DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT, CORPS OF ENGINEERS
69 A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

REPLY TO
ATTENTION OF

PUBLIC NOTICE

REGULATORY DIVISION 12 DECEMBER 2003
SUBJECT: REVISED MITIGATION & MONITORING GUIDELINES

In December, 2002, the United States Department of the Army, Office of the Assistant Secretary of the Army (Civil Works) in conjunction with the United States Environmental Protection Agency issued Regulatory Guidance letter (RGL) 02-02, regarding compensatory mitigation for aquatic resource impacts under the Clean Water Act Section 404 and the Rivers and Harbors Act Section 10 programs. Part of the RGL included the findings of an independent evaluation by the National Academy of Sciences (NAS) on the effectiveness of wetlands compensatory mitigation for authorized losses of wetlands and other waters under Section 404 of the Clean Water Act and the consequential National Mitigation Action Plan (MAP).

As a result of the NAS findings and consequential National Mitigation Action Plan (MAP) the Corps is commencing several major initiatives to improve the success of compensatory mitigation overall and in the context of a regional watershed approach. The first part of the Corp's approach to implement better compensatory mitigation is for Corps districts with existing mitigation and monitoring guidelines to review the existing guidelines for improvement and incorporate the recommendations of the National Academy of Sciences (NAS) report, "Compensating For Wetland Losses Under the Clean Water Act", and the Corps and Environmental Protection Agency Headquarters joint guidance, Model Compensatory Mitigation Plan Checklist For Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act" into existing guidelines.

The Charleston District Regulatory Division has revised our mitigation and monitoring guidelines and incorporated the recommended improvements. The purpose of this public notice is to solicit comments on the revised Charleston District Compensatory Mitigation Guidelines (or Standard Operating Procedure), which are attached.

In order to give all interested parties an opportunity to express their views

NOTICE

is hereby given that written statements regarding the proposed guidelines will be received by the above mentioned office until

12 O'CLOCK NOON, MONDAY, JANUARY 12, 2004

from those interested in the activity and whose interests may be affected by the proposed work.

NOTE: The revised mitigation guidelines are also available for review by appointment between the hours of 9:00 am and 3:30 pm Monday through Friday at the Corps office at the address listed above. Please Call Mary Hope Glenn at 843-329-8044 to make an appointment.

If there are any questions concerning this public notice, please contact Mary Hope Glenn at 843-329-8044 or toll free at 1-866-329-8187.

Tina B. Hadden
Chief, Regulatory Division
U.S. Army Corps of Engineers

Department of the Army
Charleston District, Corps of Engineers
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RD-SOP-02-01
Regulatory Division - Standard Operating Procedure Revised December 12, 2003

Compensatory Mitigation

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GENERAL INFORMATION

1. Applicability. This SOP is applicable to regulatory actions requiring compensatory mitigation for adverse ecological effects where more rigorous, detailed studies (e.g., HGM, WET, HEP) are not considered practical or necessary. This SOP is divided into wetlands (acreage basis) and stream (linear basis) sections. It should be applied in the following manner based on the location of project impact and type of system impacted:

- For impacts to wetlands, use the wetland portion of the SOP to calculate mitigation on an acreage basis.
- For impacts to streams or rivers use the linear system portion of the SOP to calculate mitigation on a linear footage basis. This includes Piedmont stream systems where only bed and bank wetlands are impacted.
- For impacts to stream or riverine systems with a defined channel where impacts extend to adjacent or neighboring wetlands, use the linear portion of the SOP to calculate mitigation on a linear footage basis for the stream or river and the wetland portion to calculate mitigation on an acreage basis for the wetlands.
- For impacts to seepage wetlands and braided stream systems, use the wetland portion of the SOP to calculate mitigation credits on an acreage basis.

Note that some projects will require use of both the wetlands and linear portions of the SOP to determine appropriate levels of compensatory mitigation and that mitigation should be in-kind (e.g. impacted stream or riverine systems with adjacent or neighboring wetlands should be replaced with stream or riverine systems with adjacent wetlands).

This SOP may not be appropriate for some large, complex projects. This SOP does not address mitigation for categories of effects other than ecological (e.g., historic, cultural, aesthetic). Types of mitigation other than compensation (e.g., avoidance, minimization, reduction) are not addressed by this SOP. This SOP does not obviate or modify any requirements given in the 404(b)(1) Guidelines or other applicable documents regarding avoidance, sequencing, minimization, etc. Such requirements shall be evaluated during consideration of permit applications. This SOP was developed in coordination with State and Federal agencies to enhance its effectiveness and acceptability. When this SOP is used in the establishment of a Mitigation Bank, the Army Corps of Engineers (ACE) will consult with the Mitigation Bank Review Team (MBRT), in accordance with MBRT procedures, with the goal of achieving a consensus of the MBRT regarding the factors, elements, and design of the Mitigation Bank Plan. Also, note that this document is subject to periodic review and modification. This is an internal policy document, and does not provide a private or citizens' right-of-action.

2. Purpose. The intent of this SOP is to provide a basic written framework which will provide predictability and consistency for the development, review, and approval of compensatory mitigation plans. A key element of this SOP is the establishment of a method for calculating mitigation credits. While this method is not intended for use as project design criteria, appropriate application of the method should minimize uncertainty in the development and approval of mitigation plans and allow expeditious review of applications. However, nothing in this SOP should be interpreted as a promise or guarantee that a project which satisfies the guidelines given herein will be assured of approval. The District

Engineer (DE) has a responsibility to consider each project on a case by case basis and may determine in any specific situation that authorization should be denied, modified, suspended, or revoked. Following the guidelines herein does not confer any absolute guarantee of mitigation acceptability. Site specifics of a particular project may warrant alternative mitigation requirements.

3. Other Guidance. In addition to the policies and requirements set forth in this document, there may be other guidance provided by State or Federal agencies. Mitigation proposals should also be in compliance with the National Research Council's Mitigation Guidelines, in Appendix A. For projects impacting less than a cumulative total of 0.25 acre of waters of the United States or 100 linear feet of streams, compensatory mitigation plans which have been approved by the State or NRCS, when applicable, will usually be considered acceptable. Projects impacting more than 0.25 acre of Waters of the United States or 100 linear feet of streams will usually have to satisfy the requirements of this document in addition to any requirements imposed by the State. The policies and regulations regarding mitigation are still evolving and it is possible that conflicting guidance may occasionally be provided. Efforts have been made in the preparation of this document to minimize or eliminate such discrepancies. If a significant conflict is discovered between this document and any other relevant guidance, the applicant should notify the ACE of the conflict and request clarification before incorporating any such guidance into a proposed plan.

4. Processing Procedures.

4.1. *Information required.* The following information generally may be required for consideration of a mitigation proposal (For a more detailed list, see Appendix B, Model Compensatory Mitigation Checklist). Applicants are encouraged to provide several copies of proposals (usually eight) to expedite agency notification. Proposals will be reviewed and the applicant will be advised what additional information will be required to make the proposal adequate for consideration. Other information may be needed as part of the General Permit Notification process, Individual Permit process, or State procedures. Those requirements are not addressed herein.

- Plans and detailed information regarding the work for which the mitigation is required.
- Drawings in accordance with the requirements given in this SOP.
- Names, addresses, and phone numbers for all parties responsible for mitigation and monitoring.
- A description of the existing conditions of all areas to be affected by the proposed mitigation.
- A description of the existing vegetative communities to be affected by the proposed mitigation.
- A narrative discussion of the key elements of the proposed mitigation plan.
- A schedule showing earliest start and latest completion dates for all significant activities.
- A listing of measurable success factors with quantifiable criteria for determining success.
- Definitions for all success factors and other significant terms used in the plan.
- Description of the equipment, materials, and methods required for execution of the plan.
- A management plan, if necessary, for any maintenance of the mitigation.
- A proposed monitoring and contingency plan.

4.2. *Monitoring and Contingency Plans.* The applicant will be required to monitor the mitigation area for success and to provide written reports describing the findings of the monitoring efforts. Because of the many variables involved, no specific standards are set forth. Instead, a monitoring plan should be submitted as a part of the mitigation proposal for review. Monitoring efforts usually include periodic reviews in the first years, as needed, and annually thereafter. The plan should include contingency measures specifying remediation actions which will be followed should the success criteria or scheduled performance criteria not be fully satisfied. Monitoring and contingency plans and reports will typically address the following items, as applicable.

- A narrative discussion of the key elements of the monitoring and contingencies plan.
- Names and contact info for parties responsible for the plan.
- A description of the baseline conditions (e.g., soils, hydrology, vegetation, wildlife).
- Schedules with earliest start and latest completion dates for monitoring activities and reporting.
- Drawings in accordance with the requirements given in this SOP.
- A listing of measurable success factors with quantifiable criteria for determining success.
- Definitions for success factors and other terms used in the plan.
- Descriptions of equipment, materials, and methods to be used.
- Protective measures (e.g., restrictive covenants or conservation easements).
- Vegetation monitoring and contingency plan.
- Hydrological monitoring and contingency plan.
- Designation and reporting of reference sites.
- Photographic documentation and quantification of species survival rates.
- Bonding or other contingency measures.
- Alternative site provisions in case the mitigation site is determined unsuccessful.

4.2.1. *Linear System Monitoring.* Monitoring is generally conducted to determine whether the enhancement/restoration has accomplished the desired effect on the ecosystem. Both physical and biological monitoring will be required for major restoration projects. **For most restoration projects, both pre (baseline) and post construction surveys should be conducted.** Monitoring should include a reference reach that would act as control data. Reference reach data collected for the restoration design may also be used as the reference for monitoring success. The reference reach is generally a stream of the same stream type (Rosgen, 1996), similar size, located in the same ecoregion and preferably the same or neighboring watersheds, and that is stable and relatively undisturbed. In some cases, the reference reach could be located on the same stream either above or below the impacted area being restored. Monitoring should be conducted annually for a minimum of five (5) years after completion of the enhancement/restoration activity. For restoration activities, it is essential to conduct monitoring after at least one bankfull event, preferably two. Monitoring requirements for smaller projects will be tailored to the size of the project and may include both physical and biological elements on a case-by-case basis. Methods for stream restoration monitoring are described in Rosgen, 1996 and The Federal Stream Restoration Working Group, 1998.

4.2.1.1. *Physical Monitoring.* The types of measurements and monitoring that will typically be required include, but are not limited to, flow characteristics, channel cross-sections, longitudinal profiles, substrate and sediment characteristics, other morphological characteristics (dimension, pattern and profile), channel stability (vertical and lateral), water temperature, dissolved oxygen, and turbidity. It is important that selected monitoring variables are sensitive enough to show change and can be measured. Data sheets for determining stream type and dimension, pattern and profile are included under Item 23.

4.2.1.2. *Biological Monitoring.* Biological surveys are useful tools in determining the success of a restoration project. Biological surveys of stream fauna such as fish and macro-invertebrates should be used on projects that target, either directly or indirectly, in-stream habitat restoration. One acceptable method for biological monitoring in streams is the index of biological integrity (IBI). Biological surveys of flora should be made when buffers are being enhanced and when bioengineering techniques are being used for bank stabilization. Vegetation monitoring, which will be required for most riparian restoration and bioengineered bank stabilization projects, includes measurement of vegetation survival and growth (density, height, diameter at breast height, or other biomass measure). Potential biological parameters that may be monitored include density and diversity of mammals, birds, reptiles, amphibians, fish, macro-invertebrates and other fauna.

4.2.2. *Success Criteria.* Success criteria will be used to determine the effectiveness of achieving restoration goals on a given project. Success criteria should be established that specifically address the goals of a given restoration project. **It is critical that success criteria selected for various monitoring measures are appropriate for demonstrating attainment of projected restoration goals.** For wetlands, this will often entail the restoration of natural hydrology demonstrated through appropriate monitoring. For stream systems, this may entail bringing an actively aggrading or degrading system into a state of dynamic equilibrium whereby the monitoring data will indicate stream channel stability and improved biological integrity.

4.3. *Drawings.* Mitigation plans should include drawings in conformance with the following.

a. Drawings must be on 8.5 x 11 inch paper. Drawings must be clear, readable, and reproducible on standard, non-color office copiers. For large or complex projects, plans should also be submitted on paper sized no smaller than 11 x 17 inch and no greater than 30 x 42 inch. Each drawing sheet should include:

- an unused margin of no less than ¼ inch;
- title block with applicant's name, project title, site location, drawing date, permit number, and sheet number;
- all significant dimensions clearly indicated and annotated;
- the site's latitude and longitude should be annotated on the drawings or map sheets.
- a directional arrow indicating north;
- an appropriate graphic scale (when reasonable);
- a clear, legible plan view indicating area sizes and length (e.g. square feet, acres, linear feet) for all mitigation sites.

b. Location maps for the proposed activity must be included. Two maps are desired. A County road map and a US Geological Quadrangle map are preferred as sources. The location maps must show roads leading to the site and must include the name or number of these roads. Each map must include a title block.

c. Plan views of the proposed mitigation must be included. These drawings must show the general and specific site location and character of all proposed activities, including the relationship of all proposed work to Waters of the United States in the vicinity of the project.

d. For ground disturbing mitigation work, cross section views must be submitted depicting the existing ground contours and the proposed finished contours.

e. All aquatic areas within the project boundaries (avoided, impacted, or mitigated) must be shown.

f. Mitigation areas must be shown (enhancements, creations, restorations, etc.).

g. A legend must be shown identifying cross-hatching, shading, or other marking techniques used.

h. A summary table with the quantity of each category of impacted area and each category of mitigation must be shown.

i. Show the ordinary high water line of affected and adjacent non-tidal open surface waterbodies.

j. Show the mean high tide line and spring high tide line of affected and adjacent tidal waterbodies.

k. If the plan involves dredging in navigable waters, the drawings must include:

- The method of dredging;
- The site and plans for disposal of the dredged material;
- A description of the type, composition and quantity of the material to be dredged.

l. If the plan includes discharge of dredged or fill material into Waters of the United States or transportation of dredged material, the drawings must include:

- The source of the material;
- A description of the type, composition and quantity of the material;
- The method of transportation and disposal of the material;
- The location of the disposal site.

m. For large or complex mitigation projects involving creation, restoration, enhancement (other than by buffering), or a combination thereof, certified topographic drawings showing the contours and elevations of the completed mitigation area may be required. The drawings should show types of plantings, locations of plantings, and all other structures and work which are a significant part of the mitigation.

4.4. *Distribution.* Generally, proposals with bound or voluminous information will not be distributed via public notice mailings in order to minimize reproduction and mailing costs. For projects with proposals which are fully shown on a few pages, the Project Manager may include the proposal with the public notice for the permit application. When the proposal is distributed via public notice it must be clearly labeled as the mitigation proposal. One complete original along with at least one copy of the proposal should be submitted when it is to be distributed via the public notice. Applicant may be requested to provide a sufficient number of copies (usually eight) for reviewing agencies if the proposal includes material that is bound, voluminous, on paper larger than 8.5 x 11 inch size, not reproducible in black and white, or which for other reasons cannot readily be distributed by means of the regular public notice mailings.

5. General Guidelines. Mitigation must be designed in accordance with the following guidelines.

5.1. *Mitigation Goals.* As defined by Webster, *Mitigate*, means to cause to become less harsh or hostile, or to make less severe. Furthermore, the Council on Environmental Quality has defined at 40 CFR Part 1508.20 that *mitigation* includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Resource and regulatory agencies have adopted this definition to apply in a sequential manner.

This SOP is limited to evaluation of compensatory mitigation plans for adverse ecological effects. Categories of mitigation other than compensation (e.g., avoidance, minimization, reduction) are not addressed by this SOP. However, before compensatory mitigation is considered, other categories of mitigation should be evaluated consistent with the sequence listed above. To facilitate a timely review decision, applicants are encouraged to submit information demonstrating project planning and design following this sequenced approach.

The goal of compensatory mitigation shall be the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters by replacing unavoidably lost wetland or stream functions as close as possible to the impact site. All such mitigation actions relate to one or more of the following.

- *Biological Integrity* involves the natural state of living organisms using aquatic systems. Biological functions include shelter, food production, breeding sites, and migration pathways.
- *Chemical Integrity* involves the natural composition and properties of inanimate substances within aquatic systems. Chemical functions include nutrient cycling, particulates retention, organic carbon export, removal and sequestration of elements and compounds, water quality improvement.
- *Physical Integrity* involves the natural contiguity of aquatic systems. Physical functions include flood attenuation, storm surge reduction, groundwater exchange, commercial and recreational navigation, and cultural uses such as swimming.

5.2. *Qualitative Analysis.* It must be determined that the general quality of the mitigation is acceptable. The "quality" decision is discretionary and is not based on quantitative factors. Certain general guidelines are included here for use in making this decision. For example, creation of ponds as mitigation for filling wetlands is against the guidelines. However, it is impossible to provide all encompassing guidelines on all quality issues. Generally, the quality issue can be decided based on the answer to questions such as the following:

- Is the plan likely to succeed?
- Is it appropriate?
- Does it replace lost functions?
- Is it enforceable?
- Is it ecologically beneficial?

If the answer to one of these, or similar questions, is no, then the plan may be of unacceptable quality and should probably be rejected regardless of quantitative considerations. Examples of proposals that might be rejected based on a quality analysis include:

- Restrictive covenants on property the permittee does not own. (unenforceable - use conservation easement)
- Out-of-watershed preservation in another state. (may be inappropriate)
- Buffers which provide no benefit to system integrity. (exclude from credit calculations)
- Mitigation with resources which do not provide functional similarity relative to either individual or cumulative impacts. Such a determination should consider both the nature of the impacts for the individual project as well as cumulative impacts known or foreseeable within the larger landscape.
- Preservation of poor quality wetlands when enhancement or restoration opportunities are available.

5.3. *Quantitative Analysis.* After the initial quality analysis has been passed, then the mitigation plan is evaluated quantitatively. This is done using the equation method with the guidelines, credit calculation procedures and tables given in this SOP.

5.4. *Units of Measure.* For the purpose of calculating credits, units of measure shall be made in accordance with the following guidelines.

5.4.1. *Before and After Basis of Measure.*

a. Before the Impacts. Units used in calculating required mitigation credits are based on the existing condition of the aquatic area before the impacts and its future without the proposed project. For example, if a riverine waterbody is to be impacted by impounding, then the required mitigation credits shall be calculated based on the existing condition, which is riverine waters, not impounded waters. The proposed impact area evaluation baseline shall be the area as it existed prior to any recent (within approximately two years) alterations such as clearing, ditching, sedimentation, etc.

b. After the Mitigation. Units used in calculating proposed mitigation credits are based on the conditions of the aquatic area expected to exist after the mitigation actions. For example, if a mitigation action restores an impounded waterbody to a natural riverine waterbody, then the proposed mitigation credits are calculated based on the units of the resulting riverine waters, not the existing impounded waters.

5.4.2. *Linear and Area Units of Measure.*
(Also see Item 1.0 Applicability)

a. Streams. For streams, calculation of credits shall use linear feet as the unit of measure. Measurements for streams shall be along the centerline of the channel. As used in this SOP, a *stream* is defined as unimpounded portions of perennial and intermittent open surface waterbodies which flow in a linear or curvilinear direction due to a changing gradient along the flowline. Examples include rivers and creeks. For streams, mitigation tables and definitions of factors can be found under the linear systems portion of the SOP.

b. Wetlands and other Waters of the U. S., excluding streams. For these systems, calculation of credits shall use acres as the unit of measure. The following are examples:

- All ocean waters, ephemeral waters, naturally isolated waters, and wet meadows.
- Mudflats, sand flats, adjacent wetlands, sloughs, and other aquatic areas which do not lie within the bank full boundaries of a stream or river system.
- Ponds and Lakes.
- Braided stream systems.

5.5. *Adverse Impacts Area.* The area of adverse impacts as used in this document includes aquatic areas impacted by filling, excavating, flooding, draining, clearing, or other adverse ecological effects. Other categories of effects such as aesthetic, cultural, historic, health, etc., are not addressed by this

document. For the purposes of this section, the terms effects or impacts includes:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.

5.6. *Mitigation Area.* In general, the adverse impacts and compensatory mitigation are geographically distinct areas. The aquatic area in which the adverse effects occur will generally not be given credits as part of the compensatory mitigation area. For example, if a pond is excavated in wetlands with a resulting wetland fringe, the wetland fringe is generally not considered compensation for the excavation impacts. Similarly, an impoundment of a riverine system with a resulting increase in open surface water area or wetland fringe is not considered compensatory mitigation for the adverse impacts to the impounded riverine system.

A compensatory mitigation area may not be given credits under more than one mitigation category nor credited more than once under any category. However, it is acceptable to subdivide a given area into sub-areas and calculate credits for each sub-area separately. For example, a restored aquatic area donated to a conservancy organization may be credited as either restoration or preservation but not both. An aquatic area that is enhanced by improving hydrology and by buffering should be given one net enhancement credit calculation, not separate credits for both types of enhancement. An aquatic area that contains some restoration (e.g., plugging ditches) and some enhancement (e.g., improved hydrology) could either be subdivided into a restoration area component and an enhancement area component, or the entire area could be lumped together and given one net enhancement/restoration credit calculation. Whether or not an area is subdivided or lumped for the purpose of credit calculations is a case-by-case decision based on what is reasonable and appropriate for the given mitigation proposal.

5.7. Conservation Restrictions. **All property** used for mitigation credits (e.g. all created, restored, enhanced, and preserved sites and buffers) must be protected by suitable conservation restrictions. Depending upon the circumstances, as discussed below, suitable conservation restrictions may include deed restrictive covenants, conservation easement, or transfer in fee title. In some cases, ownership by a suitable conservancy organization or government agency may suffice. Shown below are a few of the typical considerations relevant to this subject.

- In order for covenants or easements to be considered acceptable they should be in accordance with the most recent edition of the samples maintained by the Corps. The samples are subject to change without notice and will be made readily available at the Corps web site on the Internet. Printed copies may be obtained directly from the Corps upon written request.
- Covenants, easements, and transfers in fee title must be duly executed and recorded with the appropriate local entity responsible for maintaining the public register of real property transactions.
- If protected areas are sold or conveyed to another entity the protected area must be clearly defined in appropriate documents utilized for that transaction.

- The restrictive covenants option is intended primarily for smaller tracts. In particular, where the relatively small size of the protected area makes it unlikely that a conservancy group would accept an easement, or where the costs involved in establishing easements is not determined to be a reasonable requirement to impose on the permittee. In general, preservation of large tracts should be by means of easement or transfer in fee title to a conservation entity and not covenants. Determinations regarding this issue will be made on a case-by-case basis.

- By inserting suitable conditions in the permit, the Corps will reserve the right to review the draft language for covenants and easements. Typically a 30 to 45 day review period will be reserved for this purpose.

- Subdivision of preservation areas into individual lots for residential developments is strongly discouraged. Such subdividing makes enforcement of the preservation agreement burdensome on the government. Experience has shown that subdividing mitigation into lots lowers the likelihood of success for the mitigation. To the maximum extent practicable, preserved areas should be placed in the undivided control of a single owner such as a property owners association, a conservancy organization, or any suitable owner with responsibility for enforcement of the preservation agreement.

- Review the samples available from the Corps for other requirements that may apply. Any exceptions to the general requirements stated here or any changes to the wording of the sample documents must be coordinated with and approved by the Corps' Office of Counsel prior to execution and recording.

5.7.1. *Use of Current Models.* Applicants and permittees will be made aware of the model conservation restrictions documents in use at the time. The current model documents will be available for downloading from ***http://www.sac.usace.army.mil/*** on the internet. Regulatory personnel are advised to monitor this site to ensure that model documents provided are current. Models are subject to periodic review and will be updated as necessary. The current model for restrictive covenants at the time of printing of this SOP can be found under Item 23 at the end of the SOP.

