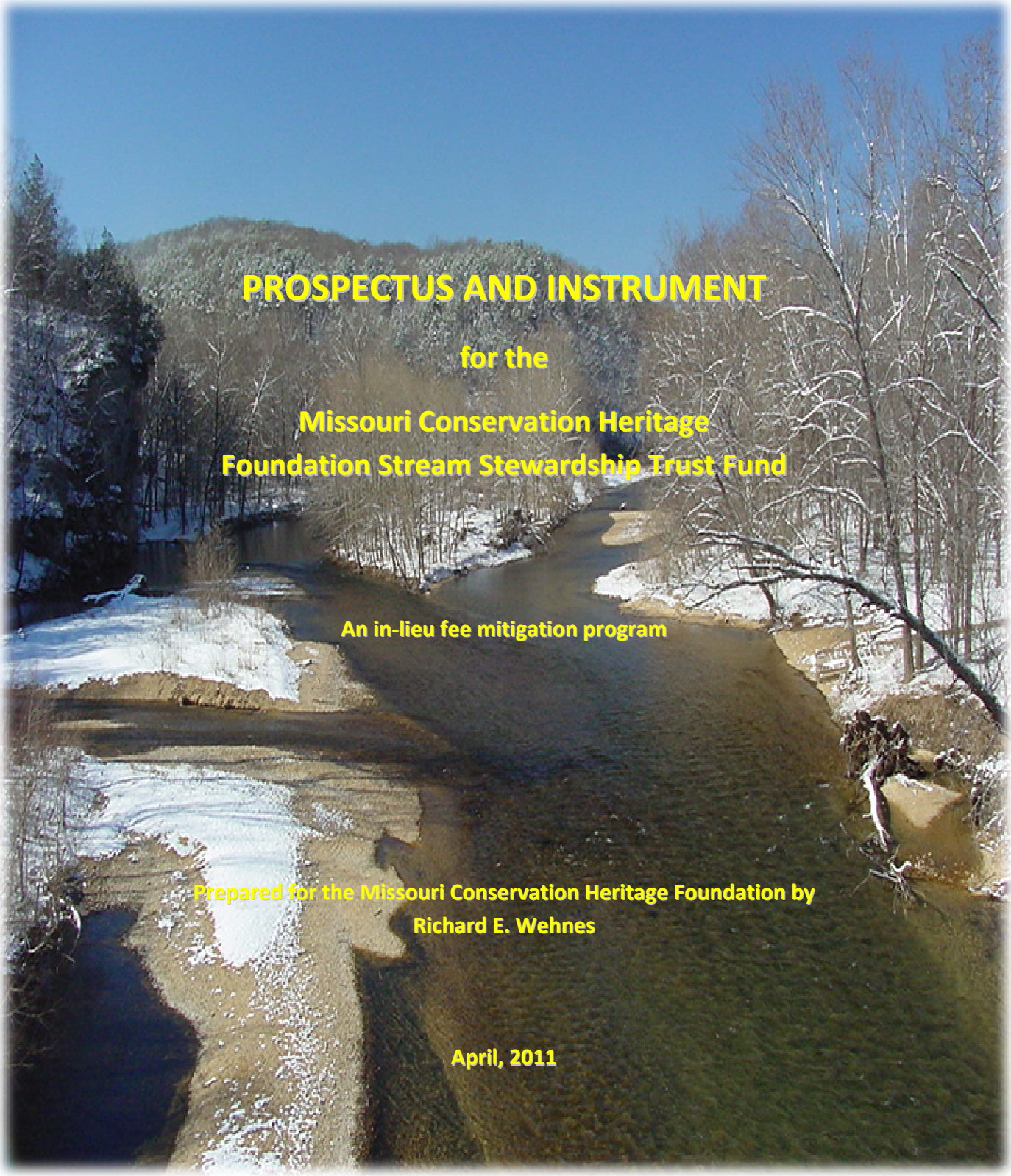

PROSPECTUS AND INSTRUMENT

for the

Missouri Conservation Heritage Foundation Stream Stewardship Trust Fund

An in-lieu fee mitigation program

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Prospectus and Instrument for the Missouri Conservation Heritage Foundation's Stream Stewardship Trust Fund: An In-Lieu Fee Mitigation Program

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Prospectus and Instrument for the Missouri Conservation Heritage Foundation's Stream Stewardship Trust Fund: An In-Lieu Fee Mitigation Program

I. INTRODUCTION

Permits are required by the U.S. Army Corps of Engineers (COE) through Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for discharge of dredge or fill materials within the waters of the United States. The COE, acting in concert with other state and federal agencies, requires that aquatic resource functions and values lost due to development impacts be replaced. A developer may be asked to provide mitigation for these lost functions and values by installing an improvement project on-site or off-site of the development; however, these may be difficult to accomplish in many cases. In the last decade, compensatory mitigation has been possible by developers purchasing "habitat values" through a mitigation bank or in-lieu fee program, making mitigation easier especially in association with small developments in urban areas.

In 2000, the Missouri Conservation Heritage Foundation (MCHF) signed a memorandum of understanding (hereafter known as the 2000 MOU) with the COE to establish the Stream Stewardship Trust Fund (SSTF) to provide an additional option to compensate for stream impacts caused by COE -regulated activities in Missouri and to provide greater flexibility to COE permitees (Appendix G). Since then, the MCHF has been operating an in-lieu-fee (ILF) mitigation program in partnership with the Missouri Department of Conservation (MDC). With COE approval, this in-lieu-fee mitigation program allowed developers to satisfy their mitigation requirements related to Department of the Army permits under Section 404 of the Clean Water Act and Section 10 of the 1899 Rivers and Harbors Act by contributing to the SSTF when required on-site mitigation was not possible. The program has been successful, with the MCHF allocating almost $4 million to over 60 projects throughout the state of Missouri (Appendix B) under the 2000 MOU.

