SECTION 5 - Calculating Credits And Debits

DETERMINING CREDITS and DEBITS

The objective of a mitigation bank is to replace or offset the chemical, physical and biological functions of wetlands and other aquatic resources which are lost as a result of authorized impacts. Using appropriate methods, the newly-established functions are quantified as mitigation credits. For Federal purposes, the same method used to quantify credits should also be used at the impact sites to determine debits. In accordance with their respective rules, the method(s) through which the participating State agencies determine credits and debits may differ from what is proposed herein. Please consult with your local DEP or WMD office.

Preface - The advent of mitigation banking is bringing change to the traditional ways regulators evaluate compensatory mitigation for permitted wetland impacts. For banking to work, a predictable trading system must be established based upon a standardized currency. The purpose of this section is to present the MBRT's proposal for a mitigation trading system. This system is designed to work for project-specific mitigation as well as for banking. Traditionally, the following factors were usually considered by the evaluator to determine the appropriate level of compensatory mitigation needed to offset a permitted impact:

1) the functional level (i.e., the quality) of the wetlands to be affected by the impact project,
2) the functional level that the created, restored, enhanced, or preserved wetlands are expected to attain through the mitigation project,
3) the uncertainty that the predicted functional level of the mitigation project will in fact be attained and maintained in the long term,
4) the timing of the mitigation project relative to the impact project,
5) the proximity of the mitigation project relative to the impact project (i.e., on-site versus off-site or in-watershed versus out-of-watershed),
6) the respective wetland types involved (i.e., in-kind or out-of-kind compensation),
7) the landscape context of the mitigation and impact sites, and
8) the "importance" or "value" to society of the wetland functions being evaluated.

This analysis traditionally resulted in an acreage-based compensation ratio (e.g., create 3 acres of new wetlands for every natural acre destroyed). Please note that except for items 2, 3, 7 and 8, some specific information about the impact site is required to develop a compensation ratio. When determining the appropriate number of credits to be awarded to a mitigation bank, however, specific information about the impact sites is not known. One way to handle this situation is to evaluate the actual functional levels that have been attained at the bank at the time of debiting for each and every impact. Clearly, this would not be an efficient approach to the administration of the banking system. The alternative is to relate conditions at the bank and impact sites back to an independent datum. As long as the impact and mitigation sites are evaluated through the same method, and that method is calibrated to a datum common to both sites, the independent evaluation of the impact and mitigation sites can be done. The following credit and debit evaluation method employs this premise and attempts to capture all of the elements 1-8 listed above.

Credit and Debit Units – In the context of the Federal wetlands regulatory program, the purpose of requiring compensatory mitigation for permitted impacts is to achieve "no net loss" of wetland **function**. The does not mean that the total spatial extent of the wetlands in a given watershed is unimportant. Rather, this goal reflects the reality that wetlands protection legislation was enacted to protect the functions wetlands perform which are important to society. Regulatory decisions are therefore based on a blend of scientific analysis of wetland functions and judgement regarding the relative importance of the functions being analyzed. To keep these concepts separate, the terms "capacity" and 'importance" are used herein. Credits and debits are the terms used to designate the units of trade in mitigation banking. The number of credits assigned to a bank should reflect the improvement in wetland functional level expected to result from establishment of the bank and also recognize the importance of these improvements. Similarly, the number of debits needed to compensate for permitted impacts should reflect the decrease in wetland functional level expected to result from the project and also recognize the importance of the losses. A credit/debit unit is therefore defined, as the ecological value associated with one acre of wetland that is functioning at the highest possible capacity that is attainable within the service area of the bank. As you will see, these units will be weighted according to societal importance and other intangibles. The units will also be corrected for temporal losses.

