

PERFORMANCE STANDARDS AND MONITORING PROTOCOL FOR TIDAL WETLAND
MITIGATION BANKS

October 28, 2016

- A. Tidal wetland mitigation banks shall conform to the following performance standards by the end of the monitoring period, unless otherwise determined by the Interagency Review Team (IRT) co-chairs (the U.S. Army Corps of Engineers and the Maryland Department of the Environment), in consultation with the IRT.
- B. Reporting and Performance Standards: All required documentation, including monitoring reports, semi-annual ledgers, and as-built surveys shall be submitted to IRT co-chairs for distribution to the IRT. The IRT co-chairs, in consultation with the IRT, will use best professional judgment, visual observation, and monitoring reports to evaluate attainment of performance standards and in determining whether part of or the entire Bank is successful or whether corrective actions are warranted. Success will be determined on a transect, plot, well, field, or cell basis. Presenting averages or means of plot data across a bank site is not satisfactory to demonstrate success. All of the following standards will be used to assess project success and credit releases and must be achieved each monitoring year:

1. Vegetated Wetland Area(s):

- I. **Wetland Vegetation Dominance:** Wetland vegetation dominance, defined as a vegetation community where more than 50% of all dominant plant species across all strata are rated obligate (“OBL”), facultative wet (“FACW”), or facultative (“FAC”), using the vegetation sampling procedures as described in the appropriate regional supplement to the Corps of Engineers Wetland Delineation Manual, must be achieved; and
- II. **Aerial Cover Vegetative Standards:**
- a. By the end of monitoring year two, achieve a minimum of 45% coverage by native wetland (FAC or wetter) plant species.
 - b. By the end of monitoring year three, achieve a minimum of 70% coverage by native wetland (FAC or wetter) species.
 - c. By the end of monitoring year five, achieve a minimum of 85% coverage by native wetland (FAC or wetter) species
 - d. The IRT may consider volunteer species in the aerial coverage estimates (a-c above) when they support functions consistent with the project design goals, including being appropriate for the planned community type.
- III. **Invasive Species:** The goal of any Bank is to have no invasive species. However, if invasive species are present, no more than 10% of relative plant cover¹ over the entire Bank site shall be made up by non-native or invasive species, with no individual colony greater than or equal to 5% of relative plant cover. No more than 5% of relative plant cover over the entire Bank site shall be made up of *Phragmites australis*². Native status

¹ “Relative plant cover” is defined as the cover of a particular species as a percentage of total plant cover. Thus, relative cover will always total 100%, even when total absolute cover is quite low.

² American Common Reed, *Phragmites australis* subsp. *americanus*, is not considered to be an invasive plant.

will be based on the Natural Resources Conservation Service Plants Database. Invasive species are identified on the National Park Service/U.S. Fish and Wildlife Service document *Plant Invaders of Mid-Atlantic Natural Areas* (<http://www.nps.gov/plants/alien/pubs/midatlantic/>) and the Maryland Invasive Species Council *Invasive Species of Concern in Maryland* (http://www.mdinvasivesp.org/invasive_species_md.html). *Phalaris arundinacea* and *Typha* spp. may also be considered as invasive species by the IRT; and

IV. **Wetland Hydrology:**

- a. Establishment and verification of proper tidal hydrology and substrate elevations relative to closest tidal datum. Tidal inundation appropriate to the planned community type is present throughout the site.
- b. For areas planned as low marsh, tides must alternately flood and expose the land surface at least once daily. The surface elevations of this wetland type will be between the mean high and mean low tide elevations.
- c. For areas planned as high marsh, tides should flood the land surface less often than once daily. The surface elevations of this wetland type will be between the mean high tide and spring high tide elevations.

V. **Wetland Soils:**

- a. The substrate must be of a suitable depth and composition to ensure the survival and growth of wetland plants. The substrate must be stabilized to prevent erosion.

2. Buffer Area(s) Performance Standards are only required to be met if the buffer is getting mitigation credit:

I. **Aerial Cover Vegetative Standards:**

- a. By the end of monitoring year one, a minimum of 50% of the mitigation site shall be vegetated (either by planted or volunteer plants) by native species.
- b. By the end of monitoring year two, a minimum of 60% of the mitigation site shall be vegetated (either by planted or volunteer plants) by native species.
- c. By the end of monitoring year three, a minimum of 70% of the mitigation site shall be vegetated (either by planted or volunteer plants) by native species.
- d. By the end of monitoring year five and each monitoring year thereafter, a minimum of 85% of the mitigation site shall be vegetated (either by planted or volunteer plants) by native species.
- e. Volunteer species should support functions consistent with the project design goals.