On April 10, 2008, the COE and the Environmental Protection Agency (EPA) issued their respective regulations to require new rules regarding compensatory mitigation for the losses of aquatic resources authorized by permits issued by the Department of the Army. The new regulations establish performance standards and criteria for the use of in-lieu-fee programs to improve the quality and success of compensatory mitigation projects, to improve the planning and management of compensatory mitigation projects, and to apply equivalent standards to the various types of compensatory mitigation programs.

Since 2000, the in-lieu-fee program of the MCHF has provided useful mitigation alternatives to the COE and its applicants, while restoring and preserving stream habitat values across the state. In realigning the program to meet the new rules, the success of the past program must be built upon, using all of the elements of the "old" program that were beneficial and useful, and adding new ones to bring the program up to date and in compliance with the new federal requirements.

II. OBJECTIVES OF THE PROPOSED ILF PROGRAM

The objectives of the Stream Stewardship Trust Fund are to:

1. provide an alternative to permitee-responsible compensatory mitigation that replaces functions and values lost through permitted impacts, especially in areas that lack ecologically viable on-site options for mitigation;
2. enhance the stream resources of Missouri by addressing ecological needs on a watershed basis, provide additional funding for stream improvement projects in Missouri's watersheds, direct mitigation resources to ecologically impaired watersheds, and assist in implementing physical, chemical and biological improvement objectives of MDC's Watershed Inventory and Assessment, Comprehensive Wildlife Strategy, and Watershed Strategies documents;

3. minimize the temporal loss of stream functions and services by gaining approval of mitigation sites in advance of or concurrent to mitigation needs;
4. provide projects to meet current and expected demand for credits in areas without mitigation banks;
5. achieve ecological success on a watershed basis by water quality and stream habitat improvements that are appropriate to the stream or watershed, and by integrating ILF projects with other conservation activities;
6. provide a funding complement to statewide stream management efforts of MDC;
7. utilize scale efficiencies by combining the impacts from individual smaller projects within a service area into larger mitigation projects with greater ecological value;
8. procedurally unhook the mitigation of development projects from those with little training and experience in replacing natural values; and
9. promote an ecologically necessary complement to stream reach-based mitigation banking, which generally provides a narrower range of habitat located at single sites within limited areas, and is generally less focused on providing benefits as part of a larger, watershed-based conservation vision.

III. HOW THE ILF PROGRAM WILL BE ESTABLISHED AND OPERATED

A. Establishment of the ILF Program

The MCHF intends to establish itself as a qualified in-lieu-fee mitigation sponsor for COE authorizations in Missouri and upon formal approval of the final instrument by the COE, the SSTF will be reestablished under the new rules. MCHF will work with the MDC, as well as other state natural resource agencies as appropriate, to assure that COE requirements are being met. An Interagency Review Team (IRT) will advise the COE on the establishment and management of the ILF program, and recommend project approvals to the COE. The IRT will be composed of representatives invited by the COE from other federal and state resource agencies that would have a substantive interest in the establishment and management of the ILF program being sponsored by the MCHF.

MCHF intends to establish the SSTF only as a stream mitigation program and will not include small wetland mitigation. While small wetland mitigation projects were undertaken under the 2000 MOU as a favor to the COE, we intend to concentrate on stream mitigation and will no longer do wetland mitigation under SSTF.

B. Legal Responsibility of the MCHF

The MCHF, as the principal sponsor of the SSTF, accepts the transfer of mitigation responsibility from the applicants from which funds are accepted, and warrants the replacement of that responsibility through the funding of projects as outlined below. MCHF assumes all legal responsibility for satisfying the mitigation requirements of the COE for which fees have been accepted (i.e., the implementation, performance, and long term management of the compensatory mitigation projects approved under this agreement and subsequent mitigation plans). The transfer of liability is established by: 1) the approval of this in-lieu fee instrument; 2) the transfer of fees from the permittee to MCHF, and 3) receipt by the district engineer of a credit sale letter that is signed by the MCHF. The MCHF will pursue appropriate remedies, including legal actions, in the event issues arise with projects for which mitigation responsibility has been assured that cannot otherwise be resolved.

C. Service Area(s)

The proposed geographic service area for the SSTF is defined as the EDU. MCHF will provide compensatory mitigation for permitted impacts within the same geographic service area in which impacts occur and within three years of receiving mitigation credit responsibility unless the district engineer, in consultation with the IRT, has agreed to an exemption. The EDU was selected because the MCHF has concluded that the scale is appropriate to ensure that the projects selected can be done in a realistic time frame, and will be able to effectively compensate for adverse environmental impacts across the entire service area. Because of restrictions on moving mitigation credits to good projects outside the EDU of impact, MCHF will not accept fees from permittees in watersheds in which MCHF, and their MDC technical cooperator, does not believe there is a reasonable probability of identifying appropriate mitigation. Individual projects will be proposed for specific service areas in project-specific mitigation plans.

D. ILF Project Approval

For each proposed ILF project, MCHF will submit a project application/mitigation plan to the appropriate COE district and the IRT describing the project, its location and other project-specific information (Appendix C). Each mitigation project will be reviewed and approved by the MCHF, MDC, the IRT and the COE, and added through amendment to the ILF instrument. Mitigation plans will include the following information:

1. Project objectives
2. Watershed objectives and site selection rationale
3. Site protection instrument
4. Baseline information
5. Determination of credits and credit calculation
6. Mitigation work plan
7. Maintenance plan
8. Performance standards
9. Monitoring requirements
10. Long-term management plan
11. Adaptive management plan
12. Financial assurances

Project selection criteria are discussed in a later section of this document. To the extent feasible dictated by each project site, all projects will involve a stream habitat or water quality improvement or maintenance aspect that will benefit the overall watershed of each individual stream that becomes part of the program. Potential projects will be brought to MDC who will work with MCHF to bring the project before the COE and IRT for consideration. Projects may also be brought to MDC by various stakeholders such as private developers, Missouri Department of Transportation, other state agencies, municipal governments, federal government, and environmental organizations. MCHF will manage the project for consistency with the review criteria and a project will be added as an instrument amendment following IRT review and COE approval. MCHF and MDC will be responsible for the implementation, performance, and long term management of compensatory mitigation projects.

