colonies/sites at elevations up to the 100-year flood frequency (including a colony/site with over 16,000 stems).

c. The apparent good to excellent health of pondberry colonies/sites despite experiencing 20 years of below average flooding from 1984 to 2003.

d. The substantial role of local hydrology at pondberry colonies/sites as determined by field surveys and jurisdictional determinations by the Vicksburg District's Regulatory Branch.

We appreciate your partially addressing and incorporating these issues in the draft BO. We believe, however, that your agency presents conclusions about the decline or eventual extirpation of some populations on Delta National Forest that are not consistent with the analysis in the BO concerning these major factors.

We agree that the project will not jeopardize the continued existence of pondberry. We are providing specific comments to clarify points of data and science in the BO (enclosure 1). We are also providing, for your reference: our comments on the preliminary draft BO provided informally on December 18, 2006 (enclosure 2); our 2006 Regulatory Branch jurisdictional

determination report for the pondberry colonies/sites on Delta National Forest (enclosure 3); and our 2006 review of the statistical analysis provided in the preliminary draft BO (enclosure 4). Pertinent data and comments from enclosures 3 and 4 were incorporated into the comments of enclosure 2 and do not constitute new information.

We look forward to receiving the final BO in the very near future. If you have any questions, please contact either Mr. Gary Young (telephone (601) 631-7156) or Mr. Kent Parrish (telephone (601) 631-5006) of this office.

Sincerely,

Anthony C. Vesay
Colonel, Corps of Engineers
District Engineer

Enclosures

COMMENTS ON U.S. FISH AND WILDLIFE SERVICE'S
DRAFT PONDBERRY BIOLOGICAL OPINION
YAZOO BACKWATER REFORMULATION PROJECT

NOTE: Enclosure 2 referenced in these comments is the 25 September 2006 preliminary draft Biological Opinion (BO) (without conclusion) comments provided to the U.S. Fish and Wildlife Service (FWS) on December 18, 2006. These comments are referenced again because they were not addressed in the draft BO. The U.S. Army Corps of Engineers, Vicksburg District, also numbered the unnumbered pages in the 14 March 2007 draft BO beginning on pages 86-109.

1. Page 1, first paragraph, second sentence. ". . . December 4, 2006, . . ." should be ". . . December 4, 2005, ..."

2. Page 1, "Consultation History." See Comment 1 of Enclosure 2. All references to activities associated with review of technical appendixes and wetland analyses prior to December 5, 2005, should be deleted.

3. Page 7, "Consultation History." Add effective date of Memorandum of Agreement after the February 5, 2007, entry.

4. Page 7, second paragraph, first sentence. Delete ". . . interrelated . . . ." These projects are independent with distinct flood damage reductions purposes.

5. Page 7, second paragraph, third sentence. The Yazoo Backwater Reformulation Project does impact headwater flooding.

6. Page 7, last paragraph. Change ". . . goal of acquiring . . . " to ". . . acquiring . . . ." End sentence after ". . . agricultural lands." Insert a new sentence "In association with the proposed action, the Corps will also conduct a pondberry conservation project to propagate and stock pondberry for two new populations with a conservation research program." Also need to add that the operation of the Steele Bayou structure will be modified to maintain the minimum water elevation between 70 and 73 feet, National Geodetic Vertical Datum (NGVD), during low-water periods. Current operation is to maintain water elevations between 68.5 and 70 feet, NGVD.

7. Page 8, third paragraph, first sentence. Revise sentence to read, "In association with the proposed action, a pondberry conservation and recovery program to artificially propagate and stock pondberry to create two new populations in wetland habitats that will not be affected by the project will be implemented under a separate Memorandum of Agreement."

8. Page 8, third paragraph, second sentence. Revise "In conjunction with propagation and stocking, related conservation research will be conducted . . . " to "The Corps will also conduct a conservation research program . . . ."

9. Page 11, "Demography," first three paragraphs. There is a lot of information that should have citations provided. See Comment 4 of Enclosure 2.

10. Page 12, "Demography," third full paragraph, third sentence. There are 12 colonies/sites sampled in 2000 and 2005 in the Mississippi Delta near Shelby, Mississippi, approximately 60 miles north of the project area. These sites are relevant because they are above the 100-year flood plain and have been sustained by local hydrology and precipitation. They also call into question the BO conclusions about impacts within the project zone (e.g., 7 of the 12 colonies/sites had increases in stem numbers between 2000 and 2005). See Comment 5 of Enclosure 2.

11. Page 13, "Status and Distribution," second full paragraph, first sentence. The 1993 Pondberry Recovery Plan lists 37 populations. The BO needs to state that there are now 54 populations because of additional surveys conducted between 1993 and 2007. In other words, a more extensive survey effort has resulted in data which increased the number of populations.

12. Page 13, "Status and Distribution," third full paragraph. It is important to note, either here or elsewhere in the document, that the Shelby colonies/sites are above the 100-year flood plain and are not sustained by overbank flooding. See Comment 6 of Enclosure 2.

13. Page 13, "Habitat," first paragraph, third sentence. See Comment 7 of Enclosure 2.

14. Page 16, "Habitat," first paragraph, third sentence. Should the sentence read ". . . Delta National Forest . . . " instead of ". . . De Soto National Forest . . . ." Also see Comment 8 of Enclosure 2.

15. Page 19, second full paragraph. See Comment 11 of Enclosure 2.

16. Page 19, fifth full paragraph. This population was relocated in 2006 (Gulf South Research Corporation (GSRC) 59) during colony/site visits to obtain photographic documentation of hydrology conditions. It appeared to be approximately the same number of stems as the 2000 sample, but the site was flooded and the plants were in a leaf-off condition, and therefore difficult to count. This site will be recounted in spring 2007. It should also be noted, here or elsewhere in the BO, that GSRC 52 at the Shelby site went from 219 stems in 2000 to 16,638 in 2005 (this site is above the 100-year flood frequency). Therefore, the data from this colony/site and the other 11 colonies/sites (all above the 100-year flood frequency) in or near Shelby should be included in any analysis of the relationship between flood frequency and stem count at pondberry colonies/sites.

17. Page 25, last paragraph, third sentence. This only indicates that pondberry is capable of large stems changes over a relatively short timeframe. Two points in time are not sufficient to establish a trend; therefore, it is not appropriate to use these to make "worse-case scenarios" in the subsequent sentences in this paragraph. The next 5 years could produce an increase in stem numbers. The data are insufficient to make definitive conclusions about decline and extirpation. Also need to add a discussion of data and research which show increases in pondberry numbers (e.g., the 1993, 1994, and 2006 Colby site analysis and the Shelby, Mississippi, pondberry data). As written, this paragraph does not provide a full and complete analysis.

18. Page 27, first full paragraph. This discussion needs to include the pondberry data for colonies/sites near Shelby identified in the Corps 2000 and 2005 data analysis. This is one of the three largest populations in the southeast United States, and the data collection and analysis (including genetics) for this site are similar to that of the Delta National Forest (DNF) colonies/sites.

19. Page 29, second full paragraph, last sentence. Suggest revising ". . . a wetland species . . ." to read ". . . a listed wetland species . . . ."

20. Page 30, first partial paragraph, last sentence. The 2000 and 2005 colonies/sites are not necessarily the same sites used in the 1991 profile. The locations were not permanently marked in 1991, and there is no way to determine if any of the 1991 sites were used in subsequent analyses. This is an important distinction that needs to be clarified in the BO.

21. Page 30, second full paragraph, third sentence. See Comment 18 of Enclosure 2.

22. Page 30, third full paragraph, first sentence. See Comment 19 of Enclosure 2.

23. Page 31, first partial paragraph, tenth sentence. See Comment 20 of Enclosure 2.

24. Page 32, third full paragraph, last sentence. See Comment 22 of Enclosure 2.

25. Page 33, second full paragraph. See Comment 23 of Enclosure 2.

26. Pages 33-38. The changes in the colony metrics observed between 2000 and 2005 were compared to the project flood frequency zones. These zones were predicted based on period-of-record (POR) stage data and represent zones of annual flood probability. If the observed changes in the pondberry colonies/sites are due to flood hydrology, then the observed changes must be compared to the flooding that occurred during that period (2000 to 2005) and not to zones of annual flood probability. Actual flooding during any discrete period of time can vary significantly from the predicted, particularly when a short period is compared to a much longer period. The table below compares the observed peak elevations during 2000 to 2005 to the POR 2-year frequency (median) flood elevations. The observed 2-year frequency (median) flood peak was less than the predicted 2-year flood at the gages up and down stream of the pondberry colonies/sites. The 2-year (median) observed peak stage was also less than the expected 2-year (median) for the preferred alternative (Plan 5). The differences in the extent of the POR predicted 2-year frequency flood and the observed 2-year flood are shown in Figure 1 (Attachment 1).

OBSERVED ANNUAL FLOOD PEAKS
AND 5 PERCENT DURATION ELEVATIONS FROM 2000 TO 2005

Year	Annual Peaks		Annual 5 Percent Duration	
	Anguilla	Holly Bluff	Anguilla	Holly Bluff
2000	97.93	91.14	91.97	88.31
2001	98.21	93.6	92.31	91.04
2002	96.78	92.63	91.87	90.65
2003	95.66	91.16	88.84	88.42
2004	95.66	91.29	89.5	87.29
2005	91.91	90.46	82.59	81.38
Median	96.22	91.23	90.69	88.37
Mean	96.03	91.71	89.51	87.85
Base	97.1	93	93.3	91
Plan 5	96.4	91.6	93	90.2
Deviation From Base	-0.88	-1.775	-2.615	-2.635
Deviation from Plan 5	-0.18	-0.375	-2.315	-1.835

As an obligate wetland plant, pondberry requires more than the 1 day of flooding every other year, which is all that is promised by a peak flood. When the observed flooding is compared to the base median 5 percent duration flood, the observed median is 2.6 feet less than the expected 5 percent duration flood. The observed median 5 percent duration flood is also about 2 feet less than the expected median 5 percent duration flood for Plan 5. The difference in the extents of the POR 5 percent duration and the observed 5 percent duration floods is depicted in Figure 2 (Attachment 1). The period 2000-2005 experiences both peak and 14-day duration flooding that was much less than average. The low level of flooding experienced from 2000 to 2005 reflects a greater reduction in flooding than would be expected based on the with-project condition. Any conclusions drawn about flooding in relation to pondberry colony/site attributes should recognize that the project will not have impacts comparable to the period between 2000 and 2005.

27. Page 35, second full and third paragraphs. This discussion recognizes that increases in pondberry numbers did and can occur. This needs to be presented in the second paragraph of page 107.

28. Page 36, first full paragraph, sixth sentence. This indicates that the Red Gum population is likely larger and therefore, underestimated. The BO also should acknowledge undercounting at:

Page 37, second full paragraph, last sentence
Page 37, fourth full paragraph, last sentence
Page 38, first full paragraph, last sentence
Page 38, second full paragraph, third sentence
Page 38, third full paragraph, last sentence
Page 93, first full paragraph

Page 98, last partial paragraph, first sentence
Page 99, third full paragraph, fifth sentence
Page 100, first partial paragraph, second full sentence
Page 100, first full paragraph, first sentence

29. Page 36, second full paragraph, second sentence. See Comment 27 of Enclosure 2.

30. Page 36, last paragraph, first sentence. Delete ". . . which also is declining . . . ." Whether the Spanish Fort population is declining has not been established. The only conclusive statement that can be made is that the number of stems in the GSRC colonies/sites in this population declined between 2000 and 2005. See also Comment 17.

31. Page 36, last paragraph, fourth sentence. See Comment 30 of Enclosure 2.

32. Page 36, last paragraph, fourth sentence. This statement is misleading. It sounds like none of the area is above the 3-year flood frequency. Twenty-one of the 49 Corps colonies/sites occur in this population, with 14 colonies/sites occurring above the 3-year flood frequency. See Comment 31 of Enclosure 2.

33. Page 37, fourth full paragraph, second sentence. See Comment 33 of Enclosure 2.

34. Page 38, first full paragraph, second sentence. The number of plants in 2005 should read 130.

35. Page 38, second full paragraph, second sentence. See Comment 35 of Enclosure 2.

36. Page 39, first full paragraph, last sentence. The Vicksburg District provided FWS maps of the extent of flooding from four historical periods, including the period 1901-1932. Those plates are included in the BO.

37. Page 41, first partial paragraph. The description of the pumps authorized in 1941 should include that the project included three pumps and no diversion canal.

38. Page 43, first paragraph, next to last sentence. Suggest deleting sentence. There is no basis in the preceding discussion to conclude the potential for rapid understory growth, and competition is probably a site-specific factor related to hydrology.

39. Page 44, first paragraph, first sentence. See Comment 38 of Enclosure 2.

40. Page 44, second full paragraph, sixth sentence, and last paragraph. Ten of 12 satellite images between 1993-2006 showed both areas with ponded water. See Comment 39 of Enclosure 2.

41. Page 44, third and fourth paragraphs. This discussion recognizes the uncertainty of limited data and timeframes for predicting decline. However, the BO relies principally on limited data (two points over 5 years) to make definitive conclusions (see Comment 17). The BO needs to recognize the uncertainty of limited data clearly and consistently throughout the BO. Also see Comment 40 of Enclosure 2.

42. Page 45, first full paragraph, last sentence. This sentence should be deleted. The Corps precipitation analysis indicates that 1994 was a wetter than average year, particularly between July and December. More than 62 inches of rain were received at Rolling Fork in 1994. This is 10 inches above average. Precipitation from January through June was slightly above average (30.5 versus 29.2 inches average), but the period July through December received more than 9 inches of rain above the average for that period (31.4 versus 22.3 inches average). Only September 1994 received less than average precipitation (2.11 versus 2.93 inches), while precipitation in July and October 1994 was more than twice normal (July 8.4 versus 3.72 inches, October 9.3 versus 3.12 inches). Figure 3 (Attachment 1) shows the annual and monthly precipitation, along with the average, at Rolling Fork for the period 1988-2005. In addition, the spring of 1994 experienced a prolonged backwater flood event which started in early February and persisted until the end of May. The water surface of the flood was only moderate, with the stage at Holly Bluff averaging around 91 feet, NGVD, with a peak water surface elevation of 95.8 feet, NGVD, at Anguilla and 92.6 feet, NGVD, at Holly Bluff. Figure 4 (Attachment 1) shows the stage hydrograph for 1993-1994 at Anguilla and Holly Bluff.

43. Page 45, fourth paragraph, second and last sentences. The annual rate of change in number of plants sampled is predicted to be ± 7 percent, but the conclusion is extirpation. Extirpation is not supported if the annual rate of change has a range that includes negative and positive change in numbers. It is just as probable that the colony could continue to increase in numbers through time. The BO needs to provide a balanced discussion throughout the document.

44. Page 45, fifth paragraph, first and sixth sentences. See Comment 41 of Enclosure 2.

45. Page 46, first partial paragraph, first full sentence. See Comment 42 of Enclosure 2.

46. Page 46, last paragraph. The sources of hydrology for the project area are backwater flooding, headwater flooding, and rainfall. Depressions can store water from any one of the sources, but they are not the hydrologic source of water. Discussion on HGM should be deleted. It was not used to assess pondberry colonies/sites and has no connection to potential project effects.

47. Page 47, first group of bullets. The following points should be added to the list. More than 90 percent of the known colonies exist above the backwater flood 5 percent duration (wetland) elevation based on the Flood Event Assessment Tool (FEAT). More than 50 percent of the known colonies exist above the 2-year flood frequency elevation.

48. Page 47, last bullet. See Comment 50 of Enclosure 2.

49. Page 48, first bullet. See Comment 48 of Enclosure 2.

50. Page 48, second bullet. With the exception of reference to Galloway's report, the BO provides no additional data to support this conclusion concerning reduced flood frequency as it relates to pondberry locations. As noted in our previous comments, we do not agree with Galloway's conclusions concerning changes in flood frequency. The Galloway Report (Report No. IWR-80-D1) crudely modeled two possible flood conditions. The first was conditions in the Delta if no mainline levees had been constructed and the second was conditions with no internal flood control measures completed. Projected maps of these two conditions were presented in the report. The map for the first condition, Figure 35, assumed that Mississippi River stages would be maintained laterally across the Delta. This assumption is not supported by historical data. The 1927 flood caused massive flooding in the Delta after the local levees failed in several locations. The northernmost levee failure was north of Greenville. The maximum observed stage at Yazoo City was 8 feet less than the peak stage at the Lake Providence gage which is at the same latitude. In other words, it took a water surface elevation 8 feet higher at the Mississippi River than on the eastern edge of the Mississippi Delta to create a 100-year flood event. The Galloway analysis assumed that the water surface elevation of the Mississippi River and the water surface elevation on the eastern edge of the Mississippi Delta were the same. If it takes an 8-foot difference in water surface elevation to create a 100-year event, then a 2- or 5-year event cannot occur with no difference in water surface elevation. Also see Comment 49 of Enclosure 2.

51. Page 48, last paragraph, first and fifth sentences. These statements do not comport with statements on pages 33 through 38 indicating that most of the populations identified by FWS do not occur within jurisdictional wetlands as defined by the 5 percent duration backwater flood (FEAT data). The statement just says the National Research Council supports the method, but not necessarily all of the results. However, it is still possible that portions of these populations do occur in jurisdictional wetlands supported by some source of hydrology other than backwater flooding. If this is the case, then the required wetland hydrology for these populations will not be affected by the project.

52. Page 51, first full paragraph, third sentence. See Comment 55 on Enclosure 2.

53. Page 52, first full paragraph. Given the size and nature of flood damage reduction projects, it is routine for the Vicksburg District (over 15 years) to use a variety of offsite and remote methods. These methods were field verified. In fact, the 1987 Wetland Manual explains how to utilize an offsite method using satellite imagery. The National Wetland Inventory maps are based on offsite methods using remote sensing.

54. Page 53, second full paragraph, fifth sentence. It is not technically possible to provide a 95 percent confidence interval for the Flood method. The stages measured on the day of the satellite scene do not have an error associated with them. Although the 95 percent confidence interval was not provided for the FEAT method, the 90 percent confidence interval was provided. The EPA also used a 90 percent confidence interval in the EMAP wetland estimate. The FEAT 90 percent confidence interval was calculated from the variance of the annual 5 percent duration elevations at each gage. EMAP estimated that there 216,567 acres of wetlands in the Yazoo Backwater Area, with a 90 percent confidence interval of 173,594 to 259,541 acres. The FEAT estimate of wetland extent was 189,600 acres with a 90 percent confidence interval of 157,100 to 232,100 acres. The EMAP estimate included wetlands sustained by headwater flooding, backwater flooding and precipitation, while the FEAT estimate is based solely on backwater flooding. The Corps made several assumptions for the FEAT modeling to ensure that the extent of wetlands would be overestimated rather than underestimated. These assumptions include (a) the 5 percent duration flood (14-day) is the upper limit of wetlands rather than the 12.5 percent duration flood (34-day); (b) the median 5 percent elevation at each gage was used instead of mean 5 percent elevation; (c) backwater flooding is the sole source of water that sustains wetlands in the study area (that the 52 inches of average annual precipitation do not play a role in sustaining wetlands); and (d) all areas, which meet the hydrology requirement of wetlands, will also meet the soil and vegetative requirements of wetlands.

55. Page 54, last paragraph, third sentence. Suggest refrain from using the term "nonwetland." If the colonies/sites are not in the FEAT coverage, that does not mean they are not wetlands. The FEAT only delineates wetlands based on backwater (5 percent duration) flooding.

56. Page 54, last paragraph, last sentence. See Comment 58 of Enclosure 2.

57. Page 57, fifth paragraph, first sentence. The FEAT model estimates duration only.

58. Page 57, fifth paragraph, second and third sentences. The 2-year frequency means there is a 50 percent probability in any given year that an area will receive flooding, and a 5-year frequency means there is a 20 percent probability in any given year that an area will receive flooding.

59. Page 62, last partial paragraph, second sentence. Response provided by Dan Smith of the U.S. Army Engineer Research and Development Center (ERDC). This statement is inaccurate to a large extent, but accurate in one way. The Yazoo Basin HGM Guidebook is "fully developed" in that it included the establishment of reference standard wetlands, verification, and field testing. However, it has not undergone validation as established in Smith and Wakeley, 2001. Validation entails use of independent data to validate reference standards and assessment variable curves. In some cases, such independent data are not available. In other cases, it is available, but the lack of funding has resulted in validation not occurring. To my knowledge, none of the published HGM Guidebooks have undergone the validation phase of the protocol.

60. Page 65, first full paragraph. See Comments 60 and 62 of Enclosure 2.

61. Page 65, first full paragraph, sixth sentence. See Comment 63 of Enclosure 2.

62. Page 65, first full paragraph, seventh through eleventh sentences. These data should be viewed carefully. This was not a gradual linear loss, but a dramatic loss that happened 50 to 75 years ago. Therefore, pondberry survived a 50- to 75-year period in which 85 to 98 percent of the known colonies/sites occurred outside of wetland areas defined by FEAT (backwater 5 percent duration flooding). Also see Comments 64 and 65 of Enclosure 2.

63. Page 66, second full paragraph. The Flood Control Act was passed in 1928 after the 1927 flood. Prior to 1927, the mainline Mississippi River levees were constructed and maintained by various Districts, but the system was in place and provided substantial protection.

64. Page 67, first full paragraph. Although we recognize this assumption is made for the purposes of additional analysis, wetland hydrology can be established by any source of hydrology.

65. Page 68, third full paragraph, last sentence. The BO fails to consider that the greatest change in colonies/sites occurred immediately after the 1901-1931 period. The BO gives the impression, notwithstanding its discussion of the different periods, that a continual decline in wetland hydrology from backwater flooding has occurred (FEAT data), and it is now to the point where it has become critical to pondberry survival. The greatest decline in wetland hydrology from backwater flooding occurred in the 1932-1957 period. The number of colonies/sites with wetland hydrology from backwater flooding (never greater than 15 percent of the total number of colonies/sites) has remained relatively stable over the last 50 to 75 years. See Comment 72 of Enclosure 2.

66. Page 69, fourth full paragraph, first sentence. One of the major features of hydrophytic vegetation is the adaptation to survival to anaerobic conditions in soils due to prolonged inundation or saturation. As it takes 14 or more days for these conditions to develop, examination of shorter flood durations would be of little use. The duration of the annual peak flood is 1 day. Almost all plants can survive a 1-day flood event.

67. Pages 69-86. The change in pondberry colony attributes between 2000 and 2005 is compared and statistically analyzed in reference to both the POR wetland duration zones and flood frequency zones. The actual observed changes between 2000 and 2005 should only be compared to the frequency and duration of floods that occurred during that period, not to events that were predicted to occur. However, in this case, the observed flooding between 2000 and 2005 is very different from the expected with regard to both frequency and duration. See also Comment 26.

68. Page 70, first partial paragraph, last sentence. Suggest revising sentence to read "Overall, we believe the data show the total number of pondberry at profiled colonies/sites declined substantially between 2000 and 2005, and we believe this was affected by flood frequency during this period." This acknowledges that FWS and the Corps disagree on these points. See Comment 84 of Enclosure 2.

69. Page 83, fifth full paragraph, second and third sentences. We concur that other factors are important, but there is little discussion about the effects of these factors. In fact, flooding was likely not an important factor in growth rates between 2000 and 2005.. Although flooding did affect some colonies, no events in this timeframe achieved 5 percent duration. See also Comment 26.

70. Page 84, first partial paragraph. See Enclosure 3. The Corps asks FWS to consider the Vicksburg District's Regulatory Branch analysis of the jurisdictional status of the 49 pondberry colonies/sites in DNF as indicative that the obligate category for pondberry may be mistaken and in any case, its appropriate category should be based on data.

71. Page 84, third full paragraph. The only conclusive statement that can be made is that the number of stems in the GSRC colonies/sites in this population declined between 2000 and 2005. To state that pondberry is declining in the DNF based on these limited data is not scientifically supported. Suggest revising sentence to read "Pondberry declined in DNF, as indicated by data from profiled colonies/sites during 2000 and 2005; however, pondberry increased in DNF as indicated by Colby site data from 1993 to 2006." See also Comment 17.

72. Page 85, first partial paragraph, last sentence. The BO does not establish that the hydrology of pondberry for growth, survival, and persistence closely reflects the jurisdictional definition of hydrology (regulatory definition for purposes of Section 404 Clean Water Act). This statement is misleading because it is based on a factual inaccuracy. The Corps has provided a large volume of data that indicates most pondberry is not dependent on jurisdictional wetland hydrology based on regulatory field determinations or FEAT 5 percent backwater flood duration.

73. Page 85, fourth full paragraph, last full sentence. This statement recognizes that stem dieback is just as likely to have caused the decline between 2000 and 2005. This should be given equal weight and clearly stated in any conclusions discussion.

74. Page 86, first paragraph, last sentence. The Corps suggestion that pondberry is a facultative wetland species is inclusive of the three facultative classifications. The distribution of pondberry in DNF does not support its designation as an obligative wetland species. Even during the wettest historical period, less than 50 percent of the known colonies were in the FEAT modeled wetland areas. The Corps suggestion that pondberry is a facultative wetland species is supported by both the current and the historical distribution of pondberry in DNF. A facultative wetland species would be found in areas that are frequently flooded, wetland, and nonwetland sites as determined by the FEAT model. More than 90 percent of the colonies in DNF are found in areas with this hydrology, and more than 80 percent fall into the category of frequently flooded, nonwetland. The area which meets these conditions is the 2- to 5-year flood plain above the

FEAT modeled 5 percent duration wetlands. Currently, 83 percent of the pondberry in the DNF can be found in this environment (17 of 177 are in wetlands, 68 of 177 are in the 2 year above the FEAT modeled 5 percent wetlands, 79 of 177 are in the 5 year, and 12 of 177 are above the 5 year). Those colonies that were in the 2- to 5-year flood plain above the 5 percent duration for the period 2000-2005 did better than all other colonies. Those colonies in this band include GSRC colonies 53, 54, and 56.

75. Page 87, "Factors to be Considered," last paragraph, third sentence. The change in pondberry colony/site attributes between 2000 and 2005 should only be compared to observed floods during that period and not to flood frequency zones based on the POR data. See also Comment 26.

76. Page 88, "Project Operations and Hydrological Change," second full paragraph. Eighty-seven feet, NGVD, is the minimum pumping elevation. The floodgate operation is dependent on the difference in water surface elevation between the Yazoo River side of the Steele Bayou structure and the water surface elevation interior of the Steele Bayou structure. For example, during the spring flood of 1991, the interior elevation exceeded 87 feet, NGVD, but the pumps would not have operated because the Yazoo River side elevation was always lower and the gates would have remained opened.

77. Page 89, "Project Operations and Hydrological Change," third full paragraph, second sentence. Approximately 26,300 acres will **potentially** [emphasis added] lose jurisdictional wetland hydrology based on the FEAT 5 percent backwater flood duration. It is likely that areas within the 26,300 acres will maintain wetland hydrology through other sources of water.

78. "Colonies/Sites and Population Segments Unlikely to Be Adversely or Significantly Affected."

a. Page 89, last partial paragraph. The processing error was in reference to the Plan 5 1-year frequency flood plain. The Plan 5 1-year frequency elevations were 0.1 foot less than the base elevations at the three Big Sunflower gage locations. This drop produced a slight decrease in the with-project 1-year flood plain. However, the recommended plan will not alter the 1-year frequency flood plain with regard to the pondberry colonies. The same 17 colonies are in both the base and Plan 5 1-year flood plains. The base and Plan 5 5 percent duration zones will change. Three colonies will change duration intervals within the 5 percent duration flood plain from base to Plan 5. The 1-year frequency and 5 percent duration zones are not the same. The paragraph discusses both as though they were the same. Table 42 shows the colonies in duration intervals, not the 1-year flood plain. The confusion between the 1-year frequency flood plain and the 5 percent duration flood plain is continued in the next two paragraphs. There are 15 colonies in the base 5 percent duration flood plain and 14 in the Plan 5 5 percent duration flood plain. There are 17 colonies in both the base and Plan 5 1-year frequency flood plains.

b. Page 90, last partial paragraph, first sentence. The three subject colonies 2, 21, and 42 are in the following base flood frequency zones 2, 1, and 5, respectively. Under with-project conditions, colony 42 shifts from the 5 to the 25-year flood plain. The other two do not change flood frequency zones.

c. Page 92, last partial paragraph, fourth and fifth sentences. If there is no statistical difference between the average number of stems in wetland and nonwetland colonies, further speculation is not warranted nor appropriate.

