Methodology for Assessing Functional Gains and Losses for Permittee Responsible Compensatory Mitigation and Calculating Compensatory Mitigation Credits and Debits for Third Party Mitigation Providers in the Alaska District

Developed by the U.S. Army Corps of Engineers, Alaska District in Consultation with the Alaska Statewide Interagency Review Team

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1 INTRODUCTION

On April 10, 2008, the United States (U.S.) Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (USEPA) published a joint federal rule (Mitigation Rule) which established regulations governing compensatory mitigation for activities authorized by Department of the Army (DA) permits issued pursuant to Section 404 of the Clean Water Act and/or Sections 9 and 10 of the Rivers and Harbors Act of 1899.

The Alaska District's goal is to develop a methodology for the calculation of compensatory mitigation requirements to offset specific unavoidable losses to aquatic resources authorized by DA permits. In order to provide a tool to determine that the amount of required compensatory mitigation is, to the extent practicable, sufficient to replace lost aquatic functions, the Alaska District set out to establish methodology based on the following criteria: 1) to utilize existing functional and conditional assessment methodologies; 2) to measure the value of establishment, restoration, and enhancement using a pre/post assessment; 3) to measure the value of preservation considering a "with preservation" and a "without preservation" assessment; 4) adjust for temporal loss; 5) adjust for risk and uncertainty; and 6) to increase efficiency and consistency when assessing debits or functional loss.

This methodology was developed by the Alaska District in consultation with the Statewide Interagency Review Team (SIRT) consisting of the U.S. Army Corps of Engineers Alaska District, the U.S. Environmental Protection Agency Region 10, the U.S. Fish and Wildlife Service, the U.S. Bureau of Land Management, the USDA Natural Resource Conservation Service, the Alaska Department of Environmental Conservation and the Alaska Department of Fish and Game.

The purpose of this document is to address the requirements for making a determination of credits and debits (for third party compensatory mitigation providers) or functional gain and functional loss (for permittee responsible mitigation) identified in Sections 332.3(f), Sections 332.4(c)(6) and 332.8(o)(1) of the Mitigation Rule and does not replace any other mitigation plan requirements or components identified in the Mitigation Rule. The terms functional gain and functional loss, for purposes of this methodology, were chosen to differentiate permittee responsible mitigation from third party compensatory mitigation providers.

All mitigation plan documentation must be prepared in accordance with the Mitigation Rule, which governs planning, implementation, and management of permittee responsible and third party compensatory mitigation projects.

Development of this methodology is an important step in promoting consistency in the Alaska District for determining the sufficiency of compensatory mitigation to offset specific unavoidable losses to aquatic resources authorized by DA permits. This document is intended to serve as a tool for determining the amount of debits or functional loss resulting from project specific unavoidable impacts to jurisdictional waters and mitigation credits or functional gain that a specific compensatory mitigation project will generate. Applicants and permittees may propose alternate methodologies to the Corps.

Use of the methodology allows an option for new third-party mitigation proposals to obtain approval for a credit/debit methodology for their bank site or in-lieu fee program without creating a new methodology. Approved mitigation banks and in-lieu fee programs may choose, but are not obligated, to modify their instruments to utilize the methodology or continue to calculate credits utilizing their approved methodology. This methodology will also allow permittees requiring compensatory mitigation to calculate and propose to the Corps the appropriate amount of compensatory mitigation for their individual projects.

Use of these procedures requires compliance with all other applicable regulations. For permittees, this methodology does not answer the question as to whether compensatory mitigation is required and should only be used when a determination has been made by the Corps that compensatory mitigation is required. Upon a determination by the Corps that compensatory mitigation is required to offset unavoidable impacts to aquatic resources, this methodology can be used to quantify the compensatory mitigation requirement i.e. acreage, credits etc.

For the development of a mitigation bank and/or in-lieu fee program, this method assumes that the user has already developed a robust draft bank or in-lieu fee instrument.

This methodology is not intended to supersede or replace any existing rules, including those regarding avoidance and minimization, nor does it address the appropriateness of the type of mitigation proposed. The credit methodology may only be utilized when impact sites and mitigation sites are evaluated using the same functional or condition assessment. This calculation is the last step in the process of determining sufficiency for compensatory mitigation.

To utilize this methodology, it may be necessary to normalize the functional or condition assessment scoring. There are numerous functional assessment methodologies in the State of Alaska. In order to build upon the work of the past and to maintain regional specificity when needed, the District established a goal of using these existing methods whenever possible. Many methods produce a functional condition index that has a range of values between 0.0 and 1.0. This methodology uses a range of 0.0-1.0. If the output of the functional assessment is not within the 0.0-1.0 range, the values must be normalized so that a range of 0.0-1.0 is realized to use the functional assessment output as the Delta (Δ).

