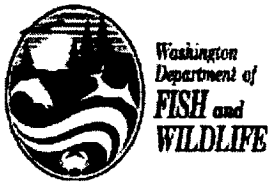

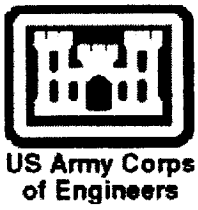

Guidelines for Developing Freshwater Wetlands Mitigation Plans and Proposals

March 1994
Ecology Publication #94-29
printed on recycled paper

Guidelines for Developing Freshwater Wetlands Mitigation Plans and Proposals

Washington State Department of Ecology
Washington State Department of Fish And Wildlife
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

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Preface

This document was written to provide guidance for those planning to undertake the restoration, creation, or enhancement of freshwater wetlands as part of a mitigation program to compensate for unavoidable impacts to existing freshwater wetlands. Six federal and state agencies that review wetland projects and issue permits have collaborated to develop this guidance to improve and facilitate the permit process. By developing one document outlining our recommendations for mitigation plans we will significantly increase the coordination between agencies and reduce possible confusion on the part of applicants.

Acknowledgements

The report was written by Thomas Hruby, PhD and Cyd Brower of the Washington State Department of Ecology's Wetland Section, with help from:

Debbie Knaub - U.S. Army Corps of Engineers
Joanne Stellini - U.S. Fish and Wildlife Service
Linda Storm - U.S. Environmental Protection Agency
Robert Zeigler - Washington State Department of Wildlife

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1.0 Introduction

Constructing and monitoring wetlands is an activity that has become a key component in compensating for unavoidable impacts to wetlands. Unfortunately the success of such mitigation efforts has up to now been variable. It is estimated that less than one-half of the mitigation projects undertaken to date are even partially successful. The failure of mitigation projects is often attributed to inadequate planning, poor site selection and insufficient information on the critical environmental variables at a mitigation site. For these reasons the Washington State Departments of Ecology, and Fish and Wildlife, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service, have developed this guide which outlines the information needed by these agencies to process and review permits requiring compensatory wetland mitigation. **NOTE: These guidelines will not tell you how to do wetland mitigation, nor do they guarantee that a permit will be issued.**

This guide describes a format for presenting wetland mitigation plans, and identifies the information usually needed by agencies to review a plan. It is intended to be a tool for permit applicants, wetland consultants, and landscape architects who may be unfamiliar with the complex and detailed information needed to develop a mitigation plan. The guide provides a checklist of information needed by agencies to evaluate a project. If the pertinent information described here is included in a mitigation plan, review of the project can be expedited.

Important Note:
Compensatory mitigation should not be considered until the other steps of mitigation sequencing have been carried out. Agencies need evidence that the following steps have been carried out (in the order listed) before they will consider compensatory mitigation: 1) Avoidance, 2) Minimization, 3) Rectification, and 4) Reduction.

The ultimate decision on the adequacy of avoidance and minimization of impacts to wetlands for a specific project generally lies with the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency pursuant to the CWA Section 404(b)(1) Guidelines. Inherent in the Section 404(b)(1) Guidelines is the assumption that less environmentally damaging alternatives which do not involve fill in wetlands are available for non-water dependent activities. The burden of proof to demonstrate otherwise lies with the permit applicant. The avoidance of impacts to wetlands should, therefore, be pursued to the maximum extent.

Preparing a mitigation plan usually involves writing two separate documents: a "Preliminary Mitigation Plan" and a "Final Mitigation Plan." The latter includes everything found in the Preliminary Plan as well as more detailed plans, construction drawings, and schedules. This two-phased approach is needed to provide regulatory agencies an opportunity to review the project before too much effort is spent on designing a mitigation plan that does not meet the legal or regulatory needs. It also provides an applicant a preliminary idea of what will be required by the agencies. Furthermore, restoring, creating, or enhancing wetlands is still a new science, and the

successful replacement of wetland functions is not always assured. A technical review of the conceptual plans by a larger group of technical experts is very helpful in developing a final plan that will have a higher probability of attaining its ecological goals.
This guide is not intended to provide all the details for collecting data, analyzing it, and writing wetland mitigation plans, since many of the information needs are site and project specific. It does, however, list the type of information needed and describes methods that may be used to collect the necessary data for **freshwater wetlands**. Mitigation projects involving estuaries or streams will usually require data collected using other methods that are not described in this guide. The level of detail suggested for data collection is geared to larger projects involving freshwater wetlands. Smaller, less complex projects involving wetlands with small areas or with simple ecology may not need to provide all the information described because it may not be relevant or applicable. Decisions about the data needed for the mitigation plan may vary between the agencies depending on their mandates and the resource problems they are trying to protect or manage. **Each project should be assessed individually and more or less information provided depending on the scale of the project and comments by resource agencies during pre-application meetings**.

Mitigation projects require the collection and analysis of data that are the domain of many different disciplines, and thus, often a team of experts needs to be assembled (e.g. plant ecologist, wildlife biologist, hydrologist, soils scientist, landscape architect, construction contractor, and horticulturist). For suggestions on how to select qualified wetlands experts see Appendix A.

The types of information needed to prepare Preliminary and Final Mitigation plans are summarized in Table 1 and 2. Table 3 provides a uniform format for the Executive Summary which should be included at the beginning of both sets of plans. More detail on the information requested is provided in Sections 2 and 3.

The tables are in the form of checklists which can also be used to help organize mitigation plans. Agencies reviewing plans expect to receive information on all the points listed unless justification is provided for exclusions. For example, if a category of information listed is not applicable to a specific project, the applicant should note the omission and provide a rationale. The checklists have a column to indicate information that is or is not included in a mitigation plan. Review of a mitigation plan will be expedited if the checklist and Executive Summary are presented at the beginning of any submission to the agencies.