E. Initial Allocation of Credits

From 2000 through 2010, the SSTF received funds from and took on the mitigation credit responsibility of a number of developers. These funds were used to implement a number of improvement projects (Appendix B). Beginning in 2000, the metric by which mitigation replacement was measured was jurisdictional acres; that is, the habitat value of a development project that adversely affected 1 acre of stream habitat was replaced by a stream improvement project that increased the habitat value of 1 acre of stream habitat (assuming a 1:1 replacement). This method had its advantages and disadvantages, but a serious limitation was its inability to take into consideration the quality of the habitat lost or replaced. In 2007, jurisdictional acres were replaced with a system of mitigation credits, as measured by the Missouri Method of Mitigation Credit Assessment. Between 2007 and 2008, mitigation credits were phased in on both development and improvement projects, by late 2008, all projects were assessed with mitigation credits.

While the change from jurisdictional acres to mitigation credits complicated calculating the exact amount of this balance, an analysis of mitigation credits received from developers and mitigation credits replaced by habitat projects since the Missouri Method was used (see Appendix I) shows a large credit balance of 195,876 credits. This was broken down by EDU (Appendix J) to determine where mitigation obligations have been met and where they have not. With this credit balance, MCHF can initially fund the SSTF with existing credits, eliminating the need to request advance credits.

In order to completely fund the new program with existing credits, we need to adjust the current balances within the EDUs. Some had a negative balance and others had zero or positive balances. Table 1 shows our proposed credit allocations in the nine EDUs we will operate in at the beginning of this effort. To accomplish this we will use 107,813 existing credits. This redistributes credits from large positive balance EDUs, zeroes out negative balance EDUs, and adds positive balances to negative and zero balanced EDUs. This leaves 88,063 existing credits in the SSTF Program (Appendix J). We are recommending that these additional, existing credits be used for future reallocation needs within the EDUs listed or as startup credits for future expansion into additional EDUs.

Table 1—Proposed SSTF Beginning Credit Balance by EDU

EDU	Stream Credits
Apple/Joachim	3000
Blackwater/Lamine	7500
Cuivre/Salt	3000
Nishnabotna/Platte	7500
Black/Current	15000
Meramec	15000
Moreau/Loutre	20000
Osage	20000
White	7500

Upon approval of the instrument for the SSTF, MCHF intends to cover its own mitigation needs under the new program by selling existing credits as described above. As milestones in each project's schedule are reached (i.e., restoration, creation, enhancement and/or preservation is implemented and interim and final performance measures are met), credits released from new projects undertaken under this instrument will begin to accrue in each EDU. At a minimum, credits will not be released until MCHF has obtained IRT approval of the mitigation plan for a site, has achieved the applicable milestones in the credit release schedule as specified in the project mitigation plan, and the credit releases have been approved by the District Engineer in a timely manner. This process will be ongoing and continuous: as released credits accumulate within each EDU, additional credit sales may occur as long as the number of credits available remains sufficiently high to accommodate additional development projects and received credits are first offset by credits associated with the initiation of stream projects within the 3-year time frame outlined in this instrument. MCHF may, with COE approval, offset a failed project with credits from their pooled mitigation credit balance described above. Credits approved for release by the COE will be tracked in detail to show how each credit of mitigation responsibility is offset by credits of approved projects; this information will be included in project spreadsheets and will be summarized in the annual reports.

Although credit release schedules for mitigation projects last beyond 5 years, depending on the unpredictable changing demand of mitigation, MCHF believes that their existing credit balance will meet their needs in the long term (much like that of a mitigation bank) and does not anticipate that an allocation of advanced credits will be needed. If this changes due to changing needs of the program, MCHF will submit a request in writing for an allocation of advanced credits by EDU for approval by the District Engineer in consultation with the IRT.

F. Draft Fee Schedule for Mitigation Credits

The fee schedule for mitigation credits will be determined based on market forces which will depend on several factors, including costs associated with restoration, establishment, enhancement and/or preservation activities. These costs will be determined using full cost accounting and will include land acquisition, project planning and design, construction, plant materials, labor, legal fees, monitoring, and remediation, as well as administration, contingency costs, and long term management. Program fees will be subject to COE review and approval.

G. Methodology for Determining Project-Specific Credits and Fees

The COE's Missouri Stream Mitigation Method (MSMM) will be used to determine the number of stream credits used for impacts and for projects. Developers will complete the MSMM and, upon COE approval, will communicate a project description and number of credits to the MCHF for a written estimate. The MSMM will also be used to determine the number of credits involved in an on-the-ground restoration, enhancement or preservation project. Stream impact credits will be offset with stream project credits; the Stream Stewardship Trust Fund handles only stream impact credits and will not be involved in mitigating small wetland impacts.

To determine a cost per credit amount in the past, MCHF used a formula involving costs for project-related land acquisition, either through fee-title purchase or easements; planning, design and construction; plant materials; monitoring; project maintenance and repair; and other costs. The MCHF will continue to assess a per-credit charge to developers to assume mitigation responsibilities. The amount of charge under this agreement will be reviewed annually, and will include expected land acquisition or easement costs, project planning and design, construction, plant materials, labor, legal fees, monitoring, project maintenance and repair, program administration, contingency costs, and long term management and protection of the project. Some of these services may be provided to the MCHF by agencies at no cost or reduced rates; however, the full value of those services will be incorporated into project accounting and the per-credit charge to developers. Prior to assessing the first per-credit charge under the new agreement, MCHF will provide the COE an analysis of what is included in that charge for approval. Thereafter, per-credit fees will be changed as appropriate following annual reviews.

Since the assessment of restoration, creation, enhancement, and preservation projects are a discrete part of the MSMM and are weighted differently, mitigation ratios for the various types of mitigation projects have already been taken into account and are not used in determining a final per-credit cost.