Measuring Changes in Wetland Function Level - Changes in functional levels between site conditions under the with-bank and without-bank scenarios should be measured by an appropriate wetland functional assessment method to determine the number of bank credits. Conversely, to determine the number of debits needed to meet the mitigation requirement for a permitted activity, the same functional assessment method should be used to measure the change in levels between the existing conditions and the predicted post-project conditions at the impact site. The ecological conditions of each of these scenarios, both at the bank and impact sites, are compared against a datum that is applicable within the bank's service area. The datum should be developed to represent the highest possible functional capacities that wetlands within the service area can attain. The reference domain concept, as developed in the Hydrogeomorphic (HGM) approach, represents the range of wetland functioning levels of a specific type of wetland within a specific region. The reference domain is applicable to many other wetland functional assessment techniques. For example, in the Wetland Rapid Assessment Procedure (WRAP) developed by the SFWMD, the calibration descriptors for the highest possible numerical score for a given function describe the highest functional capacity which that particular function can attain within the region WRAP is written for. In other words, the calibration descriptors for the "best" scores in WRAP can be construed as describing the "attainable conditions" in an HGM reference domain. Comparing the gains in functional levels at the bank and the losses in functional levels at impact sites against a common datum allows for "standardization" of the credits and debits for a given bank. The standardized measurement of differences in functional levels produce outputs that represent the percentage increase and decrease in wetland function at the bank and impact sites, respectively. The percentage increase or decrease in a functional level is herein referred to as "the delta" or symbolically as Δ. To illustrate the concept of the level of a wetland function, a brief example is presented. In the HGM approach, a Functional Capacity

Unit (FCU) is defined by multiplying the Functional Capacity Index (FCI) for the function in question by the acreage of the wetland area being assessed. It should be noted that each wetland function addressed in a given HGM model has its own FCI. For example, in the model for Peninsular Florida Depressional Wetlands (currently under development) the following FCIs are generated:

- FCI_{HYDRO} - Maintenance of Characteristic Hydrologic Regime
- FCI_{BCNC} - Biogeochemical Processes
- $FCI_{REMOVAL}$ - Abiotic Retention and Removal of Nutrients and Compounds
- FCI_{PART} - Particulate Retention
- FCI_{PLANT} - Maintenance of Characteristic Plant Community
- $FCI_{WILDLIFE}$ - Maintenance of Distribution and Abundance of Vertebrates and Invertebrates.

In mitigation banking, the HGM delta would be the difference in FCIs under the with- and without-bank scenarios. Please refer to the following table for an example. Note: The listed FCIs are for only one of the assessment areas at a theoretical bank and do not represent an actual situation.

FCI	Column A With-Bank Scenario	Column B Without-Bank Scenario	Column C (B-A) FCI Delta	Column D Assessment Area	(CxD) Assessment Area FCU
Hydro	0.8	0.5	0.3	100 acres	30 FCU_{HYDRO}
BCNC	1.0	1.0	0.0	100 acres	0 FCU_{BCNC}
Removal	0.9	0.7	0.2	100 acres	20 $FCU_{REMOVAL}$
Part	1.0	0.6	0.4	100 acres	40 FCU_{PART}
Plant	0.7	0.2	0.5	100 acres	50 FCU_{PLANT}
Wildlife	0.6	0.3	0.3	100 acres	30 $FCU_{WILDLIFE}$

To accurately account for the relative gains and losses of the various capacities within a watershed, the mitigation banking currency units could be the FCUs themselves. In other words, a bank's "inventory" would have a certain number of FCU_{HYDRO}, FCU_{BCNC}, $FCU_{REMOVAL}$ and so on. The appropriate level of compensatory mitigation needed to offset a permitted impact could be determined in the same way. This approach to mitigation accounting precludes the need to "weight" the importance of the various functions against one another in order to produce a single unit of trade. Although this approach may be more accurate from a purely scientific standpoint, it would make the accounting more complicated and ignores the fact the regulatory decisions include societal considerations regarding the importance of the functions. Regardless of the assessment procedure used to evaluate changes in capacity, the way in which the suite of functional outputs is handled is significant and must be carefully considered. The MBRT presently prefers the use of WRAP, see Section 5a.