Important Note

Mitigation of wetland impacts will usually require an area ratio that is greater than 1:1 to ensure that there is a full replacement of both wetland area and functions. The regulatory agencies are using this approach because the existing information and scientific consensus indicate that there are major losses in wetland functions over the time it takes for mitigation wetlands to become a fully functioning part of the ecosystem (at least 30-50 years). The extra area is used to compensate for the loss of these functions. Furthermore, reviews of mitigation projects have found a significant failure in current mitigation projects. The success rate is less than 50% and a large percentage of mitigation projects fail to meet the goal of "no-net-loss" of either wetland area or function. Mitigation ratios are negotiable and will be based on the functions being replaced and the risks involved with the proposed mitigation.

2.0 Annotated Outline for the Preliminary Mitigation Plan

The purpose of the preliminary mitigation plan is to describe the project, its impacts, and an overview of the mitigation strategies employed. A preliminary plan offers agencies an opportunity to comment and provides a forum to discuss goals and approaches. This step will go a long way in reducing frustration for an applicant by involving regulatory and review agencies early in the mitigation development process.

The preliminary mitigation plan is generally presented to agencies during a pre-application consultation. It is usually submitted as part of a wetland report, but may be submitted as a separate document. If the preliminary plan is submitted with the wetland report as one document, duplication of some information usually needed for both can be avoided.

The checklist given in Table 1 identifies the sections that need to be included in the preliminary mitigation plan. The following subsections describe the information that needs to be included under each heading, and the approaches that may be used to collect data and make the necessary analyses.

2.1 Executive Summary

An executive summary should be prepared and placed at the beginning of the Plan which summarizes the project, its impacts, and the proposed mitigation. The information needed for the Executive Summary is given in Table 3.

2.2 Project Description

The following information should be provided to adequately describe the project.

2.2.1 Project Location

- Project name
- Location of wetlands (Township, Range, Section, Lat., Long.) and size (in acres).
- A general site map using a U.S. Geological Survey (USGS) Quadrangle (1:25,000 or 1:24,000), with the site, and its immediate watershed, clearly marked. The map should be on an 8.5" x 11" page with north at the top. If the site is large and will not fit on a standard page, include several pages, but do not reduce the original scale.

- A site map (small scale - not larger than 1 in. = 400 ft.) showing the area that will be impacted and include location and size of developments in adjacent uplands (this map may be larger than the standard 8.5" x 11" page).

- For large or complex projects, a small scale (1 in. = 400 ft. to 1 in. = 100 ft.) airphoto with overlays displaying site property and wetland boundaries (to obtain aerial photos of your location, check your local telephone directory under "Photographers - Aerial").

- Site identified on a National Wetlands Inventory Map.

- Site identified on a Soil Conservation Service (SCS) Soil Survey map (include a description of the soil series).

- Clearly identifiable markers on the ground for orientation. These "reference points" might include existing roads, fence lines, conspicuous trees, or structures to facilitate location of site "on the ground."

2.2.2 Responsible Parties

Provide name(s), title(s), address(es), and phone numbers of applicant(s), or applicant's representative; include contact person(s) if applicant is a company, and the preparers of the mitigation plan. Name the consulting firm responsible for the wetland delineation report if it is different from the firm responsible for the mitigation plan.

2.2.3 Description of Overall Project

Describe the overall project, the proposed land use, and type of construction to be done. Include a description of impacts to wetland functions that will be caused by the project, the steps taken to avoid impacts, and the type of mitigation being proposed. Identify the wetland functions that will be replaced, those that will be permanently lost, those that will be temporarily lost, and those that will be enhanced. Also include the approximate quantities of fill to be placed in wetlands and the dimensions of the impacted site.

2.2.4 Wetland Delineation of Impact Area

Provide a topographic base map (scale: 1 in. = 400 ft. or smaller) of the wetlands that are under state, federal, or local jurisdiction. For projects requiring a Corps of Engineers permit the wetland boundary and area to be impacted should be surveyed accurately and certified by a registered engineer or surveyor. Include which federal manual was used for the delineation (Environmental Laboratory, 1987; FICWD, 1989), the methodology used (routine, intermediate,

problem, or disturbed), the date(s) in which field work was performed, the field data sheets, and a list of the reference material used. **NOTE: The location of the wetland boundary has to be documented in the report by including the raw data collected on the three criteria (hydrology, vegetation, soils).**

2.3 Ecological Assessment of Impact Site

An analysis is needed to determine what ecological functions and social values provided by the wetland to be impacted would be lost and would need to be replaced. The aspects of a wetland that need to be described include vegetation, hydrology, soils, and specific functions that the wetland performs. The following outline summarizes the information needed to make such an assessment. **NOTE: This guide does not specify the methods to be used to collect the necessary data and analyze it. A variety of qualitative and quantitative methods are available, but their use depends on the scale of the project, the severity of impacts, and the type of wetland functions to be impacted.**

2.3.1 Existing Vegetation

- A qualitative description of each wetland community using the Cowardin (1979) classification (include subclass and water regime modifiers); if a forested class is present, also estimate the average age of the canopy species.

- Relative abundance of each plant community with a sketch showing distribution between June and mid-September. NOTE: If the plant community changes seasonally, then a description of each is needed. Different plant species may dominate a wetland depending on the season, especially if the dominants are emergent types. Emergent wetlands should be sampled both in late spring and in the fall.

- Relative abundance of dominant and subdominant plants within each community.

- Wetland indicator status of dominant and subdominant species (e.g., OBL, FAC, FACW).

- Distribution of exotics, if any are present.

- Vegetation structure of adjacent upland plant communities.

Detailed methods for characterizing and sampling vegetation are found in Bonham (1989) and Hays, et al. (1981).

2.3.2 Existing Water Regime

- Source of water: If several sources are present, estimate the percentage contribution from each.

- Duration and frequency of inundation and/or saturation.

- Map of the drainage area with flow directions.

- Depth of surface and/or subsurface water and time of year when it was measured (include estimated average and seasonal highs and lows and the soil type in which measurements were made).

- References used to substantiate this information or a description of the monitoring performed.

2.3.3 Existing Soils

- Soil characteristics including soil type and classification, and a description of texture, color, structure, permeability, and organic content.

- Map showing soil sampling locations.

2.3.4 Existing Fauna

- Description of the animal community using the wetland and its buffers, especially evidence of past or present beaver use. NOTE: The important animal community may include species not often considered in wildlife assessments, including invertebrates, insects, and amphibians.

