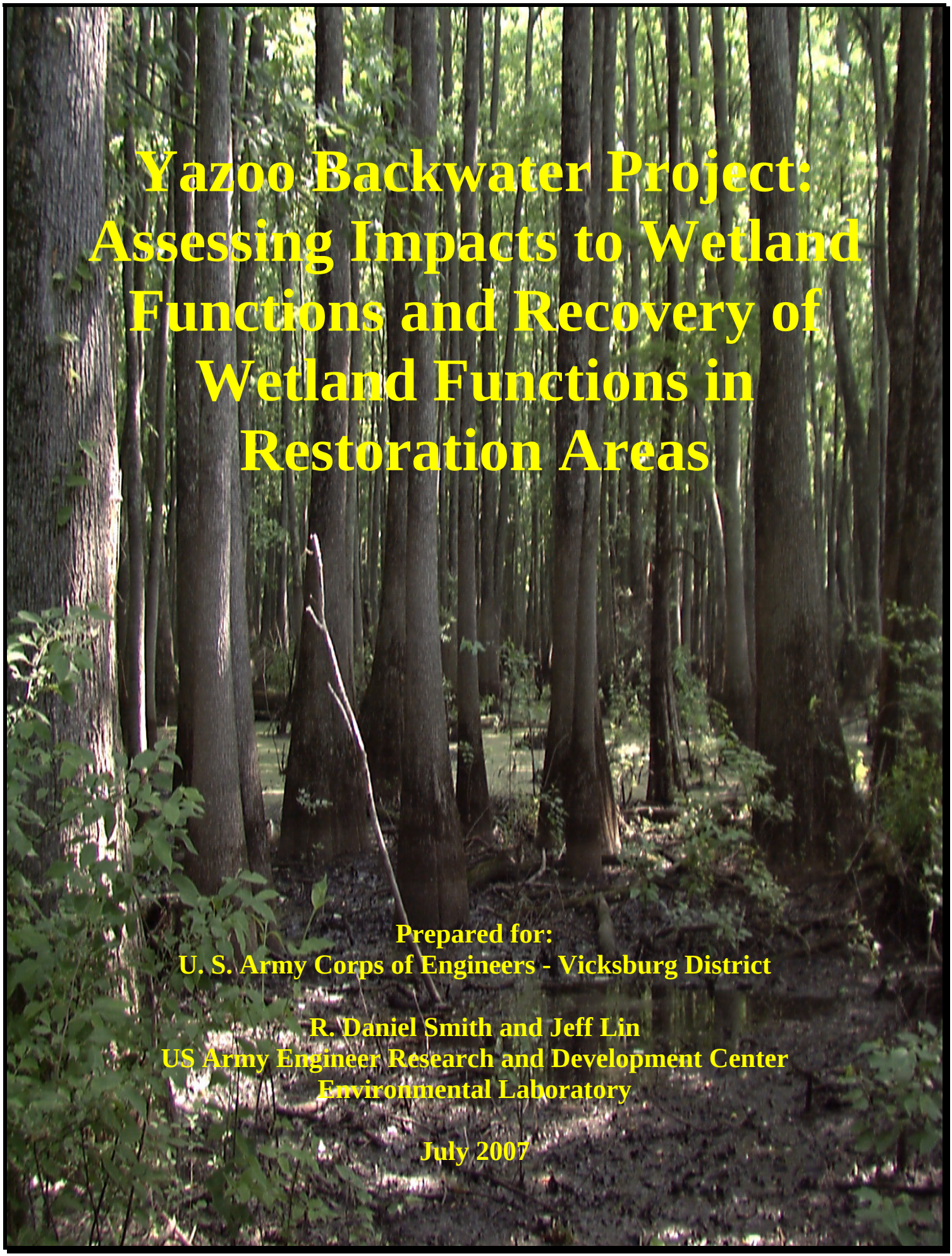
SUPPLEMENT B

YAZOO BACKWATER PROJECT: ASSESSING IMPACTS TO WETLAND FUNCTIONS AND RECOVERY OF WETLAND FUNCTIONS IN RESTORATION AREAS



Yazoo Backwater Project: Assessing Impacts to Wetland Functions and Recovery of Wetland Functions in Restoration Areas

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Yazoo Backwater Project: Assessing Impacts to Wetland Functions and Recovery of Wetland Functions in Restoration Areas

1.0 Introduction

The Yazoo River Basin is the large drainage basin that lies east of the Mississippi River between Memphis, TN and Vicksburg, MS. The basin has complex hydrology and geomorphic settings that once supported a diversity of natural communities. However, over the past century, much of the basin has been converted to agriculture. A few large patches of forest remain in the Delta National Forest and other isolated locations.

Flooding problems in the Yazoo Backwater Area are significant. Approximately 630,000 acres are subject to inundation by the 100-year flood event. The U.S. Army Corps of Engineers, Vicksburg District, is reformulating the remaining unconstructed features of the Yazoo Backwater Area Project in the Yazoo Basin, Mississippi. An array of nonstructural, structural, and combination of plans emphasizing increased urban flood protection, reduced agricultural intensification, and fewer adverse environmental impacts are being evaluated. The Vicksburg District has proposed ten alternative plans for the Yazoo Backwater Project Alternative plans, which are fully described in the main report, include:

Alternative Plan 1
Alternative Plan 2
Alternative Plan 2a
Alternative Plan 2b
Alternative Plan 2c
Alternative Plan 3
Alternative Plan 4
Alternative Plan 5
Alternative Plan 6
Alternative Plan 7

The YBP is expected to have Construction impacts on wetlands due to the placement of pumps and other infrastructure Plans 2B, 3-7. Hydrologic impacts on wetlands due to the

alteration of the extent and duration of backwater flooding in portions of the lower Yazoo Basin occur on these same plans. The Vicksburg District has developed GIS coverage for the YBP project area that defines the percent duration of backwater flooding during the growing season under pre-project conditions, and for each of the alternative plans under two different post-project scenarios. The first post-project scenario, identified throughout this document as "B1", assumes that the Big Sunflower River Maintenance Project (U.S. Army Corps of Engineers – Vicksburg District 1997) has no hydrologic influence on the YBP. The second post-project scenario, identified throughout this document as "B2", assumes that the Big Sunflower River Maintenance Project is in place and has a hydrologic influence on the YBP. Calculations of the percent duration of backwater flooding during the growing season were based on predictions of backwater flooding produced from the Flood Event Simulation Model (FESM) an adaptation of the Flood Event Assessment Tool (Ballard and Kress 1999).

The US Army Corps of Engineers - Vicksburg District requested that the Engineering Research and Development Center (ERDC), Environmental Lab, Wetlands and Coastal Ecology Branch assess the impacts of the proposed Yazoo Backwater Project (YBP) on wetland functions, and estimate the potential for proposed non-structural and other restoration areas to offset the impacts of the YBP using the Yazoo Basin Regional Guidebook (Smith and Klimas 2002).

2.0 Methods

The procedures and models used to assess impacts to wetland functions and the recovery of wetland functions for the YBP are fully described in the Yazoo Basin Regional Guidebook (Smith and Klimas 2002). Specific modifications to the models and procedures described in the Regional Guidebook are described in following two sections respectively.

2.1 Modification of the Yazoo Basin Regional Guidebook Models

The first modification consisted of revisions to the assessment models for the Export Organic Carbon, Physical Removal of Elements and Compounds, Biological Removal of Elements and Compounds, and Provide Fish and Wildlife Habitat functions. Revisions to these models were made to take advantage of the newly available data related to the percent duration of backwater flooding during the growing season. In practice, the model revisions involved development of a subindex curve for the new "percent duration of backwater flooding during the growing season" variable, and revision of several assessment models to add or substitute the duration variable for the flood frequency variable.

At the time the Yazoo Basin Regional Guidebook was being developed, data on duration of backwater flooding was not available, and therefore not incorporated into assessment models. However, the authors recognized at the time that the addition of duration data could improve the assessment models (Smith and Klimas 2002, page 120). The improvement is related to the fact that the frequency of flooding variable only indicates whether or not flooding occurs at a prescribed interval, whereas, the duration of flooding variable adds an indication of the length of time flooding occurs.

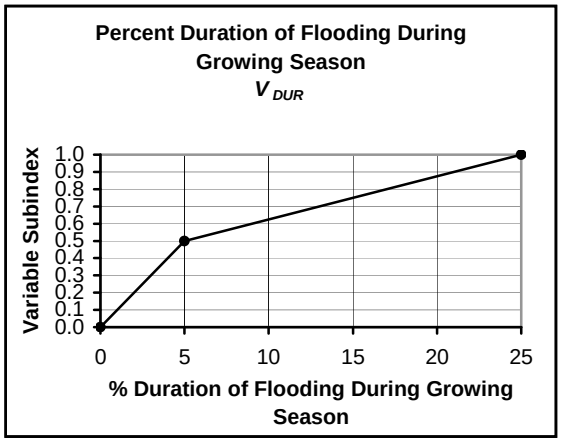

Figure 1. Subindex curve for the V_{DUR} variable

Figure 1 shows the relationship developed for the percent duration of flooding during the growing season (V_{DUR}) and the performance of a function. Backwater areas in the Yazoo Basin do not exceed 25% duration during the growing season (based on stage duration data provided by the Vicksburg District). Specific modification of assessment models in relation to the V_{DUR} variable is discussed below.

2.1.1 Function 4: Export Organic Carbon

The original model for Export Organic Carbon was constructed as follows:

$$FCI = V_{FREQ} * \frac{\left[\frac{(V_{OHOR} + V_{WD} + V_{SNAG})}{3}\right] + \left[\frac{V_{TBA} + V_{SSD} + V_{GVC}}{3}\right]}{2}$$

The model for the Export Organic Carbon Function was revised by adding, and double weighting, the V_{DUR} variable.

$$FCI = (((V_{DUR} * 2) + V_{FREQ}) / 3) * \frac{\left[\frac{(V_{OHOR} + V_{WD} + V_{SNAG})}{3}\right] + \left[\frac{V_{TBA} + V_{SSD} + V_{GVC}}{3}\right]}{2}$$

In the Export Organic Carbon Function, the addition of the V_{DUR} variable compliments the V_{FREQ} variable, which indicates that flooding does occur, by adding an indication of the length of time flooding occurs. The double weighting reflects the greater importance of the length of time flooding occurs versus the fact that flooding does periodically occur. The addition of the V_{DUR} variable to the model makes it possible to account for several important processes in the Export of Carbon Function. These include the leaching of the labile portion of organic carbon, the breakdown of refractory carbon, and the physical export of organic particles.

The first portion of the V_{DUR} curve (Figure 1) is steep reflecting the fact that labile carbon, which constitutes approximately 25% of total organic carbon, is removed rapidly within seven days (Brinson 1977). Refractory carbon is lost at much slower rate and consequently the slope of the curve above 5% is less. It is assumed that most of the refractory carbon in floodplain systems is exported over a one year period.