79. "Hydrological Alterations and Affected Colonies/sites and Populations."

a. Page 95, first paragraph, fourth sentence. This sentence should read, "Currently, 48 percent (85) and 44.6 percent (79) of the colonies currently occur in the 0- to 2-year and 3- to 5-year flood plains, and 7.3 percent (13) occurs above the 5-year flood plain." Table 48 should be modified to reflect this information. The last sentence in that paragraph should be changed to read "The sites for 10 (5.6 percent) of these colonies will be transformed to the 6+ flood plains."

b. Page 95, third paragraph, first sentence. Using only two points to establish a trend is not scientifically credible. See previous Comment 17.

c. Page 96, second and third paragraphs. The BO fails to consider the 12 colonies outside the DNF. These colonies/sites are all above the 100-year flood plain. These sites are not dependent on wetland hydroperiod sustained by either overbank flood frequency or duration. This is a critical omission to establishing the baseline role frequency and duration play in sustaining pondberry. In 2000, 10 of these colonies had greater pondberry stem numbers than the 2 colonies/sites below the 1-year frequency in the DNF. Also, 7 of the 12 colonies had increased stem numbers between 2000 and 2005 (5 decreased). One colony/site (GSRC 52) increased from 219 stems in 2000 to over 16,000 stems in 2005. These changes demonstrate that factors, independent of any effect from overbank flood frequency or duration, can produce substantial changes (positive or negative) in pondberry colonies/sites. The cause(s) of the changes for these colonies/sites and the colonies/sites in the DNF cannot be concluded with any degree of scientific certainty based on the available data. These data suggest that substantial changes in pondberry colonies/sites can occur without any effect from overbank flood frequency or duration.

d. Page 96, third full paragraph, last sentence. See Comment 77c. The importance of the 12 colonies/sites near Shelby in defining baseline relationships between pondberry numbers and flood frequency cannot be understated.

e. Page 97, fourth full paragraph, third sentence. Figure 5 (Attachment 1) shows the annual 5 percent duration elevations at Holly Bluff from 1932-2005. The figure also includes the median and mean 5 percent duration elevations for that period. The flooding that has been experienced between 2000-2005 is below both the mean and the median in 4 of the 6 years. The average 5 percent duration elevation for those 6 years is 87.85 feet, NGVD. That average is 2 feet less than the overall mean and 3 feet less than the overall median. The observed 5 percent

duration elevations for these 6 years is also less than the expected with-project median 5 percent duration elevation. Thus, future conditions should not remain the same as 2000-2005. Figure 5 also plots a moving 5-year average 5 percent duration elevation. This moving average smoothes the annual variations and gives a general view of how the 5 percent duration elevation changes over time. The plot shows there have been three extended periods with above average 5 percent elevations and four extended periods with below average 5 percent duration elevations. See also Comment 26.

f. Page 97, third and fourth paragraphs. It is unlikely that any 20-year period will match a longer POR due to the cyclical nature of hydrological conditions. The Corps recognizes this cyclical phenomenon and requires a minimum 50-year POR, which includes the major floods within the subject basin. The period 1984-2003 does not meet either of those criteria. The Corps **did not** [emphasis added] conclude that the with-project growing season flooding would not be significantly different than flooding observed during 1984-2003. The Corps interpretation of the data is that infrequent flooding occurred during this 20-year period and the colonies appeared to be in excellent to good health. Therefore, overbank flooding appeared to have little effect and colonies can tolerate periods with little overbank flooding. It is inappropriate to compare frequency of actual events in a portion of a POR to the entire POR. These comments also apply to subsequent paragraphs based on this discussion. Also see Comment 104 of Enclosure 2 and Comment 26 of this Enclosure.

g. Page 97, last partial paragraph, first sentence. The BO fails to meaningfully examine other factors which could account for the observed decline from 2000-2005. One potential factor could be the low amount of precipitation received from July through October 2000. That 4-month period received just 4.55 inches of precipitation compared to the average of 13.10 inches for that period. The 4.55 inches was the least cumulative precipitation received in those 4 months in the 111-year period from 1895-2005. The lack of precipitation received during those 4 months following the low level of flooding experienced that spring provides a plausible explanation for the observed decline. See also Comment 26.

h. Page 98, third full paragraph. The table below provides stem data by population area and wetland status. Among all profiled populations, there were 6,556 stems at wetland sites in 2000 and 4,748 stems at nonwetland sites. In 2005, there were 4,127 stems at the 13 wetland sites, a decline of 2,429 stems. There were 2,375 stems at the 36 nonwetland sites in 2006, a decline of 2,373 stems. The overall loss of stems from all colonies from 2000-2005 was 4,802. The overall loss was nearly evenly divided between the wetland (51 percent) and nonwetland (49percent) sites. The loss per colony was three times greater at wetland sites than nonwetland sites. Based on this information, it does not appear that wetland sites performed any better between 2000-2005.

PONDBERRY BY JURISDICTIONAL WETLAND STATUS

Site Name	Wetland Status 1/	# Colonies	Stems 2000	Stems 2005	# Stems Change	% Change
Colby	Wet	2	5,855	1,993	-3,862.0	-66.0
	Non-Wet	3	63	55	-8.0	-12.7
Red Gum	Wet	6	380	197	-183.0	-48.2
	Non-Wet	13	2,740	1008	-1,732.0	-63.2
Spanish Fort	Wet	2	108	59	-49.0	-45.4
	Non-Wet	17	1,136	515	-621.0	-54.7
Other	Wet	3	213	1,878	1,665.0	781.7
	Non-Wet	3	809	797	-12.0	-1.5
Total	Wet	13	6,556	4,127	-2,429.0	-37.1
	Non-Wet	36	4,748	2,375	-2,373.0	-50.0
Total less 54 and 56	Wet	11	6,415	1,981	-4,434.0	-69.1
	Non-Wet	36	4,748	2,375	-2,373.0	-50.0

1/ Based on jurisdictional field determinations.

i. Page 98, third full paragraph, fourth sentence. There are no data to support that flooding between 2000 and 2005 were similar to project conditions. Not only did the overbank flooding data provided to FWS end in 2003, the BO incorrectly interprets and concludes that the 1984-2003 flooding data are representative of with-project conditions (see Comment 69). This paragraph should state that any projections of decline are the worst-case scenario and not a certainty. Also, there is no discussion in the BO establishing the basis for how long it takes for a decline or any indication of a linear decline of this nature.

j. Page 98, "Populations." This section compares the change in colony size between 2000-2005 by flood frequency zones. These zones were calculated based on the 1943-1997 POR, not the observed flood frequency zones for the period 2000-2005. Figure 1 shows that none of the colonies in the Colby, Red Gum, and Spanish Fort populations were flooded by the 2-year flood for this period, and none were within the median 5 percent duration flood for that period. Thus, the differences that FWS attributes to colonies for both the 2- and 5-year flood plains are not valid, as neither flood zone experienced flooding during that period. See also Comment 26.

k. Page 100, second and third full paragraph. If some of these colonies/sites are in the 0- to 2-year flood plain, where the positive growth rates occurred, there appears to be no scientific basis for concluding that all nine small populations will become extirpated. This conclusion needs to be modified.

l. Page 100, third full paragraph. See Comments 48 and 60 of Enclosure 2.

m. Page 101, first full paragraph. See Enclosure 3. The Corps asks FWS to consider the Vicksburg District's Regulatory Branch analysis of the jurisdictional status of the 49 pondberry colonies/sites in the DNF.

n. Page 104, third full paragraph, fourth sentence. The BO does not provide a scientific basis to conclude any effects from past projects. The only available data (historic duration data provided by the Corps) indicate that at no point over the last 50 to 75 years has more than 15 percent of the colonies/sites in the DNF occurred in the 5 percent backwater flood duration zone; the duration the BO concludes is necessary for pondberry to survive and reproduce. In addition, the most recent flood damage reduction project in the Yazoo Backwater Area was completed in 1978.

o. Page 104, last partial paragraph, last two sentences. No scientific basis is provided for these statements.

p. Page 105, first full paragraph. This paragraph presupposes that past flood damage reduction measure in combination with the proposed project is the sole reason for the decline in pondberry numbers. This paragraph needs to be expanded to discuss other plausible explanations or factors that could account for changes in numbers. It should also be noted there is a large degree of scientific uncertainty associated with these statements that FWS presents as conclusive.

q. Page 105, second full paragraph, third sentence. Revise ". . . Corps committed as part of this proposed project to . . . " to read ". . . Corps committed in association with this project to . . . ."

r. Page 106, third full paragraph, first sentence. Revise beginning of sentence to read "The Corps will also conduct a research program to assess the effects of flooding . . . ."

s. Page 106, last partial paragraph. The BO should recognize here and other appropriate sections that until an area is fully surveyed, the existing population levels likely are understated. For example, the 1993 Pondberry Recovery Plan lists 37 populations and the BO lists 54.

t. Page 107, first full paragraph, first and second sentences. Suggest the word "will" not be used. The evidence is equivocal.

80. Page 106, "Survival and Recovery," first partial paragraph, first sentence. This should read ". . . 54 . . ." instead of ". . . 56 . . . ."

81. Page 108, "Conservation Recommendations," third full paragraph, fifth sentence. Response provided by Dan Smith of ERDC. This statement is addressed to some extent with respect to "fully implementing" by Comment 57. However, it also indicates a misunderstanding of the author with respect to the difference between wetland subclasses and assessment variables. Connected depressions and isolated depressions are two of the seven regional subclasses in the Yazoo Basin. Microdepressional ponding (V_{POND}) is a variable used to assess functions of several regional subclasses. Reference standard wetlands were established for the depressional subclasses, but there is no reference standard wetlands for "microdepressions" or "vernal pools"

as they do not represent regional subclasses. Variable curves were established for the microdepressional ponding (V_{POND}) assessment variable based on sampling in reference standard wetlands for the regional subclasses in which the microdepressional ponding (V_{POND}) assessment variable is utilized.

82. Page 108, fourth full paragraph. This conservation recommendation was not raised during the consultation and the population is located outside the Vicksburg District's jurisdiction.

Duration

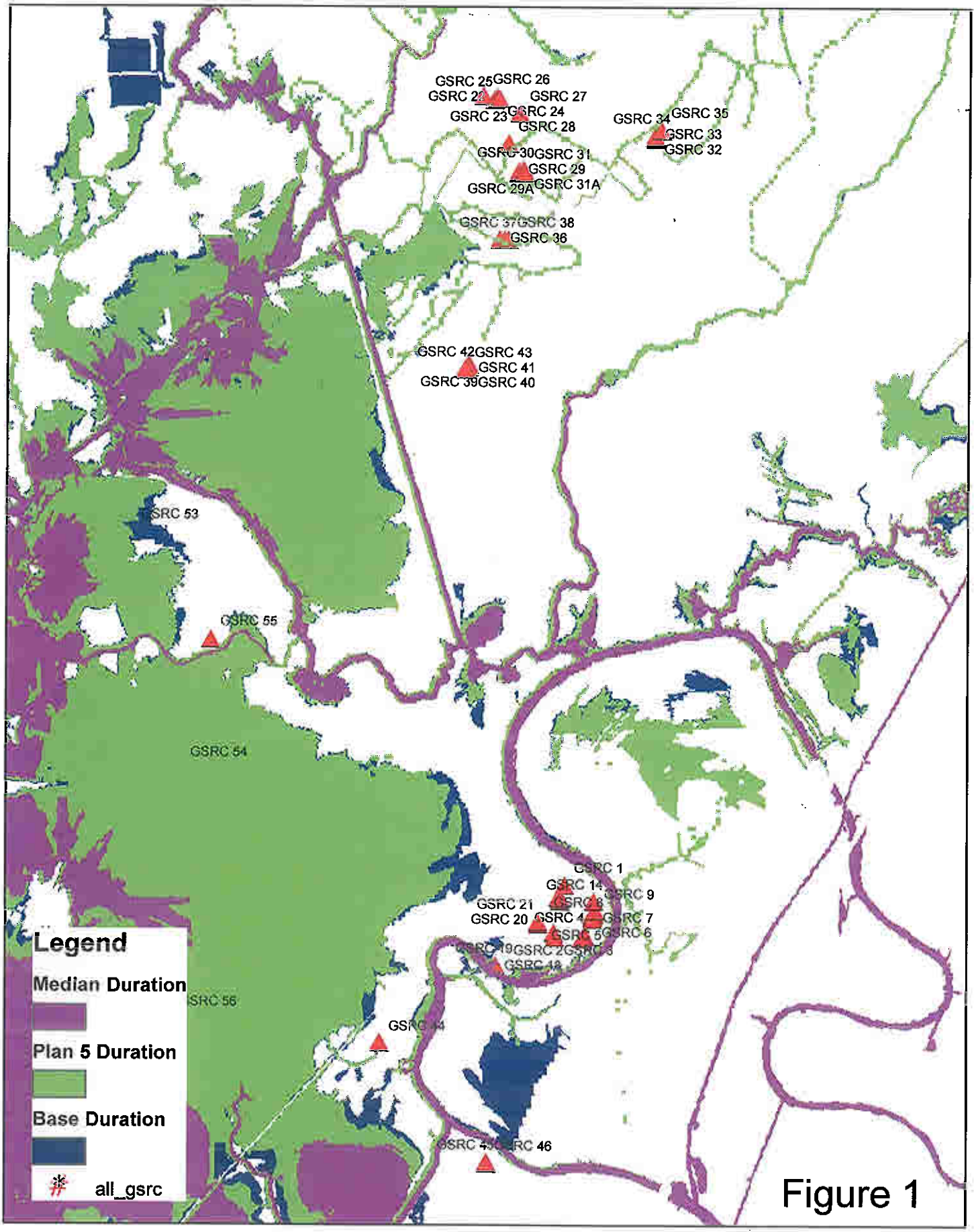


Figure 1

Peak

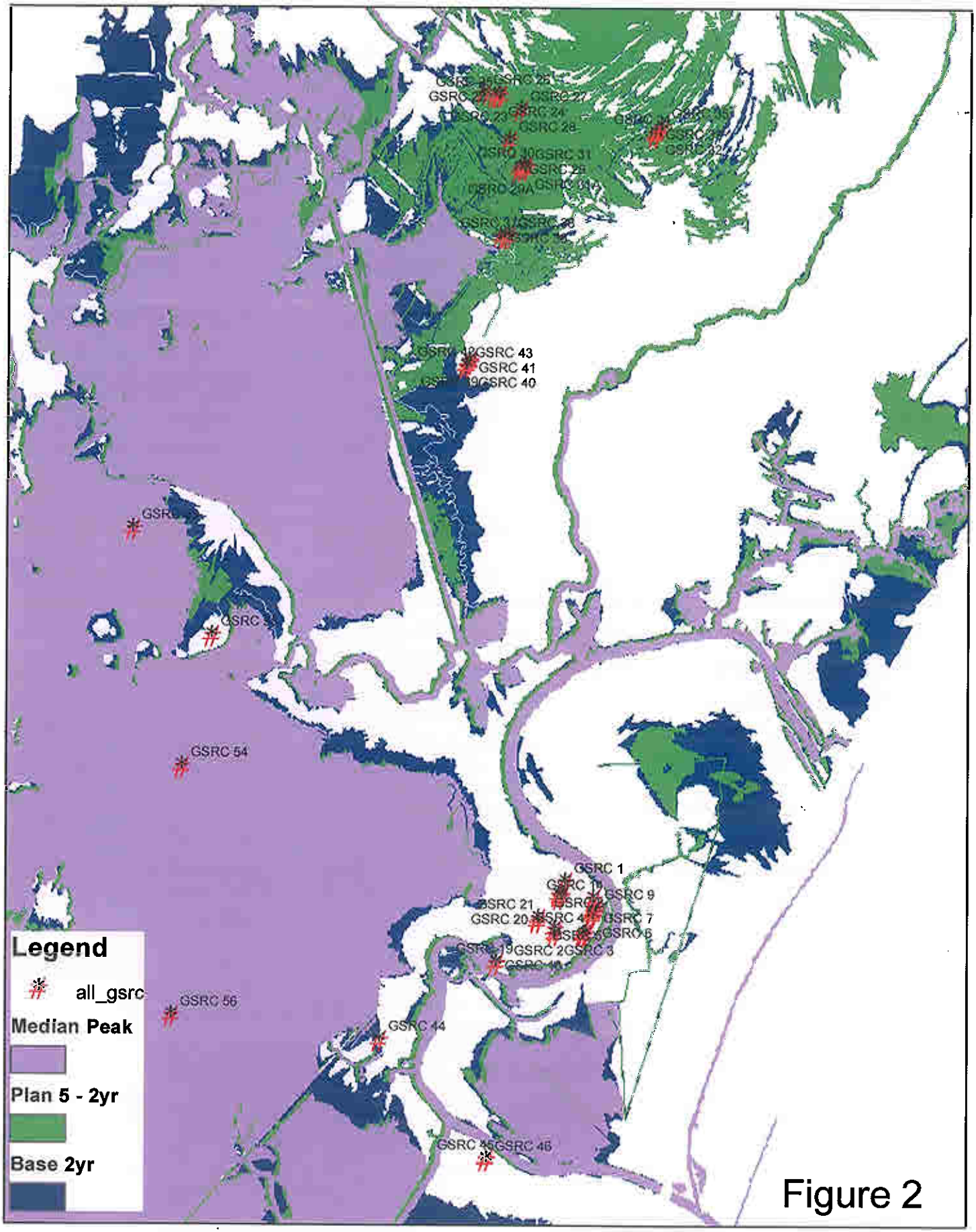


Figure 2

Figure 3: Annual Precipitation - By Month

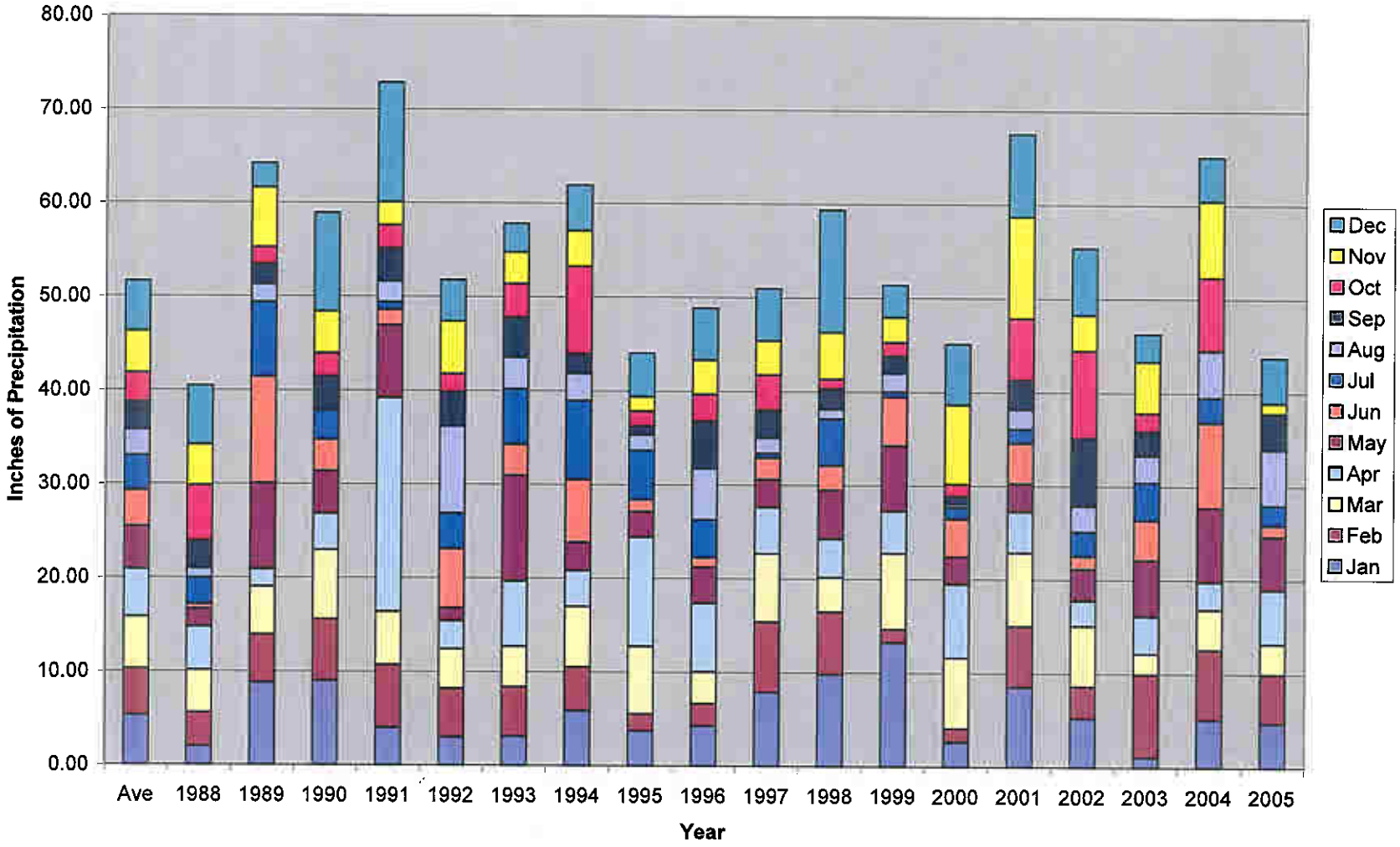


Figure 4: Observed Stages - 1993 and 1994

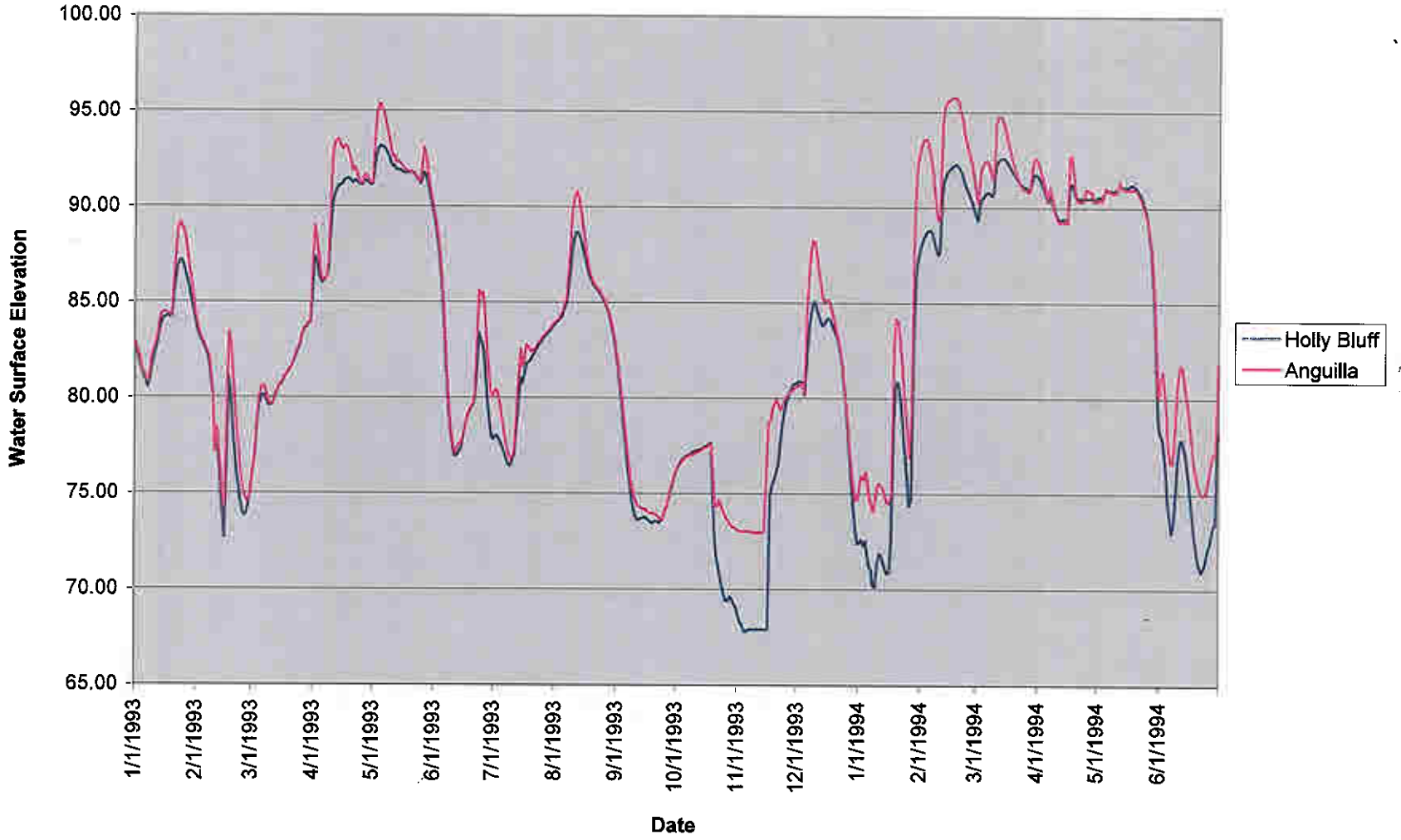
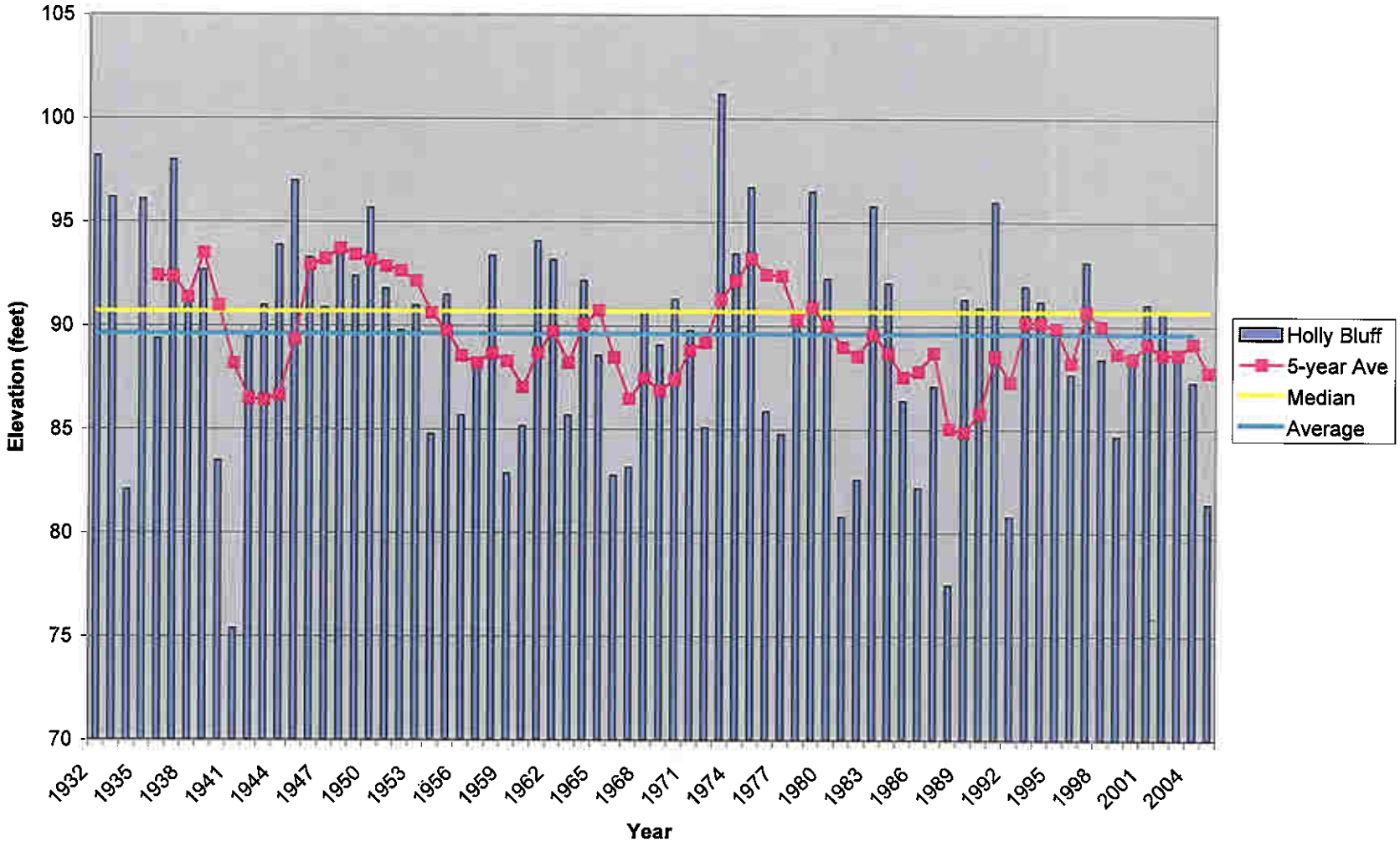


Figure 5: Holly Bluff Annual 5% Duration



COMMENTS ON U.S. FISH AND WILDLIFE SERVICE'S PRELIMINARY DRAFT PONDBERRY BIOLOGICAL OPINION (WITHOUT CONCLUSION), YAZOO BACKWATER REFORMULATION PROJECT

1. Page 1, "Consultation History." All references to activities associated with review of technical appendixes and wetland analyses prior to December 5, 2005, should be deleted. None of these activities occurred as part of informal or formal consultation associated with pondberry. They are simply retrospective inclusions. Specifically January 14-15, 2003; March 24, 2003; June 2003; June 23, 2003; December 17, 2003; January 22, 2004; January 26, 2004; February 11, 2004; March 8, 2004; July 21, 2005; July 29, 2005; August 19, 2005; and October 11, 2005.

2. Page 7, second paragraph. ". . . 62,500 . . ." should read ". . . 55,600. . . ." This 55,600 is the revised acreage based on the U.S. Army Corps of Engineers 2005 land use data provided for your use in the Fish and Wildlife Coordination Act Report.

3. Page 8, third full paragraph, third sentence. Is there a scientific literature citation to support this sentence?

4. Page 10, first three full paragraphs. Are there any scientific literature citations for this discussion? If not, then it needs to be clearly stated what these statements are based on (personal observation, speculation, etc.).

5. Page 11, first full paragraph. The number of colonies/sites monitored in the Delta National Forest (DNF) is 50, not 52. Only 49 colonies/sites are included in the analyses because one colony/site is located in a greentree reservoir. Only three colonies/sites showed no signs of above-ground biomass in DNF, not five (the Biological Opinion (BO) uses the term extirpated). The other two colonies/sites are part of 12 colonies/sites included in the 2000 and 2005 data collection that are outside of the project area. These 12 colonies/sites are in the Mississippi Delta approximately 60 miles north of the project area. These sites are relevant because they are above the 100-year flood plain and have been sustained by local hydrology and precipitation. They also call into question the BO conclusions about impacts within the project zone (e.g., 7 of the 12 colonies/sites had increases in stem numbers between 2000 and 2005).

6. Page 12, first paragraph. Again, it is important to note, either here or elsewhere in the document, that the Shelby colonies/sites are above the 100-year flood plain and are not sustained by overbank flooding.

7. Page 12, second paragraph, third sentence. If precipitation is the primary source of hydrology in four of the five habitat types that pondberry occurs in across the Southeast, then unless there is something unique about the populations in DNF (bottom-land hardwoods), then clearly the species is capable of being sustained by precipitation in all habitat types. Given that 52 to 56 inches of rainfall occur annually in the Yazoo Backwater Area, you cannot discount the possibility that precipitation is the primary source of hydrology.

enclosure 2

8. Page 14, first full paragraph, last sentence. Given the discussion on the previous four habitat types, a source of hydrology could include simply precipitation.

9. Page 14, third full paragraph, fourth sentence. This sentence does not make sense. Something is missing.

10. Page 14, third full paragraph, last sentence. This is extrapolation and speculation across two different habitat types.

11. Page 16, fourth full paragraph and fifth partial paragraph. The largest population in Mississippi (at least 20,000 plants) is located near Shelby, Mississippi, and will not be impacted by the project. This population is above the 100-year flood plain and not sustained by overbank flooding. This population also includes five colonies/sites sampled in 2000 and 2005. These data are relevant to assessing the environmental baseline for pondberry and potential effects caused by a change in frequency.

12. Page 19, last paragraph, second sentence. These are limited data represented by two points in time and are not sufficient to establish a trend. Could there have been increases in the number of stems between 2000 and 2005?

13. Page 19, last paragraph, last sentence. This is beyond the data set limits and needs to be noted as such. Using this logic, if there had been an increase between 2000 and 2005, the pondberry would be on its way to recovery.