- Description of the fish community - contact the Department of Fish and Wildlife for sampling methods.

Examples of wildlife sampling protocols can be found in Cooke, Richter, and Horner (1989), Hays et al. (1981), Fletcher, et al. (1993), and O'Connell, et al. (1993).

2.3.5 Functions and Values

Wetlands perform many different ecological functions and provide social values. Not all wetlands, however, perform all functions to the same level, and the level of detail needed in the assessment for each function may vary. Check with local resource agencies, scientists, and your consultant to determine which functions may be important in your region. At present there are no quantitative methods to assess functions and social values, and this analysis will need to be based on one of the qualitative, or semi-quantitative, methods such as the Habitat Evaluation Procedure

(HEP), Wetland Evaluation Technique (WET), Washington State Wetland Rating System, and/or the "best professional judgement" of those preparing the report. Since all these methods depend, to a large degree, on the expertise of those preparing the report, it is crucial that all analyses of functions and values be fully documented, including the sampling and assessment methods used, the training of professional people making judgements, and references consulted. In general the following functions and values need to be assessed:

- How the wetland improves water quality in the watershed.
- How the wetland functions as habitat for plants and animals.

This includes documentation of the presence or absence of priority wildlife species. Priority species are "animal species that are of concern due to their population status and their sensitivity to habitat manipulation." They include all federal or state listed, or candidate threatened endangered and sensitive plant and animal species. Information on documented occurrences of priority animal species is available from the Department of Wildlife (Department of Fisheries and Wildlife, phone (206) 664-9476), and on plant species from the Department of Natural Resources, Washington Natural Heritage Program, Division of Land and Water Conservation, P.O. Box 47047, Olympia, WA 98504-7047.

The description of the habitat function should also include an assessment regarding any overlaps "Priority Habitats" (for example: aspen, riparian, cliffs, islands, meadows, old growth/mature forest, talus, eastern Washington sand dunes, snag rich areas, and urban natural open spaces). For more information on priority habitats contact the Department of Fisheries and Wildlife at (206) 664-9476.

Information on special habitat features such as connection to other aquatic and terrestrial habitat areas forests, stream corridors, estuaries, lakes, ponds, snags, downed logs, and beaver activity in the area impacted is also important.

- The wetland's function in storing floodwaters and reducing peak flows.
- Groundwater recharge or discharge in the wetland.
- Recreational and educational opportunities in the wetland.

2.3.6 Water Quality

- Dissolved oxygen (DO)
- pH and alkalinity
- Temperature (seasonal average daily averages and annual maximum and minimum)

- Turbidity, suspended solids and sediment accretion
- Nutrients (seasonal averages for inorganic nitrogen and phosphorus)
- Fecal coliform
- Heavy metals, in water and sediments

2.3.7 Buffers

Report the size of undeveloped upland buffer (within 300 feet of the wetland) that would be degraded by the project. Also describe the dominant vegetation in the buffer and the physical structure of plants in this buffer (i.e. wooded deciduous, wooded coniferous, diameter at breast height (DBH), density, snags, canopy coverage, and downed woody debris). Provide maps of the buffer areas and the vegetation types.

2.3.8 Wetland Rating

Rate the wetland according to the Washington State Rating System (Department of Ecology, 2d Ed., 1993) into one of the four categories. Include copies of the original data sheets.

2.3.9 Position and Function of the Wetland in the Landscape

Classify the wetland according the Hydrogeomorphic Classification (Brinson, 1993) to describe its position in the watershed. Also provide a qualitative description of the functions performed by the wetland relative to its position in the watershed. This may include its role in attenuating flooding, its role as a corridor for wildlife between different regions of the watershed, its role in regional flyways, or its regional value for the improvement of water quality.

NOTE: If the performance standards (see Section 2.4) are based on comparing the existing, pre-impact, wetland to the mitigated one, then it is imperative that sampling methods for the ecological assessment be the same as those for monitoring.

2.4 Mitigation Approach

2.4.1 Mitigation Sequencing

The first step of any project impacting wetlands should be to avoid impacts to wetland and aquatic resources to the maximum extent possible (see p. 1). Explain what steps were taken to avoid and minimize wetland impacts. Include the following:

- A summary of strategies used for avoiding impacts altogether (be specific and explain why the project requiring wetland fill cannot be completed on an upland site).
- Description of methods that were considered to minimize wetland impacts on site or reduce impacts over time (e.g. timing of project, redesign of project, orientation, and/or location).
- Discussion of wetland rectification strategies or how impacts could be reduced or eliminated over time through restoration and maintenance operations during the life of the project (e.g. removal of temporary fill for access road, and re-vegetation of wetland area).

2.4.2 Goals and Objectives

Goals are broad statements that generally define the intent or purpose of the proposal. **Objectives** specify the direct actions necessary to achieve those goals and should be performance-based and measurable.

Describe the long-term goals of the mitigation project. Specifically identify:

- Size and Cowardin class of wetlands to be restored, created, enhanced, and/or preserved.
- Functions and values to be restored, created, enhanced and/or preserved.

For each goal develop a list of objectives. There should be at least one measurable objective identified for each goal, but there often will be more. Specifically address objectives in terms of the water regime, the vegetation structure, and habitat features to be restored, created, or enhanced.

Example of Goals and Objectives for a Mitigation Project

A goal for a mitigation project may be to "establish a 10 acre diverse wetland habitat with 4 wetland classes that will provide food chain support for amphibians and birds." To achieve this goal, the following objectives may be appropriate to the mitigation site:

Water Regime

a. An area of open water of approximately 1 acre will be established with maximum seasonal depths ranging between 12 - 36 inches.

b. The wetland will provide baseflow to the adjacent stream of at least 1 cfs during the dry season.

Vegetation Structure

c. The vegetated portions around the open water will have 3 acres each of emergent, scrub-shrub, and forested vegetation classes.

Habitat Attributes

d. The area of open water will provide habitat for at least two species of amphibians within five years.

e. The open water and emergent area will provide habitat for at least one species of nesting water birds within five years.

f. The open water will have scalloped edged to maximize the edge habitat and nesting areas.

g. Upland buffers will provide adequate protection for nesting water birds.

