Department of the Army
Kansas City District, Corps of Engineers
Kansas City District Regulatory Office

KANSAS STREAM MITIGATION GUIDANCE (SMG)

This SMG document was jointly created with input from the following federal and state agencies:
US Army Corps of Engineers (Corps)
*US Environmental Protection Agency (EPA)
*US Fish and Wildlife Service (FWS)
*Kansas Dept. of Wildlife and Parks (KDWP)
*Kansas Biological Survey (KBS)
USDA – Natural Resources Conservation Services (NRCS)
Kansas Dept. of Agriculture – Division of Water Resources (DWR)
Kansas Dept. of Heath and Environment (KDHE)
Kansas Dept. of Transportation (KDOT)
Kansas Water Office (KWO) – Committee Chair
Kansas State Conservation Commission (SCC)
State Association of Kansas Watersheds (SAKW)

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* Agencies which comprised the technical working committee (page 23).

GENERAL INFORMATION

1. Applicability.

This document defines the Stream Mitigation Guidance (SMG) for compensatory stream mitigation within the state of Kansas, including Indian Country. It describes the method for quantifying the unavoidable adverse impacts (debits) and the acceptable compensatory mitigation (credits) in relation to a project that would result in more than minimal adverse impacts to a stream. It is applicable to Corps regulatory actions requiring compensatory mitigation for adverse ecological effects where more rigorous, detailed functional assessment techniques such as the Hydrogeomorphic (HGM) methodology are not available or are not considered practical or necessary. The following points are noted:

- All types of stream systems (ephemeral, intermittent or perennial) can be evaluated under this SMG. Impacts to streams are calculated based upon the existing stream condition and proposed type of impact in combination with overall linear footage, which are ultimately defined as "debits."
- This SMG does not address mitigation for categories of effects other than permitted activities. Types of mitigation other than compensation (e.g., avoidance, minimization, reduction) are not addressed by this SMG. This SMG do not obviate or modify any requirements of the Section 404(b)(1) Guidelines or other applicable documents regarding avoidance, sequencing, and minimization. Such requirements shall be evaluated during consideration of permit applications. This SMG was developed in coordination with State and Federal agencies to enhance its effectiveness and acceptability. When this SMG is used in the establishment of a mitigation bank, the Corps will consult with the Interagency Review Team (IRT), with the goal of achieving a consensus of the IRT regarding the factors, elements, and design of the Mitigation Banking Instrument. From the date of adoption, this document will be reviewed and, if necessary, modified annually or as needed.
- Some applicant-sponsored projects may require both stream and wetland mitigation to offset adverse impacts. However, for impacts to streams where impacts extend to adjacent or neighboring wetlands, this SMG will be used to calculate mitigation only for the stream. Not all projects will require mitigation. Compensatory stream mitigation requirements will be determined on a case-by-case basis.
- This SMG was developed from other Corps District procedures (including Missouri, Omaha, Charleston and Savannah). Corps Regulatory Guidance Letter (RGL) 02-2 was also referenced. It is intended that this SMG be compatible with this and other appropriate Corps RGLs. [NOTE: RGL 02-2 was replaced by the "Mitigation Rule" published at 33 Code of Federal Regulations (CFR) Parts 325 and 332.]

2. Purpose.

The intent of this SMG is to provide a written framework that will provide predictability and consistency for the development, review, and approval of compensatory stream mitigation plans. A key element of this SMG is the establishment of a method for calculating compensatory mitigation debits and 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, using this guidance should not be interpreted as a promise or guarantee of project assurance, approval or any absolute guarantee of mitigation acceptability. Site specifics of a particular project may warrant alternative mitigation requirements.

Disclaimer. Mention of any trade names or commercial products does not constitute endorsement or recommendation for use. This document is not a regulation itself, nor does it change or substitute for statutory provisions and regulations.

3. Projects Not Requiring Mitigation.

Corps regulations at 33 CFR Part 323.4(a) list specific activities exempt from Section 404 regulations.

4. Corps Regulatory Authorities, Guidelines, and Policy on Stream Mitigation.

In addition to the policies and requirements set forth in this document, other federal, state or local agencies within Kansas may require additional mitigation. The policies and regulations regarding mitigation can change and it is possible that new guidance will result in periodic modifications to this SMG. Efforts have been made in the preparation of this document to incorporate the most recent Corps policy. If a discrepancy with any relevant Corps policy is discovered, users should notify the Corps of the item and the Corps will review relevant policy, obtain clarification, and modify this SMG as necessary.

Regulatory Authorities & Guidelines

Section 10 of the Rivers and Harbors Act of 1899 authorizes the Corps of Engineers to regulate all work in, over, and under navigable waters of the United States.

Section 404 of the Clean Water Act, as amended in 1977, authorizes the Corps of Engineers to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. The purpose of the Clean Water Act is to restore and maintain the physical, chemical, and biological integrity of the nation's waters.

Section 230.10 (d) of the Section 404 (b)(1) Guidelines states that "no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem." The Section 404 (b)(1) Guidelines require the application of a sequence of mitigation - avoidance, minimization and compensation. In other words, mitigation consists of the set of modifications necessary to avoid adverse impacts altogether, minimize the adverse impacts that are unavoidable and compensate for the unavoidable adverse impacts. Compensatory mitigation is required for unavoidable adverse impacts, which remain after all appropriate and practicable avoidance and minimization has been achieved.

Section 401 of the Clean Water Act provides authority for the state water quality agency to determine if the proposed action will violate water quality standards through a water quality certification. KDHE is the certifying agency with the exception of Indian Country. Indian Country certifications are issued solely by the EPA. Mitigation activities are included in the conditions of the 401 water quality certification.

http://www.nwk.usace.army.mil/regulatory/2007nwps/KS401.pdf
http://www.nwk.usace.army.mil/regulatory/2007nwps/2007%20NWP%20Regional%20Condition%20PN.pdf
http://www.nwk.usace.army.mil/regulatory/2007nwps/EPA401.pdf
For additional/specific information regarding the 401 permitting process contact KDHE
http://www.kdheks.gov/water/index.html

Relationship to other federal, tribal, state, local programs: except for projects undertaken by federal agencies, or where federal funding is specifically authorized to provide compensatory mitigation, federally-funded conservation projects undertaken for purposes other than compensatory mitigation such as Wetland Reserve Program (WRP) and the Partners for Fish and Wildlife Program activities, cannot be used for the purpose of generating compensatory mitigation credits for activities authorized by DA permits. However, compensatory mitigation credits may be generated by activities undertaken in conjunction with, but supplemental to, such programs in order to maximize the overall ecological benefits of the conservation project (See regulations at 33 CFR 332.3 (j) and 40 CFR 230.93 (j)).

Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (Mitigation Rule), dated 10 April 2008, states regulations governing compensatory mitigation for activities authorized by permits issued by the Department of the Army. The regulations establish performance standards and the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs to improve the quality and success of compensatory mitigation projects for activities authorized by Department of the Army permits. This Final Rule can be found at **33 CFR Parts 325 and 332**.

Regulatory Guidance Letter (RGL) 02-02 provides guidance toward compensatory mitigation projects 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 of 1899**. This guidance requires compensatory mitigation to replace aquatic resource functions unavoidably lost or adversely affected by authorized activities. RGL 02-02

provides important guidance on compensatory mitigation including requiring the increased use of functional assessment tools, improved performance standards, and a stronger emphasis on monitoring with the purpose of improving the success of compensatory mitigation projects. [**Replaced by Mitigation Rule.**]

Regulatory Guidance Letter (RGL) 05-05 provides guidance for identifying the ordinary high water mark. RGL 05-05 applies to jurisdictional determinations for non-tidal waters under Section 404 of the Clean Water Act and under Sections 9 and 10 of the Rivers and Harbors Act of 1899.

Regulatory Guidance Letter (RGL) 06-03 provides guidance toward the minimum monitoring requirements, including the required content for monitoring reports, for compensatory mitigation projects involving the creation, restoration, and/or enhancement of aquatic resources. [**Replaced by RGL 08-03.**]

District Mitigation and Monitoring Guidelines are developed by each individual District to address mitigation activities. Each Corps District has developed mitigation and monitoring procedures specific to that District. These are subject to review and modification as needed by each District and are available on each District's website.

5. Mitigation Objectives.

Generally, mitigation in Kansas should be designed in accordance with the following guidelines:

5.1. Objectives.

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 (addressed by this SMG).

Resource and regulatory agencies have adopted this definition to apply in a sequential manner. Applicants must demonstrate first that they have avoided impacts when practicable, and that unavoidable impacts have been minimized to reduce adverse impacts to the aquatic resource before compensatory mitigation is considered.

The goal of compensatory mitigation is the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters by replacing unavoidably lost stream functions as close as possible to the impact site. The Mitigation Rule further addresses the siting preference for Mitigation Banks, In-lieu fee Mitigation and watershed based mitigation. All such mitigation actions relate to one or more of the following:

- *Biological Integrity* involves the natural state of all living organisms using aquatic systems. Biological functions include shelter, food production, reproduction, and movement, etc.
- *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, and water quality.
- *Physical Integrity* involves the natural contiguity of aquatic systems. Physical functions include natural flow regime, flood attenuation, storm surge reduction, groundwater exchange, maintenance of suitable thermal regimes, navigation and commercial, recreational and cultural uses.

