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ExxonMobil Environmental Services
Company

Cove Restoration Planting Plan

Mayflower Pipeline Incident Response
Mayflower, Arkansas

February 2015

Revision 1
Cove Restoration Planting Plan

Mayflower Pipeline Incident Response
Mayflower, Arkansas

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ExxonMobil Environmental Services Company

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1. Introduction

ARCADIS U.S., Inc. (ARCADIS) prepared this Cove Restoration Planting Plan (CRPP) for ExxonMobil Environmental Services Company (EMES) on behalf of ExxonMobil Pipeline Company (EMPCo) for the Mayflower Pipeline Incident Response located in Mayflower, Arkansas (site; Figure 1). In April 2013, the U.S. Army Corps of Engineers (USACE) issued a Nationwide Permit 38 Cleanup of Toxic and Hazardous Waste (NWP 38) to EMPCo (Permit No. 2013-00129) for the cleanup of a crude oil release on March 29, 2013.

Initial response actions in 2013 and sheen mitigation actions in the fall of 2014 temporarily disturbed portions of the site. These response actions included vegetation removal in the marsh between Interstate 40 and Highway 89 (herein referred to as “the cove”). This plan outlines the proposed restoration activities for the cove and the subsequent monitoring requirements.

A Stream and Wetland Compensatory Restoration Plan (ARCADIS 2014b) was submitted to the USACE in June 2014 and proposed the level of stream and wetland mitigation to meet the compensatory mitigation rule outlined by the U.S. federal government. The Stream and Wetland Compensatory Restoration Plan included an overview of the proposed on-site restoration. Arkansas Game and Fish Commission (AGFC; 2014) and the Arkansas Natural Heritage Commission (ANHC; 2014) provided comments to EMES on the proposed on-site restoration and these letters are included in Appendix A. Through discussions between EMES and the USACE, the USACE indicated that the Stream and Wetland Compensatory Restoration Plan will address the NWP 38 requirements and that the AGFC and ANHC comments should be incorporated into a detailed planting plan for the site. The CRPP addresses the AGFC and ANHC comments and provides detailed planting plan associated with the proposed level of mitigation. This current CRPP (Revision 1) incorporates additional comments on the CRPP received from the ADEQ on February 12, 2015.

2. Project Description

On March 29, 2013, a breach in a pipeline operated by EMPCo (the 20-inch Pegasus Pipeline) released crude oil in Mayflower, Arkansas (Figure 1). The crude oil was identified as Wabasca heavy crude oil (herein referred to as “crude oil”). An emergency response action was implemented immediately to mitigate the release, and a substantial amount of the crude oil was removed. Wetland, riparian and upland habitats of the cove were disturbed during the 2013 initial response action and 2014 mitigation activities.

Response action cleanup activities affected approximately 17.1 acres of forested wetlands and approximately 1,300 linear feet of an unnamed stream (referred to as the Inlet Channel) in the cove. Sheen mitigation actions described in the Mitigation Action Plan (ARCADIS 2014a) were completed in November 2014. The remedial action objective was to mitigate surface water sheens related to crude oil from the Pegasus Pipeline, to the
extent technologically feasible. The completed mitigation actions in three areas of the cove are summarized below (areas are shown on Figure 2):

- **Inlet Channel.** Targeted removal of sheen-bearing sediment along the bottom of the main channel between Interstate 40 and the Open Water Area. Removal depths varied from 6 to 18 inches. Approximately 750-800 cubic yards of sediment were removed from along approximately 1,300 feet of the Inlet Channel. Excavation areas with depths greater than 6 inches were backfilled with clean material.

- **Open Water Area.** A thin-layer reactive cap was placed over approximately 4.5 acres in the open marsh and water area located between the Inlet Channel and the Heavily Vegetated Area. The reactive cap consisted of an approximate 3- to 6-inch layer of clean sand mixed with organoclay placed directly over the sediment surface. Organoclay is an effective sorptive medium for petroleum hydrocarbons and sheens.

- **Heavily Vegetated Area.** The Heavily Vegetated Area is located downstream of the Open Water Area, extends east, and includes several natural channels. Targeted in-situ amendment in the Heavily Vegetated Area consisted of organoclay placed directly over the sediment, limiting disturbance to the existing vegetation. This vegetation was preserved during the response activities because of its habitat value and the relatively light degree of oiling that occurred in this area.

These activities completed in the Inlet Channel and Heavily Vegetated Area were followed by cap installation in the Open Water Area in November 2014.

3. **Wetland Delineation and Assessment**

The outline of disturbed wetlands is shown on Figure 2. This CRPP focuses on restoring the disturbed Inlet Channel and forested wetlands in the cove. The following sections discuss the cove hydrology, the wetland delineation performed in April 2014, and the supplemental wetland assessment performed in September 2014.

3.1 **Cove Hydrology**

Lake Conway hydrology is the controlling factor for the wetlands habitat in the cove as well as other habitats surrounding the lake. The AGFC began impounding Palarm Creek in 1948 to create the state-owned recreational fishing lake known as Lake Conway (AGFC 2013). From April 15 through November 15, the water surface elevation in Lake Conway is controlled by the dam elevation, which is at approximately 262.87 feet (NAVD88). During winter, November 16 through April 14, the lake level is lowered to an elevation of 261.87 feet (NAVD88) for flood control purposes. Due to the controlling effect of the cove outlet culverts (invert elevation of 262.2 feet [NAVD88]), normal seasonal water levels in the cove are 262.2 feet (NAVD88)
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during winter (or possibly lower) and 262.87 feet (NAVD88) during summer, as controlled by the Lake
Conway dam.

As a result of the seasonal flooding of Lake Conway, portions of the cove are periodically inundated. As
shown on the National Wetland Inventory Map (Figure 3), this results in the creation of two vegetation
communities:

• Palustrine Forested Broad-Leaved Deciduous (PFO1Ah) with a temporary non-tidal water regime that
  has been diked/impounded

• Palustrine Scrub-Shrub Broad-leaved Deciduous (PSS1Fh) with a semi-permanent non-tidal regime
  that has been diked/impounded

3.2 Wetland Delineation

Wetlands in the cove were delineated by Conestoga-Rovers & Associates in April 2014, and documented in
a memorandum provided in the Stream and Wetland Compensatory Restoration Plan (ARCADIS 2014b).
The delineation was conducted using the following U.S. Army Corps of Engineers (USACE) guidance:

• Wetlands Delineation Manual (USACE 1987)

• Eastern Mountains and Piedmont Regional Supplement (USACE 2012)

• Regulatory Guidance Letter 08-02 (USACE 2008)

The wetlands delineation classified the 17.1 acres of disturbed wetlands as 8.8 acres as Palustrine Forested
Wetland – Broad-leaved Deciduous (PFO1) and 8.3 acres as Palustrine Scrub-Shrub Wetland – Broad-
leaved Deciduous (PSS1). A summary figure is provided Appendix B.

3.3 Wetland Assessment

In September 2014, ARCADIS conducted a supplemental wetland assessment to evaluate current site
conditions, sample reference wetland areas around Lake Conway, and develop a restoration planting plan
for the cove. The assessment was performed in response to correspondence from the AGFC and ANHC
to EMES (Appendix A) that requested similar wetlands in the area of high natural quality be used as reference
areas to determine the most appropriate species to plant for the site restoration.

Three nearby wetlands (Figure 4) were assessed to determine which plant species would be proposed in the
CRPP. The Hydrogeomorphic Approach, as outlined in "A Regional Guidebook for Conducting Functional
Assessments of Forested Wetlands in the Arkansas Valley Region of Arkansas" (USACE 2008b), was used for the assessment, with the following modification. In place of detailed transects recommended in the Hydrogeomorphic Approach, forested wetland habitats around Lake Conway were sampled. This modification allowed for an efficient assessment of the existing wetland communities affected by the Lake Conway hydrology.

The surveys conducted in three reference areas are summarized in the following sections. Appendix C provides the U.S. Department of Agriculture (USDA) Soil Survey data for each of the three reference areas (2013). Table 1 provides the plant species observed.

3.3.1 Forested Wetland Reference Area A

Reference Area A is a late successional forested wetland representing a typical undisturbed system for the cove. It is part of the forested wetland areas associated with Palarm Creek in the northeast portion of Lake Conway and is classified as Fringe Forested Wetlands.

The community located in and adjacent to standing water in the drainage swales of Reference Area A was dominated by a bald cypress (Taxodium distichum) and water tupelo (Nyssa aquatica). The upper edge was dominated by the sweet gum (Liquidambar styraciflua) and red maple (Acer rubrum) community. There was an absence of a dense shrub and herbaceous community due to the closed tree canopy. The sampling plots in Reference Area A are shown in Figure 5.