Weighting Wetland Functions – There are several ways to derive a single unit of trade from the suite of wetland function capacities produced by a given assessment model. The following approaches illustrate how the FCI outputs from the HGM example could be used. One simple way to produce a single HGM delta for a given assessment area would be to take the largest FCI delta from the suite of FCIs and multiply it by the acreage of the assessment area. Using the data in the example table, the 0.5 delta for FCI_{PLANT} would be multiplied by 100 acres to produce 50 credits for that assessment area. Another simple approach would be to weight the individual FCI deltas equally by taking the average and multiplying the result by the acreage of the assessment area. This would produce 28.3 credits for the 100-acre assessment area. Another approach would be selection of an "umbrella function." For example, if it was determined that $FCI_{WILDLIFE}$ is the function most sensitive to change in a given HGM model, it could be designated the umbrella function. In the above example, the delta of 0.3 for $FCI_{WILDLIFE}$ would be multiplied by 100 acres producing 30 credits. The difference between 28.3 credits and 50 credits is substantial. Obviously, careful value judgments must be made regarding the relative importance of each function in order to produce a single output. The emergence of mitigation banking and its demand for a specific accounting system sharply focuses the need for watershed /ecosystem planning. Such plans should establish the relative societal importance of the individual wetland functions to aid the decision-making process. In order to move mitigation accounting forward in the meantime, the MBRT proposes a simple method to assign relative importance weights to the wetland functions under evaluation. The method is described in Section 5b, Wetland Function Weighting.

Affected Areas - This section discusses the way acres are introduced into the credit/debit calculations. Deltas are applied to the individual wetland areas that will be affected by mitigative actions at the bank, or will be adversely affected by development activities at the impact site. These individual assessment areas are measured in acres and are herein referred to as "polygons". In most cases, the polygon boundaries will coincide with the wetland boundaries, but there can be exceptions (e.g., a non-wetland in the without-bank scenario that will become a wetland in the with-bank scenario should be delineated as a polygon). The complexity of polygon delineation will largely depend upon the complexity of the landscape at the bank or impact site, and the various scenarios that are under comparison. There are no strict rules in delineating polygons other than the fact that upland areas under the with-bank scenario can not be included. This rule is necessary to maintain balance in the overall equation because upland areas cannot be included in the delineation of polygons at the impact sites.

Ecosystem Considerations

- **Preservation** - Consideration of the without-bank scenario when measuring changes in wetland function allows for quantification of the preservation value of the bank when compared with existing conditions. The determination of an appropriate without-bank scenario should be based on a demonstrable threat of wetland function degradation due to human activities that might not otherwise be expected to be restricted. The existence of a demonstrable threat will be based on clear evidence of ecologically destructive land use changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor.

- **Uplands** - It is widely recognized that intact uplands can augment the functional capacities of adjacent wetlands. This augmentation is captured in the scoring of the deltas for the individual wetland polygons at a bank. Conversely, upland development at the impact site can produce secondary impacts to adjacent wetlands. These losses in capacity are similarly considered in the scoring of deltas for the wetland polygons at the impact site.

- **The Bigger Picture** - Some ecological considerations may not be captured in the functional assessment method used to assess the deltas for individual polygons at the bank or impact sites. These large-scale considerations are usually related to the site's location within the overall landscape, or its "ecosystem context" if you will. Location of the bank or impact site relative to other ecological features, hydrologic sources, and compatibility with adjacent land uses and watershed management goals are important factors for consideration. These large-scale considerations are usually related to the capacity of a given wetland function but they are best captured in the weighting of the appropriate wetland function as described in Section 5b.