5.2. Possible Mitigation Activities.

Projects involving stream channel or stream bank manipulation may result in unavoidable impacts to the aquatic resources associated with the stream. Projects may also result in the discharge of fill materials into the stream altering its physical, chemical or biological characteristics. These alterations can result in adverse

impacts to aquatic resources that may require mitigation. Impacts may be in terms of direct fill or adverse modification of in-stream habitat or morphology, loss of natural stream function, and negative alterations and/or degradation of stream functions. Compensatory mitigation for adversely impacted streams will require a combination of in-stream restoration and riparian improvement. Activities that constitute restoration/improvement include, but are not limited to: stream channel restoration; non-rigid (soft) bank stabilization; impoundment removal; livestock exclusion/reduction devices and practices; road crossing improvements; removal of foreign objects from streams; fish screens and fish passage features; dedication of a water right to be placed in the custodial care of the state; creation of wildlife corridors; re-vegetation of riparian areas; removal of exotic/invasive species; creation of a floodplain; or other similar actions. The intent of this SMG, in accordance with regulatory requirements, is to promote in-stream, in-kind and on-site compensatory mitigation, to keep the mitigation near the proposed adverse in-stream impact(s). It is also recognized that in some cases, riparian preservation/enhancement may be the most effective means of stream mitigation (Section 15 on page 16). For purposes of this SMG, a minimum of 25% of the required mitigation must be generated from in-stream credits. Preservation of existing aquatic and upland resources in buffer zones/riparian areas is also a component of stream mitigation.

All restoration/enhancement measures should be designed with the goal of improving habitat, biological and morphological integrity, and water quality.

Information on stream restoration principles and techniques can be found in:

Stream Corridor Restoration: Principles, Processes and Practices, 1999, compiled by the Federal Interagency Stream Restoration Working Group, National Technical Information Service, Springfield, Virginia, Government Printing Office Item No. 0120-A.

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

Watershed Assessment of River Stability and Sediment Supply (WARSSS), 2006, D.L. Rosgen. Wildland Hydrology Books, Ft. Collins, Colorado.

5.2.1. 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 alter the stability and function of streams including changes in stream flow, sediment regime, land use within the watershed, and direct disturbances (e.g., channelization, culverts, bridges and loss of bank stabilizing riparian vegetation). Restoration of natural stream stability may require 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. It may entail changes in the stream's dimension, pattern and profile, consistent with appropriate stream type and valley slope, to re-establish stability. Reference reach data from a stream or stream(s) of the same target stream type and valley type, both being from the same ecoregion, should serve as a template for the design of the dimensions, pattern, profile, bed material and erosional processes of the stream targeted for restoration (Rosgen, 1996 and 2006). It is important to develop restoration plans in consultation with appropriate resource and regulatory agencies.

5.2.2. Bank Modifications.

The baseline level of bank erosion is an integral component of a streams overall stability and character. Erosional rates and locations depend on the hydrology, geology, vegetation and land use at any one point in time. The benefits of bank erosion include the introduction of materials from which point bars are created or extended, that in-turn provides substrate for riparian vegetation establishment, habitat creation, and maintenance of morphological characteristics. However, accelerated bank erosion can be viewed as a process that needs correction before it results in damages to adjoining property. In many instances, anthropogenic actions result in

accelerated rates of bank erosion that can exceed the streams sediment transport capacity, causing local deposition and stream aggradation over a given reach, which in turn leads to high width/depth ratios and additional erosional issues.

Bank stabilization can be accomplished using a variety of techniques. Techniques that use materials natural to the stream and that mimic the appropriate stream morphology, including in-channel features, are preferred over those that harden or armor stream banks such as concrete or riprap. Structures designed to reduce energy at the bank, and that use native stone, may be acceptable if needed to reestablish proper channel geometry and erosion/ deposition rates. However, the installation of certain types of channel structures may not be successful in certain stream types. The quantity of stone used should be the minimum amount required to stabilize the eroding reach. Structures combined with bank shaping/sloping and vegetation reestablishment will receive higher credit than those using stone alone. Specific success criteria should be developed for each technique used in the mitigation project to ensure the proposed project has no adverse secondary impacts.

Note: Broad watershed assessment should be made as bank instability may be an indicator of a more complex systemic problem to establish/maintain proper channel morphology, erosion and deposition rates, meander patterns and riparian vegetation. This assessment would also help ensure long term project success.

5.2.3. In-stream Habitat Recovery.

In-stream habitat recovery is controlled by factors such as stream flow, channel structure, cover, water quality and condition of riparian corridors. Generally, to improve in-stream habitat, proposals including riparian management (creation/enhancement/preservation) and/or creation of pool and riffle habitat are encouraged. For the purposes of this guidance, man-made structures are generally considered less desirable than those features of a stable channel. Therefore, project designs should mimic natural features to the greatest extent practicable. Stable stream channels normally provide adequate habitat and caution is needed to ensure that proposed fish habitat structures such as rock/log vanes, cross-vanes, check dams and weir structures do not result in upsetting natural stream processes or improve one type of habitat at the expense of another. In-stream 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 and introduce features that are inconsistent to the stream. In addition, differing stream types may be incompatible with certain prescribed habitat structures (i.e. placing riffles in sand bed stream systems). Where such man-made structures are deemed beneficial, periodic review and/or maintenance should be incorporated into project plans.

5.2.4. 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 natural stream functions. However, without sufficient evaluation, dam removal may 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 Aquatic Organism Passage (AOP), revegetating the reservoir area, and long term monitoring of sediment transfer, water quality, stream channel morphology and aquatic ecology.

5.2.5. Livestock Exclusion.

Where a documented problem exists, fencing and reduced grazing are measures that can be used to manage livestock along streams thereby avoiding bank degradation, sedimentation, and water quality problems in streams. Creditable actions include: fencing stream and riparian corridors, construction of controlled stream crossings with stable, protected stream banks, and or eliminating access entirely, providing alternative livestock drinking water sources located away from the stream corridor such as those found http://www.oznet.ksu.edu/glwq/pdf/FINAL Waterer handbook.pdf.

Note: Total livestock exclusion with native riparian restoration will generate more credit.

5.2.6. Road Crossing Improvements.

Properly constructed road crossing improvements can reconnect natural floodplains, maintain/reestablish natural flow regimes, and prevent downstream scour and/or upstream ponding. It should be noted that removal and/or maintenance of culverts could initiate instability of the stream channel. Improvements include, but are not limited to:

- Removal of culverts and bridges or replacing them with one that allows formation and creation of proper dimension, pattern, and profile.
- Providing floodplain culverts in existing roadbeds.
- Resetting or resizing culverts which block AOP and/or interfere with stream processes.

5.2.7. Establishment of Natural Buffers.

Natural buffers provide functions such as surface runoff filtration, bank stabilization, stream shade, wildlife corridors, and contribution of woody debris and detritus. Buffer enhancement can be accomplished by revegetating with appropriate native riparian species and/or removal of exotics. Streams typically require additional buffer protection in comparison to wetlands. For purposes of obtaining buffer enhancement credit, buffer widths should be a minimum width of 50 feet landward from top of streambank (see Requirements for Minimum Buffer Width, page 17). Buffer zones can include aquatic and/or upland resources that can be preserved as is or enhanced for additional credits.

5.2.8. Other Enhancement.

The Corps, in consultation with other 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 storm water detention facilities, restoration of in-stream flow in a de-watered stream by, but not limited to, a dedication of a water right to be placed in the custodial care of the state, construction of off channel storm water detention facilities in areas where runoff is accelerating stream bank erosion and other watershed protection practices such as removal of exotic/invasive species.

5.2.9. Acquisition of Wildlife Corridors/Crossings.

Acquisition or restoration, along with legal protection, of critical wildlife corridors or crossings necessary to maintain contiguous corridors between and/or along streams and riparian areas could be accepted as mitigation on a case by case basis.

5.2.10. Creation of Floodplains.

In some instances, natural or anthropogenic activities sever the floodplain from the active stream channel (e.g. levee or berm construction along a stream channel, or channel degradation), resulting in channel incisement/entrenchment, increased bed and bank erosion, lowering of the water table, reduced productivity in the riparian area, etc. Measures that re-connect the channel to its floodplain will receive credit under this program. The floodplain may be upland, wetland or a combination thereof. In some cases, a natural and fully functional floodplain may have numerous “high flow” channels or side channels that are normally dry, but help convey peak flows. Where appropriate, restoration or re-establishment of these high flow channels in floodplains which were artificially disconnected will receive credit.

5.2.11. Water Rights.

The applicant proposing large stream restoration projects may provide, along with other planning and design elements of the mitigation plan, a form of commitment such as: the acquisition of water rights in and near the projects and placement of those rights in the custodial care of the state to ensure protection of the resource. Such applicants should coordinate with the DWR Chief Engineer’s office and be aware of the provisions of KSA 2-1915 and 1919, and KSA 82a-707. The utilization of this mitigation activity will remain to be

considered on a case-by-case basis and limited to areas specifically designated by the state under the Water Transition Assistance Program (WTAP). The following websites deal with water rights issues.

http://www.ksda.gov/includes/document_center/appropriation/DWR_forms/1_100_17.pdf
http://www.ksda.gov/includes/document_center/appropriation/DWR_forms/1_100_172.pdf
http://scc.ks.gov/index.php?option=com_content&task=view&id=715&Itemid=155

5.3. Stream Assessments.

A. Pre-Construction Assessment: Units used in calculating required mitigation (debits) are based on the existing condition of the aquatic resource before project implementation, and its future without the proposed project. For example, if a riverine water body is to be impacted by impounding, then the debits shall be calculated based on the existing condition, which is riverine waters, not impounded waters. The stream reach proposed for alteration shall be evaluated as it existed prior to any recent (within approximately two years) anthropogenic alterations such as clearing, ditching, sedimentation, etc. (i.e. via use of aerial photography or imagery).

B. Post-Construction Assessment: 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 water body to a natural riverine water body, then the proposed mitigation credits are calculated based on the units of the resulting riverine waters, not the existing impounded waters.

5.3.1. Impacts vs. Improvement.

Calculation of credits is ultimately based on a combination of linear feet and factors that convert to credits, as the dimensionless unit of measure. Measurements for linear feet of streams shall be along the centerline of the channel, except for some features that involve work only on one bank of larger streams, where the length of project on each bank may be considered. Mitigation tables (Appendix D, page 32) and definitions of factors (Section 11, page 11) are included in this SMG.