3.3.2 Forested Wetland Reference Area B

Reference Area B is an undisturbed young forested wetland, representative of an early successional wetland forest as would be present in the cove. It lies southeast of Lake Conway. This forested wetland consists of a dense stand of small diameter-at-breast height sweet gum trees with little to no shrub community as a result of the closed canopy. Two plots were sampled in Reference Area B (Figure 6).

3.3.3 Forested Wetland Reference Area C

Reference Area C is a mature forest on the fringe of Lake Conway. It is representative of emergent hydrological regimes such as the edges of the cove. Two plots were sampled in this area, along the eastern shore of Lake Conway (Figure 7). In this area, Wetland Fringe and Forested Wetland habitats were observed. Their vegetation community was dominated by bald cypress trees. These were growing in 6 inches of water, with water marks on the trunks approximately 12 inches above the water line, indicating the range of water levels these habitats experience.
3.4 Project Area Current Conditions

In September 2014, an assessment was conducted in the cove to document current conditions. Plant species presence and abundance, hydrology and habitat descriptions were recorded. A number of trees remain within the disturbed area of the cove. For each of these individual trees, the species was identified, it was located with a global positioning system device, and its diameter at breast height was measured and recorded (Figure 8; Table 1). The trees in the upland forest edge (i.e., undisturbed areas) around the cove were not surveyed. Soil survey data from USDA shows that the cove exhibits similar soils to the reference areas (Appendix C).

The following plant communities, habitats, and conditions were observed in the cove:

- The higher elevations of the cove are dominated by the beggar ticks (*Bidens frondosa*) and water pepper (*Polygonum hydropiper*) community. This community has naturally colonized the area during 2014 and it is expected to be replaced by other species in subsequent years as the plant community matures. This dense herbaceous community provides important organic matter for the soils and traps waterborne seeds for colonization.

- Wetland swales are located throughout the cove. The majority of on-site swales have established new vegetation through waterborne seed deposition and are dominated by a mixture of spikerushes (*Eleocharis spp.*), Virginia buttonweed (*Diodia viginiana*), ditch stonecrop (*Penthorum sedoides*), soft rush (*Juncus effusus*), and beaksedge (*Rhynchospora comiculata*). In September 2014, the swales were retaining water, which is assumed to be at the same elevation as the water level in Lake Conway.

- The Inlet Channel was undergoing remediation at the time of the assessment and was largely devoid of vegetation due to the removal of sediments and placement of clean backfill.

Several wetland communities have developed over the last two growing seasons in the cove from natural seed deposition and the seed bank. It is expected that existing trees in the disturbed area and along the upland forest edge will also function as a seed source for natural recruitment of tree species in the cove.

4. Restoration Objectives and Planting Plan

This CRPP describes the methods that will be used to restore areas temporarily disturbed during the response action and sheen mitigation activities.

4.1 Objectives

The objectives of the restoration include:
• Restore the Inlet Channel in accordance with the Little Rock District Stream Method (Little Rock Method) (USACE Little Rock District 2011).

• Revegetate riparian and wetland habitats temporarily disturbed by cleanup activities and the sheen mitigation activities. Use the wetlands assessment to verify the species for planting.

• Provide slope stability and erosion control through revegetation and restoration activities.

• Use local obtained native plants (as available) to match local vegetation dormancy periods, fruiting, leafing out, and hardiness.

• Develop a monitoring program to measure restoration success and report results.

4.2 Planting Plan for Disturbed Wetlands

The cove wetlands contain three distinct hydrologic zones and associated plant communities: Upper Edge Forested Wetland habitat, Wetland Fringe habitat, and Forested Wetland habitat (Figure 9). The three reference wetland areas associated with Lake Conway were evaluated in order to find examples of each type of habitat with the respective hydrology to aid the restoration planning. The reference wetlands are driven by Lake Conway hydrology, as are the wetland habitats in the cove.

Figure 10 shows a conceptual drawing of a cross-section of the proposed planting plan across the range of habitats as well as the species recommended for each hydrological condition. The approximate locations of these habitats are shown on Figure 11. Based on current site conditions and the assessment of other hydrologically comparable forested wetlands associated with Lake Conway, the planned restoration of the cove is as follows:

• **Upper Edge Forested Habitat (3.2 acres).** The cleared, higher elevations of the cove currently dominated by beggar ticks (*Bidens frondosa*)/water pepper (*Polygonum hydropiper*) community and associated with the Upper Edge Forested Wetland habitats of Lake Conway will be planted with bare root seedlings of sweet gum, red maple and persimmon. The area will be seeded with riparian herbaceous seed mix (NC Piedmont Riparian Mix, ERNMX-307; Table 2) to reduce erosion and stabilize slopes until the seedlings establish root systems.

• **Forest Wetland Habitat (8.4 acres).** In both the Reference Areas and the cove, a collection of tree species were identified in those areas of the forested wetlands that occurred in areas with seasonal flooding. These species included: overcup oak (*Quercus lyrata*), willow oak (*Quercus phellos*), silver maple (*Acer saccharinum*), and river birch (*Betula nigra*). Bare root seedlings of these species will be planted in the Forested Wetland habitat of the cove in areas of appropriate hydrology. A combination of
the Riparian and Wet Meadow seed mixes (NC Piedmont Riparian Mix [ERNMX-307] and NC Piedmont FACW Mix [ERNMX-308]; Table 2) will be applied to the Forested Wetland habitat.

• **Forested Wetland Fringe Habitat (5.5 acres).** The lower elevations of the cove wetlands will be planted with bare root seedlings of bald cypress and water tupelo trees. Historical Lake Conway water elevations will be used to estimate average hydrologic conditions and select seedling placement within the cove. Wetland swales provide ideal hydrology for the development of cypress/water tupelo communities as observed in Reference Area C. A native wet meadow seed mix (NC Piedmont FACW Mix, ERNMX-308; Table 2) will be applied in the saturated soils of the Fringe Forested Wetland habitat to provide species diversity with modifications.

The reactive cap was placed in October through November 2014 and portions of the cap cover the three habitat types within the cove. The Site Planting Plan (Figure 11) shows the location and hydrology of the cap and the proposed plant communities to be restored. In these areas with the reactive cap, special measures will be taken to not compromise the cap’s integrity with restoration activities. Areas of the cap that can be reached from adjacent uncapped areas will be planted with seedlings and seeded with a Wetland mixes (Obligate Wetland Mix, ERNMX-131; Table 2) will be applied to accessible edges of the cap. For the remainder of the area, methods of access will be used that prevent damage to the cap:

• A shallow-draft small boat (e.g., jon-boat with electric motor) to access submerged areas of the cap

• The use of boards/mats to walk out on the cap and plant seedlings.

A Standard Operating Procedure for planting and seeding in the reactive cap area is included in Appendix D. The seedling frequency will be reduced and the planting techniques may also be modified in the field as necessary. For example, mesh bags may be filled with seeds and weighted with rocks and placed in the open waters to hold the seeds to bottom until roots develop. Other ways to plant seeds or seedlings will be evaluated as necessary in the field for their efficacy and safety in application.

### 4.3 Planting Plan for the Inlet Channel

The Inlet Channel (1,300 linear feet) will be restored in accordance with the Little Rock Method (USACE Little Rock District 2011). Figure 12 shows a conceptual drawing of the restoration plan for the Inlet Channel. These restoration activities include installing root wads, and live stakes and planting bare root seedlings to armor stream banks, establish a riparian buffer, and create a diverse habitat structure for fish, reptiles, and amphibians (Figure 12).
4.4 Seed and Plant Types

Table 2 shows the proposed seed mixes. The seed mixture have been modified as requested by the agencies in accordance with correspondence from AGFC and ANHC to EMES (Appendix A).

Existing trees, shrubs, and herbaceous species in the cove, as well as plant communities upstream of the cove, are important seed sources for revegetation of the cove, as evidenced by the naturally recruited black willow (Salix nigra), water willow (Decodon verticillatus), and buttonbush (Cephalanthus occidentalis) are already abundant in the cove. Given their natural recruitment, these species will not be included in the initial restoration planting.

4.5 Planting Density

Trees and shrubs will be planted at sufficient density to account for natural competition and mortality among seedlings. The target planting density will be approximately 10 percent greater than observed for seedlings and young trees in reference areas. The plant stem density in the early successional forested system in Reference Area B was approximately 890 stems per acre and the bare root seedlings on site will be planted at a rate of up to 1000 stems per acre. In the areas with the reactive cap, the planting frequency will be reduced to approximately 500 stems per acre to reduce the impact on the reactive cap.