2.1.2 Function 5a: Physical Removal of Elements and Compounds

The original model for Physical Removal of Elements and Compounds was constructed as follows:

$$FCI = V_{FREQ} * \left[\frac{(V_{CEC} + V_{OHOR} + V_{AHOR})}{3}\right]$$

The original Remove Elements and Compounds Function was split into two separate functions including the Physical Removal of Elements and Compounds and the Biological Removal of Elements and Compounds. The Physical Removal of Elements and Compounds Function addresses those elements and compounds (i.e., phosphorus and other elements and compounds adsorbed to soil particles) that are removed primarily by the physical process of settling. The Biological Removal of Elements and Compounds Function addresses the elements and compounds that are removed by biological processes. The Biological Removal of Elements and Compounds Function is discussed in the next section.

The revised Physical Removal of Elements and Compounds model was constructed as follows:

$$FCI = (((V_{DUR} * 2) + V_{FREQ}) / 3) * V_{POND}$$

In the physical removal of elements and compounds model the variables V_{CEC}, V_{AHOR}, and V_{OHOR} were deleted because in the physical removal process (i.e., settling) a source of carbon to provide energy to drive biological processes is unnecessary. The variable V_{POND} is also added to the model to reflect the capture of suspended particles in micro-depressions following subsidence of floodwater. These two variables are averaged in the model. In addition, the V_{DUR} variable was added and double weighted.

As in the Export Carbon Function, the addition of the V_{DUR} variable compliments the V_{FREQ} variable. The V_{FREQ} variable indicates whether or not flooding occurs at a site, and the V_{DUR} variable indicates how long flooding occurs. Both these variables capture important elements of the Physical Removal of Elements and Compounds Function. The double weighting of the V_{DUR} variable reflects the greater importance of the length of time flooding occurs versus the fact that flooding does periodically occur.

For the V_{DUR} variable the first portion of the curve is steeper due to the more rapid settling of larger particles. The latter portion of the curve levels off as the size of the settling particles decrease in size (Figure 1).

2.1.3 Function 5b: Biological Removal of Elements and Compounds

The Remove Elements and Compounds Function was split into two separate functions including the Physical Removal of Elements and Compounds and the Biological Removal of

Elements and Compounds. The Biological Removal of Elements and Compounds Function addresses the elements and compounds removed by biological processes (e.g., nitrogen).

The revised Biological Removal of Elements and Compounds model was constructed as follows:

$$FCI = (((V_{DUR} * 2) + V_{FREQ}) / 3) \frac{\left[\frac{(V_{OHOR} + V_{WD} + V_{SNAG})}{3}\right] + \left[\frac{V_{TBA} + V_{SSD} + V_{GVC}}{3}\right]}{2}$$

As in the Export Carbon Function and Physical Removal of Elements and Compounds Function, the addition of the V_{DUR} variable compliments the V_{FREQ} variable. The V_{FREQ} variable indicates whether or not flooding occurs at a site, and the V_{DUR} variable indicates how long flooding occurs. Both these variables capture important elements of the Biological Removal of Elements and Compounds Function. The double weighting of the V_{DUR} variable reflects the greater importance of the length of time flooding occurs versus the fact that flooding does periodically occur.

For the V_{DUR} variable the first portion of the curve, up to two weeks (i.e., 5% duration of backwater flooding during the growing season), is steep, reflecting relatively rapid denitrification that results from an abundance of available nitrogen and carbon energy sources in the system (Figure 1). The latter portion of the curve levels off reflecting the depletion of available nitrogen and carbon sources in the system.

2.1.4 Function 7: Provide Fish and Wildlife Habitat

The original Provide Fish and Wildlife Habitat Function was constructed as follows:

$$FCI = \left\{\left[\frac{(V_{FREQ} + V_{POND})}{2}\right] \times \left[\frac{(V_{T\,COMP} + V_{SNAG} + V_{TBA})}{3}\right] \times \left[\frac{(V_{LOG} + V_{OHOR})}{2}\right] \times \left[\frac{(V_{TRACT} + V_{CONNECT} + V_{CORE})}{3}\right]\right\}^{1/4}$$

The model for the Provide Fish and Wildlife Habitat Function was revised by adding the V_{DUR} variable to the model.

$$FCI = \left\{ \left[\left[\frac{\left(V_{DUR} + V_{FREQ} + V_{POND} \right)}{3} \right] \times \left[\frac{\left(V_{T\,COMP} + V_{SNAG} + V_{TBA} \right)}{3} \right] \times \left[\frac{\left(V_{LOG} + V_{OHOR} \right)}{2} \right] \times \left[\frac{\left(V_{TRACT} + V_{CONNECT} + V_{CORE} \right)}{3} \right] \right] \right\}^{1/4}$$

As in the Export Carbon Function, Physical Removal of Elements and Compounds Function and the Biological Removal of Elements and Compounds Function, the addition of the V_{DUR} variable compliments the V_{FREQ} variable in this model. The V_{FREQ} variable indicates whether or not flooding occurs at a site (i.e., As in the Export Carbon Function, Physical Removal of Elements and Compounds Function and the Biological Removal of Elements and Compounds Function, the addition of the V_{DUR} variable compliments the V_{FREQ} variable in this model. The V_{FREQ} variable indicates whether or not aquatic organisms can access a floodplain area), and the V_{DUR} variable indicates how long flooding occurs (i.e., how long of a period can aquatic and terrestrial organisms utilize the floodplain habitat for feeding, reproductive and other activities. Both these variables capture important elements of the Provide Fish and Wildlife Function. Second, for the Provide Fish and Wildlife Habitat Function.

For the V_{DUR} variable the first portion of the curve, up to two weeks (i.e., 5% duration of backwater flooding during the growing season) is steep, reflecting the opportunistic and broad-based utilization of the floodplain by aquatic species. The latter portion of the curve levels off reflecting the completion of reproductive activities and the depletion of certain food resources utilized by aquatic organisms (Figure 1).

2.2 Modification of the Yazoo Basin Regional Guidebook Procedures

A second modification was made because of the large size of the assessment area. It was not possible, or practical, to sample the entire assessment area as prescribed in the Yazoo Basin Regional Guidebook. Therefore, an alternative procedure, consistent with available time, resource, and accessibility constraints was used. The assessment area was classified into six land cover types including: 1) mature forest (dominant trees >50 years of age), 2) middle aged forest, (dominant trees 20-50 years of age, 3) early aged forest /planted BLH restoration areas (dominant trees<20 years of age), 4) agricultural, 5) recently logged, and 6) other. The “other” land cover type included permanent water bodies, catfish ponds, roads, and other areas where a change in function would not occur as a result of project impacts. Impact areas were classified

by land cover types using 1996 digital ortho quarter quadrangles (DOQQ) obtained from the Mississippi Automated Resource Information System (MARIS) website http://www.maris.state.ms.us/. Throughout this document, this land cover classification will be referred to as the ERDC land cover classification to distinguish it from the land cover classification developed by the CEMVK based on interpretation of satellite imagery. The CEMVK landuse provided a greater definition of agricultural lands, but provided limited definition of forested lands. The greater definition of agricultural lands (crop types) was unimportant to the assessment of wetland functions. The DOQQs allowed the forest class to be subdivided into four classes based on stand development, which enabled a more refined wetland functional analysis. In early 2007, the original land cover classification was updated using recent satellite imagery to reflect changes in land cover that had occurred since the 1996 aerials were flown. These revisions were minor, consisting primarily of reclassifying agricultural lands that had succeeded to early age forest. Examples of aerial photo signatures and ground level views for the cover types 1-5 are shown in Figures 2-7 below.

2.3 Identification of the Assessment Areas for Construction and Hydrologic Impacts

2.3.1 Construction Impact Assessment Area

The US Army Corps of Engineers - Vicksburg District provided ERDC with GIS coverage (i.e., ArcView shape files) of construction impact areas by location (Figure 8). These polygons were defined as the construction impact assessment area. The construction impact assessment area was the same for Plans 3-7 which involved the construction of a pump staton. Plans 2, 2A, 2B, and 2C did not involve a pump station and constructed primarily of nonstructural features. The ERDC land cover classification theme was clipped using the GIS coverage of construction impact areas to determine the number of acres in each land cover type impacted.

2.3.2 Hydrologic Impact Assessment Area

The hydrologic impact assessment area was based on GIS coverage provided by CEMVK. This GIS coverage showed the percent duration of backwater flooding during the growing season under pre-project conditions in four percent duration bands including a 5.0% - 7.5% band, >7.5% - 10% band, >10 – 12.5% band, and >12.5% band (Figure 8). The U.S. Army Corps of Engineers – Vicksburg District determined that areas with less that 5% backwater flooding during the growing season were not considered to be wetlands, and therefore would not be

impacted by the YBP. For this reason, the analysis was restricted to those areas within the YBP project area where the duration of backwater flooding during the growing season is greater than 5%. The assessment area was defined as the area encompassed by all four bands under pre-project conditions (Figure 8). The size of the assessment area was 188,730 acres. The entire assessment area occurred within the regional subclass Riverine Backwater, therefore, the models from the Yazoo Basin Regional Guidebook for this subclass were used to conduct the analysis.