2.4.3 Performance Standards

Performance standards (also called performance criteria) are the measurable values of specific variables that establish when objectives have been met. Performance standards may include values for variables such as dissolved oxygen, nutrient levels in water, survival rates of planted vegetation, species diversity, water flows, water depths, and wetland size. The actual performance standards to be applied to a project will depend on its goals and objectives.

Describe what measures will be used to determine when the objectives listed in section 2.4.2 have been achieved. It is critical that these performance standards are based on variables that can be measured or ranked. Unmeasurable qualitative standards such as "the mitigation objective will be met when a pond with a mix of emergent and scrub/shrub vegetation is created" are not acceptable.

Example of Performance Standards (for objectives identified in previous section)

Water Regime

Objective a. An area of open water of approximately 1 acre will be established with maximum seasonal depths ranging between 12 - 36 inches.

Performance Standard: Area of open water after five years will be 1 acre during wet season, 1/4 acre during dry season, with a minimum depth during dry season of 12 inches, and a maximum depth of 36" during the wet season.

Objective b. The wetland will provide baseflow to the adjacent stream of at least 1cfs during the dry season.

Performance Standard: The weekly average of water flow from wetland will be at least 1 cfs between May and October.

Vegetation Structure

Objective c. The vegetated portions around the open water will have 3 acres each of emergent, scrub-shrub, and forested vegetation classes.

Performance Standard #1: The emergent vegetation will cover at least 3 acres of the wetland after five years, and the cover of native emergent species will be at least 80% in these 3 acres as measured by belt transects. The standard deviation of the mean cover value in the sampling quadrats will be less than 1/4 of the mean value (i.e. SD < (1/4 x 0.8); therefore SD < 0.2).

Performance Standard #2: The scrub/shrub vegetation will cover at least 3 acres after five years with an 80% cover of native scrub shrub species in this area as measured by belt transects. The standard deviation of the mean cover value will be less than 1/4 of the mean.

Performance Standard #3: The forest vegetation will cover at least 3 acres after 20 years with a canopy cover of at least 40% of native species in these 3 acres.

Habitat Attributes

Objective d. The area of open water will provide habitat for at least two species of amphibians within five years.

Performance Standard: The use of the wetland by two species amphibians will be documented by live trapping, and/or observation of egg masses during the breeding season.

Objective e. The open water and emergent area will provide habitat for at least one species of nesting water birds within five years.

Performance Standard: Nesting by one species of water birds will be documented by providing a photographic record of a successful brood, or nests with eggs.

Objective f. The open water will have scalloped edged to maximize the edge habitat and nesting areas.

Performance Standard: The ratio of actual water edge to average circumference of pond is greater than 2. (i.e. [actual water edge]/[average circumference of pond ellipsoid] > 2)

Objective g. Upland buffers will provide adequate protection for nesting water birds.

Performance Standard: There will be a vegetated upland buffer of at least 100 feet surrounding the entire wetland consisting of shrubs and trees with an average height of 10 feet within five years.

2.5 Proposed Mitigation Site

2.5.1 Site description

Give pertinent location information, including:

- Location of site (Township, Range, Section, Latitude, Longitude) and size (in acres).
- A general site map using a U.S. Geological Survey (USGS) Quadrangle (1:25,000 or 1:24,000), with site clearly marked and its local watershed;
- A site map (small scale - not larger than 1 in. = 400 ft.) showing the area that will be mitigated and topography at 6" elevation intervals (1' intervals may be adequate if the yearly water level changes are greater than 4-5 feet). If a reference site is being used to establish the performance standards a site map will also be needed.
- For large or complex projects, a small scale (1 in. =400 ft. to 1 in. =100 ft.) airphoto with overlays displaying site property and wetland boundaries.
- Site identified on an SCS Soil Survey map with descriptions of the appropriate soil series.
- Distance of impacts from mitigation site.
- Location of all existing wetlands, streams, and lakes at or near (within 300 feet) the mitigation site. Include a delineation report with data sheets and the name of the company or person doing the delineation if it is different from the firm responsible for the mitigation plan. Include which manual was used for the delineation (1987 or 1989), methods used (routine, intermediate, problem, or disturbed), date(s) in which field work was performed, and a list of the reference material used.

2.5.2 Ownership

Describe the current ownership of the property chosen for mitigation and the owners who will be responsible for the site in perpetuity. If the owner of the mitigation site is different from the permit applicant(s), what is the availability of the property? Does the property carry any easements or encroachments, such as pipelines or power lines? If so, this may not be a suitable mitigation site. If an entity other than the applicant will assume the responsibility for managing the site following completion of the mitigation project, is there a signed, written agreement to that effect identifying the responsibilities of all parties in the case performance standards are not met? Copies of these legal documents should be provided in the mitigation plan.

Indicate what entity, if any, controls water flow to and/or from the site. Who maintains water control structures? What arrangements have been made to guarantee appropriate water flow in the mitigation area during and after establishment of the mitigation project?

2.5.3 Rationale for Choice

Discuss the reasons why the site was chosen for mitigation, and the technical information you have indicating the site will successfully compensate for lost functions. Discuss any other sites that may have been considered. You will need to demonstrate that there will be:

- Enough water at the right time of year, and of adequate quality, to support the target wetland systems.
- Adequate buffers to protect the wetland and functions of that wetland.
- Soils that are appropriate for a wetland or that can be modified.
- Adjacent land uses and zoning that will not degrade your mitigation site.
- An area that will work as a wetland in the natural landscape.

2.5.4 Ecological Assessment of Mitigation Site

Include the same information as in Section 2.3 above (Ecological Assessment of the Impact Site), and add the following:

- An explanation of how adequate hydrology will be provided to support a wetland in perpetuity, and include the hydrologic data to support your proposal. Obtain a water rights permit if one is needed, and provide documentation to that effect.

- A description of your experience (or your consultant's) with this type of mitigation;

  - Has it been done before?
  - Have you or your consultants had experience with this type of work?
  - Give references of similar mitigation that has been completed.

- A description of how you propose to control possible invasions of exotic species.