4.6 Schedule

Planting activities are scheduled to begin in March 2015 to maximize time in the first growing season and help establish the plant community. The restoration activities are anticipated to take 2 to 3 weeks to complete.

5. Restoration Monitoring Program

Monitoring and adaptive management of the restoration will be conducted, as proposed in this section, to ensure the wetland plant communities and habitats are reestablished in the cove after completion of the restoration and planting activities. The first monitoring of the restored wetlands will occur at the conclusion of the first full growing season. Wetland scientists will conduct subsequent monitoring events in the following spring and fall to evaluate conditions relative to the restoration goals. The schedule of additional monitoring events will be determined based on completed monitoring results and adaptive management activities.

5.1 Success Criteria

Success criteria provide measureable objectives to gauge project success. The goals for restoration in the cove include:
• Restore habitats temporarily disturbed by remedial activities.

• Restore Inlet Channel in accordance with the Little Rock Method (USACE Little Rock District 2011).

Performance standards associated with habitat restoration will be based on the criteria of 70 percent areal coverage of restoration plantings and/or target hydrophytes.

5.2 Monitoring Methods

This section presents the methods to be used during the collection and analysis of qualitative and quantitative data from the mitigation project area.

5.2.1 Qualitative Data

During each field visit, wetland ecologists will record observations of wetland hydrology (e.g., standing water, saturated soils) in restored wetland habitats. Photographs will be taken from permanent monitoring locations, to be established in the field following restoration activities, to supplement recorded field notes. At least one permanent photograph location will be established for each habitat type.

In addition, observations of wildlife use in and around the site will be recorded during field events. Records will include both direct sightings of wildlife as well as visual and audible indications of wildlife use (e.g., burrows, scat, calls). When possible, an activity associated with a sighting (e.g., fly over, roosting, feeding) will be recorded.

5.2.2 Quantitative Data

A representative plot approach will be used to assess the vegetative community during the annual monitoring events. This method provides a direct measure of success criteria metrics. Representative plots will be selected at random prior to the start of each monitoring event in each habitat type (Upper Edge Forested Habitat, Forested Wetland Habitat, and Forested Wetland Fringe Habitat). Plot sizes corresponded to each vegetative stratum as follows:

• Sapling/shrub$^1$ – 15-foot radius circular plot, with a minimum of five plots per habitat

$^1$ Sapling/shrub defined as woody vegetation greater than 2 feet but not more than 20 feet in height.
• Herbaceous – 1 square meter quadrat with a minimum of five plots per habitat

Within each plot, shrub/sapling community composition, stem count and percent cover by community type will be recorded. Within each quadrat, herbaceous community species composition, average height and percent cover will be recorded, as well as the composition, abundance and stem height of any shrubs or saplings. Quadrat and plot locations will be recorded using a global position system device. Information will be collected on monitoring data sheets (Appendix E).

Minimum sampling areas specific to each tree/shrub community type (Tiner 1999) will be used to establish the number of plots. This commonly-accepted approach for evaluating composition and structure of multi-layered communities provides multiple lines of data/evidence to support achievement of success criteria, accounts for natural recruitment/colonization, and facilitates the identification of changes in communities over time.

5.3 Adaptive Management

Adaptive management assesses the success of a restoration project at a particular point in time based on monitoring results, and based on those results, adjusts the state of the project through maintenance to improve the likelihood of project success. As such, the adaptive management program for the cove restoration project will evaluate the habitat types relative to the success criteria listed above and make recommendations for management activities (e.g., invasive species control), as necessary, that would further the attainment of these goals.

If determined that invasive species control is needed, it would be accomplished by the broadcast spraying of glyphosphate herbicide, such as Rodeo®, and/or physical removal of invasive species. Monitoring results and invasive species control activities, along with any additional recommendations for the following year, will be summarized in the annual mitigation monitoring report.

5.4 Schedule

The following schedule is proposed for annual monitoring and maintenance inspections:

• September 2015 – Quantitative monitoring event at the end of the first growing season

• December 2015 – Annual Monitoring Report

• April 2016 – Spring qualitative monitoring event

• September 2016 – Annual monitoring event at the end of the second growing season
• December 2016 – Annual Monitoring Report

The results of the annual monitoring events and future recommendations, if any, will be submitted to the USACE, ADEQ, and AGFC by December 31 of each year. If results indicate that the success criteria have not been met, then recommendations will be discussed in cooperation with the USACE, ADEQ, and AGFC.

6. References


Tables
Table 1
Species Observed During Wetland Assessment (September 2014)

Cove Restoration Planting Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<th>Reference Area A</th>
<th>Reference Area B</th>
<th>Reference Area C</th>
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<td>Green ash</td>
<td>Fraxinus pennsylvanica</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indian grass</td>
<td>Sorghastrum nutans</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese Honeysuckle</td>
<td>Lonicera japonica</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese stilt grass</td>
<td>Microstegium vimineum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jewelweed</td>
<td>Impatiens capensis</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late goldenrod</td>
<td>Solidago gigantea</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lizard's tail</td>
<td>Saururus cernuus</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millet</td>
<td>Pennisetum glaucum</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monkey flower</td>
<td>Mimulus ringens</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Musclewood</td>
<td>Carpus caroliniana</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern sea oats</td>
<td>Chasmanthium latifolium</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Overcup oak</td>
<td>Quercus lyrata</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pignut Hickory</td>
<td>Carya glabra</td>
<td>X</td>
<td></td>
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<td>X</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Cove</td>
<td>Reference Area A</td>
<td>Reference Area B</td>
<td>Reference Area C</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------------</td>
<td>------</td>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Pin Oak</td>
<td>Quercus palustris</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poison ivy</td>
<td>Toxicodendron radicans</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Red Maple</td>
<td>Acer rubrum</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Rice cut grass</td>
<td>Leersia oryzoides</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River birch</td>
<td>Betula nigra</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sassafras</td>
<td>Sassafras albidum</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sensitive fern</td>
<td>Onoclea sensibilis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver Maple</td>
<td>Acer saccharinum</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small white aster</td>
<td>Aster vimeinus</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soft rush</td>
<td>Juncus effusus</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spike rush</td>
<td>Eleocharis spp.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. John's wort</td>
<td>Hypericum perforatum</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Swamp Rose Mallow</td>
<td>Hibiscus moscheutos</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet gum</td>
<td>Liquidambar styraciflua</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tall blue lettuce</td>
<td>Lactua biennis</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trumpet vine</td>
<td>Campsis radicans</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Unknown sedge</td>
<td>Carex spp</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Upland boneset</td>
<td>Eupatorium sessilifolium</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Virginia buttonweed</td>
<td>Diodia viginiana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia creeper</td>
<td>Parthenocissus quincuefolia</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Virginia dayflower</td>
<td>Commelina virginica</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Water horehound</td>
<td>Lycopus americanus</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water oak</td>
<td>Quercus nigra</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water pepper</td>
<td>Polygonum hydropiper</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Water purslane</td>
<td>Ludwigia palustris</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water tupelo</td>
<td>Nyssa aquatica</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Willow oak</td>
<td>Quercus phellos</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Yellow nut sedge</td>
<td>Cyperus esculentus</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Proposed Seed Mixes

**Cove Restoration Planting Plan**  
**ExxonMobil Environmental Services Company**  
**Mayflower Pipeline Incident Response, Mayflower, Arkansas**

### Riparian Seed Mix

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name/Ecotype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NC Piedmont Riparian Mix, ERNMX-307</strong></td>
<td></td>
</tr>
<tr>
<td>Redtop Panicgrass</td>
<td><em>Panicum rigidulum (P. stipitatum)</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Virginia Wildrye</td>
<td><em>Elymus virginicus</em>, 'Suther'-NC Ecotype</td>
</tr>
<tr>
<td>River Oats</td>
<td><em>Chasmanthium latifolium (Uniola latifolia)</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Beaked Panicgrass</td>
<td><em>Panicum anceps</em>, SC Ecotype</td>
</tr>
<tr>
<td>Indiangrass</td>
<td><em>Sorghastrum nutans</em>, NC Ecotype</td>
</tr>
<tr>
<td>Winter Bentgrass</td>
<td><em>Agrostis hyemalis</em>, Piedmont NC Ecotype</td>
</tr>
<tr>
<td>Mistflower</td>
<td><em>Eupatorium coelestinum (Conoclinium c.)</em>, VA Ecotype</td>
</tr>
<tr>
<td>Leathery Rush</td>
<td><em>Juncus coriaceus</em>, Coastal Plain NC Ecotype</td>
</tr>
</tbody>
</table>

