



Hatchie/Loosahatchie, Mississippi River Mile 775-736, TN and AR Final Integrated Feasibility Report and Environmental Assessment



Appendix 1c – Sensitivity Analysis

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1.1 INTRODUCTION

During feasibility level of design, the project delivery team (PDT) performed a sensitivity analysis on the 40 measures of the recommended plan (RP) to assess how sensitive the RP's ecological benefits could be to the risk that all the lands required to implement the RP are not able to be acquired. This question was raised because of the study assumption that all real estate necessary for ecosystem restoration measures would be acquired in fee, whereas the possibility exists that acquiring private lands from potentially unwilling sellers may pose implementation risks. The sensitivity analysis considered 1) the type of real estate (categorized as privately - or publicly owned lands), 2) the technical significance of the habitat that the measures address, and 3) the risk of being able to acquire the lands in fee (or not). Technical significance rankings are further described in Section 2.2.2 of the report and inform habitat scarcity and importance to special species status. Technical significance habitat rankings are described in Table 2-3. Risk of acquisition of lands was informed by the non-Federal sponsor's (NFS) interest in using state-owned public lands for the success of the project, as well as their engagement with private landowners during right-of-entry requests for feasibility level of design.

1.2 LAND CATEGORIZATION

Types of lands in the RP were categorized into two categories: public lands and privately-owned lands. Measures located on public lands are highly likely to be acquired due to public landowners' partnerships with the non-Federal sponsor and the public landowners' vested interests in the successful implementation of the project. Acquisition of private lands could be more difficult, expensive, and time-consuming depending on the owners' willingness to sell (their willingness is unknown at the writing of this report). The non-Federal sponsor wishes to minimize these potential implementation risks through continued engagement with private landowners in the study area and to educate all landowners and stakeholders on the environmental, regional economic, and social benefits of the project.

1.3 TECHNICAL SIGNIFICANCE

Technical significance categories were formulated from the normalized scores included in Table 2-3 of the main report. The calculations for normalized scores are explained in Section 2.2.2 of the main report. In brief, the scores can range from 0 to 1, with 1 being the highest potential significance score for a habitat. Four categories were created from the normalized scores: extremely high, high, medium, and low. The type of measures and associated habitats with their associated categories and numerical scores are included in Table 1c-1 of this appendix.

Table 1-c1. Technical Significance Categories

Category	Types of Measures and Associated Habitats
Extremely High Technical Significance	Meander scarps (0.94)
	Forest stand improvements of cypress/tupelo (0.77)

High Technical Significance	Hardpoint bank protection of secondary channels (0.77)
	Moist soil management for waterfowl (0.77)
	Reforestation of cypress/tupelo (0.77)
	Stone/pile dike notching for connectivity in secondary channels (0.77)
	Wood traps in secondary channels (0.77)
	Flow restoration/wetland complex restoration (0.76)
Medium Technical Significance	Forest stand improvements of BLH (0.56)
	Reforestation of BLH (0.56)
Low Technical Significance	Flow restoration to backwater slough (0.38)
	MS River riparian buffer (0.38)
	Recreation (not applicable)

1.4 REAL ESTATE RISK

The recommended plan is proposed to be implemented on 2,948 acres of land that includes 51 acres of public lands and 2,897 acres of private lands with includes 56 acres of private land for perpetual road easements. As outlined in the Real Estate Appendix (Appendix 6) the non-Federal sponsor shall acquire the real estate property interests necessary for the construction, operation, and maintenance of the project. Since a portion of the necessary lands for the project are located on private lands, an analysis was conducted to look at the potential risk of acquiring the lands identified in the RP. For example, if the non-Federal sponsor is not able to acquire a certain parcel of land, landowner opposition could block measures within the project, or, at the very least, increase the cost of the project and extend the implementation period. The RP proposes many measures that are located in adjacent aquatic channels connected to the main navigation channel. The RP also proposes measures located on public lands whereby managers are supportive of the restoration objectives. To manage the risk of landowner willingness in measures located on private lands, the NFS has maintained close coordination with private landowners and provided education on the project, as needed. The risk for acquisition of the lands needed for each measure in the recommended plan was evaluated.

Real estate risk was ranked into three categories: low, medium, and high.

- Low risk indicates that the measures reside on public lands or lands that are in partnerships with the non-Federal sponsor.
- Medium risk indicates that the measures are located on private lands, the landowner has expressed support or interest in the project, and the non-Federal sponsor has been successful in engaging the landowner for right of entry during feasibility level of design.
- High risk indicates that the measures are located on private lands, the landowner may be uncertain about their commitment to the project or there was limited engagement with the landowner at the time that the sensitivity analysis was performed.

The selection of risk was qualitative in nature and based on available information. It is important to note that the sensitivity analysis provides a snapshot in time and is subject to change as more information is collected regarding landowner cooperation and support during project implementation. For example, it is expected that lands that are categorized as high risk due to being private and not yet engaging the landowner could move to medium or low risk as contact is made with landowners. Without information, the risk was assumed to be high as a conservative worst case scenario approach.