Figure 2. Mature forest and recently logged aerial photo signatures

Figure 3. Middle aged forest and early aged forest aerial photo signatures

Figure 4. Example of an early aged forest stand

Figure 5. Example of a middle aged forest stand

Figure 6. Example of a mature forest stand

Figure 7. Example of a recently logged stand

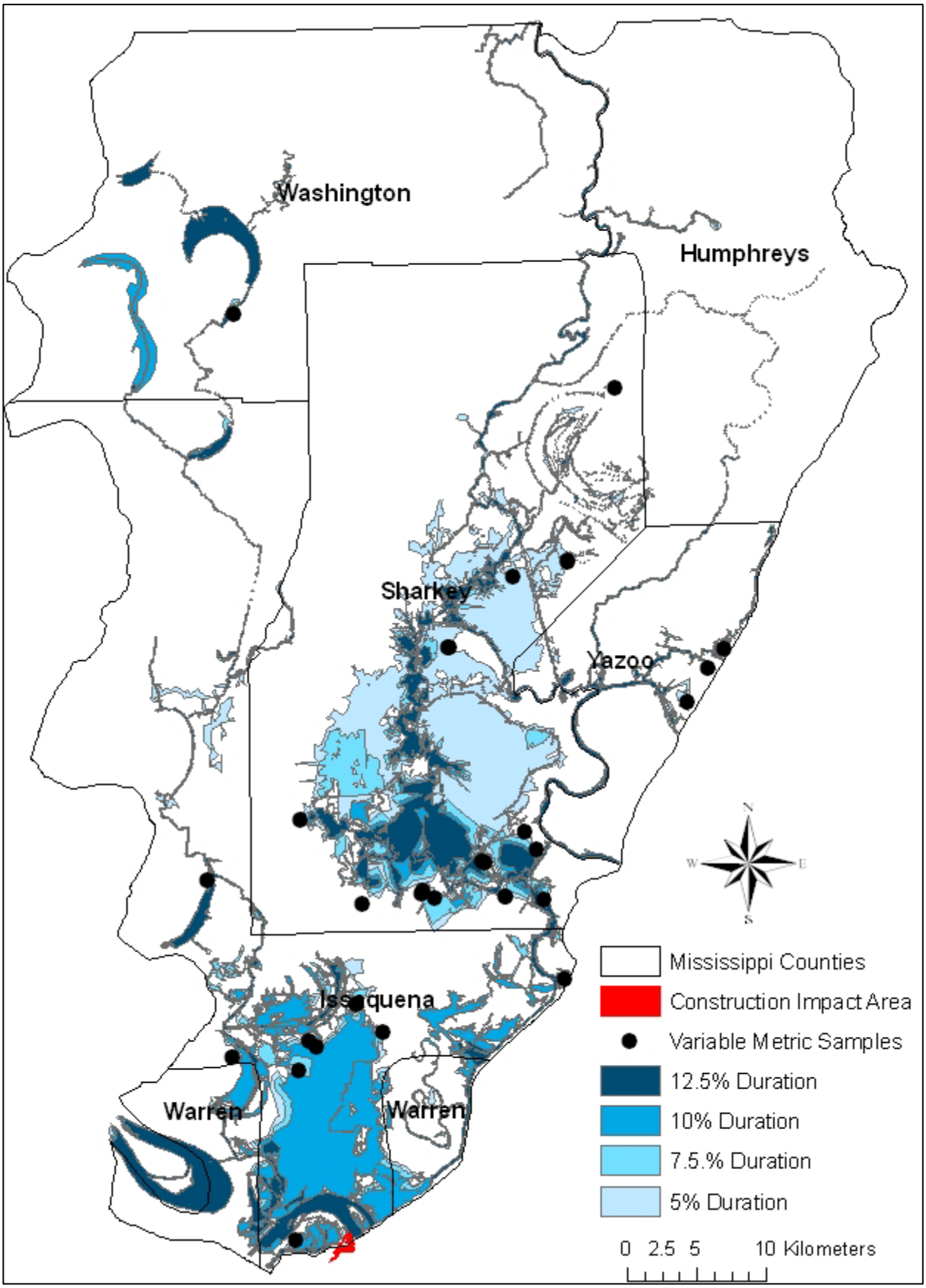

Figure 8. Construction impact area, percent duration bands, and variable metric sample points

2.4 Assessment of Wetland Functions Under Baseline Conditions

A representative number of field sampling sites were selected to represent land cover types 1-5 (see Section 2.2) using a stratified random approach across the assessment area (Figure 8). Accessibility constraints prevented us from visiting all field sites initially selected. At the field sites visited, we verified the initial land cover type and sampled for variables in the Riverine Backwater assessment models per the methods in the Yazoo Basin Regional Guidebook. The number of sample plots collected for each land cover type were as follows: 1) mature forest – 39 sample sites, 2) middle aged forest – 9 sample sites, 3) early aged forest / planted BLH restoration areas – 21 sample sites, 4) agricultural – 4 sample sites, 5) recently logged – 12 sample sites. Areas classified as "other" were not sampled or included in any of the subsequent analyses. Using the data collected at field sampling sites, a "typical" metric value for each assessment model variable was calculated for each of the land cover types (Table 1). This metric value was used to calculate the variable subindex and Functional Capacity Indices (FCI) for each of the functions in each land cover type under baseline condition.

2.5 Assessment of Hydrologic Impacts to Wetland Functions

Assessment of post-project conditions required simulation of the conditions that could be expected to occur as a result of implementing each of the YBP alternative plans. These changes consisted solely of a shift in the percent duration of backwater flooding during the growing season. In order to assess these changes, we used GIS coverage supplied by CEMVK that indicated "polygons of changing duration" within the assessment area for each plan. This information was generated using the FESM model with the assumed post-project hydrology of each alternative plan in place. For example, under the Plan 3 some of the areas within the 10% - 12.5% duration range under baseline condition shifted to the 7.5% - 10%, 5% - 7.5%, 2.5-5%, or <2.5% duration range. Using the polygons of changing duration information, post-project metric values were calculated for the percent duration variable, subindices, and FCI for each alternative. As with the baseline analysis, the "typical" values for each land cover type were utilized for all other variables in determining the variable subindex

Table 1. Variable metric values and sub-indices for 5% to 7.5% duration of flooding during growing season (baseline)

Variable	Land Cover Types									
	Mature Forest		Middle Aged Forest		Early Aged Forest / Planted / Pasture		Agricultural		Recently Logged	
	Metric Value	Subindex	Metric Value	Subindex	Metric Value	Subindex	Metric Value	Subindex	Metric Value	Subindex
V_{TRACT}	3000	1.00	3000	1.00	3000	1.00	3000	1.00	3000	1.00
V_{CORE}	50.0	1.00	50.0	1.00	50.0	1.00	50.0	1.00	50.0	1.00
$V_{CONNECT}$	50.0	1.00	50.0	1.00	50.0	1.00	50.0	1.00	50.0	1.00
V_{FREQ}	2.0	1.00	2.0	1.00	2.0	1.00	2.0	1.00	2.0	1.00
V_{POND}	31.1	0.78	49.3	1.00	12.1	0.30	25.0	0.63	28.8	0.72
V_{SOIL}	0.0	1.00	0.0	1.00	0.0	1.00	50.0	0.50	0.0	1.00
V_{CEC}	0.0	1.00	0.0	1.00	0.0	1.00	50.0	0.50	0.0	1.00
V_{TBA}	28.0	1.00	22.8	1.00	1.1	0.05	0.0	0.00	5.8	0.29
V_{TDEN}	339.0	1.00	741.3	0.65	45.1	0.18	0.0	0.00	103.3	0.41
V_{SNAG}	46.6	1.00	33.4	1.00	0.0	0.00	0.0	0.00	10.5	0.53
V_{TCOMP}	93.0	0.93	94.2	0.94	29.3	0.29	0.0	0.00	70.5	0.71
V_{COMP}	93.0	0.93	94.2	0.94	81.6	0.82	0.0	0.00	81.5	0.82
V_{WD}	206.1	0.82	14.4	0.06	22.4	0.09	0.0	0.00	93.2	0.37
V_{LOG}	67.2	1.00	11.6	0.46	20.9	0.83	0.0	0.00	85.0	0.80
V_{SSD}	1389	0.93	1583	1.00	3673	1.00	0.0	0.00	1156	0.77
V_{GVC}	14.2	1.00	19.5	1.00	36.1	1.00	25.0	1.00	45.2	0.94
V_{OHOR}	1.5	0.88	2.3	1.00	0.7	0.66	0.0	0.50	1.2	0.80
V_{AHOR}	5.0	1.00	5.0	1.00	5.0	1.00	10.0	0.50	5.0	1.00
V_{DUR}	6.25	0.53	6.25	0.53	6.25	0.53	6.25	0.53	6.25	0.53

and FCI. Post-project FCI were then multiplied by the area of each land cover type to determine post-project FCU.

2.6 Assessment of Construction Impacts to Wetland Functions

Construction impacts to wetlands were the same for Plans 3-7, and consisted of the area required for the placement of pumps and other infrastructure (Figure 8). Plans 2, 2A, 2B, and 2C were primarly nonstructural plans. Thirty-eight acres of forested wetlands were impacted by the construction of the pump station in Plans 3-7. Construction impacts were assessed by multiplying the baseline Functional Capacity Index (FCI) of each land cover type by the acres of each land cover type impacted. This calculation provided a measure of Functional Capacity Units (FCU) under baseline conditions, which is a measure of annual construction impacts since the impacts will be permanent.

2.7 Recovery of Wetland Functions in Restoration Areas

Proposed restoration areas consist of cleared, agricultural lands within the two-year floodplain. Based on 2005 land use, the current estimate is that there are 95,700 acres available for restoration in the two-year floodplain. In order to determine how the eight wetland functions in these areas will recover over time, the Riverine Backwater assessment models were run under current conditions (Year 1) as well as ten-year time intervals (Years 10, 20, 30, 40, 50) to represent change in function over the proposed life of the project. Recovery of wetland functions over the 50 year period of analysis was simulated using the variable recovery trajectory curves (Figure 9) from the Yazoo Basin Regional Guidebook (Smith and Klimas 2002). A comparison was then made in terms of FCI and FCU to determine how functions could be expected to change in the restoration areas over the period of analysis.

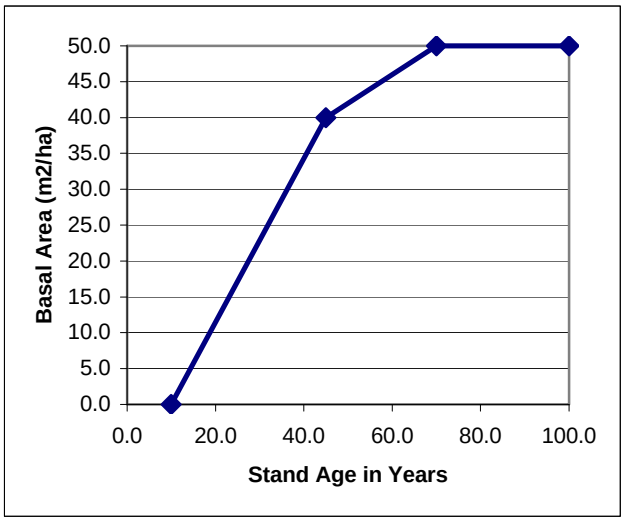

Figure 9. Example of a recovery trajectory curve for the basal area variable

The following assumptions were made in order to calculate FCI for restoration areas. The metric values for the V_{TRACT}, $V_{CONNECT}$, and V_{CORE} landscape variables were all set to reference condition because the metric values for these variables will remain unknown until the actual restoration sites has been identified. It is unlikely that these variables will exhibit reference condition in all the restoration areas that are ultimately selected, and therefore the projections for gain in FCU in restoration areas is preliminary, and subject to change, but conservative estimates of variable values were used to assure that functional values would likely be underestimated. This underestimation will result in lower wetland functional values of the restored wetlands, thereby requiring more mitigation acres to offset wetland losses. The metric value for the V_{FREQ} variable was set based on the assumption that all restoration areas would be within the two-year floodplain. The metric value for the V_{POND} variable was set to zero for Year 1, then incremented to 5, 10, 20, 30, and 40 for Years 10, 20, 30, 40, and 50 respectively to reflect the natural development of microdepressional areas in maturing forest areas. The metric value for the V_{SOIL} and V_{CEC} variables were set based on the assumption that no altered soils exist in the restoration area. The same caveats that apply to the V_{TRACT}, $V_{CONNECT}$, and V_{CORE} landscape variables also apply to these variables. The metric value for the V_{COMP} variable was set so the resulting subindex would be 1.0. This was based on the assumption that the planting specifications in the restoration plan include the appropriate species. The metric value for the V_{TCOMP} variable was set so that the subindex would be 0.0 until year 15 at which time we assumed that 20% cover of trees will be achieved. At this point it is assumed that the metric valued will be reset to 1.0 and then remain at 1.0 for the duration of the 50 year period of analysis. This is based on the assumption that the planting specifications in the restoration plan include the appropriate species. The metric valued for the V_{DUR} variable was set to 0.5 based on the assumption that the percent duration of backwater flooding will be <5% (this is a conservative assumption; average duration of lands within the 1-year floodplain is greater than 8%).