5.4. Adverse Impacts Area.

The area of adverse impacts as used in this document includes stream areas impacted by filling, excavating, inundation, draining, clearing, channelizing, straightening, shortening, canalizing, piping, incising/entrenching, culverting or other adverse actions. Other categories of effects such as aesthetic, cultural, historic, health, etc., are included in the Corps assessment of the project, but are not addressed by this SMG, which is limited to physical, chemical and biological impacts to stream channels. 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.
- Cumulative effects which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions.

5.5. 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, 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 riverine system. Incorporation of a mitigating design feature such as a bankfull riparian planting bench in a revetment is an example of an exception to this general rule.

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 contains some restoration and some enhancement could 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.

5.6. Restoration/Enhancement.

Proposed restoration/enhancement plans must include the following information:

- An explanation of what functions and the condition/degree to which those functions are being restored/enhanced.
- A narrative description of how the restoration/enhancement will be accomplished.
- A narrative description of what and how the buffer will protect specific functions and/or resources. Include species specific information (i.e. black willow not just willow).

5.7. Lakes, Ponds and Impoundments.

Mitigation using lakes, ponds, and impoundments will generally not be acceptable as compensatory mitigation for adverse impacts to riverine systems.

5.8. Location Factor.

Where practicable and environmentally desirable, all mitigation should be at or near the project site or within the same watershed (8-digit HUC) as the area of adverse impacts. Mitigation off-site or outside the watershed boundary will result in a lower credit calculation due to the kind and location factors in the tables. Out-of-watershed compensatory mitigation is not acceptable unless an exception is granted. Larger watershed boundaries may be allowed for consolidated mitigation options such as mitigation banking and in-lieu fee projects to ensure program viability.

5.9. Mitigation Construction Timing.

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 100% completion of the approved mitigation concurrent with completion of the permitted project. **Note**: a higher credit value is given for pre-construction mitigation.

5.10. Temporal Lag Functional Replacement Factor.

A temporal lag factor is included in the credit calculations to help account for the time lag in functional replacement.

5.11. Maintenance.

Proposed mitigation plans that require perpetual or long-term human intervention/maintenance will usually not be acceptable. Mitigation areas should be designed to be naturally sustaining without human input 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 generally not be acceptable. The goal is to achieve a natural state that does not depend upon maintenance.

5.12. 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 projects. For

creation proposals and other complex mitigation projects, such consultation is likely to improve the likelihood of mitigation success and reduce permit-processing time.

5.13. Legal Protection.

An appropriate real estate instrument, approved in advance by the Corps, will be required to protect the mitigation work in perpetuity. Third party grantee protection will receive higher credit value. For additional information (see Control/Site Protection on page 18). Consolidated mitigation sites, such as banks and In-lieu fee projects, must be protected by an adequate legal encumbrance.

6. Variance/Approval.

The Corps, at its discretion, may determine that the KSMG calculated mitigation is not appropriate based upon Section 404(b)(1) Guideline Analysis, Public Interest Review Factors, Threatened and Endangered Species concerns or other appropriate factors. In the event it is determined that calculated mitigation is inappropriate for the identified adverse impacts, the Corps will consult with relevant agencies when appropriate and determine an alternate level or type of mitigation. The KSMG calculated mitigation will generally be used as a baseline. The Corps, in administration of its regulatory authority, may waive any provision of this guidance, or use alternate approved assessment methodologies, provided the variance is documented and the final mitigation plan is determined to comply with the Mitigation Rule.

7. Mitigation Banking.

Proposals that include credits from a mitigation bank must normally comply with the Mitigation Rule (33 CFR 325 and 332).

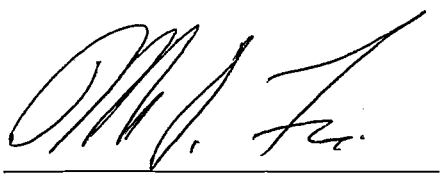
8. Stream Mitigation Costs.

Costs for mitigation are dependent upon a combination of relatively specific costs for design, construction, monitoring and contingencies, and maintenance. Other less readily definable costs associated with banks and an in-lieu fee program include those for securing real estate instruments (easement, fee title, title search, covenants, enforcement protection, administration, etc.) and overall management of an In-Lieu Fee Program. All costs are the responsibility of the applicant. Financial assurances in the form of a bond or other similar binding document may be applied to assure funds will available to complete mitigation via a bank or directly with the applicant.

9. Point of Contact.

Copies of this document are available on the Kansas City Regulatory Office website at www.nwk.usace.army.mil/regulatory/regulatory.htm. Questions regarding use of this policy for specific projects must be addressed to the Corps Project Manager handling the action. Other general inquiries or comments regarding this document may be addressed to the U. S. Army Corps of Engineers, Kansas City District Office.

10. Authorizing Signature. By the signature given below, this SMG is authorized for use.



30 October 2008
Date

Mark D. Frazier
Chief, Regulatory Branch
Operations Division

COMPENSATORY STREAM MITIGATION – THE PROCESS

11. Mitigation Options.

In general, there are four options available to an applicant to implement compensatory stream mitigation. The options discussed and listed below are not listed in order of preference (Note: the Mitigation Rule identifies sequential mitigation preference). The first option is project specific mitigation designed to compensate for impacts associated with a proposed project. The second option is to pay a calculated fee to an In-Lieu Fee Sponsor. The third option is to buy credits from an established stream mitigation bank. The fourth option is a combination of two or more of the above. The cost of compensatory mitigation will vary according to the option selected by the applicant. These options are described in more detail below.

1. Project Specific Mitigation: The applicant may prepare his/her own mitigation proposal or hire a consultant to prepare a mitigation plan and, if approved by the Corps, implement and ensure success of the plan at their own expense.
2. Pay an In-Lieu Fee: The applicant may elect to pay a fee to an In-Lieu Fee (ILF) sponsor. Fees will be calculated based on a per-credit basis. The process described in this guidance determines the number of required credits. The ILF Sponsor determines the cost per credit. The ILF sponsor assumes responsibility for the mitigation obligation upon acceptance of the negotiated fee. Upon collection of sufficient fees within a given service area, the ILF sponsor will complete a stream mitigation project that satisfies the mitigation obligation.
3. Purchase Bank Credits: The applicant may elect to purchase credits from an approved Mitigation Bank. In this case, the bank sponsor will determine the cost per credit and total cost for purchasing an appropriate number of credits.
4. Combination of above: With Corps' approval, the above options may be combined to satisfy a compensatory mitigation obligation.

12. The Mitigation Equation.

When compensatory mitigation is required, it will be determined through the following definitions, tables, and worksheets. This guidance is based on an empirical analysis of indicator factors related to important stream functions. It establishes a clear, understandable, and consistent method for use by applicants and regulators. As additional data are gathered and analyzed, the SMG may be periodically reviewed and revised. When using these equations, use the most recently approved edition of the tables.

Simply stated, the mitigation equation establishes that the Proposed Mitigation Credits (PMC) must be equal to or greater than the Mitigation Debits (Debits). *The portion of the PMC resulting from stream channel restoration, as compared to work in the riparian buffer, must satisfy at least 25% of the Debits.* The mitigation credits and debits are calculated using the options and factor definitions described in the next section.

STREAM MITIGATION DEBITS

13. Adverse Impact Factors / Definitions:

Streams are not simply storm water conveyances, but are complex ecosystems with morphological characteristics that are dependent on appropriate geomorphic dimension, pattern, and profile, as well as biological and chemical integrity. The following factors will determine the amount of mitigation credits required:

Stream Type: For purposes of this SMG, only three categories of streams are defined: ephemeral/intermittent, intermittent with permanent pools and perennial. Solid blue lines on a USGS topographic quad sheet (map), generally represent perennial streams (see Appendix B page 24 for definitions).

Stream Priority Status: is a factor used to determine the importance of the stream that would be **impacted** or **used for mitigation**. This status will influence the amount of stream credits generated. As new knowledge becomes available, a stream may change to a different category on a case-by-case basis. **Note:** If a stream falls into more than one category the higher priority status is to be utilized. The priority status areas are divided into three categories:

Primary: These streams and riverine systems (including associated tributaries) provide very important contributions to biodiversity on an ecosystem scale or high levels of function contributing to landscape, social, economic or human values. Impacts to these streams should be rigorously avoided or minimized. Compensation for impacts in these streams should emphasize replacement nearby and in the same immediate 8-digit hydrological unit code (HUC 8) watershed. Designated primary priority areas include:

- National Wild and Scenic Rivers and those streams listed on Nationwide Rivers Inventory,
- Outstanding National Resource Waters,
- Exceptional State Waters,
- Special Aquatic Life Use Waters,
- Waters within Federal/State protected areas (Parks, designated Natural Areas, Wildlife Refuges, etc.),
- Stream Reference Reach Sites,
- *Waters with listed Federal or State Endangered / Threatened species,
- *Designated Fish Spawning Habitat / Native Freshwater Mussel Refuges,
- Waters with outstanding Fisheries Resource Value as reported by the Kansas Dept. of Wildlife and Parks,
- Highest Value and High Priority waters as identified in the Kansas Stream and River Fishery Resource Evaluation, 1981.

* These areas are determined on a case by case basis in coordination with the U.S. Fish and Wildlife Service and Kansas Department of Wildlife and Parks.