1.5 RECOMMENDED PLAN (RP) ANALYZED THROUGH REAL ESTATE RISK AND TECHNICAL SIGNIFICANCE OF HABITAT

The 40 measures within the RP were separated into five groups for the sensitivity analysis. Each group of measures builds upon the previous groupings' measures. The first, Group A, captures all public lands (state or federally owned). Group B captures all of Group A plus private lands with management measures of extremely high technical significance. Group C captures all of Group B plus private lands with measures of high technical significance. Group D captures all of Group C plus private lands with measures of medium technical significance. Group E captures all of Group D plus private lands with measures of low technical significance, encompassing all the measures of the RP.

Table 1c-2 presents the changes in Average Annual Habitat Units (AAHUs) for each Group. Figure 1c-1 provides the sensitivity analysis results.

- Group A incorporates 1,163 AAHUs. Group A encompasses 11 measures residing on public lands. One measure is of extremely high technical significance, nine measures are of high technical significance, and one measure is of low technical significance.
- Group B incorporates an additional 122 AAHUs for a total of 1,285 AAHUs. Group B is comprised of private lands with measures of extremely high technical significance. Group B adds one measure to the array for a total of 12 measures. This measure is classified with a medium real estate risk.
- Group C incorporates an additional 855 AAHUs for a total of 2,140 AAHUs. Group C is comprised of private lands with measures of high technical significance. This adds 10 additional measures to the array for a total of 22 measures. Five of these measures are characterized with low real estate risk, two with medium real estate risk, and three with high real estate risk.
- Group D incorporates an additional 2,194 AAHUs for a total of 4,334 AAHUs. Group D is comprised of private lands with measures of medium technical significance. Group D adds 11 measures to the array (for a total of 33 measures), one with low real estate risk, four with medium real estate risk, and six with high real estate risk.

Group E incorporates an additional 344 AAHUs for a total of 4,678 AAHUs. Group E is comprised of private lands with measures of low technical significance. This ultimately totals to the 40 measures of the RP. Group E adds seven measures, all of which are characterized as high real estate risk.

Table 1c-2: Findings of Sensitivity Analysis

Group	Group Description	AAHU	Technical Significance				Real Estate Risk		
			Ext. High	High	Med	Low	Low	Med	High
A	Public Lands (11 Measures)	1,163	1	9	0	1	11	0	0
B	Addition of Private Lands w/ Measures of Extremely High Technical Significance (+1 Measure)	+122	+1	0	0	0	0	+1	0
C	Addition of Private Lands with Measures of High Technical Significance (+10 Measures)	+855	0	+10	0	0	+3	+2	+5
D	Addition of Private Lands with Measures of Medium Technical Significance (+11 Measures)	+2,194	0	0	+11	0	+1	+4	+6
E	Addition of Private Lands with Measures of Low Technical Significance (+7 Measures)	+344	0	0	0	+7	0	0	+7