### Wet Meadow and Wetland Seed Mix

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name/Ecotype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NC Piedmont FACW Mix, ERNMX-308</strong></td>
<td></td>
</tr>
<tr>
<td>Redtop Panicgrass</td>
<td><em>Panicum rigidulum (P. stipitatum)</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Beaked Panicgrass</td>
<td><em>Panicum anceps</em>, SC Ecotype</td>
</tr>
<tr>
<td>Virginia Wildrye</td>
<td><em>Elymus virginicus</em>, 'Suther'-NC Ecotype</td>
</tr>
<tr>
<td>Lurid (Shallow) Sedge</td>
<td><em>Carex lurida</em>, NC Ecotype</td>
</tr>
<tr>
<td>Hop Sedge</td>
<td><em>Carex lupulina</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Squarrose Sedge</td>
<td><em>Carex squarrosa</em>, VA Ecotype</td>
</tr>
<tr>
<td>Soft Rush</td>
<td><em>Juncus effusus</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Lizard's Tail</td>
<td><em>Saururus cernuus</em>, NC Ecotype</td>
</tr>
<tr>
<td>Woolgrass</td>
<td><em>Scirpus cyperinus</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Mistflower</td>
<td><em>Eupatorium coelestinum (Conoclinium c.)</em>, VA Ecotype</td>
</tr>
<tr>
<td>Showy Tickseed Sunflower</td>
<td><em>Bidens aristosa</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Path Rush</td>
<td><em>Juncus tenuis</em>, NC Ecotype</td>
</tr>
<tr>
<td>Green Bulrush</td>
<td><em>Scirpus atrovirens</em>, 'Suther'-NC Ecotype</td>
</tr>
</tbody>
</table>

Note:
1. New York ironweed (*Vernonia noveboracensis*), and crimsoneyed rosemallow (*Hibiscus moscheutos*) are part of the standard seed mix, but will be excluded from the seed mix for this site.
## Table 2
### Proposed Seed Mixes

**Cove Restoration Planting Plan**  
ExxonMobil Environmental Services Company  
Mayflower Pipeline Incident Response, Mayflower, Arkansas

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name, Ecotype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obligate Wetland Mix, ERNMX-131</strong></td>
<td></td>
</tr>
<tr>
<td>Fox Sedge</td>
<td><em>Carex vulpinoidea</em>, PA Ecotype</td>
</tr>
<tr>
<td>Lurid (Shallow) Sedge</td>
<td><em>Carex lurida</em>, PA Ecotype</td>
</tr>
<tr>
<td>Hop Sedge</td>
<td><em>Carex lupulina</em>, PA Ecotype</td>
</tr>
<tr>
<td>Green Bulrush</td>
<td><em>Scirpus atrovirens</em>, PA Ecotype</td>
</tr>
<tr>
<td>Eastern Bur Reed</td>
<td><em>Sparganium americanum</em></td>
</tr>
<tr>
<td>Blue Vervain</td>
<td><em>Verbena hastata</em>, PA Ecotype</td>
</tr>
<tr>
<td>Soft Rush</td>
<td><em>Juncus effusus</em>, PA Ecotype</td>
</tr>
<tr>
<td>Boneset</td>
<td><em>Eupatorium perfoliatum</em>, PA Ecotype</td>
</tr>
<tr>
<td>Joe Pye Weed</td>
<td><em>Eupatorium fistulosum</em>, PA Ecotype</td>
</tr>
<tr>
<td>Fringed (Nodding) Sedge</td>
<td><em>Carex crinita</em>, PA Ecotype</td>
</tr>
<tr>
<td>Swamp Milkweed</td>
<td><em>Asclepias incarnata</em>, PA Ecotype</td>
</tr>
<tr>
<td>Square Stemmed Monkeyflower</td>
<td><em>Mimulus ringens</em>, PA Ecotype</td>
</tr>
<tr>
<td>Softstem Bulrush</td>
<td><em>Scirpus validus</em>, PA Ecotype</td>
</tr>
<tr>
<td>Swamp (Narrowleaf) Sunflower</td>
<td><em>Helianthus angustifolius</em>, Coastal Plain NC Ecotype</td>
</tr>
<tr>
<td>Woolgrass</td>
<td><em>Scirpus cyperinus</em>, PA Ecotype</td>
</tr>
<tr>
<td>Roughleaf Goldenrod</td>
<td><em>Solidago patula</em>, PA Ecotype</td>
</tr>
<tr>
<td>Nodding Bur Marigold</td>
<td><em>Bidens cernua</em>, PA Ecotype</td>
</tr>
</tbody>
</table>

Note:
1. Blueflag (*Iris versicolor*), Giant Bur Reed (*Sparganium eurycarpum*), and Rattlesnake Grass (*Glyceria canadensis*) are part of the standard seed mix, but will be excluded from the seed mix for this site.
Figures
1. The Heavily Vegetated Area shown in this plan was digitized based on the February 2014 aerial photo that was acquired via Google Enterprise Geo Master License.
2. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.
Legend

- Drainage Path
- Approximate Water's Edge
- Approximate Limit of Work

Wetlands

- Freshwater Forested/Shrub Wetland
- Cove

Palustrine Forested Wetland
Broad-Leaved Deciduous
(PFO1Ah)

Palustrine Scrub-Shrub Wetland
Broad-Leaved Deciduous
(PSS1Fh)

Cove (L1UBHh)

NOTE:
1. NATIONAL WETLAND INVENTORY DATA DOWNLOADED FROM THE U.S. FISH & WILDLIFE SERVICE AT:
   http://www.fws.gov/wetlands/Data/index.html

SITE NATIONAL WETLAND INVENTORY MAP
MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN

2014 WETLAND ASSESSMENT OVERVIEW

FIGURE 4
NOTE:
1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).
NOTE:
1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
COVE RESTORATION PLANTING PLAN

FORESTED WETLAND
REFERENCE AREA B

Legend

Wetland Assessment Area Plot
and Transect Center
1. ALL LOCATIONS ARE APPROXIMATE. INDIVIDUAL POINTS WERE SURVEYED USING A TRIMBLE GeoXH HANDHELD GLOBAL POSITIONING SYSTEM (GPS) EQUIPPED WITH REAL-TIME CORRECTION. THE GPS DATA SET WAS CORRECTED USING A REFERENCE POSITION FROM BASE PROVIDER LITTLE ROCK (ARLR).

Legend
- Wetland Assessment Area Plot and Transect Center

NOTE:
- MAYFLOWER PIPELINE INCIDENT RESPONSE
- EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
- COVE RESTORATION PLANTING PLAN

FORESTED WETLAND REFERENCE AREA C

SERVICES CENTER: SERVPRO LLC, 5500 APPOLONIA DRIVE, LAKEWOOD, WASHINGTON, 98499.
SERVICES CENTER: 5050 116TH STREET W., WEST WACO, TEXAS 76712.
SERVICES CENTER: 3000 DAKOTA STREET W., WINTER GARDEN, FLORIDA 34787.
SERVICES CENTER: 1370 FRESNO AVENUE, ELK GROVE, CALIFORNIA 95757.
NOTES:
1. SURVEY DATA COLLECTED DURING FIELD ACTIVITIES INTERPOLATED BY THE INVERSE DISTANCE WEIGHTING (IDW) METHOD USING AN OPTIMIZED POWER TERM TO DEVELOP A DIGITAL ELEVATION MODEL (DEM) FOR THE AREA SHOWN.
2. HYDROLOGIC CONDITIONS SHOWN ARE BASED ON LAKE CONWAY MEAN WATER ELEVATIONS CALCULATED USING DATA RECORDED IN NATIONAL GEODETIC VERTICAL DATUM (NGVD) 29 FROM FEBRUARY 18, 2008 THROUGH JULY 10, 2013.
3. TOPOGRAPHY AND PLANTING PLAN IN AREA OF REACTIVE CAP SUBJECT TO CHANGE.
**BARE ROOT SEEDLING NOTES:**
1. SELECTED SHRUB AND TREE SEEDLING SPECIES BASED ON OBSERVATIONS OF HIGH-VALUE FORESTED WETLAND SYSTEMS ASSOCIATED WITH UNDISTURBED PORTIONS OF LAKE CONWAY CONDUCTED DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT. SPECIES AND THE LOCATION THAT THEY WERE OBSERVED CAN BE FOUND IN TABLE 1.
2. DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT THE FOLLOWING SPECIES WERE OBSERVED TO BE NATURALLY RECOLONIZING THE PROJECT AREA: BLACK WILLOW, BUTTONBUSH, WATER WILLOW. NO BARE ROOT SEEDLINGS OF THESE SPECIES WILL BE PLANTED DURING THE INITIAL RESTORATION EFFORTS.
3. SHRUB AND TREE SEEDLING SPECIES AND HERBACEOUS PLUGS WILL BE PLANTED AS AVAILABLE.
4. LOCATIONS OF THE FEATURES SHOWN HAVE BEEN APPROXIMATED. ACTUAL PLANT PLACEMENT WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.
5. RESTORATION PLANTING WILL TARGET A DENSITY OF 1,000 SEEDLINGS PER ACRE.