14. Page 21, third paragraph, last sentence. This statement is both historically inaccurate and taken out of context. The Galloway Report (Report No. IWR-80-D1) crudely modeled two possible flood conditions. The first was conditions in the Delta if no mainline levees had been constructed and the second was conditions with no internal flood control measures completed. Projected maps of these two conditions were presented in the report. The map for the first condition, Figure 35, assumed that Mississippi River stages would be maintained laterally across the Delta. This assumption is not supported by historical data. The 1927 flood caused massive flooding in the Delta after the local levees failed in several locations. The northernmost levee failure was north of Greenville. The maximum observed stage at Yazoo City was 8 feet less than the peak stage at the Lake Providence gage which is at the same latitude. In other words, it took a water surface elevation 8 feet higher at the Mississippi River than on the eastern edge of the Mississippi Delta to create a 100-year flood event. The Galloway analysis assumed that the water surface elevation of the Mississippi River and the water surface elevation on the eastern edge of the Mississippi Delta were the same. If it takes an 8-foot difference in water surface elevation to create a 100-year event, then a 2- or 5-year event cannot occur with no difference in water surface elevation.

15. Page 22, third full paragraph, first sentence. The upland and Delta regions of the Yazoo Basin are approximately equal in size, and the annual precipitation is approximately 52 inches across the basin, thus total runoff from the two regions should be approximately equal. Runoff is, however, more rapid in the hill region.

16. Page 23, second full paragraph, last sentence. Construction on the pumping station was started in 1986, but stopped after the Water Resources Development Act of 1986 changed the local sponsor cost–sharing requirements. This made it cost-prohibitive for the local sponsor to continue.

17. Page 25, third full paragraph, last sentence. The 2000 and 2005 colonies/sites are not necessarily the same sites used in the 1991 profile. The locations were not permanently marked in 1991. It is important to note that one of the primary reasons for the 1991 profile was to identify likely locations for pondberry occurrence for future surveys.

18. Page 26, first partial paragraph, second full sentence. It is not clear which colony the BO is discussing. If this is the colony near Webb, Mississippi, then it was in the Upper Yazoo Projects study area. It needs to be noted that this colony was above the 100-year flood plain, and the Vicksburg District did request Section Formal Consultation which resulted in a no-jeopardy determination.

19. Page 26, first full paragraph, first sentence. See comment 16. Nine additional colonies/sites were not simply added to the 41 DNF colonies assessed in 1991. The 2000 and 2005 colonies/sites are not necessarily the same sites used in the 1991 profile. The locations were not permanently marked in 1991.

20. Page 26, third full paragraph, tenth sentence. The data are insufficient to indicate a trend. They simply represent only two points in time. The only thing that can be concluded is that there appears to be a decline between 2000 and 2005. Perhaps 2000 numbers were a peak over the previous 5 or 10 years, and the 2005 numbers simply represent a return to pre-2000 levels. The point is simply that there are insufficient data to establish a scientifically defensible trend.

21. Page 27, third full paragraph, second sentence. It is stated that the stem counts from the 2005 Corps data on 49 colonies/sites cannot be used, ". . . to accurately estimate the total number of stems in DNF." The discussion on the 13 DNF populations identified by the U.S. Fish and Wildlife Service (FWS) (pages 30-34) uses subsets of the stem counts on the 49 colonies/sites to estimate population levels for areas within the DNF. The adequacy of these data to estimate population levels is questionable.

22. Page 28, first partial paragraph, last sentence. This sentence contradicts the use of the Corps stem count data to estimate population size on the 13 FWS-identified populations in the DNF. See comment 20.

23. Page 30, second full paragraph. This discussion raises issue about the Corps colony/site selection being random and whether the data represent the other colonies within the population. It is deeply concerning that FWS chooses to proceed with data they considered to be suspect, but in other portions of the BO where the Corps provides highly accurate colony/site elevation and stage data, they provide reasons to reject the use of those data or simply state there is a high degree of scientific uncertainty associated with the data.

24. Page 31, first full paragraph, first sentence. Five of the 49 Corps colonies/sites (Gulf South Research Corporation (GSRC) 39–43) occur in the Colby population. According to the Corps overbank flooding data provided as part of the Biological Assessment (BA), these sites received no overbank flooding in 1993 (dormant or growing season), and only two sites received overbank flooding in the dormant season in 1991. All of the sites received overbank flooding in the growing season of 1991, but this was a headwater flood and not a backwater flood. We are not disputing that water was on the site, but our engineering data clearly indicate the source was not backwater flooding in 1993 and depending on when the water was observed in 1991, may not have been backwater flooding in 1991.

25. Page 31, second full paragraph, second sentence. This sentence means these sites are not within the backwater 5 percent duration; therefore, if they are wetlands sites, the hydrology is from another source. This demonstrates that it is possible to have an obligate wetland species occur on this site, but it is not being sustained by backwater hydrology.

26. Page 31, second full paragraph, third sentence. According to the Corps overbank flooding data provided as part of the BA, these sites received no overbank flooding in 1993 or 1994. The source of water was not overbank flooding.

27. Page 32, last paragraph, second sentence. This statement is misleading. It sounds like none of the area is above the 5-year frequency. Not true. Based on data provided in the Corps BA, 17 of the 49 Corps colonies/sites occur in this population and 9 of these are above the 5-year frequency:

Colony/Site Frequency (Years)	Number of Colonies/Sites
3.0	1
3.5	1
4.0	5
4.5	1
6.0	2
7.0	1
14.0	1
15.0	3
16.0	1
17.0	1

28. The Corps analysis of the 49 colonies/sites contained in the BA is based on more accurate, site-specific engineering surveys and actual river stage data. The FWS analysis is based on landscape-level Geographic Information System (GIS) frequency data analysis designed for broad determinations.

29. Page 32, last paragraph, fourth sentence. Should be rewritten to state ". . . jurisdictional wetlands as defined by the backwater 5 percent duration." Areas could be determined to be jurisdictional wetlands, but the source of hydrology is not backwater flooding.

30. Page 33, second full paragraph, fourth sentence. Should be rewritten to state "No jurisdictional wetlands as defined by the backwater 5 percent duration . . . ." Areas could be determined to be jurisdictional wetlands, but the source of hydrology is not backwater flooding.

31. Page 33, second full paragraph, fourth sentence. This statement is misleading. It sounds like none of the area is above the 3-year frequency. Not true. Twenty-one of the 49 Corps colonies/sites occur in this population.

Colony/Site Frequency (Years)	Number of Colonies/Sites
1.5	2
2.0	2
2.5	2
3.0	1
3.5	3
4.0	1
4.5	1
5.0	1
6.0	1
7.0	1
7.5	2
9.0	1
11.0	1
15.0	1
16.0	1

32. The Corps analysis of the 49 colonies/sites is based on more accurate, site-specific engineering surveys and actual river stage data. The FWS analysis is based on a landscape-level analysis designed for broad determinations.

33. Page 33, fifth full paragraph, second sentence. Should be rewritten to state ". . . no jurisdictional wetlands as defined by the backwater 5 percent duration . . . ." Areas could be determined to be jurisdictional wetlands, but the source of hydrology is not backwater flooding.

34. Page 34, second full paragraph, second sentence. The number of plants in 2005 should read "130." The third sentence should read ". . . without jurisdictional wetlands as defined by the backwater 5 percent duration . . . ."

35. Page 34, third full paragraph, second sentence. Should read ". . . jurisdictional wetlands as defined by the backwater 5 percent duration . . . ."

36. Page 34, third full paragraph, last sentence. Should read ". . . in this colony in 2000 . . . ."

37. Page 34, fourth full paragraph, third sentence. Should read ". . . jurisdictional wetlands as defined by the backwater 5 percent duration."

38. Page 36, first full paragraph, first sentence. Given that 79.6 percent (39 of 49) of the DNF sampled colonies/sites had dieback noted in 2000, this sentence appears to be a reasonable alternate scientific explanation for the decline in the number of stems between 2000 and 2005. It may be that, given a few more years, the stem count may recover to 2000 levels. This seems even more plausible given our data analyses (both previously provided analyses and our comments included in this document) indicate no association between flood frequency and pondberry characteristics.

39. Page 36, second full paragraph, sixth sentence, and page 37, first paragraph. Ten of 12 satellite images between 1993 and 2006 showed both areas with ponded water, thus the discussion comparing the ponded to the unponded groups is not scientifically valid.

40. Page 36, third and fourth paragraphs. This analysis supports comment 36. The sampled colonies experienced a 50 percent dieback between 1993 and 1994 (similar to the Corps data indicating a 40 percent loss of stems between 2000 and 2005). In 2006, the total number of stems was greater than 1993. It may be that the 2000 and 2005 colonies/sites may be experiencing the same cycle of dieback and recovery. Again, given that our analyses demonstrate no association between flood frequency and pondberry characteristics, this appears to be a more reasonable explanation of the decline.

41. Page 37, last paragraph, first and last sentences. How can the 1993, 1994, and 2006 non-Corps data (three points in time) be inadequate to predict future growth and decline, but the Corps 2000 and 2005 data (two points in time) be adequate to establish a trend of decline and extirpation? This is counter to sound scientific logic and reasoning.

42. Page 38, first full paragraph, fourth sentence. This is a weak attempt to dispense with data that are contrary to any explanation related to flood frequency or duration. In combination with what other factors? This sentence also includes speculation about other factors that "may" cause slow rates of decline over longer periods of time.

43. Page 38, first full paragraph, last sentence. This sentence is contrary to how FWS interprets the 2000 and 2005.

44. Page 38, last paragraph, first sentence. The BO does not scientifically establish that one, a combination, or all, of these sources of hydrology is "required." They are simply potential sources of hydrology.

45. Page 39, third full paragraph, first bullet. We do not state that pondberry is absolutely restricted to depressions. We state that our data indicate an association with localized depressions as defined in the BA.

46. Page 39, third full paragraph, third bullet. This is misleading. We did not conclude that pondberry naturally occurs at infrequently flooded sites. The BA states the 49 colonies/sites occur across a range of flood frequencies (<1 to 17 years).

47. Page 39, fourth full paragraph, first bullet. See comment 43.

48. Page 39, fourth full paragraph, second bullet.

a. The Corps concluded with the 2000 data that there was no significant statistical relationship between flood frequency and the average colony size. After analyzing the 2005 data, we have come to the same determination concerning flood frequency and average colony size, and we have further concluded there is no significant statistical evidence that pondberry has declined significantly between 2000 and 2005 on less frequently flooded sites. There was a statistically significant decline in average colony size between 2000 and 2005, but it was independent of the flood frequency of the site.

b. The information included in subparagraphs 48b-48h is based on an analysis from A. Dale Magoun, Ph.D., Applied Research and Analysis, Inc., "A Review of the Statistical Methods Used in the FWS Biological Opinion and an Analysis of the 2000 – 2005 DNF Data." In 2005, the Corps revisited the 49 DNF pondberry colonies and collected additional information about the health-related attributes. Revisiting the sites over time represents a longitudinal study, and the data arising from such a study must be analyzed using a repeated measures experimental design. In the BO, FWS recommended this approach as the appropriate method of analysis when combining the multiyear data. The experimental units (pondberry colonies) were sampled in 2000 and 2005. The reuse of the same experimental unit over time forms the basis of the repeated measure and the covariance structure that may exist should be accounted for. The repeated measures design is characterized and displayed in the following table.

REPEATED MEASURES DESIGN

Flood Zone	Colonies	2000	2005
0 to 2 years	9	X	X
2 to 5 years	23	X	X
5 to 10 years	8	X	X
> 10 years	9	X	X

c. "Analysis of such data must use the relaxed maximum likelihood method (REML) rather than the traditional maximum likelihood method. The REML algorithms are available in most statistical packages, and SAS' PROC MIXED procedure, which is one of the algorithms of choice for handling variance structures that arise from these complex designs, was used to produce the analysis of variance results from this longitudinal observational study. My analysis, as with the analysis from the BO, used the common log transformation so that our subsequent analyses would be consistent with that in the BO. In 2005, there were three colonies that exhibited no aboveground pondberry characteristics. The FWS considered these as extirpated and recorded zeros for the respective biological attributes. I followed their lead and used zeros for these missing data characteristics.

d. "The repeated measures analysis did indicate that significant changes in the pondberry characteristics occurred between the 2000 and 2005 sampling surveys; however, the data do not support the BO conclusion that the average pondberry colony size is greater on more frequently flooded sites, and that it declined significantly between 2000 and 2005 on less frequently flooded sites. Sample year differences were present for the attributes of number of clumps per colony ($F = 18.66$, p-value < 0.0001), number of stems per colony ($F = 6.69$, p-value $= 0.0130$), number of female plants per colony ($F = 5.54$, p-value $= 0.0230$), number of fruit per colony ($F = 4.75$, p-value $= 0.0346$), average stem height per colony ($F = 11.30$, p-value $= 0.0016$), and the average stem diameter per colony ($F = 24.88$, p-value < 0.0001), and in all cases the 2005 attribute averages were significantly less than observed in 2000. However, since the interaction term between the main effects of flood zone and sampling years (Zone*Year) was not significant, the conclusions pertaining to sampling year differences are applicable regardless of which flood zones the colonies are in, that is, regardless of the flood zone, the average pondberry characteristics observed in 2005 were significantly less than observed in 2000. When considering differences in pondberry characteristics within the four flood zones, the corresponding F-values and their respective p-values were number of clumps ($F = 1.21$, p-value 0.3171), number of stems per colony ($F = 2.35$, p-value $= 0.0847$), number of females ($F = 1.12$, p-value $= 0.3505$), number of fruit ($F = 1.33$, p-value $= 0.2774$), average stem height ($F = 2.10$, p-value $= 0.1132$), and average stem diameter ($F = 0.53$, p-value $= 0.6640$). None of the F-tests are significant at the standard alpha level of 0.05. The following table summarizes the test statistics for the above conclusions.

ANALYSIS OF VARIANCE RESULTS
REPEATED MEASURES

Characteristic	Source	Num-DF	Den-DF	F-Value	P-Value
Clumps	Zone	3	45	1.21	0.3171
	Year	1	45	18.66	< 0.0001
	Zone*Year	3	45	1.86	0.1491
Stems	Zone	3	45	2.35	0.0847
	Year	1	45	6.69	0.0130
	Zone*Year	3	45	0.71	0.5529
Females	Zone	3	45	1.12	0.3505
	Year	1	45	5.54	0.0230
	Zone*Year	3	45	1.63	0.1959
Fruit	Zone	3	45	1.21	0.3186
	Year	1	45	4.75	0.0346
	Zone*Year	3	45	2.10	0.1132
Stem Height	Zone	3	45.2	2.10	0.1132
	Year	1	43.5	11.30	0.0016
	Zone*Year	3	43.3	0.09	0.9647
Stem Diameter	Zone	3	42.7	0.53	0.6640
	Year	1	43	24.88	< 0.0001
	Zone*Year	3	42.8	0.59	0.6319

e. "With the addition of the new data collected in 2005 and the recommendation from FWS for using a repeated measures design, I still find no evidence supporting the FWS claim that increasing flood frequency promotes better or healthier pondberry colonies. I further conclude, as with the 2000 survey report that decreased flooding does not appear to significantly impact the colonies surveyed in the DNF; however, there was a significant change in the biological characteristics between the two sampling years, 2000 to 2005. These changes, however, were observed across all four flood zones strata and are not limited to only the zones associated with less frequent flooding, as indicated in the BO.

f. "To provide additional insight into the distribution of the colonies across flood zones, discriminate analysis was used to group the colonies into more biologically homogeneous (similar) groups. Colonies were clustered based on their biological characteristics and not on a given flood zone characteristic. The following table displays the results of this analysis.

DISCRIMINATE ANALYSIS

Flood Zone	Predicted Grouping (2000)				Total	Predicted Grouping (2005) [a/]				Total
	1	2	3	4		1	2	3	4	
1	4	1	3	1	9	5	1	1	1	8
2	6	8	3	6	23	2	12	3	6	23
3	2	1	4	1	8	0	1	4	3	8
4	0	3	1	5	9	0	0	3	4	7
Totals	12	13	11	13	49	7	14	11	14	46

a/ The three extirpated colonies were eliminated from the analysis due to missing data values for the average stem diameters and stem heights.

g. "The salient point of this analysis is the distribution of pondberry colonies over flood zones within the homogenous biological groupings. Of the 12 colonies in homogeneous group No. 1 in 2000, four colonies came from flood zone No. 1, six from flood zone No. 2, and two from flood zone No. 3. Of the 13 colonies in group No. 2, one came from zone No. 1, eight from zone No. 2, 1 from zone No. 3, and three from zone No. 4. Of the 11 colonies in group No. 3, three were from zone No. 1, three from zone No. 2, four from zone No. 3, and one from zone No. 4. Of the 13 colonies in group No. 4, one came from zone No. 1, six from zone No. 2, one from zone No. 3, and five from zone No. 4. Similar distributions were observed for the 2005 data set. The results displayed in this table imply that pondberry colonies with similar biological characteristics exist across all flood zones, that is, healthy and vibrant pondberry colonies as well as nonhealthy and less vibrant colonies are not restricted to any given flood zone, but can be found in all flood zones.

h. "Although the BO provided a wealth of circumstantial evidence to indicate otherwise, their conclusions did not refute the conclusions of the 2000 DNF report. On page 68 of the BO they state, "Our ANOVA, however, also was statistically insignificant." In summary, I feel, as previously reported, that the data do not provide enough evidence to indicate that decreased flood frequency adversely impacts the biological characteristics of the surveyed pondberry colonies within the Yazoo Backwater area of the DNF."

i. As was stated in Dr. Magoun's 2001 statistical analysis of the 2000 data, the Corps recognized the lack of randomization in the selected 49 colonies/sites. The following is Dr. Magoun's analysis of the pondberry survey design.

> "Observational studies arise in all facets of scientific research. Unlike their counterpart, observational studies focus on assessing the effects of intervention strategies with data collected by a sampling plan that may violate some of the underlying concepts of randomization. An optimum study is a scientific study, which fixes or controls the experimental conditions and employs randomization

techniques to assign subjects to those conditions. Studies that employ this type of control are considered to be 'cause and effect' experiments. This ability to control and to randomize permits the researcher to extrapolate of the findings of such a study to a larger population. However, situations do exist where neither randomization nor physical control of the experimental conditions can be fully achieved. Experiments with restrictions such as these rely on quasi-experimental designs in order to study the effects of the experimental conditions and are called observational studies. One major advantage of an observational study is practicality in real-world settings. However, when making inferences about the findings of such a study, caution must be taken and other alternative explanations that could also affect the outcomes of the experiment must be considered. Inferences from a scientific study may imply 'cause and effect,' however, inferences from an observational study becomes more of 'an association' rather than a 'cause and effect.' Observational studies arise in all areas of science including, but not limited to, clinical studies, psychological studies, and environmental studies.

"The DNF 2000 survey is a prime example of an observational study in that the pondberry colonies were not randomly selected, but were selected from known pondberry colonies within the questioned flood frequency zones. The Corps in their Biological Assessment used profile data as evidence of an association, or for the absence thereof, between reduced flooding and pondberry colony characteristics that assessed colony health and other related characteristics. Pondberry colony health was assessed using the attributes of the number of stems per colony, the number of clumps per colony, the number of females per colony and the number of fruit bearing plants per colony. It is important to keep focused in our minds that the true experimental condition, that is, the installation of the pumping station to lessen backwater conditions has not been implemented; and that any study purporting to assess the effects of this unknown experimental condition is truly observational and must rely on field data collected using the best available scientific principles. This study was not designed as a population study within the DNF, but was designed only to consider the potential effects of altering the flood frequencies by the proposed project on the pondberry colonies within the affected areas. The colonies were not randomly selected. Hence, the study does not represent a scientific study, but an observational study to evaluate the association of pondberry colonies with flood frequency and to investigate the effects that reduced flooding may have on pondberry colonies."

49. Page 40, top of page, first bullet.

a. You have to assume that all of the existing colonies have remained spatially static through time. There are no data to support this. Past flood damage reduction projects have changed the flood frequencies of sites in the DNF. However, this is only relevant to pondberry if there is an association between pondberry and flood frequency. As noted in previous and

following comments, based upon the 2000 and 2005 data sets, there are no statistically significant differences in pondberry colonies/sites based on the flood frequency of the site. That pondberry numbers have declined from 2000 to 2005 is not in dispute. What is not known is the reason for the decline. The only way to conclude it is because of differences in flood frequency is to ignore the body of site-specific data that is contrary to that conclusion.

b. As noted in previous comments, included in the Corps BA are 12 additional colonies/sites outside the project area (near Shelby, Mississippi) that are indisputably dependent on local hydrology and precipitation because they are located above the 100-year flood plain. Seven of the 12 had increased stem numbers between 2000 and 2005 (5 decreased). One colony/site (GSRC 52) increased from 219 stems in 2000 to over 16,000 stems in 2005. These changes demonstrate that factors, independent of any effect from overbank flood frequency or duration, can produce substantial changes (positive or negative) in pondberry colonies/sites.

50. Page 40, top of page, second bullet. This is misleading. It is not unexpected that the apparent health would decline on the 49 colonies/sites in the DNF, given that the quantified pondberry characteristics declined, but almost 80 percent of the colonies/sites in 2005 were still rated as excellent or good (compared to 96 percent in 2005). Also, you failed to consider that the 12 colonies outside the DNF (near Shelby, Mississippi, and all above the 100-year flood plain) showed an increase in apparent colony health. Five of 12 colonies/sites (42 percent) were rated as excellent or good in 2000. This increased to 10 of 12 rated excellent or good in 2005 (83 percent). This is a critical omission because overbank flooding does not impact these sites and, therefore, any changes in apparent colony health cannot be related to flood frequency. Something other than overbank flooding accounts for the change. These data are contrary to the BO conclusions on DNF.

51. Page 40, fifth full paragraph, last sentence.

a. The interval between 2000 and 2005 is too short a period in which to predict long-term trends, and the BO conclusion that lack of flooding is the cause of decline is unfounded. The pattern of decline, as a result of severe dieback, and recovery is clearly documented by FWS' 1993, 1994, and 2006 data at the Colby site (BO, page 36). This is a scientifically credible alternate explanation for the decline on the 49 colonies/sites, particularly considering that almost 80 percent of the colonies/sites in 2000 had fungal damage. The decline may simply be the first portion of a larger cycle that has not had enough time to complete. The appropriate scientific interpretation of these data is that there are insufficient data to establish any trend, positive or negative. This is the approach the Corps took concerning the apparent health of pondberry colonies/sites between 2000 and 2005. Paragraph 64 of the BA states, "Although these health assessments are qualitative, they are relative within and between years and represent the best available information on colony health. *However, it is difficult to make a strong conclusion about the long-term trend of colony health from these data* [Emphasis added]." The BA does not dispute the decline of apparent colony health, but simply recognizes insufficient data exist to predict a trend.

b. Using only two points to establish a trend is not scientifically credible. If this same approach was used for the 1993 and 1994 FWS Colby site data (using only two of the three points in time), then pondberry should now be well on its way to extirpation on the Colby site. However, inclusion of the 2006 data substantially changes the interpretation and conclusions drawn concerning any trend. The 2006 data indicate the total number of pondberry stems increased by 15 percent over 1993 levels. In fact, FWS projects that of the three large populations within the project impact area, only the Colby population will survive. This illustrates the risk and scientific uncertainty associated with establishing a trend (particularly biological trends) based on two points. To simply state that these are the only available data so they must be used does not impart scientific credibility or certainty to methods used or conclusions drawn.

c. The flooding frequency data between 1984 and 2003 (Corps BA, Attachment 7) do not support this statement. Your conclusion assumes that a lack of overbank flooding (despite precipitation) is responsible for the decline. Yes, little overbank flooding occurred during this 20-year timeframe (1984-2003). However, in 2001, 19 colonies/sites (39 percent) were affected by backwater flooding. This was the most active year for backwater flooding from 1984 to 2003. It appears the significant decline occurred in the timeframe (2000 to 2005) where the most backwater flooding occurred in the 20-year period and annual rainfall was higher than the 59-year average (1944 to 2005) 3 out of 5 years. In addition, the largest number of stems occurred in 2000 which was preceded by 16 years of little backwater flooding effect (only 5 years had more than 5 percent of colonies/sites affected (10 to 18 percent)). This indicates that other factors for decline (or growth) cannot be discounted.

52. Page 41, first partial paragraph, second and third full sentence. This lacks scientific objectivity. The second sentence assumes that only the hydrology can influence the number of pondberry stems to the exclusion of all other factors; i.e., if these features exist (physical and hydrologic features), then numbers should reveal a stable trend. This is an unscientific over-simplification of a very complex ecosystem. This is like saying if there is gas in a car, it should start. There a lot of possible reasons a car with a full gas tank will not start. The BO documents that dieback can cause significant decline (page 35, "Pathogens, Stem Dieback, and Patterns of Decline"). As noted on page 35, inadequate soil moisture is a stress factor associated with infection and dieback. The precipitation data provided in Figure 12 of the Corps BA show that the 2000 annual rainfall amount (39.24 inches) was the smallest reported over the 1984 to 2003 timeframe. It was 15 inches below the 20-year average. This, coupled with the Corps 2000 data indicating almost 80 percent of the colonies had fungal damage, is a reasonable alternate explanation for decline even if the physical features are present at the pondberry colonies/sites.

53. Page 41, fourth full paragraph, sixth sentence. This statement does not comport with statements on pages 31 through 34 indicating that most of the populations identified by FWS do not occur within jurisdictional wetlands as defined by the 5 percent duration backwater flood. However, it is still possible that portions of these populations do occur in jurisdictional wetlands,

but only if the wetlands are supported by some source of hydrology other than backwater flooding. If this is the case, then the required wetland hydrology for these populations will not be affected by the project.

54. Page 43, last partial paragraph, first sentence. What is meant by ". . . published studies or data . . . ."? Is this meant to say peer-reviewed journals? This needs to be clarified. The 2000 and 2005 Corps data represent the most complete set of available data concerning the growth, reproduction, and survival of pondberry as it relates to flood frequency that exists (particularly data specific to the project area). In fact, the BO relies heavily on these data for its conclusion concerning the decline and extirpation of pondberry.

55. Page 43, last partial paragraph, second sentence.

a. Since receiving the draft preliminary BO, the U.S. Army Corps of Engineers, Vicksburg District, Regulatory Branch, has made a jurisdictional determination (JD) on 47 of the 49 colonies/sites in DNF. These field determinations are made without regard to identifying a specific source of hydrology. Seventy-two percent of the pondberry colonies/sites were determined to be nonwetlands (Appendix 2). The following table summarizes the results.

Flood Zone	Wetland	Nonwetland	Percent Wetland
0.0 – 2.0	5	3	62.5
2.1 – 5.0	4	18	18.2
5.1 – 10.0	0	8	00.0
10.1 – 20.0	4	5	44.4
Total a/	13	34	27.6

a/ Determinations were completed on only 47 of the 49 colonies/sites.

b. These data are contrary to the BO's reliance on the definition of pondberry as an obligate wetland species. The first full sentence on page 44 of the BO states, "By the relationship between the fidelity of an obligate wetland species and the *regulatory hydrology* [emphasis added] threshold, then the occurrence for pondberry under natural conditions would be expected as 'almost always (estimated probability >99%)' in wetlands with the regulatory defined hydroperiod." Less than one-third of the colonies/sites meet the regulatory definition of a wetland, including the requisite regulatory wetland hydroperiod, and therefore substantial scientific uncertainty exists that pondberry requires jurisdictional wetland hydrology. Given that 14 or more days of continuous inundation or saturation from March 1 through November 27 do not appear to be requisite to pondberry occurrence, precipitation or other local hydrology as a primary source of hydrology is scientifically plausible or, at the very least, it cannot be excluded as a primary source of hydrology.

c. In addition, 8 of the 13 colonies/sites determined to be wetlands are above the 2-year frequency for overbank flooding and therefore fail to meet the a requisite criterion for wetland hydrology, ". . . in most years." In other words, their sustaining wetland hydrology is provided by other sources of hydrology. Three of the eight wetland colonies/sites above the 2-year frequency had no evidence of localized depressions (GSRC 24, 25, and 35) as documented in the Corps 2000 data set. No backwater flooding occurred on GSRC 24 and 25 from 1984 to 2003, and GSRC 35 was affected by only one backwater event during the same period. These data demonstrate that colonies/sites without backwater flooding or localized features are capable of sustaining wetland hydrology.

d. The following table illustrates that only five wetland colonies/sites (10.6 percent) are potentially sustained or partially sustained by overbank flooding (this assumes they also meet the duration criterion).

OVERBANK FLOODING (1984 – 2003)
ON THE 13 JURISDICTIONAL WETLAND COLONIES/SITES
IN DELTA NATIONAL FOREST

Frequency	Colony/Site	Years with Overbank Flooding	Years with Backwater Flooding
Below 2-year	GSRC 2	7	7
	GSRC 21	7	7
	GSRC 42	3	3
	GSRC 54	16	16
	GSRC 56	15	15
Above 2-year	GSRC 22	0	0
	GSRC 23	1	0
	GSRC 24	1	0
	GSRC 25	1	0
	GSRC 30	2	1
	GSRC 35	2	1
	GSRC 43	2	1
	GSRC 44	2	1

e. The duration criterion of 11 of 13 wetlands colonies/sites determined by regulatory methods is not met by the 5 percent duration backwater flood.

Percent Duration	Days	Wetland Colonies/Sites		Nonwetland Colonies/Sites	
		JD	Flood Event Assessment Tool (FEAT)	JD	FEAT
Above 5.0	<1	4	0	23	29
	1 to 6	7	0	11	18
	7 to 13	0	0	0	0
Below 5.0	14 to19	0	0	0	0
	20 to 26	2	2	0	0
	27 to 33	0	0	0	0
	>34	0	0	0	0
Total		13	2	34	47

f. Only 2 of the 13 colonies are potentially sustained by backwater flood duration. The two colonies are below the 1-year frequency. These frequency and duration data on backwater flooding do not support conclusions presented in the BO and must be given serious consideration. The explanation that "natural conditions" no longer occur is not scientifically defensible when all existing site-specific data indicate that pondberry is capable of surviving independent of wetland hydrology and apparently has done so despite a 50- to 75-year period where the duration criterion for wetland hydrology has not been met by overbank flooding.

g. Of the 13 colonies/sites classified as jurisdictional wetlands by regulatory methods, 4 had increases in pondberry numbers between 2000 and 2005 and 9 had decreases. Two of the nine that had decreases had no aboveground biomass present (the BO considers these colonies/sites to be extirpated). This is contrary to the BO's conclusion that the decline in pondberry numbers is because of removal of the requisite wetland hydrology through time. It is also important to consider that two of nine colonies/sites (GSRC 42 and 43) with decreased pondberry numbers are collocated with the FWS plots at the Colby site. This is the same site identified in the BO that experienced an even more significant decline over a shorter period (1993 to 1994), but by 2006 had recovered its total number of pondberry to 15 percent over the 1993 numbers.

h. The following table is a summary comparison of wetlands determined by regulatory and FEAT methods for the three large populations defined by the BO.