H. Credit Release Schedule

As project milestones (initial construction, completed project, performance standards met, etc.) for ILF mitigation projects (except acquisition projects for preservation; see below) are reached, credits can be released, meaning MCHF has "earned" those credits and may sell more credits to developers. The number of credits involved in a project is determined by the Missouri Mitigation Assessment Method; the schedule of release of those credits will be as follows:

20%	Upon project approval by the COE and the IRT
20%	Upon completion of project installation (construction or planting)
20%	Upon completion of 2 years of monitoring showing positive progress towards meeting performance objectives
20%	Upon completion of 4 years of monitoring showing positive progress towards meeting performance objectives
20%	Upon full achievement of performance objectives (or the end of the 5th and final year of monitoring, if project was designed to achieve performance objectives at the completion of project installation)

MCHF will submit completion or monitoring reports to the COE and IRT at the end of each phase demonstrating the achievement of each milestone and request the release of the appropriate number of credits. At the request of MCHF, the COE and IRT may modify the credit release request, increasing or decreasing the number of credits when changes in the performance objectives have been observed or specific requirements of the approved project proposal have either been exceeded or have not been met. For strictly preservation (acquisition and permanent easements) projects (no restoration project installation involved), 20% of the credits will be released upon COE and IRT approval of the project; the remaining 80% will be released when the permanent easement has been recorded or fee title has been transferred to MDC or an appropriate natural resource not for profit organization or federal, state or local governmental agency capable of managing the stream resources effectively.

I. Reporting protocols

MCHF will report the following information to the COE and the IRT on an appropriate time schedule defined below:

1. Monitoring reports, on a schedule and for a period as defined by project-specific mitigation plans;
2. Credit transaction notifications;
3. An annual program report summarizing activity from the program account (financial and credit accounting) as detailed below; and
4. An annual financial assurances and long-term management funding report as detailed below.

Monitoring reports: Monitoring is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. If MCHF fails to submit reports within 90 days of the deadlines outlined in the mitigation plans, the COE may take appropriate compliance action (see Default and Closure section).

Project specific mitigation plans will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the COE and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report. The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project.

The COE is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Credit transaction notification: The Provisions Stating Legal Liability section establishes the terms by which the legal responsibility for compensation requirements is transferred from the permittee to the MCHF. These terms require the MCHF to submit a copy of the credit sale letter to the COE. The document must be signed by the MCHF and dated. The credit transaction letter must include the permit number(s) for which the MCHF is accepting fees, the number of stream mitigation credits being purchased, and the name of the project for which credits are being purchased. To assist in project tracking, the stream name, EDU, MDC region, and COE district may also be included in the letter. Since MCHF will not be involved in wetland mitigation projects, the resource type for every mitigation project for which funds are received will be a stream. See Appendix D for a sample credit transaction form.

The MCHF must submit the signed and dated credit transaction letter within 10 working days of receiving the fees from the permittee. A copy of each credit transaction letter will be retained in both the COE's and the MCHF's administrative and accounting records for the SSTF.

Annual program report: The MCHF must submit an annual report to the COE and the IRT. The report must be made available to the public upon request. The annual program report must be submitted no later than April 1st, or the following business day if that date falls on a federal/state holiday or weekend. The annual report will include income received and interest earned by the program account for the program and by service area (EDU), a list of all permits for which SSTF funds were accepted by service area (including COE permit number, EDU, amount of authorized impacts, amount of required compensatory mitigation, amount paid to the SSTF, and the date the funds were received from the permittee), a description of SSTF program expenditures/disbursements from the account for the program and by service area, the balance of approved and released credits at the end of the reporting period for the program and by service area, the permitted impacts for each resource type, all additions and subtractions of credits, an accounting of the positive credit balance pool after mitigation responsibilities have been offset, and other changes in credit availability.

Financial assurances and long-term management funding report: MCHF will submit an annual report on the financial and long term management status of each project to the COE and the IRT. The MCHF has previously demonstrated its ability to fund good stream projects and through its management of a separate dedicated SSTF account, is committed to the requirements found in this instrument and to the installation, monitoring, and long term management of its compensatory mitigation projects. Sufficient funds currently exist in the Stream Stewardship Trust Fund accounts to undertake future projects and long term management. MCHF will give the COE at least 30 days advance notice if required financial support of a project will be terminated or revoked. No additional financial assurances are required.

The financial assurances and long term management funding report will include the beginning and ending balances of the individual project accounts providing funds for financial assurance and long-term management, deposits into and withdrawals from the individual project accounts providing funds for financial assurance and long term management, and information on the amount of required financial assurances and the status of those assurances, including their potential expiration for each individual project.

J. Contingency plans and remedial actions

When mitigation projects have been installed, they will be monitored for project success and attainment of performance standards. Should any monitoring report reveal that the mitigation is not achieving the success envisioned that is beyond the scope of routine maintenance, the COE and the IRT will be notified as soon as possible. MCHF will provide a proposed remedial action plan for ensuring that the site continues to meet its success criteria. The contingency plan may be simple, such as a switch in plant species to replace those initially used in the project, or complex, such as a complete change in engineering design based on new stream hydraulic factors. Once approved by the COE, the contingency plan may be implemented and will replace the approved mitigation plan. If the project fails (i.e., underperformance is substantial), MCHF in consultation with the COE will evaluate whether additional maintenance and longer monitoring periods are needed, or whether alternative contingency measures (including abandoning the project and accommodating mitigation credits at an alternative site) are needed.

K. Accounting Procedures

MCHF shall establish and maintain a system for tracking the production of credits, credit transactions, and financial transactions between MCHF and permittees. Credit production, credit transactions and financial transactions must be tracked on a programmatic basis (i.e., the number of total acquired and released credits for the entire program by service area) and separately for each individual project. For additional information, please refer to the ILF Program Account Description section below.

L. Financial Assurances

The MCHF has previously demonstrated its ability to fund good stream projects and through its management of a separate dedicated SSTF account, is committed to the requirements found in this instrument and to the installation, monitoring, and long term management of its compensatory mitigation projects. Since an important basis for project selection is a project's fit into MDC's statewide stream management plan, a commitment of the biological, engineering, and legal resources of MDC also accompanies each project. No additional financial assurances are required.

