Monitoring and Adaptive Management Plan

This Monitoring and Adaptive Management (M&AM) Plan is designed to aid in the success of the recommended ecosystem restoration project in DeSoto County, Mississippi. Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007), as amended by Section 1161 of the WRDA 2016, which amends requires the development of a plan to monitor for the ecological success of an ecosystem restoration project. As detailed in the Implementation Guidance for Section 2039 of the WRDA 2007, Section 1161 of the WRDA 2016, which amends - Monitoring Ecosystem Restoration, the "monitoring plan shall include a description of types and number of restoration activities to be carried out; physical actions to be undertaken to achieve project objectives; functions and values that will result from the restoration plan; monitoring activities to be carried out; criteria for ecosystem restoration success; the estimated cost and duration of the monitoring; and a contingency plan for taking corrective actions in cases in which the monitoring demonstrates that the restoration measures are not achieving ecological success in accordance with the criteria described in the monitoring plan Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost. Any additional monitoring required beyond ten years will be a non-Federal responsibility". In addition, the same guidance requires that an adaptive management plan is developed for all USACE ecosystem restoration projects. The need for adaptive management will be determined using information generated by implementation of the monitoring plan. This information would be used by the USACE, in conjunction with the non-federal sponsor and interagency team, to guide decisions on operational or structural changes (adaptive management) that may be needed to ensure that the ecosystem restoration project meets the success criteria.

Monitoring Plan

1.1 ECOLOGICAL SUCCESS CRITERIA FOR BOTTOMLAND HARDWOOD FOREST (BLH) RESTORATION

A. Initial Success Criteria

1. Achieve a minimum survival of 75% of planted canopy species (planting density would be determined in coordination with the inter-agency team (IAT) once a site and specific vegetation suite has been selected). Minimum survival of planted canopy species is necessary to ensure that a suitable amount of canopy is replaced, in time, to promote species diversity, improve forage and nutrient cycling, enhance surface protection, and to restore habitat for migratory songbirds and other species.

2. The observed composition must approximate the planted species composition and percentages specified in the initial plantings component.
of the final planting plan. A final planting plan would be created in coordination with the non-federal sponsor, IAT, and interested federally recognized tribes, per the Programmatic Agreement. It is critical to ensure that desirable native species, including mast-producers, are included in the reforestation rather than allowing fast-growing early successional species to colonize the area, prolonging the regeneration of a mature BLH forest.

3. These criteria would apply to the initial plantings, as well as any subsequent re-plantings necessary to achieve this initial success requirement. Greater flexibility for species composition or canopy coverage may be necessary if initial success criteria is not met within 3 years.

Initial success criteria should be met within one year of planting. If initial success criteria are not met within one year of planting, see Adaptive Management Strategies identified in Section 1.8, below.

B. Intermediate Success Criteria

1. Maintain a minimum survival of 50% of planted living native canopy species per acre (density may include planted trees and/or naturally recruited native canopy species).

2. Achieve a minimum density of 50% of the living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum may be comprised of soft-mast producing native species.

3. Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria. Community must exhibit characteristics and diversity indicative of a viable native forested wetland community, i.e. vegetation community where more than 50% of all dominant species are facultative (FAC), FAC wet and/or obligate.

Intermediate success criteria should be met within 5 years of the initial success determination. If intermediate success criteria are not met within 5 years of planting, see Adaptive Management Strategies identified in Section 1.8, below.

C. Long-Term Success Criteria (Within 4 growing seasons following attainment of Intermediate Success Criteria and maintained for the duration of the remaining 50-year project life).

1. Maintain survival of approximately 50% by planted and/or naturally recruited native canopy species. If the project doesn’t meet 50% canopy survival within approximately 6 years following attainment of Intermediate Success Criteria, the IAT would meet and discuss path forward.
2. Maintain a minimum density of 50% of the living hard-mast producing species in the canopy stratum (planted trees and/or naturally recruited native canopy species). The remaining trees in the canopy stratum may be comprised of soft-mast producing native species.

3. Maintain USACE hydrophytic vegetation criteria. The plant community must exhibit characteristics and diversity indicative of a viable native forested wetland community, i.e. vegetation community where more than 50% of all dominant species are FAC, FAC wet and/or obligate.

Long-term success criteria should be met within 4 years of the initial success determination. If intermediate success criteria are not met within 4 years of planting, see Adaptive Management Strategies identified in Section 1.8, below.