2.8 Analysis Time Frame

The analysis reflects baseline conditions at a single point in time dictated by the date of the aerial photography use to classify land cover types (1996) as adjusted with the 2005 land use, and the date of field work (2002). The 1996 DOQQ land use categories were modified with the 2005 satellite imagery to reflect the increase early aged forestland found on WRP lands.Projections for restoration areas are based on these baseline conditions at the same point in

time. Changes in the baseline conditions that occur subsequent to this point in time (i.e., reforestation of agricultural lands) are not reflected in the results simply because these changes cannot be accurately predicted. However, because of the time it takes for newly reforested areas to accumulate biomass, we believe the results of this analysis will not change significantly for 15-20 years after the point in time on which this analysis is based.

3.0 Results

3.1 Hydrologic Impacts

3.1.1 Change in Acreage Within Duration Ranges

Tables 2-25 show the change in baseline duration by land cover type for Plans 2b, 3, 4, 5, 6 and 7 under the B1 scenario, and Tables 26-49 show the same change for the B2 scenario. For example in Table 2, 6,866 acres of mature forest in the 5%-7.5% duration range under baseline conditions shifted to the <2.5% duration range under Plan 2b. Calculations for these tables are in the worksheets "Plan 2b (B1), Plan 3 (B1), etc. and the Plan 2b (B2), Plan 3 (B2) etc. in the attached spreadsheet. It was assumed that the change in duration would be permanent and remain in effect for the life of the project. Plans 2, 2a, and 2c had no hydrologic impacts under the B1 or B2 scenario.

Table 2. Plan 2b (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 2b <2.5	Base 5-7.5 to Plan 2b 2.5-5	Base 5-7.5 to Plan 2b 7.5-10	Base 5-7.5 to Plan 2b 10-12.5	Base 5-7.5 to Plan 2b >12.5
Mature Forest	6824	0	0	0	0
Middle Aged Forest	207	0	0	0	0
Early Aged Forest	5612	0	0	0	0
Recently Logged	2	0	0	0	0
Agricultural	9418	0	0	0	0
Other	581	0	0	0	0
Total	22645	0	0	0	0

Table 3. Plan 2b (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 2b <2.5	Base 7.5-10 to Plan 2b 2.5-5	Base 7.5-10 to Plan 2b 5-7.5	Base 7.5-10 to Plan 2b 10-12.5	Base 7.5-10 to Plan 2b >12.5
Mature Forest	14580	0	0	0	0
Middle Aged Forest	56	0	0	0	0
Early Aged Forest	6737	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	4008	0	0	0	0
Other	267	0	0	0	0
Total	25648	0	0	0	0

Table 4. Plan 2b (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 2b <2.5	Base 10-12.5 to Plan 2b 2.5-5	Base 10-12.5 to Plan 2b 5-7.5	Base 10-12.5 to Plan 2b 7.5-10	Base 10-12.5 to Plan 2b >12.5
Mature Forest	2720	0	0	0	0
Middle Aged Forest	81	0	0	0	0
Early Aged Forest	5843	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	4296	0	0	0	0
Other	93	0	0	0	0
Total	13033	0	0	0	0

Table 5. Plan 2b (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 2b <2.5	Base >12.5 to Plan 2b 2.5-5	Base >12.5 to Plan 2b 5-7.5	Base >12.5 to Plan 2b 7.5-10	Base >12.5 to Plan 2b 10-12.5
Mature Forest	6588	0	0	0	0
Middle Aged Forest	483	0	0	0	0
Early Aged Forest	10477	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	8276	0	0	0	0
Other	4954	0	0	0	0
Total	30778	0	0	0	0

Table 6. Plan 3 (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 3 <2.5	Base 5-7.5 to Plan 3 2.5-5	Base 5-7.5 to Plan 3 7.5-10	Base 5-7.5 to Plan 3 10-12.5	Base 5-7.5 to Plan 3 >12.5
Mature Forest	11771	1361	11	0	0
Middle Aged Forest	246	13	0	0	0
Early Aged Forest	6628	484	3	0	0
Recently Logged	35	0	0	0	0
Agricultural	9171	2036	23	0	0
Other	172	533	1	1	0
Total	28023	4427	38	1	0

Table 7. Plan 3 (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 3 <2.5	Base 7.5-10 to Plan 3 2.5-5	Base 7.5-10 to Plan 3 .5-7.5	Base 7.5-10 to Plan 3 10-12.5	Base 7.5-10 to Plan 3 >12.5
Mature Forest	6568	11707	8328	10	0
Middle Aged Forest	19	26	480	0	0
Early Aged Forest	3496	3318	1976	0	0
Recently Logged	26	0	0	0	0
Agricultural	1946	1825	2640	0	0
Other	30	89	155	1	0
Total	12085	16965	13579	11	0

Table 8. Plan 3 (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 3 <2.5	Base 10-12.5 to Plan 3 2.5-5	Base 10-12.5 to Plan 3 5-7.5	Base 10-12.5 to Plan 3 7.5-10	Base 10-12.5 to Plan 3 >12.5
Mature Forest	2757	954	6810	3697	3
Middle Aged Forest	45	2	35	25	0
Early Aged Forest	430	490	2809	1231	0
Recently Logged	27	1	3	0	0
Agricultural	147	382	2021	1114	0
Other	173	3	48	16	2
Total	3580	1831	11726	6083	5

Table 9. Plan 3 (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 3 <2.5	Base >12.5 to Plan 3 2.5-5	Base >12.5 to Plan 3 5-7.5	Base >12.5 to Plan 3 7.5-10	Base >12.5 to Plan 3 10-12.5
Mature Forest	0	0	1451	5943	3730
Middle Aged Forest	0	0	2	24	53
Early Aged Forest	0	0	327	2390	2815
Recently Logged	0	0	1	4	3
Agricultural	0	0	90	1078	1926
Other	0	0	3	113	179
Total	0	0	1874	9552	8705

Table 10. Plan 4 (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 4 <2.5	Base 5-7.5 to Plan 4 2.5-5	Base 5-7.5 to Plan 4 7.5-10	Base 5-7.5 to Plan 4 10-12.5	Base 5-7.5 to Plan 4 >12.5
Mature Forest	10754	2138	0	0	0
Middle Aged Forest	225	25	0	0	0
Early Aged Forest	6431	594	0	0	0
Recently Logged	36	0	0	0	0
Agricultural	8760	2160	0	0	0
Other	132	527	0	0	0
Total	26338	5444	0	0	0

Table 11. Plan 4 (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 4 <2.5	Base 7.5-10 to Plan 4 2.5-5	Base 7.5-10 to Plan 4 5-7.5	Base 7.5-10 to Plan 4 10-12.5	Base 7.5-10 to Plan 4 >12.5
Mature Forest	3787	2545	18662	0	0
Middle Aged Forest	6	7	455	0	0
Early Aged Forest	927	2055	5475	0	0
Recently Logged	22	0	4	0	0
Agricultural	528	1273	4071	0	0
Other	10	30	233	0	0
Total	5279	5910	28899	0	0

Table 12. Plan 4 (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 4 <2.5	Base 10-12.5 to Plan 4 2.5-5	Base 10-12.5 to Plan 4 5-7.5	Base 10-12.5 to Plan 4 7.5-10	Base 10-12.5 to Plan 4 >12.5
Mature Forest	0	0	1188	8238	0
Middle Aged Forest	0	0	5	85	0
Early Aged Forest	0	0	349	3128	10
Recently Logged	0	0	10	19	0
Agricultural	0	0	137	2470	6
Other	0	0	8	228	0
Total	0	0	1697	14168	15

Table 13. Plan 4 (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 4 <2.5	Base >12.5 to Plan 4 2.5-5	Base >12.5 to Plan 4 5-7.5	Base >12.5 to Plan 4 7.5-10	Base >12.5 to Plan 4 10-12.5
Mature Forest	0	0	0	1343	6425
Middle Aged Forest	0	0	0	1	41
Early Aged Forest	0	0	0	1152	2657
Recently Logged	0	0	0	0	6
Agricultural	0	0	0	372	1736
Other	0	0	0	27	118
Total	0	0	0	2895	10983

Table 14. Plan 5 (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 5 <2.5	Base 5-7.5 to Plan 5 2.5-5	Base 5-7.5 to Plan 5 7.5-10	Base 5-7.5 to Plan 5 10-12.5	Base 5-7.5 to Plan 5 >12.5
Mature Forest	4719	3987	14	0	0
Middle Aged Forest	14	226	0	0	0
Early Aged Forest	2235	3723	4	0	0
Recently Logged	33	2	0	0	0
Agricultural	4651	4995	23	0	0
Other	17	451	1	0	1
Total	11669	13384	42	0	1

Table 15. Plan 5 (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 5 <2.5	Base 7.5-10 to Plan 5 2.5-5	Base 7.5-10 to Plan 5 5.5-7.5	Base 7.5-10 to Plan 5 10-12.5	Base 7.5-10 to Plan 5 >12.5
Mature Forest	219	619	9569	16	1
Middle Aged Forest	1	0	39	0	0
Early Aged Forest	73	114	4869	1	0
Recently Logged	3	2	18	0	0
Agricultural	53	109	3583	0	0
Other	0	0	202	1	0
Total	350	844	18279	18	1

Table 16. Plan 5 (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 5 <2.5	Base 10-12.5 to Plan 5 2.5-5	Base 10-12.5 to Plan 5 5.5-7.5	Base 10-12.5 to Plan 5 7.5-10	Base 10-12.5 to Plan 5 >12.5
Mature Forest	0	0	2	4083	752
Middle Aged Forest	0	0	0	33	0
Early Aged Forest	0	0	1	2425	2622
Recently Logged	0	0	0	16	0
Agricultural	0	0	3	1737	1464
Other	0	0	0	218	2
Total	0	0	6	8511	4840

Table 17. Plan 5 (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 5 <2.5	Base >12.5 to Plan 5 2.5-5	Base >12.5 to Plan 5 5-7.5	Base >12.5 to Plan 5 7.5-10	Base >12.5 to Plan 5 10-12.5
Mature Forest	0	0	0	174	5667
Middle Aged Forest	0	0	0	0	28
Early Aged Forest	0	0	0	14	2094
Recently Logged	0	0	0	0	4
Agricultural	0	0	0	38	924
Other	0	0	0	0	56
Total	0	0	0	226	8773

Table 18. Plan 6 (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 6 <2.5	Base 5-7.5 to Plan 6 2.5-5	Base 5-7.5 to Plan 6 7.5-10	Base 5-7.5 to Plan 6 10-12.5	Base 5-7.5 to Plan 6 >12.5
Mature Forest	3018	3889	0	0	0
Middle Aged Forest	5	221	0	0	0
Early Aged Forest	449	3908	0	0	0
Recently Logged	13	20	0	0	0
Agricultural	252	7575	0	0	0
Other	5	403	0	0	0
Total	3741	16016	0	0	0

Table 19. Plan 6 (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 6 <2.5	Base 7.5-10 to Plan 6 2.5-5	Base 7.5-10 to Plan 6 5.5-7.5	Base 7.5-10 to Plan 6 10-12.5	Base 7.5-10 to Plan 6 >12.5
Mature Forest	0	86	7150	0	0
Middle Aged Forest	0	0	23	0	0
Early Aged Forest	0	27	3298	0	0
Recently Logged	0	0	8	0	0
Agricultural	0	52	2333	0	0
Other	0	0	160	0	0
Total	0	165	12972	0	0