M. IRT Review schedule for ILF Project Site Mitigation Plans

The IRT will review and respond to complete submissions of ILF project mitigation plan proposals within the time frames specified in Section 332.8 of the Final Rule for Compensatory Mitigation for Losses of Aquatic Resources.

N. Actions under multiple authorities

Proposed ILF project activities may address requirements of multiple regulatory programs and authorities for the same activity; however, mitigation credits may only address the mitigation requirements of a single permitted activity. If funding authorities of other federal agencies (e.g., Riparian Conservation Reserve Program) are utilized for individual projects, the number of credits MCHF may accrue will be reduced by the percentage that said federal funds make up of the project total.

O. Default and closure

If the COE determines that MCHF has failed to : 1) provide the required compensatory mitigation in a timely manner; 2) meet performance-based milestones set forth in project-specific mitigation plans; 3) meet ecological performance standards; 4) submit monitoring reports in a timely manner; 5) establish and maintain an individual ledger report and individual ledgers for each project in accordance with the provisions below (see section entitled ILF Account Description below); 6) submit an annual financial assurances and long-term management funding report; 7) report approved credit transactions; 8) complete land acquisition and initial physical and biological improvements by the third full growing season after the credit in that service area is secured by a permittee; and/or 9) otherwise comply with the terms of the instrument, the COE will provide 90 days for the MCHF to make arrangements to correct the problem to the satisfaction of the COE. If, after this period of time, the actions are still unsatisfactory, the COE must take appropriate action to achieve compliance with the terms of the instrument and all approved mitigation plans. Such actions may include suspending credit sales, decreasing available credits, requiring adaptive management measures, utilizing financial assurances or contingency funds, transferring available credits from other service areas, terminating the agreement, using the financial assurances or contingency funds to provide alternative compensation, directing the use of ILF program

account funds to provide alternative mitigation (e.g., securing credits from another third-party mitigation provider), or referring the non-compliance with the terms of the instrument to the Department of Justice.

Any delay or failure of MCHF to comply with the terms of this agreement shall not constitute a default if and to the extent that such delay or failure is primarily caused by conditions beyond MCHF's reasonable control and significantly adversely affects its ability to perform its obligations hereunder, such as flood, drought, lightning, earthquake, fire, landslide, condemnation, other unforeseen legal actions, or other taking by a governmental body. MCHF shall give written notice to the District Engineer if the performance of any of its ILF projects is affected by any such event as soon as is reasonably practicable.

Either party to this agreement may terminate the agreement within 60 days of written notification to the other party. In the event that the ILF operated by MCHF is terminated, MCHF is responsible for fulfilling any remaining project obligations including the successful completion of ongoing mitigation projects, relevant maintenance, monitoring, reporting, and long term management requirements. MCHF shall remain responsible for fulfilling these obligations until such time as the long term financing obligations have been met and the long term ownership of all mitigation lands has been transferred to the party responsible for ownership and all long-term management of the project.

Funds remaining in the MCHF accounts after all obligations are satisfied will continue to be used for the restoration, establishment, enhancement, and/or preservation of aquatic resources. These funds may be used for additional stream restoration, enhancement or preservation projects in any of the EDUs listed in the instrument, or to replace projects where monitoring shows it unable or impractical to meet the conditions specified in this instrument. The funds will be used, to the maximum extent practicable, to provide compensation for the amount and type of aquatic resource for which the fees were collected. The COE itself cannot accept directly, retain, or draw upon those funds in the event of a default.

The SSTF will remain in operation as long as the COE supports the operation of the fund, and MCHF and MDC agree to work together on stream projects. If any of the three parties provides a 60-day written notice of a desire to terminate their association with the SSTF, the fund shall be dissolved and the monies remaining in the fund will be used for expenses relating to long term maintenance, repair, and monitoring of already-installed projects, as well as the administrative fees detailed in this instrument.

P. Grandfathering

Mitigation projects that are approved for installation prior to the execution of this agreement will be subject to the provisions of the operational agreements that were in place at the time those projects were submitted (i.e., the 2000 MOU between MCHF and the COE). Additionally, all mitigation requirements for which MCHF is responsible, which are included in permit authorizations dated prior to the execution of this agreement, will be subject to the provisions of the operational agreements that were in place at the time of issuance of the permit authorization.

IV. PROPOSED SERVICE AREAS

A watershed approach will be used in compensatory mitigation planning and site selection, using MDC's Watershed Inventory and Assessment (WIA), Watershed Strategies (Appendix H), and Aquatic Biodiversity Assessment (Nigh, 2005; Sowa et. al, 2007) documents, watersheds containing species of conservation concern (SOCC), and other priority geographies. Although WIAs are primarily watershed assessments, they go a long way in identifying broad goals, objectives and general direction for improving the physical, chemical and biological functions within the individual WIA. When dovetailed with the 158 Aquatic Conservation Opportunity Areas (ACOAs) identified through the Aquatic Biodiversity Assessment, MDC profiled COAs, and other landscape-scale geographies (e.g., SOCC range) within 17 Ecological Drainage Units (EDU), these documents constitute watershed plans. They clearly show the physical, chemical, and biological functions at work within Missouri's watersheds, describe the current and historical resource conditions, describe the threats to aquatic resources in those watersheds, and provide a hierarchical approach to identifying the locations with the most pressing ecological needs in those watersheds and streams. The Compensation Planning Framework document has more information on EDUs, WIAs, and COAs.