1.2 ECOLOGICAL SUCCESS CRITERIA FOR STREAM STABILIZATION

A. Initial Success Criteria (End of first growing season following construction of grade control structures)

1. Structures would be inspected to ensure structure integrity, satisfactory slopes, and stability. Stream stability is reliant upon structure stability. Loss of structure stability could lead to flanking and/or failure of grade control in streams causing a loss of stream stability up and downstream of the structure, jeopardizing the system.

2. Prior to construction of the grade control structures, streams would be evaluated using the channel evolution model (CEM) to establish baseline conditions. Note areas where bank height exceeds critical bank height. Establishing the baseline would allow for future monitoring to view changes in the channel and determine the need for further improvements or adaptive management.

3. The following stream characteristics would be evaluated at baseline condition using the Stream Condition Index Model: bank stability, bank angle, surface protection, habitat diversity, fish cover, canopy cover, riparian zones, rooting depth, and root density. These criteria would be used to evaluate the benefits of the work on channel geomorphology, water quality, and plant and animal habitat within the restoration area.

Initial success criteria should be met within 1 year of construction of the grade control structures and associated bank stabilization. If initial success criteria is not met within 1 year of construction, see Adaptive Management Strategies identified in Section 1.8, below.

B. Intermediate Success Criteria (End of second growing season following construction of grade control structures, or 1 growing season after initial success criteria are met)
1. Maintain structure integrity to ensure continued improvements in channel stability.

2. Streams would be evaluated using the channel evolution model to evaluate how the stabilized stream reaches progress to reach an equilibrium. Stabilized stream reaches should show reduction in bank failures, bank erosion, and improvement in habitat. Bank heights that were noted as exceeding critical bank height during the monitoring period for initial success begin to show improvement.

3. The following stream characteristics would show improvement, as compared with baseline conditions noted during the monitoring period for initial success: bank stability, bank angle, surface protection, habitat diversity, fish cover, canopy cover, riparian zones, rooting depth, and root density using the Stream Condition Index Model. This information would be evaluated to determine the actual benefits realized due to the stream stabilization.

Intermediate success criteria should be met within 5 years of the initial success determination. If intermediate success criteria are not met within 5 years of the initial success determination, see Adaptive Management Strategies identified in Section 1.8, below.

C. Long-Term Success Criteria (Within 3 growing seasons following attainment of intermediate success criteria and maintained for the duration of the remaining 50-year project life).

1. A stable structure is in place, which has begun to function as a natural part of the stream environment providing substrate for macro-invertebrates, spawning habitat for (some) fish species, and other aquatic species to colonize along with the natural reestablishment of native vegetation. Pool and riffle sequences are reestablished, providing dissipation of stream flow energy.

2. Streams would be evaluated using the channel evolution model to evaluate how the stabilized stream reaches progress to reach an equilibrium. Stabilized stream reaches begin to form floodplain berms and benches to provide further stability to over-steepened streambanks. New channel margins for the recruitment of woody species riparian corridors provide stable terrestrial and aquatic habitat. Bank heights that were noted as exceeding critical bank height during the monitoring period for initial success are improved and mass wasting along banks is significantly reduced, or no longer occurs, within the restored stream reach.

3. The following stream characteristics would achieve the best attainable condition for the restored stream reach: bank stability, bank angle, surface protection, habitat diversity, fish cover, canopy cover, riparian zones,
rooting depth, and root density. This information would be evaluated to determine the actual benefits realized due to the stream stabilization.

Long-term success criteria should be met within 4 years of the intermediate success determination. If long-term success criteria are not met within 4 years of the intermediate success determination, see Adaptive Management Strategies identified in Section 1.8, below.

During an annual monitoring event, each constructed grade control structure and associated bank protection should be monitored for the success criteria noted above. This should occur in conjunction with the monitoring for reforestation to alleviate multiple trips into the field. It is estimated that, due to the difficulty in accessing some areas along streams, that these monitoring events would require approximately 160-200 person hours of labor for each stream, totaling approximately $16,000-$20,000 per stream for monitoring and report writing. This estimate would likely need to be adjusted for each stream, due to field conditions, number of structures, and accessibility. The cost of monitoring included in the total project cost and cost shared with the non-Federal sponsor shall not exceed one percent of the total first cost of ecosystem restoration features. The monitoring team should consist of (at least) a biologist and engineer who are familiar with the intent of the stream stabilization and success criteria.

Habitat Suitability: Populations of wildlife would increasingly utilize the restored stream reaches for food, shelter, and/or reproductive purposes as the habitat stabilizes and stream functions return and increase. A comparison of the future with and future without project conditions would be conducted to ensure the physical condition of the stream and/or adjacent areas are suitable for native wildlife populations.

