

ASSESSMENT FRAMEWORK FOR WETLAND COMPENSATORY MITIGATION

Syllabus for a Watershed Approach to Mitigation Project Review

June 2011 (Version 1.0)

INTRODUCTION

Staff from EPA Region 8 (Denver), the U.S. Army Corps of Engineers (Denver Regulatory Office, Omaha District), the Colorado Department of Transportation, the Colorado Natural Heritage Program and Colorado State University prepared this syllabus. The syllabus outlines an assessment framework that is used for

making determinations about whether proposed compensatory mitigation is adequate to offset proposed impacts to wetlands. Compensatory mitigation is usually required to offset unavoidable impacts as may be authorized by a federal Clean Water Act Section 404 permit. In addition, the 2008 federal Compensatory Mitigation Rule specifies that mitigation be implemented using a “watershed approach.” The assessment framework is based on the use of the approach.

Assessment framework is defined in this syllabus as a system for the gathering, management, interpretation and reporting of information for aquatic resource regulation and management. It includes a logic flow or other formalized approaches that describe how environmental monitoring and assessment information is applied and interpreted to make a regulatory decision.

The syllabus was prepared for use by regulatory agency staff, consultants and the regulated community. It is a relatively concise outline of the assessment procedures and indicators used to make mitigation determinations. It is not a comprehensive description or analysis of those procedures and indicators. That type of information is best provided through training. This document can be used to guide such training, hence use of the term “syllabus.”

The design of the syllabus is based somewhat on the Washington Department of Ecology document entitled, “Selecting Wetland Mitigation Sites using the Watershed Approach” (Hruby et al., 2009). The syllabus is comprised of two sections. The first

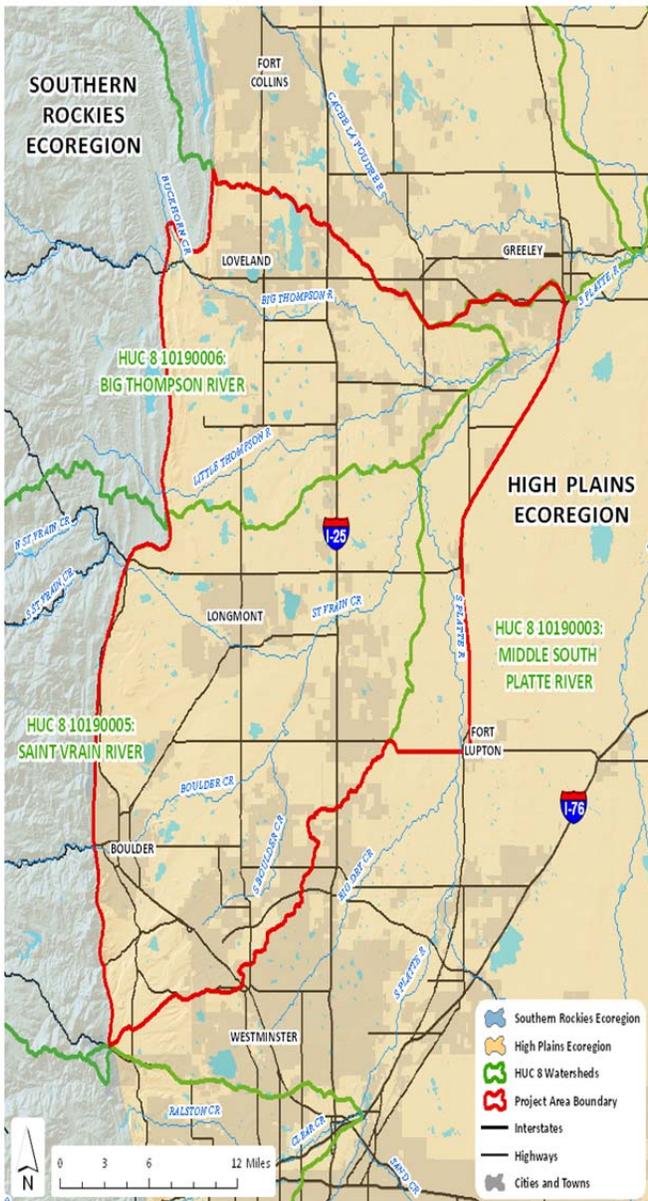


Figure 1. Syllabus focus area: Front Range of Colorado

section describes the assessment framework. It also includes a list of mitigation planning principles that form the foundation of the framework. The second section describes the seven (7) review factors used in the framework. They are:

- (1) Impact site description
- (2) Impact site condition
- (3) Mitigation category
- (4) Mitigation consistency with watershed profile
- (5) Mitigation site suitability – Landscape review
- (6) Mitigation site suitability – Field review
- (7) Mitigation performance over time

The seven (7) review factors are presented in the order that they are generally considered in the mitigation review process.

Assessment information gathered from the Front Range region of Colorado was used in the development of the assessment framework (see Figure 1). The area was selected because it is experiencing rapid urbanization, including highway and transit improvements. Valued wetlands and associated aquatic resources in the area are at risk from direct, indirect and cumulative impacts due to conversion for development, and from degradation as a result of stormwater discharges and the over allocation of water. The same assessment framework described in the syllabus can be applied elsewhere in Colorado and other regions. The framework will be expanded over time to cover other types of aquatic resources (e.g., streams).

An appendix to the syllabus provides a set of “Questions and Answers” to help clarify concepts and uses of the assessment framework.

Background

Regulatory agencies require compensatory mitigation from permit applicants when more than minimal impacts to wetlands and their functions are unavoidable. State and national studies of wetland mitigation, however, show a disappointingly low success rate in meeting performance measures and replacing wetland functions (National Research Council 2001; Ambrose et al. 2007; Mack and Micacchion 2006; Reiss, Hernandez and Brown 2007). The studies identify two main reasons. First, there has been a historical bias toward on-site mitigation. Past policies and practices have over-emphasized the need to replace lost functions near impacted aquatic sites, rather than selecting mitigation sites that best fit with the mitigation goals for the project and the watershed. Second, there has been overuse of easily acquired mitigation project sites. Those sites often come with ecological constraints that limit their potential functional performance. The published studies demonstrate a clear need to modify past practices.