The proposed geographic service area for the SSTF is defined as the EDU, and MCHF proposes to provide compensatory mitigation in nine EDUs (Apple/Joachim, Blackwater/Lamine, Cuivre/Salt, Nishnabotna/Platte, Black/Current, Meramec, Moreau/Loutre, Osage and White basins). Additional EDUs may be added in the future, to be submitted as proposed amendments to this instrument for COE and IRT approval. MCHF will provide compensatory mitigation for permitted impacts within the same geographic service area in which impacts occur unless the district engineer, in consultation with the IRT, has agreed to an exemption. The EDU was selected because the MCHF has concluded that the scale is appropriate to ensure that good, high quality projects can be located and designed, the projects approved can be done in a realistic time frame, and those projects will be able to effectively compensate for adverse environmental impacts across the entire service area. MCHF will not accept fees from permittees in watersheds in which MCHF, and their MDC technical cooperator, does not believe there is a reasonable probability of identifying appropriate mitigation. Individual projects will be proposed for EDUs through project-specific mitigation plans.

V. GENERAL NEED FOR AND THE TECHNICAL FEASIBILITY OF THE PROPOSED ILF PROGRAM

Lacking good ecological alternatives, most permittee-responsible and offsite compensatory stream mitigation projects implemented are small with limited environmental benefits. Some common problems associated with permittee-responsible mitigation plans is that they are designed within a stream reach and not within a watershed context; they have ill-defined project goals and success criteria; they lack good baseline data and measurable metrics for success; they often combine poor location with poor (or inadequately implemented) design; they lack competent professional oversight; long term maintenance or adaptive management may be limited or nonexistent; and many projects lack performance inspections and monitoring. Federal regulations recognize that mitigation banks and in-lieu fee programs may be environmentally preferable options because they generally involve consolidating compensatory mitigation resources to target more ecologically significant functions, provide financial planning and scientific expertise, often are larger in scope where ecological gains can be more significant, reduce temporal losses of function, and reduce uncertainly over project success.

The Stream Stewardship Trust Fund is a more preferable option because inherent in it are the benefits attributed to environmentally preferable programs mentioned above, as well as leveraging compensatory mitigation sites to fit within an overall stream improvement program of the Missouri Department of Conservation. The SSTF would use a watershed based approach in selecting sites and would identify streams and aquatic resource needs in watersheds identified as Aquatic Conservation Opportunity Areas; watersheds containing scarce, rare, unique or endangered species or communities; watersheds managed for public use and recreation; and watersheds with habitat or water quality problems that degrade ecological values. Mitigation planning efforts for the SSTF will seek to identify and prioritize aquatic resource restoration, establishment, enhancement activities, and preservation of existing aquatic resources that are important for maintain or improving ecological functions of a watershed.

The benefits of dovetailing the SSTF with stream management programs of the Missouri Department of Conservation are twofold. First, MDC has been leading and promoting an organized and directed program of stream habitat improvement under a watershed approach since the late 1980s. Installing stream improvements on public and private lands for the benefit of aquatic species of conservation concern (Niangua darters and Topeka shiners), unique communities, and species of public interest (smallmouth bass and trout), as well as overall water quality and habitat improvement purposes (e.g., cattle exclusion, stream bank and streambed management, etc.) in watersheds with localized degradation, has been and continues to be a cornerstone of this program. Implementation of projects has been conducted under the umbrella of watershed plans for decades. Second, projects receive a high level of technical expertise by involving fishery biologists, stream habitat specialists, and engineers. MDC has been in the forefront of the technical aspects of stream improvement for decades, and has a long history of providing training in these areas at the national and state level. SSTF projects benefit greatly from the involvement of MDC staff, resulting in a high success rate for installed projects.

VI. PROPOSED OWNERSHIP ARRANGEMENTS AND THE LONG TERM MANAGEMENT STRATEGY FOR THE ILF PROJECT SITES

The MCHF, as the principal sponsor of the SSTF, accepts the transfer of mitigation responsibility from the applicants from which funds are accepted, and warrants the replacement of that responsibility through the funding of projects as outlined above. Projects approved for funding will be secured for the long term using primarily two legal instruments. While the MCHF will not own or permanently secure land rights in its name, they will provide for long term protection and management of SSTF-funded projects. MCHF will pursue appropriate remedies, including legal actions, in the event long term maintenance issues arise that cannot otherwise be resolved.

Acquisition: Acquisition represents the ultimate in project protection and is most used, in whole or in part, for preservation projects. A project area is purchased and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas. In most cases, the acquisition is a key property offering substantial benefits to the stream system, contains unique or rare habitats, is important for one or more species of conservation concern, and/or provides an opportunity to add to an already large area in public ownership managed for one of the above purposes.

Perpetual Easement: A project protection involving a signed, recorded easement on the project area that specifies what can and cannot be done within the easement area. Appendix F contains the easement template. This type of protection is most appropriate for preservation, restoration, and establishment projects. A project with a landowner or other entity can involve an easement, where the landowner donates, sells, or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation or a natural resource-oriented federal, state, or local government agency or natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust, or similar not-for-profit entity. If a stream improvement project is warranted (e.g., stream bank stabilization structures or riparian planting), MCHF covers the cost of the improvements. In addition, if the easement is not donated, the landowner may receive a pre-determined payment rate per acre for the easement (see Appendix E). The payment rate is based on the county in which the land is located; perpetual easements are recorded on the landowner's deed and MCHF receives a copy of the recorded easement.

In some cases, perpetual easements or acquisition may not be possible or warranted. Examples may include a high quality and focused watershed project where all landowners within the project area do not agree to provide permanent easements on their properties. If the quality of the project is of sufficient critical importance to the improvement of the EDU, the COE and IRT may, at their discretion, approve of long term management instruments that do not involve perpetual easements. While these will be extremely rare, MCHF reserves the right to propose the use of the following for high quality projects, subject to COE and IRT approval:

Maintenance Agreement: Our partners include not only private landowners but also counties, municipalities and other state and federal agencies. These entities have opportunities to impact the stream in a positive manner (i.e., low water bridge replacement for AOP), however, they do not own the property upstream or downstream from the project and an easement cannot be placed on the project. In this case a maintenance agreement will be utilized to protect the project for its lifespan or 30 years whichever is longer. Although these will not be common, there will be opportunities to use these and in the past have been a valuable tool.