**SEED MIX NOTES:**
1. NATIVE SEED MIXES WILL BE APPLIED THROUGHOUT THE PROJECT AREA IN ADDITION TO THE PLANTED TREES AND SHRUBS.

**ABBREVIATIONS:**
- STRATUM "T" IS TREE
- STRATUM "S" IS SHRUB
- STRATUM "H" IS HERBACEOUS

- **FT AMSL - FEET ABOVE MEAN SEA LEVEL**

- **OBLIGATE SEED MIX (OBL Wetland Mix, ERNMX-131) WILL BE APPLIED TO THE WETTER LOCATIONS OF THE "FORESTED WETLAND FRINGE HABITAT" AND "FORESTED WETLAND HABITAT" AREAS.**

- **THE SEEDING RATE WILL BE APPROXIMATELY 5 POUNDS PER ACRE.**
NOTES:
1. REFER TO FIGURE 10 FOR PLANTING PLAN DETAILS.
2. SOME TOPOGRAPHIC FEATURES HAVE BEEN GENERALIZED FOR THE PURPOSE OF THIS PLAN. APPROPRIATE PLANT PLACEMENT IN SITE MICROTOPOGRAPHY WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.

MAYFLOWER PIPELINE INCIDENT RESPONSE EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY COVE RESTORATION PLANTING PLAN

SITE PLANTING PLAN VIEW

FIGURE 11
1. SELECTED SHRUB AND TREE SEEDLING SPECIES BASED ON OBSERVATIONS OF HIGH VALUE FORESTED WETLAND SYSTEMS ASSOCIATED WITH UNDISTURBED PORTIONS OF LAKE CONWAY CONDUCTED DURING THE SEPTEMBER 2014 WETLAND ASSESSMENT. SPECIES AND THE LOCATION THAT THEY WERE OBSERVED CAN BE FOUND IN TABLE 1.

2. NATIVE SEED MIXES WILL BE APPLIED THROUGHOUT THE RIPARIAN AREA IN ADDITION TO THE PLANTED TREES AND SHRUBS. THE SPECIES INCLUDED IN THE SEED MIXES ARE LISTED IN TABLE 2. RIPARIAN SEED MIX (NC PIEDMONT RIPARIAN MIX, ERNMX-307) WILL BE APPLIED TO THE INLET CHANNEL BANKS AND ADJACENT FLOODPLAIN. WET MEADOW AND WETLAND SEED MIX (NC PIEDMONT FACW MIX, ERNMX-308) WILL BE APPLIED TO PORTIONS OF THE INLET CHANNEL CORRIDOR EXHIBITING APPROPRIATE HYDROLOGIC CONDITIIONS.

3. BLACK WILLOW LIVE STAKES FROM EXISTING TREES ONSITE WILL BE USED TO REVEGETATE THE INLET CHANNEL CORRIDOR.

4. SHRUB AND TREE SEEDLING SPECIES WILL BE PLANTED AS AVAILABLE.

5. LOCATIONS OF THE FEATURES SHOWN HAVE BEEN APPROXIMATED. ACTUAL PLANT PLACEMENT WILL BE SELECTED BY AN ECOLOGIST IN THE FIELD.

6. ROOT WADS WILL BE PLACED THROUGHOUT THE CORRIDOR TO PROVIDE WILDLIFE HABITAT AND ARMOR INLET CHANNEL BANKS.
Appendix A

Letter Correspondence
Mr. Michael Sixsmith
ExxonMobil Environmental Services Company
13401 North Freeway
Houston, TX 77060

Dear Mr. Sixsmith:

An integrated team of Arkansas Game and Fish Commission staff has reviewed the Draft Stream and Wetland Compensatory Restoration Plan prepared by ARCADIS U.S., Inc. and submitted on behalf of ExxonMobil as requested by the U.S. Army Corp of Engineers under a Nationwide Permit 38 to determine the level of stream and wetland mitigation required to meet the compensatory mitigation rule outlined by the US federal government. The plan proposes to conduct on-site restoration by planting and reseeding 17.1 acres of wetlands and 1,300 linear feet of the inlet channel. The treatment of 17.1 acres of wetlands includes 8.8 acres of wetlands that will be restored to palustrine forested wetlands and 8.3 acres of wetlands that will be restored to palustrine scrub-shrub wetlands. The Arkansas Game and Fish Commission staff is providing the following comments on the draft restoration plan, and specifically the proposed re-vegetation portion of the plan.

- While the species lists included in the Proposed Bareroot Plants for Forested Habitat (PP01) and Proposed Bareroot Plants for Emergent Habitat (PSS1) may suggest some generic restoration composition, similar wetlands in the area of high natural quality and diversity should be used as a more precise reference to determine the most appropriate species to plant in the restored areas.
- Specifically in the restored forested wetlands site, the Arkansas Game and Fish Commission requests to be consulted in the development of a more detailed restoration map and planting guide. The previously developed topographic survey of Dawson Cove should be used, in collaboration with the AGFC, to develop a planting guide based on site elevation to determine which species, or assemblage of species, should be planted to mimic natural transitional wetland forests.
- All plants and seedlings used for re-vegetation should be secured from local genotypes.
- Restoration activities for the woody plantings (planting seedlings) and the herbaceous plants (seeding) should be timed to promote the optimal survival of the two plantings. Ideally, tree seedlings would be planted in the late fall/winter while dormant and the herbaceous species would be planted in the spring to allow for a full growing season during establishment.
- Several of the emergent wetland species proposed for use are not appropriate for this site:
- *Acorus americanus* is a northern species and not native to Arkansas. No *Acorus* species should be used in the restoration plantings.
- *Iris versicolor* (Harlequin blueflag iris) is not native to Arkansas. *Iris virginica* would be an acceptable replacement for this site.
- *Schoenoplectus acutus* (hardstem bulrush) is a rare species in the Arkansas and is not known to occur in this region. The use of this species on this site is not appropriate.
- *Vernonia noveboracensis* (New York ironweed) is an eastern species and is not native to Arkansas. *Vernonia gigantea* is a common wetland species in central Arkansas and would be a suitable alternative.
- *Hibiscus moscheutos* (crimsoneyed rosemallow) is not native to Arkansas. *H. lasiocarpos* is present in Arkansas and *H. laevis* is known from this region and may be an appropriate alternative.

The Arkansas Game and Fish Commission appreciates the opportunity to provide constructive comments regarding the Draft Stream and Wetland Compensatory Restoration Plan. The Commission would welcome any opportunity to further collaborate in finalizing this restoration plan.

Sincerely,

Ricky Chastain
Deputy Director

CC: Jim Ellis, Corps of Engineers, Little Rock District
    Jennifer Sheehan, Arkansas Game and Fish Commission
    Lindsey Lewis, U. S. Fish and Wildlife Service
Dear Mr. Sixsmith:

Staff members of the Arkansas Natural Heritage Commission have reviewed the Stream and Wetland Compensatory Restoration Plan prepared by ARCADIS U.S., Inc. for ExxonMobil Environmental Services Company on behalf of ExxonMobil Pipeline Company for the Mayflower Pipeline Incident Response in Mayflower, Arkansas. The purpose of the plan was to determine the level of wetlands/stream mitigation required to meet the federal rules on compensatory mitigation. The plan proposes to conduct on-site restoration by planting and reseeding 17.1 acres of wetlands and 1,300 linear feet of the inlet channel.