NOTE: Among the species of greatest concern are reed canary grass (*Phalaris arudinacea*), purple loosestrife (*Lythrum salicaria*), and the bullfrog (*Rana catesbeiana*).

- An estimate of the wetland functions at the site after all performance standards have been met.

- A description of the buffers proposed for the mitigation site. This should include the size of buffers proposed as well as a description of any upland plantings or grading to be done. The success of the mitigation project can be improved by providing adequate buffers to protect the functions being created or modified. Connections to streams and other natural undisturbed areas are also very important and should be preserved or enhanced if possible.

- A discussion of present and proposed land use on the site and in the immediate vicinity of the mitigation site. If the land is currently forest or agricultural, what is the potential for conversion to urban or industrial uses? How does the mitigation site fit into any watershed plans that have been developed for the region?

- A description of how this project may include improvements based on experience from previous projects.

2.5.5 Constraints

Identify constraints outside the owner's control that might affect the mitigation site. Examples of constraints are sites where:

- The major source of water is a stream in which the hydroperiod is controlled by upstream stormwater discharges;
- The mitigation site is next to a pasture from which cattle sometimes escape and may cause damage to new plantings;
- The forest buffer is owned by someone else, and may be logged;
- The site is in a rural area, but within the urban growth boundary of a local jurisdiction.

2.6 Preliminary Site Plan

A preliminary site plan for the mitigation site describes the mitigation strategies that will be used to achieve the goals and objectives described in Section 2.3. At this stage in the process a brief description is needed of the methods, or processes, that will be used to meet **each of the objectives** proposed. At this stage, detailed engineering drawings are not needed, but schematic drawings are very important. The following lists the type of information that is usually needed.

- Schematic drawing of proposed changes in topography.
- Schematic drawing of hydrologic structures.
- Schematic drawing of soils.
- Schematic drawing of proposed vegetation distribution and structure.
- Proposed changes in habitat attributes and their location.
- Location of existing or proposed buffers.
- Section drawings showing relationship of topography, hydrology, and vegetation.

Examples of methods (using sample performance standards from 2.4.3)

Objective a. An area of open water of approximately 1 acre will be established with maximum seasonal depths ranging between 12 - 36 inches.

Performance Standard: Area of open water after 5 years will be 1 acre during wet season, 1/4 acre during dry season, with a minimum depth during dry season of 12 inches, and a maximum depth of 36 inches during the wet season.

METHOD: The area of open water will be created by excavating an area of 1 acre to a depth of 3.5 feet below existing grade. This excavation will intersect the groundwater level even during the dry season (see data presented in the site description). The data also indicate that the proposed elevation of the bottom of the pond is at least 12 inches below the mean groundwater level during the dry season, and this will satisfy the performance standard developed. The maximum depth will be maintained by building an outlet structure that is 36 inches higher than the maximum depth of the open water.

Objective d. The area of open water will provide habitat for at least two species of amphibians within five years.

Performance Standard: The use of the wetland by two species amphibians will be documented by live trapping, and/or observation of egg masses during the breeding season.

METHOD: Amphibian habitat will be created by grading the area of open water so that at least 1/4 acre will have water depths of ---- during the months of ----. Groundwater levels at the site during these months are between (x.x) ft. and (x.x) ft. below grade as indicated by the data collected. To create this water depth the area of open water will be excavated to xx inches below grade in the location marked on the map in figure X. Carex spp. will be planted at these water depths to provide support for amphibian egg masses.

2.7 Monitoring Plan

A monitoring plan is needed that outlines the methods by which data are to be collected for demonstrating that the performance standards have been met. The monitoring plan needs to include the following elements:

- Variables to be measured.
- Sampling methods for each variable.
- Schedule for sampling each variable.

- Sampling locations for each variable.
- Laboratory methods to be used (if any).
- Clearly identifiable markers on the ground to act as reference points for orientation. These may include properly surveyed roads, benchmarks, and permanent structures.
- List of individuals or groups doing the monitoring.

As mentioned previously, the methods used for monitoring specific variables need to be the same as those used in establishing baseline data at either the reference site or the wetland to be impacted (Sections 2.3, 2.4).

NOTE: The objectives developed in Section 2.4 are expected to be confirmed through the monitoring program. The monitoring plan, therefore, has to be designed to assess the quantitative performance standards previously developed.

Time frames for monitoring will vary with the scope of the project and should be determined in conjunction with the lead agency. Typically, monitoring should continue for at least five years, though sampling every year may always be necessary. Monitoring beyond five years should occur on projects expected to take longer to develop (e.g. forested wetland creation), or where proposed development projects have the potential to affect on-site mitigation. Additional monitoring should be made a part of the contingency plan if the project fall short of its goals and objectives.

Monitoring will usually include the following elements of the wetland ecosystem.

2.7.1 Vegetation

Vegetation monitoring is needed to measure the success of planting or recolonization both in the wetland and its buffer. It should be done using established methods such as belt or line transects. Transects should be permanently marked in the field (eg. rebar painted orange) and identified on surveyed topographic maps. Each sampling site should also be photographed at the time of monitoring. The vegetation sampling should measure:

- percent cover of each plant stratum and species
- species composition (also note whether native or exotic; planted or colonizer),
- average height and survival of each species
- biomass (for certain species)
- vegetation structure in and around wetland
- type of trees (coniferous, deciduous, size)
- density and size of snags and downed woody debris

- canopy structure

Descriptions of methods for sampling vegetation are found in Bonham (1989).

2.7.2 Water Regime

Monitoring the water regime is needed to determine if there is adequate water for successful plant establishment, and to maintain the necessary flows in the wetland and its watershed. *The water regime is the single most important variable in establishing or maintaining a functioning wetland*, and it is extremely important to understand how water will be provided to your mitigation site. A thorough understanding of the seasonal variability in water flows, water volumes, and residence time is needed.