- II. **Invasive Species:** The goal of any Bank is to have no invasive species. However, if invasive species are present, no more than 10% of relative plant cover¹ over the entire Bank site shall be made up by non-native or invasive species, with no individual colony greater than or equal to 5% of relative plant cover. No more than 5% of relative plant cover over the entire Bank site shall be made up of *Phragmites australis*², *Persicaria perfoliata*, or *Pueraria montana*. Native status will be based on the Natural Resources Conservation Service Plants Database. Invasive species are identified on the National Park Service/U.S. Fish and Wildlife Service document *Plant Invaders of Mid-Atlantic Natural Areas* (<http://www.nps.gov/plants/alien/pubs/midatlantic/>) and the Maryland Invasive Species Council *Invasive Species of Concern in Maryland* (http://www.mdinvasivesp.org/invasive_species_md.html); and

- III. **Vegetation Density for Forested Buffers:** For forested buffers, native plant density of at least 435 living trees/shrubs per acre with a minimum height of 10 inches shall be achieved by the end of the first growing season following planting and maintained each monitoring year thereafter through the end of the monitoring period; and
- C. **Monitoring Timeframe:** The Bank Sponsor will be responsible for submitting annual monitoring reports to IRT co-chairs (the U.S. Army Corps of Engineers and the Maryland Department of the Environment) to be distributed to the IRT, for a period of five years from the completion of the construction and planting of the mitigation site or phase thereof. Monitoring reports should be concise and effectively provide the information necessary to assess the status of the compensatory mitigation project. Reports should provide information necessary, including supporting data such as plans, maps, and photographs, to illustrate site conditions and whether the compensatory mitigation project is meeting its objectives and performance standards. Monitoring reports, paper copies and an electronic version, must be submitted to the IRT co-chairs by December 31 of each monitoring year. Monitoring must be conducted a minimum of once per year during the monitoring years following construction of any phase of the bank site. Monitoring may be terminated or the extent of monitoring may be reduced over part or the entire site at the discretion of the IRT co-chairs, in consultation with the IRT. Conversely, the IRT co-chairs, in consultation with the IRT, may extend the original monitoring period upon a determination that performance standards have not been met or the bank is not on track to meet them.
- D. **Monitoring Reports:** The first monitoring report is due the year the mitigation planting occurs, unless planting occurs after April 15, in which case the first monitoring report will not be due until the end of the next year. For each monitoring report, vegetative monitoring shall be conducted between June 15 and September 30. These site visits should preferably be during a period with normal hydrologic conditions. The following information must be included with the monitoring report:
1. **Overview / Background Data:**
 - I. Title page indicating the bank name, umbrella bank name (if applicable), site name (if applicable), bank phase (if applicable), monitoring year, any requested action (e.g., credit release, IRT review), Bank Sponsor identification (name, address, phone number, and email address), preparer identification (name, address, phone number, and email address).
 - II. Written description of the location, any identifiable landmarks of the Bank, including information to locate the site perimeter(s), and coordinates of the mitigation site (expressed as latitude and longitude).
 - III. Date(s) of site inspections.
 - IV. A brief paragraph describing the purpose of the Mitigation Bank, including the proposed mitigation acreage and type of aquatic resources approved as part of the mitigation plan and Mitigation Banking Instrument (MBI). Include the dates the mitigation construction was started and the planting was completed.
 - V. A brief narrative description of the Mitigation Bank addressing its position in the landscape, adjacent waterbodies, and adjacent land use.
 - VI. A short statement on whether the performance standards are being met.