2 Debits or Functional Loss

A debit or unit of functional loss means a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the loss of aquatic functions at an impact or project site. The measure of aquatic functions is based on the resources impacted by the authorized activity.

In Alaska, one debit or unit of functional loss is equal to the total loss of function from one acre of optimum functioning aquatic resource as measured by an appropriate function or condition assessment. Debit or unit of functional loss calculations reflect the difference, or Delta (Δ), between the baseline (Current Condition) of the assessment area and the anticipated condition (With Impact) of the assessment area after the authorized discharge has occurred.

$$\Delta = Current\ Condition - With\ Impact$$

This Δ is then multiplied by the number of acres in the assessment area to yield the number of debits or unit of functional loss.

$$Debits = (\Delta)(Acres)$$

$$Funtional\ Loss = (\Delta)(Acres)$$

3 Credits or Functional Gain

A credit or unit of functional gain means a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the resources restored, established, enhanced, or preserved.

In Alaska, one credit or unit of functional gain is equal to one acre of optimum functioning aquatic resource as measured by an appropriate function or condition assessment. A credit or functional gain calculation may be based on the anticipated condition of the compensatory mitigation assessment site after full achievement of ecological performance standards.

3.1 Credit or Functional Gain Calculations For Establishment, Restoration, or Enhancement

Credit or functional gain calculations for establishment, restoration, or enhancement reflect the difference, or Delta (Δ), between the anticipated condition (With Mitigation) of the assessment area and the baseline (Current Condition) of the assessment area after the mitigation activities have occurred.

$$\Delta = With\ Mitigation - Current\ Condition$$

This Δ may be further adjusted through the application of Time Lag and Risk. Time Lag and Risk should be assessed in light of the credit release schedule for third party providers, the planning, implementation, and management of the assessment area, and the ecological performance standards for permittee responsible compensatory mitigation sites. For more information on Time Lag and risk, please refer to the Time Lag and Risk Sections.

$$Adjusted\ \Delta = \frac{\Delta}{(Time\ Lag)(Risk)}$$

This will result in an Adjusted Delta (Adjusted Δ) that can then be used, with area, to determine the potential number of credits that an assessment area can generate or if a permittee responsible mitigation site is sufficient.

$$Credits = (Adjusted\ \Delta)(Acres)$$

$$Functional\ Gain = (Adjusted\ \Delta)(Acres)$$

3.2 Credit Calculations For Preservation

Credit or functional gain calculations for preservation reflect the difference, or Delta (Δ), between the anticipated condition if the project site were preserved (With Preservation) and the anticipated condition if the project site were not preserved (Without Preservation).

$$\Delta = With\ Preservation - Without\ Preservation$$

This Δ is further adjusted through the application of a Preservation Adjustment Factor (PAF) to yield a Preservation Adjusted Δ. The PAF assigned is based on the summation of the scores for Threat (T) and Ecological Significance (ES). For more information on the PAF, please refer to the Preservation Adjustment Factor Section.

$$PAF = T + ES$$

$$Preservation\ Adjusted\ \Delta = (\Delta)(PAF)$$

This Preservation Adjusted Δ may be further adjusted through the application of Time Lag and Risk. Time Lag and Risk shall be assessed in light of the credit release schedule for third party providers, the planning, implementation, and management of the assessment area, and the ecological performance standards for permittee responsible compensatory mitigation sites. For more information on Time Lag and risk, please refer to the Time Lag and Risk Sections.

$$Adjusted\ \Delta = \frac{Preservation\ Adjusted\ \Delta}{(Time\ Lag)(Risk)}$$

This will result in an Adjusted Delta (Adjusted Δ) that can then be used, with area, to determine the potential number of credits that an assessment area can generate.

$$Credits = (Adjusted\ \Delta)(Acres)$$

$$Functional\ Gain = (Adjusted\ \Delta)(Acres)$$

4 Preservation Adjustment Factor

When assessing preservation, the “with preservation” assessment should consider the potential of the assessment area to perform current functions in the long term, considering the protection mechanism proposed, and the “without preservation” assessment should evaluate the assessment area’s functions considering the extent and likelihood of what activities would occur if it were not preserved, the temporary or permanent effects of those activities, and the protection provided by existing easements, restrictive covenants, or state, federal, and local rules, ordinances and regulations.