Some of the methods used to monitor water regime are:

- groundwater wells
- piezometers
- surface water gauging stakes
- continuous recording flow meters
- crest gauges

2.7.3 Soils

Soil monitoring is needed to track the development of hydric soils over time. The characteristics to monitor include:

- soil color (use Munsells Soil Chart)
- pH
- particle size
- redox potential
- organic content
- microbial activity
- time and duration of saturation or ponding
- alkalinity

2.7.4 Fauna

Monitoring fauna is needed to determine if wildlife functions are developing as planned. Monitoring may include some quantitative measure of:

- invertebrate populations
- amphibian populations

- fish populations
- reptile populations
- bird populations
- mammal populations
- use of wetland by priority species (i.e. Endangered, Threatened, or Sensitive)
- use of wetland and buffers by fish and wildlife species.

The monitoring should be tailored to address the specific objectives for the mitigation, and needs to provide sufficient data to determine whether the performance standards have been met. For wildlife the methods may include live trapping and fixed census stations at the impact site and the reference site. The level of sampling intensity will be very site specific and depend on the mitigation being proposed. The regulatory agencies should be consulted to determine what level of wildlife monitoring is appropriate.

Descriptions of methods for sampling wildlife are found in Hays, et al. (1981); O'Connell, et al. (1993); and Cooke, Richter, and Horner (1989).

2.7.5 Development of Habitat Structure

Monitoring the development of habitat structure and connection is needed to determine if suitable habitat is being created. Monitoring may involve some measures of:

- Tree structure around and in wetland (deciduous, coniferous)
- Density and size of snags, downed trees, woody debris
- Canopy cover
- Number of structural levels (i.e. groundcover, shrub/scrub, trees) and distribution,
- Connection of mitigation area with aquatic and terrestrial habitats and other open lands
- Description of adjacent land uses and their impact on the mitigation site
- Presence of Priority Habitats (Department of Fisheries and Wildlife)

2.7.6 Water Quality

Monitoring water quality is necessary to determine the success of storm water treatment, erosion control measures, and more. Runoff from development may also need to be monitored prior to discharge into a wetland mitigation site to assure that minimum water quality standards are maintained. Baseline data should be collected prior to site work by monitoring the wetland to be impacted or reference wetlands in the same watershed. The goal is to know what the water quality is prior to mitigation, so that if a change occurs, it can be measured against a background standard. If there is a change, remedial actions should be taken. Examples of projects where water quality monitoring would be required are landfills, sewage treatment plants, and industrial facilities. Parameters that may be measured include:

- Dissolved oxygen
- Nutrients (nitrogen, phosphorus dissolved and/or particulate)
- Toxic substances
- Suspended solids
- Biological and/or chemical oxygen demand
- Bacteria
- Temperature
- pH
- Alkalinity and/or hardness
- Heavy metals

NOTE: The selection of sampling sites that are representative of the wetland is critical for providing an accurate assessment. Sites should be chosen by persons with experience in water quality monitoring.

2.7.7 Buffers

Adequate buffers around a wetland are critical in protecting many wetland functions. The monitoring plan needs to describe how the buffers will be monitored, and whether they are protecting the wetland functions being mitigated. If a buffer is being created then the vegetation can be sampled using the methods described in Section 2.7.1. If a good buffer already exists at the mitigation site then the monitoring should involve some measure of its effectiveness at protecting the wetland and its functions(i.e. no visible vandalism, dumping, etc.). Monitoring should include the species and the physical structure of the vegetation in the buffer.

2.8 Site Protection

The mitigation plan needs to specify what measures will be taken to protect the site "in perpetuity." Conservation easements, deed restrictions, and direct donations are a few options available for protecting the mitigation site in perpetuity. Regulatory agencies will require some legal proof that the site has been adequately protected. The preliminary plan should discuss the measures proposed by the applicant for protecting the site.

3. Annotated Outline for Final Mitigation Plan

The final mitigation plan provides all the information necessary to actually implement the mitigation. In addition to revisions of the preliminary plan resulting from agency comments, the final plan should include site design specifications, construction designs, and planting/repopulation schedules. The final plan should be developed only after the appropriate review agencies have provided written approval of the conceptual mitigation plan described in Section 2. Furthermore, a field review of the project for the resource agencies may have to be arranged prior to preparing a final plan. This will, to a large degree, depend on the size and scope of the project and any problems that may have arisen. **Any comments from resource agencies on the conceptual plan should be addressed and reflected in the final mitigation plan/report. If comments have not been incorporated explanations should be provided.**

3.1 Executive Summary

(same as in Preliminary Plan - see Section 2.1)

3.2 Project Description

(same as in Preliminary Plan - see Section 2.2)

3.3 Ecological Assessment of Wetland to be Impacted

(same as in Preliminary Plan - see Section 2.3)

3.4 Mitigation Goal(s), Objectives and Performance Standard

(same as in Preliminary Plan - see Section 2.4)

3.5 Proposed Mitigation Site

(same as in Preliminary Plan - see Section 2.5)

3.6 Final Site Plan

Detailed site plans are crucial to the ultimate success of a project and should be developed by experienced professionals. The plans should include at a minimum:

3.6.1 Site Surveys/Topography (to be conducted by a registered surveyor)

- Contours at 6 inch or 1 foot intervals of the final design. Contour intervals will depend on water level fluctuations. If seasonal water fluctuations are less than 2-3 feet then contour intervals should be 6 inches. This will provide you with 4-6 contours within the critical area for vegetation development and simplify your plans for plantings.
- Spot elevations for low points, high points and structures (such as culverts, hydraulic controls, utilities, and roads.
- Property boundaries.
- On-site wetland boundaries (existing and after mitigation).
- On-site floodplain and ordinary high water mark (OHWM) boundaries.
- Orientation and scale (1 inch = 50 feet).
- Benchmarks.
- Location and elevation of soil borings (if performed).
- Location of soils to be stockpiled, if any.
- Location and elevation of all structures, especially those controlling hydrology.
- Location of all permanent markers and sampling stations used for monitoring.
- Adjoining land uses.
- Buffer areas proposed for the site and their boundaries.

3.6.2 Water Regime

- Seasonal water level information and flow through rate.
- Depth to ground water.
- Sources of water and volume, velocity, frequency of flooding.
- Groundwater and surface water source and characteristics.

- Elevation of water table and dates when measured.
- Engineering drawing of water control structures.

3.6.3 Soils

- Position, thickness, and classification of each soil layer.
- Existence of any foreign materials.
- Soil characteristics (from the Soil Conservation Service).