Periodic surveys of aquatic invertebrates, fish, and wildlife in representative reaches would be documented. Any observations of fauna and non-living remains of fauna would be documented and photographed in each trip report. Any direct observations of wildlife usage would be noted and photographed. General observations of evidence of wildlife usage including scat, used food sources, remnants of hatched eggs, etc. would also be noted in each trip report. Observations of invasive or non-native species, or other detrimental factors would also be documented to aid in the development or execution of adaptive management solutions.

1.3 MONITORING REPORTS

Monitoring Reports would be drafted and coordinated after each annual assessment of the restoration sites.

1.3.1 Baseline Monitoring Report

Within 90 days of completion of the general construction of grade control structures with associated bank protection and/or restoration of riparian
A baseline monitoring report shall be prepared. Information provided would include the following items:

- A detailed discussion of all restoration activities completed with as-built drawings of completed activities and specifications included.

- A description of habitats and notable features within the restoration site(s).

- Maps/aerial photography of restoration site(s) showing the approximate boundaries of constructed features including planted areas, grade control structures, stone toe (or other) bank protection, site access, areas that required (or may require further) eradication of invasive and nuisance plant species, surface water management features, proposed monitoring transects/plots, photo station locations, and if applicable, piezometer and staff gage locations.

- A detailed inventory of all canopy and midstory species planted, including the number of each species planted and the stock size planted. General locations of plantings should be included and indicated on maps/aerial photography, to the extent practicable.

- A detailed inventory of all grade control and/or associated bank protection. A discussion of the site per the channel evolution model, would be included. Discussion should include bank height and slopes and stream cross sectional data. In addition, the following stream characteristics would be evaluated at baseline condition using the Stream Condition Index Model: bank stability, bank angle, surface protection, habitat diversity, fish cover, canopy cover, riparian zones, rooting depth, and root density.

- Initial and final construction surveys for areas that required topographic alterations, including elevations of all constructed surface water drainage features, culverts, and/or water control structures. The initial and final construction surveys should include cross-sectional surveys of topographic alterations involving the removal of existing linear features such as berms/spoil banks, or the filling of existing linear ditches or canals. The number of cross-sections must be sufficient to represent elevations of these features. The initial and final construction surveys must include areas where existing berms, spoil banks, or dikes have been breached, if applicable.

- Qualitative observations would be made to document existing conditions and would include, but not be limited to, potential problem zones, general condition of native vegetation, and wildlife utilization as observed during monitoring.

- Photographs documenting conditions in the project area would be taken at the time of monitoring and at permanent photo stations within the corridor/BLH.
mitigation site. At least two photos would be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required, and the locations of these stations would vary depending on the restoration site(s). The USACE would make this determination in coordination with the IAT.

1.3.2 Annual Monitoring Reports

All monitoring reports generated after the Baseline Monitoring Report would be called Initial, Intermediate or Long-Term Success Criteria Monitoring Reports and shall be numbered sequentially based on the year in which the monitoring occurred (i.e. Initial Success Criteria Monitoring Report, 2019). All Monitoring Reports shall provide the following information unless otherwise noted:

- All items required for the Baseline Monitoring Report should be included in each annual monitoring report. The Annual Monitoring Reports should be comprehensive, beginning with the baseline monitoring event and progressing through each monitoring event so that a clear progression of habitat improvement and/or needs for adaptive management can be clearly shown and understood.

- A brief description of maintenance and/or adaptive management activities (if applicable) performed since the previous monitoring report should be described. In addition, a discussion of any other significant occurrences (i.e. severe storm events, encroachment, etc.) should be included.

- A detailed inventory of each grade control and/or associated bank protection structure should be made. A discussion of the site/stream reach, per the channel evolution model, would be included.
  - Bank height and slopes and stream cross sectional data, as compared to previous conditions;
  - description of structure integrity, slopes, and stability;
  - description of stabilized stream reach based on the channel evolution model;
  - a suitability index would be determined for each of the following characteristics using the Stream Condition Index Model: bank stability, bank angle, surface protection, habitat diversity, fish cover, canopy cover, riparian zones, rooting depth, and root density which would be compared with the baseline conditions noted in the Baseline Report.