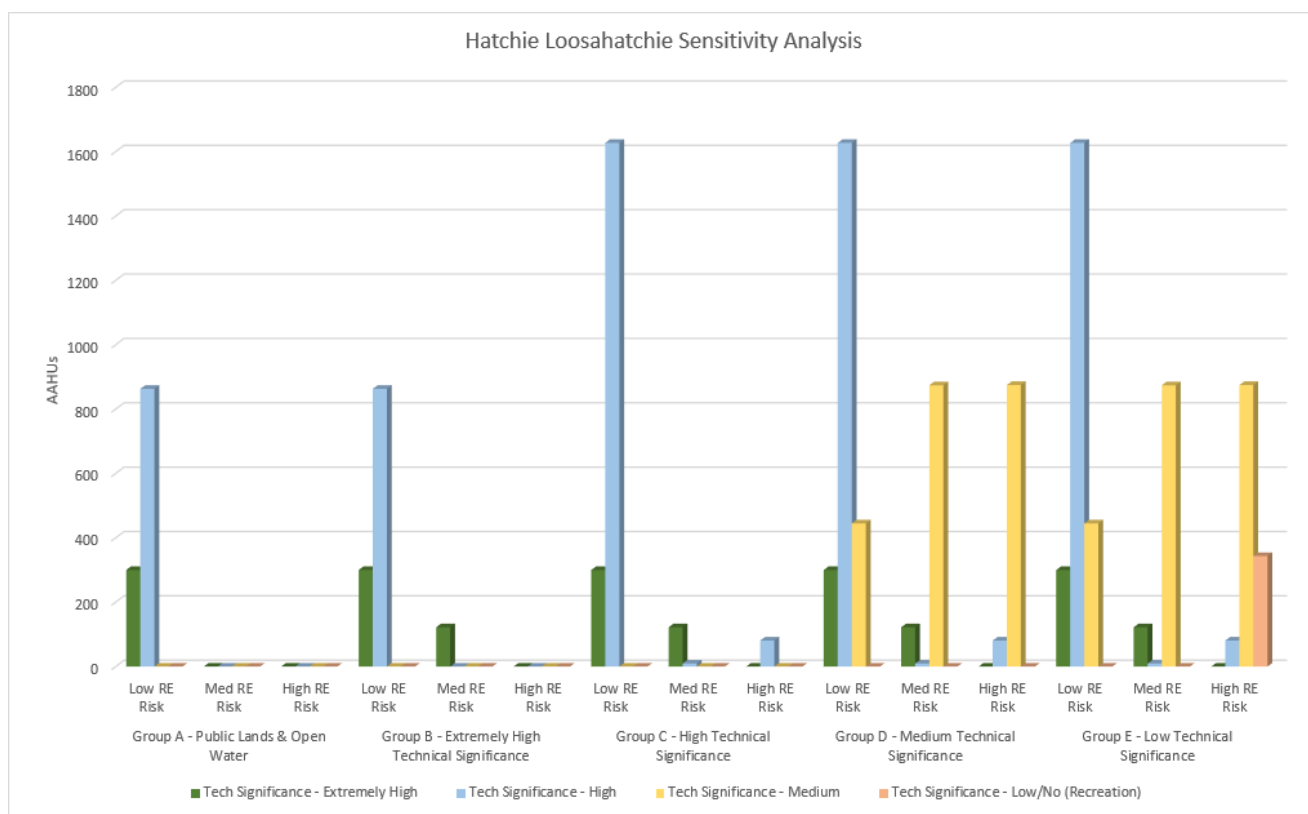


Figure 1c-1: Sensitivity Analysis Results for Hatchie Loosahatchie

1.6 CONCLUSION

Due to the high likelihood of acquiring lands containing measures included in Group A and Group B, it is likely that the acquisition of measures with the highest technical significance, meander scarps, will be achieved. Group A includes 1,163 AAHUs and Group B increases AAHU output to 1,285 AAHUs. The bottom line is that management measures characterized as having *extremely high technically significant habitats* (meander scarps) and *high technically significant habitats* (forest stand improvements of cypress/tupelo, bank protection of secondary channels, moist soil management for waterfowl, dike notching for connectivity in secondary channels, wood traps, and flow restoration/wetland complex restoration) *also have the lowest associated real estate risk*. Ninety-two percent of the measures are of low real estate risk.

Group C delivers an additional output of 855 AAHUs of mostly extremely high and high technically significant habitat on lands that are *mostly low or medium real estate risk*. The bottom line for Group C is that the total 2,140 AAHUs of the most valued habitat are on lands with low to medium real estate risk. Seventy-three percent of measures are of low real estate risk.

Group D delivers an additional output of 2,194 AAHUs of mostly high or medium technical significance (medium technical significance includes forest stand improvements or reforestation of bottomland hardwoods) on *lands that are still predominately low or medium real estate risk*. Fifty-two percent of the measures are of low real estate risk and twenty-one percent are of medium real estate risk. If the non-Federal sponsor were to achieve the acquisition of all measures included as Group D, 4,334 AAHUs would be restored, which is comparable to the total output of the RP (4,678 AAHUs). There are nine measures on high real estate risk lands. If the PDT were unable to acquire high real estate risk measures in Group D, this would eliminate 956 AAHUs of reforestation of cypress/tupelo, forest stand improvement of bottom land hardwood, or reforestation of bottomland hardwood habitat.

Measures with *higher real estate risk* where it may be most difficult to acquire and/or implement the project are generally measures *with lower technical significance* (in terms of ecological outputs) and are included in the final group, as Group E. Group E achieves an additional 344 AAHUs. Forty-three percent of the measures are of low real estate risk and 18 percent are of medium real estate risk. Habitats or benefits that would be lost if the measures in Group E are not able to be acquired include riparian buffer restoration and backwater slough. A recreational opportunity would also be lost.

In summary, Groups A through C provide the most significant habitats (characterized as extremely high or high) through management measures implemented on lands with low or medium real estate risk. These lands are very likely to be able to be acquired, and they deliver the most highly significant habitats, equal to 2,140 AAHUs. Group D of the RP effectively doubles the output to 4,334 AAHUs, but most of these additional AAHUs are of medium technical significance. Management measures associated with these additional AAHUs are located on a mix of medium and high real estate risk lands. Some portion, if not all, of these lands will be able to be acquired. Group E of the RP, with 344 additional AAHUs, is the only group with both lower significance of habitats and higher real estate risks.

While the ultimate ability to acquire these lands with medium and high real estate risk is unknown, these private landowners are either currently cooperating with the non-Federal sponsor on rights of entry (a positive sign regarding future cooperation), or the non-Federal sponsor plans further engagement with the landowners to constructively communicate about the project and increase their awareness of the environmental, social, and regional economic benefits.