COMPARISON OF JURISDICTIONAL AND FEAT WETLANDS BY LOCATION

Location	Wetland Colonies/Sites		Nonwetland Colonies/Sites	
	JD(<2-year freq) a/	FEAT	JD(<2-year freq)	FEAT
Spanish Fort	2 (2)	0	17 (1)	19
Red Gum	6 (0)	0	11 (0)	17
Colby	2 (1)	0	3 (2)	5
All Colonies	13 (5)	2	34 (3)	47

a/ JD=Jurisdictional Determination by Vicksburg District Regulatory Office. Only 47 were evaluated.

i. Although the FEAT method, based on the 5 percent duration backwater flood, indicates that no sample colonies/sites occur in wetlands, the jurisdictional determinations indicate that wetlands are sustained in the three populations. Some are clearly not sustained by backwater flooding (Red Gum location)--some colonies/sites may be sustained or partially sustained by backwater flooding (two on the Spanish Fort location and one on the Colby location). Two points--over 70 percent of the colonies/sites are not jurisdictional wetlands, and colonies/sites are capable of sustaining wetland hydrology outside any dependence of backwater flooding.

56. Page 45, last paragraph, fourth sentence. This statement is false. The duration zones are based on the statistical analysis of 55 years of stage data. The 90 percent confidence interval for the 5 percent duration event was provided in the report.

57. Pages 47 through 50, general comment. Although the section title implies the discussion will be about pondberry occurrence in wetlands, most of the discussion is about the difference between the GIS-based flood frequency and the site-specific flood frequency determinations. In order for an area to be a wetland, it must experience both the frequency and duration of flooding required to create and maintain wetlands. Only 1 pondberry colony/site in 10 is potentially sustained by backwater flooding based on FEAT. If pondberry is an obligate wetland species, you would expect to find it in the zones of the longest duration of flooding; however, there are no known colonies/sites in the >12.5 percent duration zone and only one known colony/site in the 10 to 12.5 percent duration zone. Sixty-three colonies experience 1 to 6 days of flooding every other year, and 90 colonies experience less than 1 day of backwater flooding every third year or less.

58. Page 47, first paragraph, last sentence. One would expect that site-specific elevation data are more accurate than landscape scale estimates.

59. Page 49, fourth paragraph, last sentence. This is a misleading statement. It gives the reader the impression that all of the known colonies/sites and the 49 sampled colonies/sites are within the 5-year flood plain. This again is contrary to very specific elevation data acquired at each of the 49 colonies/sites using a professional engineering survey crew. The elevation data determined that these colonies/sites occurred on sites ranging from less than 1- to the 17-year flood frequency.

60. Page 50, last paragraph. The discussion assumes that all colonies present today were present in 1901-1932. There is no evidence to support this assumption. There are no data on the distribution of pondberry colonies from that time period or any other time period prior to 1980 (What is this date based on?). Page 10 of the BO states that individual pondberry plants seldom live more than 10 years, which makes the assumption that all colonies present today were present 80 years ago unreasonable.

61. Page 50, fourth paragraph, first sentence. This statement is not correct. There are 92 colonies above the 2-year frequency flood plain. Seventy-nine are in the 3- to 5-year flood plain, 8 in the 6- to 10-year flood plain, and 5 in the 11- to 25-year flood plain.

62. Page 50, last paragraph. If pondberry is highly dependent on regulatory wetland hydrology provided by backwater flooding and is a relatively short-lived plant (10 years), then spatial occurrence of pondberry should have been reduced to areas possessing the requisite backwater flood duration over the last 75 years of flood damage reduction projects (since 1931). The FEAT analysis and Regulatory determination at the 49 colonies/sites demonstrate with a large degree of scientific certainty that this is not occurring. In fact, the opposite is true. Most known pondberry colonies/sites do not occur in wetlands.

63. Page 50, last paragraph, third sentence. The FWS seems to assume that "natural conditions" means before any flood control projects on the lower Mississippi River. There are no data on pondberry related to the period prior to flood control projects. It may be more appropriate to consider the data available on pondberry from the 1990s through 2005 to evaluate the wetland and hydrology-source conditions for pondberry.

64. Page 50, last paragraph, fourth sentence. This is only part of the story. At no point over the last 75 years has more than 15 percent of the colonies/sites in DNF possessed FEAT wetland hydrology. In fact, between 1958 and 1978, only 2.3 percent of currently known colonies/sites occurred in areas possessing FEAT wetland hydrology. (This assumes these colonies have remained spatially static, which the BO implicitly assumes. However, there are no data to support any conclusions about the historic areal extent of pondberry.) The data seem to indicate that pondberry has survived for 75 years in locations where hydrology was not dependent on backwater flooding. This seems to confirm the Corps view that the pondberry habitat is being fed by other sources of hydrology.

65. Page 50, last paragraph, seventh and eighth sentences. The statement, "The Spanish Fort Population . . . was the least hydric historically," is misleading. No greater than 14 percent of the area has possessed backwater 5 percent flood duration since 1901. It does not seem plausible that an obligate wetland species could survive for 105 years in an area that lacks the requisite wetland hydrology from backwater flooding. In addition, the Red Gum area was 96 percent wetlands (based on the backwater 5 percent duration flood) during the 1901 to 1931 period, but since 1931 (75 years), the area has never been greater than 12 percent wetlands.

66. Page 50, last paragraph, ninth sentence. The Corps concurs that 79 percent of the colonies/sites have lost wetland status based on FEAT compared to 1901 through 1931. These data should be viewed carefully. This was not a gradual linear loss, but a dramatic loss that happened 50 to 75 years ago. Therefore, pondberry survived a 50- to 75-year period in which 85 to 98 percent of the known colonies/sites occurred outside wetland areas defined by FEAT. Table 20, which displays the FEAT analysis for the same periods as Table 19, but for only the three large populations identified by FWS (Colby, Red Gum, and Spanish Fort), exhibits the same pattern. A significant reduction after 1931 and a 50- to 75-year period in which 88 to 100 percent of the known colonies/sites occur outside wetland areas was defined by FEAT. Based on these estimated historic extent of wetlands, pondberry, an obligate wetland species, has survived an extended period without wetland hydrology provided by overbank flooding.

67. Page 50, last paragraph, tenth sentence. As stated in previous comments, the Corps suggests that FWS misreads the data from 2000-2005 since it does not show a relationship between backwater flooding and impacts to pondberry.

68. Page 51, first partial paragraph, first full sentence. The Corps requests that FWS identify those inaccuracies in FEAT that it believes are pertinent to this analysis.

69. Page 51, first full paragraph. Galloway makes several large assumptions regarding the extent of flooding for the two conditions that he describes. These assumptions are not supported by historical gage data. For the without-levees condition, he assumed that the water surface of the Mississippi River for the 2- and 5-year floods would extend laterally across the Delta with no change in the water surface elevation. This assumption is not valid. The 1927 flood caused several levee breaches. The northernmost breach occurred north of Greenville. The peak observed stage at Yazoo City was 8 feet less than the peak at Lake Providence, which is at the same approximate latitude. Thus, if there is an 8-foot drop in the water surface of a 100-year flood, how could there be no drop in a 2-year flood?

70. Page 51, second full paragraph. The Corps did evaluate the direct and indirect potential effects on pondberry. The Corps December 5, 2005, transmittal letter states, "The information contained in that report [2000 draft Yazoo Backwater Reformulation Report], combined with the information in the enclosed revised BA, provides the necessary data requirements."
Pages SEIS-80 through SEIS-87 contain past and future actions and their effects on environmental resources, including threatened and endangered species.

71. Page 51, fifth full paragraph, fifth sentence. The statement is incorrect; it should read as follows: "The model was a much simplified version because of limited historical data, without extrapolated simulated nodes and no off-channel nodes." The model maintained those simulated nodes where the water surface elevation was calculated by interpolation between the existing gages.

72. Page 53, last full paragraph, last sentence.

a. The BO fails to consider that the greatest change in colonies/sites occurred immediately after the 1901 to 1931 period. The BO gives the impression, notwithstanding its clear discussion of the different periods, that a continual decline in wetland hydrology from overbank flooding has occurred and it is now to the point where it has become critical to pondberry survival. The greatest decline occurred in the 1932 to 1957 period, increasing the number of colonies/sites into areas outside the FEAT determined wetlands by 53 (57 percent increase). Only a 6 percent increase has occurred (nine colonies/sites) over the last 50 to 75 years. Assuming the colonies/sites remained spatially static and recognizing there is climatic variation across the periods (particularly the 1958 to 1978 period), this appears to be relatively stable as evidenced by the small net change in nonwetland colonies/sites since 1932 (149 versus 158).

b. Flood damage reductions projects have reduced the flood frequency and duration in the study area. The central issue is whether these changes, combined with the effects created by implementation of the Yazoo Backwater Area Reformulation Project, adversely affect or jeopardize the survival and recovery of the pondberry species. The Corps BA includes data that 89.6 percent of the known pondberry colonies/sites occur outside the 5 percent backwater flood and that with implementation of the project, this percentage would be 91.2 percent, an extremely small incremental change by any standard. The percentage since 1932 has ranged from 85.1 to 97.7. The with-project duration effect is almost exactly in the middle of the range over the last 75 years (6.1 percent higher than the minimum and 6.5 percent lower than the maximum).

73. Page 54, last paragraph, second sentence. The statement is not correct. The Corps has never stated or concluded that pondberry is ". . . established and maintained exclusively by rainfall and ponding of precipitation in local depressions . . ." to the exclusion of overbank flooding. A more accurate statement of the Corps position would be, because 90 percent of the colonies/sites in DNF are above the 5 percent duration backwater flood elevation and there is no statistical association between overbank flood frequency and pondberry number of stems, backwater flooding cannot be the primary source of hydrology that sustains pondberry in DNF. Backwater flooding likely is a supplemental source of hydrology at some sites. Backwater flooding is an important source of water for 189,000 acres of wetlands in the backwater area, including roughly two-thirds of DNF. The majority (~90 percent) of the pondberry colonies are found outside of the 5 percent duration wetlands as defined by backwater flooding, and over 50 percent of the known colonies are above the 2-year overbank flood frequency (i.e., do not meet the ". . . in most years . . ." criterion).

74. Page 54, last paragraph, sixth sentence. The historical duration analysis will be included in the Yazoo Backwater Area Reformulation Report and Final Supplemental Environmental Impact Statement.

75. Page 54, last paragraph, seventh sentence. There are various ways of estimating wetland extent and source of hydrology. The Corps analysis used FEAT to estimate the 5 percent backwater flood duration and used these data in conjunction with the EPA/Corps developed hydrogeomorphic methodology to estimate wetland functional value. As stated in the Wetland Appendix provided to your agency in July 2005, there are an estimated 189,000 acres of wetlands in the project area as defined by backwater flooding. The Corps position, based on the information in the BA, historical duration data provided your agency during formal consultation, and additional information provided in these comments, is that there is little association between the occurrence and characteristics of pondberry with backwater flooding (i.e., 5 percent backwater flood duration), and therefore, it is not a sustaining source of wetland hydrology for pondberry survival and recovery. There are substantial data to support this position.

76. Page 55, first paragraph, last sentence. A large body of site-specific evidence on pondberry and hydrology has been provided to your agency that indicate that pondberry colonies/sites are not, and apparently have not been, associated for 50 to 75 years with areas possessing wetland hydrology defined by overbank flood frequency or duration. The BO only concludes that backwater cannot be excluded. The central issue is whether project effects on flood frequency and duration will impact pondberry. To cause impacts, pondberry must be related or have an association with overbank flooding or backwater duration. The best available project-specific data indicate that only 10 percent of known colonies/sites occur in wetlands defined by backwater flooding and that no more than 15 percent have occurred in these areas since 1932. Our data, both modeled and the jurisdictional determinations, indicate that few colonies/sites exist in wetland areas. The Corps suggests a careful review of the jurisdictional determination data before concluding that backwater flooding is critical for pondberry.

77. Page 57, fourth paragraph, second sentence. The 1991 sites are not the same sites used in 2000 and 2005.

78. Page 58, first paragraph, first and second sentences. The statement, ". . . which included the previously 44 profiled sites . . .," is not a true statement. The 1991 sites were not marked. Some of the sites likely are the same, but the exact number of 1991 sites used in the 2000 and 2005 analysis cannot be determined. Consequently, any statements or conclusions drawn about changing accounts based on this statement are unfounded.

79. Page 58, last paragraph, quotation. The issue is not whether FWS agrees that locations are depressional. The issue is whether the data indicate that pondberry locations have hydrology based on backwater flooding. While the Corps maintains that the microgeography of pondberry sites supports the conclusion that water is retained in those sites (i.e., that they serve as depression), this is a minor point in relation to the source of that water.

80. Page 60, first full paragraph. See comment 79. Also, the BO includes considerable discussion to establish the fact that pondberry is an obligate wetland species (pages 41 through 44). The jurisdictional determinations on the 2000 and 2005 colonies/sites do not support this (72 percent nonwetlands) nor does the historic (85 to 97 percent nonwetland over the last 50 to 75 years) and current 5 percent duration backwater flood data (90 percent occur in nonwetlands). An obligate wetland species requires the requisite wetland hydrology. These data indicate that 70 percent or more of known colonies/sites do not require wetland hydrology according to both regulatory field determinations and modeling of backwater flooding. If 14 days duration or saturation is not required to sustain pondberry, then rainfall on depressional areas, as defined by the Corps, is a reasonable alternate source of hydrology.

81. Page 61, last paragraph. The BO is implying that large depressional areas must be present to maintain pondberry independent of flooding. This is not consistent with the Corps definition of localized depressions on page 58 of the BO. It would be unreasonable to expect an association at a scale defined by a 10-meter (m) digital elevation model (DEM). The BO also questions the accuracy of defining depression using the 10-m DEM. The BO then states, "Depression, nevertheless, are capable of storing overbank floodwater, which increases the hydroperiod relative to the stage duration." Depressional areas are capable of storing overbank flooding, but there is no analysis of the frequency of overbank flooding reaching these areas. Depressional areas are also capable of storing rainwater and local hydrology as well.

82. Page 62, first paragraph, first sentence. The previous paragraph states the accuracy of the depressional analysis, but then uses these scientifically uncertain data to draw conclusions about pondberry and landscape level depressions. Can rainfall be considered local hydrology?

83. Page 62, first paragraph, last sentence. This is sheer speculation with no supporting scientific data. It also reflects a lack of understanding concerning hydrology data. During periods of "inadequate precipitation," there will be no overbank flooding to supplement hydrology. Overbank flooding events are normally associated with periods of heavy precipitation.

84. Page 62, fourth paragraph, last sentence. A statistical analysis performed by Dr. Magoun found no significant statistical difference between 2000 and 2005 pondberry numbers based of flood zone (Attachment 1). See comment 46.

85. Page 64, third, fourth, and fifth paragraphs; page 65, first partial paragraph and second and third full paragraphs. A statistical analysis performed by Dr. Magoun found no significant statistical difference between 2000 and 2005 pondberry numbers based on flood zone (Attachment 1). See comment 46.

86. Page 64, fourth full paragraph, first sentence. Concur with this statement.

87. Page 64, fourth full paragraph, second sentence. Since the BA was provided, jurisdictional determinations on 47 of the 49 sampled colonies/sites were made by the Vicksburg District's Regulatory Branch. Two of the three colonies/sites that had no aboveground biomass (the BO concludes were extirpated) were classified as wetlands. Despite possessing wetland hydrology, these sites had no evidence of any pondberry aboveground biomass. Yes, little overbank flooding occurred during this 20-year timeframe (1984-2003). However, in 2001, 19 colonies/sites (39 percent) were affected by backwater flooding. This was the most active year for backwater flooding from 1984-2003. It appears the significant decline occurred in the timeframe (2000 to 2005) where the most backwater flooding occurred in the 20-year period and annual rainfall was higher than the 59-year average 3 out of 5 years. In fact, 2001 annual rainfall was 15.96 inches more, and 2004 annual rainfall was 13.54 inches more than the 59-year average of 51.6 inches at Rolling Fork, Mississippi. This is not suggesting that overbank flooding and above normal rainfall are causing a decline in pondberry numbers, but it creates significant scientific uncertainty about concluding the difference in pondberry numbers between years is a result of lack of hydrology.

88. Page 64, fourth full paragraph, third sentence. Colony size was not affected by flood frequency. See comment 46 and Attachment 1.

89. Pages 66 and 67, *Study Design*. See comment 46 and Attachment 1.

90. Page 67, last partial paragraph, and page 68, first partial paragraph and second and third full paragraphs.

a. The 2000 survey data represented pondberry colonies in four flood frequency zones--0 to 2 years, 2 to 5 years, 5 to 10 years, and greater than 10 years. The quasi-experimental design for this field study stratified 49 colonies within 1 of 4 flood zones, and the hypotheses of interest were evaluated using a one-way analysis of variance (ANOVA). Biological studies involving count data are always highly variable, as count data follows the Poisson distribution. Theoretically, this implies that the variance will be linearly related to the mean. Thus, the larger the counts the larger the variance. Data such as these must be transformed in order to meet the assumptions of ANOVA and assess the hypotheses of interest. In the original treatment of these data, the square root transformation was used to stabilize the variances among the experimental groups. Another such transformation that will stabilize the variance is the common logarithm transformation, $\log_{10}(Y + 1)$. This transformation was recommended by FWS and is widely used in the literature, as is the square root transformation.

b. The analysis of the 2000 survey data using the square root transformation could not reject the null hypothesis of no differences in the mean biological attributes between the flood zone strata; i.e., the study inferred "one can conclude with a good degree of confidence that flood frequency does not affect these characteristics, and if these characteristics are a good measure of the health of the pondberry colonies, then the installation of the pumping station in

the Yazoo Backwater Area should not have any serious impacts on pondberry colonies." The analysis of the attribute number of stems per colony was based on 43 colonies only. The BO questioned this as their records indicated there should have been 49 colonies. A search of our records cannot find any reason for the discrepancy, and hence, the new analyses are based on all 49 colonies. Using the recommended FWS transformation, as well as our original square root transformation, still does not refute the conclusions of the 2000 data report. The following table below shows the summary of the F-tests for both transformations.

SUMMARY OF F-TEST
2000 SURVEY DATA ONLY

Characteristics	Square Root Transformation		Common Log Transformation	
	F-Ratio	P-Value	F-Ratio	P-Value
Number of Clumps	0.9645	0.4178	0.9016	0.4478
Number of Stems	1.3078	0.2835	1.4279	0.2471
Number of Dead Stems	1.7072	0.1790	2.7015	0.0567
Number of Females	0.7749	0.5142	0.8464	0.4758
Number Plants Bearing Fruit	0.6182	0.6068	0.6303	0.5993
Stem Height a/	1.2016	0.3200	1.2016	0.3200
Average Stem Diameter a/	0.6785	0.5698	0.6785	0.5698

a/ No transformation need for this biological characteristic

91. Page 68, third full paragraph, last partial paragraph; pages 69-71, first and second full paragraphs.

a. The following is Dr. Magoun's response to questions on power calculations.

"The power calculations reported in the 2000 report were retrospective power calculations. Calculating retrospective power at the actual sample size and estimated effect size is somewhat noninformative and according to some authors, somewhat controversial [Hoenig and Heisey, 2001]. Retrospective power does not give any additional information to the significance test, but rather shows the test in a different perspective. We believe, however, that many studies fail due to an insufficient sample size needed to detect a meaningful effect size, and that retrospective power studies provides a basis to better design future studies. As such, the 2000 survey data was used to estimate the power for a sample of size 49 to detect various effect-sizes. With the sample size of 49, the effect size was changed to reflect the case where the sum of squares of the hypothesis would be doubled, tripled, or quadrupled. With these parameters the power of being able to

detect this new effect size at the given alpha level and sample size was computed along with the Least Significant Number (LSN) and the power of detecting the effect size when N = LSN. The following table displays the results of this analysis for the 2000 survey data.

RETROSPECTIVE AND PROSPECTIVE POWER CALCULATIONS
NOTE: COMMON LOG TRANSFORMATION AND SIGNIFICANCE LEVEL 0.05

Characteristic	Sigma (RMSE)	N	Effect Size	Power	LSN	Power when N = LSN
Clumps	0.28	49	0.06390	0.22005 a/	154	0.64260
			0.09037	0.41487	79	0.64251
			0.11068	0.59103	54	0.64203
			0.12780	0.72992	42	0.64774
Stems	0.72	49	0.21430	0.35712 a/	92	0.64157
			0.50504	0.98535	50	0.63650
			0.61855	0.99932	15	0.64006
			0.71424	0.99998	15	0.67133
Females	0.53	49	0.11950	0.21547 a/	158	0.64373
			0.16900	0.40575	81	0.64357
			0.20698	0.57954	55	0.63994
			0.23900	0.71839	43	0.64870
Fruit	0.69	49	0.13630	0.17278 a/	204	0.64218
			0.24435	0.49052	66	0.64003
			0.29926	0.68080	46	0.64709
			0.34556	0.81417	35	0.63810
Stem Height	7.2	49	1.95220	0.30032 a/	110	0.64144
			2.76083	0.56232	57	0.64092
			3.38131	0.75670	40	0.64897
			3.90440	0.87629	31	0.64738
Stem Diameter	0.17	49	0.03500	0.18478 a/	204	0.64144
			0.04949	0.34279	66	0.64092
			0.06062	0.49657	46	0.64897
			0.07000	0.63034	35	0.64738

a/ Retrospective Power.

b. "As can be seen from this table, the retrospective power ranges from a low of 0.17278 for stem height to 0.35712 for number of stems. The LSN is the smallest sample size needed to detect the given effect-size. Notice from the table, for the effect-size to represent orders of magnitude changes the LSN are approaching the sample size selected for the study, that is, the 49 colonies. Thus, when combining the 2000 and 2005 survey data, the sample sizes of 49 for each year appears to provide enough replication for reasonable conclusions about the hypotheses of interest.

c. "The retrospective power for these tests, as noted in the FWS BO, are not as high as the power calculations previously reported; however, now that the multiyear data surveys have been completed and the 2000 data set updated, new power calculations were warranted."

92. Page 73, third and fourth full paragraphs. The 2000 and 2005 data should have been transformed. We agree there is a statistically significant decline in the number of pondberry plants between 2000 and 2005. However, as previously stated, there is no statistically significant association between flood frequency and the number of stems (see previous comments and Attachment 1). The cause of the decline has not been established with any degree of certainty. Also, defining a trend based on two points involves a large degree of uncertainty.

93. Page 74, first full paragraph, seventh and last sentence. See comment 94. The historical data suggest that greater than 85 percent of the known colonies/sites have had no wetland hydrology form backwater flooding for the past 50 to 75 years (1932 to 1958). A large degree of uncertainty is associated with a conclusion that the last 5 years of this period result in significant decline based on a lack of wetland hydrology. In addition, in 2001, 19 colonies/sites (39 percent) were affected by backwater flooding. This was the most active year for backwater flooding from 1984 to 2003. It appears the significant decline occurred in the timeframe (2000 to 2005) where the most backwater flooding occurred in the 20-year period and annual rainfall was higher than the 59-year average 3 out of 5 years.

94. Page 74, last paragraph. A pattern of pondberry decline, as a result of severe dieback, and recovery is clearly illustrated by FWS' 1993, 1994, and 2006 data at the Colby site. This is a scientifically credible alternate explanation for the decline on the 49 colonies/sites, particularly considering that almost 80 percent of the colonies/sites in 2000 had fungal damage. The decline may simply be the first portion of a larger cycle that has not had enough time to complete.

95. Page 77, first full paragraph, last sentence.

a. These colonies/sites were the least affected by changes in frequency and duration from past flood damage reduction measures. The only duration period in which they occurred outside wetlands defined by FEAT was the period 1958 to 1978. Using the logic presented in the BO, these sites should have contained the largest number of stems in 2000 because they maintained hydrology closest to "natural conditions." Sixteen colonies/sites above the 1-year frequency (33 percent of the colonies/sites) contained more stems than GSRC 56 (0.7-year flood frequency) and 19 colonies/sites above the 1-year frequency (39 percent) contained more stems than GSRC 54 (0.8-year flood frequency). The data are contrary to the BO's conclusions. The conclusion that these are an important source for potential future growth is based on 2 colonies/sites that were included as part of the 49 colonies/sites.

b. The BO fails to consider the 12 colonies outside the DNF. These colonies/sites are all above the 100-year flood plain. These sites are not dependent on wetland hydroperiod sustained by either overbank flood frequency or duration. This is a critical omission to establishing the baseline role frequency and duration play in sustaining pondberry. In 2000, 10 of these colonies had greater pondberry stem numbers than the 2 colonies/sites below the 1-year frequency on the DNF. Also, 7 of the 12 had increased stem numbers between 2000 and 2005 (5 decreased). One colony/site (GSRC 52) increased from 219 stems in 2000 to over 16,000 stems in 2005. These changes demonstrate that factors, independent of any effect from overbank flood frequency or duration, can produce substantial changes (positive or negative) in pondberry colonies/sites. The cause(s) of the changes for these colonies/sites and the colonies/sites in the DNF cannot be concluded with any degree of scientific certainty based on the available data. These data do suggest that substantial changes in pondberry colonies/sites can occur without any effect from overbank flood frequency or duration.

96. Page 78, second full paragraph, last sentence. We agree that the historical duration data indicate a substantial change in duration from past flood damage reduction projects. However, the largest change, as it relates to the spatial distribution of pondberry colonies/sites, occurred 50 to 75 years ago and duration has been relatively stable since (ranging from 85 to 98 percent of colonies/sites above the 5 percent duration backwater flood).

97. Page 78, last paragraph, and page 79, first partial paragraph. This is only meaningful if pondberry is dependent on frequency or duration. The BO has not established this, and Corps previous analyses and comments on the BO provide significant data analyses that are contrary the BO conclusions.

98. Page 79, first full paragraph, first sentence. See previous comment. Also, two points do not make a scientifically defensible trend, and other plausible alternate explanations could account for the trend (recall that 80 percent of the colonies/sites had fungal damage in 2000).

99. Page 79, last paragraph, first and third sentences. See previous comments concerning a lack of statistically significant relationship between pondberry and flood frequency. The BO also fails to consider 12 colonies above the 100-year flood plain. In 2000, 10 of these colonies had greater pondberry stem numbers than the 2 colonies/sites below the 1-year frequency on the DNF. Also, 7 of the 12 had increased stem numbers between 2000 and 2005 (5 decreased). This is a fatal omission to any presumed relationship between flood frequency and pondberry stem numbers.

100. Page 79, last paragraph, fifth sentence. For this statement to be true, pondberry must be dependent on backwater flooding hydrology. As previously stated, 85 to 98 percent of the colonies/sites have not occurred in areas with 5 percent backwater flood duration since 1931, and only 13 of the colonies sampled in 2000 and 2005 were determined to be wetlands based on the 1987 manual. In addition, 8 of the 13 did not occur within the backwater 2-year flood plain.

This is not consistent with a plant that requires wetland hydrology for survival. A simple and obvious explanation is that pondberry occurs mostly in areas without a backwater 5 percent flood duration because it does not require 5 percent backwater flooding duration, but it is capable of tolerating the 5 percent backwater flooding duration.

101. Page 80, second full paragraph, first sentence. Seven of 12 colonies/sites located above the 100-year frequency that the BO failed to consider had increases between 2000 and 2005.

102. Page 80, second full paragraph, third sentence. Even if this assumption holds true, the period between 2000 and 2005 had the most significant backwater event that reached pondberry colonies in the DNF in the last 20 years, and 3 of 5 years in this period had annual rainfall amounts above the 59-year average between 1944 and 2005 (two of which were >13 inches above the average).

103. Page 80, third full paragraph, first sentence. This sentence seems inconsistent with the remainder of the BO analysis.

104. Page 81, first full paragraph, second, third, and fourth sentences. It is not appropriate to recalculate flood frequency on a period that does not reflect a range of conditions, particularly significant events like the 1973 flood. This is a period where little overbank flooding occurred. Secondly, the shorter the period of analysis, the larger degree of uncertainty associated with the estimated frequency. Frequency based on 20 years has a much larger degree of uncertainty than frequency based on 55 years of record. Any subsequent analysis conclusions based on this comparison is not valid.

105. Page 82, first full paragraph, first sentence. Per other comments, the Corps believes that FWS underestimates the role of other factors such as disease. We do not agree that the 2000 to 2005 changes are predictive, but even if FWS is correct in predicting a trend, FWS has not adequately considered the other factors.

106. Page 82, second full paragraph. A statistically significant relationship based has not been established. See Appendix 1.

107. Page 82, third full paragraph. The Corps questions FWS' emphasis on backwater flooding since the data indicate that colonies/sites above the 1-year frequency contain more plants than those below. Sixteen colonies/sites above the 1-year frequency (33 percent of the colonies/sites) contained more stems than GSRC 56 (0.7-year flood frequency), and 19 colonies/sites above the 1-year frequency (39 percent) contained more stems than GSRC 54 (0.8-year flood frequency). These 2 colonies received substantially more overbank flooding than any other of the 49 colonies/sites between 1984 and 2003. According to the BO's analysis, pondberry numbers on these colonies/sites should have substantially greater than any other site in 2000.

108. Page 83, last paragraph, last sentence. Just because these are the "only" available data does not give validity to their use. Also, the FWS 1993, 1994 and 2006 data, although spatially limited, indicate that pondberry is very capable of significant decline and recovery.

109. Page 84, second paragraph, first sentence. See previous comments on pondberry decline and flood frequency.

110. Pages 84, 85 and 86. The Corps cannot accept FWS' conclusions about potential effects on the identified populations based on the significant comments raised concerning FWS assumptions, use of data, and analysis.

111. Page 86, last paragraph, first sentence. The only statistically significant conclusion that can be drawn concerning pondberry numbers is that there was a significant decline between 2000 and 2005. The BO does not statistically or otherwise establish the cause of the decline. Secondly, two points do not constitute a scientifically defensible trend.

112. Page 87, second, third, and fourth full paragraphs. The data presented in the Corps BA, the historical duration data from 1901 to present, and the jurisdictional determinations suggest that pondberry does occur on sites without hydrology consistent with an obligate species. Moreover, if it does require 5 percent duration hydrology, it does not appear that backwater flooding is a major source.