In the last ten years there has been a general shift in national and state policies toward using watershed-based approaches to make mitigation determinations. Recent guidance recommends that mitigation be done in areas where ecological processes can be restored, unless it is ecologically necessary to maintain the affected functions near the impact site (Hruby et al. 2009, USACE & EPA 2008). While this shift in policy is becoming widespread among regulatory agencies, there is a lag in practitioners actually using a watershed approach for making mitigation determinations. Also, there is an overall lack in availability of methods and training for the approach.

In simplest terms, the watershed approach involves (a) building program partnerships, (b) recognizing watershed needs and goals, and (c) using monitoring and assessment information to inform decision-making based on established needs and goals. The goal of this assessment framework is to improve mitigation success by integrating those three tenets into routine decision-making.

SECTION 1: OVERVIEW OF ASSESSMENT FRAMEWORK

The assessment framework for compensatory mitigation has evolved alongside lessons learned from science-based studies of mitigation project success. It is compatible with standard operating procedures that are in current use for making mitigation determinations. The process of aligning the lessons learned from science with standard operating procedures begins with a listing of mitigation planning principles. The principles can be thought of as “best practices”.

Planning Principles for Compensatory Mitigation

The assessment framework is based on the following principles:

1. All permit decisions must comply with applicable provisions of Section 404 of the federal Clean Water Act (40CFR part 230), including those which require the permit applicant to take all appropriate and practical steps to avoid and minimize adverse impacts to waters of the United States.
2. Mitigation should be located where it will help protect or restore the health and condition of aquatic resources within a watershed or other appropriate area within an ecological landscape. This principle is also expressed in terms of mitigation meeting “watershed needs” and “watershed goals.” The two terms are synonymous.
3. A “wetland landscape profile” or “watershed profile” provides a relatively simple way of characterizing watersheds and identifying watersheds needs. Profiles are described below in the “Watershed Criterion” section.
4. Wherever possible, existing watershed and environmental planning information should be analyzed in advance of mitigation to:
 - determine the location of relatively intact, natural areas in a watershed,
 - Identify those areas for preservation and protection, and
 - Identify nearby degraded areas that are amenable to enhancement, restoration or establishment, and that would contribute to the sustainability of natural areas and the overall health of a watershed’s aquatic resources.
5. When watershed and environmental information is not readily available, project impact sites and mitigation sites can be evaluated using knowledge of basic landscape principles and watershed management goals (e.g., Principle #3 above).
6. Assessment results may indicate that on-site mitigation is appropriate when:
 - the wetland at the impact site is of measurable significance to the ecological condition of the watershed;
 - the on-site mitigation opportunities have a high likelihood of successfully replacing the functions lost at the impact site; and
 - The mitigation is consistent with watershed goals.
7. A watershed approach may be used to justify use of more than one mitigation site to provide compensation for an impacted wetland. For example, it may be ecologically advantageous and consistent with a watershed profile and watershed goals to restore or enhance different types of wetlands at multiple locations.
8. The watershed approach underscores the concept that existing mitigation “replacement ratios” must take into account wetland acreage, as well as wetland condition and wetland rates of function. Wetland abundance, along with ecosystem condition and landscape position, control the delivery of ecosystem services.

9. Use of a watershed approach may sometimes result in mitigation wetlands that are of different types (e.g., hydrogeomorphic wetland type) and/or that provide different levels of functions than impacted wetlands. This may be preferable if assessment shows that the “out-of-kind” mitigation fits within the broader watershed profile and would better address watershed needs. This situation commonly occurs in urban or urbanizing areas.

Applying the Watershed Approach in Urbanizing Areas

In urbanizing areas, wetland functioning is commonly altered from natural reference levels because of local environmental stress and degraded conditions. This is particularly true for wetlands in highly modified watersheds where ecological processes are unlikely to be restored. In some cases, it may be preferable to compensate for impacts to those wetlands by locating mitigation sites at other locations that have a lesser degree of urbanization. In other cases, there may be opportunity to mitigate aquatic resource impacts within an urban watershed by implementing compensatory mitigation projects that both supplement and that can be ecologically supported by planned water quality management projects. The enhancement of existing urban wetlands is possible within a planned “green-infrastructure” development scenario. However, mitigation projects cannot serve as a surrogate for the implementation of planned water quality management practices (e.g., stormwater management).

Assessment Framework

This assessment framework is structured around a single criterion in the 2008 federal Compensatory Mitigation Rule that requires implementation of mitigation using a watershed approach. Using this framework, the consistency or compliance of a permit application and mitigation plan with this criterion is evaluated using seven (7) review factors that are detailed in Section 2 of this syllabus. A weight-of-evidence approach is applied to evaluate collected assessment information and then to make a well-documented technical determination. The role of weigh-of-evidence analysis in environmental assessment is summarized by Linkov and others (2009).

The Watershed Criterion

Part 332.3(c) of the federal Compensatory Mitigation Rule and Part 230.93(c) (2) of the federal Clean Water Act 404(b) (1) Guidelines require use of a watershed approach when making decisions regarding authorization of a regulated activity that would impact an aquatic resource. In this framework the watershed criterion is that compensatory mitigation, proposed by a permit applicant to offset unavoidable aquatic impacts, should sustain or improve the overall abundance, diversity and condition of aquatic resources in a project watershed area. “Watershed profiles” are a technical representation of the watershed criterion.