The restoration plan identifies 8.8 acres of wetlands that will be restored to palustrine forested wetlands and 8.3 acres that will be restored to palustrine scrub-shrub wetlands. It is proposed that the forested wetlands will be planted with bareroot seedlings from a list of 21 species and seeded with North Carolina Piedmont Riparian Mix and North Carolina Piedmont FACW Mix. The scrub-shrub wetlands will be planted with bareroot seedlings from a list of 13 species. We have the following comments on the proposed revegetation:

- Ideally, similar wetlands in the area of high natural quality should be used as reference areas to determine the most appropriate species to plant in the restoration site.
- Plants and seeds used for revegetation should be secured from local genotypes.
- The woody plants proposed for use (listed in Table 1 of the plan) appear appropriate to this region of the state and are probably present around Lake Conway in suitable habitat.
- Several of the emergent wetland species proposed for use are not appropriate for this site:
  - *Acorus americanus* (sweet flag) is a northern species and not native to Arkansas. No *Acorus* species should be used as this genus is not native to the state.
  - *Iris versicolor* (Harlequin blueflag iris) is not native to Arkansas. *Iris virginica* would be the native iris in wetlands in this part of Arkansas.
  - *Schoenoplectus acutus* (hardstem bullrush) is a rare species in the state and is not known from this region. Although
- we support planting native species, rare species should only be planted within their documented range and, because they may have genetic distinctiveness, only local genotypes should be used.

- Several of the species in the Piedmont FACW Mix are not appropriate for this area:
  - *Vernonia noveboracensis* (New York ironweed). This is an eastern species, not native to Arkansas. The common Vernonia species in central Arkansas are *V. baldwinii*, *V. gigantea*, and *V. missurica*. Of these, *V. gigantea* is the most frequently encountered in wetlands.
  - *Hibiscus moscheutos* (crimsoneyed rosemallow) is not native to Arkansas. *H. laevis* is known from the region and might be appropriate.

Your attention to these concerns is appreciated.

Sincerely,

Cindy Osborne
Data Manager/Environmental Review Coordinator

CC: Jim Ellis, Corps of Engineers, Little Rock District
    Jen Sheehan, Arkansas Game and Fish Commission
    Lindsey Lewis, U.S. Fish and Wildlife Service
Appendix B

Wetland Delineation Summary
Notes:
2. The vegetated area shown in this plan was digitized based on the February 2014 aerial photo that was acquired via Google Enterprise Geo Master License.
3. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.
4. Vegetation was not cleared from the areas labeled "Existing Forested Wetland" and "Existing Vegetated".

Legend
- Wetland Delineation Points
- Drainage Path
- Approximate Waters Edge
- Existing Forested Wetlands (4.4 acres)
- Existing Vegetated Wetlands (10.3 acres)
- Disturbed Wetlands (17.1 acres)
### Faulkner County, Arkansas (AR045)

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Leadvale silt loam, 3 to 8 percent slopes</td>
<td>43.1</td>
<td>48.2%</td>
</tr>
<tr>
<td>11</td>
<td>Linker fine sandy loam, 3 to 8 percent slopes</td>
<td>8.6</td>
<td>9.7%</td>
</tr>
<tr>
<td>17</td>
<td>Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes</td>
<td>3.7</td>
<td>4.2%</td>
</tr>
<tr>
<td>32</td>
<td>Taft silt loam, 0 to 2 percent slopes</td>
<td>19.0</td>
<td>21.2%</td>
</tr>
<tr>
<td>35</td>
<td>Water</td>
<td>14.9</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>89.3</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

**Warning: Soil Map may not be valid at this scale.**

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:20,000. The design of map units and the level of detail shown in the resulting soil map are dependent on that map scale. Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.
<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Amy soils, frequently flooded</td>
<td>242.1</td>
<td>11.3%</td>
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<tr>
<td>3</td>
<td>Enders gravelly fine sandy loam, 3 to 8 percent slopes</td>
<td>31.9</td>
<td>1.5%</td>
</tr>
<tr>
<td>8</td>
<td>Leadvale silt loam, 1 to 3 percent slopes</td>
<td>733.6</td>
<td>34.3%</td>
</tr>
<tr>
<td>9</td>
<td>Leadvale silt loam, 3 to 8 percent slopes</td>
<td>137.5</td>
<td>6.4%</td>
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<tr>
<td>12</td>
<td>Linker fine sandy loam, 8 to 12 percent slopes</td>
<td>13.1</td>
<td>0.6%</td>
</tr>
<tr>
<td>17</td>
<td>Mountainburg gravelly fine sandy loam, 3 to 8 percent slopes</td>
<td>2.9</td>
<td>0.1%</td>
</tr>
<tr>
<td>18</td>
<td>Mountainburg gravelly fine sandy loam, 8 to 12 percent slopes</td>
<td>86.1</td>
<td>4.0%</td>
</tr>
<tr>
<td>20</td>
<td>Mountainburg very stony fine sandy loam, 12 to 40 percent slopes</td>
<td>1.6</td>
<td>0.1%</td>
</tr>
<tr>
<td>23</td>
<td>Ouachita silt loam, occasionally flooded</td>
<td>75.6</td>
<td>3.5%</td>
</tr>
<tr>
<td>32</td>
<td>Taft silt loam, 0 to 2 percent slopes</td>
<td>722.7</td>
<td>33.8%</td>
</tr>
<tr>
<td>35</td>
<td>Water</td>
<td>89.3</td>
<td>4.2%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td><strong>2,136.4</strong></td>
<td><strong>100.0%</strong></td>
<td></td>
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</table>
Warning: Soil Map may not be valid at this scale.
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<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Amy soils, frequently flooded</td>
<td>41.6</td>
<td>49.9%</td>
</tr>
<tr>
<td>8</td>
<td>Leadvale silt loam, 1 to 3 percent slopes</td>
<td>24.8</td>
<td>29.8%</td>
</tr>
<tr>
<td>10</td>
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<td>2.1</td>
<td>2.6%</td>
</tr>
<tr>
<td>11</td>
<td>Linker fine sandy loam, 3 to 8 percent slopes</td>
<td>8.7</td>
<td>10.4%</td>
</tr>
<tr>
<td>13</td>
<td>Linker-Mountainburg association, 8 to 12 percent slopes</td>
<td>3.2</td>
<td>3.8%</td>
</tr>
<tr>
<td>32</td>
<td>Taft silt loam, 0 to 2 percent slopes</td>
<td>2.9</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Totals for Area of Interest 83.4 100.0%
### Faulkner County, Arkansas (AR045)

<table>
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<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Enders gravelly fine sandy loam, 12 to 45 percent slopes</td>
<td>2.3</td>
<td>1.0%</td>
</tr>
<tr>
<td>8</td>
<td>Leadvale silt loam, 1 to 3 percent slopes</td>
<td>89.6</td>
<td>41.2%</td>
</tr>
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<td>0.7%</td>
</tr>
<tr>
<td>20</td>
<td>Mountainburg very stony fine sandy loam, 12 to 40 percent slopes</td>
<td>46.6</td>
<td>21.4%</td>
</tr>
<tr>
<td>35</td>
<td>Water</td>
<td>67.9</td>
<td>31.2%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>217.5</strong></td>
<td><strong>100.0%</strong></td>
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Standard Operating Procedure: Planting of Emergent Aquatic Vegetation on a Reactive Sediment Cap

Rev. #: 2

Rev Date: February 19, 2015
Approval Signatures

Prepared by: __________________________ Date: 2/19/2015

Reviewed by: __________________________ Date: 2/19/2015

( Technical Expert)
I. Scope and Application

This document describes the procedures for planting emergent vegetation on a reactive sediment cap. The reactive sediment cap contains sand and organoclay. The cap placement area was formerly vegetated with a mix of emergent vegetation and shrubs, with open water in deeper areas. To restore vegetation to the cap area, the cap will be planted with seedlings of select species native to the area, live stakes from nearby vegetation, and seed mix placement. The restoration will be completed in a manner that does not disrupt the integrity of the cap and/or reduce its effectiveness in mitigating oil sheens from the underlying sediments.

During planting, it is anticipated that portions of the reactive cap area will be inundated with water up to 3 feet. The seedling will be planted in areas with less than 0.5 feet of water (as determined in the field). Planting of live stakes will be conducted in areas with water depths between 0.5 and 1 foot. Seed mix placement (by hand) will occur throughout the cap area regardless of water depth.

The following sections list the necessary equipment and provide detailed instructions for planting with seedlings, planting with live stakes from nearby vegetation, and seeding by hand.

II. Personnel Qualifications

ARCADIS field personnel will have current health and safety training, including 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training, and site-specific health and safety training. In addition, personnel overseeing, directing, or supervising planting will be versed in the applicable Standard Operating Procedures (SOPs) to successfully complete the planting, and will have familiarity with restoration of vegetation.