The gain in aquatic resource function is determined by the difference between the “with preservation” and “without preservation,” or Delta (Δ), multiplied by a Preservation Adjustment Factor (PAF). The PAF is scored on a scale from 0 (no preservation value) to 1 (optimal preservation value), as described below. The factor assigned is based on first establishing a base Threat Score (T), ranging from 0.1-0.4, and second applying appropriate additives for Ecological Significance (ES), ranging from 0-0.6.

$$PAF = T + ES$$

The evaluation must be based on currently available information, such as aerial photographs, topographic maps, geographic information system data and maps, site visits, scientific articles, journals, other professional reports, and reasonable scientific judgment.

4.1 Threat Score (Scale 0.1 to 0.4) NOT additive

The base Threat (T) Score is NOT additive (i.e., choose one score from the options below)

(0.4) Documented evidence of an authorization to adversely impact the aquatic resources within the mitigation site (Example: existing land use permit, 404 permit).

(0.3) Demonstrated land use trend within the boundaries of an incorporated city, town, or borough. (Example: Platted land zoned for development). Demonstrated threat of mining activities through extensive prospecting, which indicates there are economically recoverable reserves/commodities Demonstrated threat of oil/gas activities through exploration activities, which indicate there are economically recoverable reserves.

(0.2) Demonstrated land use trend locally or regionally resulting in destruction or alteration of aquatic resources outside of incorporated areas. Demonstrated threat of mining activities through sampling, i.e. sampling of water quality constituents, which indicate there are economically recoverable reserves/commodities.

(0.1) Inholdings within regionally important publically held lands.

4.2 Ecological Significance (Scale 0.0 to 0.6) Additive

The Ecological Significance (ES) scaling factor is Additive. Therefore, select all that apply.

(0.1) Aquatic resources that are adjacent to or connect regionally important publicly held lands, such as: National Marine Sanctuaries, National Seashores, National and State Parks, Forests, Refuges and Wildlife Management Areas.

(0.3) Site contains aquatic resources that have been identified as significant within a specified Ecoregion. Such as: Alaska's Wildlife Action Plan or Anadromous Waters Catalog, Alaska Department of Fish and Game.

(0.1) Aquatic resources that provide habitat important to species that are listed under the Endangered Species Act, or have some other special designation.

(0.1) Scarcity of Aquatic Resource Type. Such as: Specific preservation to maintain diversity of habitat type within islands systems removing the threat of habitat fragmentation for fish and wildlife species (Alexander Archipelago Islands (Southeast Alaska) Kodiak and the Aleutian Chain).

5 Time Lag

5.1 Time Lag for Credits

For third party compensatory mitigation providers, time lag means the period of time (in years) between credit release and when the assessment area has achieved the outcome that was scored using an appropriate functional or conditional assessment method. In general, the time lag varies by the type and timing of mitigation in relation to the credit release schedule. Wetland establishment generally has a greater time lag to establish certain wetland functions than most restoration activities. Forested systems typically require more time to establish characteristic structure and function than most herbaceous systems. Factors to consider when assigning time lag include biological, physical, and chemical processes associated with nutrient cycling, hydric soil development, and community development and succession.

There is no time lag (Time Lag value of 1) if the assessment area has achieved the outcome that was scored prior to credit release.

5.2 Time Lag for Functional Gain

For permittee responsible compensatory mitigation, time lag means the period of time (in years) between when the functions are lost at an impact site and when the compensatory mitigation site has achieved the outcome that was scored using the apprpropriate funcational or conditional assessment methodology. In general, the time lag varies by the type and timing of mitigation in relation to when the functions are lost at an impact site. Wetland establishment generally has a greater time lag to establish certain wetland functions than most restoration activities. Forested systems typically require more time to establish characteristic structure and function than most herbaceous systems. Factors to consider when assigning time lag include biological, physical, and chemical processes associated with nutrient cycling, hydric soil development, and community development and succession. There is no time lag (Time Lag value of 1) if the compensatory mitigation fully offsets the anticipated impacts prior to or at the time of impact.

5.3 Time Lag Table

The table below is for the user to specify a discount rate (in this case 3%) which is commonly used in economic analyses to express the idea that a benefit to be received in the future is less valuable than the same benefit received today. Specifying a discount rate increases the weight given to levels of wetland function achieved sooner (i.e., increasing the discount rate decreases the "present value" of functional levels accrued in the distant future).