113. Page 87, fifth full paragraph. See comment 112. Again, the BO relies in large part on the Corps 2000 and 2005 data sets as the basis for its conclusions about population trends on the DNF, but according to the BO, these data cannot be used as a basis for evaluating effects to the DNF population as indicated on page 84.

114. Page 88, first, second, and third paragraphs. Flooding trends and rainfall data at the Colby site indicate this location suffered decline and fungal damage despite receiving a high level of hydrology. Annual rainfall between 1989 and 1992 was above the 59-year average each year at the Colby site. In fact, in 1991, over 70 inches of rain fell and this site was impacted by significant growing-season flooding (this event affected 80 percent of the sampled colonies). In addition, 1993 and 1994 were both above the 59-year average. This site experienced above average rainfall over a 5-year period and the largest overbank flooding event in the last 20 years prior to the severe dieback that occurred between 1993 and 1994. As such, it seems inappropriate to conclude that the decline and advance of fungus were related to dryness.

115. Page 90, entire page. This discussion about the reduction in the 5 percent backwater flood duration since the 1901-1931 period gives the impression that there has to be a gradual decline and it is now to the point where it will cause severe impacts to pondberry. As previously stated, the greatest decline occurred between 1932 and 1958 (87 percent of the movement of colonies/sites occurred). Since 1931, 85 to 98 percent of the known colonies/sites have been above the 5 percent backwater flood duration.

116. Page 91, second full paragraph. Given that the data cannot establish any scientifically defensible cause of the pondberry decline or trend to predict future growth or decline and 9 of the 11 largest populations in the southeast are on public property, it appears there is no basis to conclude that the project will appreciably reduce the likelihood of the survival and recovery of the species.

117. Page 91, third full paragraph, third sentence. There are no historic data on occurrence of pondberry in wetlands.

118. Page 91, third full paragraph, third sentence. The Corps maintains FWS should not predict a long-term trend based on the 2000 to 2005 data as discussed in previous comments.

119. Page 92, first partial paragraph. The Corps cannot accept FWS' conclusions, given the preceding comments concerning FWS' assumptions and analysis. In addition to concerns with the FWS use of detailed data from the 49 sites, FWS should consider the jurisdictional wetland determinations provided with these comments. The FWS must also consider the 12 colonies/sites (outside of the project impact area) which provide data that supports the Corps assessment of the needs of pondberry and the potential impacts of reduced backwater flooding.

CEMVK-OD-FS (1145b)

MEMORANDUM FOR RECORD 21 February 2007

SUBJECT: Wetland Delineation - Pondberry Sites in Delta National Forest

1. At the request of Mr. Kent Parrish, CEMVK-PP and Mr. Gary Young, CEMVK-PP-D, a wetland delineation was performed at known pondberry sites within the Yazoo Backwater Area project area in the Delta National Forest. Regulatory Branch personnel conducted field work during November 2006. POC for this document is Dr. Jim Wiseman, 1-5292. Future Regulatory POC's for pondberry are Mr. David Lofton, 1-5147, and Mr. Kirk Ross, 1-5369.

2. Methodology used to document the presence or absence of wetlands for a particular sample point can be found in 1987 Corps of Engineers Wetlands Delineation Manual[1] and in supplemental guidance (HQUSACE 1991[2] and 1992[3]). In order to be classified as a wetland, a plant community must have hydrophytic vegetation, occur on hydric soils and grow under a wetland hydrologic regime.

3. Background on Indicator Status: Most wetland plants have been assigned a wetland fidelity indictor status based on their estimated probability of occurrence in wetlands.

Status	Probability of Occurrence in Wetlands
OBL	> 99%
FACW	67 – 99%
FAC	33 – 66%
FACU	1 – 33%
UPL	< 1%

The list used by Vicksburg District is the 1988 National List of Plant Species that Occur in Wetlands: Southeast (Region 2)[4]. The list was developed, as were all the regional lists, by examining floristic and ecological texts. Each indicator status was determined by regional experts, but it was not based on empirical data (Robert Lichvar, personal communication[5]). The indicator status of pondberry is OBL.

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[1] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[2] U.S. Army Corps of Engineers, Headquarters (HQUSACE). 1991. Questions and Answers on 1987 Manual. Memorandum dated 7 October 1991. 6 p.

[3] U.S. Army Corps of Engineers, Headquarters (HQUSACE). 1992. Clarification and Interpretation of the 1987 Manual. Memorandum dated 6 March 1992. 5 p.

[4] Reed, Porter B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Southeast (Region 2). U.S. Department of Interior. National Ecology Research Center, St. Petersburg, FL. 122p.

[5] Lichvar, Robert. 2006. Personal Communication. Research Ecologist, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. Responsibility for the wetland plant list was transferred from U.S. Fish and Wildlife Service to the Corps of Engineers and Mr. Lichvar in 2006.

enclosure 3

4. Results: Attached are maps and completed data sheets for 30 sample sites representing 50 pondberry populations. In some cases, where popuations were in close proximity and at the same landscape position, a single data sheet was taken to represent several populations. Each pondberry population had previously been surveyed, staked and numbered by a consultant and labeled with "GSRC#". Samples taken during this study attempted to locate the GSRC stakes. If not, the location was determined using GPS. See Appendix for a list of sample sites, the results of the jurisdictional determinations and brief notes on each sample site. Of the 50 pondberry colonies sampled, 37 (74%) were considered non-wetland, and 13 (26%) were determined to be wetland. Of the 30 samples, 20 were not wetland (67%) and 10 were wetland (33%).

5. Conclusions: It appears that pondberry is incorrectly classified as OBL. There is a review process in which alternative ratings can be presented. I plan to provide data from this study to the National Technical Committee for Hydrophytic Vegetation and propose a change in the indicator status of pondberry.

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Environmental Specialist
Regulatory Branch

CEMVK-OD-FS (1145b)

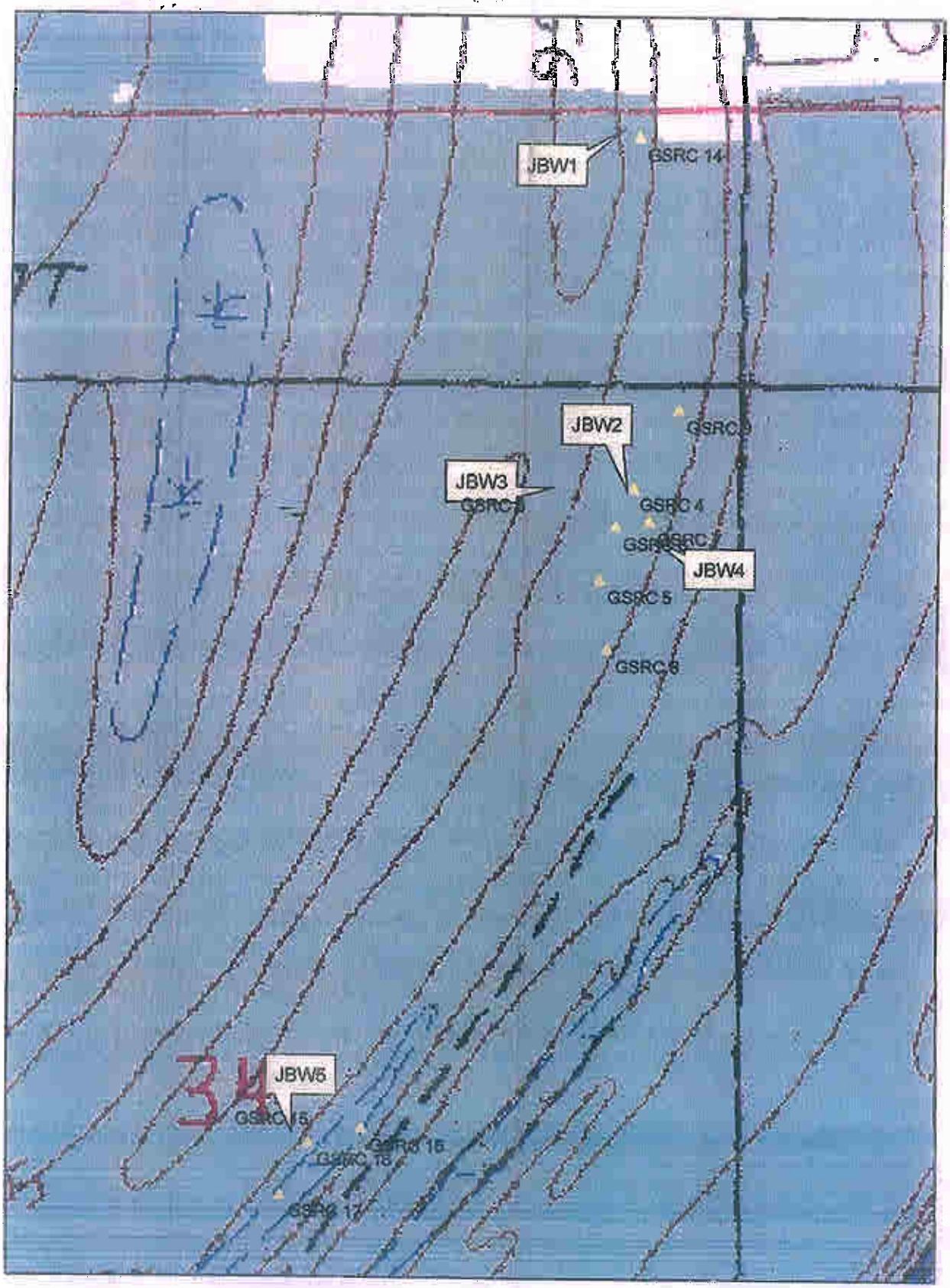
MEMORANDUM FOR RECORD 21 February 2007

SUBJECT: Wetland Delineation - Pondberry Sites in Delta National Forest
Appendix – JD's by Plot

JBW#	GSRC#	JD	Notes
1	14	NW	on ridge in ridge/swale landscape
2	4	NW	1 sample for 6 populations since all populations near each other on same ridge
2	5	NW	1 sample for 6 populations since all populations near each other on same ridge
2	6	NW	1 sample for 6 populations since all populations near each other on same ridge
2	7	NW	1 sample for 6 populations since all populations near each other on same ridge
2	8	NW	1 sample for 6 populations since all populations near each other on same ridge
2	9	NW	1 sample for 6 populations since all populations near each other on same ridge
3	n/a	NW	not a GSRC site but sample taken in swale near JBW#2
4	n/a	NW	not a GSRC site but sample taken on flat at slightly lower elevation than JBW#2
5	15	W	transitional from ridge to broad slough/swale; appears to define W/NW boundary
5	16	NW	transitional from ridge to broad slough/swale; appears to define W/NW boundary
5	17	NW	transitional from ridge to broad slough/swale; appears to define W/NW boundary
6	1	NW	well defined ridge near open field
7	10	NW	1 sample for 4 populations near each other on broad ridge
7	11	NW	1 sample for 4 populations near each other on broad ridge
7	12	NW	1 sample for 4 populations near each other on broad ridge
7	13	NW	1 sample for 4 populations near each other on broad ridge
8	21	W	transitional area
9	20	NW	ridge adjacent to slough
10	3	NW	ridge near large wet area to the south
11	2	W	near head of small swale; transitional
12	36	NW	beginning of ridge near large slough
13a	37	NW	beginning of ridge near large slough; research study area nearby
13a	38	NW	beginning of ridge near large slough; research study area nearby
13b	29	NW	broad flat; sample taken between GSRC 29 and 29A (29A located by GPS, stake not found)
13b	29A	NW	broad flat; sample taken between GSRC 29 and 29A (29A located by GPS, stake not found)
14	30	W	vegetation shift from 13b
15	31	NW	possible candidate for resampling in spring; transitional
15	31A	NW	possible candidate for resampling in spring; transitional
16	28	NW	small ridge higher than surrounding area
17	27	NW	marked by Forest Service as sensitive plant area
18	22	W	possible perched water table
18	23	W	possible perched water table
18	24	W	possible perched water table
18	25	W	possible perched water table
19	26	NW	ridge adjacent to slough; only sample with non-hydric soil
20	39	NW	transitional area due to vicinity of slough; may need resampling in spring
20	40	NW	transitional area due to vicinity of slough; may need resampling in spring
21	41	NW	transitional area but drainage pattern indicates wetland hydrology
22	42	W	pondberry abundant, vigorous and fruiting
22	43	W	pondberry abundant, vigorous and fruiting
23	35	W	stake not found, sample point determined by GPS; possible influence of beavers?
24	32	NW	sample taken near GSRC#33; stake 32 not found; area marked with sign by Forest Service
24	33	NW	sample taken near GSRC#33; stake 32 not found; area marked with sign by Forest Service
24	34	NW	sample taken near GSRC#33; stake 32 not found; area marked with sign by Forest Service

25	44	W	low clay flat
26	45	NW	sample taken between GSRC#45 and 46; stake 45 not found
26	46	NW	sample taken between GSRC#45 and 46; stake 45 not found
27	56	W	low clay flat; sample near large cypress tree
28	54	W	low clay flat
29	55	NW	adjacent to pipeline
n/a	18	n/a	not sampled due to access problems
n/a	19	n/a	not sampled due to access problems
n/a	53	n/a	not sampled since plot within greentree reservoir with artificial hydrology

Regulatory Pondberry Samples - November 2006 - JBW1-5



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 14 Applicant/Owner: DNF Investigator: [illegible]	Date: 11/1/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Liquidambar styraciflua	T	FAC	9.		
2. Quercus nuttallii	T	OBL	10.		
3. Celtis laevigata	SS	FACW	11.		
4. Ilex decidua	SS	FACW	12.		
5. Diospyros virginiana	H	FAC	13.		
6. Toxicodendron radicans	H	FAC	14.		
7. Parthenocissus quinquefolia	WV	FAC	15.		
8. T. radicans	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:
5 of 8 are FAC = suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Field Observations
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: N/A (in.)
Depth to Saturated Soil: N/A (in.)

Remarks: oxidized root channels on live roots

SOILS

Map Unit Name
(Series and Phase): not precisely mapped

Drainage Class: _____

Taxonomy (Subgroup): _____

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/2			
3+		10yr 5/1	7.5yr 5/8	common medium, prominent	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: on ridge in ridge/swale landscape

Pondberry @ JBW 1

JBW 1

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 4-9 Applicant/Owner: DAF Investigator: WICKMAN, LOFTON, ALLRED, ROSS	Date: 11/1/06 County: SHARKEY State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Liquidambar styraciflua	T	FAC+	9. Parthenocissus quinquefolia	WV	FAC
2. Quercus nigra	T	FAC	10. T. radicans	WV	FAC
3. Celtis laevigata	SS	FACW	11.		
4. Morus rubra	SS	FAC	12.		
5. Ilex decidua	SS	FACW	13.		
6. Toxicodendron radicans	H	FAC	14.		
7. Eupatorium serotinum	H	FAC	15.		
8. Vitis rotundifolia	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 10/10 = 100%

Remarks:

8 of 10 FAC = suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Field Observations

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: N/A (in.)

Depth to Saturated Soil: N/A (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase): not precisely mapped

Drainage Class: _____
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): _____

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/2			
3-10		10yr 5/3	10yr 5/6 ← 10yr 5/2 ←	faint, common / faint, medium	Mn concretions
				faint, few fine	
10+		10yr 4/2	10yr 3/3	faint, few fine	Mn concretions

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ✓ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: On ridge in ridge/swale landscape
Six pondberry colonies represented by 1 data sheet since all are at same topographic position along the same ridge

Approved by HQUSACE 3/92

JBW 2

Research Area Between GCR 4 & GCR 7

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: SWAMP WEST of GSRC 4-9 Applicant/Owner: DAF Investigator: WISEMAN, LOFTON, MILLER, FOSS	Date: 11/1/06 County: SHARKEY State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Liquidambar styraciflua	T	FAC+	9.		
2. Celtis laevigata	T	FACW	10.		
3. Ilex decidua	SS	FACW	11.		
4. Ulmus americana	SS	FACW	12.		
5. C. laevigata	SS	FACW	13.		
6. Toxicodendron radicans	H	FAC	14.		
7. Vitis rotundifolia	H	FAC	15.		
8. " "	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	N/A	(in.)
Depth to Saturated Soil:	N/A	(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
✓ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
✓ Oxidized Root Channels in Upper 12 Inches
✓ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): not precisely mapped

Drainage Class: _____

Taxonomy (Subgroup): _____

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		10yR 3/1	10yR 5/2	few, faint, fine	
5+		10yR 5/1	7.5yR 5/6	many, medium, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks:
Swale in ridge/swale landscape

JBW 3

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: FLAT NEAR GSRC 4-9 Applicant/Owner: DNF Investigator: WISEMAN, LOFTON, MURRELL, JONES	Date: 11/1/06 County: SHARKEY State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW4

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Liquidambar styraciflua	T	FAC+	9.		
2. Quercus nigra	T	FAC	10.		
3. Ulmus crassifolia	SS	FAC	11.		
4. Ilex decidua	SS	FACW	12.		
5. Carpinus americana	SS	FAC-	13.		
6. Taxodium ascendens	H	FAC	14.		
7. T. ralicanus	WV	FAC	15.		
8. Berchemia scandens	WV	FACW	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/8 = 87.5%

Remarks: 6 of 8 FAC or FACW = suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: N/A (in.)

Depth to Saturated Soil: N/A (in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks: micro-bus w/in flat likely pond precipitation and have wetland hydrology - water stained leaves

SOILS

Map Unit Name (Series and Phase): not precisely mapped
Drainage Class: _____
Taxonomy (Subgroup): _____
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10 yr 3/2			
3+		10 yr 5/1	10 yr 5/8	Common, medium, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: FLAT JUST OFF WIDE RIDGE IN RIDGE/SWALE LANDSCAPE

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 16 Applicant/Owner: DMF Investigator: WESTRAW, LOFTON, ALLRED, ROSS	Date: 11/1/06 County: SHARKEY State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: JBWS

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Liquidambar styraciflua	T	FAC+
2. Celtis laevigata	T	FACW
3. Ilex decidua	SS	FACW
4. C. laevigata	SS	FACW
5. Campsis radicans	H	FAC
6. Toxicodendron radicans	H	FAC
7. Vitis rotundifolia	WV	FAC
8. Rubus trivialis	H	FAC
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks: 5 of 8 FAC = Suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Transitional area from ridge to swale
wetland hydrology shown in pit dug 20' downslope from this plot

SOILS

Map Unit Name (Series and Phase): not precisely mapped

Drainage Class: _____

Taxonomy (Subgroup): _____

Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/1			
2-6		10yr 5/3	10yr 4/6	few, fine, faint	
6+		10yr 6/1	10yr 5/6	common, med, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

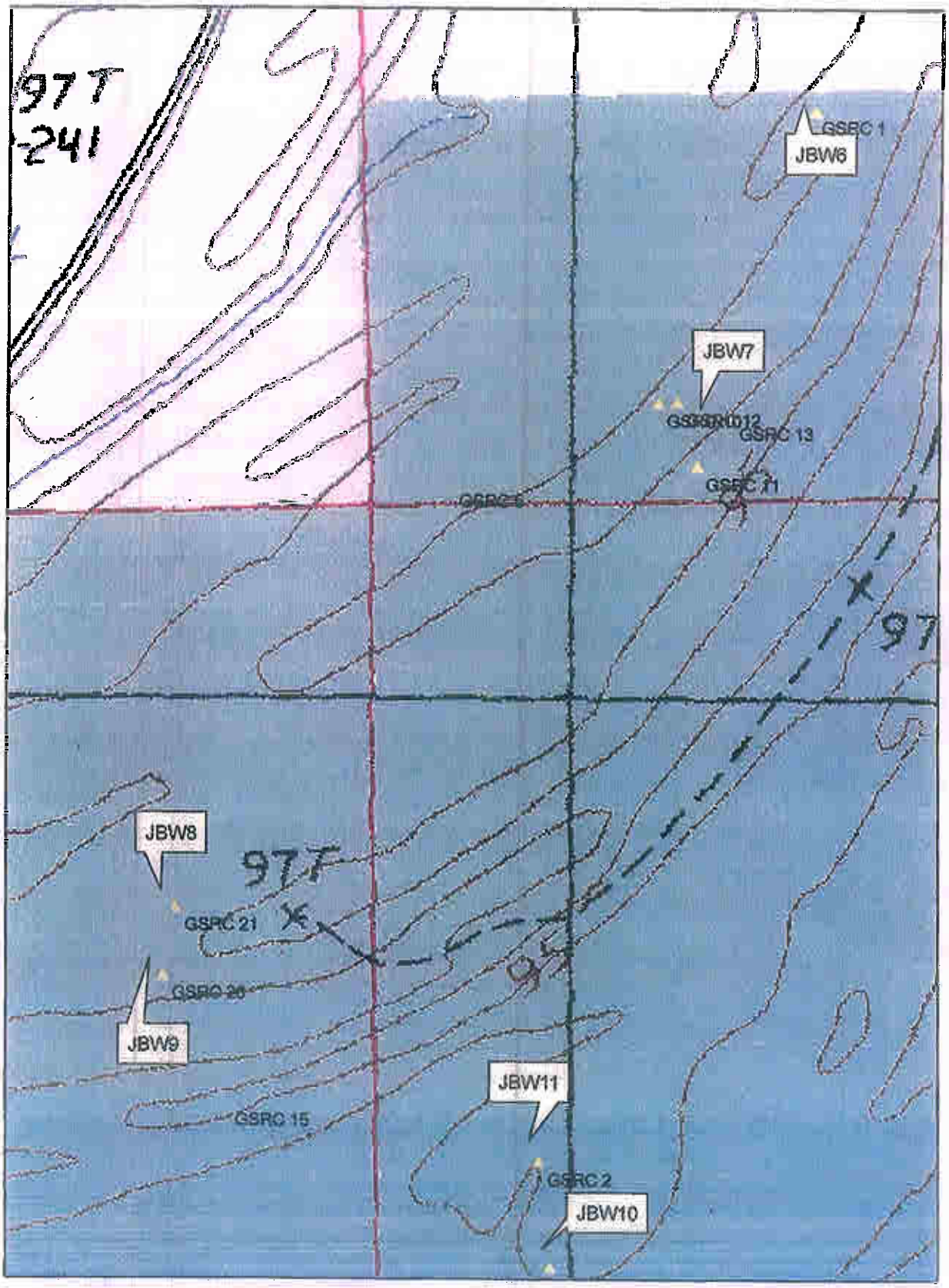
Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks : transitional site

JBW 5

SOIL PIT 20' DOWN SLOPE FROM JBOS - DEPTH TO WATER TABLE 8"

Regulatory Pondberry Samples - November 2006 - JBW6-11



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 1 Applicant/Owner: DMF Investigator: [illegible]	Date: 11/3/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: Plot 6

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. L. styraciflua	T	FAC	9. T. radicans	H	FAC
2. Carya illinoensis	T	FACU	10.		
3. Celtis laevigata	T	FACW	11.		
4. C. laevigata	SS	FACW	12.		
5. Ulmus americana	SS	FACW	13.		
6. Eupatorium serotinum	H	FAC	14.		
7. T. radicans	H	FAC	15.		
8. Vitis rotundifolia	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:

FAC 6/9 = suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: N/A _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): not precisely mapped

Drainage Class: _____

Taxonomy (Subgroup): _____

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/2	10yr 5/2	few, med., distinct	
3+		10yr 6/1	7.5yr 5/8	common, med., prominent	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

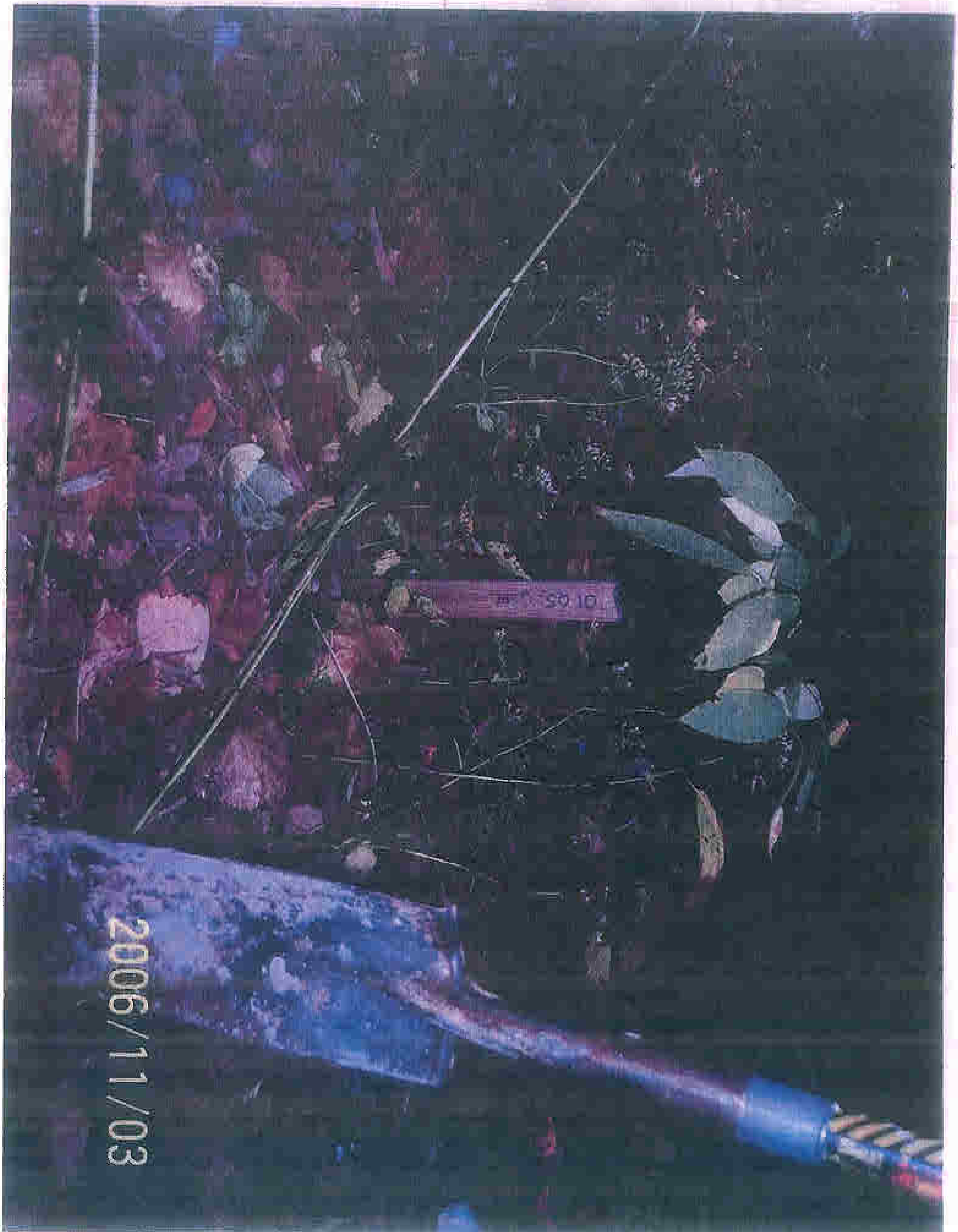
Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: ridge near open field


2006/11/03

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: CSRC 10,11,12,13 Date: 11/3/06
Applicant/Owner: DNF County: Sampson
Investigator: Wiesnad, Ross, Carpenter State: NC

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBWT

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Quercus phellos	T	FACW
2. Q. nigra	T	FAC
3. L. styraciflua	T	FAC
4. Acer negundo	T	FACW
5. M. americana	SS	FACW
6. C. laevigata	SS	FACW
7. E. serotinum	H	FAC
8. T. radicans	H	FAC
9. C. laevigata	H	FACW
10. V. rotundifolia	WV	FAC
11. T. radicans	WV	FAC
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/11 = 100%

Remarks:
FAC 6/11 = 55% - suspect hydrology (minor)

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: (in.)
Depth to Saturated Soil: (in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): not precisely mapped

Drainage Class: _____

Taxonomy (Subgroup): _____

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 4/2	10yr 6/1	few, fine, faint	
2+		10yr 6/1	7.5yr 5/8	comm, med, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Ramarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: broad ridge flat transitional

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 21 Applicant/Owner: DNF Investigator: WIDEMAN, ROSS, CARPENTER	Date: 11/3/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: TEW B

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. L. styraciflua	T	FAC	9.		
2. Q. phellos	T	FACW	10.		
3. Acer rubrum var. drummondii	SS	OBL	11.		
4. Ilex decidua	SS	FACW	12.		
5. Q. nuttallii	T	FACW	13.		
6. T. radicans	H	FAC	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 6/6 = 100%

Remarks:
FAC 2/6 - predicts positive hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations
Depth of Surface Water: _____ (in.)
Depth to Free Water in Pit: _____ (in.)
Depth to Saturated Soil: 10 (in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
✓ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks: saturated @ 10"

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 4/2			
2+		10yr 6/1	7.5yr 5/8	common, med, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Ramarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No (Circle)	Is this Sampling Point Within a Wetland?	(Circle) (Yes) No
Wetland Hydrology Present?	(Yes) No		
Hydric Soils Present?	(Yes) No		

Remarks: transitional area on wet side
Pondberry appears to define the NW side
of the WL/Non transition


2006/11/03

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 10 Applicant/Owner: DNF Investigator: WILKMAN, ROSS, CARTER	Date: 11/3/06 County: SURRY State: NC
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: TBW9

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. L. styraciflua	T	FAC	9.		
2. Q. phellos	T	FACW	10.		
3. C. laevigata	SS	FACW	11.		
4. L. styraciflua	SS	FAC	12.		
5. Campsis radicans	H	FAC	13.		
6. Lindera melissifolia	H	OBL	14.		
7. V. rotundifolia	WV	FAC	15.		
8. T. radicans	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:
FAC - 5/8 = Suspect hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations N/A
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 4/2			
2+		10yr 6/1	7.5yr 5/8	common, med, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 3 Applicant/Owner: [illegible] DNF Investigator: [illegible], [illegible], CARPENTER	Date: 11/3/06 County: SHARKEY State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBWTO

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. C. stagnalis	T	FAC	9. V. rotundifolia	WV	FAC
2. Q. phellos	T	FACW	10. T. radicans	WV	FAC
3. C. laevigata	SS	FACW	11.		
4. T. radicans	H	FAC	12.		
5. Rubus trivialis	H	FAC	13.		
6. Campsis radicans	H	FAC	14.		
7. Amphicarpa bracteata	H	FAC	15.		
8. V. rotundifolia	H	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 10/10 = 100%

Remarks:
1 small black gum tree in sample area
FAC O/U = compost hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations N/A
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	[redacted]	10yr 4/2			
2+		10yr 6/1	7.5yr 5/8	Com., med., distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
__✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


2006/11/03

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: LOERC 2 Applicant/Owner: [redacted] Investigator: WISEMAN, BOSE, CARPENTER	Date: 11/3/06 County: State:
Do Normal Circumstances exist on the site? Yes (No) Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: TRUTH

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. L. styraciflua	T	FAC	9.		
2. Q. phellos	T	FACW	10.		
3. U. americana	SS	FACW	11.		
4. Carya illinoensis	SS	FAC+	12.		
5. C. laevigata	SS	FACW	13.		
6. C. radicans	H	FAC	14.		
7. T. radicans	H	FAC	15.		
8. T. radicans	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 6/8 = 100%

Remarks:
FAC 4/8 - transitional hydrology?