Secondary: Secondary priority areas include:

- Waters on the 303(d) list, impaired by sediment, dissolved oxygen and nutrients or has impaired biology (www.kdheks.gov/tmdl/index.htm).
- All streams within one of the following Kansas watersheds targeted for water quality improvement (KDHE, and US EPA): Mill Creek (Geary, Wabaunsee, and Pottawatomie Counties), Marmaton River, Vermillion Creek, Little Arkansas River and Cheney Lake.
- Streams adjacent to an approved mitigation bank or mitigation site.
- Stream reaches within ½ mile upstream or downstream of primary priority reaches.
- Stream or river reaches within high growth areas that are not ranked as primary priority areas. Contact a Corps employee for any District designations.

Tertiary: These areas include all other streams not ranked as primary or secondary priority.

Existing Condition is a reflection of the functional state of a stream before any project impacts that would occur from an applicant's proposed project. This is a measure of the stream's natural stability and resilience relative to the physical, chemical and biological integrity of the system. The impaired waters database [303(d) List] (www.kdheks.gov/tmdl/index.htm) can be consulted to help determine the existing condition of many Kansas streams. If a stream is impaired, it cannot be considered fully functional. **Note:** If its condition has a characteristic that would allow it to be placed in more than one category, the higher category should be utilized. Use the definitions below to determine the existing condition. (See Appendix B, page 24, for data submission requirements).

* If the existing condition cannot be properly determined, the "Fully Functional" value should be utilized.

Fully Functional means that the physical geomorphology of the stream reach is stable (see definition of stable stream on page 22) and is representative of an appropriate stream hydrograph for the topographical setting and watershed characteristics. The biological community, as appropriate to the stream, is diverse and unimpaired by excessive anthropogenic inputs. For purposes of this SMG, a fully functional stream has one or more of the following characteristics:

- Has no more than one existing stream impact within 0.5 stream miles upstream or downstream of the proposed stream impact, including perched culverts, pipes, impoundments, or other manmade modifications (less than 30 feet of impacted section).
- Does not exhibit channel incision and headcutting. The entrenchment and width/depth ratios at bankfull discharge (as defined, on pages 21 and 23) are appropriate for its stream type relative to unimpaired stream condition based on reference reach data.
- Shows little evidence of accelerated sedimentation or erosion.
- The existing riparian buffer is a minimum of 25 feet in width on both sides of the stream and consists of deep-rooted native vegetation.
- Scores between 8-10 if using the KDWP Stream Habitat Evaluation (www.kdwp.state.ks.us/news/other_services/environmental_reviews/aquatic_field_habitat_evaluations)

Exception: The Corps, at its discretion, may designate the largest streams within an 8-digit HUC as fully functional, regardless of whether they meet the criteria above, based on the streams recreational, commercial, or water supply values. Contact a Corps employee for any District designations.

Moderately Functional means that the stability and resilience of the stream 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 SMG, a moderately functional stream generally has one or more of the following criteria:

- The entrenchment ratio and width/depth ratio at bankfull discharge is inappropriate for the stream type relative to the unimpaired stream conditions based on reference reach data.
- The stream shows moderate accelerated sedimentation and erosion.
- The stream has a moderate riparian buffer of deep-rooted vegetation present (minimum of at least 10 feet on both sides of the stream).
- The stream has no more than four stream impacts within 0.5 stream miles upstream or downstream of the proposed stream impact, including culverts, pipes, or other manmade modifications (with less than 100 feet of impacted section).
- Scores between 5.6-7.9 if using the KDWP Stream Habitat Evaluation.

Functionally 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, unless restoration is undertaken. For purposes of this SMG, a functionally impaired stream generally has one or more of the following criteria:

- The entrenchment ratio and width/depth ratio at bankfull discharge is inappropriate for the stream type relative to the 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”).
- The stream has extensive accelerated sedimentation.
- The stream has little to no riparian buffer of deep-rooted vegetation on one or both stream banks.
- The stream has banks that are extensively eroded or unstable.

- The stream has five or greater stream impacts within 0.5 stream miles upstream of the proposed stream impact, including culverts, pipes, impoundments, or other manmade modifications.
- Scores between 1.0 - 5.5 if using the KDWP Stream Habitat Evaluation.

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

Temporary means impacts will occur within a period of less than 12 months and recovery of system integrity will follow completion of the permitted activity, or active restoration of the site. For example, temporary structures which will be removed and site restored to pre-project/stable contour and conditions.

Short Term means impacts will remain evident after one year and will not exist after two years.

Permanent means project impacts will remain for greater than 2 years. Examples: armoring, detention, morphological change, impoundment, piping, and channelization.

Impact Activity is the type of impact proposed that will diminish the functional integrity of the riparian system. Nine categories of impact are used.

Clearing means activities, such as streambank vegetation clearing that reduce or eliminate the diversity, quantity, quality and functions of the vegetation within the riparian habitat zone (e.g. clearing vegetation for utility lines, pipelines, bridge ends, etc.). Although these impacts may not be directly regulated, mitigation for these activities may be required if the impact occurs as a result of, or in association with, an activity requiring a permit.

Utility crossings mean open cut construction or other pipeline/utility line installation methods that require temporary disturbance of the streambed.

Below Grade Culvert means to route a stream through an embedded pipe, box culvert, or other enclosed structure (≤ 100 linear feet of stream to be impacted per crossing). The culvert flowline including head and toe-walls be set to a depth of no less than 12-inches below thalweg of the flowline out. If bedrock exists throughout the culvert area, a bottomless culvert should be considered. To deter aggradation, the below grade culverts' pilot cell(s) should be further designed to pass bankfull flow, while flows greater than bankfull should be passed through other cells with their flowline set at the bankfull elevation. Culverts should be designed to allow fish and other aquatic organism passage and allow other natural stream processes to occur unimpeded. If a culvert does not meet the requirements of a below grade culvert, the structure will be evaluated under a Dominant Impact Factor as a "Pipe" thus will receive fewer credits.

Armor means to riprap, bulkhead, or use other hard methods to contain stream channels, leaving stream bed unaltered. Examples: any type of riprap, gabions, retaining walls, etc. (i.e. bridge ends protected by riprap will use "armor" as the Dominant Impact category.

Note: armoring of the stream bed should be assessed as a "Morphologic change".

Diversion/Weir means to place a weir in a stream to slow or to divert water to a channel when bankfull is reached. The structure should be designed to pass flows below bankfull stage and aquatic organisms. Impacts to the stream channel where the structure is located are considered fill, as defined below. Examples: hard point jetties, long jetties, dikes, cofferdams, etc.

Morphologic change means to channelize, dredge, or otherwise alter the established or natural dimensions, depths, patterns, or limits of an existing stream channel. This includes the creation of a concrete lined open channel, grassed waterway, or excavation of a basin area upstream or downstream of a detention structure or dam, and workpads, etc.

Impound means the installation of a dam or similar structure that modifies the stream converting the stream to a lentic (ponded) state, such as dams to facilitate sediment control and/or stormwater management.

Pipe means to route a stream through a pipe, culvert, or other enclosed structure.

Fill means the fill of a stream channel including the relocation of a stream channel (even if a new stream channel is constructed), or other fill activities. Examples: footprints for a dam, channel block, low-water crossing, temporary crossings, column/pier placement, for footing/pier placement.

Total Project Impact: means the total length of stream, in feet, that will be impacted by a project, as authorized under Section 404 of the Clean Water Act, and for which mitigation will be required. **Note: Use this formula for impacts greater than 1000 linear feet: LF / 1000 x 0.4. i.e.: Scaling Factor for 5,280 LF = 2.1. (5280 LF / 1000 x 0.4 = 2.1)**

Example: A 100 foot below grade culvert and 25 feet of rip-rap upstream and 25 feet downstream of the structure would total 150 feet for Total Project Impact length.

Linear Feet of Stream Impacted in Reach: unit of measure, in feet, for each individual activity. Using the previous example, Impact 1 would be a "Below Grade Culvert" at 100 feet, while Impact 2 would be "Armor" for 50 feet.

STREAM MITIGATION CREDITS

14. Stream Restoration Credit Factors.

Stream Type as defined on page 11.

Stream Priority Status as defined on page 11.

Existing condition as defined on page 12.

Net Benefit: is an evaluation of the proposed mitigation action relative to the restoration, enhancement, creation, and preservation of the chemical, biological, and physical integrity of the Nation's waters. Five stream mitigation methods are covered under these guidelines: 1) stream channel restoration/stream enhancement, 2) stream relocation, 3) riparian creation, 4) riparian enhancement/restoration, and 5) riparian preservation. The Corps will determine, on a case-by-case basis, the acceptability of debit/credit analysis.

Net Improvement for Stream Channel Restoration is a measure of restored stream channel stability. Stable streams (as defined on page 22) are in dynamic balance and have proper morphology relative to the physical characteristics of the watershed. Improvements in stream stability relate directly to improvements in stream functions.

Substantial stream channel restoration actions include:

- Removing stream impoundments, pipes, culverts, or other man-made structures, then restoring the stream reach to a stable, appropriate channel configuration as per reference stream reaches.
- Restoring appropriate bankfull discharge width, stream sinuosity, entrenchment ratio, length and width/depth ratio to a referenced morphologic pattern.
- Building a new, morphologically stable channel at a higher elevation to connect it to the floodplain.
- Creating or re-connecting floodplains adjacent to streams artificially disconnected from their floodplain.
- Where relocation of an incised stream is impracticable, modifying the existing channel and re-establishing a floodplain *in situ,* but not at the abandoned/disconnected floodplain elevation.
- Construction of off-channel storm water detention facilities in areas where runoff quantities are accelerating.
- Removing a dike, levee or berm that is within the 100-year floodplain to re-connect the floodplain to the stream channel.
- Reconnecting abandoned side channels or meanders that were artificially cutoff, blocked, or filled where functionally appropriate.

- Removing riprap and reconstructing the stream banks to the proper radius of curvature, at the appropriate bank heights, then stabilizing all disturbed surfaces with either biodegradable erosion control fabric, native sod mats, and/or seeding with local native vegetation, and if necessary, bank modifications per guidance stated in Section 5.2.2. (page 5).