5.7.2. *Conservation Easements vs. Restrictive Covenants.* For mitigation banks, conservation easements with third-party rights of enforcement or transfer in fee title to a conservation entity will be the protective mechanism; **any exception to this policy must be preapproved by the Office of Counsel.** For permitting situations not involving mitigation banks, conservation easements or restrictive covenants, or both, may be used. However, if the applicant does not own the property on which they propose to place conservation restrictions, then a conservation easement will normally be required. In order to "own the property," the applicant must be the same legal entity as the landowner. If the applicant is an individual, and the landowner is a corporation, then they are not the same. Exceptions allowing the use of restrictive covenants where the applicant does not own the property on which the restrictions are to be placed must be preapproved by the Corps' Office of Counsel.

5.7.3. Subdivisions. In the case of a permit for a subdivision, the permit will include a condition that the conservation restrictions be included in the developer or owner's own general scheme of restrictions for the subdivision. The conservation restrictions to be included in the general scheme should be drafted by the Corps' Office of Counsel. In some cases, the language of the general scheme of restrictions for the subdivision may be sufficient without additional Corps restrictions, and in such cases the Office of Counsel may determine that the recording of a separate conservation restriction document is unnecessary. Also see the discussion of subdivisions in Section 5.7.

5.7.4. *Changes to Model Documents Before Recording.* Changes necessary to customize a model document to a particular applicant, such as the filling in of blanks, determination of whether the State should be a party to the document, and the description of the real property to be protected, may be approved by Regulatory Division personnel. Note well that the property description must be sufficient to enforce the restrictions as intended. **However, any other changes to a model document, such as ANY additional exceptions or modifications of standard wording, must be approved by the Office of Counsel prior to execution or recording,** and are subject to approval on a case-by-case basis (for example, exceptions approved in one case may not be suitable for another). **An applicant will be required to clearly identify all proposed changes, including those necessary to customize the model, when the conservation restriction document is submitted for preliminary approval; if all changes are not clearly identified, the document may be returned to the applicant without approval.** When Office of Counsel approval of changes is required, Regulatory Division personnel will compare the proposed conservation restriction document against the model document and ensure that ***all*** changes are identified before submitting for Office of Counsel approval. This Paragraph is subject to periodic review by the Regulatory Division and Office of Counsel to determine whether changes are necessary.

5.7.5. *Record of Approval and Recording.* Approval by the Office of Counsel of a conservation restriction document will be indicated by the attorney's initials on the approved version. The approved copy will be part of the official file. In addition, the official file will include the copy thereafter recorded by the applicant. All conservation restriction documents must be recorded and filed prior to either the issuance of the permit or to the transfer of the file from the project manager handling the permit to the clerical staff for filing. All permits requiring conservation restrictions as mitigation will be tracked by entry in the database. The database entry will indicate the geographic location of the conservation restrictions. Standard special conditions will be added to the permit to ensure that protective mechanisms are legally recorded in a timely manner (see Permit Conditions under Item 8). Compliance with these conditions shall be the obligation of the project manager until the condition is satisfied.

5.7.6. *Changes to Conservation Restriction Documents After Recording.* "Changes" include amendments, trades, corrections, or any other modifications of a recorded document. Because the conservation restrictions are legal documents, **no change may be processed or agreed to without being pre-approved by the Office of Counsel.** This Office of Counsel approval is separate and apart from any permitting process. Applicants will be informed up front to expect that the restrictions are permanent and that changes should NOT be anticipated; even where provision for changes is made in the recorded document, changes are the exception, not the rule. Applicants desiring any change must submit a copy of the recorded document in question in advance to the project manager and Office of Counsel, and prior to the issuance of any public notice involving the conservation restrictions. The determination of whether and how a change may be made to a recorded conservation restriction will be made by the Office of Counsel based upon the language in the recorded document, applicable policy, and coordination with the Regulatory Division.

5.7.7. *Enforcement.* The Corps Regulatory staff will promptly notify the Office of Counsel of violations of conservation restrictions of which they become aware. The resolution of all such violations will be coordinated and concurred with by the Office of Counsel.

5.7.8. *Database Requirements.* All permits requiring conservation restrictions as mitigation will be tracked by entry in the database. The database tracking system will include the type of mitigation (e.g. preservation, restoration), the quantity of each type of mitigation, the status of the restrictions (e.g. pending, approved, recorded), and the geographic location (geocode) of the area to be placed under conservation restrictions using either point or polygon data.

5.8. *Wetland Preservation.* Preservation mitigation (as it applies to wetlands in this SOP) must include restrictive covenants, conservation easements, transfer in fee title or other approved protective measures setting the preserved areas aside as natural areas. In accordance with the goal of no net loss of aquatic functions, it will usually not be allowed to provide a majority of the required wetland mitigation by pure preservation. **Preservation may not account for more than 50% of the total required wetland mitigation credits.**

5.9. *Buffer Zones.* Upland buffers adjacent to aquatic areas help maintain the biologic and chemical system. The relative importance of such buffers will depend upon a number of variables including the buffer width and condition, adjacent land uses and wildlife habitat requirements. Vegetated riparian buffers often provide the only filtering of surface runoff before it enters into streams. See Items 14.2 and 19.2 for further information.

5.10. *Restoration/Enhancement.* Restored and enhanced mitigation sites must be protected by restrictive covenants or similar measures. Except for enhancement by buffering, proposed restoration/enhancement mitigation plans must include the following additional information.

- An explanation of what values or functions are being restored/enhanced and to what degree.
- A narrative description of how the restoration/enhancement will be accomplished.

5.11. *Wetland Creation.* In designing creation mitigation, the selection of high quality upland habitat for conversion will not be acceptable. Designers should use good judgment in selecting sites for wetland creation. For example, a cutover area or former agricultural field would be ecologically preferable to a mature forested area as a candidate for alteration. Mature forested areas will generally not be approved as suitable creation areas. Created mitigation sites must be protected by restrictive covenants or similar measures following the creation work. Wetland creation is generally discouraged based on its low success potential.

5.12. *Lakes, Ponds, and Impoundments.* Mitigation using lakes, ponds, and impoundments may be allowed as compensation for impacts to similar waterbodies. *Mitigation using lakes, ponds, or impoundments will generally not be acceptable as compensatory mitigation for adverse impacts to wetlands or riverine systems.* Enhancement credit may be allowed as compensation for impacts to similar waterbodies if buffer zones are established around the perimeter of the waterbody and the buffers have acceptable restrictions. Enhancement credits for buffered lakes and ponds shall be based on the tables for enhancement credits provided in the wetland mitigation portion of this document. It is understood that open surface waterbodies provide some valuable public interest factors such as storm water storage, wildlife habitat, or ground water recharge. Therefore, in recognition of this fact, the adverse effect factors for flooding and impounding have been adjusted relative to other factors.

5.13. *Location.* Where practicable and environmentally desirable, mitigation should be at or near to the project site and within the same watershed as the area of adverse impacts. Mitigation which fails to meet this standard will result in a lower credit calculation due to the kind and location factors in the tables. Distant or out-of-watershed compensatory mitigation may not be acceptable and must be approved on a case-by-case basis.

5.14. *Scheduling.* When practicable and feasible, mitigation should be completed prior to or concurrent with the adverse impacts. The preferred method is to complete mitigation prior to the commencement of the impacts. However, it is recognized that because of equipment utilization it may be necessary to perform the mitigation concurrent with the overall project. This is usually acceptable provided the time

lag between the impacts and mitigation is minimized and the mitigation is completed within one growing season following commencement of the adverse impacts. Justification should be provided for schedules showing less than 50% completion of the mitigation prior to commencement of the adverse impacts. Note also that a temporal lag factor is included in the credit calculations to help account for the time lag in functional replacement.

5.15. *Maintenance.* Mitigation plans which require perpetual or long-term human intervention will usually not be acceptable. Mitigation areas should be designed to be naturally sustaining following the completion of the mitigation. Care should be taken that hydrology is adequately considered since plans requiring an energy subsidy (pumping, intensive management, etc.) will normally not be acceptable. The goal is to achieve a natural state which does not depend upon maintenance. Plans with maintenance will generally be discouraged.

5.16. *Consultation.* To minimize delays and objections during the permit review process, applicants are encouraged to seek the advice of resource and regulatory agencies during the planning and design of mitigation plans. For creation proposals and other complex mitigation projects, such consultation may improve the likelihood of mitigation success and reduce permit processing time.

6. Variance Approval (Internal use by Corps Project Managers). The following formula and table establish levels of authority for approval of mitigation plans where the proposed mitigation does not satisfy the SOP. The variance shown in the following table is the maximum variation that can be approved at the indicated level. This allowance for variance is intended for situations where the mitigation formula is found to be unreasonable or otherwise not in the public interest. This policy applies to approval of variances for the minimum of 50% non-preservation PMC and the maximum of 25% enhancement by buffering PMC as it applies to wetlands and the minimum of 25% stream restoration PMC as it applies to linear stream systems. This policy also applies to approval of variances from the total PMC. *The Project Manager should document the reasons for any approved variances.*

$$\text{Variance} = 100 \times \frac{\text{Required} - \text{Proposed}}{\text{Required}}$$

Variance	Approval Authority
up to 25%	Project Manager
up to 50%	Branch Chief
over 50%	Division Chief

7. Mitigation Banking. Proposals to establish mitigation banks will be processed in accordance with current joint state and federal processing procedures for the establishment and operation of mitigation banks. Proposals which include use of credits from a mitigation bank must normally comply with the requirements given in this SOP as well as any conditions or restrictions applicable to the bank. Sample worksheets for application of this method to mitigation banks are included in the attachments.

8. Permit Conditions (Internal use by Corps Project Managers). In general, permits issued with a mitigation plan should include the following standard conditions. These conditions may be modified as appropriate on a case-by-case basis.

a. That the compensatory mitigation plan must be implemented expeditiously. The mitigation plan includes the following elements:

[Note: Project manager should insert here a general description of the mitigation plan. For example: *The compensatory mitigation plan is described in the above referenced Pre-Construction Notice and supplemental materials. The mitigation plan includes preservation of not less than 52.0 acres of aquatic area on the project site together with not less than 10.5 acres of undisturbed non-aquatic buffers and 5.5 acres of restoration. The locations of said areas to be preserved, buffered, and restored being shown on the above referenced drawing sheets.*]

b. That evidence of completion of the mitigation plan must be submitted to the Corps not later than 60 days from the date of issuance of this [Note: Insert either "permit" for Individual Permits or "verification letter" for Nationwide or Regional General Permit verifications], or prior to commencement of the authorized work, whichever is later.

c. That preservation of property owned by the permittee shall be done by means of either deed restrictive covenants, conservation easement or transfer in fee title to a conservation entity. Restriction of property not owned by the permittee at the time the restrictions are executed must be done by means of conservation easement, or donation of the preservation area to an approved conservancy organization, and not by restrictive covenants.

d. That not less than 30 days prior to execution, the draft covenants, easement documents, or transfer in fee title must be submitted to the Corps for approval. Documentation must be submitted to the Corps within 30 days following approval of the drafts or prior to commencement of the authorized activity, whichever is later, evidencing the execution and recording. Samples for covenants and easements will be provided upon written request or may be obtained on the Internet at http://www.sac.usace.army.mil/.

9. Glossary and References.

9.1. *Glossary*. The acronyms, abbreviations, and terms used in this document are in accordance with the definitions given in the ACE's SOP titled *Terminology and Definitions*. For the purposes of this SOP, certain additional terms are defined in the attachments and as follows:

Adverse effects as used in this SOP means any adverse ecological effect on Waters of the United States including all filling, excavating, flooding, draining, clearing, or similar changes impacting U. S. Waters. Other categories of effects such as aesthetic, cultural, historic, health, etc., are not addressed by this SOP.

Aquatic site means any Water of the United States, including special aquatic sites such as wetlands.

Bankfull Discharge is the flow at which stream channel maintenance is most effective. It is the discharge that is most effective at moving sediment, forming or removing bars, forming or changing bends and meanders, and doing work that results in the average morphologic characteristics of channels (Dunne and Leopold 1978). The bankfull stage is the point at which water begins to overflow onto a floodplain. Bankfull may not be at the top of the stream bank in incised or entrenched streams.

Bankfull Width is the surface width of the stream channel measured at the bankfull stage.

Braided stream system means a multiple-thread channel system with a very low stream gradient (<.005) and individual channels with highly variable bank full width. These streams have extensive, well-vegetated floodplains and associated wetlands. (see Rosgen, D.A. (1996) Applied River Morphology.)

Buffer zone means an area designed to separate. As used in this SOP it refers to a defined area intended to separate, protect, and maintain certain functions of an aquatic system from upland development or other adverse effects.

Channel Features as found in natural streams are sequences of riffles and pools or steps and pools that maintain channel slope and stability and provide diverse aquatic habitat.

Riffles are bed features with gravel or larger size particles where the water depth is relatively shallow and the slope is steeper than the average slope of the channel. At low flows, water moves faster over riffles, which provides oxygen to the stream. Riffles are found entering and exiting meanders and control the streambed elevation.

Pools are located on the outside bends of meanders between riffles. The pool has a flat slope and is much deeper than the average depth of the stream. Deep pools are found at the bottom of each step.

Steps are vertical drops often formed by large boulders or downed trees. Deep pools are found at the bottom of each step. Step/pool sequences are found in higher gradient streams.

Compensatory mitigation means compensating for adverse effects by replacing or providing substitute resources or environments. Categories of compensatory mitigation for ecological effects include creation, restoration, enhancement, and preservation. Compensatory Mitigation for aquatic areas addressed by this SOP include:

Creation means the conversion of non-aquatic habitat to aquatic habitat. Wetland creation usually includes grading, providing a suitable substrate, hydrology, and establishment of appropriate vegetation.

Enhancement means increasing or improving one or more of the functions or values of an existing aquatic area.

Preservation means the conservation of an area to prevent its destruction or degradation.

Restoration means actions taken to correct previous alterations that have either destroyed or seriously impaired the character and functions of an aquatic area. An example is hydrological restoration followed by planting of appropriate wetland vegetation in a bottomland hardwood area that had previously been converted to a non-aquatic site.

DE stands for District Engineer.

Effect is defined by Webster to mean something that inevitably follows an antecedent (as a cause or agent). The Council on Environmental Quality (CEQ) has defined at 40 CFR Part 1508.8 that the words *impacts* and *effects* are synonymous and that *effects* includes ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Further, the CEQ stated that *effects* include:

- Direct effects, which are caused by the action and occur at the same time and place.
- Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
- Cumulative effects which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions.

This SOP is limited to evaluation of compensatory mitigation plans for adverse ecological effects. Mitigation for other categories of effects (e.g., historic, cultural, aesthetic) is not addressed in this SOP.

Entrenchment Ratio is an index value used to describe the degree of vertical containment of a river channel. It is the ratio of the width of the flood-prone area divided by bankfull width.

Ephemeral streams are streams that flow only in direct response to rainfall or snowmelt and in which discrete periods of flow persist no more than 29 consecutive days per event.

Flood-prone Area Width is the width of the flood-prone area as measured in the field at an elevation twice-maximum depth at bankfull. Maximum depth is the difference between the bankfull stage and thalweg elevations in a riffle section.

HEP stands for Habitat Evaluation Procedures (see US Fish and Wildlife Service 1980. "Habitat Evaluation Procedures (HEP) Manual," 102 ESM, Washington, D. C.).

HGM stands for Hydrogeomorphic Methodology (see Brinson, M. M. 1993. "A Hydrogeomorphic Classification for Wetlands," Technical Report WRP-DE-4, US Army Engineer Waterways Experiment Station, Vicksburg, MS.).

Intermittent streams are streams that generally have defined natural watercourses that do not flow year around, but beyond periods of rainfall and with greater frequency than similarly located ephemeral streams.

Mean Depth at Bankfull is the mean depth of the stream channel cross-section at bankfull stage as measured in a riffle section.

MBRT stands for Mitigation Bank Review Team. An interagency group designated to review and consult with proponents regarding Compensatory Mitigation Bank proposals.

Mitigate, as defined by Webster, means to cause to become less harsh or hostile, or to make less severe. The Council on Environmental Quality has defined at 40 CFR Part 1508.20 that *mitigation* includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the effected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

This SOP is limited to evaluation of compensatory mitigation plans for adverse ecological effects. Categories of mitigation other than compensation (e.g., avoidance, minimization, reduction) are not addressed by this SOP. However, before compensatory mitigation is considered, other categories of mitigation should be evaluated consistent with the sequence listed above. Applicants are encouraged to submit information demonstrating project planning and design followed this sequenced approach.

MOA stands for Memorandum of Agreement.

NTIS stands for National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. 703-487-4650 or 487-4780.

NWP stands for US Army Corps of Engineers Nationwide Permit.

Perennial streams are streams that flow most of the year in a well-defined channel.

Riverine, as used in this SOP, means rivers, streams, and similar natural flowing waterbodies together with their associated adjacent wetlands and riparian zones.

Sinuosity of a stream is defined as the ratio of channel length/valley length. In addition to slope, the degree of sinuosity is related to channel dimensions, sediment load, streamflow, and the bed and bank materials.

Special aquatic sites means wetlands, mud flats, vegetated shallows, coral reefs, riffle and pool complexes, sanctuaries, and refuges as defined at 40 CFR 230.40 thru 230.45.

Stable Stream is one that maintains its dimension, pattern, and profile over time such that the stream does not degrade or aggrade. Naturally stable streams must be able to transport the sediment load supplied by the watershed. Instability occurs when scouring causes the channel to incise (degrade) or when excessive deposition causes the channel bed to rise (aggrade).

Stream Order refers to a systematic process for describing the degree of branching of a stream network within a watershed. The order of any stream segment is determined by starting at the headwaters and labeling each unbranched tributary as order one (first order stream). Where two order one streams come together, a second order stream is designated. Similarly, when two second order streams merge, a third order stream is created. The junction of any two streams of equal order results in a stream of the next higher order.

Stream Pattern describes the view of a stream channel as seen from above. Streams are rarely straight; they tend to follow a sinuous path across a floodplain.

Stream Profile refers to the longitudinal slope of the stream. At the watershed scale, channel slope generally decreases in the downstream direction with commensurate increases in streamflow and decreases in sediment size. Channel slope is inversely related to sinuosity, so steep streams have low sinuosities and flat streams have high sinuosities.

Stream Type as used in this document refers to the "Rosgen Stream Classification System" (Rosgen, 1996), which categorizes streams based on channel morphology so that consistent, reproducible and quantitative descriptions can be made. See Appendix II for a table of stream types.

Thalweg is a line connecting the lowest or deepest points along a streambed channel.

Threshold means the level, point, or value above which something is true or will take place and below which it is not true or will not take place. For the purposes of this SOP, the thresholds given herein are considered to be the level of adverse impacts caused by the proposed project above which the project fails to meet the conditions, limitations, restrictions, or other requirements specified in relevant laws or regulations.

WET stands for Wetland Evaluation Technique (see Adamus, Paul R., Stockwell, Lauren T., Clairain, Ellis J., Jr., Morrow, Michael E., Rozas, Lawrence P., and Smith, R. Daniel. 1991. "Wetland Evaluation Technique (WET); Volume I: Literature Review and Evaluation Rationale," Technical Report WRP-91-, US Army Engineer Waterways Experiment Station, Vicksburg, MS.).

Width/Depth Ratio is an index value that indicates the shape of the channel cross-section. It is the ratio of the bankfull width divided by the mean depth at bankfull.

9.2. *References.*

Dunne, T. and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman and Col, San Francisco, CA. 818 pp.

Nelson, B. The Natural Communities of South Carolina, Initial Classification and Description. South Carolina Wildlife and Marine Resources Department, Charleston, SC. 56 pp.

Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, Colorado.

South Carolina Atlas and Gazetteer. 1998. Delorme, Yarmouth, Maine.

The Federal Interagency Stream Restoration Working Group. 1998. Stream Corridor Restoration; Principles, Processes, and Practices. National Technical Information Service, Springfield, Virginia.

United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). 1996. Streambank and shoreline protection. In Engineering field handbook, Part 650, Chapter 16.

10. Signature Authority (Internal use by Corps Project Managers). All actions regarding Mitigation Plans subject to this SOP may be signed at the appropriate authority level indicated below. Signature authority for actions which do not fall into one of the categories listed below shall be determined on a case-by-case basis.

10.1. *Routine Actions.* The following categories of letters regarding projects subject to this SOP are considered routine actions and may be signed by Project Managers. Letters falling into the Standard or Special categories listed below shall be signed at the level indicated for those categories.

a. Letters responding to requests for information.
b. Letters requesting additional information from applicants.
c. Letters responding to requests for delineations or verification of delineations.
d. Letters approving mitigation monitoring reports.

10.2. *Standard Actions.* The following categories of letters regarding projects subject to this SOP are considered standard actions and will be signed by the Chief of the Permit Evaluation Branch. Letters falling into the Routine or Special categories shall be signed at the level indicated for those categories.

a. Letters approving mitigation plans for Nationwide Permits.
b. Letters approving mitigation actions for resolution of enforcement actions.

10.3. *Special Actions.* The following categories of letters regarding projects subject to this SOP are considered special actions and shall be signed by the Division Chief or his designated representative.

a. Letters of denial, disapproval, suspension, or revocation.

b. Letters authorizing or approving a mitigation plan after any resource agency has recommended that the mitigation plan be disapproved.

c. Letters imposing special conditions regarding a mitigation plan or modifications to a mitigation plan when the applicant has indicated they do not agreed with the conditions.

d. Letters authorizing or approving a mitigation plan when the proposed plan deviates significantly from the policies and guidance given in this SOP, excluding quantitative variances that are covered under Variance Approval in Item 6.

11. Point of Contact. Copies of this document will be made available at http://www.sac.usace.army.mil/ on the Internet. Questions regarding use of this policy for specific projects must be addressed to the Project Manager handling the action. Other general inquiries or comments regarding this document may be addressed to:

U. S. Army Corps of Engineers, Charleston District
Attn: Mary Hope Glenn or Tracy Hurst, Regulatory Division
69 A Hagood Avenue, Charleston, South Carolina 29403-5107
Tel: 843-329-8044 Fax: 843-329-2332
e-mail: Mary.H.Glenn@usace.army.mil or Tracy.Hurst@usace.army.mil

12. Authorizing Signature. By the signature given below, this SOP is authorized for use.

Tina B. Hadden
Chief, Regulatory Division

MITIGATION FOR WETLANDS

13. Definition of Factors Used in Tables and Worksheets.

Control means the mechanism for enforcing land protection. Related terms are:

Conservancy means transferring fee title to a qualified, experienced, non-profit conservation organization or government agency.

Easement means a conservation easement granted to a qualified, experienced, non-profit conservation organization or government agency.

Covenant POA means filing deed restrictions with oversight by a property owners association or other similar, formally chartered, non-profit organization.

Covenant Private means filing deed restrictions by a private individual or business enterprise.

Credit Schedule (i.e. Timing) means the relative time when the mitigation will be performed. *Mitigation schedules are reviewed and approved on a case-by-case basis.* Note well that, for projects other than mitigation banks, schedule 5 is unlikely to be approved. All credit withdrawals associated with mitigation banks must be able to meet interim success criteria commensurate with the level of credit withdrawal. Related terms include:

Schedule 1. For mitigation not involving banks it means that the mitigation is done prior to the adverse impacts. For Mitigation Banks this means that no credits may be withdrawn prior to final determination of success.