- VII. A narrative description of existing site conditions and how the Mitigation Bank has or has not achieved the goals, objectives and performance standards established for the project.
 - VIII. Dates of any recent corrective or maintenance activities conducted since the previous report submission.
 - IX. Specific recommendations for any additional corrective or remedial actions.
 - X. Estimate the amount of the Mitigation Bank that is establishing into each type of wetland system (e.g., tidal low-marsh, tidal high-marsh, beach, open water, etc.). If this differs from what was planned, show the boundaries of the actual wetland area/types on the plans or maps.
 - XI. Estimate the amount of the Mitigation Bank buffer that is establishing into forested buffer, if applicable. If this differs from what was planned, show the boundaries of the actual forested buffer area on the plans or maps.
2. Requirements: List the monitoring requirements and performance standards, as specified in the approved mitigation plan, mitigation banking instrument, and/or special conditions of the permit and evaluate whether the compensatory mitigation project site is successfully achieving the approved performance standards or trending towards success. A table is a recommended option for comparing the performance standards to the conditions and status of the developing mitigation site.
 3. Summary data: Summary data should be provided to substantiate the success and/or potential challenges associated with the compensatory mitigation project. Take one set of photographs from established photographic points any time between June 15 and September 30 of each monitoring year (pictures should be taken at the same time of year when possible). Photo location points should be identified on the appropriate maps and labeled with the direction in which the photo was taken. Submitted photos should be formatted to print on a standard 8.5 by 11-inch piece of paper, dated, and clearly labeled with the direction from which the photo was taken. GPS coordinates should be shown on the plans for each photographic reference point and sample plot.
 4. Maps and Plans: Maps should be provided to show the location of the compensatory mitigation site relative to other landscape features, habitat types, locations of photographic reference points, transects, sampling data points, and/or other features pertinent to the mitigation plan. In addition, the submitted maps and plans should clearly delineate the mitigation site perimeter(s), which will assist the project managers in locating the mitigation area(s) during subsequent site inspections. Each map or diagram should be formatted to print on a standard 8.5 by 11-inch piece of paper and include a legend and the location of any photos submitted for review. As-built plans should be included if they were not already submitted to the IRT.
 5. Conclusions: A general statement shall be included that describes the conditions of the compensatory mitigation project. If performance standards are not being met, a brief explanation of the difficulties and potential remedial actions proposed by the Bank Sponsor, including a timetable, must be provided. The Corps and MDE, in coordination with the IRT, will ultimately determine if the mitigation site is successful for a given monitoring period.
 6. Monitoring Report Measurements:

I. Wetland Area(s):

a. Vegetation:

- i. During each monitoring year, to assess the overall site, estimate the actual and relative percent cover by dominant plant species (including volunteer plants) and any invasive plant species. Estimate percent cover by plants with a wetland indicator status of FAC or wetter. Estimate the percent survival of planted species. Please note that projects where the vegetation is inconsistent throughout the site may not meet the performance standards (e.g. a site where some portions have high densities of FAC or wetter plants but other portions have low densities).
- ii. Measurements of vegetation based upon performance standard and methods used to evaluate the vegetative success of the mitigation site.
- iii. For monitoring years three and five, summarize the results from the vegetation plot study, including the percent cover of planted species and percent cover of each wetland species (planted and volunteer) present in order of dominance and for each vegetative stratum. Data should be summarized for each transect, plot and also by field or cell. **Do not include the raw plot data in your monitoring report.**

b. Hydrology:

- i. Establishment of elevation transects coinciding with vegetation monitoring transects. Elevation profiles shall depict all wetland zones, vegetation plots and transition areas. Elevations should be referenced in feet to a benchmark elevation based upon the North American Vertical Datum of 1988 (NAVD88).
- ii. Establishment of the location of the Mean High Water Line (MHWL), Mean Low Water Line (MLWL), and Spring High Tide Line (SHTL) using onsite monitoring by the applicant and approved by the IRT.
- iii. Measurement of ground water levels, recording the minimum and maximum water table conditions through the wetland transition areas.
- iv. Discuss any relevant hydrologic events (e.g., storms) that may have affected the site.

c. Stability

- i. Estimate percent of site that has erosion problems or slope failure and explain reasons for these problems.
- ii. Discuss long-term stability of the site.

d. Remediation:

- i. Describe any problems observed within the mitigation site, such as: soil stability concerns (e.g., bank or marsh erosion, slope failures, etc.), inappropriate hydrologic regime for the planned wetland community, seasonal drought conditions, storm events, invasion by undesirable species of plants or wildlife, poor plant establishment, adverse water quality impacts (i.e., excessive sediment loading, water pollution, etc.), and human encroachment.
- ii. Describe the proposed remedial measures to address the problems noted above.

- e. Remedial measures proposed by the Bank Sponsor are subject to review and approval by the IRT, acting through the Chairs, prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis. The treatment of non-native invasive plant species does not need the approval of the IRT, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required MDE toxic materials permit.