Moderate stream channel restoration actions include:

- Restoring stability in highly eroded areas or areas with artificially accelerated erosion, using non-rigid (soft) methods such as native vegetative stabilization, root wads with a relatively small percentage of rock, resloping and reshaping banks and creating a vegetated floodplain bench.
- Restoring natural channel features (i.e., riffle/run/pool/glide habitat) using morphology appropriate to target stream type, but not a comprehensive channel reconstruction/relocation.
- Where relocation of an incised stream is not practicable and modifying the existing channel to create a stable 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 channel. This converts the stream to a new stream type at the existing elevation of the channel but without an active floodplain.
- Routing a stream around an existing impoundment by creating a morphologically stable reach.
- Constructing fish ladders or other fish passage structures where appropriate.
- Replacing culverts with a span bridge.
- Excluding livestock with native riparian vegetation restoration (see Section 5.2.5 page 6).

Minimal stream channel restoration actions include:

- Restoring stream bank stability by hardening the existing channel in place where accelerated erosion is documented. It should only be allowed when there are insurmountable constraints to using other restoration solutions, as may be the case in urban settings. Some proposals undertaken by this methodology may be considered to have adverse aquatic impacts and require compensatory mitigation.
- Incorporation of a bankfull planting bench into a rock riprap project.
- Culverting floodplains at existing road crossings to facilitate flood flows.
- Replacing inadequate culverts with the appropriate configuration per hydrology and AOP.
- Removing check dams, weirs, car bodies, foreign materials/junk, debris and artificial in-stream structures and/or other structures that are directly contributing to bank erosion, scour or blocking stream processes and aquatic organism movements without any additional measures.
- Excluding livestock without riparian restoration.

Note: No mitigation credit is provided for either constructing channels that do not incorporate the principles of natural channel design or replacing a span bridge with a floored culvert design.

15. <u>Riparian Area Credit Factors</u>:

Properly vegetated riparian zones are essential to stream system function, channel stability and maintenance of water quality and in-stream habitat. Credits may be obtained for enhancing buffers by revegetating riparian zones adjacent to the stream. Riparian buffers and stream projects protected in perpetuity will generate more compensatory mitigation credit than projects that are not protected. **Note: streams which are recognizably unstable and which require major stream channel or bank restoration are not considered candidate streams for solely buffer enhancement credit.**

Riparian Buffer Creation means the manipulation of the physical, chemical, and/or biological characteristics present to develop a buffer on an upland where a buffer did not previously exist.

Riparian Buffer Restoration/Enhancement means implementing rehabilitation practices within a stream riparian buffer zone to improve water quality and/or ecological function. Buffer enhancement may include increasing or improving upland and/or wetlands habitat within or adjacent to riverine systems. Restoration programs should strive to mimic the composition, density and structure of a reference reach habitat. For the purposes of these guidelines, an area will be considered as riparian buffer restoration if 51-100% of the area would require planting of vegetation to restore streambank stability and improve wildlife habitat. An area will be considered as riparian buffer enhancement if 10-50% of the area would require planting of vegetation to restore streambank stability and improve wildlife habitat.

Riparian Buffer Preservation means the conservation, in its naturally occurring or present condition, of a riparian buffer to prevent its destruction, degradation, or alteration in any manner not authorized by the governing authority. For the purposes of these guidelines, an area will be considered as riparian buffer preservation if less than 10% of the area would require planting of vegetation to restore streambank stability and improve wildlife habitat.

Additional Riparian Improvements means restoring and/or enhancing vegetation within the riparian corridor proposed for mitigation credit as well as conducting additional improvements in the riparian corridor that have not been accounted for in this Mitigation Credit section. These additional riparian improvements may include:

- Restoring or creating wetlands for purposes of improving water quality, flood storage, and increasing biodiversity in the mitigation area,
- Removing substantial accumulations of trash or debris that may impair water quality in the mitigation area,
- Removal of floodplain structures that disrupt the riparian community planned to be restored or enhanced in the mitigation area,
- Fencing livestock from actively grazed riparian pastures, where grazing activities are impacting water quality and/or stream ecological function, thereby minimizing or avoiding streambank degradation, sedimentation, and water quality problems. Livestock exclusion is normally accomplished by fencing stream corridors and can include the construction of stream crossings with controlled access including stable and protected stream banks (page 6). The width of the livestock crossing will be deducted from the total length of the stream mitigation segment. This buffer may not be used for preservation purposes unless cattle have been removed. No more than one livestock crossing may be planned per 1,000 linear feet of stream mitigation.

Note: If any one of the above improvements is proposed in the mitigation area selected for restoration or enhancement, use an additional 1.2 multiplier applied to the value selected in Table 1 (page 18). The use of the 1.2 multiplier will be used to calculate mitigation credits generated for additional improvements within the riparian buffer of the proposed mitigation area.

*** Requirements for Minimum Buffer Width: The minimum buffer width (MBW)** for which mitigation credit will be earned is 50 feet on one side of the stream, measured from the top of the streambank, perpendicular away from the stream channel. Smaller buffer widths may be allowed on a case-by-case basis for small streams and consideration for a reduced buffer width will be based on issues related to construction constraints, land ownership, and land use activities. If topography within a proposed stream buffer has more than a 2% slope, 2 additional feet of buffer are required for every additional percent of slope (e.g., minimum buffer width with a +10% slope is 66 feet: Calculation [10% - 2% = 8%] [8 x 2 = 16] [16ft + 50ft = 66 feet]). Buffer slope will be determined in 50-foot increments beginning at the stream bank. For the reach being buffered, degree of slope will be determined at 100-foot intervals and averaged to obtain a mean degree of slope for calculating minimum buffer width. This mean degree of slope will be used to calculate the minimum buffer width for the entire segment of stream being buffered.

Table 1 below provides appropriate Net Benefit values for the riparian creation, restoration, enhancement, and preservation mitigation worksheet. Note that on this worksheet, buffers on each bank of a given reach, generate mitigation credit separately (Stream Side A and Stream Side B).

Table 1. Riparian Buffer Creation, Restoration, Enhancement, and Preservation

Buffer width (on one side of the stream) Equal to or greater than	**Percent buffer that needs planting**		
	***Buffer Creation and Restoration** Exotic Removal and (51-100%) Planting	**Buffer Enhancement** Exotic Removal and (10-50%) Planting	**Buffer Preservation** (<10%) Planting
300 feet	0.56	0.28	0.140
275 feet	0.54	0.27	0.135
250 feet	0.52	0.26	0.130
225 feet	0.50	0.25	0.125
200 feet	0.48	0.24	0.120
175 feet	0.44	0.22	0.110
150 feet	0.40	0.20	0.100
125 feet	0.36	0.18	0.090
100 feet	0.32	0.16	0.080
75 feet	0.24	0.12	0.060
50 feet (MBW)	0.16	0.08	0.040

Note: Credits may not be given for riparian widths deemed excessive to providing benefits to the aquatic system. Credits will not be given for portions of riparian areas that lie outside the drainage area of the buffered stream (e.g., portions of buffers that extend beyond a ridge top into an adjacent drainage area). Should the close proximity of a break in the drainage area (e.g., a ridge top) to the buffered stream preclude attainment of the required minimum buffer width, the Net Improvement may be calculated based on the "Minimum width" 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 recommended. Streams that are unstable and require major stream channel or bank restoration are not considered candidate streams for solely buffer enhancement credit.

Supplemental Buffer Credit: Additional mitigation credit may be generated if proposed riparian mitigation activities include minimum width buffers on **both** sides of a stream reach.

Control/Site Protection: An appropriate legally binding real estate instrument, approved in advance by the Corps, will be required to ensure that the mitigation work, land and aquatic resources offered are protected in perpetuity from anthropogenic changes that would compromise the aquatic resource. **Five** different types of protection are recognized, with varying levels of security of which one should be selected per appropriateness for the subject property depending on the situation. **Note: third party grantee protection will receive higher credit value**.

Non-Third Party:

1. *Permit Conditions* means the mitigation site does not have any legal encumbrance protecting it other than special conditions associated with a Corps permit. This alternative may not be acceptable in all cases.

2. *Deed restriction* means a provision in a deed limiting the use of the property and prohibiting certain uses. The District approves mitigation areas and requires deed restrictions to protect and preserve mitigation sites. If the applicant can demonstrate that the mitigation activity will occur within a right-of-way easement and if the easement will offer protection and preservation of the site, such as associated with highway projects, the credit will be considered the same as that for deed restriction of the mitigation site.

3. *Restrictive covenant* means a legal document whereby an owner of real property imposes perpetual limitations or affirmative obligations on the real property.

Third Party:

4. *Conservation easement* means a legally binding recorded instrument approved by the District to protect and preserve mitigation sites by giving protection and enforcement rights by real estate interest to a qualified, experienced, third party.

5. *Fee Title* means a transfer of complete ownership 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 Service for non-profit purposes.

Mitigation Construction Timing: No additional credits are generated for this factor if the mitigation action in a reach is primarily riparian buffer preservation.

Schedule 1: All mitigation (100%) is completed before the impacts occur.

Schedule 2: At least 75% of the mitigation is completed and approved prior to and/or concurrent with the impacts. (The other 25% of the mitigation could be completed after the impacts.)

Schedule 3: Less than 75% of the mitigation will be completed prior to and/or concurrent with the impacts.

Temporal Lag is a factor to compensate for the time required for a mitigation area to fully replace functions lost at the impact site. Different systems will require different times to reach levels of functional capacity level with the impact site. For example, a forested buffer would have a greater temporal lag than a grass buffer.

Site Factor: In-kind replacements are stream losses or buffer losses, which are replaced by a stream/buffer that is established, restored, enhanced, or protected of the same physical and functional type. This is required when the impacted resource is locally important.