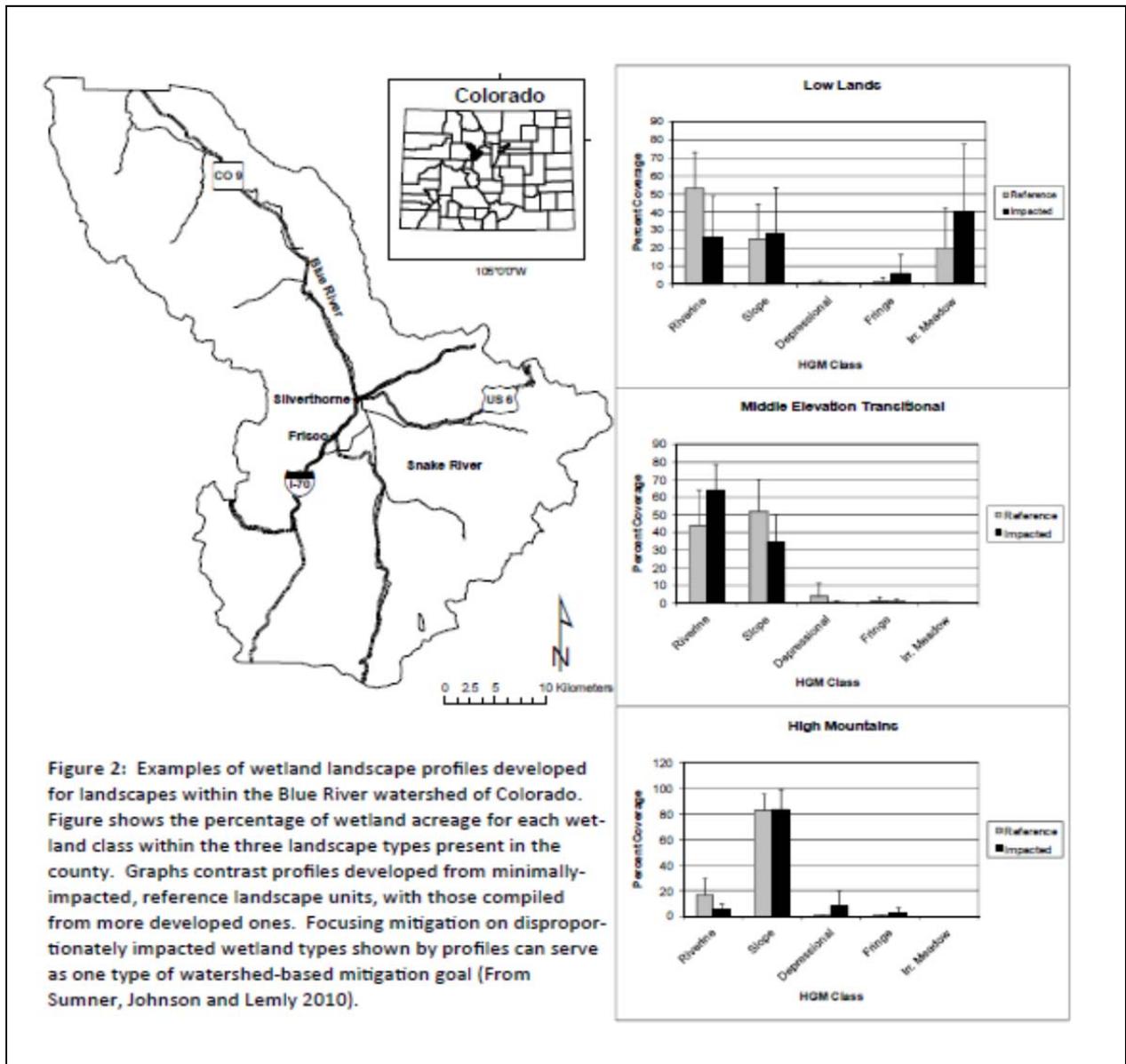
A watershed profile provides a tabular or graphical account of the abundance, diversity and ecological condition of aquatic resources in a geographically-bounded area called a “project watershed area” (see Figure 2). The project watershed area can be an actual watershed or some other ecologically meaningful unit of the landscape. A watershed profile includes an accounting of all aquatic resource types in a geographically-bounded area. In contrast, a “wetland landscape profile” specifically depicts the wetland component of a watershed profile.

More specifically, wetland landscape profiles stratify wetland area by hydrogeomorphic (HGM) class (Brinson 1993). However, other classification systems may be used with HGM classification depending on the geographical region and watershed goals. For example, the National Vegetation Classification System (NVC)

includes listings for different types of wetlands (FGDC 2008). NVC can be used to subclassify HGM wetland types, for example “HGM: Slope, NVC: Rocky Mountain Alpine-Montane Wet Meadow” or “HGM: Slope, NVC: Rocky Mountain Subalpine-Montane Fen.” Throughout this document, wetland type generally means a wetland’s HGM type and includes the option of adding a NVC modifier.

The theory behind using watershed profiles is that the abundance, diversity and condition of wetlands influences landscape function (Bedford 1996, Bedford 1998, Gwin et al. 1999, Johnson 2005). In turn, a well-functioning landscape supports the delivery of wetland ecosystem services. Those services include the provisioning of habitat, flood control and water quality among others (Millennium Ecosystem Assessment, 2005).

Accordingly, the criterion to sustain or improve a watershed profile is analogous to an expression of “watershed needs” and “watershed goals.” Watershed needs and goals also can be expressed in more definitive terms based on the results of watershed planning and analysis activity. For example, a watershed goal for some Front Range watersheds of Colorado is the sustainability of hydrological conditions and the quality of stream flow.



Review Factors

The assessment framework identifies seven (7) review factors (detailed in Section 2) that are considered when making a determination about the environmental acceptability of compensatory mitigation. The factors guide a reviewer in the use of monitoring and assessment information to make a reasoned determination about the risks and the acceptability of a mitigation project proposal. The first two factors apply to impact site assessment, and the remaining five factors apply to the assessment of a proposed mitigation site.

Figure 3 shows the review factors as organized within the assessment framework. A reviewer uses the figure as a checklist to summarize the results of their assessment. The factors are listed in Column A of the figure and high risk concerns for each factor are listed in Column B. Other high risk concerns, not currently listed in Figure 3, may be added to the checklist if identified during the review process.

The factors used in the review are:

- (1) Impact site description
- (2) Impact site condition
- (3) Mitigation category
- (4) Mitigation consistency with watershed profile
- (5) Mitigation site suitability – Landscape review
- (6) Mitigation site suitability – Field review
- (7) Mitigation performance over time

Information gathered from the assessment of each factor is drawn together and is used to evaluate whether or not proposed wetland mitigation will sustain or improve the watershed profile of a project watershed area. The evaluation is based on weight-of-evidence. The final weight-of-evidence determination is entered in Column C of Figure 3.

If the results of the evaluation show that a mitigation proposal is not sufficient to offset impacts, then assessment information can be used to modify the proposal with a more environmentally acceptable design.