II. Buffer Area(s):

a. Vegetation

- i. For each monitoring year, estimate the actual and relative percent cover by native plant species and by invasive plant species. Estimate the number of native trees/shrubs per acre (including native planted and volunteer woody species taller than ten inches). Data should be summarized for each plot and also by field or cell. Please note that projects where the vegetation is inconsistent throughout the site may not meet the performance standards (e.g. a site where some portions have high densities of woody species but other portions have low densities).
- ii. Measurements of vegetation based upon performance standard and methods used to evaluate the vegetative success of the mitigation site. **Do not include the raw plot data in your monitoring report.**

b. Remediation:

- i. Describe any problems observed within the buffer, such as: invasion by undesirable species of plants or wildlife, disease condition for plants, poor plant establishment, human encroachment, and slope failures or erosion problems.
- ii. Describe the proposed remedial measures to address the problems noted above.

- c. Remedial measures proposed by the Bank Sponsor are subject to review and approval by the IRT, acting through the Chairs, prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis. The treatment of non-native invasive plant species does not need the approval of the IRT, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required MDE toxic materials permit.

Below are the recommended techniques for monitoring mitigation sites. Alternate techniques may be considered, but must be approved in writing by the IRT co-chairs, in consultation with the IRT, prior to the commencement of the monitoring period.

Recommended Wetland Vegetation Density Measurement Technique

- a. The following method for measuring the success of the vegetative colonization should be conducted between June 15 and September 30 of monitoring years three and five, subsequent to the completion of the construction of the mitigation project, unless an alternate schedule is agreed upon by the IRT.
- b. Vegetation sample plots shall be located on a stratified random basis over the site in order to sample all areas of restored/constructed wetlands at locations adjacent to each photo location marker. Plots should be located within each elevation gradient and spread throughout the Bank.

- c. The following minimum numbers of samples will be required:
 - i. If the site is < 1 acre, then a minimum of 5 plots/acre is required.
 - ii. If the site is > 1 acre but less than 3 acres, then a minimum of 4 plots/acre is required.
 - iii. If the site is > 3 acres, then a minimum of 3 plots/acre is required.
- d. All cells, fields, or blocks shall be sampled. A targeted vegetation monitoring approach that correlates monitoring stations with vegetative signatures on aerial photography may be useful for larger mitigation sites. Record GPS coordinates for plot locations. Plot locations should be fixed throughout the monitoring period.
- c. Each plot shall be of a size no less than 3'x3' (or circular with approximately the same surface area). The vegetation data shall be collected during the growing season and shall include:
 - i. Dominant vegetation species identification
 - ii. Percent ground cover assessment
 - iii. Number of woody plant stems greater than 10 inches in height (total and #/acre)
 - iv. The percentage of dominant species FAC or wetter
 - v. Percent survival by planted species
 - vi. An invasive/noxious species assessment including percent cover

Recommended Buffer Vegetation Density Measurement Technique

- a. The following method for measuring the success of the vegetative colonization should be conducted once between May 1 and September 30 of monitoring years three and five, subsequent to the completion of the construction of the mitigation project, unless an alternate schedule is agreed upon by the IRT co-chairs, in consultation with the IRT.
- b. Vegetation sample plots shall be located on a stratified random basis over the site in order to sample all areas of wetland buffer at locations adjacent to each photo location marker. The following minimum numbers of samples will be required:
 - i. If the site is < 5 acres, then a minimum of 3 plots/acre is necessary.
 - ii. If the site is > 5 acres but less than 20 acres, then a minimum of 3 plots/acre is required for the first 5 acres, then 2 plots/acre is required for the remaining acreage.
 - iii. If the site is > 20 acres, then a minimum of 2 plots/acre is required for the first 20 acres, then 1 plot/acre is required for the remaining acreage.
 - iv. All cells, fields, or blocks shall be sampled. A targeted vegetation monitoring approach that correlates monitoring stations with vegetative signatures on aerial photography may be useful for larger mitigation sites.
- c. Each plot shall be of a size no less than 400 square feet for woody plants (or circular with approximately the same surface area). The vegetation data shall be collected during the growing season and shall include:
 - i. Total actual and relative percent cover of native plant species
 - iii. Number of native woody plant stems greater than 10 inches in height (total and #/acre)
 - v. An invasive/noxious species assessment including percent cover