Year	Time Lag
< or =1	**1.0000**
2	**1.0170**
3	**1.0341**
4	**1.0518**
5	**1.0696**
6-10	**1.0876**
11-15	**1.1805**
16-20	**1.2805**
21-25	**1.3873**
26-30	**1.5015**
31-35	**1.6233**
36-40	**1.7532**
41-45	**1.8917**
46-50	**2.0485**
51-55	**2.1962**
>55	**2.3292**

6 RISK

Mitigation risk should be evaluated to account for the degree of uncertainty that the proposed conditions will be achieved, resulting in a reduction in aquatic resource function of the mitigation assessment area. In general, mitigation projects which require longer periods of time to replace lost functions or to recover from potential perturbations will be considered to have higher risk than those which require shorter periods of time. The assessment area should be scored on a scale from 1 (for no or de minimis risk) to 3 (high risk), on quarter-point (0.25) increments.

1.0	.25	.50	.75	**2.0**	.25	.50	.75	**3.0**
No/ De Minimis				Moderate				High

A score of 1.0 would most often be applied to mitigation conducted in an ecologically suitable landscape and deemed successful, whereas a score of 3.0 would indicate an extremely low likelihood of success based on the ecological factors below.

Risk should be assessed in light of the credit release schedule for third party providers, the planning, implementation, and management of the assessment area, and the ecological performance standards for permittee responsible compensatory mitigation sites. A single risk score should be assigned, considering the applicability and relative significance of the factors below, based upon consideration of the likelihood and the potential severity of reduction in aquatic resource function due to these factors.

(a) Plant Communities: The vulnerability of the mitigation to the establishment and long-term viability of plant communities other than that proposed, and the potential reduction in aquatic resource function which might result, considering the compatibility of the site soils and hydrologic conditions with the proposed plant community, planting plans, and track record for community or plant establishment method;

(b) Invasive Exotic/Noxious Species: The vulnerability of the mitigation to colonization by invasive exotic or noxious species, considering the location of recruitment sources, the suitability of the site for establishment of these species, the degree to which the functions provided by plant community would be affected;

(c) Water Quality: The vulnerability of the mitigation to degraded water quality, considering factors such as current and future adjacent land use, and construction, operation, and maintenance of surface water treatment systems, to the extent that aquatic resource function is affected by these changes;

(d) Water Quantity: The vulnerability of the mitigation to and the extent of the effect of different hydrologic conditions than those proposed, considering the degree of dependence on mechanical or artificial means to achieve proposed hydrologic conditions, such as reliability of the hydrologic data, modeling, and design, unstable conditions due to waves, wind, ice, or currents, and the hydrologic complexity of the proposed community. Systems with relatively simple and predictable hydrology, such as tidal wetlands, would entail less risk than complex hydrological systems such as seepage slopes or perched wetlands;

(e) Secondary Impacts: The vulnerability of the mitigation to secondary impacts due to its location, considering potential land use changes in surrounding area, existing protection provided to surrounding areas by easements, restrictive covenants, or federal, state, or local regulations, and the extent to which these factors influence the long term viability of functions provided by the mitigation site; and

(f) Direct Impacts: The vulnerability of the mitigation to direct impacts, considering its location and existing and proposed protection provided to the mitigation site by easements, restrictive covenants, or federal, state, or local regulations, and the extent to which these measures influence the long term viability of the mitigation site.

(g) In-Lieu Fee Advanced Credits: The vulnerability that an in-lieu fee program will not be able to provide the required compensatory mitigation.

7 Example Scenarios

7.1 Debit or Functional Loss Determination.

The impact site will result in 5 Acres of wetland that will be filled. Utilizing the chosen functional assessment the: Current Condition Score is: 6.50; the With Impact Score is: 0.

$$\Delta = Current\ Condition - With\ Impact$$

$$\Delta = 6.5 - 0$$

$$\Delta = 6.5$$

For this example, the Δ is 6.5; therefore, the normalized score is 0.65 or 6.5/10, since the maximum score is 10.

This Δ is then multiplied by the number of acres in the assessment area to yield the number of debits or unit of functional loss.

$$Debits\ or\ Functional\ Loss\ Units = (\Delta)(Acres)$$

$$Debits\ or\ Functional\ Loss\ Units = (0.65)(5)$$

$$Debits\ or\ Functional\ Loss\ Units = 3.25$$

7.2 CREDITS OR FUNCTIONAL GAIN

7.2.1 Credit or Functional Gain Calculations for Establishment, Restoration, or Enhancement

The mitigation site is for 55 Acres of restoration (rehabilitation). Utilizing the chosen functional assessment the: Current Condition Score is: 2.80; the With Mitigation Score is: 7.83.