Schedule 2. For mitigation not involving banks it means the majority of the mitigation is done prior to the impacts and the remainder is done concurrent with or after the impacts. For Mitigation Banks this means that no more than 10% of the credits may be withdrawn prior to final determination of success.

Schedule 3. For non-banking mitigation it means the mitigation is concurrent with the impacts. For Mitigation Banks this means no more than 20% of the credits may be withdrawn prior to final determination of success.

Schedule 4. For mitigation not involving banks it means the majority of the mitigation is done concurrent with the impacts and the remainder is done after the impacts. For Mitigation Banks this means that no more than 30% of the credits may be withdrawn prior to final determination of success.

Schedule 5. For mitigation not involving banks it means the mitigation is done after the impacts. For Mitigation Banks this means that more than 30% of the credits may be withdrawn prior to final determination of success.

Cumulative Impact is an evaluation of the cumulative adverse impacts to aquatic sites for the overall project. This factor is proportional to the acres of impact. The formula used to calculate this value is $0.05 \times \sum AA_i$ where $\sum AA_i$ stands for the sum of the acres of adverse impacts to aquatic areas for the overall project. When computing this value, round to the nearest tenth decimal place using even number rounding. Thus 0.01 and 0.050 are rounded down to give a value of zero while 0.051 and 0.09 are rounded up to give 0.1 as the value for the cumulative impact factor.

Degree of Threat is an assessment of the level of imminent risk of loss or damage to a system. The existence of a demonstrable threat will be based on clear evidence of proposed destructive land use changes or habitat alterations that are consistent with local and regional land use trends and are generally not the consequence of actions under the control of the land owner.

Dominant Impact categories are defined as follows.

Clear means to remove vegetation without disturbing the existing topography of the soils.

Draining means ditching, channelization, or excavation that results in the removal of water from an aquatic area causing the area, or a portion of the aquatic area, to change over time to a non-aquatic area or to a different type of aquatic area.

Dredge means to dig, gather, pull out, or excavate from U. S. waters.

Fill means depositing material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a water body.

Impound means to collect or confine the flow of a riverine system by means of a dike, dam, or other man made barrier. Impoundments may result in the formation of ponds, lakes, reservoirs, detention basins, etc. Or, as in flood dikes, they may limit the reach of high waters.

Shading means to shelter or screen by intercepting radiated light or heat. Examples of projects causing shading impacts include bridges, piers, and buildings on pilings.

Duration means the length of time the adverse impacts are expected to last. S*easonal duration* means that the adverse impacts are limited to times outside of applicable nesting, breeding, or growing periods.

Existing Condition means the degree of disturbance relative to the ability of the site to perform its physical, chemical, and biological functions. This factor evaluates site disturbances relative to the existing functional state of the system.

Fully functional means that the typical suite of functions attributed to the system type are functioning naturally. Existing disturbances do not significantly alter important functions. For examples: pristine (undisturbed) wetlands or riverine waters, aquatic areas with non-functional ditches or swales (no effective drainage), minor selective cutting, temporarily cleared utility corridors, or old logging ruts.

Slightly impaired means that site disturbances have resulted in partial or full loss of one or more functions typically attributed to the given system type but functional recovery could be reversed through natural processes. For examples: clear-cut wetlands or riparian zones for riverine waters, aquatic areas with ditches that impair but do not eliminate wetland hydrology, or wetlands with maintained cleared utility corridors.

Impaired means that site disturbances have resulted in major impairment of several functions typically attributed to the system type and where functional recovery is unlikely to occur naturally. Restoration activities are probably necessary for such recovery. For examples: areas that have been bedded and converted to pine monoculture, areas that are severely fragmented, or streams that have been channelized.

Very impaired means sites where many functions typically attributed to the system type have been lost due to site disturbances and where full functional recovery would require major restoration effort. For examples: filled areas, excavated areas, or effectively ditched wetlands (hydrology significantly altered).

Kind is a factor used to compare the relative functions and values of the mitigation site to the impacted site. For Mitigation Banks, kind categories are defined for each bank unit after an assessment of the banking proposal. For proposals not involving mitigation banks, kind categories are In-Kind and Out-of-Kind. Related terms include:

Category 1 is **In-Kind for non-mitigation banks** and is specially defined for mitigation banks.
Category 2 is defined for each mitigation bank following an assessment of the bank.
Category 3 is defined for each mitigation bank following an assessment of the bank.
Category 4 is **Out-of-Kind for non-mitigation banks** and is specially defined for mitigation banks.
Category 5 is defined for each mitigation bank following an assessment of the bank.

In-kind Mitigation means the replacement of the impacted aquatic site with one that has very similar morphological and biological features.

Out-of-kind Mitigation means the replacement of an impacted aquatic site with one that has different morphological and biological features. For example, if a wooded swamp habitat is filled or altered and the mitigation consists of grading an area and planting it in freshwater emergent marsh species, this would be out-of-kind.

Location is a factor used to compare the relative location of the mitigation site to the impact site. For Mitigation Banks, Zones will be defined for the bank after an assessment of the banking proposal. For mitigation proposals not involving mitigation banks, location categories are as shown below. Related terms include:

Zone 1 means **On-Site for non-mitigation banks** and is specially defined for mitigation banks.
Zone 2 means **Inside for non-mitigation banks** and is specially defined for mitigation banks.
Zone 3 is defined for each mitigation bank following an assessment of the bank.
Zone 4 means **Outside for non-mitigation banks** and is specially defined for mitigation banks.
Zone 5 is defined for each mitigation bank following an assessment of the bank.

On Site means within or adjacent to the project boundaries and within the impacted watershed.
Inside means within the impacted watershed but offsite.
Outside means outside of the impacted watershed.

Lost Type categories are based on the suite of functions that they perform and are defined as follows.

Type A means:

- Tidal vegetated systems
- Riverine systems including headwaters and riparian zones
- Intertidal flats
- Shallow subtidal bottoms
- Bottomland hardwoods

Type B means:

- Seeps and bogs
- Savannahs and flatwoods
- Subtidal zones
- Depressions
- Pocosins and bays

Type C means:

- Man-made lakes and ponds
- Vegetated lake littoral
- Impoundments
- Shallow cove areas

Other habitat types not categorized above will be evaluated and assigned a category ranking by the Project Manager on a case-by-case basis with consideration of any comments provided by the resource agencies.

Net Improvement (NI) is an evaluation of the net level of functional enhancement or restoration to an aquatic site associated with a proposed mitigation action. This factor is evaluated using a sliding scale, with values ranging from 0.1 for low-level enhancement to 4.0 for excellent restoration. The break between enhancement and restoration generally occurs at a NI value of 2.0.

Examples of low NI actions include: the placement of upland buffers, wildlife habitat enhancement (prescribed burning, water control manipulation), exotic plant removal and/or management, and erosion and sediment control.

Examples of moderate NI actions include: planting cleared wetlands to speed succession and increase species diversity, planting upland buffers, and hydrological enhancement (breaching causeways or dikes, increasing number and/or size of culverts in causeways, plugging ditches in impaired wetlands).

Examples of high NI actions include: fill removal, restoration of native wetland plant communities in converted wetlands, and hydrological restoration (complete causeway or dike removal, plugging and/or removal of ditches in effectively drained wetlands, restoration of braided creek system and natural sheet flows).

Priority Category means designated areas of aquatic systems that provide functions of recognized importance because of their inherent functions, their position in the landscape, or their rarity. This includes both the immediate contiguous watershed and the adjacent wetlands.

Primary priority areas are those which provide important contributions to biodiversity on an ecosystem scale, or which provide high levels of functions contributing to landscape or human values. Impacts to primary priority areas should be rigorously avoided and minimized. Compensation for impacts in these areas should emphasize replacement nearby and in the same watershed.

Designated Primary Priority Areas include:

- National Estuarine Sanctuaries
- Wild and Scenic Rivers.
- Designated Shellfish Grounds
- Outstanding Resource Waters
- Essential Fish Habitat
- Waters on the 303(d) list
- Trout waters
- All tidal waters
- Anadromous fish spawning waters
- State Heritage Trust Preserves
- National Wildlife Refuges
- Waters officially designated by State or Federal agencies as high priority areas
- Old growth climax communities that have unique habitat structural complexity likely to support rare communities of plants or animals

And the following categories of rare aquatic systems:

- Hillside Herb Bog
- Upland Bog
- Atlantic White Cedar Bog
- Depression Meadow
- Piedmont Seepage Forest
- Limestone Sink
- Pine Savannah
- Interdune Pond

Secondary priority areas include the following categories of vulnerable or uncommon aquatic systems that do not fall into the designated primary priority category:

- Carolina Bay
- High Elevation Seep
- Bay Forest
- Salt Shrub Thicket
- Swale Pocosin
- Pond Cypress Pond
- Seepage Pocosin
- Upland Depression Swamp Forest

Tertiary priority areas include the following categories of aquatic systems that do not fall into the designated primary priority category:

- Bald Cypress-Tupelo Gum Swamp
- Swamp Tupelo Pond
- Pocosin (other than seepage or swale)
- Bottomland hardwood
- Non-alluvial Swamp Forest
- Pond Pine Woodland
- Pine flatwoods

Note: descriptions of these community types may be found in Nelson, John B. The Natural Communities of South Carolina, Initial Classification and Description.

Soil means the upper layer of earth which may be dug or plowed and in which plants grow. Related terms include:

Existing Suitable Soil (E. S. S.) means the appropriate use of soils existing at the mitigation site or contiguous with the site and which have been determined to be of a proper type for the proposed mitigation.

Transferred Suitable Soil (T. S. S.) means the appropriate use of soils imported to the mitigation site from a non-contiguous location which have been determined to be of a proper type for the proposed mitigation.

Unknown Suitability Soil (U. S. S.) means use of a soil type or source that is of unproven or uncertain suitability for the proposed mitigation.

Temporal Lag is a factor designed to compensate for the temporal loss of wetland or aquatic area functions due to a time lag in the ability of the enhanced, restored or created mitigation area to fully replace functions lost at the impact site. Different systems will require different time to reach levels of functional capacity level with the impact site. For example, if a mature bottomland hardwood wetland is impacted, it may take up to 60 years to replace all functions including structural habitat complexity, whereas replacement of functions in an emergent marsh situation may take much less time (e.g. 5 to 15 years).

Vegetation means the plant material within a defined area. Related terms used in this SOP include:

Natural vegetation involves no planting and allows spontaneous revegetation.

Planted means using transplanted or nursery stock vegetation.

14. Tables and Worksheets.

14.1. *Adverse Impacts Table.*

ADVERSE IMPACT FACTORS FOR WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS

FACTORS	OPTIONS					
Lost Type	Type C 0.2		Type B 2.0		Type A 3.0	
Priority Category	Tertiary 0.5		Secondary 1.5		Primary 2.0	
Existing Condition	Very Impaired 0.1	Impaired 1.0	Slightly Impaired 2.0	Fully Functional 2.5		
Duration	Seasonal 0.1	0 to 1 0.2	1 to 3 0.5	3 to 5 1.0	5 to 10 1.5	Over 10 2.0
Dominant Impact	Shade 0.2	Clear 1.0	Dredge 1.5	Drain 2.0	Impound 2.5	Fill 3.0
Cumulative Impact	$0.05 \times \sum AA_i$					

Note: For the **Cumulative Impact** factor, $\sum AA_i$ stands for the sum of the acres of adverse impacts to aquatic areas for the overall project. When computing this factor, round to the nearest tenth decimal place using even number rounding. Thus 0.01 and 0.050 are rounded down to give a value of zero while 0.051 and 0.09 are rounded up to give 0.1 as the value for the cumulative impact factor. **The cumulative impact factor for the overall project must be used in each area column on the Required Mitigation Credits Worksheet below.**

Required Mitigation Credits Sample Worksheet

Factor	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Lost Type						
Priority Category						
Existing Condition						
Duration						
Dominant Impact						
Cumulative Impact						
Sum of r Factors	$R_1 =$	$R_2 =$	$R_3 =$	$R_4 =$	$R_5 =$	$R_6 =$
Impacted Area	$AA_1 =$	$AA_2 =$	$AA_3 =$	$AA_4 =$	$AA_5 =$	$AA_6 =$
R × AA=						

Total Required Credits = $\sum$ (R × AA) = ____

14.2. Enhancement by Buffering Credits for Wetlands (to be used in determining a net improvement score for buffering on the Restoration and Enhancement table in Item 14.3).

14.2.1. *Enhancement by Buffering.* If the buffer zone meets the requirements specified below, a portion of the buffered aquatic site will qualify for enhancement credit. Both the buffer and the buffered aquatic area must be preserved through acceptable restrictive covenants or other approved protective measures (except in the case of publicly owned waters such as streams/rivers). **No more than half of required non-preservation credits (from restoration, creation, and/or enhancement) may be generated through buffering.** Buffer credits exceeding this cap will be considered as preservation credits. SCDHEC/OCRM master planned projects may be exempt from this requirement on a case-by-case basis as determined by SCDHEC and the Corps.

14.2.2. *Qualitative Considerations.* The following issues should be considered when evaluating buffers in terms of the overall quality and general acceptability of a mitigation plan.

- In order to assure that buffers serve the intended use in perpetuity, they must be protected by covenants, easements, or other approved measures. Buffers without acceptable protective measures will not be included in calculation of credits.
- Buffers or portions of buffers may be excluded from calculation of credits if their contribution to system integrity is of questionable value due to shape, condition, location, inadequate or excessive width, or other reasons (e.g. around drained wetlands which require restoration to maintain hydrologic viability).
- Buffers may not include aquatic areas. It is not allowable to designate aquatic areas as buffer in order to satisfy buffering goals. The credited buffer must consist of uplands.

14.2.3. *Quantitative Considerations.* Buffers should be of adequate width to restore, enhance, or maintain the physical, chemical, and biological integrity of the buffered waters. Minimum buffer widths eligible for credit are found in the tables below. The numbers vary based on land use, aquatic system type and slope. Buffers that do not meet the minimum width or mean width requirements will not be included in calculating credits. Based on literature, the numbers in the tables are considered true minimums relative to providing benefits. Therefore, only a minimum net improvement factor will be assigned to buffer widths matching those in the tables. It is possible to raise the net improvement factor through increasing buffer widths beyond these minimum values (see Net Improvement Factor Buffer Values Section). The following steps should be followed to determine enhancement by buffering credits:

To determine the minimum buffer width:

Step 1: Use the Minimum Buffer Width table below to determine the minimum mean buffer width for your proposed or existing landuse.

MINIMUM BUFFER ZONE WIDTHS FOR ENHANCEMENT BY BUFFERING CREDIT FOR WETLANDS (0-5% SLOPE)*		
Land Use	Min. Mean Width (ft)	Min. Width (ft)
Single Family Residential	25	15
Multi-Family Residential	40	15
Commercial / Golf Course / Agricultural	50	20
Industrial	75	25
Landfill	75	25
Other Categories	case-by-case	
*Widths are based on linear, constant elevation measurement		

Step 2: Multiply the width determined in Step 1 by the appropriate multiplier from the Slope Multiplier Table below.

SLOPE MULTIPLIER TABLE

Percent Slope Perpendicular to Wetland	Multiplier Factor For Minimum and Minimum Mean Widths
Less than 5%	1x
5% - 20%	2x
21%-40%	3x
Greater than 40%	4x

To determine area eligible for indirect enhancement by buffering credits:

Step 3: Calculate the total acreage of the proposed upland buffer (must meet the minimum buffer width determined in Step 2). Buffers will not be given direct enhancement credits. It is assumed that an equivalent area within the perimeter of the wetland is enhanced, therefore this acreage is given indirect credits (in other words, the upland buffer is "flipped" inward to determine the enhancement by buffering area). See the following illustration.

Step 4: Multiply the value determined in Step 3 by the appropriate value in the table below (based on the percentage of the wetland perimeter that is buffered).

AREA FOR ENHANCEMENT CREDITS BY BUFFERING

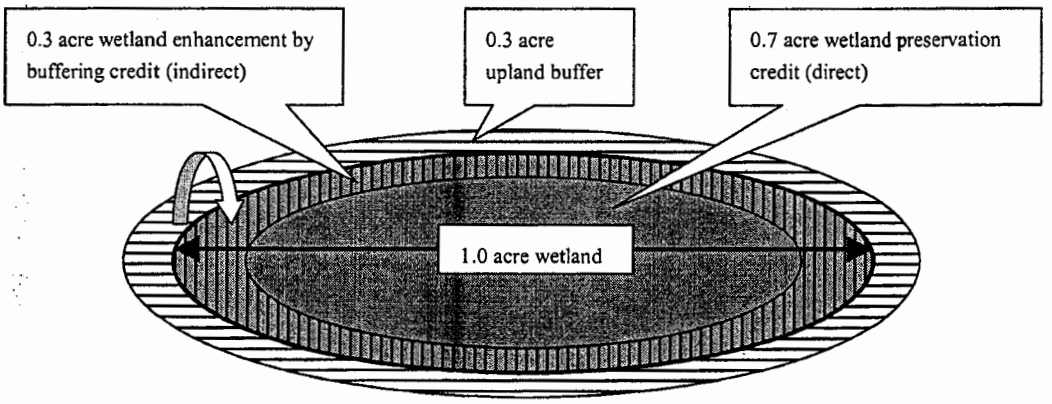
Aquatic Area Protected By Buffer	**Enhanced Aquatic Area Equals the Lesser of The Protected Aquatic Area* OR**
More than 95%	1.0 x The Buffer Area
25 to 95%	$\frac{\%\ \text{Area Protected}}{100}$ x The Buffer Area
Less than 25%	Determined and allowed only on a case-by-case basis

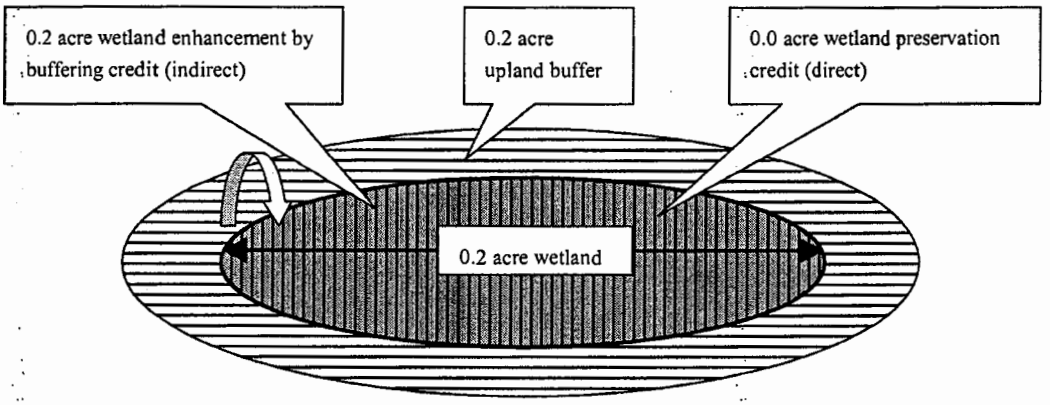
*In other words, the area eligible for indirect enhancement credits may not be larger than the area of the wetland it is enhancing.

To determine the remaining area eligible for preservation credits after enhancement by buffering credits have been calculated:

Step 5: Subtract the value determined in Step 3 from the total wetland acreage.

Note: **The acreage of the protected aquatic site that receives credit for enhancement by buffering may not be counted for preservation credit as well.** (An illustration of this concept is found on the next page.)


0.3 acre wetland enhancement by buffering credit (indirect)
0.3 acre upland buffer
0.7 acre wetland preservation credit (direct)
1.0 acre wetland


0.2 acre wetland enhancement by buffering credit (indirect)
0.2 acre upland buffer
0.0 acre wetland preservation credit (direct)
0.2 acre wetland

To determine the Net Improvement factor for enhancement by buffering:

Step 6: Compare your proposed buffer width to the values in the Net Improvement table below. For purposes of evaluating this factor, the minimum mean width is that determined in Step 2.

NET IMPROVEMENT FACTOR CREDITING FOR BUFFERS	
Minimum Mean Width	**Net Improvement Factor**
Minimum Table Values Based On Land Use And Slope	0.1
2X Minimum Table Values	0.2
3X Minimum Table Values	0.4

In certain instances, on a case-by-case basis, a higher net improvement factor may be considered where substantial buffer restoration work is proposed and/or where there are extensive buffers with high habitat value (3x or wider).

14.3. *Restoration and Enhancement Table.*

RESTORATION AND ENHANCEMENT MITIGATION FACTORS FOR WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS

Factors	Options				
Net Improvement	Minimal Enhancement ----------to---------- Excellent Restoration 0.1				4.0
Control	N. A. 0	Covenant Private 0.1	Covenant POA 0.2	Conservation Easement 0.4	Transfer Fee Title Conservancy 0.6
Temporal Lag	N.A.* 0	Over 20 - 0.3	10 to 20 - 0.2	5 to 10 - 0.1	0 to 5 0
Credit Schedule	Schedule 5* 0	Schedule 4 0.1	Schedule 3 0.2	Schedule 2 0.3	Schedule 1 0.4
Kind	Category 5 - 0.1	Category 4 0	Category 3 0.2	Category 2 0.3	Category 1 0.4
Location	Zone 5 - 0.1	Zone 4 0	Zone 3 0.2	Zone 2 0.3	Zone 1 0.4

N. A. = Not Applicable

*Use this option to calculate credits for enhancement by buffering

Proposed Restoration or Enhancement Mitigation Sample Worksheet

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Net Improvement					
Control					
Temporal Lag					
Credit Schedule					
Kind					
Location					
Sum of m Factors	M_1 =	M_2 =	M_3 =	M_4 =	M_5 =
Mitigation Area	A_1 =	A_2 =	A_3 =	A_4 =	A_5 =
M × A=					

Total Restoration/Enhancement Credits = $\sum$ (M × A) = ____

14.4. *Preservation Table.*

PRESERVATION MITIGATION FACTORS FOR WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS

Factors	Options				
Priority Category	Tertiary 0.1	Secondary 0.2	Primary 0.4		
Existing Condition	Impaired - 0.1	Slightly Impaired 0	Fully Functional 0.1		
Degree of Threat	Low - 0.1	Moderate 0.1	High 0.2		
Control	Covenant Private 0	Covenant POA 0.1	Conservation Easement 0.4	Transfer Fee Title Conservancy 0.6	
Kind	Category 5 - 0.1	Category 4 0	Category 3 0.1	Category 2 0.2	Category 1 0.3
Location	Zone 5 - 0.1	Zone 4 0	Zone 3 0.1	Zone 2 0.2	Zone 1 0.3

Note: Preservation credit should generally be limited to those areas that qualify as Fully Functional or Slightly Impaired. Impaired sites should be candidates for enhancement or restoration credit, not preservation credit. In special circumstances when Impaired sites are allowed preservation credit (e.g. within the scope of some OCRM wetland master planned projects), a negative factor will be used to calculate credits as per the matrix table.