- Quantitative data regarding planted species would be collected from circular plots having a radius of approximately 30 feet, and (2) permanent transects sampled using the point-centered quarter method with a
minimum of 20 sampling points established along the course of each transect, or (3) permanent belt transects approximately 50 feet wide and perpendicular to planted rows. The number of permanent monitoring plots and transects, as well as the length of each transect would vary depending on the restoration site. The USACE would make this determination prior to the first monitoring event in coordination with the IAT. This document may be supplemented, or monitoring plans specific to each stream restoration, may be required. Data recorded in each plot or transect would include:

- Number of living planted canopy species (present within plots and along transects) and the species composition;
- Number of living planted midstory species (present within plots and along transects) and the species composition;
- Average density of living planted canopy species (i.e., the total number of each species present per acre, plot method) and the species composition (transect method);
- Average density of living planted canopy species (i.e., the total number of each species present per acre, plot method) and the species composition (transect method);
- Wetland indicator status of each species observed;
- Average percent cover accounted for by invasive or nuisance plant species (all vegetative strata combined).

Quantitative data regarding plants in the understory stratum would be gathered from sampling quadrats. These sampling quadrats would be established either along the axis of the belt transects discussed above, or at sampling points established along point-centered quarter transects discussed above, depending on which sampling method is used. Each sampling quadrat would be approximately 1 meter X 1 meter in size. The total number of sampling quadrats needed along each sampling transect would be determined by the USACE in coordination with the IAT. Data recorded from the sampling quadrats would include:

- List of understory species identified in each quadrat;
- Average percent cover by native understory species;
- Composition of native understory species;
- Wetland indicator status of each species observed;
- Average percent cover by invasive and nuisance plant species.
• A summary assessment of all data and observations along with recommendations for the likelihood of success and/or the need for adaptive management activities.

• A brief description of anticipated adaptive management work to be conducted during the period from the current monitoring report to the next monitoring report.

1.4 MONITORING SCHEDULE AND MAINTENANCE RESPONSIBILITIES

Monitoring would be dependent upon site conditions but should be conducted within the growing season to determine the survival of planted trees and for ease of identification of plant species. Monitoring reports would be submitted to the IAT and non-federal sponsor, as soon as possible but no later than December 31 of that year.

The USACE would be responsible for conducting the monitoring events and preparing the associated monitoring reports until the long-term success criteria are achieved, as described above. If, after 10 years the long-term success criteria have not been met, a determination would be made as to future monitoring requirements, roles and responsibilities. Coordination with the IAT and non-federal sponsor would occur annually to share monitoring results and reports and to determine the likelihood of success and/or need for adaptive management.

Section 2039(e) of WRDA 2007, as amended by Section 1161 of the WRDA 2016, directs that the responsibility of a non-federal interest for operations and maintenance (O&M) of the nonstructural and nonmechanical elements of a project (or component of a project) for ecosystem restoration shall cease 10 years after the date on which the Secretary makes a determination of success per Section 2039(b)(2). The Secretary is not responsible for the O&M of any components of a project with respect to which a nonfederal interest is released from obligations under Section 2039(e).

It is recommended that restoration features be constructed in phases. For example, the grade control and associated bank stabilization should be constructed prior to reforestation. This construction ordering would allow stabilization to occur prior to reforestation to prevent the loss of newly planted acreage, and to allow space for construction access. This scenario may require adjustment to the typical monitoring schedule, described above, in order to develop a reasonable and efficient monitoring schedule that covers all restoration features. Such adjustments, if necessary, would be made at the time final site-specific monitoring plans are generated. This schedule would be prepared by the USACE in coordination with the non-federal sponsor and the IAT.

Adaptive Management Plan

This section details the Adaptive Management planning for ecosystem restoration features for the North DeSoto County Feasibility Study. The importance of natural variability to ecological resilience and productivity in the DeSoto County area is being taken into consideration. By developing an AM plan, effective operational decisions and enhancement of socio-economic and ecological benefits can be made. In addition, based
on the results and interim conclusions made during the prescribed monitoring process, adjustments can be made in the monitoring plan.

Flexibility would be retained in the management of the riparian restoration and grade control structure placement and design that would provide options to maximize benefits to all fish and wildlife resources. Adaptive management decisions would be based upon monitoring results with input from the IAT. Additionally, overall project construction may be adjusted if the ecosystem restoration project does not function, as intended. Examples of adaptive management actions may include, but are not limited to, replanting of riparian buffers and/or BLH forested areas if survival criteria are not met, planting different types of vegetation, thinning, or implementing modified methods to enhance and restore hydrology, if necessary.