Normalize each score to a 0.0 - 1.0 scale. In this case, divide each score by 10. 2.80/10 = 0.28 is the current condition score; 7.83/10 = 0.783 is the with mitigation score.

Credit or functional gain calculations for establishment, restoration, or enhancement reflect the difference, or Delta (Δ), between the anticipated condition (With Mitigation) of the assessment area and the baseline (Current Condition) of the assessment area after the mitigation activities have occurred.

$$\Delta = With\ Mitigation - Current\ Condition$$

$$\Delta = 0.783 - 0.280$$

$$\Delta = 0.503$$

This Δ is further adjusted through the application of Time Lag and Risk. Time Lag and Risk were assessed in light of the credit release schedule for third party providers, the planning, implementation, and management of the assessment area, and/or the ecological performance standards for permittee responsible compensatory mitigation sites. The Time Lag for this example was determined to be two years, which resulted in a Time Lag value of 1.017. The Risk for this example was determined to be minimal and assigned a value of 1.25 considering the applicability and relative significance of the risk factors.

$$Adjusted\ \Delta = \frac{\Delta}{(Time\ Lag)(Risk)}$$

$$Adjusted\ \Delta = \frac{0.503}{(1.017)(1.25)}$$

$$Adjusted\ \Delta = 0.3956735497$$

This Adjusted Delta (Adjusted Δ) can then be used, with area, to determine the potential number of credits that an assessment area can generate or to determine if a permittee responsible mitigation site is sufficient.

$$Credits\ or\ Functionl\ Gain\ Units = (Adjusted\ \Delta)(Acres)$$

$$Credits\ or\ Functionl\ Gain\ Units = (0.3956735497)(55)$$

$$Credits\ or\ Functionl\ Gain\ Units = 21.76$$

7.2.2 Credit Calculations for Preservation

The mitigation site is for 55 Acres of preservation. Utilizing the chosen functional assessment the: Without Preservation Score is: 2.80; the With Preservation Score is: 7.83.

Normalize each score to a 0.0 - 1.0 scale. In this case, divide each score by 10. 2.80/10 = 0.28 is the without preservation score; 7.83/10 = 0.783 is the with preservation score.

Credit or functional gain calculations for preservation reflect the difference, or Delta (Δ), between the anticipated condition if the project site were preserved (With Preservation) and the anticipated condition if the project site were not preserved (Without Preservation).

$$\Delta = \textit{With Preservation} - \textit{Without Preservation}$$

$$\Delta = 0.783 - 0.280$$

$$\Delta = 0.503$$

This Δ is further adjusted through the application of a Preservation Adjustment Factor (PAF) to yield a Preservation Adjusted Δ. The PAF assigned is based on the summation of the scores for Threat (T) and Ecological Significance (ES). For this example, the base score or threat was determined to be 0.3 and the Ecological significance was also determined to be a 0.3.

$$PAF = T + ES$$

$$PAF = 0.3 + 0.3$$

$$PAF = 0.6$$

$$\textit{Preservation Adjusted } \Delta = (\Delta)(PAF)$$

$$\textit{Preservation Adjusted } \Delta = (0.503)(0.6)$$

$$\textit{Preservation Adjusted } \Delta = 0.3018$$

This Preservation Adjusted Δ is further adjusted through the application of Time Lag and Risk. Time Lag and Risk were assessed in light of the credit release schedule for third party providers, the planning, implementation, and management of the assessment area, and/or the ecological performance standards for permittee responsible compensatory mitigation sites. The Time Lag for this example was determined to be two years, which resulted in a Time Lag value of 1.017. The Risk for this example was determined to be minimal and assigned a value of 1.25 considering the applicability and relative significance of the risk factors.

$$\textit{Adjusted } \Delta = \frac{\textit{Preservation Adjusted } \Delta}{(\textit{Time Lag})(\textit{Risk})}$$

$$\textit{Adjusted } \Delta = \frac{\Delta}{(\textit{Time Lag})(\textit{Risk})}$$

$$\textit{Adjusted } \Delta = \frac{0.3018}{(1.017)(1.25)}$$

$$\textit{Adjusted } \Delta = 0.2374041298$$

This will result in an Adjusted Delta (Adjusted Δ) that can then be used, with area, to determine the potential number of credits that an assessment area can generate.

$$\textit{Credits or Functionl Gain Units} = (\textit{Adjusted } \Delta)(\textit{Acres})$$

$$\textit{Credits or Functionl Gain Units} = (0.2374041298)(55)$$

$$\textit{Credits or Functionl Gain Units} = 13.06$$