III. Equipment List

The following equipment will be required during the planting activities:

- Personal protective equipment (PPE) and safety equipment required by the Health and Safety Plan
- Global Positioning System (GPS) equipment with sub-meter accuracy
- Wading staff
- Non-motorized flat bottomed boat (aluminum Jon boat) and oars
- Laminated site location map (with the reactive cap and water depths less than 0.5 feet estimated)
- Indelible ink pen and ball point pen
- Field log book
- Digital camera
• 3 Steel tree-planting bars (dibble)
• Loppers or hand shears to cut live stakes from nearby vegetation
• Fertilizer tablets, mycorrhizal tablets, and water gel (Safety Data Sheets are attached to this SOP)
• Purchased seedlings per the plan
• Purchased seed mixes per the plan
• Four 2 feet by 6 feet textured composite wood boards (non-sorbet) at least ½ inch thick with deck grip tape applied for extra non-slip protection and ropes attached through holes at both ends of the sheet of composite board for walking on the cap to plant seedlings (See below for example).

IV. Cautions

Plants should be watered regularly until planting. This can be done by using the water in the cove.

Premix water gel prior to loading the boat to minimize activities being performed over water.

If inclement weather occurs (lighting or severe storm), then planting will be discontinued and personnel should take appropriate cover per the Health and Safety Plan.

V. Procedures

Preparation of seedlings:

1. Seedlings will be kept wet and shaded until time for planting. This will be done by either using water from the cove or from a hose and a woven fabric cover (such as burlap). They will be checked at the beginning of each day to ensure that they are wet.
2. Seedling roots will be dipped in a mixture of “Soil Moist Root Dip” to inoculate the bare roots before they are planted.
Planting seedlings in inundated areas (less than 0.5 feet of water):

In areas of the cap where low water levels prevent access via boat, field staff will plant seedlings on foot. To avoid compromising the integrity of the cap, a planting platform will be utilized to spread out the weight of field personnel and minimize the possibility of damaging the cap surface.

1. Use textured composite wood boards to avoid absorbing water and gaining unnecessary weight. Carefully place the composite board on the cap without disturbing the cap surface.
2. Make sure that the composite board is in full contact with the cap material before stepping on to ensure sheet will not move while working on it. If movement is observed place weights on board (rocks, hand weights or sand bags) to hold boards in place.
3. Place the second composite board next to the first one to allow for access on the cap. Always work on the sheets and not the cap.
4. The relocation of the sheets is done by lifting up the end with the rope and then slowly lifting the rest while standing on the other sheet.
5. The dibble will be placed through the surface of the cap and any overlying erosion protection mats to a depth of about 10 inches and pushed forward and removed.

6. The seedling roots will be placed in the dibble hole along with fertilizer and mycorrhizal tablets.

7. The dibble will be placed 2-3 inches behind the seedling and pushed into the ground and pushed against the seedling to close the hole.

If numerous planted seedlings are observed to be uprooted by wildlife or inclement weather, new methods will be utilized and/or the area will be revegetated via hand seeding only.
Relocating plants into inundated areas (0.5 to 1 feet of water):

In areas of the cap where the water is between 0.5 to 1 feet, some plants and live stakes can be planted from the adjacent vegetated area.

1. Plants will be collected throughout the adjacent wetland by using loppers and shears to cut live stakes or by pulling the plants up with their roots.
2. To harvest live stakes, cut branches that are roughly ½ to 1 ½ inches in diameter (some thinner widths may be successful as well) in 2 to 3 foot lengths. Collect live stakes from multiple locations in the adjacent wetland.
3. Cut the bottom of the stake on an angle to form a point. This will help with inserting the stakes.
4. Deploy the boat into the water body closest to where plants will be installed.
5. Plants will be relocated to the cap area in water depths up to 1 foot. Relocation will be completed in the same day.
6. Plants pulled up with their roots will be placed on the cap with their roots in contact with the cap material by hand.
7. Live stakes cut from nearby vegetation can be placed into the cap by pushing them in by hand or use of a dibble as outlined for seedling planting if the stake will not advance.
Spreading seed by hand on to the cap (all water depths):
Seed mixes will be placed on the entire surface of the cap by hand, regardless of water depth.

1. The seed mix selected for the cap area will be spread by hand over the entire cap area.
2. When working in water less than 6 inches composite board will be used to spread the seed by hand over the water surface.
3. When working in water deeper than 6 inches a boat will be used to spread the seed by hand over the water surface.

VI. Waste Management

Waste materials such as excess gel and planting materials (e.g., shipping boxes, wrapping materials) generated during the planting activities will be minimal and along with disposable equipment will be transported for off-site disposal in accordance with project requirements and applicable State regulations. PPE such as gloves will be collected for proper disposal.

VII. Data Recording and Management

Daily planting activities will be recorded in the field notebook, including total number of seedlings planted, live stakes, pounds of seed mix and additives used. Water depth levels and planting methods will be documented on a figure. Photographs of planting and field activities will be taken as appropriate, and photographs taken will be recorded (e.g., subject matter, photograph location, and photograph facing) in the field notebook. Copies of the field notebook will be forwarded to the Project Manager or designee, as requested. Upon completion of the field activities, field notebooks will be maintained in the project files.

Attachments: Safety Data Sheets
Fertilizer Tabs

Material Safety Data Sheet

May be used to comply with OSHA’s Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

IDENTITY (as Used on Label and List)
REMKE Planting Tablets 20-10-5

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

Section I

Manufacturer’s Name
REMKE Enterprises, Inc.

Emergency Telephone Number
630/810-1162

Address (Number, Street, City, State, and ZIP Code)
P.O. Box 893
Addison, IL 60101

Telephone Number for Information
630/351-9915

Date Prepared
1/19/69

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Component (Specific Chemical Identity, Common Name(s))
Non-Hazardous: A non-hazardous blend of ureaformaldehyde,
Mono-Ammonium Phosphate, Potassium Sulphate,
Calcium Sulphate and other non-hazardous
fertilizer slow release agents and carriers.

Oral LD-50 - greater than 2000mg/kg for male rat.

Section III — Physical/Chemical Characteristics

Boiling Point
not known

Specific Gravity (H2O = 1)
1.5

Vapor Pressure (mm Hg)
not known

Melting Point
not known

Vapor Density (AIR = 1)
Evaporation Rate
not known

not known

Scarcity in Water
75%

Appearance and Odor
Blue tablet - No odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)
Not flammable

Flammable Limits
Not Flammable

LEL, Not flammable

UEL, Not flammable

Extinguishing Media
Water

Special Fire Fighting Procedures
Remove ignition source. Minimize breathing of fumes.

Unusual Fire and Explosion Hazards
Excessive inhalation of fumes from metals can produce metal fume fever. Toxic and irritating gas may be evolved in a fire.

Reproduce locally

OSHA 174, Sept. 1955

04/10/97 12:16   TX/RX NO.1642   P.002
Section V — Reactivity Data

Stability

|       | Unstable | Stable | Incompatible (Materials to Avoid) | None known |

Hazardous Decomposition or Byproducts

|       | May Occur | Conditions to Avoid | None known |

Hazardous Polymerization

|       | Will Not Occur | X |

Section VI — Health Hazard Data

Route(s) of Entry:

- Inhalation? No
- Skin? No
- Ingestion? Yes

Health Hazards (Acute and Chronic): Rat oral LD-50 greater than 20 gm/kg.

Carcinogenicity:

- NTP? No
- IARC Monographs? No
- OSHA Regulated? No

Signs and Symptoms of Exposure: Ingestion can lead to gastrointestinal disturbances.

Medical Conditions Generally Aggravated by Exposure: Ingestion can aggravate gastrointestinal problems.

Emergency and First Aid Procedures:

For ingestion, if victim is conscious, give large quantities of water and induce vomiting. Call doctor. For inhalation, remove to fresh air.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled: Sweep up.

Waste Disposal Method: Apply as fertilizer to field.

Precautions to Be Taken in Handling and Storing: Store in dry area. Mildly corrosive to copper, brass alloys and metals. Store away from strong acids and oxidizers.

Other Precautions: Keep away from children. Keep away from feed and foodstuffs.

Section VIII — Control Measures

Respiratory Protection (Specify Type): None required

Ventilation:

- Local Exhaust: No
- Mechanical (General): Special
- Other: Other

Protective Gloves: Eye Protection

Other Protective Clothing or Equipment: None required

Washroom/Toilet Practices: Wash hands after handling.
JRM Chemical, Inc.