General Compensatory Mitigation Requirements for the Front Range of Colorado

The assessment framework is applied in context of existing compensatory mitigation requirements and local procedures. For the Front Range of Colorado, wetland compensatory mitigation should be based on the watershed approach and commensurate with the degree and scope of impacts of an authorized activity. In general, the proposed compensatory mitigation should be located within the same watershed or mitigation service area as the impact site and where it is most likely to successfully replace lost functions. Functional replacement is achieved when a mitigation project site is of an appropriate size, wetland type, design, and ecological condition that complements the watershed profile and contributes to watershed needs. In addition, compensatory mitigation may occur in a combination of on-site and off-site mitigation to replace permitted losses of aquatic resource functions and services, when appropriate.

Functional replacement is evaluated using performance standards and the Functional Assessment of Colorado Wetlands (FACWet) methodology (Johnson et al. 2010).

Compensatory mitigation will typically be required using a minimum of a 1:1 replacement ratio, on an acreage basis, if proposed as wetland restoration or establishment. However, standard procedures used to review mitigation project proposals, including use of the described assessment framework, can lead to higher ratios.

The adjustment of a ratio will depend on the category of mitigation and the risks attributed to mitigation success. For example, ratios for enhancement type mitigation can range from 4:1 to 20:1. In this situation, aquatic resource functional rates are improved but no change in acreage would occur. Mitigation practices for enhancement might include the use of innovative grazing practices and invasive weed control. Ratios for preservation type mitigation can range from 10:1 to 20:1. In this situation there is no change in aquatic resource functions or acreage. Compensation is based on the level of risk to an existing natural area.

Applicants may choose to develop mitigation plans that reflect higher replacement ratios as a way of reconciling risk or temporal loss attributed to their particular mitigation plan. Temporal loss is discussed in Review Factor 7. Also, the Corps of Engineers may require additional administrative assurance in situations involving higher risk mitigation or when higher ratios conflict with water rights. Additional administrative requirements may include the use of higher financial assurances, more restrictive adaptive management plans, and/or the purchase of mitigation bank credits to offset temporal losses. Proposed mitigation plans should address all required elements described in the 2008 federal Compensatory Mitigation Rule.

The assessment framework described in this syllabus makes transparent the technical review process used to review mitigation proposals along the Front Range region of Colorado. Also, the framework provides the regulated community with a set of explicit expectations for compensatory mitigation projects and mitigation plans. Mitigation plans that do not meet those expectations or do not otherwise reconcile deficiencies are less likely to receive favorable review.

SECTION 2 – MITIGATION REVIEW FACTORS

A determination is made for each the following seven (7) review factors by using best professional judgment, by using existing information, and/or by gathering new information.

The results of assessment are summarized by checking the appropriate boxes in Figure 3.

The level of effort required to conduct a mitigation evaluation, based on use of the review factors, is commensurate with the perceived magnitude of impact cause by a proposed development project. The level of effort also depends on the skill-set of practitioners, the time available to conduct an evaluation and the availability of assessment methods to efficiently gather new information.

Review Factor 1. Impact Site Description

A record is made of the amount of area and the type of wetland that would directly and indirectly impacted by a proposed project. A “high risk” notation is made when the area is known to have special status species or have other special features. High risk notations are also made if the impact area is large relative to other permitted activity in the region, if the impact area includes a rare type of wetland and/or if the impact area includes a difficult to replace type of wetland. A “difficult to replace” wetland means a type of wetland that has not been successfully restored or established within the Level 4 Ecoregion that encompasses a proposed mitigation site, or which are known to be problematic. Maps of Level 4 Ecoregions in Colorado can be found at: www.epa.gov/wed/pages/ecoregions/co_eco.htm. Difficult to replace wetlands can include forested wetlands, bogs and fens. FACWet may be used for impact site description and documentation. Training curriculum exists for FACWet.

As mentioned in Section 1, wetlands at a proposed impact site can be classified in terms of both their HGM type and NVC class. The characterization of special status species at a proposed impact site also may be required. A determination of whether a wetland type is “rare,” is based on review of the watershed profile or other reliable sources (e.g., Colorado Natural Heritage Program: <http://www.cnhp.colostate.edu/>).

ASSESSMENT FRAMEWORK FOR COMPENSATORY MITIGATION

A. Review Factors (√)	B. High Risk Concerns (√)		C. Determinations (√)
1. Impact Site Description			<u>No Net Loss or Net Gain in Area</u>
Amount of area (<i>known?</i>)	√	<i>Large area</i>	
Wetland type (<i>known?</i>)	√	<i>Rare or difficult to replace type</i>	
Occurrence of special status Resource (<i>known or not present?</i>)	√	<i>Documented special resource</i>	
2. Impact Site Condition			—
Good/Excellent		<i>Good/Excellent condition</i>	<u>No Net Loss or Net Gain in Condition</u> √
Fair			
Poor	√		
3. Mitigation Category (See Table 1)			
Restoration		<i>Establishment category</i>	<u>Standard Replacement Ratios & Administrative Assurances</u> —
Enhancement	√		
Preservation			
Establishment			
4. Mitigation Consistency with Watershed Profile			
In-kind and improve profile		<i>Out of kind, not improve profile</i>	<u>Increase Replacement Ratios and/or Add Greater Administrative Assurances</u> √
In-kind and sustain profile			
Out-of-kind, improve profile			
Out-of-kind, not improve profile	√		
5. Mitigation Site Suitability- Landscape Review (See Table 2)			
Ecologically suitable		<i>Unsuitable or uncertain suitability</i>	—
Unsuitable			
Suitability is uncertain	√		
6. Mitigation Site Suitability- Field Review (See Table 5 and Table 6)			
Ecologically suitable	√	<i>Unsuitable or uncertain suitability</i>	<u>Increase Replacement Ratios and/or Add Greater Administrative Assurances</u> √
Poor suitability			
Suitability is uncertain			
7. Mitigation Performance over Time			
Mitigation project involves use of a mitigation bank or site that has met performance standards.		<i>Performance standards not fully developed for mitigation plan.</i>	√
Mitigation completed to as-build standards prior to impact authorization			
Performance standards not fully developed for mitigation plan	√		

Figure 3 – Assessment framework used to evaluate the environmental acceptability of compensatory wetland mitigation. The completed checklist depicts review of a hypothetical mitigation project proposal involving “out-of-kind,” “enhancement” type of mitigation to offset impacts to a rare wetland type in poor condition. A mitigation determination is based on a weight of evidence review of information in Column A and Column B. The determination is entered in Column C. In this case, a determination is made that mitigation will likely result in a net gain in overall wetland and watershed condition. The determination also shows that to attain mitigation objectives a greater than typical replacement ratio and/or greater administrative assurances.