Table 20. Plan 6 (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 6 <2.5	Base 10-12.5 to Plan 6 2.5-5	Base 10-12.5 to Plan 6 5.5-7.5	Base 10-12.5 to Plan 6 7.5-10	Base 10-12.5 to Plan 6 >12.5
Mature Forest	0	0	0	2349	1694
Middle Aged Forest	0	0	0	22	0
Early Aged Forest	0	0	0	1645	3239
Recently Logged	0	0	0	10	0
Agricultural	0	0	0	939	1828
Other	0	0	0	36	0
Total	0	0	0	5001	6762

Table 21. Plan 6 (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 6 <2.5	Base >12.5 to Plan 6 2.5-5	Base >12.5 to Plan 6 5-7.5	Base >12.5 to Plan 6 7.5-10	Base >12.5 to Plan 6 10-12.5
Mature Forest	0	0	0	18	1717
Middle Aged Forest	0	0	0	0	12
Early Aged Forest	0	0	0	13	1163
Recently Logged	0	0	0	0	2
Agricultural	0	0	0	24	436
Other	0	0	0	1	22
Total	0	0	0	56	3352

Table 22. Plan 7 (B1): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 7 <2.5	Base 5-7.5 to Plan 7 2.5-5	Base 5-7.5 to Plan 7 7.5-10	Base 5-7.5 to Plan 7 10-12.5	Base 5-7.5 to Plan 7 >12.5
Mature Forest	829	2422	0	0	0
Middle Aged Forest	1	13	0	0	0
Early Aged Forest	81	1563	4	0	0
Recently Logged	2	3	0	0	0
Agricultural	37	4560	5	0	0
Other	0	371	0	0	0
Total	949	8932	9	0	0

Table 23. Plan 7 (B1): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 7 <2.5	Base 7.5-10 to Plan 7 2.5-5	Base 7.5-10 to Plan 7 5-7.5	Base 7.5-10 to Plan 7 10-12.5	Base 7.5-10 to Plan 7 >12.5
Mature Forest	0	0	3440	0	0
Middle Aged Forest	0	0	15	0	0
Early Aged Forest	0	0	1736	0	0
Recently Logged	0	0	2	0	0
Agricultural	0	0	1485	0	0
Other	0	0	128	0	0
Total	0	0	6805	0	0

Table 24. Plan 7 (B1): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 7 <2.5	Base 10-12.5 to Plan 7 2.5-5	Base 10-12.5 to Plan 7 5-7.5	Base 10-12.5 to Plan 7 7.5-10	Base 10-12.5 to Plan 7 >12.5
Mature Forest	0	0	0	1157	3459
Middle Aged Forest	0	0	0	9	0
Early Aged Forest	0	0	0	301	3443
Recently Logged	0	0	0	1	0
Agricultural	0	0	0	263	1898
Other	0	0	0	11	0
Total	0	0	0	1742	8802

Table 25. Plan 7 (B1): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 7 <2.5	Base >12.5 to Plan 7 2.5-5	Base >12.5 to Plan 7 5-7.5	Base >12.5 to Plan 7 7.5-10	Base >12.5 to Plan 7 10-12.5
Mature Forest	0	0	0	2	555
Middle Aged Forest	0	0	0	0	1
Early Aged Forest	0	0	0	0	439
Recently Logged	0	0	0	0	0
Agricultural	0	0	0	5	155
Other	0	0	0	0	12
Total	0	0	0	7	1162

Table 26. Plan 2b (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 2b <2.5	Base 5-7.5 to Plan 2b 2.5-5	Base 5-7.5 to Plan 2b 7.5-10	Base 5-7.5 to Plan 2b 10-12.5	Base 5-7.5 to Plan 2b >12.5
Mature Forest	7531	0	0	0	0
Middle Aged Forest	211	0	0	0	0
Early Aged Forest	6537	0	0	0	0
Recently Logged	2	0	0	0	0
Agricultural	9270	0	0	0	0
Other	434	0	0	0	0
Total	23985	0	0	0	0

Table 27. Plan 2b (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 2b <2.5	Base 7.5-10 to Plan 2b 2.5-5	Base 7.5-10 to Plan 2b 5-7.5	Base 7.5-10 to Plan 2b 10-12.5	Base 7.5-10 to Plan 2b >12.5
Mature Forest	13503	0	0	0	0
Middle Aged Forest	49	0	0	0	0
Early Aged Forest	5676	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	3400	0	0	0	0
Other	222	0	0	0	0
Total	22850	0	0	0	0

Table 28. Plan 2b (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 2b <2.5	Base 10-12.5 to Plan 2b 2.5-5	Base 10-12.5 to Plan 2b 5-7.5	Base 10-12.5 to Plan 2b 7.5-10	Base 10-12.5 to Plan 2b >12.5
Mature Forest	1159	0	0	0	0
Middle Aged Forest	80	0	0	0	0
Early Aged Forest	3009	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	2500	0	0	0	0
Other	104	0	0	0	0
Total	6852	0	0	0	0

Table 29. Plan 2b (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 2b <2.5	Base >12.5 to Plan 2b 2.5-5	Base >12.5 to Plan 2b 5-7.5	Base >12.5 to Plan 2b 7.5-10	Base >12.5 to Plan 2b 10-12.5
Mature Forest	7728	0	0	0	0
Middle Aged Forest	483	0	0	0	0
Early Aged Forest	13116	0	0	0	0
Recently Logged	0	0	0	0	0
Agricultural	9919	0	0	0	0
Other	4928	0	0	0	0
Total	36174	0	0	0	0

Table 30. Plan 3 (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 3 <2.5	Base 5-7.5 to Plan 3 2.5-5	Base 5-7.5 to Plan 3 7.5-10	Base 5-7.5 to Plan 3 10-12.5	Base 5-7.5 to Plan 3 >12.5
Mature Forest	12975	1403	11	0	0
Middle Aged Forest	247	15	0	0	0
Early Aged Forest	7874	468	3	0	0
Recently Logged	35	0	0	0	0
Agricultural	9619	1483	22	0	0
Other	162	192	1	1	0
Total	30913	3560	38	1	0

Table 31. Plan 3 (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 3 <2.5	Base 7.5-10 to Plan 3 2.5-5	Base 7.5-10 to Plan 3 5-7.5	Base 7.5-10 to Plan 3 10-12.5	Base 7.5-10 to Plan 3 >12.5
Mature Forest	6900	12168	5693	9	0
Middle Aged Forest	19	170	332	0	0
Early Aged Forest	3656	2300	1534	0	0
Recently Logged	26	0	0	0	0
Agricultural	2125	1720	1431	0	0
Other	59	66	65	1	0
Total	12785	16425	9054	11	0

Table 32. Plan 3 (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 3 <2.5	Base 10-12.5 to Plan 3 2.5-5	Base 10-12.5 to Plan 3 5-7.5	Base 10-12.5 to Plan 3 7.5-10	Base 10-12.5 to Plan 3 >12.5
Mature Forest	2671	801	6799	3538	3
Middle Aged Forest	45	2	35	18	0
Early Aged Forest	411	522	2932	1522	0
Recently Logged	27	1	3	0	0
Agricultural	145	392	2040	1121	0
Other	173	3	51	15	2
Total	3472	1720	11860	6214	5

Table 33. Plan 3 (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 3 <2.5	Base >12.5 to Plan 3 2.5-5	Base >12.5 to Plan 3 5-7.5	Base >12.5 to Plan 3 7.5-10	Base >12.5 to Plan 3 10-12.5
Mature Forest	0	0	1451	5715	3678
Middle Aged Forest	0	0	2	24	54
Early Aged Forest	0	0	184	2076	3660
Recently Logged	0	0	1	4	3
Agricultural	0	0	65	1013	2435
Other	0	0	0	129	528
Total	0	0	1704	8961	10358

Table 34. Plan 4 (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 4 <2.5	Base 5-7.5 to Plan 4 2.5-5	Base 5-7.5 to Plan 4 7.5-10	Base 5-7.5 to Plan 4 10-12.5	Base 5-7.5 to Plan 4 >12.5
Mature Forest	11761	2142	12	0	0
Middle Aged Forest	218	42	0	0	0
Early Aged Forest	7005	1215	3	0	0
Recently Logged	35	0	0	0	0
Agricultural	8863	1825	23	0	0
Other	92	211	1	0	0
Total	27975	5435	39	0	1

Table 35. Plan 4 (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 4 <2.5	Base 7.5-10 to Plan 4 2.5-5	Base 7.5-10 to Plan 4 5-7.5	Base 7.5-10 to Plan 4 10-12.5	Base 7.5-10 to Plan 4 >12.5
Mature Forest	4073	11982	8200	13	0
Middle Aged Forest	5	8	497	0	0
Early Aged Forest	1866	2798	2661	1	0
Recently Logged	22	1	3	0	0
Agricultural	841	1625	2575	0	0
Other	16	52	119	1	0
Total	6823	16465	14054	15	1

Table 36. Plan 4 (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 4 <2.5	Base 10-12.5 to Plan 4 2.5-5	Base 10-12.5 to Plan 4 5-7.5	Base 10-12.5 to Plan 4 7.5-10	Base 10-12.5 to Plan 4 >12.5
Mature Forest	7	54	1629	6063	4
Middle Aged Forest	0	0	5	79	0
Early Aged Forest	0	3	1254	2613	10
Recently Logged	0	0	10	19	0
Agricultural	0	4	397	2236	5
Other	0	0	30	209	2
Total	7	62	3326	11219	21

Table 37. Plan 4 (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 4 <2.5	Base >12.5 to Plan 4 2.5-5	Base >12.5 to Plan 4 5-7.5	Base >12.5 to Plan 4 7.5-10	Base >12.5 to Plan 4 10-12.5
Mature Forest	0	0	19	2457	7205
Middle Aged Forest	0	0	0	0	43
Early Aged Forest	0	0	0	1652	4346
Recently Logged	0	0	0	1	6
Agricultural	0	0	0	529	2578
Other	0	0	0	108	549
Total	0	0	19	4747	14727

Table 38. Plan 5 (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 5 <2.5	Base 5-7.5 to Plan 5 2.5-5	Base 5-7.5 to Plan 5 7.5-10	Base 5-7.5 to Plan 5 10-12.5	Base 5-7.5 to Plan 5 >12.5
Mature Forest	4564	7877	0	0	0
Middle Aged Forest	86	149	0	0	0
Early Aged Forest	3422	3589	0	0	0
Recently Logged	33	2	0	0	0
Agricultural	5956	3609	0	0	0
Other	27	120	0	0	0
Total	14088	15347	0	0	0

Table 39. Plan 5 (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 5 <2.5	Base 7.5-10 to Plan 5 2.5-5	Base 7.5-10 to Plan 5 5-7.5	Base 7.5-10 to Plan 5 10-12.5	Base 7.5-10 to Plan 5 >12.5
Mature Forest	197	935	16799	0	0
Middle Aged Forest	1	0	289	0	0
Early Aged Forest	80	113	5249	0	0
Recently Logged	3	2	17	0	0
Agricultural	47	106	3602	0	0
Other	0	0	138	0	0
Total	329	1157	26094	0	0