VII. QUALIFICATIONS OF THE SPONSOR TO COMPLETE MITIGATION PROJECTS

For over 10 years, the MCHF has provided successful stream improvement projects as mitigation for development projects from which they have received funds. The SSTF is a successful in-lieu-fee program, allocating almost $4 million to over 60 projects (Appendix B) sponsored by the MDC in a timely manner throughout the state of Missouri under an MOU signed in 2000. The funding, oversight, and approval mechanisms of the MCHF, coupled with MDC's technical expertise in stream system management and rehabilitation, resources (equipment, staff, regional knowledge of stream needs/priorities), and management emphasis incorporating all watersheds in the state, has provided quality compensatory mitigation projects. The MCHF is uniquely qualified to continue to provide compensatory mitigation throughout the State of Missouri.

Given its close association with the MDC, the MCHF has access to the expertise of their stream engineers, biologists, and other experts in stream improvement technology. In addition, the statewide stream management programs of the MDC are already watershed-based, and SSTF-funded projects provide needed financial leverage, along with the funds of many potential partners, to accomplish watershed-based projects that are often large-scale and beyond the scope of many other compensatory mitigation efforts. MDC staff has the technical expertise, equipment, and other technical infrastructure to plan, design, and carry out all aspects of stream improvement projects and have committed to providing these services to the MCHF. MDC stream and support staff are technically qualified; they have been in the forefront of stream habitat improvement science for several decades, and state and federal regulatory agencies regularly tap their expertise for their enforcement and management work as well as look to them for their stream management continuing education needs. All SSTF projects are endorsed by and priorities of, the MDC. The two entities have worked efficiently together to advance statewide stream protection and enhancement goals, maximize results, and provide cooperative funding options that provided high quality stream projects at low cost.

VIII. COMPENSATION PLANNING FRAMEWORK

All mitigation projects provided by the SSTF under the terms of this agreement will fit within the Compensation Planning Framework presented in Appendix A.

IX. ILF PROGRAM ACCOUNT DESCRIPTION

The MCHF shall hold any mitigation resources collected pursuant to these ILF mitigation procedures in a separate, interest-bearing escrow account, investment instrument, or banking institution so as to earn interest while maximizing the safety and preservation of the principal amount of funds in the account. All funds will be held in a financial institution that is a member of the Federal Deposit Insurance Corporation. The MCHF will account for the funds so held, and the account may be audited by the COE at their request. The MCHF will provide the COE with an account statement annually which states the balance of the SSTF, the general type of investment instruments in which the SSTF invests, and a list of stream projects and associated costs supported by the SSTF. All interest and earnings accruing to the program account through investments of project receipts will be used for the purpose of providing compensatory mitigation as spelled out in this instrument. Assets left over from completed mitigation projects (for which all credit obligations have been met) will be used for additional SSTF projects in any EDU or high quality stream projects that may not meet all the stipulations of this instrument. Administrative costs accrued by MCHF may be used for any purpose designated by MCHF, including direct and administrative support of non-SSTF conservation programs. The program account will be used only for administrative costs and the selection, design, acquisition, implementation and management of mitigation project sites. Any funds received from entities other than COE permit recipients (e.g., EPA settlement fees directed to stream improvement projects) will be held in an account separate from the SSTF program account and applied to projects which satisfy the purposes for which the funds were awarded.

Beginning with projects approved and undertaken after approval of the instrument, a 15 % fee will be paid to the MCHF from all SSTF projects for administering the SSTF; handling general in-lieu-fee program coordination, oversight, and reporting; and covering other SSTF-related administrative overhead. Administrative fees can be collected only when a mitigation project is approved and will be taken after a project has been installed and paid for. MCHF staff may undertake project-specific tasks such as project coordination, monitoring, evaluation, reporting, and other duties involving the implementation of approved projects. Costs that can be tied to a specific approved project will be considered implementation costs, not administrative, and will be deemed a cost of implementing the project. These costs will not be taken out of administrative fees collected, but charged to the general project account.

All monies from the SSTF are to be allocated to specific projects in accordance with the above guidelines within three years of the date received. If more than three years pass from the date funds are received, the COE may request funds be allocated to another MCHF project or another non-profit entity. The COE may grant an extension of the three year time limit on a case-by-case basis. The MCHF anticipates completing all SSTF projects within the three year window.

X. LITERATURE CITED

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APPENDIX A

COMPENSATION PLANNING FRAMEWORK

Appendix A

COMPENSATION PLANNING FRAMEWORK

Overview and Purpose

One of the objectives of Stream Stewardship Trust Fund is to provide certain permittees more flexibility in meeting their stream mitigation requirements, while creating a financial source to restore, reestablish, enhance and preserve stream systems in Missouri. The purpose of the Compensation Planning Framework is to provide information, on a watershed basis, to assist in the selection, securing and implementation of aquatic resource restoration, establishment, enhancement and/or preservation activities and projects.

Geographic Service Area

A watershed approach will be used in compensatory mitigation planning, using the EDU as the basic unit of geography and Missouri Department of Conservation's Watershed Inventory and Assessment (WIA) and Aquatic Biodiversity Assessment reports as supportive documentation. Although primarily watershed assessments, WIAs go a long way in identifying broad goals, objectives and general direction for improving the physical, chemical and biological functions within the individual WIA. When dovetailed with the Aquatic Biodiversity Assessment identifying 158 Aquatic Conservation Opportunity Areas (geographies which, when taken together, conserve all identified Missouri aquatic fish, mussel, and crayfish species specifically in at least two locations, and as cohabitants in aquatic guilds, other vertebrate and invertebrate populations as well), these documents provide formal watershed plans because they clearly show the physical, chemical and biological functions at work within Missouri's watersheds, describe the current and historical resource conditions, describe the threats to aquatic resources in those watersheds, identify objectives for maintaining and improving biological, chemical and physical conditions in the watershed, and provide a hierarchical approach to identifying the locations with the most pressing ecological needs in those watersheds.