Review Factor 2. Impact Site Condition

A condition assessment of a proposed project impact site is conducted, in part, using procedures described in the FACWet user manual (Johnson et al. 2010). A “high risk” notation is made if the impact site is in good ecological condition. Using FACWet nomenclature, a wetland in good condition is one that is either “highly functioning” or “reference standard.” The risk is attributed to the difficulty in restoring, enhancing or establishing a wetland to good ecological condition.

The FACWet assessment begins by establishing an “Area of Interest” that encompasses the project impact area. One or more “Assessment Areas” are demarcated within the Area of Interest. Information about the amount of wetland area that would be directly and indirectly impacted by a proposed project is recorded. Also recorded are the types of wetlands that would be impacted and the condition of Assessment Areas as scored by FACWet. Condition is assessed using a “functional capacity index (FCI)” and an associated categorical ranking of index scores. A relative high FCI score (> 0.8) means that a wetland Assessment Area is functioning at rates comparable to those rates associated with an intact, minimally-disturbed wetland of similar type.

More intensive sampling of vegetation, wetland hydrology, and water quality may be necessary if the Area of Interest contains “special status” plant or animal species. The intensive sampling allows for more accurate and precise measures of species occurrence and a more robust characterization of their habitat, as needed to quantify project impacts. Also, more intensive sampling may be necessary if there is perceived risk that a proposed discharge of dredge or fill material will cause substantial impact to the aquatic environment within or beyond the project watershed area. Intensive assessment at a proposed project site also can be used to help generate mitigation performance standards (See Review Factor 7).

Review Factor 3. Mitigation Category

An assessment is made of the category of compensatory mitigation being proposed to offset direct and indirect project impacts. The categories of compensatory mitigation are restoration, enhancement, establishment and preservation. They are defined in Table 1.

A “high risk” notation is made if proposed mitigation includes the use of wetland establishment.

The scientific literature indicates that establishment mitigation often produces wetlands that lack proper structure or rates of function as compared to a least-disturbed reference site (NRC 2001). That risk can be reduced if a proposed establishment mitigation project is favorably evaluated using the six other review factors.

Review Factor 4. Mitigation Consistency with Watershed Profiles

A compensatory mitigation proposal is reviewed to determine the type(s) of wetland that will be used to offset an unavoidable impact. The type of wetland could be identified either as part of a mitigation bank or within a parcel where permittee-responsible mitigation is proposed.

A “high risk” notation is made if the proposed wetland type is out-of-kind with the watershed profile and would not improve the watershed profile.

Table 1. Definitions of compensatory mitigation categories

The following definitions for the types of mitigation practices are from the federal Compensatory Mitigation Rule, 33 CFR Parts 325/332 and 40 CFR Part 230/Pages 19671-19672.

Enhancement means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation) means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions.

Preservation means the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions

Restoration means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

As explained in Section 1, wetland landscape profiles are a tabular accounting of the abundance, diversity and condition of wetlands. Other types of aquatic resources in a watershed or project watershed area can be made a component of a watershed profile. However, in many situations a watershed profile will not have been constructed for the project watershed area that encompasses a proposed project impact site and its associated mitigation site(s). Assessment can still proceed using best professional judgment and the reviewer's familiarity with the occurrence of different wetland types in the project watershed area. More accurate watershed profiles can be constructed depending on the availability of aquatic resource maps (e.g., National Wetland Inventory), and the capacity of agencies to report aquatic resource conditions using mapped information or data from aquatic resource assessments.

Review Factor 5. Site Suitability for Proposed Mitigation Wetland Type - Landscape Review

A compensatory mitigation proposal is reviewed to determine if its location, within a broader landscape setting, would sustain the proposed wetland type in good ecological condition.

A "high risk" notation is made if there is insufficient information to inform the assessment, or if the landscape level review concludes that a proposed mitigation site is not ecologically suitable. Ecologically suitable means that a site appears capable of supporting a desired wetland type in good condition because of the existing ecological attributes of the location, or because those attributes can be modified to meet mitigation project requirements.

Overview of Landscape Review Indicators

Table 2 lists indicators that are used to assess whether a proposed site is positioned within a landscape in a way that is likely to support successful compensatory mitigation in accordance with performance criteria (see Review Factor 7). Each indicator is described further in the text below. The indicators are presented as narrative questions with “yes/no” answers. The indicators can be assessed using readily available mapped information or airphoto imagery. In some situations, many of the indicators may have already been analyzed in the production of prioritization maps by water quality management and habitat conservation groups. Mitigation practitioners are encouraged to search for such information on the Internet and within cooperating agencies and organizations. The assessment can be performed in the office without a field trip to a proposed mitigation site. Field assessment is described separately in Review Factor 6.

The first indicator listed in Table 2 is assessed for the hydrological “contributing area” that encompasses a proposed mitigation project site. A contributing area means the portion of a watershed that directly contributes water to a proposed mitigation site. Note that a contributing area is different from a project watershed area. Also, it is important to note that each assessment indicator, by itself, does not provide clear evidence of the landscape suitability of a mitigation site. Rather, it is the roll-up of indicator information that provides a weight-of-evidence basis for making a determination.

Table 2: Indicators used in the landscape-level assessment of potential wetland mitigation areas		
Landscape Review Indicators	Yes	No
1. <i>Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?</i>		
2. <i>Does the project watershed area contain a prevalence of the wetland type being proposed for mitigation?</i>		
3. <i>Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired HGM type of wetland?</i>		
4. <i>Does the proposed mitigation site possess hydric soils or is its substrate in relatively good condition?</i>		
5. <i>Is there an adequate buffer area to sustain the proposed mitigation site?</i>		
6. <i>Is the proposed mitigation site in close proximity to a significant natural area?</i>		

Landscape Review Indicators

Indicator 1: *Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?*

Answer “yes” if the contributing area fits the following description: The predominant (> 50%) land cover is natural vegetation and impervious surface density of less than 10%.