Proposed Preservation Mitigation Sample Worksheet

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Priority Category					
Existing Condition					
Degree of Threat					
Control					
Kind					
Location					
Sum of m Factors	M_1 =	M_2 =	M_3 =	M_4 =	M_5 =
Mitigation Area	A_1 =	A_2 =	A_3 =	A_4 =	A_5 =
M × A=					

Total Preservation Credits = $\sum$ (M × A) = ____

14.5. *Creation Table.*

CREATION MITIGATION FACTORS FOR WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS

Factors	Options				
Vegetation	N. A. 0	Natural 0.1	Planted 0.4		
Soil	N. A. 0	U. S. S. 0	T. S. S. 0.1	E. S. S. 0.4	
Control	N.A. 0	Covenant Private 0	Covenant POA 0.1	Conservation Easement 0.2	Transfer Fee Title Conservancy 0.3
Temporal Lag	Over 20 - 0.3	10 to 20 - 0.2	5 to 10 - 0.1	0 to 5 0	
Credit Schedule	Schedule 5 0	Schedule 4 0.1	Schedule 3 0.2	Schedule 2 0.3	Schedule 1 0.4
Kind	Category 5 0.1	Category 4 0.2	Category 3 0.3	Category 2 0.4	Category 1 0.5
Location	Zone 5 0.1	Zone 4 0.2	Zone 3 0.3	Zone 2 0.4	Zone 1 0.5

N. A. = Not Applicable

Proposed Creation Mitigation Sample Worksheet

Factor	Area 1	Area 2	Area 3	Area 4	Area 5
Vegetation					
Soil					
Control					
Temporal Lag					
Credit Schedule					
Kind					
Location					
Sum of m Factors	M_1 =	M_2 =	M_3 =	M_4 =	M_5 =
Mitigation Area	A_1 =	A_2 =	A_3 =	A_4 =	A_5 =
M x A =					

Total Creation Credits = $\sum$ (M × A) = ____

14.6. *Mitigation Summary Worksheet.*

WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS
Mitigation Summary Worksheet For Permit Application #_____

I.	**Required Mitigation**
A.	Total Required Mitigation Credits =

II.	**Non-Banking Mitigation Credit Summary**	**Credits**	**Acres**
B.	Creation		
C.	Restoration and/or Enhancement (Non-Buffer Enhancement)		
D.	Restoration and/or Enhancement (Buffer Enhancement)		
E.	Total No Net Loss Non-Bank Mitigation = B + C + D		
F.	Preservation		
G.	Total Proposed Non-Bank Mitigation = E + F		

III.	**Banking Mitigation Credit Summary**	**Credits**	**Acres**
H.	Creation		
I.	Restoration and/or Enhancement (Non-Buffer Enhancement)		
J.	Restoration and/or Enhancement (Buffer Enhancement)		
K.	Total No Net Loss Bank Mitigation = H + I + J		
L.	Preservation		
M.	Total Proposed Bank Mitigation = K + L		

IV.	**Grand Totals**	**Credits**	**Acres**
N.	Total Preservation Mitigation = F + L		
O.	Total Non-Preservation Mitigation = E + K		
P.	Total Creation = B + H		
Q.	Total Restoration and/or Enhancement (Non-Buffer Enhancement) = C + I		
R.	Total Proposed Mitigation = G + M		

Mitigation for Wetlands

The Total Mitigation Credits (Row R) should be equal to or greater than the total Required Mitigation Credits (Row A) for the proposed mitigation to be acceptable. The other requirements given in the SOP must also be satisfied, e.g., in the credits column, Row O must equal at least 50% of Row A and the addition of Row P and Row Q must equal at least 25% of Row A. If the answer to any of the questions below is no, then the proposed mix and/or quantity of mitigation is not in compliance with the policy and the plan should be revised or rejected, unless a variance is approved.

	Yes	No
$PMC \geq RMC$ or in words Are the credits in Row R greater than or equal to Row A ?		
$PMC_{Non\text{-}Preservation} \geq \frac{1}{2} RMC$ or in words Are the credits in Row O greater than or equal to 50% of Row A ?		
$PMC_{Creation + Restoration/Enhancement\ (Non\text{-}Buffer\ Enhancement)} \geq \frac{1}{4} RMC$ or in words Are the credits in Row P plus the credits in Row Q greater than or equal to 25% of Row A?		

15. Mitigation Equation.

When a mitigation plan is required, it will be evaluated by the following equations. These calculations are not intended to represent an exact or statistically proven scientific method. Rather, the method is based on the judgment of regulatory and resource agency staff. It is intended to establish a clear, understandable, and consistent method for use by applicants and regulators. The definitions and explanations for all values and factors used in these equations are provided in Item 13. Factor tables and sample worksheets are provided in Item 15 and sample cases demonstrating the methods are provided in Item 17. As additional experience with this procedure is gained, it is possible that the tables of factors will be reviewed and adjusted. When using these equations use the most recent approved edition of these tables.

Simply stated, the mitigation equation requires that for a mitigation proposal to be acceptable, the Proposed Mitigation Credits (PMC) must be equal to or greater than the Required Mitigation Credits (RMC). *In accordance with the federal goal of no net loss of aquatic resources, the portion of the PMC resulting from restoration, creation, or enhancement must be at least 50% of the RMC and in accordance with other guidance in this document, at least 25% of the required credits must be generated through creation and/or restoration/enhancement other than buffer enhancement.* SCDHEC/OCRM master planned projects may be exempt from this requirement on a case-by-case basis as determined by SCDHEC and the Corps. The mitigation credits for RMC and PMC are calculated using the options and factors given in the attachments.

Proposed Mitigation Credits (PMC) ≥ Required Mitigation Credits (RMC)

And,

$$\mathbf{PMC_{non\text{-}preservation} \geq \tfrac{1}{2} \times RMC}$$

And,

$$\mathbf{PMC_{Creation + Restoration/Enhancement\ (Non\text{-}Buffer\ Enhancement)} \geq \tfrac{1}{4} \times RMC}$$

$$PMC = \sum_{i=1}^{n} \left(M_i \times A_i\right) \qquad RMC = \sum_{i=1}^{N} \left(R_i \times AA_i\right)$$

$$M_i = \sum_{i=1}^{j} m_i \qquad R_i = \sum_{i=1}^{k} r_i$$

PMC = Proposed Mitigation Credits
A_i = The i^{th} area of mitigation
M_i = mitigation multiplier for A_i
m = mitigation factor
n = number of mitigation areas
j = number of mitigation factors

RMC = Required Mitigation Credits
AA_i = The i^{th} adverse effects area
R_i = adverse effect multiplier for AA_i
r = adverse effect factor
N = number of adverse effect areas
k = number of adverse effect factors

The RMC and PMC are each a summation of products. To calculate each product, one should first evaluate the areas under consideration and lump similar areas. It is appropriate to lump adverse effects

areas (AA_i) that involve the same adverse effect factors (r_i). Similarly, it is appropriate to lump mitigation areas (A_i) that involve the same mitigation factors (m_i). For example, if there are four separate adverse effects areas but they are all to be filled, are all Type B wetlands, all fill will be permanent, and all work has a low preventability rating then the four areas can be lumped for purposes of calculating the RMC. Such lumping is just for mathematical simplification and will not effect the resulting calculations. The adverse effects multipliers (R_i) for an area (AA_i) are calculated by summing the applicable adverse effect factors (r_i) selected from the attached tables. Similarly, the mitigation multipliers (M_i) for a mitigation area (A_i) are calculated by summing the applicable mitigation factors (m_i) selected from the attached tables. The math is much simpler than the explanation.

Each category of mitigation (restoration, creation, etc.) has a table of factors that are used to compute the credit multipliers for each unique mitigation area. Sample worksheets are provided for documenting and comparing the calculated PMC and the RMC.

16. Sample Cases.

Sample Case #1
All Mitigation On-Site

Assume that the impacts take place in the coastal plain* and involve permanent fill of 1 acre of Type A, slightly impaired waters for construction of a dike impounding 5 acres of Type A, slightly impaired bottomland hardwood wetlands, and permanent access roads over 0.4 acres of Type C, fully functional waters for a single-family residential development. The priority category ranking for all areas is tertiary.

The mitigation consists of restoring 8 acres of prior converted agricultural land to a natural forested wetlands and preservation of 22-acre of an on-site, pristine Carolina bay by transfer in fee title to a conservancy. A 25-ft wide upland buffer consisting of 1.9 acres surrounding the entire permiter of the bay will also be transferred in fee title to the conservancy. The plan includes a 3-year monitoring plan, restoration of the natural hydrology by filling drainage ditches, and suitable planting of vegetation in the restoration area. No perpetual maintenance will be required. The restoration and preservation sites are adjacent to the proposed inundated area and the mitigation will be done concurrently with the proposed activity.
*Note: If the project were located in the Piedmont of the State and affected a linear stream system, an analysis utilizing the linear systems portion of the SOP would probably be required.

REQUIRED MITIGATION CREDITS WORKSHEET

	Area 1 (Dike)	Area 2 (Impoundment)	Area 3 (Roads)
Lost Type	3.0	3.0	0.2
Priority Category	0.5	0.5	0.5
Existing Condition	2.0	2.0	2.5
Duration	2.0	2.0	2.0
Dominant Impact	3.0	2.5	3.0
Cumulative Impact	0.32	0.32	0.32
R = Sum of Factors	10.82	10.32	8.52
AA = Impact Area	1.0	5.0	0.4
Product = R x AA	10.82	51.6	3.4

Total Required Credits = Σ (R x AA) = 65.82

PROPOSED RESTORATION OR ENHANCEMENT MITIGATION WORKSHEET

Factor	**Area 1** (Restoration)	**Area 2** (Enhancement by Buffering)*
Net Improvement	3.5	0.1**
Control	0.6	0.6
Temporal Lag	-0.3	NA
Credit Schedule	0.2	0
Kind	0.4	0
Location	0.4	0.4
M = Sum of Factors	4.8	1.1
A = Mitigation Area	8.0	1.9
Credits = M x A	**38.4**	**2.1**

* See Diagram below

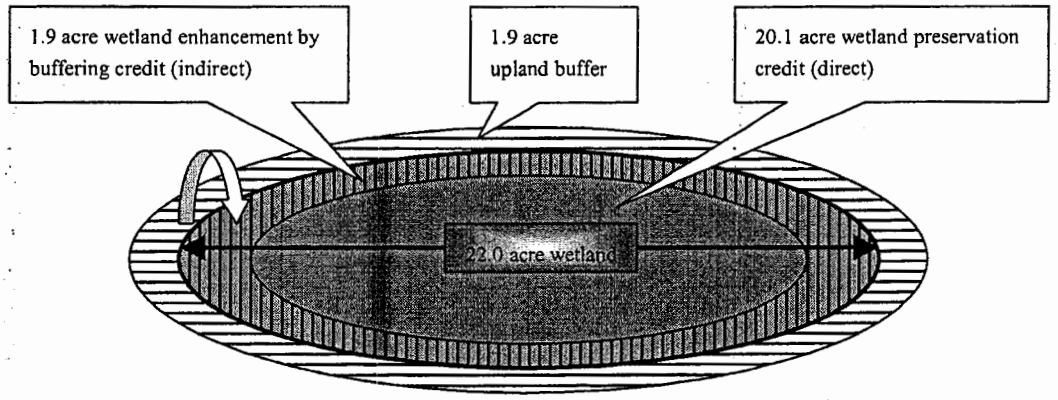
** Calculated using steps 1-6 in Item 14.2.3

PROPOSED PRESERVATION MITIGATION CREDITS WORKSHEET

Priority Category	0.2
Existing Condition	0.1
Degree of Threat	0.1
Control	0.6
Kind	0
Location	0.3
M = Sum of Factors	1.3
A = Mitigation Area (22 – 1.9 buffer)	20.1
Credits = M x A	**26.13**

SUMMARY OF MITIGATION CREDITS

Category	Credits
Preservation	26.13
Restoration/Enhancement (Non - Buffering)	38.4
Enhancement by Buffering	2.1
Total Credits = $\sum$ (M x A)	**66.6**



$$PMC \geq RMC$$
$$66.6 \geq 65.82$$

$$PMC_{non\text{-}preservation} \geq \tfrac{1}{2}\ RMC$$
$$38.4 + 2.1 \geq \tfrac{1}{2}\ (65.82)$$
$$40.5 \geq 32.9$$

$$PMC_{Creation\ +\ Restoration/Enhancement\ (Non\text{-}Buffer\ Enhancement)} \geq \tfrac{1}{4}\ RMC$$
$$38.4 \geq 16.4$$

The Total Proposed Mitigation Credits (66.6) are greater than the Total Required Mitigation Credits (65.82), the credits for restoration/enhancement (non-preservation) (40.5) are greater than ½ of the required credits (32.9), and the creation plus restoration/enhancement (non-buffer enhancement) credits (38.4) are greater than ¼ of the required credits (16.4). Therefore, the quantity and mix of mitigation is acceptable. The Project Manager must also review the other aspects of the mitigation plan to assure that it is generally in compliance with the policies and guidelines for mitigation.

Sample Case #2
On-Site Mitigation Combined With Mitigation Bank Credits

For this sample case let us assume that the impacts are the same as in the previous case sample. Thus we need 65.82 mitigation credits. Also assume the proposed 22.0 acres of preservation is the same giving us the previously calculated 26.13 credits of preservation and the 1.9 acre upland buffer resulting in 2.1 credits. However, instead of 8.0 acres of on-site restoration, assume only 4.0 acres of on-site restoration is proposed and the remaining required credits will be obtained from a Mitigation Bank. Similar to the previous example we can quickly calculate the following.

Proposed Non-Bank Preservation	= 1.3 × 20.1	= 26.13
Proposed Non-Bank Restoration/Enhancement (Non-Buffer Enhancement)	= 4.8 × 4.0	= 19.2
Proposed Non-Bank Restoration/Enhancement (Buffer Enhancement)	= 1.1 × 1.9	= 2.1
Total Proposed Non-Bank Mitigation Credits		**= 47.4**

The additional credits needed are:	
Total Mitigation Credits Required	= 65.82
Total Proposed Non-Bank Credits	= 47.4
Additional Credits Needed	**= 18.42**

We also must consider the no net loss requirement that at least half of the mitigation credits should be from categories other than pure preservation. Since a Mitigation Bank may offer preservation or non-preservation credits, we need to know the number of non-preservation credits needed.

Non-Preservation Credits Required	= ½ × 65.82 = 32.9
Proposed Non-Preservation Credits	= 19.2 +2.1 = 21.3
Additional Non-Preservation Credits Needed	**= 11.6**

We must also consider the additional requirement that at least 25% of the required credits be generated through creation and/or restoration/enhancement other than buffer enhancement.

Required Bank Restoration/Enhancement (Non-Buffer Enhancement)	= ¼ X 65.82 = 16.4
Proposed Non-Bank Restoration/Enhancement (Non-Buffer Enhancement)	= 4.8 × 4.0 = 19.2
Additional Restoration/Enhancement (Non-Buffer Enhancement) Needed	**= 0**

Therefore, the applicant must obtain 18.42 credits from a mitigation bank, of which 11.6 credits must be non-preservation credits. Since the applicant has met the requirement that at least 25% of the required credits be generated through creation and/or restoration/enhancement other than buffer enhancement, 11.6 credits may be purchased from a bank offering any type of restoration/enhancment or creation credits (buffer enhancement or non-buffer enhancement). The remaining deficit of 6.82 credits may be preservation credits. The completed summary worksheet is as follows.

WETLANDS AND OTHER WATERS OF THE U.S. EXCLUDING STREAMS
Mitigation Summary Worksheet

I. Required Mitigation

A.	Total Required Mitigation Credits =	65.82

II. Non-Banking Mitigation Credit Summary		Credits	Acres
B.	Creation	0	0
C.	Restoration and/or Enhancement (Non-Buffer Enhancement)	19.2	4
D.	Restoration and/or Enhancement (Buffer Enhancement)	2.1	1.9
E.	Total No Net Loss Non-Bank Mitigation = B + C + D	21.3	5.9
F.	Preservation	26.13	20.1
G.	Total Proposed Non-Bank Mitigation = E + F	47.4	26.0

III. Banking Mitigation Credit Summary		Credits	Acres
H.	Creation	0	0
I.	Restoration and/or Enhancement (Non-Buffer Enhancement)	0	0
J.	Restoration and/or Enhancement (Buffer Enhancement)	11.6	determined by bank
K.	Total No Net Loss Bank Mitigation = H + I + J	11.6	determined by bank
L.	Preservation	6.82	0
M.	Total Proposed Bank Mitigation = K + L	18.42	determined by bank

IV. Grand Totals		Credits	Acres
N.	Total Preservation Mitigation = F + L	32.9	20.1
O.	Total Non-Preservation Mitigation = E + K	32.9	5.9 + determined by bank
P.	Total Creation = B + H	0	0
Q.	Total Restoration and/or Enhancement (Non-Buffer Enhancement) = C + I	19.2	4
R.	Total Proposed Mitigation = G + M	65.82	26 + determined by bank

	Yes	No
$PMC \geq RMC$ or in words Are the credits in Row R greater than or equal to Row A ?	X	
$PMC_{Non\text{-}Preservation} \geq \frac{1}{2} RMC$ or in words Are the credits in Row O greater than or equal to 50% of Row A ?	X	
$PMC_{Creation + Restoration/Enhancement\ (Non\text{-}Buffer\ Enhancement)} \geq \frac{1}{4} RMC$ or in words Are the credits in Row P plus the credits in Row Q greater than or equal to 25% of Row A?	X	

The Total Mitigation Credits (Row R) is equal to or greater than the total Required Mitigation Credits (Row A), Row O equals at least 50% of Row A, and the addition of Row P and Row Q equals at least 25% of Row A. Therefore, the proposed mix and/or quantity of mitigation is acceptable. The number of acres required from the bank to obtain these credits will depend upon the approved banking documents and must be calculated by the bank operator. The calculation of bank acres used should be submitted with both the project mitigation proposal and the regular accounting summary for the Mitigation Bank.

Sample Case #3
A Variable Credits Mitigation Bank

This sample case demonstrates application of the Mitigation SOP to a Mitigation Bank proposal setup to provide a variable number of mitigation credits in the bank. This Sample Bank consists of 4 units defined in the Banking Agreement document. The classification scheme used could be whatever the Mitigation Bank Review Team (MBRT) finds suitable for the particular banking proposal. For this example assume the bank units are chosen as follows.

Diagram for Sample Variable Credits Mitigation Bank Classification Scheme

Unit # 1 160 acres Agricultural Fields being restored to natural wetlands, by plugging ditches and planting hardwood trees.	Unit #2 50 acres Hardwood Forest wetlands being enhanced by filling drainage ditches to restore natural hydrology.
Unit #3 100 acres Bedded Pine wetlands being returned to natural wetlands by leveling beds and planting hardwood trees.	Unit #4 40 acres Preservation of wetlands.

The proposed bank is located adjacent to the Edisto River, in the coastal plain and immediately upstream of a State Heritage Preserve. All units except the preservation area will be restored and/or enhanced as wetlands. A conservation easement will be placed on the entire mitigation bank area. The MBRT and the Bank Operator have agreed that the method of calculating bank credits given in the Mitigation SOP is acceptable for this bank. Therefore, the MBRT has assigned credit factors from the tables given in the SOP to each unit of the bank. Tables for each bank unit have been prepared using the assigned factors. In addition, the Team has reviewed the bank proposal and determined appropriate categories for the Location and Kind factors. Bank specific tables and definitions will be made a part of the Banking Agreement.

Unique Definitions for Sample Mitigation Bank.
Except for Kind and Location, which are defined below, the terms used in the Sample Mitigation Banking Plan are as defined in the current edition of the ACE Mitigation SOP.

Kind is a factor used to compare the relative functions and values of the mitigation site to the impact site. The Sample Mitigation Bank shall not be used as compensatory mitigation for any type which does not fit into one of the categories given below unless approved on a case specific basis. For the purposes of the Sample Mitigation Bank, the kind categories are defined as follows:

Category 1: Bottomland Hardwoods, Riverine
Category 2: Bottomland Hardwoods, Non-riverine
Category 3: Not defined for this bank
Category 4: Isolated and depressional wetlands
Category 5: All other kinds subject to MBRT approval

Location is a factor used to compare the relative location of the mitigation site to the impact site. The Sample Mitigation Bank shall not be used as compensatory mitigation for impacts that are outside of the zones given below unless approved on a case specific basis. Service Unit Areas are defined in the Joint Federal and State Standard Operating Procedures for Mitigation Banking. For the purposes of the Sample Mitigation Bank, the location categories are defined by 8-digit Hydrologic Unit Codes (HUC) as follows:

Zone 1: 3050205, mid-Atlantic flatwoods
Zone 2: 3050202, 3050208, 3050206, 3050207, mid-Atlantic flatwoods
Zone 3: Not defined for this bank
Zone 4: Not defined for this bank
Zone 5: Out of service area, subject to MBRT approval

Sample Case #3

A Variable Credits Mitigation Bank (continued)

BANK RESTORATION AND/OR ENHANCEMENT CREDITS

Factor	Unit 1	Unit 2	Unit 3
Net Improvement	3.8	2.0	3.0
Control	0.4	0.4	0.4
Temporal Lag	- 0.3	0	- 0.3
Credit Schedule	0.1	0.1	0.1
Kind	- 0.1 - 0.4	- 0.1 - 0.4	- 0.1 - 0.4
Location	- 0.1 - 0.4	- 0.1 - 0.4	- 0.1 - 0.4
Sum of M Factors	$M_1 = 3.8 - 4.8$	$M_2 = 2.3 - 3.3$	$M_3 = 3.0 - 3.8$
Acres of Mitigation	$A_1 = 160$	$A_2 = 50$	$A_3 = 100$
M × A	608 - 768	115 - 165	300 - 380

Credits = Σ (M × A) = 1023 - 1313

BANK PRESERVATION CREDITS

Factor	Unit #4
Priority Category	0.4
Existing Condition	0.1
Degree of Threat	0.1
Control	0.4
Kind	- 0.1 - 0.3
Location	- 0.1 - 0.3
Sum of m Factors	M = 0.8 – 1.6
Acres of Mitigation	A = 40
M × A	32 - 64

Credits = Σ (M × A) = 32 - 64

SAMPLE VARIABLE CREDITS BANK SUMMARY

Unit	Credits	Acres
Unit #1	608 - 768	160
Unit #2	115 - 165	50
Unit #3	300 - 380	100
Unit #4	32 - 64	40
Grand Totals	**1055 - 1377**	**350**

The number of credits the bank operator may be able to sell will be not more than 1377 if sales are all for projects in the optimal kind category and location zone. Of this total, 64 credits are classified as preservation and the remaining 1373 credits are classified as non-preservation.

The total acres in the bank will be 350. When credits are used, both the number of credits and acres consumed are calculated and recorded. When all 350 acres have been consumed, no more credits may be sold from the bank.

MITIGATION FOR LINEAR SYSTEMS

17. Background Information.

17.1. *General Guidance.*

The guidance for compensatory mitigation for linear systems is sufficiently different from that developed for wetlands to warrant a separate section. However, the majority of guidance contained in the General Information section, if not expressly overridden by guidance contained in this section, applies to compensatory mitigation for stream systems. The following items in the General Information section reference linear stream systems:

Item 4.2.1:	Linear System Monitoring
Item 5.4.2:	Linear and Area Units of Measuree
Item 9:	Glossary and References

Compensatory mitigation for linear aquatic systems (streams) will require some form of stream restoration or enhancement action. Activities that constitute restoration/enhancement include, but are not limited to: stream channel restoration; bank stabilization; in stream habitat recovery; impoundment removal; livestock exclusion devices; road crossing improvements; and natural buffer establishment. **A minimum of 25% of needed credits must be generated by enhancement or restoration activities other than buffer enhancement.** All of these restoration/enhancement measures should be designed with the goal of improving habitat, biological and morphological integrity, and water quality. Methods for stream restoration are described in detail in Rosgen 1996, The Federal Stream Restoration Working Group 1998, and United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) 1996 (see references under Item 9.2). Information on stream classification, restoration, regional curves and the following fact sheets are available online at the website for the North Carolina Stream Restoration Institute of North Carolina State University: http://www5.bae.ncsu.edu/programs/extension/wqg/sri/.