1.5 ADAPTIVE MANAGEMENT PLANNING

Adaptive management planning includes: 1) development of a Conceptual Ecological Model (CEM), 2) identification of key project uncertainties and associated risks, 3) evaluation of the ecosystem restoration projects for adaptive management needs and 4) the identification of potential adaptive management actions to ensure the constructed project meets identified success criteria. Costs for adaptive management actions may not exceed 3% of the total project cost. The adaptive management plan is a living document and would be refined as necessary as new project information becomes available.

1.6 CONCEPTUAL ECOLOGICAL MODEL (CEM)

A CEM identifies the major stressors and drivers affecting proposed ecosystem restoration project for the DeSoto County project (Table 2). The CEM does not attempt to explain all possible relationships of potential factors influencing the restoration sites; rather, the CEM presents only those relationships and factors deemed most relevant to obtaining the required acres/average annual habitat units (AAHUs). Furthermore, this CEM represents the current understanding of these factors and would be updated and modified, as necessary, as new information becomes available.
Conceptual Ecological Model for DeSoto County Ecosystem Restoration

Driver

- Altered Land-use

Stressors

- Increased flows
- Head-cutting and erosion
- Loss of bottomland hardwood forest

Effects

- Loss of structural complexity, meanders, & shallow water areas
- Sedimentation; Low DO; High nutrients
- Channel instability, uncontrolled stream bed degradation
- Disconnected habitat corridors

Objectives

- Reduce further habitat degradation by reducing instability and erosion.
- Restore suitable habitat for native and special status species.
- Improve water quality to support aquatic habitat by reducing channel degradation.
1.7 SOURCES OF UNCERTAINTY AND ASSOCIATED RISKS

A fundamental tenet underlying adaptive management is decision making and achieving desired project outcomes in the face of uncertainties. There are uncertainties associated with restoration of ecosystems within highly developed systems. The project delivery team (PDT) identified the following uncertainties during the planning process.

1. Climate change could cause planted tree mortality or damage to grade control structures:
   a. Storm frequency
   b. Intensity
   c. Timing

2. Hydrologic trends at reforestation sites are currently unknown

3. Uncertainty relative to achieving ecological success in BLH restoration sites:
   a. Water, sediment, and nutrient requirements
   b. Magnitude and duration of wet/dry cycles
   c. Adverse effects of invasive species

4. Loss rate of vegetative plantings due to herbivory, human encroachment, or other undetermined factors.

5. Uncertainty relative to achieving ecological success with grade control structures:
   a. Actual acreage stabilized with structures
   b. Magnitude and duration of channel stability
   c. Changes in bed-slope and sediment loads up and downstream of stabilized reaches

6. Fluvial systems are dynamic in nature; therefore, existing conditions can change in a short period of time.

7. Existing LiDAR data used for the analysis is approximately 10 years old and may not accurately reflect existing conditions. The data was used to identify channel stability issues and locations within the watershed where those issues are occurring. Channel stability issues were qualitatively field-identified on only three (3) watersheds with no new channel survey data collected. The specific locations of these trends have likely changed since the LiDAR data was collected, and will continue to change until construction of stabilization measures are complete.

8. Grade control structure locations were selected based on channel slopes (determined from LiDAR, as noted above). Actual detailed design locations must be field verified, and adjusted prior to final designs.
9. Any future projects, federal or otherwise, constructed downstream of the proposed grade control structures or in the Coldwater River could cause changes in the stability of the tributaries that may undermine or destabilize the existing structures and habitat gains.

1.8 ADAPTIVE MANAGEMENT STRATEGY

If at any point during the monitoring phase, the success criteria identified in Sections 1.1 and 1.2 are not achieved, as scheduled, a determination on reason(s) for delayed success would be required. The determination would assist in selecting the appropriate adaptive management action(s). For example, a severe weather event (such as extreme cold or extended high-water) or poor seedling quality, may cause mortality that isn’t indicative of a deficiency with the restoration plan or site, and a replant may be sufficient to achieve success. However, if a site is discovered to be too wet or dry to support the species list, a revision to the planting plan would be required. The USACE, non-federal sponsor and IAT would convene to decide between remedial actions. See Section 1.9 below for potential adaptive management actions.

Potential Adaptive Management Strategies:

1. Additional or modified vegetative plantings, as needed, to meet identified success criteria.

2. Microtopography work on acquired sites to obtain suitable elevations for BLH reforestation and habitat diversity.

3. Invasive species control (likely to include controlled burns or herbicidal spot treatments) to ensure survival of native species and meet required success criteria.