If the selected area meets the criterion above, then the local hydrological setting is probably intact. That situation will have a beneficial effect on the sustainability of a mitigation project. In contrast, intensely developed areas pose a risk to mitigation success because of flashy surface water flow conditions, gaps in habitat connectivity and high inputs of sediment, nutrients, and other pollutants.

However, mitigation projects in urban developed areas can support local water quality functions and open space use if sufficiently large in area. If the wetland being impacted plays an important role in its watershed for maintaining local water quality and open space use, then suitable mitigation areas in the watershed should be given priority. A mitigation project may have to include significant engineering design features both on and off site. Those features can include riparian buffers and drainage control structures.

Indicator 2: Does the project watershed area contain a prevalence of the wetland type being proposed for mitigation?

Answer “yes” if the type of wetland proposed for mitigation is found in abundance in the project watershed area. Table 3 describes characteristics of the main HGM types of wetlands as based on Brinson (1993). A query of wetland inventory information about wetlands proximal to a proposed mitigation site will provide some indication of the types of wetlands that can be sustained in that landscape setting.

Table 3. HGM wetland types in the syllabus focus area.	
HGM Wetland Type	Characteristics
Lake Fringe	Wetlands are located on shores of a body of permanent open water that is greater than 20 acres, and at least 30% of the open water area is deeper than 6.6 feet (2 meters)
Slope	Wetlands have surface water originating and flowing through the wetland in one direction and without being impounded
Riverine	Wetlands are in a valley or stream channel where they get inundated by overbank flooding from that stream or river at least once every two years
Depressional	Wetlands are in topographic depressions in which water ponds or is saturated to the surface at some time of the year

Indicator 3: Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired HGM type of wetland?

Answer “yes” or “no” based on consideration of the information in Table 4. The table generally describes the primary source of water for the HGM types of wetlands. A suitable setting for some HGM types of wetlands can be selected, in part, based on their proximity to other types of aquatic systems (e.g., streams).

Table 4. Primary sources of water for HGM type wetlands	
HGM Wetland Type	Primary Source of Water
Lake fringe	Lake water
Slope	Groundwater discharge
Riverine	Overbank flow from stream or river on average at least once every two years
Depressional	Groundwater or surface flows from precipitation on the surrounding landscape

Indicator 4: Is the proposed mitigation site comprised of hydric soils or is its substrate in relatively good condition?

Answer “yes” if the proposed mitigation site is located in an area, or in close proximity to an area, having mapped hydric soils. Also, mitigation can be successful where the substrate is not severely disturbed or is otherwise amenable to the establishment of hydric soil conditions.

Hydric soils are essential to establishing and sustaining plants adapted to wetland conditions. Additionally, hydric soils, not remnant hydric soils, may indicate that the site has the necessary water regime to maintain a wetland. Soil maps are widely available and can sometimes be used to determine the occurrence of hydric soils at a proposed mitigation project site.

(see: <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>).

However, many occurrences of hydric soil are not mapped on soil surveys because they fall below the minimum mapping unit. For this reason, the hydric soil indicator must be verified in the field per Review Factor 6. In situations where wetland establishment is proposed, project site suitability can be assessed based on an analysis of the site's adjacency to hydric soils.

Indicator 5: *Is there an adequate buffer area to sustain the mitigation site?*

Answer "yes" if a ≥ 100 foot wide buffer of relatively undisturbed vegetation extends at least 75% around the perimeter of the proposed mitigation project site (McElfish et al. 2008).

Buffers are important for meeting mitigation performance goals, because they:

- (1) Reduce the effects of stressors near a mitigation project that could impact its functioning and condition;
- (2) Support natural hydrogeomorphic processes that could sustain a mitigation project; and
- (3) Complement the habitat use that is provided by a mitigation project (e.g., habitat corridor).

Indicator 6: *Is the proposed site in close proximity to a significant natural area?*

Answer "yes" if a natural area in the vicinity of the proposed mitigation site is managed to sustain its natural features or qualities.

The ecological structure of mitigation projects can be "anchored" by the relatively intact ecological processes of existing natural areas. In turn, mitigation projects may add to the existing natural areas ecological capacity to resist and be resilient to the effects of future environmental degradation. "Close proximity to" means there is direct connectivity between the mitigation site and the biological resources or the hydrological characteristics of the natural area.

Making a Determination for Review Factor 5

Answering "Yes" to all assessment indicators supports a preliminary determination that the landscape setting is suitable for a proposed mitigation project. If there is insufficient information about any of the indicators, then the determination for this factor is recorded as "unknown." The reviewer also can decide that the suitability of the site is "unsuitable" if a negative ("No") determination is made on two or more of the indicators, or if an appropriate water source is not available (i.e., Indicator 4)

The determination is considered "preliminary" until field observations are made as described under Review Factor 6. The mitigation reviewer may choose to reconsider the preliminary determination using best professional judgment. In that situation, the reviewer should document his/her decision by describing the indicators and narrative criteria that guided the determination.

Review Factor 6. Site Suitability for Proposed Mitigation Wetland Type – Field Review

A proposed compensatory mitigation site is reviewed in the field to determine if it is ecologically suitability for use. Consideration is given to both the type of wetland being mitigated and the category of mitigation (i.e., restoration, enhancement, establishment, preservation). Three indicators are used to make the determination, including an indicator that uses a FACWet score.

Table 5: Indicators used in the site-level screening of potential wetland mitigation areas		
Field Review Indicators	Yes	No
1. Is the proposed mitigation site located within an appropriate landscape setting?		
2. Is the category of proposed mitigation appropriate given site location?		
3. Can the primary stressors affecting the site be remedied?		

A “high risk” notation is made if there is insufficient information to inform the assessment, or if the field level review concludes that a proposed mitigation site is not ecologically suitable.

Overview of Assessment Indicators

The three (3) indicators are used to conduct a field assessment are listed in Table 5. These indicators help determine the likelihood of mitigation project success.

Indicator #1: *Is the proposed mitigation site located within an appropriate landscape setting?*

Field observations are made to confirm preliminary determinations made on each of the indicators described in Review Factor 5. This assessment is conducted prior to, or concurrently with, a FACWet assessment.