Fact Sheet #1	Natural Stream Processes
Fact Sheet #2	Application of the Rosgen Stream Classification System to North Carolina
Fact Sheet #3	Finding Bankfull Stage in North Carolina Streams
Fact Sheet #4	Using Root wads and Rock Vanes for Stream bank Stabilization

Also, a manual on field techniques for stream measurements entitled "Stream Channel Reference Sites: An Illustrated Guide to Field Technique" may be downloaded from the Forest Service website: www.stream.fs.fed.us.

17.2. *Stream Channel Restoration.* Stream stability is morphologically defined as the ability of the stream to maintain, over time, its dimension, pattern, and profile in such a manner that it is neither aggrading nor degrading and is able to transport without adverse consequence the flows and detritus of its watershed (Rosgen 1996). A number of factors can change the stability and function of streams including changes in streamflow, sediment regime, land use within the watershed, and direct disturbances (e.g., channelization, culverts, bridges and loss of bank stabilizing riparian vegetation) (Rosgen, 1996). Restoration of natural stream stability requires careful study by experts trained in stream geomorphology. It may involve changing channel width, bank stabilization measures, flow modification, grade control,

stream routing changes to increase/decrease sinuosity and/or other measures to appropriately handle stream energy and reconnect the stream with its floodplain. In other words, it may entail basic changes in the stream's dimension, pattern and profile, consistent with stream type and valley slope, to re-establish stability. Reference reach data from a stream or stream(s) of the same target stream type (Rosgen, 1996) (see Appendix II) and from the same ecoregion should serve as a template for the design of the restoration stream's dimension, pattern, profile, bed material and erosional processes. It is important to develop restoration plans in consultation with appropriate resource and regulatory agencies.

17.3. *Bank Stabilization.* Bank stability depends largely on bank height, bank angle, and soil conditions. Bank stabilization can be accomplished using a number of different techniques. For direct bank placement, techniques utilizing natural materials (e.g., root wads), bioengineering, and vegetative cover are preferred over those requiring surface hardening such as placement of stone, rubble or other materials. Indirect methods include in stream measures such as flow deflectors like "J-hook" vanes to reduce energy at the bank interface. It is important to note that just "patching" banks along an unstable channel may only be a short-term fix to a more complex problem and will garner little credit.

17.4. *Instream Habitat Recovery.* Instream habitat recovery is controlled by factors such as streamflow, channel structure, cover, water quality and riparian corridors. Generally, to improve instream habitat, stream improvement structures such as cross vanes, floating log covers, gravel traps, gravel placement, bank covers and fish passage structures are widely used. Note that man-made structures are less sustainable and rarely as effective as a stable channel, therefore, project designs should be made to mimic natural features to the extent practicable. Often, stable stream channels provide adequate habitat and caution is needed to ensure that fish habitat structures do not result in upsetting stream stability. Instream structure proposals shall require a full morphological analysis to ensure that they do not alter the appropriate dimension, pattern, and profile for the stream type. Also, differing stream types may be incompatible with certain habitat structures (Rosgen, 1996). Where such man-made structures are deemed beneficial, periodic maintenance will be necessary and should be incorporated into project plans.

17.5. *Impoundment Removal.* Dam removal is another acceptable form of stream restoration. Dams adversely affect and fragment stream systems by altering the movement of aquatic organisms, water, sediment, organic matter, and nutrients; thereby, creating physical alterations in both tailwaters and downstream riparian zones and biological effects both upstream and downstream of the impoundment. Dam removal, if done properly, can restore a stream to its natural condition. However, without sufficient studies and modeling, dam removal can result in bed and bank instability and increased sediment loads. These impacts will occur until the stream reaches a state of dynamic equilibrium. Important elements to consider when doing dam removal include restoring fish passage, revegetating the reservoir area, and long term monitoring of sediment transfer, water quality, stream channel morphology and aquatic ecology.

17.6. *Livestock Exclusion.* Where a documented problem exists, livestock exclusion devices are measures used to keep livestock out of streams thereby avoiding bank degradation, sedimentation, and water quality problems in streams. Livestock exclusion is normally accomplished by fencing stream corridors and can include the construction of stream crossings with controlled access and with stable and protected stream banks. Also associated with livestock exclusion devices is construction of water tanks that provide animals drinking water from a tank instead of from streams or ponds.

17.7. *Road Crossing Improvements.* Road crossing improvements can, when constructed properly, provide enhancements to natural flow regimes by preventing scour and ponding and by connecting natural floodplains. Measures considered improvements include, but are not limited to, replacement of culverts

with bridging, providing relief culverts in floodplains, and resetting or resizing culverts which block fish passage and other stream processes.

17.8. *Establishment of Natural Buffers*. Natural buffers provide functions such as runoff filtration, bank stabilization, stream shade, wildlife corridors, and contribution of woody debris and detritus. Buffer enhancement can be accomplished by active reforestation of native species and/or removal of exotics. Streams typically require additional buffer protection in comparison to wetlands. For purposes of getting buffer enhancement credit, buffer widths should be a minimum width of 50 feet depending on slope.

17.9. *Other Enhancement*. The Corps, in consultation with other MBRT resource and regulatory agencies, will determine, on a case-by-case basis, the net benefit of mitigation actions that do not involve direct manipulation of a length of stream and/or its riparian buffers. These may include actions such as retrofitting stormwater detention facilities, construction of off channel stormwater detention facilities in areas where runoff is accelerating stream bank erosion and other watershed protection practices.

18. Definition of Factors Used in Tables and Worksheets.

Area Restored refers to the percentage of the area proposed for buffer credit that is to be reforested with native riparian vegetation.

Control means the mechanism for land protection. Related terms are:

Conservancy means transferring fee title to a qualified, experienced, non-profit conservation organization or government agency. Non-profit organization means an entity recognized and operating under the rules of the Internal Revenue Services for non-profit purposes.

Easement means a conservation easement granted to a qualified, experienced, non-profit conservation organization or government agency. The mitigation site is protected by a conservation easement held by a property owners association or other formally chartered, non-profit organization.

Covenant POA means filing deed restrictions with oversight by a property owners association or other formally chartered, non-profit organization.

Covenant Private means filing deed restrictions by a private citizen or business enterprise.

Credit Schedule (i.e. timing) means the relative time when the mitigation will be performed. *Mitigation schedules are reviewed and approved on a case-by-case basis.* Note well that, for projects other than mitigation banks, schedule 5 is unlikely to be approved. All credit withdrawals associated with mitigation banks must be able to meet interim success criteria commensurate with the level of credit withdrawal. Related terms include:

Schedule 1. For mitigation not involving banks it means that the mitigation is done prior to the adverse impacts. For Mitigation Banks this means that no credits may be withdrawn prior to final determination of success.

Schedule 2. For mitigation not involving banks it means the majority of the mitigation is done prior to the impacts and the remainder is done concurrent with or after the impacts. For Mitigation Banks this means that no more than 10% of the credits may be withdrawn prior to final determination of success.

Schedule 3. For non-banking mitigation it means the mitigation is concurrent with the impacts. For

Mitigation Banks this means no more than 20% of the credits may be withdrawn prior to final determination of success.

Schedule 4. For mitigation not involving banks it means the majority of the mitigation is done concurrent with the impacts and the remainder is done after the impacts. For Mitigation Banks this means that no more than 30% of the credits may be withdrawn prior to final determination of success.

Schedule 5. For mitigation not involving banks it means the mitigation is done after the impacts. For Mitigation Banks this means that more than 30% of the credits may be withdrawn prior to final determination of success.

Cumulative Impact for the purpose of its use in the mitigation tables refers to the total linear feet of stream impacted by the project (0.0005 X length of stream impacted).

Dominant Impact is the type of impact proposed that will diminish the functional integrity of the riparian system.

Fill means permanent fill of a stream channel.

Pipe means to route or divert a stream through a pipe, culvert, or other enclosed structure for a distance greater than 100 feet.

Impound means to dam a stream or otherwise convert it to a lentic state. Installation of a sediment control structure that modifies the stream to facilitate sediment control and/or stormwater management is considered impoundment.

Morphologic means to channelize, dredge, or otherwise alter the established or natural dimensions, depths, patterns or limits of a stream corridor.

Culvert means to route a stream through pipes, box culverts, or other enclosed structures for <=100 feet. Culverts should be designed to pass fish and allow other natural stream processes to occur unimpeded. Culverts should be designed to pass the bankfull flow in the stream channel and greater than bankfull flows in the floodplain. Improperly designed culverts will be assigned a higher Dominant Impact Factor.

Detention means to place a weir in a stream to slow or to divert water when bankfull is reached. The structure should be designed to pass flows below bankfull stage and aquatic organisms.

Armor means to riprap, bulkhead, or use other rigid methods to contain stream channels.
Clearing means activities, such as streambank vegetation clearing that reduce or eliminate the quality and functions of the vegetation within the riparian habitat without disturbing the existing topography or soil stratigraphy.

Shading means activities, such as bridging, that reduce or eliminate the quality and functions of the vegetation within the riparian habitat without disturbing the existing topography or soil stratigraphy.

Utility crossings means open cut construction or other pipeline/utility line installation methods that require disturbance of the stream bed and that require reestablishment of pre-project contours after installation.

Duration is the amount of time the adverse impacts are expected to last.

Seasonal means impacts limited to times outside of breeding and growth periods for applicable aquatic species.

0 -1 year means impacts will occur within a period of up to one year and recovery of most system integrity will follow the cessation of permitted activity.

Greater than 1 year means project impacts will occur for greater than one year and often be permanent for most types of construction activities.

Existing Condition is a sliding scale ranging from 0.1 to 1.5, reflecting the functional state of a stream before any pre-project/project impacts. This is a measure of the stream's natural stability and resilience relative to the physical, chemical and biological integrity of the system.

Fully functional means that the physical geomorphology of the reach is stable and is representative of an appropriate stream hydrograph for the topographical setting and watershed characteristics. The biological community is diverse and unimpaired by excessive anthropogenic inputs. For purposes of this SOP, a fully functional stream is one that has not been channelized; has no culverts, pipes, impoundments, or other instream manmade structures within 0.5 miles upstream or downstream; has an appropriate entrenchment ratio and width/depth ratio at bankfull discharge for its stream type relative to unimpaired stream condition based on reference reach data; shows little evidence of human-induced sedimentation; and has a wide riparian buffer of deep-rooted vegetation (>50').

Moderately Impaired means that stability and resilience of the stream or river reach has been compromised, to a limited degree, through partial loss of one or more of the integrity functions (chemical, physical, biological). System recovery has a moderate probability of occurring naturally. For purposes of this SOP, a stream is considered moderately impaired if the entrenchment ratio and/or width/depth ratio at bankfull discharge is inappropriate for the stream type relative to unimpaired stream condition based on reference reach data; human-induced sedimentation is moderate; a moderate riparian buffer of deep-rooted vegetation is present (minimum of 25 feet); and/or culverts, pipes, impoundments, or other instream manmade structures occur within 0.5 miles upstream or downstream.

Impaired means that there is a high loss of system stability and resilience characterized by loss of one or more integrity functions. Recovery is unlikely to occur naturally. For purposes of this SOP, a stream is considered impaired if the reach has been channelized or if the entrenchment ratio and/or width/depth ratio at bankfull discharge is inappropriate for the stream type relative to unimpaired stream condition based on reference reach data and the stream has degraded to a less desirable type (e.g., Rosgen type "G" or "F"); has extensive human-induced sedimentation; has little or no riparian buffer with deep-rooted vegetation (<25'); and/or culverts, pipes, impoundments, or other instream manmade structures occur within 0.1 mile upstream or downstream.

Kind is a factor used to compare the relative functions and values of the mitigation site to the impacted site. With respect to streams, kind refers to stream order. For Mitigation Banks, kind categories are defined for each bank unit after an assessment of the banking proposal. For proposals not involving mitigation banks, kind categories are In-Kind and Out-of-Kind. Related terms include:

Category 1 is **In-Kind for non-mitigation banks** and is specially defined for mitigation banks.
Category 2 is defined for each mitigation bank following an assessment of the bank.
Category 3 is defined for each mitigation bank following an assessment of the bank.
Category 4 is **Out-of-Kind for non-mitigation banks** and is specially defined for mitigation banks.
Category 5 is defined for each mitigation bank following an assessment of the bank.

In-kind Mitigation means the lost functions of the impacted stream will be mitigated through restoration or preservation of a stream of the same general order.

Out-of-kind Mitigation means the lost functions of the impacted stream will be mitigated through restoration or preservation of a stream of one or two stream order difference from the impacted stream.

Note: Plans to mitigate lost stream function at a stream of greater than 2 stream orders of difference from the impacted site will generally not be acceptable.

Location is the relative location of the mitigation site to the impact site. For stream mitigation banks, location will be defined for the bank after an assessment of the banking proposal.

Onsite means within ½ mile up or downstream of the impact.

Offsite means greater than ½ mile from the impact site, and within the watershed (8-digit HUC as mapped by USGS).

Outside means the mitigation site is not within the same watershed as the impacts but within the same ecoregion.

Note: In general, mitigation outside the impacted stream's ecoregion will not be acceptable.

Zone 1 means **On-Site for non-mitigation banks** and is specially defined for mitigation banks.
Zone 2 means **Off-Site for non-mitigation banks** and is specially defined for mitigation banks.
Zone 3 is defined for each mitigation bank following an assessment of the bank.
Zone 4 means **Outside for non-mitigation banks** and is specially defined for mitigation banks.
Zone 5 is defined for each mitigation bank following an assessment of the bank.

Lost Type categories are based on the suite of functions that they perform and are defined as follows:

First and Second Order Intermittent Streams: streams that generally have a defined natural watercourse that do not flow year round, but beyond periods of rainfall and are located upstream of the confluence of two second order streams.

All Other Streams: Means all streams other than First and Second Order Intermittent Streams.

Net Improvement for Stream Restoration is a measure of restored stream channel stability. Stable streams are in balance and reflect proper morphology relative to the physical characteristics of the watershed. Improvements in stream stability relate directly to improvements in stream functions.

Excellent stream restoration actions include:

- Removing stream impoundments and/or pipes or culverts and restoring stream channels to stable natural channel patterns shown in appropriate reference stream reaches.
- Restoring appropriate bankfull discharge width, stream sinuosity, entrenchment ratio, and width/depth ratio to referenced morphologic patterns utilizing a Priority 1 Restoration technique*, and in some circumstances, a Priority 2 Restoration technique*.

Good stream restoration actions include:

- Restoring streambank stability using non-rigid methods in highly eroded areas (e.g., vegetative stabilization, root wads, j-hook vanes, cutting back eroding slope and creating vegetated floodplain bench).
- Restoring natural channel features (i.e., riffle/run/pool/glide habitat) using morphology appropriate to target stream type.
- Certain Priority 2 and Priority 3 Restorations*.
- Routing a stream around an existing impoundment by creating a morphologically stable and appropriate stream channel
- Stream Relocations (see narrative in Item 19.4.2)

Moderate stream restoration actions include:

- Restoring streambank stability in eroded areas utilizing a Priority 4 Restoration*.
- Constructing fish ladders, where appropriate
- Culverting floodplains at existing road crossings to allow more natural flood flows
- Replacing inappropriately sized/designed culverts
- Removing check dams, weirs, and other manmade instream structures where these structures are contributing to bank erosion or scour or blocking stream processes and aquatic organism movements
- Livestock exclusion (see narrative in Item 19.4.3)

*See Item 19.4.1 for priority restoration technique definitions

Net Improvement for Riparian Buffer Enhancement is a measure of the enhancement attributed to the restoration and perpetual protection of streamside buffers and is calculated using the appropriate table under Item 19.2.

Priority Category. These are stream and riverine systems (including associated tributaries) that provide functions of recognized importance. They may be systems that also have a high social, cultural, or economic value component.

Primary Priority: These areas provide important contributions to biodiversity on an ecosystem scale or high levels of function contributing to landscape or human values. Impacts to these areas should be rigorously avoided or minimized. Compensation for impacts in these areas should emphasize replacement nearby and in the same immediate 8-digit watershed. Designated primary Priority Categories include:

- SCDNR reference streams
- State Heritage Trust Preserves
- Wild and Scenic Rivers
- Anadromous fish spawning habitat
- Outstanding Resource Waters
- Essential Fish Habitat
- State Trout Natural streams
- Waters adjacent to Federal or State protected areas
- Waters on the 303(d) list
- Waters officially designated by State or Federal agencies as high priority, rare, vulnerable, or imperiled areas
- Waters with Federal or State listed threatened or endangered species

Secondary Priority: Secondary Priority Categories include:

- Waters with Federal Species of Management Concern or State listed rare or uncommon species
- State Trout Put, Grow and Take streams
- Stream and river reaches within 0.5 miles upstream or downstream of primary priority reaches
- Stream or river reaches within high growth areas that are not ranked as primary priority systems
- State Scenic River Corridors

Tertiary Priority: These areas include all other streams.

19. Tables and Worksheets.

19.1. *Adverse Impacts Table.*

ADVERSE IMPACT FACTORS FOR LINEAR SYSTEMS

FACTORS	OPTIONS								
Lost Type	Intermittent 1st and 2nd Order Streams 0.3					All Other Streams 0.8			
Priority Category	Tertiary 0.1			Secondary 0.3			Primary 0.5		
Existing Condition	Impaired.....Moderately Impaired.....Fully Functional 0.1 0.75 1.5								
Duration	Seasonal 0.05			0-1 Year 0.1			> 1 Year 0.3		
Dominant Impact	Shade/ Clear 0.05	Utility Crossing 0.15	Culvert 0.3	Armor 0.5	Dentent-ion/Weir 0.75	Morpho-logic 1.5	Impound 2.0	Pipe 2.2	Fill 2.5
Cumulative Impact	0.0005 x total linear feet of stream impacted ($\sum LL_i$)								

Note: The cumulative impact factor for the overall project must be used in each reach column on the Required Mitigation Credits Worksheet below.

Required Mitigation Credits Sample Worksheet

Factor	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Lost Type						
Priority Category						
Existing Condition						
Duration						
Dominant Impact						
Cumulative Impact						
Sum of R Factors	R_1 =	R_2 =	R_3 =	R_4 =	R_5 =	R_6 =
Linear Feet Impact	LL_1 =	LL_2 =	LL_3 =	LL_4 =	LL_5 =	LL_6 =
R × LL=						

Total Required Credits = $\sum$ (R × LL) = ____

19.2. *Enhancement by Buffering Credits.*

It is recognized that forested riparian zones are essential to stream system function, channel stability and maintenance of water quality and instream habitat. Credits may be obtained for enhancing buffers by reforesting riparian zones adjacent to the stream. **Note that streams which are recognizably unstable and which require major stream channel or bank restoration are not considered candidate streams for solely buffer enhancement credit.** To qualify for enhancement credit, all buffers and their associated streams and banks must be protected in perpetuity through restrictive covenants, conservation easements or transfer in fee title to a conservation entity. The following steps should be followed to determine enhancement by buffering credits:

Step 1: Use the Minimum Buffer Width Table below to determine the minimum buffer width for your proposed or existing land use.

MINIMUM STREAM BUFFER ZONE WIDTHS FOR MITIGATION CREDIT (0-5%SLOPE)

Land Use	Min. Width (ft)
Single Family Residential	50
Multi-Family Residential	60
Commercial / Golf Course / Agricultural	75
Industrial	100
Landfill	100
Other Categories	Case-by-case

Step 2: Determine minimum width as adjusted for slope utilizing the table below.

SLOPE* MULTIPLIER TABLE

Percent Slope Perpendicular to Stream	Multiplier Factor For Minimum and Minimum Mean Widths
Less than 5%	1x
5% - 20%	2x
21%-40%	3x
Greater than 40%	4x

*Slope is measured from top of bank perpendicular away from the stream for a distance of 200 feet. In most instances slope may be averaged for the length of stream to be buffered. However, in situations where stream segments have definitively different slopes it may be appropriate to calculate average slopes for each stream segment.

Step 3: Determine Priority Category of the stream reach to be buffered using definition provided in Item 18 (Definition of Factors).

Step 4: Calculate the Net Improvement Factor for each side of the stream independently utilizing the table below.

NET IMPROVEMENT FOR RIPARIAN BUFFERS

Priority Category	Buffer Width* (1 side)	91-100% Area Restored	61-90% Area Restored	33-60% Area Restored	1-32% Area Restored	No Restoration Needed**
Primary	6x min. width	1.0	0.9	0.8	0.7	0.6
	4x min. width	0.8	0.7	0.6	0.5	0.4
	2x min. width	0.6	0.55	0.5	0.4	0.3
	Minimum width	0.4	0.3	0.25	0.2	0.15
Secondary	6x min. width	0.95	0.85	0.75	0.65	0.55
	4x min. width	0.75	0.65	0.55	0.45	0.35
	2x min. width	0.55	0.45	0.4	0.35	0.25
	Minimum width	0.3	0.25	0.2	0.15	0.1
Tertiary	6x min. width	0.8	0.7	0.6	0.5	0.4
	4x min. width	0.65	0.6	0.5	0.4	0.3
	2x min. width	0.5	0.45	0.4	0.3	0.2
	Minimum width	0.25	0.2	0.15	0.1	0.05

*Credit determinations for buffer widths falling between these numbers may be interpolated (e.g. 3x minimum width in a Primary Priority Category would receive a 0.7 score).

** "No Restoration Needed" refers to areas of buffer that are in native forest or will mature into native forest without active restoration. To be eligible for credits, perpetual protection of restored and/or intact, naturally forested riparian zones through restrictive covenants, conservation easements or transfer in fee title to a conservation entity is required.

Note: Credits may not be given for buffer widths deemed excessive to providing benefits to the aquatic system. Credits will not be given for portions of buffers that lie outside the drainage area of the buffered stream (e.g., portions of buffers that extend beyond a ridgetop into an adjacent drainage area). Should the close proximity of a break in the drainage area (e.g., a ridgetop) to the buffered stream preclude attainment of the required minimum buffer width, the Net Improvement may be calculated based on the "Minimum width" for the appropriate Priority Category on the chart above. Buffering both sides of the stream is beneficial. If both sides of the stream are owned or could reasonably be obtained by the applicant, buffering of both sides of the stream is required. Streams that are unstable and require major stream channel or bank restoration are not considered candidate streams for solely buffer enhancement credit.

Step 5: Use net improvements calculated in Step 4 in the table below. Net improvements should be calculated independently for each side of a single reach of stream. In cases where only a single side of a reach is buffered, a reach multiplier of 0.75 is used. In cases where both sides of a reach are buffered, a reach multiplier of 1.25 is used.