Mitigation Timing and Risk - In mitigation banking, the relative timing between the implementation of mitigation and the occurrences of the permitted wetland losses is controlled, for the most part, through the credit release schedule. In other words, credits are incrementally released to the bank as the mitigation work proceeds and as the completed work is determined to be successful through required monitoring protocols. *(Note: In this context, success does not necessarily mean the created, restored or enhanced wetland has achieved all of the functional capacities that were predicted under the with-bank scenario. Rather, success simply means the success criteria specified in the MBI have been met. Depending upon the mitigation activity, these two concepts of success could vary greatly).* Credit release schedules are usually on the order of five to ten years. For many mitigation activities, such as hydrologic restoration, the functional capacity predicted under the with-bank scenario can be verified within the relatively short time frame of a credit release schedule. For other mitigation activities, such as creation of a forested wetland, the maturation period needed to reach the functional capacities predicted under the with-bank scenario can be much longer than the credit release schedule. This delay in the replacement of the lost functional capacity is called "temporal lag". In addition to the temporal lag associated with some mitigation activities, there is uncertainty that mitigation activities will actually succeed in meeting the predicted functional capacities. The traditional way of handling temporal lag and the risk associated with uncertainty was to consider them in the determination of an acreage-based compensation ratio. This requires specific knowledge of the relative timing of the mitigation and impact activities. This is not possible in banking because the total number of potential bank credits must be determined when the bank is established. Rather than applying a ratio to bank credits at the time they are debited, it is simpler to "adjust" potential bank credits for temporal lag and risk at the time they are assigned. Therefore, a "temporal lag" factor (T) is introduced into the credit side of the equation whenever the maturation period of the proposed mitigative activity is longer than the credit release schedule. A method to determine the T-factor is discussed in detail in Section 5c, with a brief discussion of a risk factor.

In-Kind versus Out-Of-Kind Compensation - The proposed credit/debit formula does not address this issue because it is very difficult, if not impossible, to relate widely differing wetland types back to a common datum. The traditional general rule of thumb still applies. In-kind compensation is preferable and out-of-kind compensation must be considered as a special case.

FORMULA

Based on the above concepts, the following formula has been developed to assign credits to mitigation banks and determine debits needed to meet the compensation requirement for permitted impacts. For each polygon at the bank or impact site, each function in the wetland functional assessment model is evaluated. This produces a Δ for each of the functions when comparing with and without bank scenarios. The Δ for each function is then multiplied by the W- and T-factors. For each polygon you now have a weighted Δ that has been corrected for temporal lag. Each Δ is now multiplied by the acreage of its polygon. The products are then summed to produce the final credit or debit total. Please note that for debit calculations, the T-factor is set to 1.0 because the temporal lag in function has been accounted for in the credit calculation. Step-by-step examples employing this formula are presented in Sections 5f and 5g.

$$\sum_{P=1}^{P=n}\left[\sum_{function=1}^{function=n}(\Delta * W * T)A\right]P\bar{x}$$

Terms are defined as:

Σ stands for **Summation**. The operations shown to the right of a Σ symbol are performed on the indicated variables starting with the variable number below the symbol and finishing with the variable number above the symbol. The results for each of these operations are then added up (or summed) to produce the total.

Δ stands for **Delta**. The delta represents the change in the capacity of an individual wetland function for a given polygon within the bank or impact site.

P stands for **Polygon**. Polygons (1-n) at the bank site are delineated based on the areas that will be affected by the mitigative actions. For development projects proposing to debit the bank, polygons are delineated based on the wetland areas that will be impacted (both directly and secondarily) by the project.

W stands for the **Weighting Factor (or W-factor).** The W-factor takes into consideration large-scale ecological consideration not captured in the Δ. This factor includes important societal considerations such as watershed/ecosystem management issues, threatened and endangered species, rare or scarce habitats, adjacent and on-site special land use designations.

T stands for the **Temporal Lag Factor (or T-factor).** The T-factor is a correction factor used to account for temporal losses in wetland function.

Px stands for **Proximity Factor**. This multiplier is used only on the impact site; only if the site is not located in the bank's watershed.

A stands for **Area of Polygon**. A polygon is an assessment area measured in acres.