As a reminder, the indicators in Review Factor 5 are:

- *Does the contributing area to the proposed mitigation site contain mostly natural land and aquatic resources in relatively good condition?*
- *Does the project watershed area contain a prevalence of the wetland type being proposed for mitigation?*
- *Is the proposed mitigation site in proximity to an appropriate type of water source needed to support a desired HGM type of wetland?*
- *Is the proposed mitigation site comprised of hydric soils or substrate in relatively good condition?*
- *Is there an adequate buffer area to sustain the mitigation site?*
- *Is the proposed mitigation site in close proximity to a significant natural area?*

Based on field observations, a determination is made whether the proposed mitigation project is located within a landscape setting that can support the desired type of wetland. The preliminary determination made on Review Factor 5 is sustained or amended by this review.

Indicator #2: *Is the proposed mitigation category appropriate for the proposed site location?*

A determination that the proposed mitigation category is appropriate for a given location is based on the ecological condition of the site and the stressors affecting that condition. The site’s capacity for wetland enhancement, restoration, preservation and/or establishment is assessed by the amount and type of stress affecting the site.

FACWet was designed as a stressor-based wetland assessment method. It relates the functional capacity of a wetland assessment area to the intensity, duration and proximity of different types of stressors affecting the area. In turn, wetland functional capacity is correlated to wetland condition. For example, a wetland in good ecological condition will generally function at rates typical of its type and landscape setting.

Table 6. Approximate FACWet scores for mitigation categories	
Mitigation Category	FACWet Score
Preservation	1.0 – 0.85
Enhancement	<0.85 – 0.65
Restoration	0.65 – 0.50
Establishment	<0.50

Table 6 is used to make a determination of the category of mitigation best suited to a proposed mitigation site, based on the site’s FACWet score. The mitigation reviewer may choose to reconsider the preliminary determination using best professional judgment. In that situation, the reviewer should document her/his decision by describing the indicators and narrative criteria that guided the determination.

Indicator #3: *Can the primary stressors affecting the proposed mitigation site be remedied?*

Stressors affect the functional capacity of wetlands by disturbing three ecosystem attributes: Hydrology, soil and vegetation. Accordingly, stressors can be categorized by the ecosystem attribute they most directly impact. For example, stream ditching and diking impact hydrology; farm tillage and off-road vehicles impact soil; and grazing and nutrient pollutants impact vegetation. The design of a mitigation project is evaluated for its effectiveness at controlling or eliminating the intensity and duration of stressors affecting a proposed mitigation area. The design must be capable of sustaining a mitigation wetland over time.

A determination for this indicator is based on the reviewer’s best professional judgment about the adequacy of the engineering specifications of a mitigation plan. The review also takes into consideration the performance of other similarly designed mitigation projects in the region.

Making a determination for Review Factor 6

A positive (“Yes”) determination made on all three assessment indicators for Review Factor 6 means that the site is likely ecologically suitable for proposed mitigation. A negative (“No”) determination made on all three indicators means that the site is not ecological suitable. A “mixed” set of determinations means there is uncertainty about site suitability.

At this point it is important to note a limitation of the field assessment indicators and FACWet. These tools are not intended to evaluate the engineering specifications of a mitigation plan. Rather, they are used as screening tools to guide the design of more intensive sampling and analysis as may be needed to make an engineering type of determination.

Review Factor 7. Mitigation Performance over Time

A mitigation proposal is reviewed to determine whether mitigation will involve the use of an existing mitigation project or mitigation bank that meets performance standards for its specified wetland types.

A “high risk” notation is made if mitigation is proposed for a wetland type that is not part of an available mitigation project or mitigation bank, and when performance standards are not fully developed in a proposed mitigation plan. The high risk notation is warranted because of the temporal loss or time lag between the loss

of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site. The matter of temporal loss is exacerbated in situations where performance standards for a desired type of wetland have not been developed. In those situations little is known about the time and trajectory for attainment of performance standards.

Ecological performance standards are measures of ecosystem characteristics, including structure, condition and/or functional rates. The standards are used to determine if a mitigation project area has met or is satisfactorily approaching its objectives relative to those measures. The standards are based on established reference values (scores) and include a sampling design for measuring mitigation site performance.

Specific performance standards may or may not exist for specific types of wetlands being evaluated for use in compensatory mitigation. If applicable performance standards do exist, then there is greater likelihood that a favorable determination will be made on a mitigation proposal. If performance standards do not exist, then they can be developed through completion of the following five tasks.

Task 1. Establish boundaries for mitigation management units

Performance standards can be developed for either a particular type of wetland within a mitigation project or a mitigation project area that contains multiple types of wetlands. For example, a hypothetical mitigation bank might contain one dominant type of wetland interspersed with smaller patches of another type of wetland. If similar restoration and management practices were applied across the entire bank, then one set of performance standards could potentially be developed and monitored. Conversely, if a mitigation bank were comprised of multiple wetland types, and its various areas were managed differently, then multiple performance standards may be necessary.

The decision on how to structure performance standards should take into account the:

- a) Size of the mitigation project or bank,
- b) Diversity of wetland types present at the site, and
- c) Types and extent of mitigation practices applied across the wetland area.

Task 2. Define objectives

Mitigation objectives are narrative statements that characterize the desired aquatic resource type of a mitigation project or mitigation bank and its ecological condition and/or level of functioning. Objectives also help establish a connection between the functioning of a proposed mitigation project and watershed needs. Examples of anticipated mitigation outcomes could be high quality wildlife habitat and maintenance of downstream water quantity and quality. Individual management units within a mitigation site may have their own set of objectives; for example the propagation and conservation of a special status plant.

Mitigation objectives also should include information on the specific stressors that will be remediated and a general account as to how that will be accomplished.

Task 3. Select mitigation performance standards

Performance standards are used to make a determination about whether the objectives of a mitigation project have been attained. The standards are tied to the site-specific ecological attributes of the aquatic resource being managed for mitigation. For wetlands, the three attributes most commonly targeted in mitigation are hydrology, soils and vegetation.

The condition or “performance” of each attribute is measured in terms of its structure, its rates of functioning and/or the occurrence of stressors affecting the attribute. The selection of which type of measure to use is based on the amount of certainty needed for reporting performance, and for guiding any needed corrective actions. Examples of performance standards for a mitigation site include:

- An overall FACWet score,
- Individual FACWet variable value(s),
- Floristic quality or composition,
- Occurrence of alien invasive plants,
- A specified hydrograph or range of water level fluctuation, and/or
- Carbon accumulation.