19.3. *Riparian Buffer Enhancement Table.*

RIPARIAN BUFFER ENHANCEMENT MITIGATION FACTORS FOR LINEAR SYSTEMS

Factors	Options				
Net Improvement	Riparian Buffer Enhancement (Calculate Value from above Net Improvement Table) 0.05 - 1.0				
Control	Covenant Private 0.05	Covenant POA 0.1	Easement 0.15	Conservancy 0.2	
Credit Schedule	Schedule 5 * 0	Schedule 4 0.02	Schedule 3 0.05	Schedule 2 0.08	Schedule 1 0.1
Kind	Category 5 0.0	Category 4 0.04	Category 3 0.06	Category 2 0.08	Category 1 0.1
Location	Zone 5 0.0	Zone 4 0.05	Zone 3 0.1	Zone 2 0.2	Zone 1 0.3

* Use this option to calculate credits when no restoration of buffer necessary

Proposed Riparian Buffer Enhancement Mitigation Sample Worksheet for LINEAR SYSTEMS

Factors		Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
Net Improvement	Stream Side A					
Net Improvement	Stream Side B					
Control						
Credit Schedule						
Kind						
Location						
Sum of Factors	M =					
Linear Feet	L =					
Reach Multiplier Buffer one side = 0.75 Buffer both sides = 1.25	RM =					
M x L x RM						

Total Riparian Buffer Enhancement Credits = Σ (M x L x RM) = ____

19.4. *Stream Restoration Credits.*

19.4.1. *Stream Channel Restoration.* Stream restoration means actions taken to correct previous alterations that have destroyed, diminished, or impaired the character and function of stream systems. Restoration is the process of converting an unstable, altered, or degraded stream corridor to its natural or referenced stable condition, considering recent and future watershed conditions. This process may include restoration of the stream's geomorphic dimension, pattern and profile and/or biological and chemical integrity, including transport of water and sediment produced by the streams' watershed in order to achieve dynamic equilibrium. For those situations where major restoration of appropriate stream dimension, pattern and profile are warranted, credits will reflect the following priority system.

Priority 1 Restoration. Building a new morphologically stable channel at a higher elevation connected to the original floodplain. In the Southeast Piedmont, the new channels will typically be Rosgen type C or E channels.

Priority 2 Restoration. Where relocation of an incised stream is impracticable, modifying the existing channel and reestablishing a floodplain at their current elevation or higher to create a stable Rosgen type C or E stream.

Priority 3 Restoration. Where relocation of an incised stream is not practicable and modifying the existing channel to create a stable Rosgen type C or E stream channel is impracticable due to belt width constraints (limited land width available to form the meanders necessary for C or E stream types), modifying the existing channel and floodplain at its current elevation to create a stable Rosgen type B or Bc (low slope B) channel. This converts the stream to a new stream type at the existing elevation of the channel but without an active floodplain.

Priority 4 Restoration. Hardening or stabilizing the existing channel in place. This is the least desirable from a biological and asthetic standpoint and often the most costly. It should only be used when there are insurmountable constraints to using other restoration solutions, as may be the case in some urban settings. Some activities undertaken under Priority 4 Restoration may be considered adverse impacts and require compensatory mitigation.

Protection of the restored stream and minimum 50' wide native forested riparian buffers adjusted for slope utilizing the slope multiplier table under Item 19.2 through appropriate mechanisms (restrictive covenants, conservation easements or transfer in fee title to a conservation entity) is required to obtain stream channel restoration credits. Buffers wider than the minimum may receive buffer credits based on the buffer tables in Item 19.2. In unusual circumstances, where this condition may not be met for a portion of the restored stream area, the maximum-forested width possible will be protected and the Net Improvement Factor score will be adjusted accordingly.

19.4.2. *Stream Relocations.* Certain stream relocation projects will also be credited through use of the Stream Restoration table below. This refers to moving a stream to a new location to allow a project authorized under Section 404 of the Clean Water Act to be constructed in the stream's former location. To qualify for mitigation credit, relocated streams should reflect the dimension, pattern and profile of natural, referenced stable conditions and have at least a 50' native forested buffer from each bank of the stream. Preservation of the relocated stream and buffers through appropriate mechanisms (restrictive covenants, conservation easements or transfer in fee title to a conservation entity) is required to obtain stream relocation credits. Restored/Preserved buffers wider than the minimum will receive higher net improvement scores.

Most properly designed stream relocations will be credited within the range of a "Good" Net Improvement Factor. The higher end of this range will be based on design of appropriate geomorphic dimension, pattern and profile, the relocated streams ability to maintain the capacity to transport bedload sediment, proposed buffer width (minimum 50'), and bank stabilization, if necessary, through natural means (tree revetments, willow plantings or other non-rigid measures).

No mitigation credit is generated for relocated streams that do not meet the above criteria or those which are primarily rip-rapped, constructed with concrete, or serve primarily as stormwater conduits.

19.4.3. *Livestock Exclusion.* For streams impacted by livestock activities, where a documented problem exists, corrective measures to ensure elimination of the impact and stream recovery will be credited through this table. Actions which may receive mitigation credit include: fencing stream corridors, designing controlled livestock access points with stable and protected stream banks, and/or totally eliminating access and providing drinking water from tanks, troughs or other structures.

Credits within the "Moderate" range of the Net Improvement Factor will be determined by the current degree of stream impact and the extent of the corrective actions. Highest credits will be given for total exclusion in areas that are highly impacted. Generally, credits will be higher for wider buffers that are actively reforested. Measures credited for mitigation purposes must be maintained in perpetuity, or as long as there is active livestock utilization of adjacent pastureland. Therefore, to receive credit for these actions, restored areas must be protected through appropriate mechanisms (restrictive covenants, conservation easements or transfer in fee title to a conservation entity).

19.5. *Stream Restoration Table.*

RESTORATION MITIGATION FACTORS FOR LINEAR SYSTEMS

Factors	Options				
Net Improvement	Moderate 0.7 - 1.5		Good 1.6 - 2.0		Excellent 2.1 - 3.0
Priority Category	Tertiary 0.05		Secondary 0.2		Primary 0.3
Control	Covenant Private 0.05	Covenant POA 0.1		Easement 0.15	Conservancy 0.2
Credit Schedule	Schedule 5 0	Schedule 4 0.02	Schedule 3 0.05	Schedule 2 0.08	Schedule 1 0.1
Kind	Category 5 0	Category 4 0.02	Category 3 0.05	Category 2 0.08	Category 1 0.1
Location	Zone 5 0	Zone 4 0.05	Zone 3 0.10	Zone 2 0.15	Zone 1 0.2

Proposed Restoration Mitigation Sample Worksheet for LINEAR SYSTEMS

Factors		Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
Net Improvement						
Priority Category						
Control						
Credit Schedule						
Kind						
Location						
Sum Factors	M =					
Linear Feet	L =					
	M x L =					

Total Stream Restoration Credits = Σ (M x L) =

19.6. *Mitigation Summary Worksheet.*

LINEAR SYSTEMS
Mitigation Summary Worksheet For Permit Application #_____

I. Required Mitigation	
A. Total Required Mitigation Credits =	

II. Non-Banking Mitigation Credit Summary	Credits	Linear Feet
B. Riparian Buffer Enhancement		
C. Stream Restoration		
D. Total Proposed Non-Bank Mitigation = B + C		

III. Banking Mitigation Credit Summary	Credits	Linear Feet
E. Riparian Buffer Enhancement		
F. Stream Restoration		
G. Total Proposed Bank Mitigation = E + F		

IV. Grand Totals	Credits	Linear Feet
H. Total Riparian Buffer Enhancement Mitigation = B + E		
I. Total Stream Restoration Mitigation = C + F		
J. Total Proposed Mitigation = D + G		

The Total Mitigation Credits (Row J) should be equal to or greater than the total Required Mitigation Credits (Row A) for the proposed mitigation to be acceptable. The other requirements given in the SOP must also be satisfied, e.g., Row I must equal at least 25% of Row A, etc. If the answer to either of the questions below is no, then the proposed mix and/or quantity of mitigation is not in compliance with the policy and the plan should be revised or rejected, unless a variance is approved.

	Yes	No
PMC $\geq$ RMC or in words Are the Credits in Row J greater than or equal to Row A ?		
$PMC_{Stream\ Restoration} \geq$ ¼ RMC or in words Are the Credits in Row I greater than or equal to 25% of Row A ?		

20. Mitigation Equation.

When a mitigation plan is required, it will be evaluated by the following equations. These calculations are not intended to represent an exact or statistically proven scientific method. Rather, the method is based on the judgment of regulatory and resource agency staff. It is intended to establish a clear, understandable, and consistent method for use by applicants and regulators. As additional experience with this procedure is gained, it is possible that the tables of factors will be reviewed and adjusted. When using these equations use the most recent approved edition of the tables.

Simply stated, the mitigation equation requires that for a mitigation proposal to be acceptable, the Proposed Mitigation Credits (PMC) must be equal to or greater than the Required Mitigation Credits (RMC). *In accordance with the federal goal of no net loss of aquatic resources, the portion of the PMC resulting from stream restoration must be at least 25% of the RMC.* The mitigation credits for RMC and PMC are calculated using the options and factors given in the attachments.

Proposed Mitigation Credits (PMC) ≥ Required Mitigation Credits (RMC)

And,

$$\mathbf{PMC_{Stream\ Restoration} \geq \frac{1}{4} \times RMC}$$

$$PMC = \sum_{i=1}^{n} (M_i \times L_i) \qquad RMC = \sum_{i=1}^{N} (R_i \times LL_i)$$

$$M_i = \sum_{i=1}^{j} m_i \qquad R_i = \sum_{i=1}^{k} r_i$$

PMC = Proposed Mitigation Credits
L_i = The i^{th} linear foot of mitigation
M_i = mitigation multiplier for L_i
m = mitigation factor
n = number of mitigation areas
j = number of mitigation factors

RMC = Required Mitigation Credits
LL_i = The i^{th} adverse effects reach
R_i = adverse effect multiplier for LL_i
r = adverse effect factor
N = number of adverse effect areas
k = number of adverse effect factors

The RMC and PMC are each a summation of products. To calculate each product, one should first evaluate the reaches under consideration and lump similar areas. It is appropriate to lump adverse effects reaches (LL_i) that involve the same adverse effect factors (r_i). Similarly, it is appropriate to lump mitigation reaches (L_i) that involve the same mitigation factors (m_i). For example, if there are four separate adverse effects reaches but they are all to be permanently filled, are all 1st or 2nd order intermittent streams, all within a tertiary priority category, and all reaches are moderately impaired, then the four reaches can be lumped for purposes of calculating the RMC. Such lumping is just for mathematical simplification and will not effect the resulting calculations. The adverse effects multipliers (R_i) for a reach (LL_i) are calculated by summing the applicable adverse effect factors (r_i) selected from the attached tables. Similarly, the mitigation multipliers (M_i) for a mitigation reach (L_i) are calculated by summing the applicable mitigation factors (m_i) selected from the attached tables. The math is much

simpler than the explanation. Each category of mitigation (stream restoration or enhancement by buffering) has a table of factors that are used to compute the credit multipliers for each unique mitigation area. Sample worksheets are provided for documenting and comparing the calculated PMC and the RMC.

21. Sample Cases.

Compensatory Mitigation for Linear Systems
Sample Case #1
All Mitigation On-Site

Assume that impacts involve permanent fill of 30 linear feet of a moderately-impaired perennial stream in a tertiary priority category for construction of a dam, thus impounding 500 linear feet of this stream. Also assume this project, a single-family residential development, involves permanent piping of 150 feet of a fully-functional, perennial stream in a tertiary priority category.

The mitigation consists of on-site riparian buffer enhancement of a single side of 2000 feet of Reach 1 and both sides of 1000 feet of Reach 2. The buffers to be enhanced are adjacent to a perennial stream of the same order as the impact stream, are 100 feet in width, have a 6% slope, require 50% of the area to be revegetated (to be performed concurrent with the adverse impacts), are located in a tertiary priority category, and will be protected by deed restrictions overseen by a property owners association. Mitigation also includes removing 350 linear feet of culverts on-site and restoring the stream to a "daylighted" condition and establishing appropriate geomorphology based on a referenced, stable channel. The culverted stream to be restored is perennial, in a tertiary priority category, and will be restored prior to the adverse impacts and subsequently protected by deed restrictions overseen by a property owners association. The stream restoration plan was coordinated with appropriate resource and regulatory agencies and deemed acceptable.

REQUIRED MITIGATION CREDITS:

	Area 1 (Dam)	Area 2 (Impoundment)	Area 3 (Piping)
Lost Type	0.8	0.8	0.8
Priority Category	0.1	0.1	0.1
Existing Condition	0.75	0.75	1.5
Duration	0.3	0.3	0.3
Dominant Impact	2.5	2.0	2.2
Cumulative Impact	0.34	0.34	0.34
R = Sum of Factors	4.79	4.29	5.24
LL = Impact Reach	30	500	150
Product = R x LL	143.7	2145.0	786.0

Total Required Credits = Σ (R x LL) = 3074.7

MITIGATION CREDITS EARNED:

Minimum buffer width for the mitigation area is calculated by multiplying the minimum width for single-family residential (50 feet) by 2 to account for a 6% slope, yielding a minimum of a 100-foot wide riparian buffer to attain mitigation credit. Thus, the proposed 100-foot buffers satisfy the minimum buffer width.

RIPARIAN BUFFER ENHANCEMENT CREDITS

	REACH 1	REACH 2
Net Improvement Side A	0.15	0.15
Net Improvement Side B	NA	0.15
Location	0.3	0.3
Control	0.1	0.1
Kind	0.1	0.1
Credit Schedule	0.05	0.05
M = Sum of Factors	0.7	0.85
L = Linear Feet of Impact	2000	1000
RM = Reach Multiplier	0.75	1.25
M X L X RM	1050	1062.5

Credits = Σ(M X L X RM) = 2112.5

STREAM RESTORATION CREDITS

Net Improvement	2.5
Priority Category	0.05
Location	0.2
Control	0.1
Kind	0.1
Credit Schedule	0.1
M = Sum of Factors	3.05
L = Linear Feet of Impact	350

Credits = M X L = 1067.5

SUMMARY OF MITIGATION CREDITS

Category	**Credits**
Riparian Buffer Enhancement	2112.5
Stream Restoration	1067.5

Total Credits = 3180.0

$$PMC \geq RMC$$
$$3180.0 \geq 3074.7$$

$$PMC_{Stream\ Restoration} \geq \tfrac{1}{4}\ RMC$$
$$1067.5 \geq 768.7$$

The Total Proposed Mitigation Credits (3180.0) are greater than the Total Required Credits (3074.7) and the credits for stream restoration are greater than ¼ of the required credits. Therefore, the quantity and

mix of mitigation is acceptable. The Project Manager must also review the other aspects of the mitigation plan to assure that it is generally in compliance with the policies and guidelines for mitigation.

Compensatory Mitigation for Linear Systems
Sample Case #2
On-site Mitigation Combined With Mitigation Bank Credits

For this sample case let us assume that the impacts are the same as in the previous case sample. Thus we need 3074.7 mitigation credits. Also assume the same riparian buffer enhancement that generates a total of 2112.5 credits. However, instead of 350 linear feet of stream restoration, assume only 150 linear feet of stream restoration is proposed and the remaining credits will be obtained from a Mitigation Bank. Similar to the previous example we can calculate the following:

Proposed Riparian Buffer Enhancement = 2112.5
Proposed Stream Restoration = 3.05 X 150 = 457.5
Total Proposed Non-Bank Mitigation Credits = 2570.0

The additional credits needed are:

Total Mitigation Credits Required = 3074.7
Total Proposed Non-Bank Credits = 2570.0

Additional Credits Needed = 504.7

We also must consider the requirement that at least ¼ of the required mitigation credits should be from stream restoration. Since a mitigation bank may offer stream restoration or riparian buffer enhancement credits, we need to know the number of stream restoration credits needed.

Stream Restoration Credits Required = ¼ X 3074.7 = 768.7
Proposed Stream Restoration Credits = 457.5

Additional Stream Restoration Credits Needed = 311.2

The applicant then obtains 504.7 credits from a mitigation bank of which at least 311.2 are stream restoration credits. The remaining 193.5 credits may be riparian buffer enhancement credits.

I.	Required Mitigation		
Total Required Mitigation Credits = 3074.7			
II.	**Non-Banking Mitigation**	**Credits**	**Linear Feet**
	Riparian Buffer Enhancement	2112.5	3000
	Stream Restoration	457.5	150
	Total Non-Bank Mitigation	2570.0	3150
III.	**Banking Mitigation**	**Credits**	**Linear Feet**
	Riparian Buffer Enhancement	193.5	calculated by bank
	Stream Restoration	311.2	calculated by bank
	Total Banking Mitigation	504.7	calculated by bank
IV.	**Grand Totals**	**Credits**	**Linear Feet**
	Total Riparian Buffer Enhancement	2306.0	3000 + calculated by bank
	Total Stream Restoration	768.7	150 + calculated by bank
	Total Mitigation	3074.7	3150 + calculated by bank

The Grand Total Proposed Credits are equal to the required credits and the Grand Total Stream Restoration Credits are equal to at least ¼ of the total required credits. Therefore, the proposed mix and types of mitigation satisfy the policy. The number of linear feet required from the bank to obtain these credits will depend on the approved banking documents and must be calculated by the bank operator. The calculation of bank linear feet used should be submitted with both the project mitigation proposal and the regular accounting summary for the Mitigation Bank.

22. Data Forms

22.1. *Stream Channel Classification and Reference Reach Data Forms*

Stream Channel Classification

Stream NAME: ____________

Basin NAME: ____________ Drainage AREA: ______ Ac. ______ SqMi.

Location: ____________

Twp: ______ Rge: ______ Sec: ______ Qtr: ______ Lat. ______ Long. ______

Observers: ____________ Date:

Bankfull WIDTH (W_{bkf}) ____________ Ft.
WIDTH of the stream channel, at bankfull stage elevation, in a riffle section.

Mean DEPTH (d_{bkf}) ____________ Ft.
Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section. ($d_{bkf} = A / W_{bkf}$)

Bnkfl. X-Section AREA (A_{bkf}) ____________ Sq.Ft.
AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.

Width / Depth RATIO (W_{bkf} / d_{bkf}) ____________
Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.

Maximum DEPTH (d_{mbkf}) ____________ Ft.
Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and thalweg elevations, in a riffle section.

WIDTH of Flood-Prone Area (W_{fpa}) ____________ Ft.
Twice maximum DEPTH, or ($2 \times d_{mbkf}$) = the stage/elevation at which flood-prone area WIDTH is determined. (riffle section)

Entrenchment Ratio (ER) ____________
The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH: (W_{fpa} / W_{bkf}) (riffle section)

Channel Materials (Particle Size Index) **D50** ____________ mm.
The D50 particle size index represents the mean diameter of channel materials, as sampled from the channel surface, between the bankfull stage and thalweg elevations.

Water Surface SLOPE (S) ____________ Ft./Ft.
Channel slope = "rise" over "run" for a reach approximately 20 - 30 bankfull channel widths in length, with the "riffle to riffle" water surface slope representing the gradient at bankfull stage.

Channel SINUOSITY (K) ____________
Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL / VL); or estimated from a ratio of valley slope divided by channel slope (VS/S).

Stream Type ______ For reference, note: Item 22.2 (Classification Key)

REFERENCE REACH Summary Data

Channel DIMENSION

Pool Depth (dp) Ft.	Pool Width (Wp) Ft.	Pool(xs)Area: (Ap) SqFt.
Riffle Depth (dr) Ft.	Riffle Width (Wr) Ft.	Riffle(xs)Area: (Ar) SqFt.

Ratio: POOL Depth / RIFFLE Depth: (dp / dr)

Ratio: POOL Width / RIFFLE Width: (Wp / Wr)

Ratio: POOL Area / RIFFLE Area: (Ap / Ar)

Ratio: Max. Pool Depth / Mean Bankfull Depth (d_{bkf}): (dp_{max} / d_{bkf})

Ratio: Lowest Bank Height / Max. Bankfull Depth (d_{mbkf}): (BH_{low} / d_{mbkf})

Streamflow: Estimated Mean Velocity (u) @ Bankfull Stage Ft./Sec.

Streamflow: Estimated Discharge (Q) @ Bankfull Stage CFS

Channel PATTERN

Meander Length (L_M) Ft. | Radius of Curvature (R_C) Ft.

Belt Width (W_{BLT}) Ft. | Meander Width RATIO (MWR = W_{BLT} / W_{bkf}):

RATIO: Radius of Curvature / Bankfull Width (R_C / W_{BKF})

RATIO: Meander Length / Bankfull Width (L_M / W_{BKF})

Channel PROFILE

Valley Slope Ft./Ft. | Ave. Water Surface Slope Ft./Ft.

Riffle Slope Ft./Ft. | Pool Slope Ft./Ft.

Pool to Pool Spacing Ft. | Pool Length Ft./Ft.

RATIO: Riffle Slope / Average Water Surface Slope

RATIO: Pool Slope / Average Water Surface Slope

RATIO: Run Slope / Average Water Surface Slope

RATIO: Glide Slope / Average Water Surface Slope

RATIO: Run Depth / Mean Depth-Bankfull

RATIO: Glide Depth / Mean Depth - Bankfull

RATIO: Pool Length / Bankfull Width

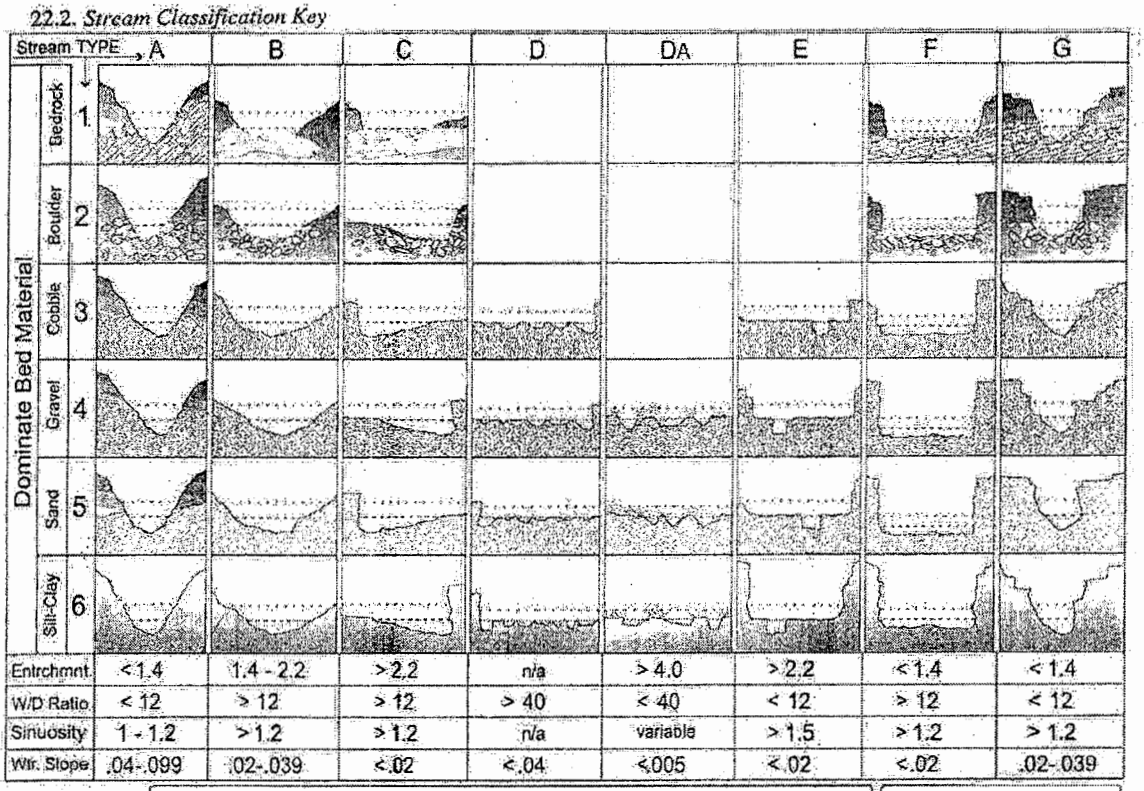
RATIO: Pool to Pool Spacing / Bankfull Width

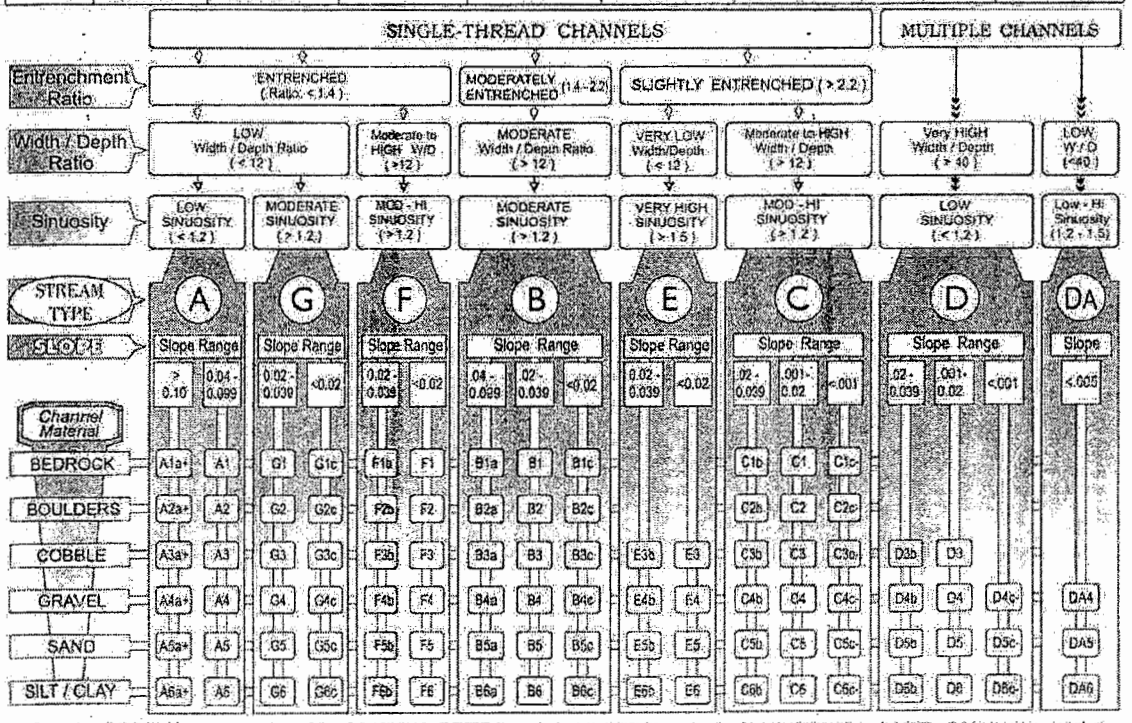
Channel MATERIALS

% Sand & <	D16 mm
% Gravel	D35 mm
% Cobble	D50 mm
% Boulder	D84 mm
% Bedrock	D95 mm

From: "The Reference Reach Field Book", courtesy of Dave Rosgen and Wildland Hydrology

22.2. *Stream Classification Key*





KEY to the ROSGEN CLASSIFICATION of NATURAL RIVERS. As a function of the *"continuum of physical variables"* within stream reaches, values of *Entrenchment* and *Sinuosity* ratios can vary by +/- 0.2 units; while values for *Width / Depth* ratios can vary by +/- 2.0 units.