Use a site factor of 1.0 for: 1) all in-kind aquatic resource or buffer replacements, 2) impacts within a mitigation bank service area and proposing to go to a bank, or 3) permittee constructed mitigation proposed within the 8-digit HUC watershed in which the impacts occurred.

Out-of-kind replacements replace aquatic resources or buffers of a different physical and functional type. This is appropriate when it provides more environmental benefit and is more practical by providing more ecological or watershed benefit than in-kind.

Use a site factor of 0.5 for: 1) all out-of-kind aquatic resource or buffer replacements, 2) impacts not within a mitigation bank service area but proposing to go to a bank, or 3) permittee constructed mitigation proposed outside of 8-digit Hydrologic Unit Code (HUC) watershed in which the impacts occurred.

Site factors for in-lieu fee mitigation will be determined by each individual District.

Appendix A

Glossary and References

Adverse effects as used in this SMG means any adverse ecological effect on waters of the United States resulting from a regulated discharge of dredge or fill material in jurisdictional waters. Other categories of effects such as aesthetic, cultural, historic, health, etc., are not addressed by this SMG. See also the definition of "effects" in this glossary.

Aggradation is a raising of local base level due to sediment depositional processes.

Aquatic Organism Passage (AOP) is the unimpeded movement of all aquatic species within the stream network.

Aquatic site means any water of the United States, including special aquatic sites such as wetlands or pool and riffle complexes.

Bankfull discharge 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. The bankfull stage is the point at which water begins to overflow onto a floodplain and is commonly referred to as the discharge with a frequency of occurrence of between 1.5-1.7 years. Bankfull may not be at the top of the stream bank in incised or entrenched stream (Dunne and Leopold, 1978).

Braided stream system means a multiple-thread channel system with a high width to depth ratio (>40), variable stream gradient (.039 to <.001) and individual channels with highly variable bank full width. These streams can have extensive, well-vegetated floodplains and associated wetlands (Rosgen, D.A.1996 Applied River Morphology).

Buffer zone means an area designed to separate one functional area from another (i.e. any vegetated upland or wetland area next to a waterbody that separates the water from developed areas, including agricultural lands). The existing buffer can be preserved as is or enhanced for additional credits.

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 because of a concentration of the larger rock found naturally in an alluvial channel.

Pools are **typically** located on the outside bends between riffles. Pools have a flatter slope that the average channel slope and greater depth than the average depth of the stream.

Riffle and pool complexes are special aquatic sites under the Section 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

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

Compensatory mitigation: for the purposes of Section 10/404, compensatory mitigation is the restoration, creation (establishment), enhancement or in exceptional circumstances, preservation (protection/maintenance) of wetland and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts that remain after all appropriate and practicable avoidance and minimization has been achieved. Compensatory Mitigation for aquatic areas addressed by this SMG includes:

Creation means the conversion of non-aquatic habitat to aquatic habitat. Creation usually includes grading; establishment of appropriate pattern, dimension and profile; providing suitable substrate, hydrology, and establishment of native vegetation.

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

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

Restoration means actions taken to correct previous alterations that have destroyed, diminished, or seriously impaired the character and function of stream systems. Restoration is the process of returning 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 dimensions, pattern and profile and/or biological and chemical integrity, including transport of water and sediment produced by the streams' watershed in order to achieve natural equilibrium. For those situations where major restoration of appropriate stream dimension, pattern and profile are warranted, credits will reflect the following priority system.

Degraded Stream is a factor of impairment of biological/chemical/morphological condition as compared to the historical quality/value.

Degradation is a lowering of local stream base level due to channel incision processes.

Effects: 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.

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 to the surface width of the bankfull channel. The flood-prone area width is measured at the elevation that corresponds to twice the maximum depth of the bankfull channel as taken from the established bankfull stage (Rosgen, D.A. 1996. Applied River Morphology).

Ephemeral is a stream that has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

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 (Rosgen, D.A. 1996. Applied River Morphology).

Intermittent is a stream with a defined bed and bank and does not flow all year round, but flows beyond periods of rainfall and with greater frequency than similarly located ephemeral streams. They do not rely solely on precipitation for flow. Their stream bed is located in a zone of groundwater fluctuation, thus the stream may gain water from or lose water to groundwater. For this SMG, intermittent streams may also include those reaches of a stream that lack surface flows even though there is perennial surface flow both up and downstream. (Exception: pools may not be evident in years of prolonged drought).

IRT stands for Interagency Review Team. An interagency group designated to review and consult with proponents regarding Compensatory Mitigation Bank and In-lieu fee proposals.

Loss of waters of the United States for purposes of the NWP program: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering

compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities eligible for exemptions under Section 404(f) of the Clean Water Act are not considered when calculating the loss of waters of the United States.

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

Mitigate as defined by 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.

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 channel with a defined bed and bank and whose channel bed remains below the groundwater table at all times of the year. A perennial stream, or reaches thereof, will go dry only during prolonged periods of drought.

Practicable means feasible and reasonable after considering cost, logistics, and technology available to the project proponent.

Reference Reach Data describe the stable morphological form of dimension, pattern and profile for a particular stream and valley type, slope, channel materials, riparian vegetation and other measurable variables to develop dimensionless relationships for natural channel design parameters.

Riparian Area refers to lands adjacent to a water body that are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects water bodies with their adjacent uplands.

Riverine, as used in this SMG, means rivers, streams, and similar natural flowing water bodies together with their associated 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, stream flow, and the bed and bank materials.

Special aquatic sites means wetlands, vegetated shallows, mud flats, 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) (Dunn and Leopold, 1978).

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 stream flow and decreases in sediment size. Channel slope is inversely related to sinuosity, so steep streams have low sinuosity and flat streams have high sinuosity.

Stream Type as used in this document refers to the "Rosgen Stream Classification System" (Rosgen, 1996), which categorizes streams based on channel and floodplain morphology so that consistent, reproducible and quantitative descriptions can be made.

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 SMG, 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.

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 a bankfull discharge.

References:

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

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

Rosgen, D.L. 2006. Watershed Assessment of River Stability and Sediment Supply (WARSSS). Wildland Hydrology Books, Ft. Collins, Colorado.

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. Stream bank and shoreline protection. In Engineering field handbook, Part 650, Chapter 16.

Technical Working Committee:

- The US Environmental Protection Agency – Kathy Mulder.
- The US Fish and Wildlife Service – Susan Blackford.
- The Kansas Dept. of Wildlife and Parks – Bryan Simmons.
- The Kansas Biological Survey – Paul Liechti.

Appendix B

Data Requirements – baseline /project plan/ monitoring / success criteria / contingency

1. *Information Required*. The following information should be submitted for consideration of a mitigation proposal. The applicant will be advised if additional information is required to make the proposal adequate for consideration. Other information requirements that are part of the permit process are not addressed herein.

- A detailed description (possibly including photographs) of baseline natural resource conditions at both the impact and mitigation site, to include any/all plant communities and identification of special aquatic sites such as wetlands and pool and riffle complexes as well as adjacent land use.
- Plans and detailed information explaining the proposed impact/mitigation and all site dimensions. Plans should include existing and proposed stream cross-sections, profiles and plan view dimensions as well as affected stream habitat, such as pool, riffle, run or a combination thereof and describe the stream bottom (i.e. silt, sand, gravel, rubble, bedrock, etc.).
- Drawings in accordance with the requirements given in this SMG (see Appendix C below).
- Names, addresses and phone numbers for all parties responsible for mitigation and monitoring.
- A narrative discussion of the key elements of the mitigation proposal.
- 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 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 maintenance of the mitigation site.
- Measures planned to provide long-term legal protection of the mitigation resource, when applicable.
- A proposed monitoring and contingency plan.
- If the plan involves dredging in Federal navigable waters (Missouri and Kansas Rivers) the plan description/drawings must include:
    - The method of dredging;
    - A description of the composition and quantity of the material to be dredged;
    - The method of transportation of the material;
    - The site and plans for disposal of the dredged material.
- If the plan includes a discharge of dredged or fill material into Waters of the United States, the plan/drawings must include:
    - The source of the material;
    - A description of the composition and quantity of material to be discharged into a jurisdictional water;
    - The location of the discharge site.
- For stream mitigation projects involving complete channel reconstruction or relocation, proposed cross section, plan, and profile drawings will be required. Extended cross sections must illustrate the relationship of the channel to the floodplain. Submitted plans must also show plan view channel dimensions, all structures and work that are part of the mitigation project, types and locations of plantings and erosion control measures.

2. *Monitoring and Contingency*. The applicant will be required to monitor the mitigation area for success and to provide written reports describing the results of the monitoring effort. Because of the many variables involved, no specific standards are set forth. Instead, a monitoring plan should be included as a part of the mitigation proposal submitted for review. Monitoring is generally conducted to determine whether the enhancement/restoration has accomplished the desired effect on the ecosystem. Both physical and biological monitoring may be required for major restoration projects. **For most restoration projects, both pre (baseline) and post construction surveys may be required**. 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 stable, relatively undisturbed stream of the same stream type (Rosgen, 1996), of similar size, located in the same ecoregion and preferably in the same or a neighboring watershed. 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 at least annually after completion of the enhancement/restoration activity, and may be required for several years. It is likely that monitoring after at least two bankfull events will be required. Monitoring requirements will be tailored to the scale of the project and may include physical, chemical 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.

The plan should include contingency measures specifying remediation actions that will be followed should the success criteria not be fully satisfied. Monitoring and contingency plans and reports could include any of the following items or additional data, on a case-by-case basis.

- Identification and descriptions of reference stream reaches.
- Hydrologic monitoring on the applicant's project reach and proposed mitigation reach.
- Photographic documentation of the impacted stream and mitigation reach.
- Bond or other contingency measures to be initiated to assure successful mitigation.
- Monitoring of the physical, biological and/or chemical characteristics of the adversely impacted and/or the mitigation site to assess the recovery of resources and functions.
- Contingency measures, including commitment to necessary repairs or efforts necessary to ensure success at the mitigation site, or development of an alternate mitigation site or project, in the case of irreparable site failure.