Table 40. Plan 5 (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 5 <2.5	Base 10-12.5 to Plan 5 2.5-5	Base 10-12.5 to Plan 5 5.5-7.5	Base 10-12.5 to Plan 5 7.5-10	Base 10-12.5 to Plan 5 >12.5
Mature Forest	0	0	0	3725	749
Middle Aged Forest	0	0	0	27	0
Early Aged Forest	0	0	0	2658	2621
Recently Logged	0	0	0	16	0
Agricultural	0	0	0	1671	1464
Other	0	0	0	225	0
Total	0	0	0	8322	4834

Table 41. Plan 5 (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 5 <2.5	Base >12.5 to Plan 5 2.5-5	Base >12.5 to Plan 5 5-7.5	Base >12.5 to Plan 5 7.5-10	Base >12.5 to Plan 5 10-12.5
Mature Forest	0	0	0	22	5674
Middle Aged Forest	0	0	0	0	28
Early Aged Forest	0	0	0	5	1695
Recently Logged	0	0	0	0	4
Agricultural	0	0	0	30	810
Other	0	0	0	0	81
Total	0	0	0	57	8292

Table 42. Plan 6 (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 6 <2.5	Base 5-7.5 to Plan 6 2.5-5	Base 5-7.5 to Plan 6 7.5-10	Base 5-7.5 to Plan 6 10-12.5	Base 5-7.5 to Plan 6 >12.5
Mature Forest	2526	5140	16	0	0
Middle Aged Forest	5	215	0	0	0
Early Aged Forest	590	4331	5	0	0
Recently Logged	12	20	0	0	0
Agricultural	791	7266	23	0	0
Other	3	75	1	0	1
Total	3927	17046	45	0	1

Table 43. Plan 6 (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 6 <2.5	Base 7.5-10 to Plan 6 2.5-5	Base 7.5-10 to Plan 6 5-7.5	Base 7.5-10 to Plan 6 10-12.5	Base 7.5-10 to Plan 6 >12.5
Mature Forest	1	34	8483	24	1
Middle Aged Forest	0	0	32	0	0
Early Aged Forest	0	4	2941	6	0
Recently Logged	0	0	7	0	0
Agricultural	0	21	1850	2	0
Other	0	0	119	1	0
Total	1	59	13433	34	1

Table 44. Plan 6 (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 6 <2.5	Base 10-12.5 to Plan 6 2.5-5	Base 10-12.5 to Plan 6 5-7.5	Base 10-12.5 to Plan 6 7.5-10	Base 10-12.5 to Plan 6 >12.5
Mature Forest	0	0	0	1925	0
Middle Aged Forest	0	0	0	17	0
Early Aged Forest	0	0	0	1788	0
Recently Logged	0	0	0	10	0
Agricultural	0	0	0	861	0
Other	0	0	0	31	0
Total	0	0	0	4632	0

Table 45. Plan 6 (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 6 <2.5	Base >12.5 to Plan 6 2.5-5	Base >12.5 to Plan 6 5-7.5	Base >12.5 to Plan 6 7.5-10	Base >12.5 to Plan 6 10-12.5
Mature Forest	0	0	0	7	1541
Middle Aged Forest	0	0	0	0	11
Early Aged Forest	0	0	0	1	840
Recently Logged	0	0	0	0	2
Agricultural	0	0	0	17	379
Other	0	0	0	0	24
Total	0	0	0	25	2797

Table 46. Plan 7 (B2): Change in Baseline 5% - 7.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 5-7.5 to Plan 7 <2.5	Base 5-7.5 to Plan 7 2.5-5	Base 5-7.5 to Plan 7 7.5-10	Base 5-7.5 to Plan 7 10-12.5	Base 5-7.5 to Plan 7 >12.5
Mature Forest	62	2794	149	1	0
Middle Aged Forest	0	14	0	0	0
Early Aged Forest	7	1764	28	0	0
Recently Logged	0	5	0	0	0
Agricultural	9	4630	30	0	0
Other	0	36	1	0	1
Total	79	9243	208	1	1

Table 47. Plan 7 (B2): Change in Baseline 7.5% - 10% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 7.5-10 to Plan 7 <2.5	Base 7.5-10 to Plan 7 2.5-5	Base 7.5-10 to Plan 7 5-7.5	Base 7.5-10 to Plan 7 10-12.5	Base 7.5-10 to Plan 7 >12.5
Mature Forest	0	1	4230	131	1
Middle Aged Forest	0	0	10	0	0
Early Aged Forest	0	0	1384	25	0
Recently Logged	0	0	2	0	0
Agricultural	0	3	817	10	0
Other	0	0	39	1	0
Total	0	4	6483	167	1

Table 48. Plan 7 (B2): Change in Baseline 10% - 12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base 10-12.5 to Plan 7 <2.5	Base 10-12.5 to Plan 7 2.5-5	Base 10-12.5 to Plan 7 5-7.5	Base 10-12.5 to Plan 7 7.5-10	Base 10-12.5 to Plan 7 >12.5
Mature Forest	0	0	0	657	21
Middle Aged Forest	0	0	0	5	0
Early Aged Forest	0	0	0	911	41
Recently Logged	0	0	0	1	0
Agricultural	0	0	0	385	9
Other	0	0	0	21	2
Total	0	0	0	1981	72

Table 49. Plan 7 (B2): Change in Baseline >12.5% duration acres by land cover

Land Cover Type	Acres Changing Duration Range				
	Base >12.5 to Plan 7 <2.5	Base >12.5 to Plan 7 2.5-5	Base >12.5 to Plan 7 5-7.5	Base >12.5 to Plan 7 7.5-10	Base >12.5 to Plan 7 10-12.5
Mature Forest	0	0	0	0	538
Middle Aged Forest	0	0	0	0	2
Early Aged Forest	0	0	0	0	149
Recently Logged	0	0	0	0	0
Agricultural	0	0	0	1	106
Other	0	0	0	0	8
Total	0	0	0	1	804

3.1.2 Change in Functional Capacity Units

The change in Functional Capacity Units (FCU), by land cover type and function, resulting from the shifts in duration ranges under Plans 2b, 3, 4, 5, 6, and 7 for the B1 and B2 scenarios are shown in Tables 50-61. Calculations for these tables are in the worksheets "Plan 2b (B1), Plan 3 (B1), etc. and the Plan 2b (B2), Plan 3 (B2) etc. in the attached spreadsheet. The change in FCU was calculated by multiplying the baseline FCI by the number of acres shifting to other duration ranges in each land cover type (Tables 2-49), multiplying the post-project FCI by the number of acres shifting to other duration ranges in each land cover type, and then subtracting the post-project FCU from the baseline FCU. The change in FCU for Plans 2b, 3, 4, 5, 6, and 7 are summarized in Tables 62 and 63 for scenarios B1 and B2 respectively. Supporting calculations for these tables are in worksheets "B1 Hydrologic Summary and B2 Hydrologic Summary" of the attached spreadsheet.

Table 50. Plan 2b (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-9227	-239	-4501	0	-2107	-16075
Physical Removal of E and C	-7645	-283	-2921	0	-5267	-16118
Biological Removal of E and C	-9227	-239	-4501	0	-2107	-16075
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1552	-39	-1011	0	0	-2602
Total	-27651	-800	-12936	-1	-9481	-50869

Table 51. Plan 3 (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-10550	-117	-2313	-18	-1180	-14177
Physical Removal of E and C	-8741	-138	-1501	-21	-2951	-13352
Biological Removal of E and C	-10550	-117	-2313	-18	-1180	-14177
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1748	-19	-514	-4	0	-2284
Total	-31589	-390	-6640	-59	-5312	-43990

Table 52. Plan 4 (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-6300	-89	-1619	-12	-951	-8971
Physical Removal of E and C	-5220	-106	-1051	-14	-2377	-8768
Biological Removal of E and C	-6300	-89	-1619	-12	-951	-8971
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1045	-14	-359	-3	0	-1420
Total	-18866	-299	-4647	-40	-4279	-28132

Table 53. Plan 5 (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-2852	-45	-886	-8	-651	-4442
Physical Removal of E and C	-2363	-53	-575	-10	-1628	-4629
Biological Removal of E and C	-2852	-45	-886	-8	-651	-4442
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-471	-7	-195	-2	0	-675
Total	-8539	-150	-2542	-28	-2930	-14188

Table 54. Plan 6 (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-1890	-39	-552	-5	-424	-2911
Physical Removal of E and C	-1566	-46	-358	-6	-1061	-3038
Biological Removal of E and C	-1890	-39	-552	-5	-424	-2911
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-313	-6	-121	-1	0	-442
Total	-5658	-130	-1584	-18	-1910	-9300

Table 55. Plan 7 (B1): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-779	-4	-187	-1	-236	-1207
Physical Removal of E and C	-646	-4	-121	-1	-591	-1363
Biological Removal of E and C	-779	-4	-187	-1	-236	-1207
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-129	-1	-41	0	0	-171
Total	-2334	-12	-537	-3	-1064	-3949

Table 56. Plan 2b (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-8974	-238	-4457	0	-2045	-15713
Physical Removal of E and C	-7435	-282	-2892	0	-5111	-15722
Biological Removal of E and C	-8974	-238	-4457	0	-2045	-15713
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1509	-39	-1001	0	0	-2549
Total	-26892	-796	-12807	-1	-9201	-49697

Table 57. Plan 3 (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-10862	-137	-2392	-17	-1181	-14590
Physical Removal of E and C	-9000	-162	-1552	-20	-2953	-13688
Biological Removal of E and C	-10862	-137	-2392	-17	-1181	-14590
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1803	-22	-532	-4	0	-2361
Total	-32528	-458	-6867	-59	-5316	-45229

Table 58. Plan 4 (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-8304	-93	-1982	-12	-984	-11375
Physical Removal of E and C	-6880	-110	-1286	-14	-2460	-10751
Biological Removal of E and C	-8304	-93	-1982	-12	-984	-11375
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-1379	-15	-440	-3	0	-1837
Total	-24868	-310	-5691	-40	-4428	-35337

Table 59. Plan 5 (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-3813	-62	-1031	-8	-671	-5585
Physical Removal of E and C	-3159	-73	-669	-9	-1678	-5589
Biological Removal of E and C	-3813	-62	-1031	-8	-671	-5585
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-629	-10	-228	-2	0	-869
Total	-11414	-206	-2959	-27	-3020	-17627

Table 60. Plan 6 (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-2030	-38	-619	-5	-444	-3137
Physical Removal of E and C	-1682	-45	-402	-6	-1111	-3246
Biological Removal of E and C	-2030	-38	-619	-5	-444	-3137
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-336	-6	-136	-1	0	-479
Total	-6077	-128	-1777	-17	-1999	-9998

Table 61. Plan 7 (B2): Change in FCU as a result of changes in duration

Function	Mature Forest	Mid Age Forest	Early Age Forest	Recent Log	Agri-cultural	Total
Detain Floodwater	0	0	0	0	0	0
Detain Precipitation	0	0	0	0	0	0
Cycle Nutrients	0	0	0	0	0	0
Export Organic Carbon	-715	-3	-227	-1	-238	-1184
Physical Removal of E and C	-592	-4	-147	-1	-595	-1339
Biological Removal of E and C	-715	-3	-227	-1	-238	-1184
Maintain Plant Communities	0	0	0	0	0	0
Provide Wildlife Habitat	-117	-1	-49	0	0	-167
Total	-2139	-11	-650	-2	-1072	-3874