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Field Observations
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Remarks: at upper end of small slough

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 4/2			
2+		10yr 6/1	7.5yr 5/6		

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

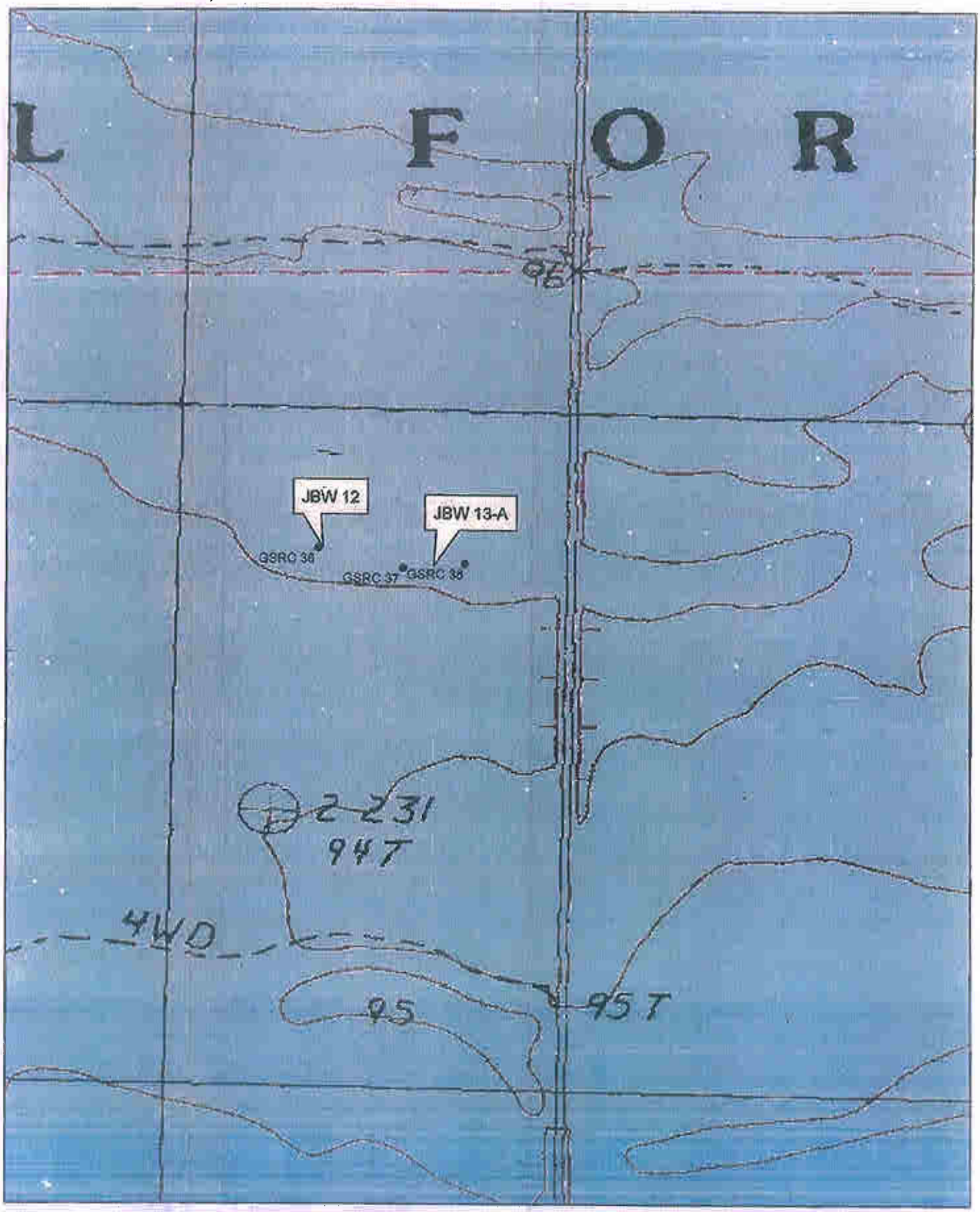
Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :


2006/11/03


2006/11/03

Regulatory Pondberry Samples - November 2006 - JBW12-13a



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: COSRC 36 Applicant/Owner: DIF Investigator: Wiseman, Lawson, Ross, Reynolds	Date: 11/16/06 County: Stone State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: JBW/12 Transect ID: Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. sweetgum	T	FAC	9. dewberry	H	FAC
2. willow oak	T	FACW	10.		
3. sugarberry	T	FACW	11.		
4. sugarberry	SS	FACW	12.		
5. box elder	SS	FAC	13.		
6. trumpet creeper	H	FAC	14.		
7. palmetto	SS	FACW	15.		
8. poison ivy	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks: FAC 5/9

HYDROLOGY

___ Recorded Data (Describe in Remarks):
  ___ Stream, Lake, or Tide Gauge
  ___ Aerial Photographs
  ___ Other
___ No Recorded Data Available N/A

Field Observations N/A

Depth of Surface Water: ________(in.)

Depth to Free Water in Pit: ________(in.)

Depth to Saturated Soil: ________(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3"		10yr 2/1			
3+		10yr 5/2	7.5yr 5/8	many/fine, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


2006/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 37+38 (plot taken between) Date: 11/16/06
Applicant/Owner: DoF County: Sharkey
Investigator: Wiseman, Lofton, Ross, Rankins State: MS

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation)? Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBWT3A

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. willow oak	T	FACW
3. Sugarberry var. ?	SS	FACW
4. Acer negundo drummondii	SS	OBL
5. Salix nigra	SS	FACW
6. Smilax rotundifolia	H	FAC
7. Muscadine	WV	FAC
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/7 = 100%

Remarks:
FAC 3/7

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs N/A
___ Other
___ No Recorded Data Available

Field Observations
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/1			
2+		10yr 6/2	7.5yr 5/8	common, fine, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

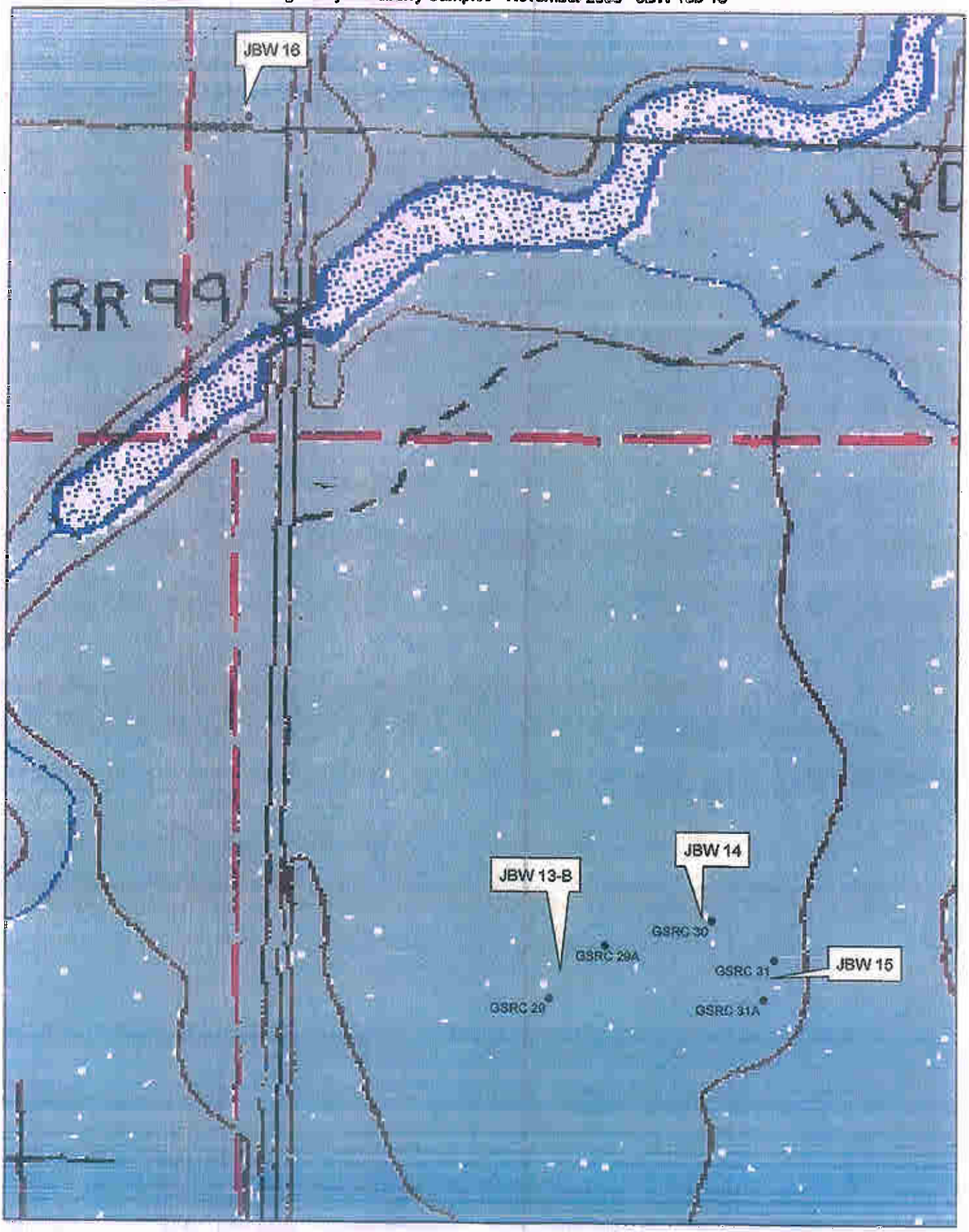
Hydrophytic Vegetation Present?	(Yes) No (Circle)	Is this Sampling Point Within a Wetland?	(Circle)
Wetland Hydrology Present?	Yes (No)		
Hydric Soils Present?	(Yes) No		Yes (No)

Remarks :


2006/11/16


2006/11/16

Regulatory Pondberry Samples - November 2003 - JBW 13b-16



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 29 + 29A
Applicant/Owner: DOT
Investigator: [illegible]

Date: 11/16/06
County:
State:

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation)? Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID: TBW 13
Transect ID:
Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. Ameri elm	T	FACW
3. Willow oak	T	FACW
4. red maple	SS	OBL
5. deciduous holly	SS	FACW
6. Eupatorium serotinum	H	FAC
7. Trumpet creeper	H	FAC
8. Muscadine	WV	FAC
9. Sm. rotundifolia	H	FAC
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:
FAC 5/9

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations N/A
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yR 2/1			
2+		10yR 6/1	7.5yR 5/8	few/fine/distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


GJRC 29-05
26/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Cos RC 30 Applicant/Owner: FHR Investigator: Wetland, Natural Areas, Ramsey	Date: 11/16/06 County: Salisbury State: MD
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Bottom Transect ID: Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Amer e/m	T	FACW	9.		
2. Sweetgum	T	FACW	10.		
3. Sweetgum	T	FAC	11.		
4. Sweetbay 2	SS	FACW	12.		
5. Red maple seedlings	SS	OBL	13.		
6. Exp. Sedge	H	FAC	14.		
7. S. Cinnor	SS	FACW	15.		
8. Muscadine	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:
FAC 3/8 predicts possible hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations

Depth of Surface Water: _____ (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil: 10 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
_✓_ Saturated in Upper 12 Inches 10"
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/1			
3-5		10yr 4/1			
5+		10yr 5/1	10yr 6/8	few, fine, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :


2006/11/16


2006/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

could not find 31A stake

Project/Site: GSRC 31 + 31A Applicant/Owner: [illegible] Investigator: [illegible]	Date: 11/16/06 County: [illegible] State: NJ
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: 31S Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Willow oak	T	FACW
2. Sassafras	T	FACW
3. Nuttall oak	T	OBL
4. Sweetgum	T	FAC
5. Sassafras	S	FACW
6. Red maple	S	OBL
7. Poison ivy	S	FACW
8. Sm. red maple	H	FAC
9. Tropical grass	H	FAC
10. Muscadine	WV	FAC
11. Poison ivy	WV	FAC
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 11/11 = 100%

Remarks:

FAC 5/11 hydrology?

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Remarks: possible candidate for resampling in Spring

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 5/1			
2-5		10yr 5/2	7.5yr 5/8	few, faint, distinct	
5+		10yr 5/1	7.5yr 5/8	many, med., distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

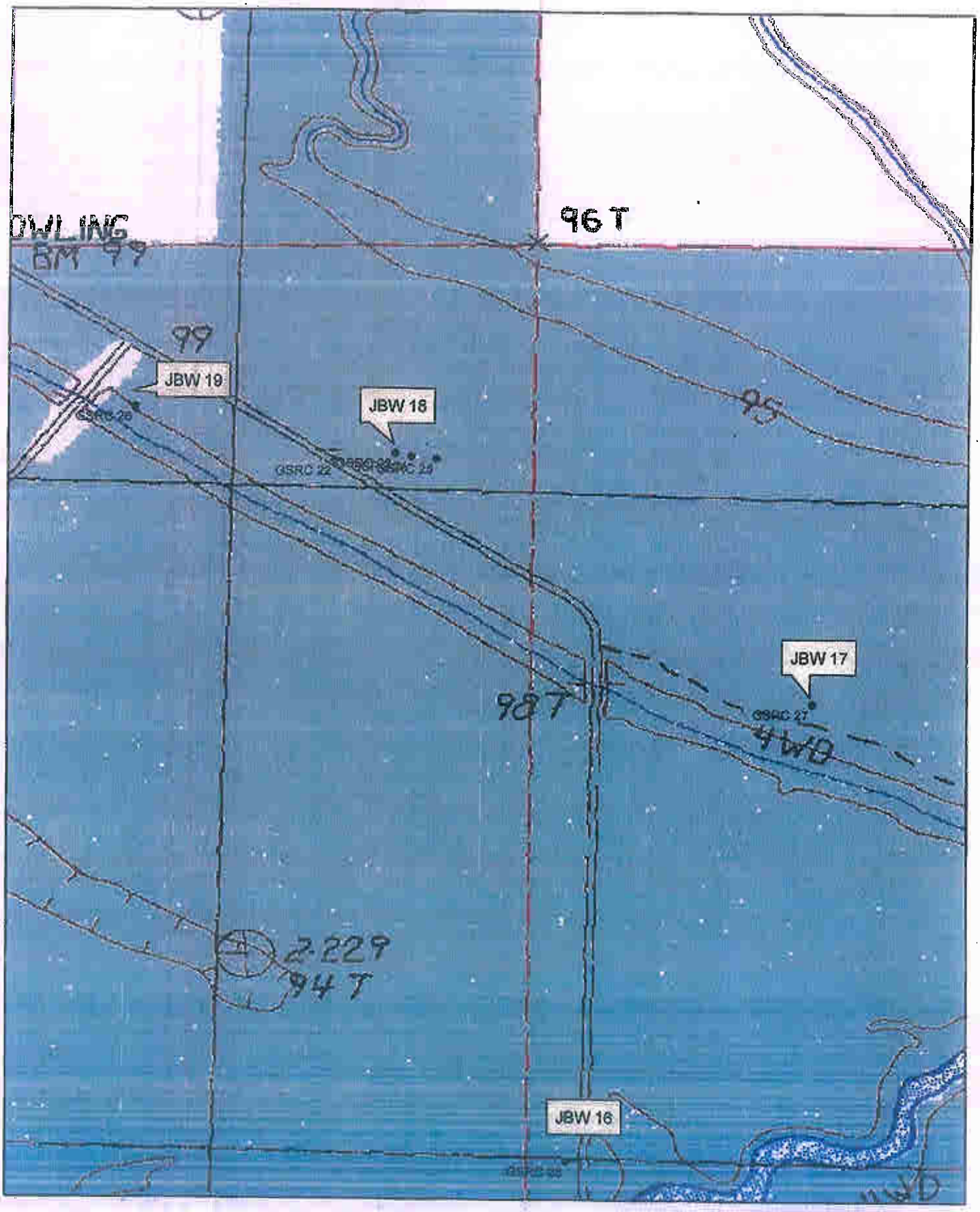
Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: possible wet depending on spring hydrology


2006/11/16

Regulatory Pondberry Samples - November 2006 - JBW 17-19



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 78 Applicant/Owner: DNF Investigator: WISEMAN, LOFTON, ROSS, RUSWELL	Date: 11/16/06 County: Hancock State: MS
Do Normal Circumstances exist on the site? Yes / No Is the site significantly disturbed (Atypical Situation)? Yes / No Is the area a potential Problem Area? Yes / No (If needed, explain on reverse.)	Community ID: FSH/P Transect ID: Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. sugarberry	T	FACW	9.		
2. sweetgum	T	FAC	10.		
3. willow oak	T	FACW	11.		
4. box elder	SS	FAC	12.		
5. sugarberry	SS	FACW	13.		
6. L. styraciflua	H	FAC	14.		
7. Sam. rotundifolia	H	FAC	15.		
8. Muscadine	WL	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks: downed tree - micro high FAC 5/8

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/1			
2-4		10yr 4/2			
4+		10yr 5/2	7.5yr 6/8	many, fine, faint vs Distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


2006/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 27 Applicant/Owner: USFS BNF Investigator: Wiseman, Lofton, Yates, Knowles	Date: 11/16/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: BNF7

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC	9. Poison ivy	WV	FAC
2. willow oak	T	FACW	10. muscadine	WV	FAC
3. water oak	T	FAC	11.		
4. Sugarberry	SS	FACW	12.		
5. Cornus foemina	SS	FACW-	13.		
6. Sabal minor	SS	FACW	14.		
7. deciduous holly	SS	FACW	15.		
8. trumpet creeper	H	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 10/10 = 100%

Remarks:
FAC 5/10 persimmon sub-dominant

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations N/A
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 5/2			
2+		10yr 5/1	7.5yr 5/8	few, faint, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
L Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle) Wetland Hydrology Present? Yes (No) Hydric Soils Present? (Yes) No	Is this Sampling Point Within a Wetland?	(Circle) Yes (No)

Remarks : Sensitive Plant Corps - marked by Forest Service


SENSITIVE PLANTS
PLEASE
TREAD LIGHTLY


2006/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

plot between 23 & 24

Project/Site: GSRC 22, 23, 24, 25 plot Applicant/Owner: Duke Investigator: Wieland, Lekad, Ross, Runnells	Date: 11/16/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JB2078

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC	9. Leersia virginica	H	FACW
2. water oak	T	FAC	10.		
3. Willow Oak Sugarberry	T	FACW	11.		
4. Sugarberry	SS	FACW	12.		
5. Q. michauxii	SS	FACW-	13.		
6. red maple Dead!	SS	OBL	14.		
7. deciduous holly	SS	FACW	15.		
8. Sabal minor	SS	FACW	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:

FAC 2/9 predicts positive hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: 8 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): ______________________ Drainage Class: ______________
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 4/1			
3+		10yr 5/1	10yr 5/8	few, faint, fine	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

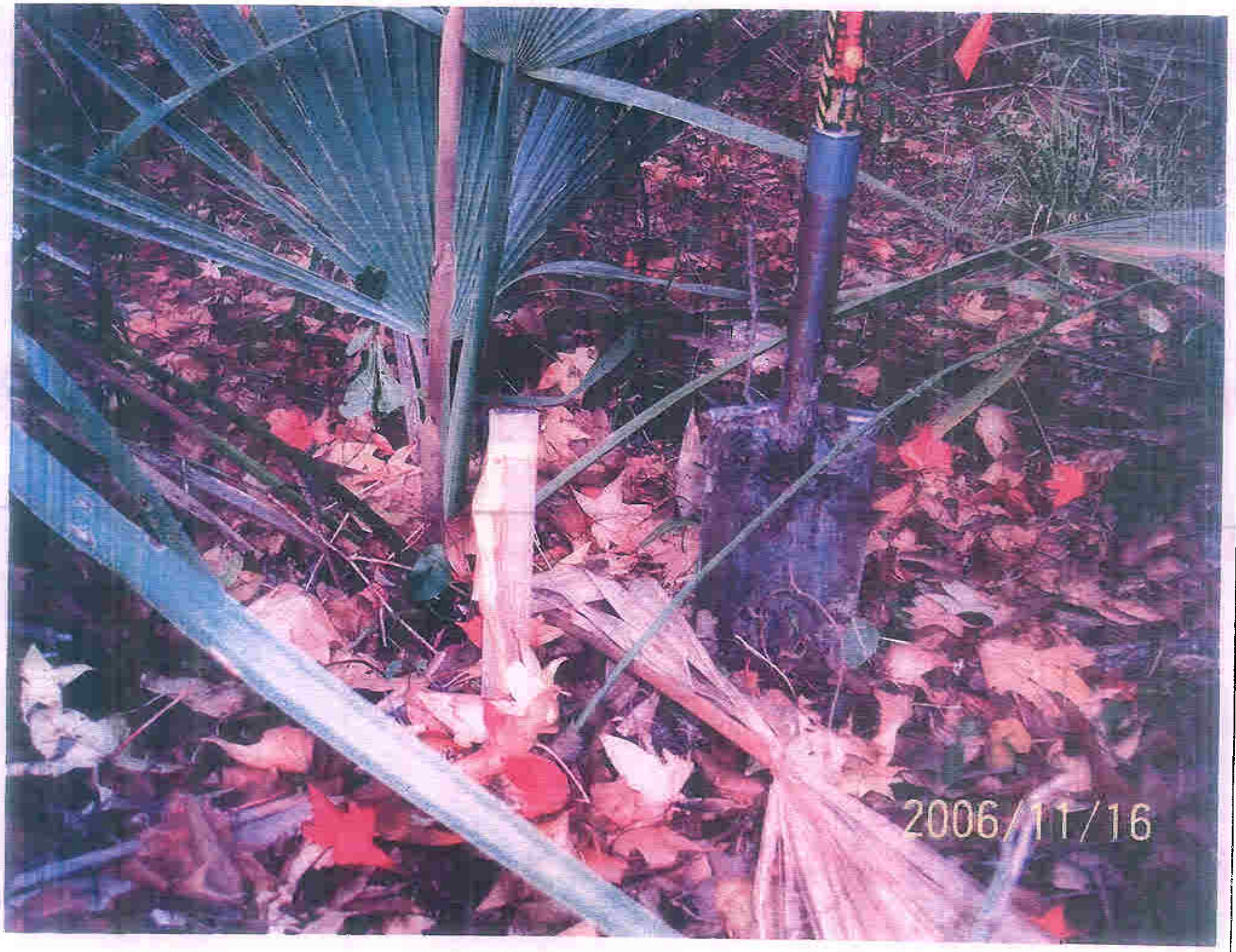
WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No (Circle)	
Wetland Hydrology Present?	(Yes) No	Is this Sampling Point Within a Wetland? (Circle) (Yes) No
Hydric Soils Present?	(Yes) No	

Remarks : broad flat - uniform elevation
hydrology appears perched or ponded from an obstruction
- road? beavers?

Approved by HQUSACE 3/92


2006/11/16


2006/11/16

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: COE 26
Applicant/Owner: DNF
Investigator: Wetland, Lofton, Ross, Badders

Date: 11/16/06
County: Lafayette
State: MS

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation)? Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBW 19

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. water oak	T	FAC
3. willow oak	T	FACW
4. Sugarberry	SS	FACW
5. Sabal minor	SS	FACW
6. Rubus trivialis	H	FAC
7. muscadine	WV	FAC
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/7 = 100%

Remarks:
FAC 4/7

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/1			
2+		10yr 5/3	10yr 5/6	fine, few, faint	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

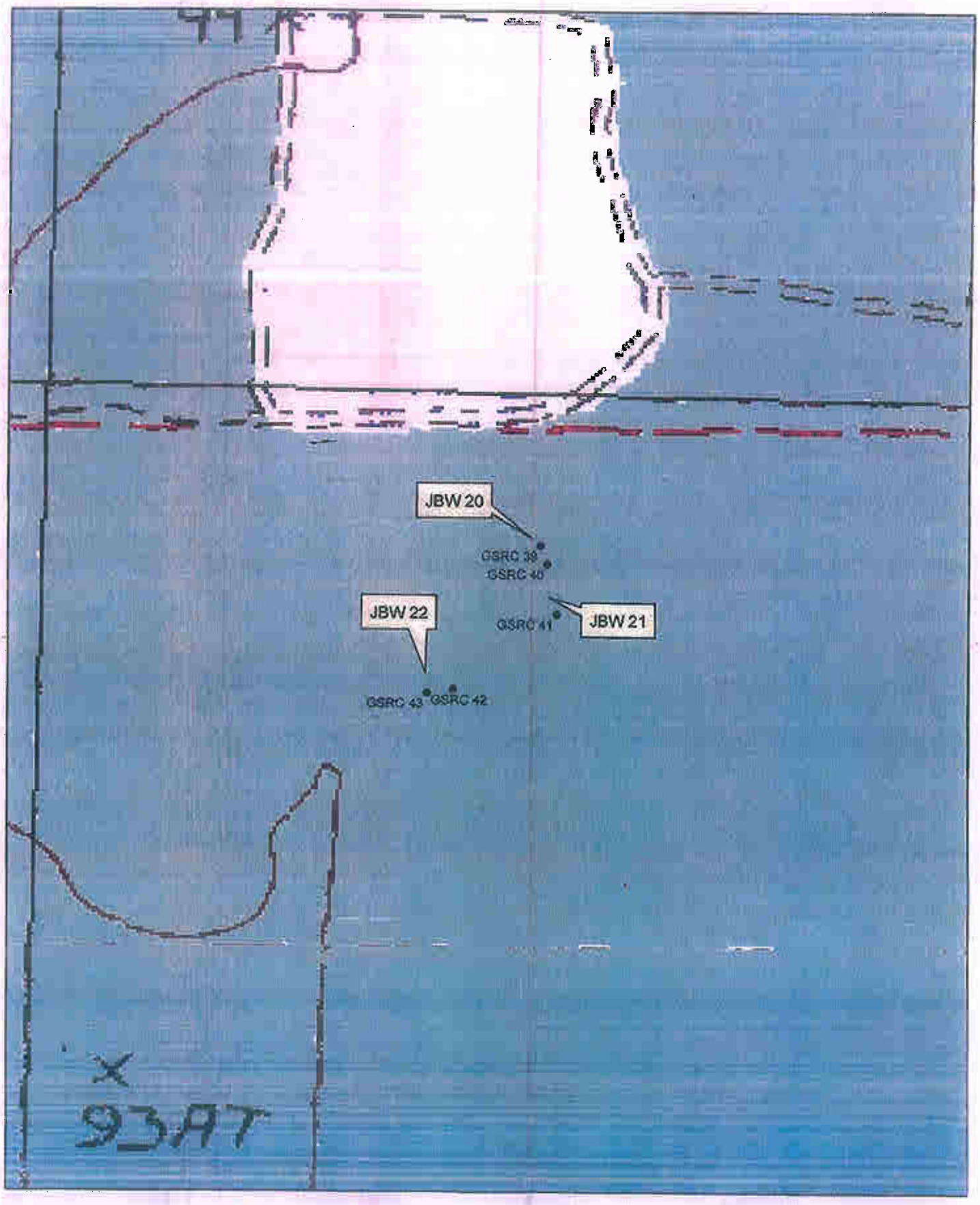
Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No) (Circle)	Is this Sampling Point Within a Wetland?	(Circle)
Wetland Hydrology Present?	Yes (No)		Yes (No)
Hydric Soils Present?	Yes (No)		

Remarks: ridge next to slough

Regulatory Pondberry Samples - November 2006 - JBW 20-22



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: CERC 39 & 40 (Temple Trahan)
Applicant/Owner: DNR
Investigator: Wetmore, Ross

Date: 11/20/06
County: Lafourche
State: LA

Do Normal Circumstances exist on the site? Yes (No)
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: TBW20

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. Persimmon	T	FAC
3. Q. nuttallii	T	OBL
4. Sugarberry	T	FACW
5. Sweetgum	SS	FACW
6. red maple (Overcup?)	SS	FACW
7. Sugarberry	SS	FACW
8. Smilax rotundifolia	H	FAC
9. T. radicans	H	FAC
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:
FAC 4/9

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks: transitional area per veg. & vicinity of slough - may need resampling

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yR 3/1			
2+		10yR 5/1	7.5yR 5/8	few, fine, faint	

Hydric Soil Indicators:

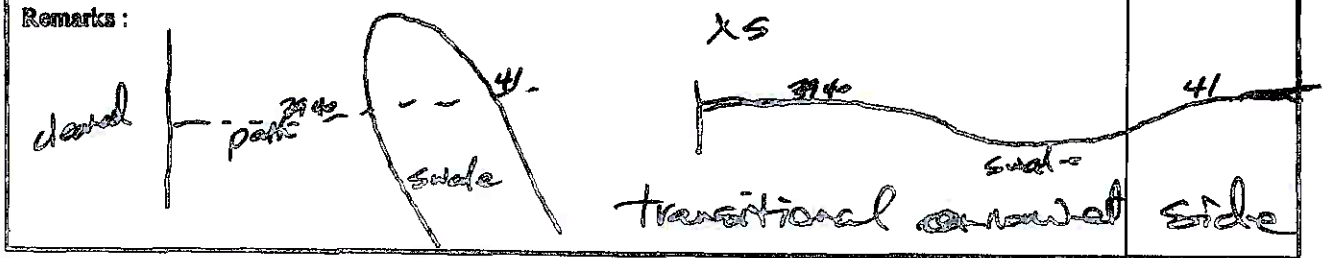
___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Ramarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes No (Circle)	touch one	(Circle)
Wetland Hydrology Present?	Yes No	Is this Sampling Point Within a Wetland?	Yes No
Hydric Soils Present?	Yes No		

Remarks :




2006/11/20

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: COAC 41 Applicant/Owner: DNF Investigator: Wiseman, Ross	Date: 4/28/06 County: Stanley State: MS
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW21