Note: Required monitoring will be appropriate and proportional to the scope and scale of the mitigation project. Only large, consolidated mitigation projects (e.g., banks) will require a comprehensive monitoring program as described in this appendix. **RGL 08-03**, issued 10 October 2008, identifies the minimum monitoring requirements for compensatory mitigation projects involving the restoration, establishment, and/or enhancement of aquatic resources.

3. Physical Monitoring. The types of measurements and monitoring that may 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, presence of large woody debris, and turbidity. It is important that selected monitoring variables are sensitive enough to document change and can be measured. Data sheets for determining stream type and dimension, pattern and profile are included in Appendix A (page 20). Other physical parameters that should be monitored include frequency and diversity of pool and riffle complexes, spawning substrates, undercut banks, and large woody debris within the stream channel.

4. 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 diversity, survival and growth (density, height, diameter at breast height, or other biomass measure). Biological monitoring may also include, conducting fish surveys (visual and/or electro fishing), or conducting macro invertebrate studies.

5. 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 selected success criteria are appropriate for demonstrating attainment of projected restoration goals.** For stream systems, this may entail bringing an actively aggrading or degrading system into a state of dynamic equilibrium, and providing monitoring data that verifies stream channel stability and improved biological integrity. Success Criteria and restoration goals should be identified early in the process and the Corps should concur prior to doing the mitigation project. The final amount of credit awarded is based on monitoring results, not predicted credits.

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

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, application or file number, and sheet number;
- All significant dimensions clearly indicated and annotated;
- 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, and linear feet) for all mitigation sites.
- Legal description (section, township, range, plus county).
- A legend explaining any cross-hatching, colors, symbols, etc that are used.

7. Location maps. Two location maps must be included. 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 and north arrow. Identification of the project's latitude and longitude is desired.

8. Distribution of Information for Projects Requiring an Individual Permit (IP). 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 that are fully shown on a few pages, the Corps 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 mailing. **Whenever possible, applicants are encouraged to provide a single physical copy to the Corps, with digital copies (PDF files less than 4 MB by email, copies burned to CDs or available for download from FTP sites) for sharing with review agencies**.

9. Timing of Mitigation Plan Submittal. The Mitigation Rule only requires the submittal of a conceptual mitigation statement with an IP application. Some NWPs require a detailed mitigation plan with the notification and verification request. The Corps will perform a completeness determination for each application/verification request at receipt and will not delay review if all mandatory information by regulation is received.

Appendix C
Sample Project Using the Kansas Stream Mitigation Guidelines

Turkey Grove is an approximate 60-acre residential subdivision proposed in Topeka, Kansas. The developer (Hal) has hired a consultant to conduct a delineation on the property. Based on the results of this Corps approved delineation, proposed design constraints, and configuration of the subdivision, there are unavoidable impacts to jurisdictional waters of the United States. The project will require Section 404 permit authorization from the Corps for impacts to a perennial stream (Frog Creek) and two unnamed tributaries to Frog Creek (Tributaries A and B) within the project site. Compensatory mitigation will be required to replace aquatic resources, functions and values that will be lost as a result of the unavoidable impacts.

Perennial Stream - Frog Creek

Existing condition – This stream is approximately 25 feet in width, is slightly entrenched relative to its bankfull discharge and stream type. There is evidence of active erosion, indicated by areas of steepened banks and sediment deposition in the channel. The riparian corridor contains a mixture of exotic and native species extending 60 feet on one side, and 30 feet on the other. A "perched" road culvert is located approximately 2,000 feet upstream of the proposed development and encloses 50 linear feet of stream channel. This crossing supports an access into an existing residential subdivision. The creek is currently listed on the 303(d) list with sediment as the impairment.

Worksheet Factor	Designation	Justification
Stream Type	Perennial	• Evidence of Permanent Water
Stream Status	Secondary	• Presently listed on 303(d) list
Existing Condition	Moderately Functional	• Extent of Riparian Width • Evidence of Active Erosion • Impairment (culvert) within ½ mile upstream

Proposed Impacts - The proposed project would construct a road crossing over the perennial channel to access the site. Due to the steep nature of the hillsides surrounding the stream at the site entrance, the road grade must be elevated. In doing so, a wide footprint is required for the base of the crossing. Therefore, a below-grade double cell reinforced box culvert (RCB) would be placed in the channel to support the fill and crossing over the channel. The channel enclosure would total 100 feet in length. An additional 25 feet of riprap is proposed to be installed upstream and downstream of the culvert to minimize erosion and scour. The rock blanket would line the entire bed and banks of the channel. The total creek length would be impacted for a 150 linear feet.

Tributary A

Existing condition – This is an intermittent stream with permanent pools that is 5 feet wide. It possesses a 25-foot wooded corridor composed of entirely native species on each bank. The banks of this stream are moderately eroded as indicated by sporadic areas of nearly vertical banks.

Tributary A

Worksheet Factor	Designation	Justification
Stream Type	Intermittent with Permanent Pools	• Evidence of Permanent Water within depressions of dry stream bed.
Stream Status	Secondary	• Is within a high growth area in Topeka.
Existing Condition	Moderately Functional	• Extent of Riparian Width • Evidence of Accelerated Erosion (Not functionally impaired - see note page 13)

Proposed Impacts – An at grade culvert (considered as a pipe – see page 14) is proposed to be installed into the channel to provide vehicular access. This culvert would enclose 75 feet of the stream. In addition, 15 feet of riprap would be placed on the upstream and downstream side of the culvert. In total, the creek would be impacted for 105 linear feet.

Tributary B

Existing Condition – This is an ephemeral tributary that is 3 feet deep and 2 feet wide. The channel runs through primarily agricultural row crop areas for its entire length. The banks are eroded and unstable. The stream has extensive, accelerated sedimentation and is entrenched. The stream has no riparian area as it is farmed to the top of the stream bank on both sides.

Worksheet Factor	Designation	Justification
Stream Type	Ephemeral/Intermittent	• Dry – no evidence of permanent water (including pool areas).
Stream Status	Secondary	• Is within a high growth area in Topeka.
Existing Condition	Functionally impaired	• No Riparian buffer • Extensive Sedimentation • Entrenched.

Proposed Impacts – the channel would be impounded for a stormwater detention structure. The proposed fill for the dam is 30 feet, and the conservation pool would impound 200 linear feet of upstream channel.

Mitigation Site

Existing Condition – Hal has an existing development in the same HUC-8 watershed as the Turkey Grove development. He has hired a certified stream consultant who proposes to use common ground on this development site to fulfill the compensatory mitigation requirements. The mitigation site contains a perennial stream named Owl Creek that is considered a Primary Designated water. The mitigation site also contains approximately 225 feet of an unnamed intermittent tributary with permanent pools labeled Tributary C that drains into the Owl Creek.

Within the mitigation site, the Owl Creek channel varies from 20 to 30 feet in width. The stream has been recently channelized and its banks are vertical and sloughing. The existing riparian corridor has been severely reduced, with only 5 to 10 feet of woody vegetation remaining at the top-of-bank for the majority of the on-site reach. Numerous stormwater discharges occur upstream and downstream of the site. The on-site reach of Owl Creek sits between two road crossings that are approximately 2,000 feet apart.

Tributary C is a direct intermittent tributary to Owl Creek with a few permanent pools. It is 10 feet in width and possesses a wooded corridor 20 feet from either bank. Prior to the construction of the surrounding development, Tributary C ran through the middle of an agricultural crop field. A culverted farm field access still remains within Tributary C and entombs 40 linear feet of the channel.

Proposed Mitigation Plan

The consultant has prepared a mitigation plan which proposes improvements along approximately 300 feet of Owl Creek. Since the stream borders the mitigation site, Hal can only make riparian improvements to one side of the channel due to lack of ownership (as he only owns one side including the channel bed). The on-site stream bank has developed a bank failure that is actively migrating toward existing yard space in the development. Hal plans to repair this failure and prevent the potential for additional erosion into the existing development site. He anticipates that he would receive mitigation credit for this channel improvement. This failure would be stabilized by backsloping approximately 50 feet of vertical creek bank and disposing of the overburden at an upland location. The backsloped bank face would be protected with stone revetment only at the flowline. A vegetated turf reinforcement mat would then be placed from the revetment to the top-of-bank.

Since Hal already has to provide equipment for the stabilization, he plans to do some in-stream modification at the failure location. This modification includes a combination bed grade stabilization and riffle/pool structure at the bank stabilization area. Additionally, Hal plans to anchor some rootwads obtained from the Turkey Grove project site into the streambed. Following this channel work, the greenspace along the stream would be planted with native trees to a minimum width of 50 feet from the top-of-bank.

Tributary C would also undergo channel and riparian corridor improvements. Hal proposes to remove the existing culvert, restore the culverted portion of the stream to a stable, appropriate, channel configuration, and plant the area with native trees. The existing wooded corridor would also be expanded from 20 feet to 50 feet on both sides of the 225 feet of channel.

A permanent deed restriction would be placed on the mitigation site, which includes all of the portion of Tributary C and it's expanded riparian corridor as well as the bank of Owl Creek and its expanded riparian corridor that are within the mitigation area. Hal has retained a consultant to perform annual monitoring inspections in which photographs of the mitigation area would be taken. The survival of vegetation and success of bank stabilization activities would also be documented. The construction of the mitigation site would be performed concurrent with construction of Turkey Grove.