Table 62. Summary of change in FCU due to hydrologic impacts for Plans 2b, 3, 4, 5, 6 and 7 under the B1 scenario

Plan	Acres Impacted by a Change in Duration	Baseline FCU	Post-Project FCU	Change in FCU
Plan 2 (B1)	0	0	0	0
Plan 2A (B1)	0	0	0	0
Plan 2B (B1)	92104	365395	314526	-50869
Plan 2C (B1)	0	0	0	0
Plan 3 (B1)	118486	580515	536525	-43990
Plan 4 (B1)	101629	493627	465496	-28132
Plan 5 (B1)	66945	299869	285680	-14188
Plan 6 (B1)	48066	209762	200461	-9300
Plan 7 (B1)	28408	122389	118440	-3949

Table 63. Summary of change in FCU due to hydrologic impacts for Plans 2b, 3, 4, 5, 6, and 7 under the B2 scenario

Plan	Acres Impacted by a Change in Duration	Baseline FCU	Post-Project FCU	Change in FCU
Plan 2 (B2)	0	0	0	0
Plan 2A (B2)	0	0	0	0
Plan 2B (B2)	89861	357195	307498	-49697
Plan 2C (B2)	0	0	0	0
Plan 3 (B2)	117081	573103	527874	-45229
Plan 4 (B2)	104935	507600	472263	-35337
Plan 5 (B2)	78519	375096	357469	-17627
Plan 6 (B2)	42003	190929	180931	-9998
Plan 7 (B2)	19045	83657	79783	-3874

3.1.3 Summary of Change in Acreage and FCU

Tables 64-75 summarize the changes in acreage and FCU for Plans 2b, 3, 4, 5, 6, and 7 under the B1 and B2 Scenarios.

Table 64. Summary of change in acreage and FCU for Plan 2b (B1)

Plan 2b (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	22645	-10274	22645	-10274
7.5-10 to <5	0	0	25648	-17098	25648	-17098
10-12.5 to <5	0	0	13033	-7280	13033	-7280
>12.5 to <5	0	0	30778	-16218	30778	-16218
Subtotal	0	0	92104	-50869	92104	-50869
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	0	0	0	0	0	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	0	0	0	0
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	0	0	0	0
10-12.5 to >12.5	0	0	0	0	0	0
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	0	0	0	0
>12.5 to10-12.5	0	0	0	0	0	0
Subtotal	0	0	0	0	0	0
Total	0	0	92104	-50869	92104	-50869

Table 65. Summary of change in acreage and FCU for Plan 3 (B1)

Plan 3 (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	32450	-15661	32450	-15661
7.5-10 to <5	0	0	29050	-16997	29050	-16997
10-12.5 to <5	0	0	5411	-4093	5411	-4093
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	66911	-36750	66911	-36750
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	38	2	0	0	38	2
5-7.5 to 10-12.5	1	0	0	0	1	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	13579	-1407	13579	-1407
7.5-10 to 10-12.5	11	1	0	0	11	1
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	11726	-2227	11726	-2227
10-12.5 to 7.5-10	0	0	6083	-746	6083	-746
10-12.5 to >12.5	5	0	0	0	5	0
>12.5 to 5.0-7.5	0	0	1874	-491	1874	-491
>12.5 to7.5-10	0	0	9552	-1620	9552	-1620
>12.5 to10-12.5	0	0	8705	-753	8705	-753
Subtotal	56	3	51520	-7243	51575	-7240
Total	56	3	118431	-43993	118486	-43990

Table 66. Summary of change in acreage and FCU for Plan 4 (B1)

Plan 4 (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	31783	-15143	31783	-15143
7.5-10 to <5	0	0	11189	-6523	11189	-6523
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	42972	-21666	42972	-21666
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	0	0	0	0	0	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	28899	-3001	28899	-3001
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	1697	-345	1697	-345
10-12.5 to 7.5-10	0	0	14168	-1700	14168	-1700
10-12.5 to >12.5	15	0	0	0	15	0
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	2895	-445	2895	-445
>12.5 to10-12.5	0	0	10983	-973	10983	-973
Subtotal	15	0	58642	-6466	58658	-6465
Total	15	0	101614	-28132	101629	-28132

Table 67. Summary of change in acreage and FCU for Plan 5 (B1)

Plan 5 (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	25053	-10068	25053	-10068
7.5-10 to <5	0	0	1194	-707	1194	-707
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	26247	-10776	26247	-10776
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	42	2	0	0	42	2
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	1	0	0	0	1	0
7.5-10 to 5.0-7.5	0	0	18279	-1784	18279	-1784
7.5-10 to 10-12.5	18	1	0	0	18	1
7.5-10 to >12.5	1	0	0	0	1	0
10-12.5 to 5.0-7.5	0	0	6	-1	6	-1
10-12.5 to 7.5-10	0	0	8511	-951	8511	-951
10-12.5 to >12.5	4840	151	0	0	4840	151
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	226	-42	226	-42
>12.5 to10-12.5	0	0	8773	-789	8773	-789
Subtotal	4902	154	35795	-3567	40698	-3413
Total	4902	154	62043	-14343	66945	-14188

Table 68. Summary of change in acreage and FCU for Plan 6 (B1)

Plan 6 (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	19757	-7306	19757	-7306
7.5-10 to <5	0	0	165	-77	165	-77
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	19922	-7382	19922	-7382
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	0	0	0	0	0	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	12972	-1279	12972	-1279
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	5001	-564	5001	-564
10-12.5 to >12.5	6762	231	0	0	6762	231
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	56	-8	56	-8
>12.5 to10-12.5	0	0	3352	-299	3352	-299
Subtotal	6762	231	21382	-2149	28143	-1918
Total	6762	231	41304	-9532	48066	-9300

Table 69. Summary of change in acreage and FCU for Plan 7 (B1)

Plan 7 (B1) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	9881	-3313	9881	-3313
7.5-10 to <5	0	0	0	0	0	0
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	9881	-3313	9881	-3313
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	9	0	0	0	9	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	6805	-654	6805	-654
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	1742	-221	1742	-221
10-12.5 to >12.5	8802	342	0	0	8802	342
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	7	-1	7	-1
>12.5 to10-12.5	0	0	1162	-103	1162	-103
Subtotal	8811	342	9716	-978	18527	-636
Total	8811	342	19597	-4291	28408	-3949

Table 70. Summary of change in acreage and FCU for Plan 2b (B2)

Plan 3 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	23985	-11108	23985	-11108
7.5-10 to <5	0	0	22850	-15486	22850	-15486
10-12.5 to <5	0	0	6852	-3661	6852	-3661
>12.5 to <5	0	0	36174	-19441	36174	-19441
Subtotal	0	0	89861	-49697	89861	-49697
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	0	0	0	0	0	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	0	0	0	0
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	0	0	0	0
10-12.5 to >12.5	0	0	0	0	0	0
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	0	0	0	0
>12.5 to10-12.5	0	0	0	0	0	0
Subtotal	0	0	0	0	0	0
Total	0	0	89861	-49697	89861	-49697

Table 71. Summary of change in acreage and FCU for Plan 3 (B2)

Plan 3 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	34473	-17073	34473	-17073
7.5-10 to <5	0	0	29210	-17468	29210	-17468
10-12.5 to <5	0	0	5192	-3895	5192	-3895
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	68875	-38436	68875	-38436
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	38	2	0	0	38	2
5-7.5 to 10-12.5	1	0	0	0	1	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	9054	-951	9054	-951
7.5-10 to 10-12.5	11	1	0	0	11	1
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	11860	-2243	11860	-2243
10-12.5 to 7.5-10	0	0	6214	-745	6214	-745
10-12.5 to >12.5	5	0	0	0	5	0
>12.5 to 5.0-7.5	0	0	1704	-464	1704	-464
>12.5 to7.5-10	0	0	8961	-1531	8961	-1531
>12.5 to10-12.5	0	0	10358	-861	10358	-861
Subtotal	55	3	48151	-6796	48205	-6793
Total	55	3	117026	-45232	117081	-45229

Table 72. Summary of change in acreage and FCU for Plan 4 (B2)

Plan 4 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	33410	-16243	33410	-16243
7.5-10 to <5	0	0	23288	-13670	23288	-13670
10-12.5 to <5	0	0	69	-51	69	-51
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	56766	-29963	56766	-29963
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	39	2	0	0	39	2
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	1	0	0	0	1	0
7.5-10 to 5.0-7.5	0	0	14054	-1448	14054	-1448
7.5-10 to 10-12.5	15	1	0	0	15	1
7.5-10 to >12.5	1	0	0	0	1	0
10-12.5 to 5.0-7.5	0	0	3326	-604	3326	-604
10-12.5 to 7.5-10	0	0	11219	-1310	11219	-1310
10-12.5 to >12.5	21	1	0	0	21	1
>12.5 to 5.0-7.5	0	0	19	-6	19	-6
>12.5 to7.5-10	0	0	4747	-749	4747	-749
>12.5 to10-12.5	0	0	14727	-1260	14727	-1260
Subtotal	77	3	48092	-5377	48168	-5373
Total	77	3	104858	-35340	104935	-35337

Table 73. Summary of change in acreage and FCU for Plan 5 (B2)

Plan 5 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	29434	-12517	29434	-12517
7.5-10 to <5	0	0	1486	-891	1486	-891
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	30920	-13409	30920	-13409
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	0	0	0	0	0	0
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	0	0	0	0	0	0
7.5-10 to 5.0-7.5	0	0	26094	-2705	26094	-2705
7.5-10 to 10-12.5	0	0	0	0	0	0
7.5-10 to >12.5	0	0	0	0	0	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	8322	-910	8322	-910
10-12.5 to >12.5	4834	151	0	0	4834	151
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	57	-8	57	-8
>12.5 to10-12.5	0	0	8292	-746	8292	-746
Subtotal	4834	151	42764	-4369	47598	-4218
Total	4834	151	73685	-17778	78519	-17627

Table 74. Summary of change in acreage and FCU for Plan 6 (B2)

Plan 6 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	20973	-7843	20973	-7843
7.5-10 to <5	0	0	60	-29	60	-29
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	21033	-7872	21033	-7872
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	45	2	0	0	45	2
5-7.5 to 10-12.5	0	0	0	0	0	0
5-7.5 to >12.5	1	0	0	0	1	0
7.5-10 to 5.0-7.5	0	0	13433	-1372	13433	-1372
7.5-10 to 10-12.5	34	2	0	0	34	2
7.5-10 to >12.5	1	0	0	0	1	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	4632	-506	4632	-506
10-12.5 to >12.5	0	0	0	0	0	0
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	25	-3	25	-3
>12.5 to10-12.5	0	0	2797	-249	2797	-249
Subtotal	82	4	20888	-2130	20970	-2126
Total	82	4	41921	-10002	42003	-9998

Table 75. Summary of change in acreage and FCU for Plan 7 (B2)

Plan 7 (B2) Duration Bands	Acres Changing with a Resulting Gain in FCU	Gain in FCU	Acres Changing with a Resulting Loss in FCU	Loss in FCU	Total Acres Changing	Net Change in FCU
Areas Shifting from > 5% Duration to < 5% Duration						
5-7.5 to <5	0	0	9322	-2955	9322	-2955
7.5-10 to <5	0	0	4	-2	4	-2
10-12.5 to <5	0	0	0	0	0	0
>12.5 to <5	0	0	0	0	0	0
Subtotal	0	0	9326	-2957	9326	-2957
Areas Remaining in > 5% Duration						
5-7.5 to 7.5-10	208	14	0	0	208	14
5-7.5 to 10-12.5	1	0	0	0	1	0
5-7.5 to >12.5	1	0	0	0	1	0
7.5-10 to 5.0-7.5	0	0	6483	-669	6483	-669
7.5-10 to 10-12.5	167	11	0	0	167	11
7.5-10 to >12.5	1	0	0	0	1	0
10-12.5 to 5.0-7.5	0	0	0	0	0	0
10-12.5 to 7.5-10	0	0	1981	-204	1981	-204
10-12.5 to >12.5	72	3	0	0	72	3
>12.5 to 5.0-7.5	0	0	0	0	0	0
>12.5 to7.5-10	0	0	1	0	1	0
>12.5 to10-12.5	0	0	804	-72	804	-72
Subtotal	450	27	9268	-944	9719	-917
Total	450	27	18595	-3901	19045	-3874

3.2 Construction Impacts

The number of agriculture, mature forest, and early aged forest land acres (ERDC land cover types) impacted under Plans 3, 4, 5, 6, and 7 for the B1 and B2 scenarios are shown in Table 76. This table comes from the worksheet “Construction Impacts” in the attached spreadsheet. Plan 2, 2a, 2b, and 2c had no construction impacts under either the B1 or B2 scenario.