From: " The Reference Reach Field Book", courtesy of Dave Rosgen and Wildland Hydrology

PROTECTIVE MECHANISMS

23. Using the Model Restrictive Covenants.

The statutory authority of the U.S. Army Corps of Engineers includes the issuance of permits under Section 404 of the Clean Water Act (33 U.S.C. 1344), and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). Section 404 covers the discharge of dredged or fill material into wetlands or other waters of the United States. Section 10 prohibits the unauthorized obstruction or alteration of any navigable water of the United States. In some cases, both Sections 404 and 10 will apply. Under Section 404, the South Carolina Department of Health and Environmental Control ("DHEC") is responsible for certifying permits for consistency with coastal zone management and/or water quality.

Prospective permittees under Section 404 may decide to perform what is known as "compensatory mitigation" in return for unavoidable impacts to wetlands or other waters of the United States by the activities or work covered by a permit. A "conservation easement" is used to place permanent "conservation restrictions" on property containing wetlands. The conservation restrictions contained in conservation easements significantly limit the property's future use. The easement is conveyed to a third-party, or "holder," which is typically a land trust (the South Carolina Department of Archives and History's conservation easement webpage includes a list of local land trusts), not-for-profit conservation organization, or governmental entity (the Corps of Engineers will not be a holder). Other alternatives for compensatory mitigation include use of a "declaration of restrictive covenants," or "mitigation banking."

Conservation easements may have tax advantages for the landowner. Circumstances will vary, and it is up to the individual landowner to determine the appropriate tax treatment or deductibility. The Corps of Engineers makes no representation whatsoever as to the appropriate tax treatment for a particular conservation easement. For a document in .pdf format providing an explanation of potential tax benefits entitled, *Local, State, and Federal Tax Aspects of Conservation Easements*, visit the South Carolina Department of Revenue publications web page.

Conservation easements are also used to place conservation restrictions on areas approved as "mitigation banks." A mitigation bank is a site where wetlands are restored, enhanced, created and/or preserved for the purpose of providing compensatory mitigation. The bank obtains credits for these activities, which it then offers for sale to prospective permittees. For additional details on wetlands banking click here.

The purpose of the model conservation easement is to allow permit applicants to insert specific information into a prepared legal document. Changes necessary to customize the model, such as the identification of parties or real property, or the selection of other italicized provisions, will generally be approved without extended review. Additional changes or alternatives to the model proposed by the permit applicant may result in a more extended regulatory and legal review, and are subject to approval on a case-by-case basis. ANY proposed changes, including those necessary to customize the model, must be clearly identified when the permit applicant submits the proposed conservation easement for preliminary approval; if all changes are not clearly identified, the document may be returned to the applicant without approval. ALL conservation easements must be approved by the Corps of Engineers and DHEC before recording.

For explanation of other aspects of these compensatory mitigation alternatives, and of Corps of Engineers permitting in general, please contact the Charleston District Regulatory Division at 69A Hagood Avenue, Charleston, South Carolina 29403, toll free (866) 329-8187.

For permitting or mitigation bank purposes, you may download the model Conservation Easement in 3 formats: WordPerfect 5.1, WordPerfect 6.1, or Microsoft Word 6.0.

Note: USE OF THE MODEL CONSERVATION EASEMENT FOR OTHER PURPOSES IS NOT AUTHORIZED!

24. Restrictive Covenants Model.

STATE OF SOUTH CAROLINA

DECLARATION OF
RESTRICTIVE COVENANTS

COUNTY OF _____

THIS DECLARATION OF RESTRICTIVE COVENANTS is made this ___ day of _____, 20__, by _____("Declarant*(s)*").

RECITALS

WHEREAS, Declarant*(s) is/are* the owner*(s)* of certain real property (*"real property" includes wetlands, any interest in submerged lands, uplands, associated riparian/littoral rights*) located in _____ County, South Carolina, more particularly described [*describe tract to be preserved, including: 1) acreage, 2) a reference to recorded plat(s), or attach an approved permit drawing or site plan (see Paragraph 9), and 3) any excluded property*] ("Property"); and

WHEREAS, as compensatory mitigation under Federal *and State* law for Department of the Army Permit No. ("Permit") issued by the U.S. Army Corps of Engineers, Charleston District ("Corps" or "Charleston District," to include any successor agency), *and certification(s) and/or permit(s) issued by the S.C. Department of Health and Environmental Control ("DHEC," to include any successor agency)*, and in recognition of the continuing benefit to the permitted property, and for the protection of waters of the United States and scenic, resource, environmental, and general property values, Declarant*(s) has/have* agreed to place certain restrictive covenants on the Property, in order that the Property shall remain substantially in its natural condition forever.

NOW THEREFORE, Declarant*(s)* hereby declare*(s)* that the Property shall be held, transferred, conveyed, leased, occupied or otherwise disposed of and used subject to the following restrictive covenants, which shall run with the land and be binding on all heirs, successors, assigns (they are included in the term, "Declarant," below), lessees, or other occupiers and users.

1.**Prohibitions**. Declarant*(s) is/are* and shall be prohibited from the following: filling, draining, flooding, dredging, impounding, clearing, burning, cutting or destroying vegetation, cultivating, excavating, erecting, constructing, releasing wastes, or otherwise doing any work on the Property; introducing exotic species into the Property (except biological controls preapproved in writing by the Corps *and DHEC*); and from changing the grade or elevation, impairing the flow or circulation of waters, reducing the reach of waters, and any other discharge or activity requiring a permit under clean water or water pollution control laws and regulations, as amended. The following are expressly excepted from this paragraph: a) cumulatively very small impacts associated with hunting (excluding planting or burning), fishing, and similar recreational or educational activities, consistent with the continuing natural condition of the Property; b) removal or trimming of vegetation hazardous to person or property, or of timber downed or damaged due to natural disaster; c) restoration or mitigation required under law [*if reference is made to the Permit, or to a mitigation plan approved by the Permit, all exceptions (including regarding buffer areas) must be specifically spelled out in the Permit or plan; also, additional, specific exceptions may be listed in this paragraph, e.g., fire or wildlife management plans, boardwalks, etc.*].

2.**Amendment**. After recording, these restrictive covenants may only be amended by a recorded document signed by the Corps *and DHEC* and Declarant. The recorded document, as amended, shall be consistent with the Charleston District model conservation restrictions at the time of amendment. Amendment shall be allowed at the discretion of the Corps *and DHEC*, in consultation with resource agencies as appropriate, and then only in exceptional circumstances. Mitigation for amendment impacts will be required pursuant to Charleston District mitigation policy at the time of amendment. There shall be no obligation to allow an amendment.

3.**Notice to Government**. Any permit application, or request for certification or modification, which may affect the Property, made to any governmental entity with authority over wetlands or other waters of the United States, shall expressly reference and include a copy (with the recording stamp) of these restrictive covenants.

4.**Reserved Rights**. It is expressly understood and agreed that these restrictive covenants do not grant or convey to members of the general public any rights of ownership, entry or use of the Property. These restrictive covenants are created solely for the protection of the Property, and for the consideration and values set forth above, and Declarant*(s)* reserve*(s)* the ownership of the fee simple estate and all rights appertaining thereto, including without limitation the rights to exclude others and to use the property for all purposes not inconsistent with these restrictive covenants.

5.**Compliance Inspections**. The Corps, *DHEC*, and *its/their* authorized agents shall have the right to enter and go upon the lands of Declarant*(s)*, to inspect the Property and take actions necessary to verify compliance with these restrictive covenants.

6.**Enforcement**. The Declarant*(s)* grant*(s)* to the Corps, the U.S. Department of Justice, and/or *DHEC*, a discretionary right to enforce these restrictive covenants in a judicial action against any person*(s)* or other entity(ies) violating or attempting to violate these restrictive covenants; provided, however, that no violation of these restrictive covenants shall result in a forfeiture or reversion of title. In any enforcement action, an enforcing agency shall be entitled to a complete restoration for any violation, as well as any other judicial remedy such as civil penalties. Nothing herein shall limit the right of the Corps to modify, suspend, or revoke the Permit.

7.**Property Transfers**. Declarant*(s)* shall include the following notice on all deeds, mortgages, plats, or any other legal instruments used to convey any interest in the Property (failure to comply with this paragraph does not impair the validity or enforceability of these restrictive covenants):

> NOTICE: This Property Subject to Declaration of Restrictive Covenants Recorded at [*insert book and page references, county(ies), and date of recording*].

8.**Marking of Property**. The perimeter of the Property shall at all times be plainly marked by permanent signs saying, "Protected Natural Area," or by an equivalent, permanent marking system.

[*Paragraph 9 - generally, a surveyed, recorded plat is required; however, at the discretion of the Corps and DHEC, an approved permit drawing or site plan attached to these restrictive covenants may suffice*]

9.**Recording of Plat**. A plat depicting the boundaries of the Property subject to these restrictive covenants shall be recorded in the deed records office for each county in which the Property is situated prior to the recording of these restrictive covenants. The plat*(s) is/are* recorded at [*include book and page references, county(ies), and date*].

10. **Separability Provision**. Should any separable part of these restrictive covenants be held contrary to law, the remainder shall continue in full force and effect.

IN WITNESS WHEREOF, the Declarant*(s) has/have* duly executed this Declaration of Restrictive Covenants the date written above.

IN THE PRESENCE OF: Declarant*(s)*

_____ By: _____
[*type name of witness under signature line*] [*type name of individual under signature line*]

_____ *Its:* _____
[*type name of witness under signature line*] [*title of signing individual, where applicable*]

STATE OF SOUTH CAROLINA

PROBATE

COUNTY OF _____

PERSONALLY appeared before me _____, the undersigned witness, and made oath that *he/she* saw the within named _____ [, *by* _____, *its* _____,] sign, seal and as *his/her/its* act and deed, deliver the within named Declaration of Restrictive Covenants; and that *he/she* with the other witness named above witnessed the execution thereof.

_____
[*Type name of witness under signature line*]

SWORN to and subscribed before me
this ___ day of _____, 20___.

NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires:

Appendix A

Incorporating the National Research Council's Mitigation Guidelines Into the Clean Water Act Section 404 Program

BACKGROUND

In its comprehensive report entitled *"Compensating for Wetland Losses Under the Clean Water Act,"* the National Research Council (NRC) provided ten guidelines to aid in planning and implementing successful mitigation projects ("Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining"; NRC, 2001). Please note that these guidelines also pertain to restoration and enhancement of other aquatic resource systems, such as streams. Each of the ten guidelines can generally be described as, A) basic requirement for mitigation success, or B) guide for mitigation site selection. The following sections include both the original text of the NRC guidelines, in italics, as well as a discussion of how applicants and field staff can incorporate these guidelines into the development and review of mitigation projects.

A. Basic Requirements for Success

When considering mitigation sites it is important to note that wetland mitigation is not a precise, exact science and predictable results are not always obtainable. Having an adaptive management attitude is a necessity. One should incorporate experimentation into the mitigation plan when possible. This may mean using experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are effectively meeting the desired goals. This requires detailed planning, effective implementation of the mitigation project, close monitoring (both short and long term) of the implemented plans and finally adjusting to intermediate results with an adaptive attitude and additional modifications to obtain long range wetland and watershed goals. In addition, researchers have found that restoration is the most likely type of mitigation to result in successful and sustainable aquatic resource replacement. Moreover, numerous studies in a variety of landscapes and watershed types have shown that of all factors contributing to mitigation success, attaining and maintaining appropriate hydrological conditions is the most important. The following NRC guidelines should be considered basic requirements for mitigation success.

A.1. Whenever possible, choose wetland restoration over creation.

Select sites where wetlands previously existed or where nearby wetlands still exist. Restoration of wetlands has been observed to be more feasible and sustainable than creation of wetlands. In restored sites the proper substrate may be present, seed sources may be on-site or nearby, and the appropriate hydrological conditions may exist or may be more easily restored.

The U.S. Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) Mitigation Memorandum of Agreement states that, "because the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, restoration should be the first option considered" (Fed. Regist. 60(Nov. 28): 58605). The Florida Department of Environmental Regulation (FDER 1991a) recommends an emphasis on restoration first, then enhancement, and, finally, creation as a last resort. Morgan and Roberts (1999) recommend encouraging the use of more restoration and less creation.

The applicant proposes the type of mitigation. However, the Corps and other agencies will evaluate proposals based on the ease of completion and the likelihood of success. Therefore, pure wetland creation will be evaluated using very stringent criteria before being approved for use as compensatory mitigation for project impacts. Some projects may include creation as part of an overall mitigation effort that involves restoration, enhancement, and/or preservation (e.g., as in a proposed mitigation bank). In these cases, evaluation will be based on the entire proposal and its location in the watershed.

A.2. Avoid over-engineered structures in the wetland's design

> *Design the system for minimal maintenance. Set initial conditions and let the system develop. Natural systems should be planned to accommodate biological systems. The system of plants, animals, microbes, substrate, and water flows should be developed for self-maintenance and self-design. Whenever possible, avoid manipulating wetland processes using approaches that require continual maintenance. Avoid hydraulic control structures and other engineered structures that are vulnerable to chronic failure and require maintenance and replacement. If necessary to design in structures, such as to prevent erosion until the wetland has developed soil stability, do so using natural features, such as large woody debris. Be aware that more specific habitat designs and planting will be required where rare and endangered species are among the specific restoration targets.*
>
> *Whenever feasible, use natural recruitment sources for more resilient vegetation establishment. Some systems, especially estuarine wetlands, are rapidly colonized, and natural recruitment is often equivalent or superior to plantings (Dawe et al. 2000). Try to take advantage of native seed banks, and use soil and plant material salvage whenever possible. Consider planting mature plants as supplemental rather than required, with the decision depending on early results from natural recruitment and invasive species occurrence. Evaluate on-site and nearby seed banks to ascertain their viability and response to hydrological conditions. When plant introduction is necessary to promote soil stability and prevent invasive species, the vegetation selected must be appropriate to the site rather than forced to fit external pressures for an ancillary purpose (e.g., preferred wildlife food source or habitat).*

The use of over-engineered structures and maintenance intensive plans for mitigation is not recommended and will be evaluated using very stringent criteria. If these types of plans are ultimately approved, they must include a comprehensive remedial plan and financial assurances [note that all mitigation projects should have remedial plans and financial assurances], along with a non-wasting endowment to insure that proper maintenance occurs.

It should also be noted that aggressive soil and planting plans using introduced plants and soil from outside sources must be closely monitored to prevent invasive plant takeovers and monotypic plant communities. Such failures can be minimized by undertaking both short-term and long-term monitoring, and having contingency plans in place.

A.3. Restore or develop naturally variable hydrological conditions.

Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration and frequency of change, representative of other comparable wetlands in the same landscape setting. Preferably, natural hydrology should be allowed to become reestablished rather than finessed through active engineering devices to mimic a natural hydroperiod. When restoration is not an option, favor the use of passive devices that have a higher likelihood to sustain the desired hydroperiod over long term. Try to avoid designing a system dependent on water-control structures or other artificial infrastructure that must be maintained in perpetuity in order for wetland hydrology to meet the specified design. In situations where direct (in-kind) replacement is desired, candidate mitigation sites should have the same basic hydrological attributes as the impacted site.

Hydrology should be inspected during flood seasons and heavy rains, and the annual and extreme-event flooding histories of the site should be reviewed as closely as possible. For larger mitigation projects, a detailed hydrological study of the site should be undertaken, including a determination of the potential interaction of groundwater with the proposed wetland. Without flooding or saturated soils, for at least part of the growing season, a wetland will not develop. Similarly, a site that is too wet will not support the desired biodiversity. The tidal cycle and stages are important to the hydrology of coastal wetlands.

Natural hydrology is the most important factor in the development of successful mitigation. Wetlands and other waters are very dynamic, and dependent on natural seasonal and yearly variations that are unlikely to be sustainable in a controlled hydrologic environment. Artificial structures and mechanisms should be used only temporarily. Complex engineering and solely artificial mechanisms to maintain water flow normally will not be acceptable in a mitigation proposal. In those sites where an artificial water source (irrigation) has been used to attempt to simulate natural hydrology there are several problems that lead to reduced likelihood of success. First, artificial irrigation does not provide the dynamic and variable nature of water flow normally found in wetlands or riparian systems. Second, the lack of seasonal flows limits the transport of organic matter into and out of the wetland or riparian system. Without any inflow, the net result of artificial irrigation is transport of organic material out of the system. Third, depending on the timing, the use of flood or sprinkler systems on newly created or restoration sites often promotes the germination and growth of exotic plant species.

Note that this changes the Corps' past policy of accepting artificial irrigation as the sole source of hydrology for mitigation projects. If permitted at all, these projects will require substantial financial assurances and a higher mitigation ratio to offset their risk of failure. Applicants must weigh the potential investment costs of acquiring land suitable for restoration versus creation projects in upland environments that will likely involve higher long-term costs and greater risks of mitigation site failure.

The Corps may approve exceptions dealing with hydrologic manipulations, on a case-by-case basis in highly unusual circumstances. It should be noted, however, that even minor engineering or hydraulic manipulation requiring long-term maintenance will only be approved after the applicant posts a non-wasting endowment, performance bond, or other financial assurance.

A.4. Consider complications associated with creation or restoration in seriously degraded or disturbed sites

A seriously degraded wetland, surrounded by an extensively developed landscape, may achieve its maximal function only as an impaired system that requires active management to support

natural processes and native species (NRC 1992). It should be recognized, however, that the functional performance of some degraded sites may be optimized by mitigation, and these considerations should be included if the goal of the mitigation is water- or sediment-quality improvement, promotion of rare or endangered species, or other objectives best served by locating a wetland in a disturbed landscape position. Disturbance that is intense, unnatural, or rare can promote extensive invasion by exotic species or at least delay the natural rates of redevelopment. Reintroducing natural hydrology with minimal excavation of soils often promotes alternative pathways of wetland development. It is often advantageous to preserve the integrity of native soils and to avoid deep grading of substrates that may destroy natural belowground processes and facilitate exotic species colonization (Zedler 1996).

When considering restoration options it is necessary to determine the spatial and temporal scale of the damage: is the damage limited to the water body itself, or is it a predominant characteristic of the watershed or the surrounding landscape? On-site damage may be restorable, whereas regional-scale damage may be more difficult, or impossible, to reverse or obtain historic conditions. Alternate goals may be necessary in order to determine specific goals of the restoration project. Those desired wetland mitigation goals will depend on the resources needed, the level of degradation and realistic mitigation targets as reflected by the watershed and surrounding landscape. This issue points to the importance of evaluating mitigation plans from a broader watershed perspective.

A.5. Conduct early monitoring as part of adaptive management

Develop a thorough monitoring plan as part of an adaptive management program that provides early indication of potential problems and direction for correction actions. The monitoring of wetland structure, processes, and function from the onset of wetland restoration or creation can indicate potential problems. Process monitoring (e.g., water-level fluctuations, sediment accretion and erosion, plant flowering, and bird nesting) is particularly important because it will likely identify the source of a problem and how it can be remedied. Monitoring and control of nonindigenous species should be a part of any effective adaptive management program. Assessment of wetland performance must be integrated with adaptive management. Both require understanding the processes that drive the structure and characteristics of a developing wetland. Simply documenting the structure (vegetation, sediments, fauna, and nutrients) will not provide the knowledge and guidance required to make adaptive "corrections" when adverse conditions are discovered. Although wetland development may take years to decades, process-based monitoring might provide more sensitive early indicators of whether a mitigation site is proceeding along an appropriate trajectory.

There are many factors that may positively or negatively influence aquatic resources and the functions they provide, such as urbanization, farming or grazing. Wetlands and other aquatic resources are often subject to a wide range and frequency of events such as floods, fires and ice storms. As with all natural systems, some things are beyond control. Well-crafted mitigation plans, however, recognize the likelihood of these events and attempt to plan for them, primarily through monitoring and adaptive management. In addition, it is important to realize the mobile nature of wetlands and streams. They change over time and over the landscape in response to internal and external forces.

Monitoring and adaptive management should be used to evaluate and adjust maintenance (e.g., predator control, irrigation), and design remedial actions. Adaptive management should consider changes in ecological patterns and processes, including biodiversity of the mitigation project as it evolves or goes through successional stages. Trends in the surrounding area must also be taken into account (i.e., landscape/watershed context). Being proactive helps ensure the ultimate success of the mitigation, and

improvement of the greater landscape. One proactive methodology is incorporation of experimentation into the mitigation plan when possible, such as using experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are meeting the desired goals.