Adverse Impact Factors for Riverine Systems Worksheet

Factor	Impact 1 **Frog Ck**	Impact 2 **Frog Ck**	Impact 3 **Trib. A**	Impact 4 **Trib. A**	Impact 5 **Trib. B**	Impact 6 **Trib. B**
Stream Type Impacted	**0.8**	**0.8**	**0.6**	**0.6**	**0.4**	**0.4**
Stream Status	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
Existing Condition	**0.8**	**0.8**	**0.8**	**0.8**	**0.1**	**0.1**
Duration	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Activity	**0.3**	**1.5**	**2.2**	**0.5**	**2.5**	**2.0**
Total Project Impact	**0.05**	**0.05**	**0.05**	**0.05**	**0.1**	**0.1**
Sum of Factors	**M = 2.65**	**3.85**	**4.35**	**2.65**	**3.8**	**3.3**
Linear Feet of Stream Impacted in Reach	**LF = 100**	**50**	**75**	**30**	**30**	**200**
M x LF	**265**	**193**	**326**	**80**	**114**	**660**

Total Mitigation Credits Required * = (M X LF) = _____1638_____

In-Stream Work / Channel Restoration or Enhancement and Relocation Worksheet

Factors	Reach 1 **Owl Ck**	Reach 2 **Trib C**	Reach 3	Reach 4	Reach 5	Reach 6
Stream Type	**0.6**	**0.4**				
Priority Area	**0.4**	**0.2**				
Existing Condition	**0.05**	**0.05**				
Net Benefit	**2.0**	**3.5**				
Control/Site Protection	**0.4**	**0.1**				
Mitigation Construction Timing	**0**	**0**				
Sum of Factors (M)	**3.45**	**4.25**				
Stream length in Reach (do not count each bank separately) (LF)	**300**	**40**				
Credits (C) = M x LF	**1035**	**170**				
Site Factor (SF) page 19.	**1**	**1**				
Total Credits Generated C x SF =	**1035**	**170**				

Total Channel Restoration/Relocation Credits Generated = ____1205____

Riparian Buffer Creation, Enhancement, Restoration and Preservation Worksheet

Factors		Reach 1 **Owl Ck**	Reach 2 **Trib. C**	Reach 3	Reach 4	Reach 5	Reach 6
Stream Type		**0.4**	**0.2**				
Priority Status		**0.4**	**0.2**				
Net Benefit	Stream Side A	**0.16**	**0.16**				
	Stream Side B	**0**	**0.16**				
Supplemental Buffer Credit Condition Met (Buffer on both sides)		**0**	**0.16**				
Control /Site Protection		**0.05**	**0.05**				
Mitigation Construction Timing (none for primarily riparian preservation) < 10% requires planting)	Stream Side A	**0**	**0**				
	Stream Side B	**0**	**0**				
Temporal Lag		**-0.3**	**-0.3**				
Sum Factors (M)=		**0.71**	**0.63**				
Linear Feet of Stream Buffer (LF) (don't count each bank separately)		**300**	**225**				
Credits (C) =M X LF		**213**	**142**				
Total Credits Generated C X Site Factor (SF) page 19		**213**	**142**				

Total Riparian Restoration Credits Generated = _____355_____

Stream Mitigation Summary Worksheet

I.	Required Mitigation	Debits
A.	Total Debits =	**1638**

II.	Non-Banking Credit Summary	Credits	Linear Feet
B.	Riparian Buffer Enhancement	**355**	**525**
C.	Stream Restoration	**1205**	**340**
D.	Total Proposed Non-Bank Mitigation = B + C	**1560**	**865**

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

IV.	In-Lieu Credit Summary	Credits	Linear Feet
H.	Riparian Buffer Enhancement		
I.	Stream Restoration		
J.	Total Proposed In-Lieu Mitigation = H + I		

V.	Grand Totals	Credits	Linear Feet
K.	Total Riparian Enhancement Mitigation = B + E + H	**355**	**525**
L.	Total Stream Restoration Mitigation = C + F + I	**1205**	**340**
M.	Total Proposed Mitigation = D + G + J	**1560**	**865**

The Total Mitigation Credits (Row M) must 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 SMG must also be satisfied, e.g., Row L 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 does not comply with the SMG and the plan should be revised or rejected, unless a variance is approved.

	Yes	No
Proposed Mitigation Credits (PMC) => Debits Or (in words) Are the Credits in M greater than or equal to debits (A)?		X
$PMC_{Stream\ Restoration} \geq$ ¼ Debits or (in words) Are the Credits in L greater than or equal to 25% of debits?	**X**	

Appendix D
Worksheets

Adverse Impact Factors Table

FACTORS	OPTIONS								
Stream Type Definition page 11	Ephemeral / Intermittent 0.4			Intermittent w/ Permanent Pools 0.6			Perennial 0.8		
Stream Status Definition page 11	Tertiary 0.1			Secondary 0.4			Primary 0.8		
Existing Condition Definition page 12	Functionally Impaired 0.1			Moderately Functional 0.8			Fully Functional 5.0		
Duration Definition page 14	Temporary (<1yr.) 0.05			Short Term (1-2 yr.) 0.1			Permanent (>2yr.) 0.3		
Impact Activity Definition page 14	Shade/ Clear 0.05	Utility Crossing 0.15	Below Grade Culvert 0.3	Armor 0.5	Diversion/ Weir 0.75	Morphologic 1.5	Impound 2.0	Pipe 2.2	Fill 2.5
Total Project Impact (length) Definition page 15	≤100’ 0	101’-200’ 0.05	201-500’ 0.1	501-1000' 0.2	>1000 Linear Feet (LF) LF / 1000 x 0.4Example: 5280 / 1000 x 0.4 = 2.1				

Adverse Impact Factors For Riverine Systems Worksheet

Factor	Impact 1	Impact 2	Impact 3	Impact 4	Impact 5	Impact 6
Stream Type Impacted						
Stream Status						
Existing Condition						
Duration						
Activity						
Total Project Impact						
Sum of Factors	M =					
Linear Feet of Stream Impacted in Reach	LF =					
M x LF						

Total Mitigation Credits Required * = (M X LF) = _____

In-Stream Work / Channel Restoration or Enhancement and Relocation Worksheet

Stream Type	Ephemeral/Intermittent Intermittent w/ Permanent Pools 0.4	Perennial Stream Average Width				
		<15' 0.4	15'-30' 0.6	30'-50' 0.8	>50' 1.0	
Priority Area	Tertiary 0.05	Secondary 0.2		Primary 0.4		
Existing Condition	Not Applicable 0	Functionally Impaired 0.4		Moderately Functional 0.05		
Net Benefit	Stream Relocation 0.1	Stream Channel Restoration / Stream Enhancement				
		Relocated Stream with In-Stream features 0.5	Minimal 1.0	Moderate 2.0	Substantial 3.5	
Control / Site Protection	Corps approved site protection without third party grantee 0.1	Corps approved site protection recorded with third party grantee, or transfer of title to a conservancy 0.4				
Mitigation Construction Timing	Schedule 1 0.3	Schedule 2 0.1	Schedule 3 0			

Factors	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Stream Type						
Priority Area						
Existing Condition						
Net Benefit						
Control/Site Protection						
Mitigation Construction Timing						
Sum Factors (M)						
Stream length in Reach (do not count each bank separately) (LF)						
Credits (C) = M x LF						
Site Factor (SF) page 19.						
Total Credits Generated C x SF =						

Total Channel Restoration/Relocation Credits Generated = _____

Riparian Buffer Creation, Enhancement, Restoration and Preservation Worksheet

Stream Type	Ephemeral/ Intermittent 0.05		Intermittent w/ Permanent Pools 0.2	Perennial 0.4
Priority Status	Tertiary 0.05	Secondary 0.2	Primary 0.4	
Net Benefit (for each side of stream	Additional Improvements (select values from Table 1 times 1.2 multiplier)	Riparian Creation, Enhancement, Restoration, and Preservation Factors (select values from Table 1) (MBW = Minimum Buffer Width = 50' + 2' / 1% slope)		
Supplemental Buffer Credit	Condition: MBW restored or protected on both streambanks To calculate:(Net Benefit Stream Side A + Net Benefit Stream Side B) / 2			
Control / Site Protection	Corps approved site protection without third party grantee 0.05		Corps approved site protection recorded with third party grantee or transfer of title to a conservancy 0.2	
Mitigation Construction Timing (for each side of stream)	Schedule 1 0.15		Schedule 2 0.05	Schedule 3 0
Temporal Lag (Years)	Over 20 -0.3	10 to 20 -0.2	5 to 10 -0.1	0 to 5 0

Factors		Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Stream Type							
Priority Status							
Net Benefit	Stream Side A						
	Stream Side B						
Supplemental Buffer Credit Condition Met (Buffer on both sides)							
Control /Site Protection							
Mitigation Construction Timing (none for primarily riparian preservation) < 10% requires planting)	Stream Side A						
	Stream Side B						
Temporal Lag							
Sum Factors (M) =							
Linear Feet of Stream Buffer (LF) (don't count each bank separately)							
Credits (C) = M X LF							
Total Credits Generated C X Site Factor (SF) page 19							

Total Riparian Restoration Credits Generated = _____

Stream Mitigation Summary Worksheet

I.	Required Mitigation	Debits
A.	Total Debits =	

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

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

IV.	In-Lieu Credit Summary	Credits	Linear Feet
H.	Riparian Buffer Enhancement		
I.	Stream Restoration		
J.	Total Proposed In-Lieu Mitigation = H + I		

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

The Total Mitigation Credits (Row M) must 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 SMG must also be satisfied, e.g., Row L 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 does not comply with the SMG and the plan should be revised or rejected, unless a variance is approved.

	Yes	No
Proposed Mitigation Credits (PMC) => Debits Or (in words) Are the Credits in M greater than or equal to debits (A)?		
$PMC_{Stream\ Restoration} \geq$ ¼ Debits or (in words) Are the Credits in L greater than or equal to 25% of debits?		