Table 76. Acres of land cover type impacted by all plans under Scenarios B1 and B2

Plan	Land Cover Type					
	Mature Forest	Middle Aged Forest	Early Aged Forest	Recently Logged	Agri-cultural	Total
Plan 2 (B1 and B2)	0.0	0.0	0.0	0.0	0.0	0.0
Plan 2A (B1 and B2)	0.0	0.0	0.0	0.0	0.0	0.0
Plan 2B (B1 and B2)	0.0	0.0	0.0	0.0	0.0	0.0
Plan 2C (B1 and B2)	0.0	0.0	0.0	0.0	0.0	0.0
Plan 3 (B1 and B2)	0.0	38.0	0.0	0.0	0.0	38.0
Plan 4 (B1 and B2)	0.0	38.0	0.0	0.0	0.0	38.0
Plan 5 (B1 and B2)	0.0	38.0	0.0	0.0	0.0	38.0
Plan 6 (B1 and B2)	0.0	38.0	0.0	0.0	0.0	38.0
Plan 7 (B1 and B2)	0.0	38.0	0.0	0.0	0.0	38.0

Table 77 shows the change in FCU for impacted areas. Column 2 shows the total baseline FCU in impacted areas. Column 3 shows post-project FCU for each plan. Column 4 summarizes the change in FCU by reach for alternative plans. Supporting calculations for this table are shown in the worksheet "Construction Impacts" in the attached spreadsheet.

Table 77. Change in FCU due to Construction impacts for all plans under Scenarios B1 and B2

Plan	Total Baseline FCU	Post-Project FCU	Change in FCU
Plan 2 (B1 and B2)	0	0	0
Plan 2A (B1 and B2)	0	0	0
Plan 2B (B1 and B2)	0	0	0
Plan 2C (B1 and B2)	0	0	0
Plan 3 (B1 and B2)	240	0	-240
Plan 4 (B1 and B2)	240	0	-240
Plan 5 (B1 and B2)	240	0	-240
Plan 6 (B1 and B2)	240	0	-240
Plan 7 (B1 and B2)	240	0	-240

3.3 Recovery of Wetland Functions under Plans 2, 2a, 2b, and 2c and in Restoration Areas

The increase in FCU was calculated for projected restoration areas based on the assumption that compensatory restoration would take place in areas currently in agricultural production within the two-year floodplain, and the assumptions related to the assignment of metric values to model variables outlined above. Table 78 shows the change in FCI and FCU per acre for all

functions for the 1, 10, 20, 30, 40, and 50-year time steps following restoration. Table 79 shows an average annual calculation for the change in FCU per acre for all functions. The average annual FCU per acre is simply the sum of the FCU per acre for Years 0 – 50 divided by 6. Supporting calculations for these tables is shown in the worksheet "Restoration Summary" in the attached spreadsheet.

3.4 Summary of Change in Functional Capacity Units

Table 80 and 81 summarize the net change in FCU for each of the plans under the B1 and B1 Scenarios. In these tables, Column 2 shows the annual change in FCU (i.e., decrease) in FCU due to Construction impacts. Column 3 shows the annual change (i.e., decrease) in FCU due to hydrologic impacts (i.e., areas shifting between duration ranges). Columns 4, 5, and 6 show the projected acres of non-structural restoration, annual (average) change (i.e., increase) in FCU per acre, and annual (average) change (i.e., increase) in FCU per year for non-structural restoration. Columns 7, 8, and 9 show the projected acres of other than non-structural restoration, annual average change (i.e., increase) in FCU per acre, and annual average change (i.e., increase) in FCU per year for other than non-structural restoration. Column 10 shows the annual change in FCU. This is equivalent to the sum of the changes in FCU due to annual construction and hydrologic, annual (average) changes due to non-structural restoration, and annual (average) changes due to other than non-structural restoration.

Table 78. Change in FCI and FCU per acre of restoration for ten-year increments following restoration

FUNCTION	FCI Year 0	Change in FCU / Acre	FCI Year 10	Change in FCU / Acre	FCI Year 20	Change in FCU / Acre	FCI Year 30	Change in FCU / Acre	FCI Year 40	Change in FCU / Acre	FCI Year 50	Change in FCU / Acre
Detain Floodwater	0.00	0.00	0.44	0.44	0.59	0.59	0.80	0.80	0.94	0.94	0.97	0.97
Detain Precipitation	0.25	0.25	0.38	0.38	0.50	0.50	0.69	0.69	0.88	0.88	1.00	1.00
Cycle Nutrients	0.19	0.19	0.56	0.56	0.60	0.60	0.95	0.95	1.00	1.00	1.00	1.00
Export Organic Carbon	0.03	0.03	0.16	0.16	0.19	0.19	0.31	0.31	0.33	0.33	0.33	0.33
Physical Removal of E/C	0.00	0.00	0.04	0.04	0.08	0.08	0.17	0.17	0.25	0.25	0.33	0.33
Biological Removal of E/C	0.03	0.03	0.16	0.16	0.19	0.19	0.31	0.31	0.33	0.33	0.33	0.33
Maintain Plant Communities	0.00	0.00	0.53	0.53	0.68	0.68	0.82	0.82	0.91	0.91	0.98	0.98
Provide Wildlife Habitat	0.00	0.00	0.00	0.00	0.59	0.59	0.80	0.80	0.87	0.87	0.90	0.90
Total FCU / Acre		0.49		2.27		3.42		4.87		5.51		5.86

Table 79. Average annual change in FCU per acre over period of analysis

FUNCTION	FCU / Acre Restoration Year 1	FCU / Acre Restoration Year 10	FCU / Acre Restoration Year 20	FCU / Acre Restoration Year 30	FCU / Acre Restoration Year 40	FCU / Acre Restoration Year 50	Average Annual[1] Change in FCU / Acre
Detain Floodwater	0.00	0.44	0.59	0.80	0.94	0.97	0.62
Detain Precipitation	0.25	0.38	0.50	0.69	0.88	1.00	0.61
Cycle Nutrients	0.19	0.56	0.60	0.95	1.00	1.00	0.72
Export Organic Carbon	0.03	0.16	0.19	0.31	0.33	0.33	0.23
Physical Removal of E/C	0.00	0.04	0.08	0.17	0.25	0.33	0.15
Biological Removal of E/C	0.03	0.16	0.19	0.31	0.33	0.33	0.23
Maintain Plant Communities	0.00	0.53	0.68	0.82	0.91	0.98	0.65
Provide Wildlife Habitat	0.00	0.00	0.59	0.80	0.87	0.90	0.53
Total	0.49	2.27	3.42	4.87	5.51	5.86	3.74

[1] Average Annual = (Sum of Year 1 through 50) / 6

Table 80. Summary of annual change in FCU for B1 Scenario

Plan	Annual Change in FCU Due to Construction Impacts	Annual Change in FCU Due to Hydrologic Impacts	Acres of Non-Structural (Projected)	Annual (average) Change in FCU Per Acre	Annual (average) Change in FCU for Non-Structural Acres (Product of Column 4 and 5)	Acres of Other than Non-Structural Restoration To Achieve No-Net-Loss (Projected)	Annual (average) Change in FCU Per Acre	Annual (average) Change in FCU for Other than Non-Structural Restoration Acres (Product of Column 7 and 8)	Total Annual Change in FCU (Sum of Columns 2, 3, 6, and 9)
Plan 2 (B1)	0	0	124400	3.74	464768	0	3.74	0	464768
Plan 2A (B1)	0	0	81400	3.74	304116	0	3.74	0	304116
Plan 2B (B1)	0	-50869	26400	3.74	98632	0	3.74	0	47763
Plan 2C (B1)	0	0	114400	3.74	427407	0	3.74	0	427407
Plan 3 (B1)	-240	-43990	0	3.74	0	20860	3.74	77935	33704
Plan 4 (B1)	-240	-28132	37200	3.74	138982	0	3.74	0	110610
Plan 5 (B1)	-240	-14188	55600	3.74	207726	0	3.74	0	193297
Plan 6 (B1)	-240	-9300	81400	3.74	304116	0	3.74	0	294576
Plan 7 (B1)	-240	-3949	124400	3.74	464768	0	3.74	0	460578

Table 81. Summary of annual change in FCU for B2 Scenario

Plan	Annual Change in FCU Due to Construction Impacts	Annual Change in FCU Due to Hydrologic Impacts	Acres of Non-Structural (Projected)	Annual (average) Change in FCU Per Acre	Annual (average) Change in FCU for Non-Structural Acres (Product of Column 4 and 5)	Acres of Other than Non-Structural Restoration To Achieve No-Net-Loss (Projected)	Annual (average) Change in FCU Per Acre	Annual (average) Change in FCU for Other than Non-Structural Restoration Acres (Product of Column 7 and 8)	Total Annual Change in FCU (Sum of Columns 2, 3, 6, and 9)
Plan 2 (B2)	0	0	124400	3.74	464768	0	3.74	0	464768
Plan 2A (B2)	0	0	81400	3.74	304116	0	3.74	0	304116
Plan 2B (B2)	0	-49697	26400	3.74	98632	0	3.74	0	48936
Plan 2C (B2)	0	0	114400	3.74	427407	0	3.74	0	427407
Plan 3 (B2)	-240	-45229	0	3.74	0	21367	3.74	79829	34359
Plan 4 (B2)	-240	-35337	37200	3.74	138982	0	3.74	0	103405
Plan 5 (B2)	-240	-17627	55600	3.74	207726	0	3.74	0	189858
Plan 6 (B2)	-240	-9998	81400	3.74	304116	0	3.74	0	293878
Plan 7 (B2)	-240	-3874	124400	3.74	464768	0	3.74	0	460654

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