4. Acquisition of additional reforestation acreage.

5. Modification of design (height, riffle length, slopes) for grade control structures.

6. Modification of grade control structure locations.
   a. Structure locations should not be in meander bends but in cross-over locations
   b. Structure locations can be adjusted to address tributary channel stability
   c. Structure locations require adjustments based on floodplain and terrace locations
   d. Structure locations may be adjusted to protect infrastructure such as utility crossings, bridges and roadways.

7. Addition of grade control structures up or downstream of the currently identified degradational reaches.
8. Some meander bends may require additional hard-structural bank protection (riprap), longitudinal stone toe protection, or soft-structural bank protection (woody material with limited riprap).

1.9 ADAPTIVE MANAGEMENT EVALUATION

As part of the North DeSoto Ecosystem Restoration Project, the grade control and reforestation sites would be further evaluated to develop a project with minimal risk and uncertainty. The items listed below would be incorporated into the Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) plans to minimize project risks subject to the above limitations as set forth in Section 2039 of WRDA 2007, as amended by Section 1161 of the WRDA 2016.

- Success criteria (achieving target habitat improvements for grade control and reforestation)
- Detailed planting guidelines for BLH (species composition, spacing, sourcing, etc.)
- Detailed design guidelines for grade control structures to allow for fish passage and minimal disruption to in-stream habitats
- Invasive species control plans

As part of the adaptive management planning effort, the ecosystem restoration project features would be evaluated using the CEM and identified uncertainty and risk to determine the need for additional actions or costs. These efforts are undertaken to ensure that the project meets the required success criteria. The following potential adaptive management actions or may be required to ensure the expected environmental benefits are achieved. Additional actions may be proposed with the acquisition of new information or with the realization of previously unidentified risks.

Potential adaptive management actions with associated uncertainties addressed are shown in Table 1., below.
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<tr>
<th>Uncertainties/Risks</th>
<th>Potential Adaptive Management Actions</th>
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<td>Replanting</td>
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<td>Climate change</td>
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<td>Hydrologic trends at reforestation sites</td>
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<td>Achieving ecological success in BLH restoration sites</td>
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<td>Loss rate of vegetative plantings</td>
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<td>Uncertainty relative to achieving ecological success with grade control structures</td>
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<td>Dynamic nature of fluvial systems</td>
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<td>Potential future projects unrelated</td>
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If monitoring reveals the restoration project is not meeting the identified success criteria, one or a combination of appropriate activities identified above would be implemented. Specific measures to implement any Potential Action, if determined necessary to achieve project benefits, would be coordinated with the NFS and the IAT, to determine the appropriate course of action. The USACE would be responsible for performing any necessary corrective actions, but the overall cost would be shared with the NFS according to the project cost-share agreement.

The USACE would monitor the project until the success criteria are met. Construction and monitoring would be funded in accordance with all applicable cost-share agreements with the NFS. The USACE would monitor (on a cost-shared basis) the completed restoration to determine whether any adaptive management are necessary to achieve the identified success criteria. Once the USACE determines that the restoration is successful, maintenance would be performed by the NFS as part of its OMRR&R obligations. The USACE would retain the final decision on the success determination until all parties are in agreement. If structural changes are necessary to meet success criteria, the USACE would implement appropriate adaptive management measures, as described above, in accordance with cost-sharing requirements, and subject to availability of funding.

1.10 MAINTENANCE PLAN

Maintenance is an integral part of the Adaptive Management Plan. A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed would be prepared. Likely measures may include invasive species control, ensuring that any required channel work is stable, correcting deficiencies, and maintaining control over access to the area where restoration occurs. Maintenance of the project area, such that the total average vegetative cover accounted for by invasive species and the total average vegetative cover accounted for by nuisance species each constitute less than 5% of the total average plant cover throughout the 50-year project life. Inspections to determine the need for invasive/nuisance control would be conducted during monitoring events, as described, until the long-term success criteria for vegetation is achieved. Ten years after ecological success has been determined the responsibility of a non-federal sponsor to conduct O&M activities on nonstructural and nonmechanical elements of an ecosystem restoration project (or component of a project) will cease. Operation, maintenance, repair, replacement and rehabilitation of structural and mechanical elements of an ecosystem restoration project (or component of a project) will continue as outlined in the operations manual for the project as the OMRR&R is subject to the above limitations as set forth in Section 2039 of WRDA 2007, as amended by Section 1161 of the WRDA 2016. Cessation of O&M activities does not alter the non-federal sponsor's obligation to retain in public ownership the real property interests required for an ecosystem restoration project for so long as the project remains authorized.