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Q. nuttallii	T	OBL	9.		
2. Q. lyrata	T	OBL	10.		
3. sweetgum	T	FAC	11.		
4. sugarberry	SS	FACW	12.		
5. sweetgum	SS	FACW	13.		
6. red maggle (drowned)	SS	OBL	14.		
7. deciduous holly	SS	FACW	15.		
8. Salix rotundifolia	H	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:

FAC 2/8 predicts positive hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 4/2			
3+		10yr 5/1	7.5yr 5/8	few, fine, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Ramarks)

Remarks:

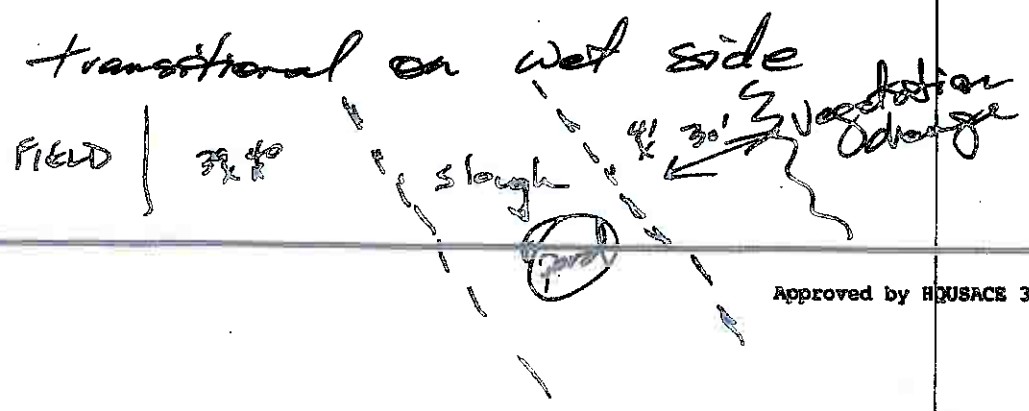
WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :

transitional or wet side




2006/11/20

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 42+43
Applicant/Owner: DNF
Investigator: WILEMAN, ROSS

Date: 11/20/06
County: SHARKEY
State: MS

Do Normal Circumstances exist on the site? Yes (No)
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBW22

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Q. nuttallii	T	OBL
2. sweetgum	T	FAC
3. sweetgum	SS	FAC
4. deciduous holly	SS	FACW
5. sugarberry	SS	FACW
6. pondberry	H SS	OBL
7. trumpet creeper	H	FAC
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/7 = 100%

Remarks:
FAC 3/7 pondberry abundant in understory

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations N/A
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/1			
2-4		10yr 4/2	7.5yr 5/8	few/fine, distinct	
4+		10yr 5/1	7.5yr 5/8	" " "	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
__L Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks: coloring monitored by video camera
the most pedestrian I (Wizard) have ever seen in our relatively small area


2006/11/20


2006/11/20

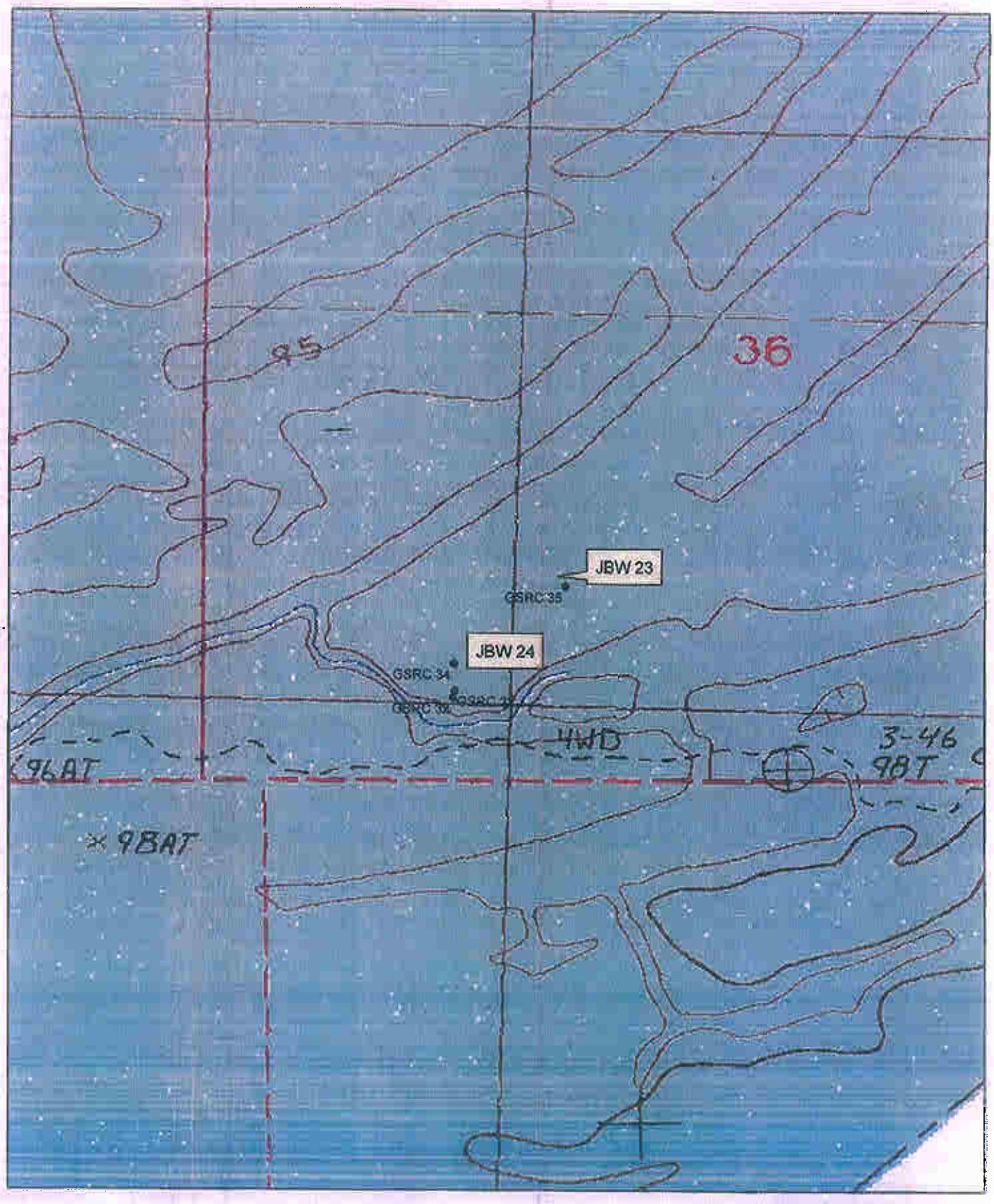

2006/11/20


2006/11/20


2006/11/20


2006/11/20

Regulatory Pondberry Samples - November 2005 - JBW 23-24



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 35 Stake not found
Applicant/Owner: DAF
Investigator: WISEMAN, LOFTON, KOSS

Date: 11/20/06
County: [illegible]
State: MS

Do Normal Circumstances exist on the site? Yes No
Is the site significantly disturbed (Atypical Situation)? Yes No
Is the area a potential Problem Area? Yes No
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBW23

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. L. americana	T	FACW
3. Deciduous holly	SS	FACW
4. Sapl miner	SS	FACW
5. Q. nuttallii	SS	OBL
6. Smilax rotundifolia	H	FAC
7. T. radicans	WV	FAC
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/7 = 100%

Remarks: FAC 3/7 Sphagnum sp. observed

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations

Depth of Surface Water: _____ (in.)
Depth to Free Water in Pit: _____ (in.)
Depth to Saturated Soil: 4 (in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
✓ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks: Surface water nearby - Beavers?

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/1			
3+		10yr 5/1	7.5yr 5/8	fine, common, distinct	

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Ramarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GRC 32, 33, 34 (Stake 32 not found) Date: 11/20/06
Applicant/Owner: DNR County: Stanley
Investigator: Wiemann, Lofton, Ross State: MS

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? Yes (No)
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID:
Transect ID:
Plot ID: JBW 24

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC
2. willow oak	T	FACW
3. Sugarberry	SS	FACW
4. deciduous holly	SS	FACW
5. S. minor	SS	FACW
6. Campsis radicans	H	FAC
7. L. styraciflua	H	FAC
8. T. radicans	WV	FAC
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 8/8 = 100%

Remarks:
FAC 4/8

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available N/A

Field Observations
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	[illegible]	loyr 4/1	7.5yr 5/8	Few, very fine,	distinct
3+		loyr 5/1	7.5yr 5/8	Common, fine,	distinct

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes No (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

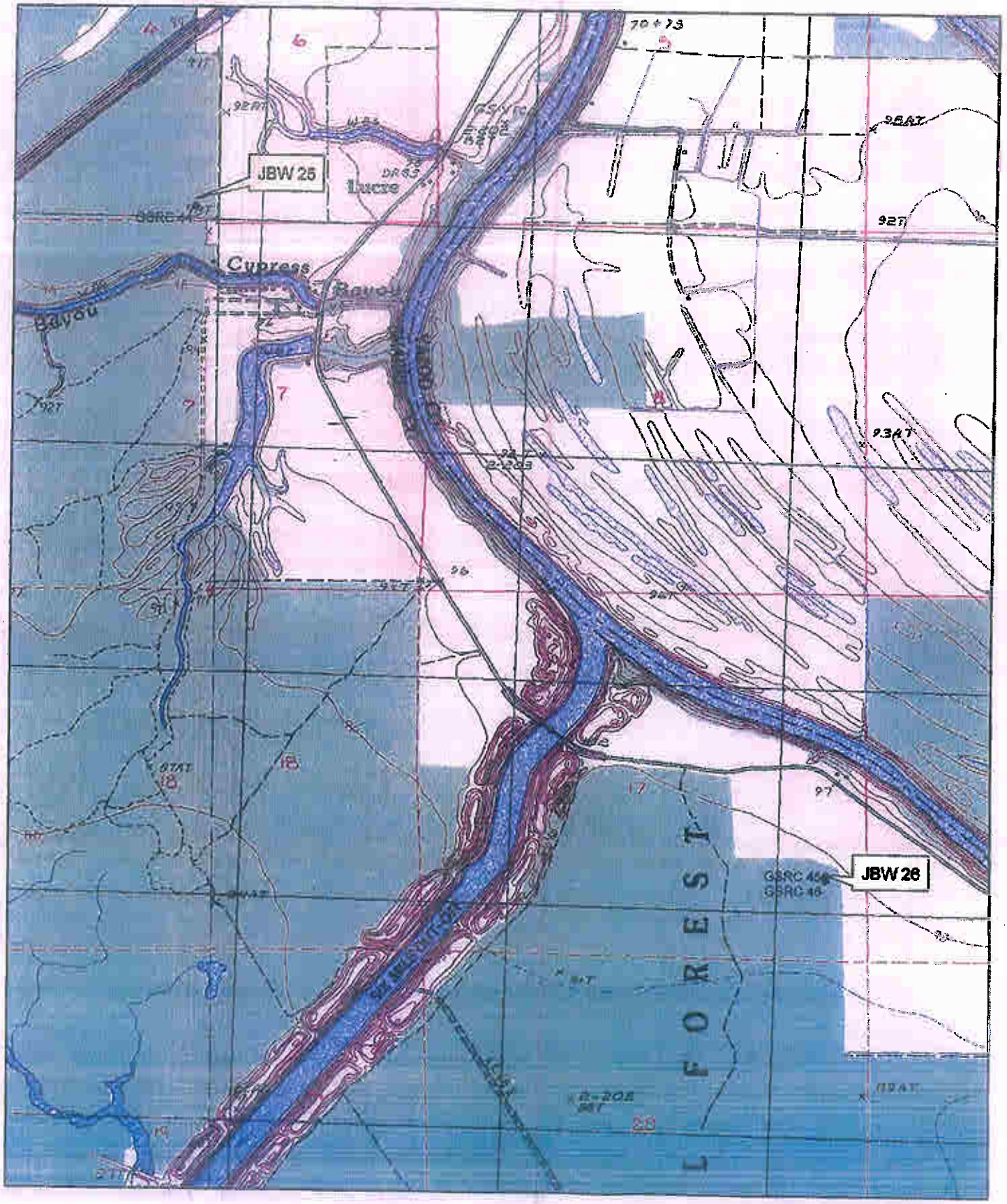
Remarks : Sensitive Plant Sign placed by USFS


2006/11/20


2006/11/20


2006/11/20

Regulatory Pondberry Samples - November 2006 - JBW 25-26



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSAC 44 Applicant/Owner: DOT Investigator: Williams & Ross	Date: 4/26/06 County: Sharkey State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: JBLDS Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC+	9. Muscadine	VV	FAC
2. American elm	T	FACW	10.		
3. Nuttall oak	T	OBL	11.		
4. Overcup oak	T	OBL	12.		
5. Red maple	S/T	FACW	13.		
6. Sweetgum	S/T	FAC+	14.		
7. Deer tongue	S/H	FACW	15.		
8. poison ivy	VV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:

4/9 FAC or FAC+ 2 OBL's

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Wetland Hydrology Indicators
Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ✓ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yr 3/2			
2+		10yr 5/1	7.5yr 5/8	Few Common, Distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks:

bad dist


Trimble
2006/11/28

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GSRC 45 & 46 (#45 stake not found)	Date: 11/28/06
Applicant/Owner: DNR	County: Sharkey
Investigator: Wiseman, Ross	State: MS
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JTW26

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC+	9. T. radicans	WV	FAC
2. willow oak	T	FACW	10.		
3. Sugarberry	SS	FACW	11.		
4. U. americana	SS	FACW	12.		
5. Sweetgum	SS	FAC+	13.		
6. Rubus trivialis	H	FAC	14.		
7. S. rotundifolia	H	FAC	15.		
8. muscadine	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100%

Remarks:

FAC 6/9

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Field Observations N/A

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/2			
3+		10yr 5/1	7.5yr 5/8	many, fine, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

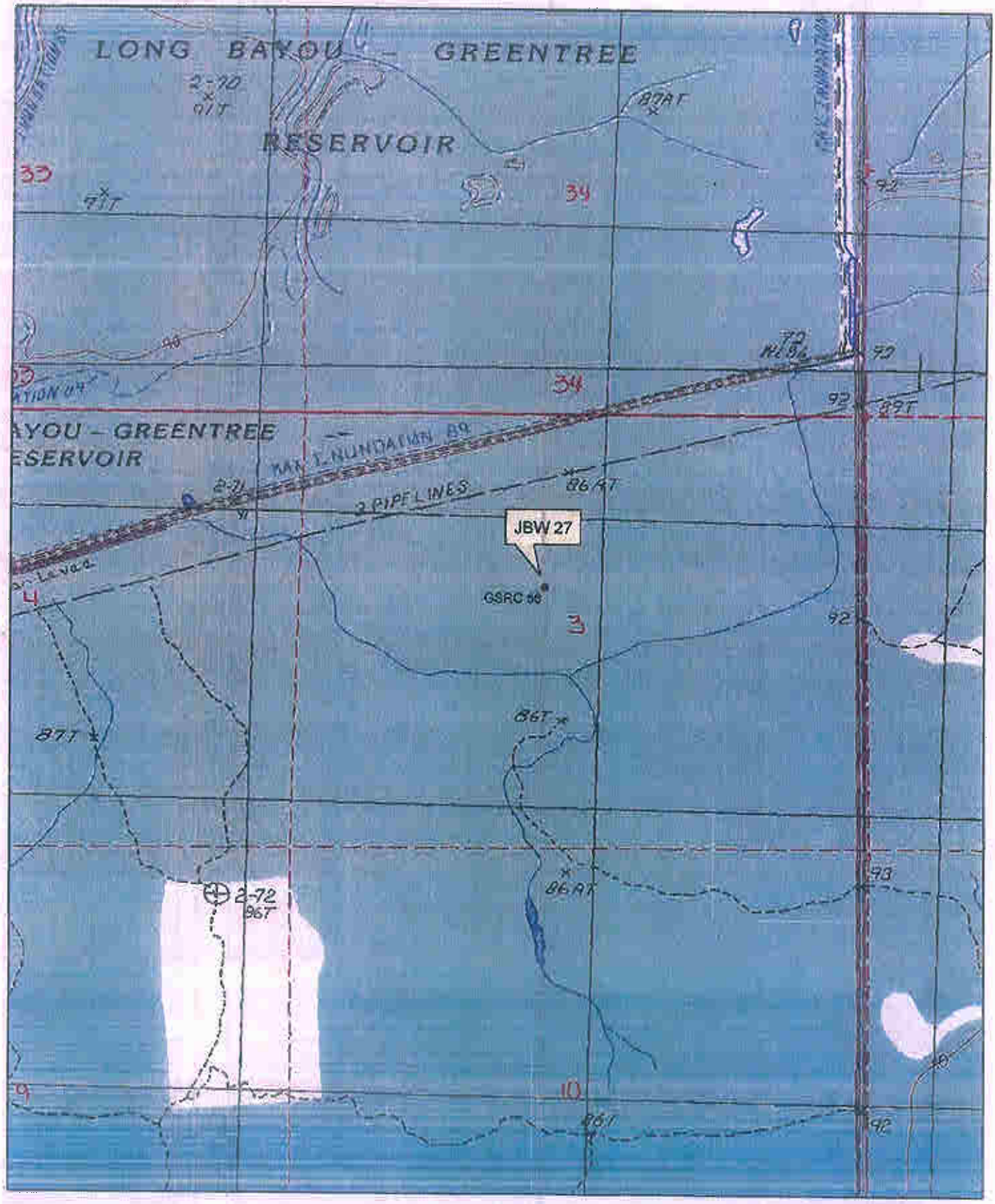
Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


Trimble
2006/11/28

Regulatory Pondberry Samples - November 2006 - JBW 27



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Corr 56 Applicant/Owner: DNF Investigator: Wiseman, Ross	Date: 11/28/06 County: [illegible] State: MS
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: JBW77

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Q. nuttallii	T	OBL	9.		
2. Q. lyrata	T	OBL	10.		
3. sugarberry	T	FACW	11.		
4. deciduous holly	SS	FACW	12.		
5. sugarberry	SS	FACW	13.		
6. P. trivialis	H	FAC	14.		
7. T. radicans	WV	FAC	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 7/7 = 100%

Remarks:

FAC 2/7 predicts hydrology 1 large cypress near plot

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Wetland Hydrology Indicators
Primary Indicators:
- ___ Inundated
- ✓ Saturated in Upper 12 Inches
- ✓ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Field Observations

Depth of Surface Water:		(in.)
Depth to Free Water in Pit:	4	(in.)
Depth to Saturated Soil:	0	(in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 4/1	7.5yr 5/8	few, fine, distinct	
3+		10yr 5/1	[illegible]	common, fine, faint	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

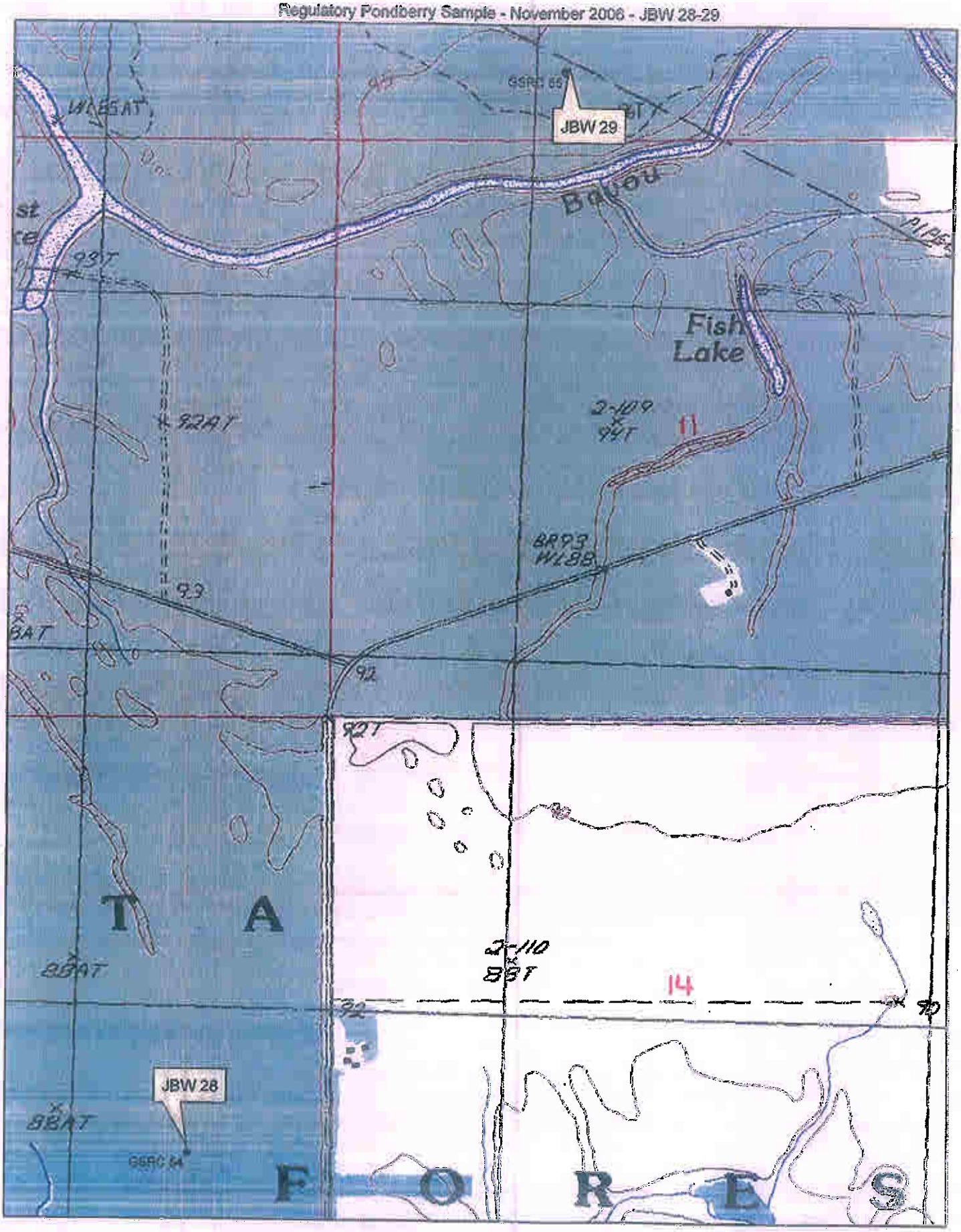
Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :


2006/11/28

Regulatory Pondberry Sample - November 2006 - JBW 28-29



DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: GRC SG Applicant/Owner: DNR Investigator: [illegible]	Date: 11/28/06 County: [illegible] State: MS
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: TA-12 Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Nuttall oak	T	[illegible]	9. Muscadine	WV	FAC
2. Sweetgum	T	FACW	10.		
3. Loblolly pine	T	FACW	11.		
4. Red holly	S	FACW	12.		
5. Sweetbay	S	FACW	13.		
6. Red elm	S	FACW	14.		
7. Soft rush	H	FAC	15.		
8. Nuttall oak	H	FACW	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 9/9 = 100 %

Remarks: only 2/9 FAC predicts hydrology

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
__X__ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3		10yr 3/2			
3+		10yr 4/1	10yr 4/6	few, common, distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks :


2006/11/28

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: LSRC SS Applicant/Owner: DAF Investigator: WREMAN, ROSS	Date: 11/28/06 County: Stanly State: NC
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: TBW29

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Willow oak	T	FACW-	9. T. radicans	WV	FAC
2. sweetgum	T	FAC+	10.		
3. Sugarberry	T	FACW	11.		
4. American elm	T	FACW	12.		
5. red maple (dwarf)	SS	OBL	13.		
6. Ulmus crassifolia	SS	FAC	14.		
7. R. trivialis	H	FAC	15.		
8. Muscadine	WV	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 5/5 = 100%

Remarks:

FAC 5/5

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available N/A

Field Observations N/A

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required)
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Taxonomy (Subgroup): _____ Field Observations
Confirm Mapped Type ? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2		10yR 3/1			
2+		10yr 5/1	7.5yR 5/8	common,fine,distinct	

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks :


2006/11/28

A Review of the Statistical Methods Used in the FWS Biological Opinion and
An Analysis of the 2000 – 2005 DNF Data

A. Dale Magoun, Ph.D.
Applied Research and Analysis, Inc.

Introduction. In their Biological Opinion, the U.S. Fish and Wildlife Service (FWS) took exception to the conclusions about pondberry colonies in the Delta National Forest (DNF) as they related to a proposed flood control project. The FWS exceptions focused on the lack of randomization of the pondberry colonies, the study design, the transformations used and the retrospective power interpretations as presented in the report. This report revisits the 2000 survey report as it relates to the concerns and recommendations of the FWS, and focuses on the 2000 study design, retrospective versus prospective power, the inclusion of the 2005 data for additional analyses, FWS's issues pertaining to localized hydrology and colony health, and a review of the statistical methods used by the FWS to support their findings in the Biological Opinion.

Study Design. Observational studies arise in all facets of scientific research. Unlike their counterpart, observational studies focus on assessing the effects of intervention strategies with data collected by a sampling plan that may violate some of the underlying concepts of randomization. An optimum study is a scientific study, which fixes or controls the experimental conditions and employs randomization techniques to assign subjects to those conditions. Studies that employ this type of control are considered to be "cause and effect" experiments. This ability to control and to randomize permits the researcher to extrapolate of the findings of such a study to a larger population. However, situations do exist where neither randomization nor physical control of the experimental conditions can be fully achieved. Experiments with restrictions such as these rely on quasi-experimental designs in order to study the effects of the experimental conditions and are called observational studies. One major advantage of an observational study is practicality in real-world settings. However, when making inferences about the findings of such a study, caution must be taken and other alternative explanations that could also affect the outcomes of the experiment must be considered. Inferences from a scientific study may imply "cause and effect," however, inferences from an observational study becomes more of "an association" rather than a "cause and effect." Observational studies arise in all areas science including, but not limited to, clinical studies, psychological studies, and environmental studies.

The DNF 2000 survey is a prime example of an observational study in that the pondberry colonies were not randomly selected, but were selected from known pondberry colonies within the questioned flood frequency zones. The COE in their Biological Assessment used profile data as evidence of an association, or for the absence thereof, between reduced flooding and pondberry colony characteristics that assessed colony health and other related characteristics. Pondberry colony health was assessed using the attributes of the number of stems per colony, the number of clumps per colony, the number of females per colony and the number of fruit bearing plants per colony. It is important to keep focused in our minds that the true experimental condition, that is, the installation of the pumping station to lessen backwater conditions has not been implemented; and that any study purporting to assess the effects of this unknown experimental condition is truly observational and must rely on field data collected using the best available scientific principles. This study was not designed as a population study within the

DNF, but was designed only to consider the potential effects of altering the flood frequencies by the proposed project on the pondberry colonies within the affected areas. The colonies were not randomly selected. Hence, the study does not represent a scientific study, but an observational study to evaluate the association of pondberry colonies with flood frequency and to investigate the effects that reduced flooding may have on pondberry colonies.

The 2000 survey data represented pondberry colonies in four flood frequency zones: 0 to 2 years, 2 to 5 years, 5 to 10 years, and greater than 10 years. The quasi-experimental design for this field study stratified 49 colonies within one of four flood zones and the hypotheses of interest were evaluated using a one-way analysis of variance (ANOVA). Biological studies involving count data are always highly variable, as count data follows the Poisson distribution. Theoretically, this implies that the variance will be linearly related to the mean. Thus, the larger the counts the larger the variance. Data such as these must be transformed in order to meet the assumptions of the ANOVA and to assess the hypotheses of interest. In the original treatment of these data, the square root transformation was used to stabilize the variances among the experimental groups. Another such transformation that will stabilize the variance is the common logarithm transformation, $\log_{10}(Y + 1)$. This transformation was recommended by the FWS and is widely used in the literature, as is the square root transformation.

The analysis of the 2000 survey data using the square root transformation could not reject the null hypothesis of no differences in the mean biological attributes between the flood zone strata. That is, the study inferred "one can conclude with a good degree of confidence that flood frequency does not affect these characteristics, and if these characteristics are a good measure of the health of the pondberry colonies, then the installation of the pumping station in the Yazoo Backwater Area should not have any serious impacts on pondberry colonies." The analysis of the attribute number of stems per colony was based on 43 colonies only. The FWS questioned this as their records indicated that there should have been 49 colonies. A search of our records cannot find any reason for the discrepancy, and hence, the new analyses are based on all 49 colonies. Using the recommended FWS transformation, as well as our original square root transformation, still does not refute the conclusions of the 2000 data report. Table 1 below shows the summary of the F-tests for both transformations.

Table 1
Summary of F-Test
2000 Survey Data Only

Characteristics	Square Root Transformation		Common Log Transformation	
	F-Ratio	P-Value	F-Ratio	P-Value
Number of Clumps	0.9645	0.4178	0.9016	0.4478
Number of Stems	1.3078	0.2835	1.4279	0.2471
Number of Dead Stems	1.7072	0.1790	2.7015	0.0567
Number of Females	0.7749	0.5142	0.8464	0.4758
Number Plants Bearing Fruit	0.6182	0.6068	0.6303	0.5993
Stem Height[1]	1.2016	0.3200	1.2016	0.3200
Average Stem Diameter[1]	0.6785	0.5698	0.6785	0.5698

1. No transformation need for this biological characteristic

Another approach to the assessment of treatment effects is the use of nonparametric procedures. Nonparametric procedures make no assumptions about distributions or variances; and hence, can be used on the raw data. The Wilcoxon Rank Sum test is a nonparametric equivalent to the one-way ANOVA, which makes use of the ranks of the data to assess shifts in the underlying distributions. It is important to note, that if the original analyses were performed using the Wilcoxon Rank Sums test, that the conclusions would not have changed. The Chi-Square (X^2) test statistics and their associated p-values by attribute were number of clumps($X^2 = 2.4143$, p-value = 0.4910, number of stems ($X^2 = 3.5678$, p-value =0.3121), number of dead stems ($X^2 = 6.7413$, p-value = 0.0806), number of females ($X^2 = 2.6551$, p-value = 0.4479), number of plants bearing fruit ($X^2 = 2.0210$, p-value = 0.5681), stem height ($X^2 =$ 3.9815, p-value = 0.2635), and average stem diameter ($X^2 = 2.2481$, p-value = 0.5225), respectively. Table 2 summarizes the Wilcoxon test for both the 2000 and the 2005 survey data.