MSDS
MATERIAL SAFETY DATA SHEET

IDENTIFICATION

Product Name: FINES
Chemical Family: Crosslinked polymer
Emergency Telephone: 216-475-8488
Company: JRM Chemical, Inc.
4881 NEO Parkway
Cleveland, OH 44128
Telephone: 216-475-8488
Fax: 216-475-6517

HAZARDOUS INGREDIENTS

Non hazardous under OSHA 29 CFR 1910.1200
HMIS Rating: 1 0 1 B

FIRST AID

Skin: Wash with warm soapy water after use.
Eye contact: Immediately flush with water. If irritation continues, consult a physician.
Inhalation: If dust is present, do not breathe. Move to open air with fresh air.
Ingestion: Do not give any medication unless specified by a physician.

FIRE FIGHTING MEASURES

Flash Point: N/A
LEL: N/A
EUL: N/A
Extinguishing Media: Use water, carbon dioxide, foam.
Special precautions: Material is slippery when wet
Special Protective Equipment: None

ACCIDENTAL RELEASE

Sweep up spill and dispose. Spilled material is very slippery when wet.
HANDLING AND STORAGE

Storage
Store in a cool dry location. Keep lid tightly secured, avoid water and moisture.

Handling
Practice good industrial hygiene.
Immediately sweep up any spills. To avoid potential dust, maintain good housekeeping.
Do not smoke when using.

PERSONAL PROTECTION

Respiratory Protection
Use NIOSH approved respirator if dust accumulation is more than 15 mg/m3.

Protective Gloves
Recommended if prolonged use of product.

Eye Protection
Goggles

Skin/Body Protection
No special suits required

Other
Wash affected areas after use.

PHYSICAL/CHEMICAL PROPERTIES

Appearance and color
White powder

Odor
None

pH
N/A

Melting Point
N/A

Flash Point
N/A

Vapor Density
N/A

Auto ignition
N/A

STABILITY

Stability
Stable

Polymerization
Will not occur

Conditions to avoid
N/A

Incompatible Material
Strong oxidizing agents

TOXICOLOGICAL

Acute Toxicity
Non-toxic by inhalation

Dermal
Non-toxic

Oral
LD50 Acute oral on rats > 5.0 gm/Kg.

IRRITATION

Eyes
Non-irritating

Skin
Non-irritating

Product does not contain any OSHA hazardous components.
MSDS
MATERIAL SAFETY DATA SHEET
FINES

ECOLOGICAL
Considered non-toxic to the aquatic environment.
LC 50/ Fathead minnow (Pimephales Promelas) , 48 hrs. > 1000 mg./l
LC 50/ Daphina magna 48 hrs. > 700 mg./l
IC50/ Scenedesmus subspicatus / 72 h>500 mg/L

DISPOSAL
Dispose in accordance with city, state and federal regulations.

TRANSPORTATION
Not regulated by Department of Transportation.

REGULATORY
Components are on TSCA and Canada DSL.

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<thead>
<tr>
<th>Hazardous Waster Number</th>
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<tr>
<td>RCRA Status</td>
<td>Not a hazardous waste</td>
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<tr>
<td>Reportable Quantity (40CFR 302)</td>
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<tr>
<td>Threshold planning Quantity (40CFR 335)</td>
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</tbody>
</table>

OTHER

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<tr>
<th>NFPA</th>
<th>Fire</th>
<th>Health</th>
<th>Reactivity</th>
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<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

CONTACT PERSON
Safety Manager

This information is given without any warranty or representation. We do not assume any legal responsibility for same. It is offered solely for your consideration, investigation and verification. Before using any product, read its label.

JRM Chemical, Inc.
4881 NEO Parkway
Cleveland, OH  44128
Phone: 216-475-8488
Fax: 216-475-6517
JRM Chemical, Inc.

MSDS
MATERIAL SAFETY DATA SHEET

IDENTIFICATION
Product Name
Soil Moist
Chemical Family
Cross linked polyacrylamide
Emergency Telephone
216-475-8488
Company
JRM Chemical, Inc.
4881 NEO Parkway
Cleveland, OH 44128
Telephone: 216-475-8488
Fax: 216-475-6517

HAZARDOUS INGREDIENTS
Non hazardous under OSHA 29 CFR 1910.1200
HMIS Rating
1
0
1
B

FIRST AID
Skin
Wash with warm soapy water after use.
Eye contact
Immediately flush with water. If irritation continues, consult a physician.
Inhalation
If dust is present, do not breathe. Move to open air with fresh air.
Ingestion
Do not give any medication unless specified by a physician.

FIRE FIGHTING MEASURES
Flash Point
N/A
LEL
N/A
EUL
N/A
Extinguishing Media
Use water, carbon dioxide, foam.
Special precautions
Material is slippery when wet
Special Protective Equipment
None

ACCIDENTAL RELEASE
Sweep up spill and dispose. Spilled material is very slippery when wet.
HANDLING AND STORAGE
Storage  
Store in a cool dry location. Keep lid tightly secured, avoid water and moisture.
Handling  
Practice good industrial hygiene. Immediately sweep up any spills. To avoid potential dust, maintain good housekeeping. Do not smoke when using.

PERSONAL PROTECTION
Respiratory Protection  
N/A
Protective Gloves  
Recommended if prolonged use of product.
Eye Protection  
N/A
Skin/Body Protection  
No special suits required
Other  
Wash affected areas after use.

PHYSICAL/CHEMICAL PROPERTIES
Appearance and color  
White granular
Odor  
None
pH  
6.0-7.0
Melting Point  
N/A
Flash Point  
N/A
Vapor Density  
N/A
Auto ignition  
N/A

STABILITY
Stability  
Stable
Polymerization  
Will not occur
Conditions to avoid  
None
Incompatible Material  
Strong oxidizing agents

TOXICOLOGICAL
Acute Toxicity
Inhalation  
Non toxic by inhalation
Dermal  
Non toxic
Oral  
Non toxic; large amounts can cause GI Tract disturbance. LD50 Acute oral on rats > 5.0 gm/Kg.

IRRITATION
Eyes  
Non irritating
Skin  
Non irritating
Product does not contain any OSHA hazardous components.
ECOLOGICAL

Considered non toxic to the environment

Fish: LC50/Danio rerio/96hr>150mg/l (OECD 203)
Algae: IC/50/scenedesmus subspicatus/72hr>100mg/l (OECD 201)
Daphnia: EC/50 daphnia magna/48hr>100mg/l (OECD 202)
Persistence/degradability: Not readily biodegradable

DISPOSAL

Dispose in accordance with city, state and federal regulations.

TRANSPORTATION

Not regulated by Department of Transportation.

REGULATORY

Components are on TSCA and Canada DSL.

Hazardous Waster Number  N/A
RCRA Status               Not a hazardous waste

Reportable Quantity (40CFR 302)  N/A
Threshold planning Quantity (40CFR 335)  N/A

OTHER

NFPA
Fire   1
Health 0
Reactivity 1

CONTACT

PERSON  Safety Manager

This information is given without any warranty or representation. We do not assume any legal responsibility for same. It is offered solely for your consideration, investigation and verification. Before using any product, read its label.

JRM Chemical, Inc.
4881 NEO Parkway
Cleveland, OH 44128
Phone: 216-475-8488
Fax: 216-475-6517
Appendix E

Example Monitoring Forms
<table>
<thead>
<tr>
<th>Quadrat I.D.</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Time:</td>
<td></td>
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<td></td>
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<tr>
<td>GPS coordinates (AR State Plane)</td>
<td>Northing:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrology</td>
<td>Easting:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Water Depth (cm):</td>
<td>Indic:</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Herbaceous (1m x 1m quadrats) - Cover Class**


<table>
<thead>
<tr>
<th>Shrub and Tree (3 m from quadrat center)</th>
<th>Quadrat</th>
<th>Height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Cover Type - % Cover**

<table>
<thead>
<tr>
<th>Vegetation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bare Soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woody debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders/rock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dead plant debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Daubenmire % Cover Classes:**

<table>
<thead>
<tr>
<th>Range of Cover (%)</th>
<th>Class</th>
<th>Hydrology Indicators</th>
<th>Wildlife Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5%</td>
<td>1</td>
<td>SW = standing water</td>
<td></td>
</tr>
<tr>
<td>6-25%</td>
<td>2</td>
<td>SS = saturated to surface</td>
<td></td>
</tr>
<tr>
<td>26-50%</td>
<td>3</td>
<td>CS = cracked soil</td>
<td></td>
</tr>
<tr>
<td>51-75%</td>
<td>4</td>
<td>SL = stained leaves</td>
<td></td>
</tr>
<tr>
<td>76-95%</td>
<td>5</td>
<td>H = vegetation hummuck</td>
<td></td>
</tr>
<tr>
<td>96-100</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

2 of 2