NOTE: If wetland soils are to be stockpiled they will have to be maintained in an anaerobic condition to facilitate colonization by wetland plants. This means they should be kept saturated with water to preserve the anaerobic microbe community. If soils become aerobic the possibility of colonization failure is much higher.

3.6.4 Landscape Plans

Generally these need to be prepared by a landscape architect with assistance from a plant ecologist. If you are constructing or altering buffers, include the same information listed below for the buffer. Plans should include at a minimum:

- drawings of plant distribution and spacing on topographic map.
- type of plant materials (size, source of nursery stock, seed, etc.).
- other planting details as needed to assure success.
- methods for controlling exotic plants if they exist in the vicinity.
- erosion control and bank stabilization.
- proposed grading plan.
- irrigation plans until plants are established (method, frequency, amount of water).
- special maintenance and protective features such as buffers, fences, weeding schedule.
- soil amendments, including mulch sources.

- cross sectional drawings showing water levels in relation to plant distributions.
- location and distribution of plantings in buffers.
- location and type of habitat structures or habitat features.

Information from the reference site or the impacted site can be used to provide guidance in identifying which of the above are the most important. A description of the methods for controlling exotic species, the grading plans, and the irrigation plan are critically important because exotics are difficult to eradicate once established, the grading will reflect the water regime possible, and transplants often need irrigation to survive.

3.6.5 Construction Specifications

- Landscape contractor's responsibilities;
- Sources (plant materials, soils, fertilizers, habitat structures);
- A copy of the contract outlining the landscape contractor's responsibilities, including:
    - Fertilizations and irrigation.
    - Replacing plant mortalities.
    - Replanting seeded areas with transplants.
    - Temporarily protecting vegetation from wildlife, (if needed).
    - The number of site inspections with dates.

3.7 Monitoring Plan

(same as Preliminary Plan, Section 2.6)

- ADD a timetable for reporting monitoring results and analyses. Tie the dates of providing results to the start of construction, unless other overriding reasons are present. For example, the first year's monitoring report will be due 15 months after the start of construction.

3.8 Site Protection

The mitigation plan needs to specify what measures will be taken to protect the site "in perpetuity." Conservation easements, deed restrictions, and direct donations are a few options available for protecting the mitigation site in perpetuity. Regulatory agencies will require some

legal proof that the site has been adequately protected. Copies of the conservation easements, deed restrictions, or other legal instruments need to be provided with the final mitigation plan.

Listed below are reference documents which may be useful for selecting the best protection option:

1) Model Wetlands Protection Ordinance (Ecology, September 1990, Section 7.5a);

2) Exploring Wetlands Stewardship: A Reference Guide for Assisting Washington Landowners (Ecology, 1996, Pub. No. 96-120);

3) The Conservation Easement Handbook (Diehl et al., 1988);

4) Designing Wetland Preservation Programs for Local Governments: A Guide to Non-Regulatory Protection (Ecology, April, 1992, Ecology Pub. No. 92-18); and

5) The Conservation Easement Stewardship Guide: Designing Monitoring and Enforcing Easements (New Hampshire Land Trust, 1991).

For example, a conservation easement is a legal agreement by a property owner to restrict certain uses of their land. An easement document is drawn up between the property owner and the prospective easement holder that specifies restrictions on use that are necessary to protect the property. The recipient of the conservation easement is given the right to enforce the restrictions. Recipients may be a public agency, a land trust, or historic preservation groups. It legally binds all present and future owners of the lands to specific restrictions, thus providing long-term protection. Deed restrictions are restrictions placed on the property deed to prohibit certain uses of the land. Direct donations are donations of property that are given to a land trust, public agency, or some other entity that will assume responsibility for managing the property.

3.9 Maintenance and Contingency Plans

Describe planned maintenance activities and the maintenance schedule, including inspection of irrigation system and water structures, plant replacement, weeding, fertilization, erosion control, herbivore protection, trash removal, and/or any other such activities. The need for these activities should be determined in advance of construction from the baseline studies. The persons/entities responsible for financing and carrying out maintenance activities need to be specified; including names, titles, and phone numbers.

A contingency plan is necessary in case mitigation fails or only partially succeeds. Contingency plans indicate corrective measures that will be taken when monitoring indicates that performance standards are not being met or when construction and re-vegetation plans have not been

completed. The contingency plan should outline the steps that will be taken if performance standards are not met. The following points need to be addressed in a contingency plan:

- **Initiating procedures** - If a performance standard is not met within the time specified in the mitigation plan the permittee shall prepare an analysis of the cause(s) of failure, propose corrective actions, and present a time frame for implementing these actions which need to be approved by the agencies. Minor corrective measures may be taken as part of routine maintenance, and should merely be identified in subsequent monitoring reports. Reporting "problems" in a timely manner will allow mid-course corrections and avoid possible enforcement actions.

- **Funding** - The contingency plan should also establish and describe a **Contingency Fund** for potential use in case any corrective actions are necessary. The contingency fund is separate from the performance bond. Its purpose is to assure implementation of necessary corrective actions in the event the project does not achieve its goals and objectives at the end of the monitoring period. You will need to indicate what funds will be available for planning, implementing and monitoring any contingency procedures that may be required to achieve the mitigation goals. Generally, the fund amount should equal about 20% of the total cost of mitigation associated with the project.

- **Responsible Parties** - The names, addresses, and phone numbers of the persons/entities responsible for implementing and monitoring contingency procedures need to be listed.

3.10 Implementation Schedule

The implementation schedule should provide a detailed outline of the starting time and duration of the mitigation activities listed in the landscape plans and construction specifications.

3.10.1 Construction Schedule

The construction schedule outlines the time at which all major earth moving, planting, and construction activities will take place. This will include:

- Construction sequence requirements for grading, water diversions, plantings, etc.

- Time schedule and completion dates (must be concurrent with or prior to construction activities that cause the impact). Delays in implementing mitigation plans may result in an increase in the mitigation required and enforcement actions.

- Any permit conditions specifying time limits.