Table 2
Wilcoxon Sum Rank Test

Characteristics	2000 Survey		2005 Survey	
	Chi-Square	P-Value	Chi-Square	P-Value
Number of Clumps	2.4143	0.4910	5.9789	0.1126
Number of Stems	3.5678	0.3121	7.2091	0.0655
Number of Dead Stems	6.7413	0.0806	NA	NA
Number of Females	2.6551	0.4479	10.6451	0.0138
Number of Fruit Bearing Plants	2.0210	0.5681	10.7712	0.0130
Stem Height[1]	3.9815	0.2635	3.9815	0.1172
Average Stem Diameter[1]	2.2481	0.5225	0.3439	0.9516

NA: Not Analyzed

The 2005 survey data exhibited mixed effects. Although the data indicated that reducing flood frequencies did not significantly change the number clumps per colony ($X^2 = 5.9789$, p-value = 0.1126), stem height per colony ($X^2 = 3.9815$, p-value = 0.1172), and average stem diameter per colony ($X^2 = 0.3439$, p-value = 0.9516); significant differences were noted for the number of females ($X^2 = 10.6451$, p-value = 0.0138) and number of plants bearing fruit ($X^2 =$ 10.7712, p-value = 0.0130), both characteristics declined with decreased flood frequencies. The remaining characteristic, number of stems ($X^2 = 7.2091$, p-value = 0.0655), indicted borderline significance and likewise exhibited lower mean values with decreased flood frequencies.

Power Calculations. The power calculations reported in the 2000 report were retrospective power calculations. Calculating retrospective power at the actual sample size and estimated effect size is somewhat non-informative and according to some authors, somewhat controversial [Hoenig and Heisey, 2001]. Retrospective power doesn't give any additional information to the significance test, but rather shows the test in a different perspective. I believe, however, that many studies fail due to an insufficient sample size needed to detect a meaningful effect size, and that retrospective power studies provides a basis to better design future studies. As such, the 2000 survey data was used to estimate the power for a sample of size 49 to detect various effect-

sizes. With the sample size of 49, the effect size was changed to reflect the case where the sum of squares of the hypothesis would be doubled, tripled, or quadrupled. With these parameters the power of being able to detect this new effect size at the given alpha level and sample size was computed along with the Least Significant Number (LSN) and the power of detecting the effect size when N = LSN. Table 3 below displays the results of this analysis for the 2000 survey data.

Table 3
Retrospective and Prospective Power Calculations
Note: Common Log Transformation and Significance Level: 0.05

Characteristic	Sigma (RMSE)	N	Effect Size	Power	LSN	Power when N = LSN
Clumps	0.28	49	0.06390	0.22005[1]	154	0.64260
			0.09037	0.41487	79	0.64251
			0.11068	0.59103	54	0.64203
			0.12780	0.72992	42	0.64774
Stems	0.72	49	0.21430	0.35712[1]	92	0.64157
			0.50504	0.98535	50	0.63650
			0.61855	0.99932	15	0.64006
			0.71424	0.99998	15	0.67133
Females	0.53	49	0.11950	0.21547[1]	158	0.64373
			0.16900	0.40575	81	0.64357
			0.20698	0.57954	55	0.63994
			0.23900	0.71839	43	0.64870
Fruit	0.69	49	0.13630	0.17278[1]	204	0.64218
			0.24435	0.49052	66	0.64003
			0.29926	0.68080	46	0.64709
			0.34556	0.81417	35	0.63810
Stem Height	7.2	49	1.95220	0.30032[1]	110	0.64144
			2.76083	0.56232	57	0.64092
			3.38131	0.75670	40	0.64897
			3.90440	0.87629	31	0.64738
Stem Diameter	0.17	49	0.03500	0.18478[1]	204	0.64144
			0.04949	0.34279	66	0.64092
			0.06062	0.49657	46	0.64897
			0.07000	0.63034	35	0.64738

1. Retrospective Power

As can be seen from this table, the retrospective power ranges from a low of 0.17278 for stem height to 0.35712 for number of stems. The LSN, the Least Significant Number, is the smallest sample size needed to detect the given effect-size. Notice from Table 3, for the effect-size to represent orders of magnitude changes the LSN are approaching the sample size selected for the study, that is, the 49 colonies. Thus, when combining the 2000 and 2005 survey data, the sample sizes of 49 for each year appears to provide enough replication for reasonable conclusions about the hypotheses of interest.

The retrospective power for these test, as noted in the FWS Biological Opinion, are not as high as the power calculations previously reported; however, now that the multiyear data surveys have been completed, and the 2000 data set updated, new power calculations were warranted.

Repeated Measures Analysis. In 2005, the COE revisited the forty-nine (49) DNF pondberry colonies and collected additional information about the health related attributes. Revisiting the sites over time represents a longitudinal study and the data arising from such a study must be analyzed using a repeated measures experimental design. In their Biological Opinion report, the FWS recommended this approach as the appropriate method of analysis when combining the multiyear data. The experimental units, the pondberry colonies, were sampled in 2000 and 2005. The reuse of the same experimental unit over time forms the basis of the repeated measure and the covariance structure that may exist should be accounted for. The repeated measures design is characterized and displayed in Table 4.

Table 4
Repeated Measures Design

Flood Zone	Colonies	2000	2005
0 to 2 years	9	X	X
2 to 5 years	23	X	X
5 to 10 years	8	X	X
> 10 years	9	X	X

Analysis of such data must use the relaxed maximum likelihood method (REML) rather than the traditional maximum likelihood method (ML). REML algorithms are available in most statistical packages, and SAS 's PROC MIXED procedure, which is one of the algorithms of choice for handling variance structures that arise from these complex designs, was used to produce the analysis of variance results from this longitudinal observational study. Our analysis, as with the analysis from the FWS report, used the common log transformation so that our subsequent analyses would be consistent with that of the FWS. In 2005 there were three colonies that exhibited no above ground pondberry characteristics. The FWS considered these as extirpated and recorded zeros for the respective biological attributes. The COE feels that this classification may not be appropriate, as there may be rhizomes from which the pondberry colony may repopulate, however, my analysis followed the FWS lead and used zeros for these missing data characteristics.

The repeated measures analysis did indicate that significant changes in the pondberry characteristics occurred between the 2000 and 2005 sampling surveys; however, the data did not support the FWS conclusion that the average pondberry colony size is greater on more frequently flooded sites and that it declined significantly between 2000 and 2005 on less frequently flooded sites. Sample year differences were present for the attributes of number of clumps per colony ($F = 18.66$, p-value < 0.0001), number of stems per colony ($F = 6.69$, p-value $= 0.0130$), number of females plants per colony ($F = 5.54$, p-value $= 0.0230$), number of fruit per colony ($F = 4.75$, p-value $= 0.0346$), average stem height per colony ($F = 11.30$, p-value $= 0.0016$), and the average stem diameter per colony ($F = 24.88$, p-value < 0.0001), and in all cases the 2005 attribute averages were significantly less than observed in 2000. However, since the interaction term

between the main effects of flood zone and sampling years (Zone*Year) was not significant, the conclusions pertaining to sampling year differences are applicable regardless of which flood zones the colonies are in, that is, regardless of the flood zone, the average pondberry characteristics observed in 2005 were significantly less than observed in 2000. When considering differences in pondberry characteristics within the four flood zones, the corresponding F-values and their respective p-values were number of clumps (F = 1.21, p-value 0.3171), number of stems per colony (F = 2.35, p-value = 0.0847), number of females (F = 1.12, p-value = 0.3505), number of fruit (F = 1.33, p-value = 0.2774), average stem height (F = 2.10, p-value = 0.1132), and average stem diameter (F = 0.53, p-value = 0.6640). As is readily observed, none of the F-tests are significant at the standard alpha level of 0.05; however, if this significance level is relaxed to an alpha level of 0.10, then one could conclude that the number of stems per colony appears to be decreasing as flood frequencies increases. Table 5 summarizes the test statistics for the above conclusions. The individual analyses of these data are given in Appendix I.

Table 5
Analysis of Variance Results
Repeated Measures

Characteristic	Source	Num-DF	Den-DF	F-Value	P-Value
Clumps	Zone	3	45	1.21	0.3171
	Year	1	45	18.66	< 0.0001
	Zone*Year	3	45	1.86	0.1491
Stems	Zone	3	45	2.35	0.0847
	Year	1	45	6.69	0.0130
	Zone*Year	3	45	0.71	0.5529
Females	Zone	3	45	1.12	0.3505
	Year	1	45	5.54	0.0230
	Zone*Year	3	45	1.63	0.1959
Fruit	Zone	3	45	1.21	0.3186
	Year	1	45	4.75	0.0346
	Zone*Year	3	45	2.10	0.1132
Stem Height	Zone	3	45.2	2.10	0.1132
	Year	1	43.5	11.30	0.0016
	Zone*Year	3	43.3	0.09	0.9647
Stem Diameter	Zone	3	42.7	0.53	0.6640
	Year	1	43	24.88	< 0.0001
	Zone*Year	3	42.8	0.59	0.6319

Conclusion. With the addition of the new data collected in 2005 and the recommendation from the FWS for using a repeated measures design, I find no evidence supporting the FWS claim that increasing flood frequency promotes better or healthier pondberry colonies. The new analysis, which includes the 2005 survey data, concludes as with the 2000 survey report that decreased flooding does not appear to significantly impact the colonies surveyed in the DNF; however, there was a significant change in the biological characteristics between the two sampling years, 2000 to 2005. These changes were observed across all four (4) flood zones strata and are not

limited to only the zones associated with less frequent flooding, as indicated in the Biological Opinion of the FWS.

To provide more insight into the distribution of the colonies across zone, Discriminant analysis was used to group the colonies into more biologically homogeneous groups, that is, colonies were clustered based on their biological characteristic and not on a given flood zone characteristic. Table 6 below displays the results of this analysis. The salient point of this analysis is the distribution of pondberry colonies over flood zones within the homogenous biological groupings, that is, of the twelve colonies in homogeneous group 1 in 2000; four colonies came from flood zone 1, six from flood zone 2 and two from flood zone 3. Of the thirteen colonies in group 2, one came from zone 1, eight from zone 2, 1 from zone 3 and three from zone 4. Of the eleven colonies in group 3, three were from zone 1, three from zone 2, four from zone 3 and one form zone 4. Of the thirteen colonies in group 4, one came from zone 1, six from zone 2, one from zone 3, and five from zone 4. Similar distributions were can be observed for the 2005 data set. The results displayed in this table implies that pondberry colonies with similar biological characteristics exist across all flood zones, that is, healthy and vibrant pondberry colonies as well as non-healthy and less vibrant colonies are not restricted to any given flood zone, but can be found in all flood zones.

Table 6
Discriminant Analysis

Flood Zone	Predicted Grouping (2000)				Total	Predicted Groupint (2005)[1]				Total
	1	2	3	4		1	2	3	4	
1	4	1	3	1	9	5	1	1	1	8
2	6	8	3	6	23	2	12	3	6	23
3	2	1	4	1	8	0	1	4	3	8
4	0	3	1	5	9	0	0	3	4	7
Totals	12	13	11	13	49	7	14	11	14	46

1. The three extirpated colonies were eliminated from the analysis due to missing data values for the average stem diameters and stem heights.

Although, the FWS Biological Opinion provided a wealth of circumstantial evidence to indicate otherwise, their conclusions did not refute the conclusions of the 2000 DNF report. On page 68 of the FWS Biological Opinion, they state, "Our ANOVA, however, also was statistically insignificant." In summary, I feel, as previously reported, that the data does not provide enough evidence to indicate that decreased flood frequency adversely impacts the biological characteristics of the surveyed pondberry colonies within the Yazoo backwater area of the DNF.

Fish and Wildlife Biological Opinion Summary Points. The U.S. Fish and Wildlife Service's Biological Opinion reported on the effects of flooding on pondberry colonies in the Delta National Forrest (DNF) and cited the following four points in their summary:

- Pondberry is not absolutely restricted to depressions, and any substantial association with depressions has not been scientifically demonstrated in terms of local hydrology or other characteristics.
- Average colony size is greater on more frequently flooded sites and pondberry has declined significantly between 2000 and 2005 on less frequently flooded sites. Statistical relationships are confounded in certain instances due to the design of the pondberry profile survey;
- Pondberry at some currently infrequently flooded sites were historically flooded more frequently prior to the completion of past flood control projects, and pondberry has declined substantially at other sites where local hydrology is supposed to exist.
- The vast majority of colonies/sites rated as excellent and good health in 2000 declined substantially by 2005.

The report continues to state, "The available evidence evaluated in the following sections mostly is secondary, however, and is subject to uncertainty from a variety of factors. Furthermore, the substantial decline in the number of pondberry between 2000 and 2005 in the absence of frequent flooding does not support the premise of the existence of an adequate local hydrology from rainfall in depressions." The FWS analysis and using the data from Tables 4 and 5 (page 108), I find these conclusions to be contrary to the information from which they were derived. The referenced tables are:

Table 4. Change in total number of pondberry plants in permanent plots, Delta National Forest, and plant density (0.25 m^2 quadrants) between 1993 and 2006, with estimated average annual change in number of plants.

Plot	N (Quadrants)	Total Plants			Average annual change, 1993-2006
		1993	1994	2006	
1	84	104	83	37	-0.0861
2	36	70	64	62	-0.0101
3	72	121	75	151	-0.0185
4	78	67	52	145	0.0643
5	100	134	87	56	-0.7027
6	36	28	12	17	-0.0416
7	110	78	91	124	0.0386
8	25	33	23	37	0.0095
9	36	67	42	175	0.0800
Total		702	529	804	

According to the report, these plots were sampled during 1993 and 1994 and then revisited in 2006. The data represents the total number of pondberry plants in these permanent plots. These data, counts of number of plants, as with the other biological characteristics that

will be considered in this summary, obey the assumptions associated with the Poisson distribution. The layout design of these plots and the underlying distribution of these data represent a longitudinal study which is also best described by the repeated measures design as discussed previously. The analysis of these data can be done in one of several ways – transforming the data so that the assumption of homogeneity of variances can be satisfied or by using generalized linear modeling procedures where the underlying distribution is set to be the Poisson. For consistency purposes, the data will be transformed using the log transformation and analyzed using the mixed procedure as before. Levene's test for homogeneity of variances was performed on the log-transformed data and was found to be not significant ($F = 1.690$, p-value = 0.1911), thus indicating that the log transformation did in fact stabilize the variances between three sampling periods. The analyses to assess mean differences among the three sampling years did not show any significant changes in the means as measured by the attribute number of stems ($F = 1.9123$, p-value = 0.1900). The only significant difference was among the plots, a difference that was anticipated since the number of quadrants in each plot was different. Plots were considered as a blocking variable, and hence, of no importance in this analysis. Table 5 of the FWS report represents a dichotomization of the plots (Table 4) into two groups – No Ponding Site and Ponding Site. The data from their study was as follows:

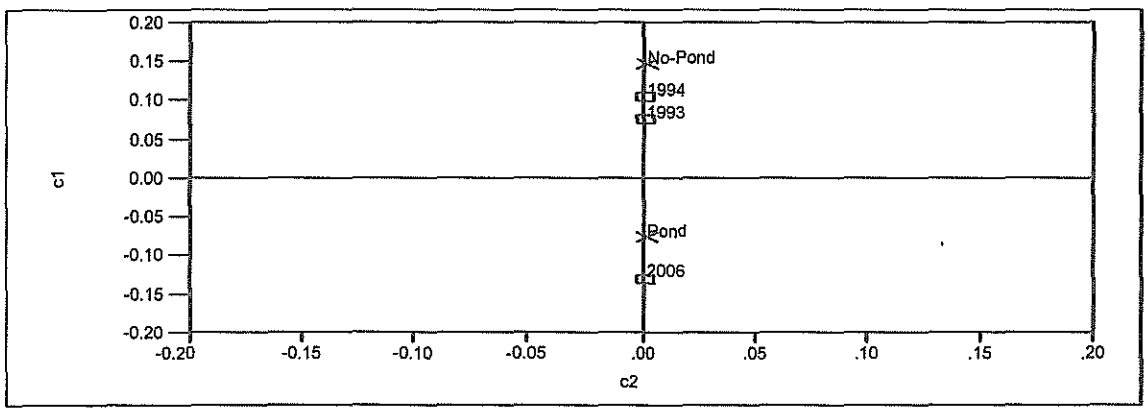
Table 5. Total number of pondberry plants by year and site from nine permanent plots at a study site (Colby) in the Delta National Forest.

Year	Observed Number of Plants		
	Site		Totals
	No-Pond	Pond	
1993	273	429	702
1994	213	316	529
2006	234	570	803
Totals	507	1315	2035

Considering this as a two-way table, the Chi-Squared "Goodness of Fit" test can be used to address the independence of rows (sampling years) and columns (sites). The results of this test yielded a test statistics of 23.150 with a p-value of <0.0001; which suggests that the rows and columns are not independent. A correspondence analysis of these data indicates that in 1993 and 1994 those colonies with the most stems were associated with the no-ponding sites. However, the opposite was true in 2006 (see Figure 1 below). In 2006 the colonies with the most stems were associated with the ponding sites. The FWS report did not emphasize this relationship; instead, the report rationalized that the 2006 increase was an isolated event and proceeded to discuss the failure of the no-ponding 2006 quadrants to return to the 1993 levels.

Between 2000 and 2006, the COE stated that no over bank flooding events occurred in the DNF. Thus, for the colonies to survive as is indicated in the FWS Table 5 data, then local hydrology must be considered as a factor in this survival. Since the 2006 plots ($X^2 = 59.56$, p-value < 0.0001) produced significantly more stems than in 1993 and 1994, this suggests that local hydrology also plays an important role for survival.

Figure 1. Correspondence Plot



Statistical Methods used in the FWS Biological Opinion.

The following sections considered some of the more relevant points of the Biological Opinion and discusses the merit of each of the findings in the order of their presentation.

Table 4. Change in total number of pondberry plants in permanent plots.

FWS Biological Opinion – (Pages 36-37) "When these permanent plots were resampled in 2006, four of the eight colonies with a net loss in 1994 had not recovered to their 1993 level (Table 4). A one-year decline of the number of plants in a colony was not, however, associated with or an accurate predictor of a continued future decline. By 2006, the loss of plants in four colonies was compensated by the increase in other colonies. The number of stems for all colonies in 2006 was greater than in 1993, with an increase of 15 percent (Table 4). The changes from 1993 to 2006 changes, however, altered colony and potential population structure due to site effects."

> **Comment:** Table 4 summarized the Wilcoxon's Rank Sum test from quadrant data measurements within a test plot. Without the actual data, verification of the Z scores and their corresponding p-values cannot be checked; however, in order to simultaneous make inferences pertaining to changes between 1993 and 2006, the significance level at the plot level should be downsized to ensure an overall confidence level, say 95%. Since these are independent plots, then the plot comparison alpha should be 0.0056. At this level the overall confidence level would be at least 0.95. With this level of significance, only plots 1, 4 and 5 are significant; the remaining 6 plots produce nonsignificant z tests. Hence, 3 of the 9 plots show a significant decrease in the number of stems and 6 of the 9 plots do not support this finding. If one treats these data as a randomized complete block design and using the common log transformation, the F statistic for comparing among the three years is 1.8857 with an associated p-value of 0.1839, which indicates no significant differences in total plants among the three sampling years. The only significant differences observed with these data are among plots, which would be expected since the number of quadrants varies among plots.

Table 5. Total number of pondberry plants by year and site from nine permanent plots at a study site in DNF. H_0: change in number of plants independent of site.

FWS Biological Opinion – (Page 37) "The total number of plants declined in the ponded and non-ponded colonies from 1993 to 1994, but independently of these site factors ($X^2 = 0.24$, $p = 0.62$). By 2006, the number in the ponded sites had increased greater than the number in 1993, but plants in the adjacent non-ponded areas had not recovered from the 1993 losses (Table 5). Pondberry in or on the edge of two vernal pools increased at a greater proportionate rate than pondberry in the non-ponded adjacent stands (Table 5, $X^2=16.04$, $p = 0.00001$). Even so, individual colonies within each site responded differently. The net increase in plants from three of the five ponded colonies exceeded the losses from the two declining colonies. In the non-ponded area, the number of plants by 2006 in two of the four colonies surpassed the number available in 1993, but the net increase was insufficient to compensate for the decline in the remaining two colonies (Figure 3)."

> **Comment.** Treating the data of the Table 5 as a 2 by 3 contingency table of the number of pondberry plants by site and year, the Chi-square "Goodness of Fit" test does indicate that the number of plants observed during the three sampling periods (1993, 1994 and 2006) are not independent of the sites in which they are located ($X^2 = 23.150$, p-value < 0.0001). The data indicated that there were more pondberry in the 2006-ponding sites that what would have been expected if the rows and columns of the table were independent. This was not the case of the non-ponding sites. In the non-ponding sites, under the assumption of independence of rows and columns, there were more plants observed than what would have been expected in 1993 and 1994 and fewer plants than what would have been expected in 206. The FWS Biological Opinion documented further stated on page 62 that there was no evidence to conclude that pondberry is maintained in depressional ponds; however, it appears that their data contradicts this statement. It appears that without ponding the number of plants did not return to their 1993 level, but with ponding they far exceeded their 1993 levels.

Table 9. Strands surveyed (acres) on Delta National Forest for pondberry, above and below the 1-year floodplain, and expected acres surveyed. H_0: Acres surveyed are proportionate to the total forest available above and below 1-year floodplain.

FWS Biological Opinion – (Page 48) "According to the Corps (Appendix 14, pg. 14-16), about 60 percent of the DNF is below the 1-year flood frequency, where about 24.4 percent of the stands have been comprehensively surveyed by U.S. Forest Service staff and about 12.6 percent of the known colonies are located. However, based on acres surveyed, the 1-year floodplain has been surveyed proportionately less than areas above the 1-year flood frequency (Table 9)."

> **Comment.** The author of the Biological Opinion was merely pointing out that more acres in the above 1-yr floodplain area was surveyed than in the below 1-year floodplain area. Stratification of survey areas places more emphasis on the area that will be most affected by the proposed project.

Table 10. Actual and expected values for acres of sands in DNF surveyed for pondberry and number of pondberry colonies/sites, in wetlands (FEAT) and non-wetlands.

FWS Biological Opinion – (Page 48) "More wetland acres were surveyed than non-wetland, reflecting the general trend that there exists more wetland overall in DNF (Table 10). The actual wetland acreage surveyed, however, is less than what would be expected by an independent or proportionate survey. Likewise, the actual wetlands that were not comprehensively surveyed are less that what would be expected. The differences are not substantial. The acres of non-wetlands surveyed (6,497) were about 12.0 percent greater than expected (5,796 acres), and the surveyed wetlands (13,016) were 5.4 percent less than expected (13,757). Unsurveyed non-wetlands (11,747 acres) were about 5.9 percent less."

> **Comment.** Calculations appear to be correct. The implications of these findings are unclear and may not be relevant to the study. According to the footnotes of the table, jurisdictional wetlands are those located on or below the elevation of the 5 percent duration backwater flood occurring once every two years on the average. If this is to include the colonies located in flood frequencies of less than 3 years, then the study would have at most 13 sites (flood frequency < 3.0). Also, as with the comment on Table 9, it appears to me that more emphasis would be placed on the non-wetland sites as this is the area where one might expect the most impact of the project.

Tables 22-26. Comparison of pondberry colony health rating for 49 profiled (GSRC) sites, in Delta National Forest, 2000 and 2005.

FWS Biological Opinion – (Pages 63-64) "The greatest change in colony health ratings between 2000 and 2005 was in the excellent category (Table 22). In 2000, about 40 percent of the colonies were rated excellent, which was reduced to 13 percent in 2005. This shift from excellent to good health ratings increased the number and proportion of colonies in the good category. There was no association between colony health classification rank and the rank change in number of pondberry from 2000 to 2005...."

> **Comment.** There is nothing wrong with the statistical procedure from which the FWS founded their conclusions (logit analysis). However, it is paramount to note that the technicians used in 2005 to rate health were not the same as in 2000. Since this is an arbitrary rating technician differences are confounded with yearly differences. Thus, one cannot conclude with any degree of confidence about the changes from one health category to another. Additionally, I could not duplicate some of the entries given in Tables 23, 24 and 25. According to our tabulations, Table 23 is as follows:

Table 23 – FWS tabulations in ( )

Health Score	Changes in Number of Plants				Total Colonies
	Increase (+)	%	Decrease(-)	%	
Excellent – 4	3	16.6	15 (16)	83.4	18
Good – 3	5 (7)	23.8	16 (18)	76.2	21
Fair – 2	0	0.0	2	100.0	2
Poor – 1	0	0.0	0	0.0	0
Total	8 (10)	12.2	33 (36)	87.8	41

Table 24 – FWS tabulations in ( )

Health Score	Change in Number of Plants			Total Colonies
	> 10%	+/- 10%	< 10%	
Excellent – 4	3	4	15	22
Good – 3	5	4 (5)	16 (15)	25
Fair – 2	0	0	2	2
Poor – 1	0	0	0	0
Total	8	8 (9)	33 (36)	46

Table 25 – FWS tabulations in ( )

Health Score	Number of plants by year		Percent Change
	2000	2005	
Excellent – 4	10,485	4,769 (5,296)	-54.5 (-49.5)
Good – 3	1,107	1,649 (1,349)	48.9 (21.9)
Fair – 2	156	240 (130)	53.4 (-16.7)
Poor 0 1	0	177 (0)	100.0 (0.0)

Tables 27 – 38. Repeated Measures

FWS Biological Opinion – (Pages 64-65) The FWS used a repeated measures experiment to evaluated relationships between the performance of the pondberry colonies and flood frequencies. In their analysis, the data were transformed using the common log transformation prior to doing any computations that make up the body of an analysis of variance table. Doing this should stabilize the within group variances, which is one of the most important assumptions of this parametric statistical procedure. The FWS used the MIXED procedure from the Statistical Analysis System (SAS) after establishing the rudimentary assumptions of homogeneity of variances and normality after invoking the common log transformation. Their analysis (reported on pages 64 and 65) is as follow: "Results revealed that the average colony size (number of pondberry) was affected by both flood frequency (P=0.0847) and year (P=0.0130). The mean number of plants per colony declined between 2000 and 2005 (P=0.0130). Colonies also were significantly different depending on flood frequency. Colonies on the 0-2 year floodplain were larger than colonies on the 11+ year floodplain (P = 0.095), but not significantly different from those on the 305 and 6-10 year floodplain. Colonies on the 3-5 year floodplain were greater than those on the less frequently flooded 6-10 (P=0.083) and 11"

year floodplain (P=0.029). In 2005, the mean colony size differed significantly by flood frequency (P=0.0444). Between years, colonies on the 11+ year floodplain in 2005 were significantly less than colonies in 2000."

Comment. The analysis performed by the FWS is appropriate. The layout of the design in which colonies were visited on multiple occasions serves as the basis for the repeated measures design and pointed out by the FWS, the data collected from these sites should be correlated. Hence, a variance-covariance structure should be expected and accounted for. The appropriate algorithm for this type of data is the relaxed maximum likelihood method and is the basis for the MIXED procedure offered by the SAS system. This procedure did show that differences were present between the sampling years of 2000 and 2005 for the biological characteristics of number of clumps, number of stems, number of female plants within the colony, and the number of fruit bearing plants within the colony. In the FWS Biological Opinion report, the authors focused only on one of these characteristics, number of stems. Their analysis and p-values are correctly computed; however, they used a relaxed alpha level of 0.10 to formulate their inferences. Relaxing alpha to 0.10 (in lieu of the standard 0.05) is at the discretion of the analyst and establishes a larger rejection region for the hypotheses of interest. Alpha levels of 0.05 or 0.01 could have and ~~have~~ been used in biological impact studies such as this. What is import here is that the interaction term between floodplain and year is not significant. The implication of this is that not only did the pondberry colonies decrease in the number of plants between 2000 and 2005, the decrease occurred in each floodplain level. Additionally, the authors chose to use the least significant difference (LSD) test to delineate all possible pairwise differences. In doing so, the Bonferroni adjust should have been made to the significance level and as with the analysis from Table 4 should have been reduced so that the overall confidence level could remain at the 90 percent level (alpha = 0.10). With the six comparisons the comparison level alpha should have been set to 0.0167. This indicates that none of the reported pairwise comparisons for number of plants are significant. Additionally, the authors then decided to perform a one-way analysis of variance of this characteristic for each year (Tables 32 and 37). These analyses are redundant and should not have been done. Table 32 indicates a non-significant F and hence the means present in Table 33 all for one homogeneous group. Table 37 indicates that a difference in floodplain levels is present (F = 1.5529, p=0.0451). The mean separation for this set of means indicates that level the number of plants appears to be declining by the 11+ year floodplain. This difference represents one change from the conclusions of the repeated measures design and at the 0.10 level of significance 1 change in 10 could have occurred at random. More importantly one should not decompose the repeated measures design into the two one-way designs. The main feature of the repeated measures is that it uses all 98 observations; whereas, the individual one-way designs are only using 48 observations.

Table 30. Correlation coefficients and regression for number of pondberry colonies during 2000 and 2005.

FWS Biological Opinion – Could not find where FWS interpreted the results of Table 30.

Comment. While the correlation and regression coefficients presented in Table 30 indicate good relationships between the number of pondberry plants found in 2000 and 2005, a more beneficial use of these relationships would be an analysis of covariance using the 2000 data as the covariate. The analysis using this approach indicates that the slopes of the regression lines are homogeneous ($F = 0.4327$, p-value = 0.7370) and that the main effect of floodplain level is not significant ($F = 1.3922$, p-value = 0.2588). This analysis supports the findings of the previously discussed repeated measures design.

Tables 31 – 38. Summaries of Single Factor analysis of variance (2000 and 2005).

Comment. Analyses are correctly done using both the square root and common log transformation on the raw data. This work, however, is redundant and should not be interpreted along with the repeated measures analysis shown in Tables 27 and 28. See comments above.

Table 37. T-Test.

Comment. The t-tests given in Table 40 are also redundant as with the single-factor analysis of variance given in the previous tables. It is simply comparing sampling year 2000 to sampling year 2005, which is more appropriately done in the repeated measures experiment. This table, however, is only used in the context of displaying why transformations on biological data are needed.

Tables 41-64.

Comment. Tables 41-64 reference classification variables which are not available at the time of this writing. The classification variables were non-wetland sites during 1901-1931, percent duration interval, GSRC colonies that only showed increase colony size from 2000 to 2005, DEM and FEAT classifications, and etc. Although the analysis is straight forward, I could not verify the accuracy of the results. Albeit, this analysis may provide a subjective look into the past, the interpretations are just that – subjective. Without prior data during the sampling windows reference in the FWS Biological Opinion, one can only speculate as to the impacts of prior projects on the pondberry colonies in the DNF.