Performance standards are scaled to least-disturbed reference condition for the target wetland type within the project watershed area or the broader ecoregion.

Task 4. Describe the design of the mitigation monitoring program

Each mitigation management area will have a sampling design linked to the area’s mitigation objectives and performance standards. The sampling design also may include the use of supplemental monitoring indicators to support implementation of a mitigation plan’s adaptive management strategy. For example, if a particular vegetation-based performance standard is not met (e.g., percent native co-dominant species richness), then information generated by a supplemental hydrological indicator (e.g., water level fluctuation) can be used to help diagnose the cause of the problem and implement an adaptive management response.

Task 5. Describe the sampling and reporting frequency of the mitigation monitoring program

The mitigation monitoring program should specify the:

- a. Frequency of environmental sampling on the mitigation site and surrounding area;
- b. Frequency of compliance reporting of analyzed sampling results; and
- c. Duration of monitoring for permit compliance or mitigation bank certification.

Appendix A -- Questions and Answers

This appendix elaborates on certain issues that may arise in the mitigation project review process.

Questions and Answers

(1) Do the review factors described in the syllabus apply to credit and debit accounting for mitigation banks and in-lieu fee programs?

The process used for technically reviewing a proposed mitigation bank or for the identification of an in-lieu fee area will rely on the same assessment framework as described in the syllabus. Mitigation bank credits are established based on the acreage, type and ecological condition of wetlands in the bank; and the category of mitigation used to establish the bank. For example, an operational mitigation bank can optimally generate one acre-credit of a type of wetland if the bank restored or established one acre of that type of wetland to specified performance standards. Performance standards and related “milestones” are specified in a

mitigation bank's credit release schedule. Partial credits can be accounted in banks that also include enhancement and preservation categories of mitigation.

(2) How do we evaluate the environmental acceptability of geographical boundaries proposed for a mitigation bank or in-lieu fee service areas?

Evaluation begins with a description of the wetland types being accounted in the mitigation bank. The hydrogeomorphic (HGM) classification system can be used in conjunction with an appropriate vegetation classification system (e.g., NVC).

The environmental acceptability of the service area boundary is based on how well the types of wetland(s) of the mitigation bank complements or otherwise corresponds to the watershed profile of the proposed service area. Generally speaking, the service area should be contained within the area intersecting an 8-digit Hydrologic Unit (HUC), a mapped watershed unit of similar scale (if available) and an associated Level III Ecoregion. A 10-digit HUC and associated Level IV Ecoregion may form a more environmental acceptable boundary in some types of hydrologic landscape. For example, impacts to a wetland located at higher elevations in the Front Range region of Colorado generally cannot be compensated at a lower elevation mitigation site (i.e., within same 8-digit HUC and Level IV Ecoregion).

(3) How do we comparatively evaluate the environmental acceptability of onsite versus offsite compensatory mitigation, including the use mitigation banks and in-lieu fee areas?

Evaluation begins with a description of the type of wetland being impacted. A sequencing process is then used to identify an environmentally acceptable mitigation site. The search is conducted using the following ordered preference of landscape location, while also considering site potential for meeting specified mitigation performance standards (i.e., Review Factors 5 and 6). Sequential preference is given to:

1. Use of an approved mitigation bank or in-lieu fee site that has a service area that encompasses a proposed wetland impact site;
2. "Onsite" areas adjacent or neighboring the proposed impact site;
3. "Offsite" areas within the contributing area of the proposed impact site;
4. "Offsite" at other ecologically suitable areas within the project watershed area.

Preference takes into account the potential for a mitigation project to offset impacts and also meet performance standards on a case by case basis. For example, permittee-responsible onsite or offsite mitigation is preferred in situations where a mitigation bank or in-lieu fee site is not expected to sustain a selected type of wetland, or function at levels needed to offset impacts. Also, on-site compensatory mitigation will be favored in situations involving the placement of a mitigation project in close proximity to a significant natural area. In some situations, a combination of onsite, offsite and mitigation bank crediting may be required to meet compensatory mitigation needs.

(4) In what situations might the placement of mitigation projects benefit a highly disturbed urban area?

Several factors of the syllabus focus on the benefits of placing mitigation projects in a relatively undisturbed, non-urban setting. This geographical prioritization helps ensure project sustainability and its likelihood of achieving desired performance. In urban settings, concern over mitigation site performance can be overcome if project proponents provide detailed (intensive) site information that predicts a desired functional rate of a mitigation project and with a known level of certainty. In the alternative, the proponents must demonstrate

that the project complements components of a publically adopted urban watershed management plan or related environmental plan.

The risk of mitigation project failure in urban settings can be high. Therefore, it is best to approach urban wetland mitigation through impact avoidance. In general, the beneficial cumulative effect of compensatory mitigation projects in urban settings is far less than, say, the benefits delivered by water quality management activity. In contrast, the impact avoidance component of a mitigation program can provide major benefits toward helping sustain the aquatic environment of an urban area.

(5) How do we take into account water rights in the evaluation and selection of compensatory mitigation sites?

The natural hydrological regime in the Front Range region of Colorado is highly disturbed. This is due in part to the administration of water rights and intense demands for water supply. Moving mitigation offsite to a less "disturbed" area, even if the off-site location is near a stream, does not guarantee that adequate hydrological conditions will be present to support a mitigation project.

In order to determine if adequate hydrology will be present, practitioners need to know where upstream diversions are located and how the diversions are operated. In addition, proposed off-site mitigation involving some types of wetlands may raise concern of "injury" to individuals who own water rights downstream from that mitigation site. For example, the "establishment" of some types of "depressional" wetlands could possible increase water consumption during a few months of the year. Other the other hand, the restoration, enhancement and establishment of many types of wetlands may have a beneficial effect on a local hydrological regime.

For these reasons, potential mitigation bank providers are required to document that they own sufficient senior water rights to support their bank. There may be no water rights available to support certain categories of mitigation and for certain types of wetlands. An increase in emphasis on impact avoidance may be a consequence of these water rights issues and the associated difficulty to mitigate some wetland impacts.

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