3.10.2 Monitoring Schedule

The monitoring schedule outlines the times when sampling will be done and the time by which the data will be analyzed. Sampling times for the five to 10 years of monitoring should be specified to within a two week period.

3.10.3 Reporting Schedule

The reporting schedule outlines the times at which reports summarizing and analyzing the monitoring data are submitted to agencies. Initially, monitoring reports should be submitted annually, but this may be extended to every two or three years if the monitoring schedule is reduced after the first three to five years.

3.11 Performance Bond

In certain cases regulatory agencies may require a permittee to post a performance bond before issuing permits. Bonding holds a permittee accountable for implementing the mitigation, monitoring, and contingency plans, and the bond may be split accordingly. The release of performance bonds may be contingent on:

- Completion of construction,
- Submittal of an "as-built" report on completion of initial work,
- Submittal and acceptance of monitoring reports,
- Or, implementation of corrective measures.

3.12 Additional Information for Preparation of Final Plans

- Monitoring the site preparation by a wetland biologist will help avoid potential problems. Hydric soils and existing topsoil can be moved to the side and reused once the site has been brought to grade. If this method is implemented, final contours will have to be below design elevations. Avoid soils that are known to carry exotic seeds or rhizomes unless they have been sterilized. Soils that contain toxic materials are not acceptable. If the soil in the impacted wetland is suitable, it can be used on the mitigation site. If you select this option, however, the soil cannot be stockpiled for more than a few months.

- Revegetation is considered key to establishing wetland functions and values. Select native species that are representative of local conditions for wetlands and buffer areas. Wetland plants with high food and cover value for fish and wildlife are often available. Priority should be given to local species or those bred from local species. Contract with nurseries to obtain the necessary plants well in advance of the work to assure a healthy and adequate supply. Most nurseries do not stock local wetland plants and have to grow them from seed or cuttings at the time a contract is signed. Select mostly perennial plant species. Phased plantings should also be considered, with more tolerant species planted first, followed by those with more restricted habitat needs (i.e. plant shade loving plants only after an appropriate canopy has formed).

- Fertilizing, irrigating, weeding, and controlling herbivores (especially deer, ducks, geese, and beaver) after planting will help root systems establish and increase plant survival. Controlled release fertilizers for saturated soils can be useful at the time of planting. Weeding will reduce competition among plants and help control invasion of the site by exotic species. Irrigation may increase survival of young plants during dry periods. This practice, however, should be stopped after the plants are established. Fences and repellents can be used to deter predators and grazers. The site will need to be revisited at frequent intervals upon completion to determine if there is a need for action, and this schedule should be listed in Section 3.6. The need for these management activities should be determined during the initial assessment of the site and incorporated into the overall plan. Failure to do so may significantly increase costs and delay the project by several years. For example, Grazing damage and poor planting methods are a major reason for project failure. This requires the replacement of the plants which often represent more than 50% of the cost of the mitigation project.

- •Management of the mitigation site is mandatory to ensure that it is properly maintained until the wetland becomes a self sustaining community. Prior to construction, an initial meeting should be held with the project biologist, landscape designer, construction crew and planting crew to review the mitigation plan and design. The biologist or landscape architect should work directly with the contractor, and be on site during construction and grading. **Often, this is the deciding factor between success and failure of mitigation projects.**

4. "As-Built" Report

An "as-built" report should be sent to the lead agency within a month of construction and planting completion. If plantings are done more than three months after construction, or are to be sequenced, two reports need to be submitted: the first, a brief note, on completion of the construction, and the second after the planting is completed. The final "as-built" report should include:

- an as-built topographical survey (by a registered surveyor);
- photographs of the established wetland taken from permanent reference points;
- as-built plan of actual planting (densities, sizes, sources, time of planting);
- highlight any changes to the plan that occurred during construction;
- habitat features actually installed and their location.

Inspection of the Completed Mitigation Site should be made by the project biologist to assure compliance with plan specifications and his/her comments included in the Time Zero Report. All goals and objectives of the design plan should be reviewed and verified when checking the completed work. Resource and regulatory agencies should be invited to view the site after completion of the work.

Changes to the Plan may occur. Minor changes to the original plan should be documented and reviewed by the project biologist. Major changes require an amendment to the mitigation plan and approval of the agencies. Changes should be noted on the original construction plan so that they are easy to verify.

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Appendix A. Hiring a wetlands consultant

Wetlands consultants are usually hired to identify and delineate wetlands, assess the values of a particular wetland, and provide guidance with wetland regulations and permits. They are generally hired by landowners who want to do something on their property which may affect a wetland. Some consultants are self-employed; others work for larger environmental consulting firms.

How to find a wetlands consultant

There are a number of ways to find the names of wetlands consultants. One approach is to look in the Yellow Pages of your phone directory (or the directories of the closest cities) under "Environmental and Ecological Services". You can also contact your local government planning office and ask if they know of any local wetlands consultants. Finally, you can contact state and federal resource agencies and ask for referrals. Be aware, however, that many agencies might not be able to provide recommendations because of questions of fairness.

Selecting a wetlands consultant

There are a number of factors you should consider before hiring a wetlands consultant. Be sure to ask the following questions before making your selection.

- **Training** - Does the consultant have training or experience in the use of the 1987 federal or 1997 state wetlands delineation manuals? Has the consultant had additional training or expertise in related fields such as botany, soils, hydrology or wildlife?
- **Experience** - How long has the consultant been doing wetlands work? How much experience do they have delineating wetlands in the field, assessing wetlands values, or working with wetland regulations? Has the consultant worked in the part of the state where you propose to develop?
- **References** - Who were some of the consultant's past clients? Were they satisfied customers? Call them and find out who they worked with from the consulting firm and how they liked working with them. Ask whether there were any problems that occurred during or after the project, how the consultant handled those problems, and what they charged for their work. You may also want to ask local governments about their experiences working with a particular consultant.
- **Staff** - Who will be working on your project? Will it be the principal consultant with the years of experience or someone with less experience who works for them? Know who you're hiring!
- **Cost** - How much will the consultant cost? Compare rates, but don't let cost be your sole criteria. Be sure to consider training, experience, and the other factors as well. A good consultant who charges you more may end up saving you money by reducing permit processing delays.