B. Mitigation Site Selection

The selection of an appropriate site to construct a mitigation project is one of the most important, yet often under-evaluated, aspects of mitigation planning. In many instances, the choice of the mitigation site has been completed by the applicant based solely on economic considerations with minimal concern for the underlying physical and ecological characteristics of the site. While economic factors are important in determining the practicability of site selection, current technology and the following NRC guidelines should also factor into the selection of a mitigation site.

B.1. Consider the hydrogeomorphic and ecological landscape and climate

> *Whenever possible, locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic class. Do not generate atypical "hydrogeomorphic hybrids"; instead, duplicate the features of reference wetlands or enhance connectivity with natural upland landscape elements (Gwin et al. 1999).*
>
> *Regulatory agency personnel should provide a landscape setting characterization of both the wetland to be developed and, using comparable descriptors, the proposed mitigation site. Consider conducting a cumulative impact analysis at the landscape level based on templates for wetland development (Bedford 1999). Landscapes have natural patterns that maximize the value and function of individual habitats. For example, isolated wetlands function in ways that are quite different from wetlands adjacent to rivers. A forested wetland island, created in an otherwise grassy or agricultural landscape, will support species that are different from those in a forested wetland in a large forest tract. For wildlife and fisheries enhancement, determine if the wetland site is along ecological corridors such as migratory flyways or spawning runs. Constraints also include landscape factors. Shoreline and coastal wetlands adjacent to heavy wave action have historically high erosion rates or highly erodible soils, and often-heavy boat wakes. Placement of wetlands in these locations may require shoreline armoring and other protective engineered structures that are contrary to the mitigation goals and at cross-purposes to the desired functions*
>
> *Even though catastrophic events cannot be prevented, a fundamental factor in mitigation plan design should be how well the site will respond to natural disturbances that are likely to occur. Floods, droughts, muskrats, geese, and storms are expected natural disturbances and should be accommodated in mitigation designs rather than feared. Natural ecosystems generally recover rapidly from natural disturbances to which they are adapted. The design should aim to restore a series of natural processes at the mitigation sites to ensure that resilience will have been achieved.*

Watershed management requires thinking in terms of multiple spatial scales: the specific wetland or stream itself, the watershed that influences the wetland/stream, and the greater landscape. The landscape in which a wetland or water exists, defines its hydrogeologic setting. The hydrogeologic setting in turn controls surface and sub-surface flows of water, while a variety of hydrogeologic settings results in biological and functional diversity of aquatic resources.

There are three aspects of watershed management that the applicant must address in a mitigation plan: hydrogeomorphic considerations, the ecological landscape, and climate. It should be noted that the overall goal of compensatory mitigation is to replace the functions being lost (functional equivalency) due to a permitted Section 404 activity. By evaluating the hydrogeomorphic setting, ecological landscape and climate, one can determine which attributes can be manipulated (i.e. hydrology, topography, soil, vegetation or fauna) to restore, create or enhance viable aquatic functions.

Hydrogeomorphic considerations refers to the source of water and the geomorphic setting of the area. For example, a riverine wetland receives water from upstream sources in a linear manner, whereas vernal pools exist as relatively closed depressions underlain by an impermeable layer that allows rainfall runoff from a small watershed to fill the pool during specific times of year. Applicants should strive to replicate the hydrogeomorphic regime of the impacted water to increase the potential that the mitigation site mimics the functions lost. Only as a last resort, should applicants prepare plans for constructing wetlands using artificial water sources or placing wetlands into non-appropriate areas of the landscape. In such cases, there should be a contingency plan to prepare for unanticipated events or failures.

Ecological landscape describes the location and setting of the wetland/water in the surrounding landscape. For example, attempting to place mitigation in a dissimilar ecological complex than that of the impacted water is expected to result in a wetland/water unlikely to replicate the functions of the wetland/water that was lost. In all cases, the applicant should evaluate the historical ecological landscape of the mitigation site; for example, if there had been large areas of forested wetland in an agricultural area, then replacement of a forested wetland may be appropriate given other factors that should be considered. In most cases, applicants should plan for a mitigation area that fits best within the ecological landscape of the watershed or region of the mitigation site. Applicants should also consider constructing mitigation sites with more than one type of wetland/water regime, if appropriate, to provide for landscape diversity.

Climate also affects mitigation and is clearly beyond the control of the applicant. Therefore, the mitigation site should be sited in an area supported by the normal rainfall, subsurface and/or groundwater in the region. Climate considerations also can impact other hydrologic issues, sediment transport factors and other factors affecting attainment of desired functions. While climate cannot be manipulated, applicants need to account for it in mitigation plans, including local and regional variability and extremes.

B. 2. Adopt a dynamic landscape perspective

> *Consider both current and future watershed hydrology and wetland location. Take into account surrounding land use and future plans for the land. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, such as preserving large buffers and connectivity to other wetlands. Build on existing wetland and upland systems. If possible, locate the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape. Design a system that utilizes natural processes and energies, such as the potential energy of streams as natural subsidies to the system. Flooding rivers and tides transport great quantities of water, nutrients, and organic matter in relatively short time periods, subsidizing the wetlands open to these flows as well as the adjacent rivers, lakes, and estuaries.*

Applicants should consider both current and expected future hydrology (including effects of any proposed manipulations), sediment transport, locations of water resources, and overall watershed functional goals before choosing a mitigation site. This is extremely critical in watersheds that are rapidly urbanizing; changing infiltration rates can modify runoff profiles substantially, with associated changes in sediment transport, flooding frequency, and water quality. More importantly, this factor encourages applicants to plan for long-term survival by placing mitigation in areas that will remain as open space and not be severely impacted by clearly predictable development. Consideration of the landscape perspective

requires evaluation of buffers and connectivity (both hydrologic- and habitat-related). Buffers are particularly important to insure that changing conditions are ameliorated, especially in watersheds that have been, or are in the process of being, heavily developed. In addition, because wetlands are so dynamic, adequate buffers and open space upland areas are vital to allowing for wetlands to "breath" (expand and/or decrease in size and function) and migrate within the landscape, particularly in watersheds under natural and/or man-made pressures.

B.3. Pay attention to subsurface conditions, including soil and sediment geochemistry and physics, groundwater quantity and quality, and infaunal communities.

> *Inspect and characterize the soils in some detail to determine their permeability, texture, and stratigraphy. Highly permeable soils are not likely to support a wetland unless water inflow rates or water tables are high. Characterize the general chemical structure and variability of soils, surface water, groundwater, and tides. Even if the wetland is being created or restored primarily for wildlife enhancement, chemicals in the soil and water may be significant, either for wetland productivity or bioaccumulation of toxic materials. At a minimum, these should include chemical attributes that control critical geochemical or biological processes, such as pH, redox, nutrients (nitrogen and phosphorus species), organic content and suspended matter.*

Knowledge of the physical and chemical properties of the soil and water at the mitigation site is also critical to choice of location. For example, to mitigate for a saline wetland, without knowing the properties of the soil and water sources at the mitigation site, it is unlikely that such a wetland is restorable or creatable. Certain plants are capable of tolerating some chemicals and actually thrive in those environments, while others plants have low tolerances and quickly diminish when subjected to water containing certain chemicals, promoting monotypic plant communities. Planning for outside influences that may negatively affect the mitigation project can make a big difference as to the success of the mitigation efforts and meeting watershed objectives.

B.4 Pay particular attention to appropriate planting elevation, depth, soil type, and seasonal timing

> *When the introduction of species is necessary, select appropriate genotypes. Genetic differences within species can affect wetland restoration outcomes, as found by Seliskar (1995), who planted cordgrass (Spartina alterniflora) from Georgia, Delaware, and Massachusetts into a tidal wetland restoration site in Delaware. Different genotypes displayed differences in stem density, stem height, belowground biomass, rooting depth, decomposition rate, and carbohydrate allocation. Beneath the plantings, there were differences in edaphic chlorophyll and invertebrates.*
>
> *Many sites are deemed compliant once the vegetation community becomes established. If a site is still being irrigated or recently stopped being irrigated, the vegetation might not survive. In other cases, plants that are dependent on surface-water input might not have developed deep root systems. When the surface-water input is stopped, the plants decline and eventually die, leaving the mitigation site in poor condition after the Corps has certified the project as compliant.*

A successful mitigation plan needs to consider soil type and source, base elevation and water depth, plant adaptability and tolerances, and the timing of water input. When possible: a) use local plant stock already genetically adapted to the local environment; b) use stock known to be generally free from invasive or non-native species; c) use soil banks predetermined to have desirable seed sources; d) choose soil with desirable characteristics (e.g., high clay composition and low silt and sand composition for compaction

purposes); e) determine final bottom elevations to insure that targeted water regimes are met and the planned plant community can tolerate the water depth, frequency of inundation and quality of water sources.

It is particularly helpful to examine reference wetlands and/or waters near the mitigation area, in order to identify typical characteristics of sustainable waters in a particular watershed or region. This allows one to determine the likelihood of certain attributes developing in a proposed mitigation site. It should be emphasized that wetland restoration is much more likely to achieve desired results than wetland creation, as evidence of a previously existing wetland or other aquatic resources is a strong indicator of what will return, given the proper circumstances. Historical data for a particular site, if available, can also help establish management goals and monitoring objectives. Creating wetlands from uplands has proven to be difficult and often requires extensive maintenance.

B.5. Provide appropriately heterogeneous topography

The need to promote specific hydroperiods to support specific wetland plants and animals means that appropriate elevations and topographic variations must be present in restoration and creation sites. Slight differences in topography (e.g., micro- and meso-scale variations and presence and absence of drainage connections) can alter the timing, frequency, amplitude, and duration of inundation. In the case of some less-studied, restored wetland types, there is little scientific or technical information on natural microtopography (e.g., what causes strings and flarks in patterned fens or how hummocks in fens control local nutrient dynamics and species assemblages and subsurface hydrology are poorly known). In all cases, but especially those with minimal scientific and technical background, the proposed development wetland or appropriate example(s) of the target wetland type should provide a model template for incorporating microtopography.

Plan for elevations that are appropriate to plant and animal communities that are reflected in adjacent or close-by natural systems. In tidal systems, be aware of local variations in tidal flooding regime (e.g., due to freshwater flow and local controls on circulation) that might affect flooding duration and frequency.

While manipulations of natural water supply may not be possible or desirable, changes in topography are possible and should be incorporated in the design of a restored or created wetland/water when needed. Varying the depths of the substrate of the mitigation area ensures a heterogeneous topography, decreasing the likelihood of homogenous plant communities. Rather than plan on one water level or one elevation of the substrate, in hopes of establishing a specific plant community, it is best to vary the depth of the bottom stratum. This will increase the likelihood of success for a more diverse targeted plant community and desired functions.

Appendix B

MULTI-AGENCY COMPENSATORY MITIGATION PLAN CHECKLIST[1]

- ☐ Mitigation Goals and Objectives
  - o Describe functions lost at impact site
  - o Describe functions to be gained at mitigation site
  - o Describe overall watershed improvements to be gained

- ☐ Baseline Information for Impact and Proposed Mitigation Sites
  - o Provide data on physical attributes of sites (soils, vegetation, hydrology)
  - o Describe historic and existing land uses and resources impacted
  - o Describe reference site attributes if available

- ☐ Mitigation Site Selection and Justification
  - o Describe process of selecting proposed site
  - o Likelihood of success, future land use compatibility, etc.

- ☐ Mitigation Work Plan
  - o Location
  - o Construction Plan
  - o Describe planned hydrology, vegetation, soils, buffers, etc.

- ☐ Performance Standards
  - o Identify success criteria
  - o Compare functions lost and gained at impact and mitigation sites
  - o Describe soils, vegetation and hydrology parameter changes

- ☐ Site Protection and Maintenance
  - o List parties and responsibilities
  - o Provide evidence of legal protective measures
  - o Maintenance plan and schedule

- ☐ Monitoring Plan
  - o Provide monitoring schedule, identify party (ies) and responsibilities
  - o Specify data to be collected, including assessment tools and methodologies

- ☐ Adaptive Management Plan
  - o Identify party (ies) and responsibilities
  - o Remedial measures (financial assurances, management plan, etc.)

- ☐ Financial Assurances
  - o Identify party (ies) responsible for assurances
  - o Specify type of assurance, contents and schedule

[1] Refer to "Supplement: Compensatory Mitigation Plan Checklist" for further explanation of specific checklist items.

SUPPLEMENT: COMPENSATORY MITIGATION PLAN CHECKLIST

This document is intended as a technical guide for Clean Water Act (CWA) Section 404 permit applicants[2] preparing compensatory mitigation plans. Compensatory mitigation is required to offset impacts that cannot be avoided and minimized to the extent practicable. The purpose of this document is to identify the types and extent of information that agency personnel need to assess the likelihood of success of a mitigation proposal. Success is generally defined as: a healthy sustainable wetland/water that – to the extent practicable – compensates for the lost functions of the impacted water in an appropriate landscape/watershed position. This checklist provides a basic framework that will improve predictability and consistency in the development of mitigation plans for permit applicants. Although every mitigation plan may not need to include each specific item, applicants should address as many as possible and indicate, when appropriate, why a particular item was not included (For example, permit applicants who will be using a mitigation bank would not be expected to include detailed information regarding the proposed mitigation bank site since that information is included in the bank's enabling instrument). This checklist can be adapted to account for specific environmental conditions in different regions of the U.S.

1. Mitigation Goals and Objectives

Impact Site

a. Describe and quantify the aquatic resource type and functions that will be impacted at the proposed impact site. Include temporary and permanent impacts to the aquatic environment.

b. Describe aquatic resource concerns in the watershed (e.g. flooding, water quality, habitat) and how the impact site contributes to overall watershed/regional functions. Identify watershed or other regional plans that describe aquatic resource objectives.

Mitigation Site

c. Describe and quantify the aquatic resource type and functions for which the mitigation project is intended to compensate.

d. Describe the contribution to overall watershed/regional functions that the mitigation site(s) is intended to provide.

2. Baseline Information - for proposed impact site, proposed mitigation site & if applicable, proposed reference site(s).

a. Location

1. Coordinates (preferably using DGPS) & written location description (including block, lot, township, county, Hydrologic Unit Code (HUC) number, as appropriate and pertinent.
2. Maps (e.g., site map with delineation (verified by the Corps), map of vicinity, map identifying location within the watershed, NWI map, NRCS soils map, zoning or planning maps; indicate area of proposed fill on site map).
3. Aerial/Satellite photos.

b. Classification – Hydrogeomorphic as well as Cowardin classification, Rosgen stream type, NRCS classification, as appropriate.

c. Quantify wetland resources (acreage) or stream resources (linear feet) by type(s).

d. Assessment method(s) used to quantify impacts to aquatic resource functions (e.g., HGM, IBI, WRAP, etc.); explain findings. The same method should be used at both impact and mitigation sites.

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[2] The checklist may be used in other federal or state programs as well; however, additional information may be needed to satisfy specific program requirements. For example, Attachment A indicates additional information needed by the Natural Resources Conservation Service (NRCS) to satisfy the Swampbuster provisions of the Food Security Act.

e. Existing hydrology
   1. Water budget. Include water source(s) (precipitation, surface runoff, groundwater, stream) and losses(s). Provide budgets for both wet and dry years.
   2. Hydroperiod (seasonal depth, duration, and timing of inundation and/or saturation), percent open water.
   3. Historical hydrology of mitigation site if different than present conditions
   4. Contributing drainage area (acres).
   5. Results of water quality analyses (e.g., data on surface water, groundwater, and tides for such attributes as pH, redox, nutrients, organic content, suspended matter, DO, heavy metals).

f. Existing vegetation
   1. List of species on site, indicating dominants.
   2. Species characteristics such as densities, general age and health, and native/non-native/invasive status.
   3. Percent vegetative cover; community structure (canopy stratification).
   4. Map showing location of plant communities.

g. Existing soils
   1. Soil profile description (e.g., soil survey classification and series) and/or stream substrate (locate soil samples on site map).
   2. Results of standard soils analyses, including percent organic matter, structure, texture, permeability.

h. Existing wildlife usage (indicate possible threatened and endangered species habitat).

i. Historic and current land use; note prior converted cropland.

j. Current owner(s)

k. Watershed context/surrounding land use.
   1. Impairment status and impairment type (e.g., 303(d) list) of aquatic resources.
   2. Description of watershed land uses (percent ag, forested, wetland, developed).
   3. Size/Width of natural buffers (describe, show on map).
   4. Description of landscape connectivity: proximity and connectivity of existing aquatic resources and natural upland areas (show on map).
   5. Relative amount of aquatic resource area that the impact site represents for the watershed and/or region (i.e., by individual type and overall resources).

3. Mitigation Site Selection & Justification

a. Site-specific objectives: Description of mitigation type(s) [3], acreage(s) and proposed compensation ratios.

b. Watershed/regional objectives: Description of how the mitigation project will compensate for the functions identified in the Mitigation Goals section 1(c).

c. Description of how the mitigation project will contribute to aquatic resource functions within the watershed or region (or sustain/protect existing watershed functions) identified in the Mitigation Goals section 1(d). How will the planned mitigation project contribute to landscape connectivity?

d. Likely future adjacent land uses and compatibility (show on map or aerial photo).

e. Description of site selection practicability in terms of cost, existing technology, and logistics.

f. If the proposed mitigation is off-site and/or out-of-kind, explain why on-site or in-kind options[4] are not practicable or environmentally preferable.

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[3] That is, restoration, enhancement, creation or preservation: see Regulatory Guidance Letter (RGL) 02-2, Mitigation RGL, for definitions for these terms.

[4] See Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation under Section 404 of the CWA.

g. Existing and proposed mitigation site deed restrictions, easements and rights-of-way. Demonstrate how the existence of any such restriction will be addressed, particularly in the context of incompatible uses.

h. Explanation of how the design is sustainable and self-maintaining. Show by means of a water budget that there is sufficient water available to sustain long-term wetland or stream hydrology. Provide evidence that a legally defensible, adequate and reliable source of water exists.

i. USFWS and/or NOAA Fisheries Listed Species Clearance Letter or Biological Opinion.

j. SHPO Cultural Resource Clearance Letter.

4. Mitigation Work Plan

a. Maps marking boundaries of proposed mitigation types; include DGPS coordinates.

b. Timing of mitigation: before, concurrent or after authorized impacts; if mitigation is not in advance or concurrent with impacts, explain why it is not practicable and describe other measures to compensate for the consequences of temporal losses.

c. Grading plan

1. Indicate existing and proposed elevations and slopes.
2. Describe plans for establishing appropriate microtopography. Reference wetland(s) can provide design templates.

d. Description of construction methods (e.g., equipment to be used)

e. Construction schedule (expected start and end dates of each construction phase, expected date for as-built plan).

f. Planned hydrology

1. Source of water.
2. Connection(s) to existing waters.
3. Hydroperiod (seasonal depth, duration, and timing of inundation and saturation), percent open water, water velocity.
4. Potential interaction with groundwater.
5. Existing monitoring data, if applicable; indicate location of monitoring wells and stream gauges on site map.
6. Stream or other open water geomorphic features (e.g., riffles, pools, bends, deflectors).
7. Structures requiring maintenance (show on map) Explain structure maintenance in section 6(c).

g. Planned vegetation

1. Native plant species composition (e.g., list of acceptable native hydrophytic vegetation).
2. Source of native plant species (e.g. salvaged from impact site, local source, seed bank) stock type (bare root, potted, seed) and plant age(s)/size(s).
3. Plant zonation/location map (refer to grading plan to ensure plants will have an acceptable hydrological environment).
4. Plant spatial structure – quantities/densities, % cover, community structure (e.g., canopy stratification).
5. Expected natural regeneration from existing seed bank, plantings, and natural recruitment.

h. Planned soils

1. Soil profile
2. Source of soils (e.g., existing soil, imported impact site hydric soil), target soil characteristics (organic content, structure, texture, permeability), soil amendments (e.g., organic material or topsoil).
3. Erosion and soil compaction control measures.

i. Planned habitat features (identify large woody debris, rock mounds, etc. on map).

j. Planned buffer (identify on map).

1. Evaluation of the buffer's expected contribution to aquatic resource functions.
2. Physical characteristics (location, dimensions, native plant composition, spatial and vertical structure.

k. Other planned features, such as interpretive signs, trails, fence(s), etc.

5. Performance Standards

a. Identify clear, precise, quantifiable parameters that can be used to evaluate the status of desired functions. These may include hydrological, vegetative, faunal and soil measures. (e.g., plant richness, percent exotic/invasive species, water inundation/saturation levels). Describe how performance standards will be used to verify that objectives identified in 3(b) and 3(c) have been attained.

b. Set target values or ranges for the parameters identified. Ideally, these targets should be set to mimic the trends and eventually approximate the values of a reference wetland(s).

6. Site Protection and Maintenance

a. Long-term legal protection instrument (e.g. conservation easement, deed restriction, transfer of title).

b. Party(ies) responsible and their role (e.g. site owner, easement owner, maintenance implementation). If more than one party, identify primary party.

c. Maintenance plan and schedule (e.g. measures to control predation/grazing of mitigation plantings, temporary irrigation for plant establishment, replacement planting, structure maintenance/repair, etc.).

d. Invasive species control plan (plant and animal).

7. Monitoring Plan

a. Party(ies) responsible for monitoring. If more than one, identify primary party.

b. Data to be collected and reported, how often and for what duration (identify proposed monitoring stations, including transect locations on map).

c. Assessment tools and/or methods to be used for data collection monitoring the progress towards attainment of performance standard targets.

d. Format for reporting monitoring data and assessing mitigation status.

e. Monitoring schedule

8. Adaptive Management Plan

a. Party(ies) responsible for adaptive management.

b. Identification of potential challenges (e.g., flooding, drought, invasive species, seriously degraded site, extensively developed landscape) that pose a risk to project success. Discuss how the design accommodates these challenges.

c. Discussion of potential remedial measures in the event mitigation does not meet performance standards in a timely manner.

d. Description of procedures to allow for modifications of performance standards if mitigation projects are meeting mitigation goals, but in unanticipated ways.

9. Financial Assurances

a. For each of the following, identify party(ies) responsible to establish and manage the financial assurance, the specific type of financial instrument, the method used to estimate assurance amount, the date of establishment, and the release and forfeiture conditions:

1. Construction phase
2. Maintenance
3. Monitoring
4. Remedial measures
5. Project success

b. Types of assurances (e.g., performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, etc.).

c. Schedule by which financial assurance will be reviewed and adjusted to reflect current economic factors.

Appendix B

ATTACHMENT A
NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
PROGRAM REQUIREMENTS[5]

- ☐ NRCS conservation practice standards and specifications
- ☐ NRCS Environmental Evaluation
- ☐ Mitigation agreement
- ☐ Federal/State/Local required permits
- ☐ Compatible use statement:
  - o Allowable uses (e.g. hunting, fishing)
  - o Prohibited uses (e.g. grazing, silviculture)
  - o Uses approved by compatible use permit
- ☐ Copy of recorded easement
- ☐ Subordination waiver on any existing liens on mitigation site
- ☐ Statement of landowner's tax liability
- ☐ Copy of Warrantee Deed from landowner's attorney (no encumbrances, if so list)
- ☐ Copy of certified wetland determination:
  - o NRCS-CPA-026 Highly Erodible Land and Wetland Conservation Certification
  - o Wetland label map
- ☐ Copy of FSA Good Faith Waiver
- ☐ Copy of easement(s) ingress/egress granted to USDA employees for gaining legal access to mitigation site
- ☐ Copy of NRCS-CPA-38 Request for Certified Wetland Determination/Delineation

[5] For a complete list of the program requirements needed by NRCS to satisfy the Swampbuster provisions of the Food Security Act see the National Food Security Act Manual.