Three Aquatic Subregions cover Missouri (i.e., Central Plains, Ozarks, and Mississippi Alluvial Basin) and largely correspond with the three major aquatic faunal regions of Missouri. Pflieger (1989) used a species distributional limit analysis and a multivariate analyses of 1,608 community fish samples to empirically define these three major faunal regions. Subsequent studies examining macroinvertebrate assemblages have also concluded that these Subregions are necessary strata to account for biophysical variation in Missouri's riverine ecosystems. Each subregion contains streams with relatively distinct structural features, and functional processes, and aquatic assemblages with relatively distinct ecological characteristics.

Within Aquatic Subregions are geographic variations in taxonomic composition (species- and genetic-level) resulting from the geographically distinct evolutionary histories of the major drainages within each subregion. These are the Ecological Drainage Units, or EDU. All of the EDUs have assemblages with relatively similar ecological characteristics (e.g., physiological tolerances, reproductive and foraging strategies). However, the actual species (i.e., taxonomic composition) that make up the assemblage of any given EDU is relatively distinct due to evolutionary processes like adaptive radiation, differences in colonization history, etc.

Given the relative similarity in ecological characteristics, the broad, general physical features within each EDU, their watershed basis, and their size and distribution, they are appropriate geographies to organize compensation mitigation strategies and plans around. A general description of each EDU within the Compensation Planning Framework follows later in the document.

A multi-variate cluster analysis of landscape variables assists in further classifying streams by ecosystem structure and function. These smaller divisions of an EDU are called Aquatic Ecological Systems (AES) and represent watersheds or subdrainages (approx 100 to 600 mi^2) with relatively distinct (local and overall watershed) combinations of geology, soils, landform, groundwater influences, hydrologic regimes, physical habitat, water chemistries, nutrient sources, energy and sediment budgets, and ultimately aquatic assemblages. AESs can be further subdivided into distinct Valley Segment Types (VSTs) to account for longitudinal and other linear variation in ecosystem structure and function that is so

prevalent in riverine environments. Each individual valley segment is a spatially distinct habitat, however, valley segments of the same size, temperature, flow, gradient, etc... all fall under the same VST. By comparing faunal characteristics, physical attributes, land use, and socio-political factors, priority areas for conservation action, known in this document as Aquatic Conservation Opportunity Areas, can be teased out and identified for focused habitat restoration, improvement and enhancement.

For the purposes of identifying geographic service areas for SSTF, we use the EDU as the basic geography around which mitigation planning takes place, and further define priority areas based on Aquatic Conservation Opportunity Areas or other designations (303[d] waters, state or federal park/recreation areas, wild and scenic rivers, watersheds home to Species of Conservation Concern, etc.). Ecological Drainage Units comprising SSTF's Compensation Planning Framework are:

Apple/Joachim Creeks Geographic Service Area

Ecological Drainage Unit name: Apple/Joachim Creeks (HUC: 07140101)

Support Data: The information in this EDU does not have a companion Watershed Inventory and Assessment (WIA) document. Information was gathered from other sources.

Geographic service area: The Apple/Joachim Creeks basin is located in St. Louis City and County, Jefferson, St. Francois, Ste. Genevieve, Perry and Cape Girardeau counties. The EDU lies in east-central Missouri and includes all of the smaller direct tributaries to the Mississippi River between the outlets of the Missouri and the Castor River diversion channel (known as the Headwater Diversion). Included are River Des Peres, Joachim Creek, Plattin Creek, Establishment Creek, Aux Vases River, Saline Creek, Cinque Hommes Creek, Apple Creek, Indian Creek, and Cape La Croix Creek. Overall there are 4,453 miles of primary stream channel within this EDU, of which 1,734 miles are classified as perennial. Because of their basic physical, chemical and biological similarity; the similarity of watershed land use and topography in each basin; the common downstream connection with the lower Mississippi River, including all of these streams in one EDU for mitigation planning will allow similar approaches to watershed, riparian, and stream channel problems and opportunities.

Threats to the aquatic resources in the Apple/Joachim Creeks EDU: The quality of aquatic resources in the Apple/Joachim EDU are variable, ranging from severely degraded in the northern watersheds of urban St. Louis, to higher quality in the less populated southern portions of the EDU. Because of the variability, there are a number of problems facing streams in the EDU:

Aquatic Resource Problems

- Livestock overgrazing and unregulated access to streams causing stream bank erosion and sedimentation
- Destruction of riparian vegetation from construction and livestock use
- Channelization ranging from full scale channel paving and/or closure in the St. Louis area (e.g., River Des Peres) to a number of more natural channels where only small-scale channelization due to bridge construction and replacement causes localized bank erosion, riparian destruction, and sedimentation downstream.
- Instream gravel operations are small scale and impacts ranging from bank erosion and riparian destruction to sedimentation are more localized

- Watershed urbanization, especially in the northern parts of the EDU in St. Louis and Jefferson counties adversely impacts riparian corridors, increases stormwater runoff, increases stream nutrients, and depresses aquatic species diversity, especially when tied to channel alterations.
- Historic lead, iron and zinc mining in the areas of St. Genevieve county continues to impact streams

Water quality problems

- In the middle of the EDU, with Ste. Genevieve County as the epicenter, historic lead, iron and zinc mining areas have impacted streams with mine discharges and erosion of tailing.
- Waste water discharges from sewage treatment plants can cause low DO, algal blooms, and ammonia buildup.
- Intensive livestock operations increase sediment and organic discharges to the stream
- Contamination of aquatic organisms, primarily with chlordane; heavy metals from mining , industrial and municipal effluents; and mercury, continue to plague the EDU

While many of the water quality problems, especially those involving heavy metals and aquatic life contamination and extensive urban channel paving and containment, will be difficult, expensive and complex to address, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects. Preservation projects, especially in streams in rapidly urbanizing areas but still containing high quality aquatic communities are particularly adaptable.

Historic aquatic resource loss in the Apple/Joachim Creeks EDU: Prior to European settlement, the Apple/Joachim watershed was extensively forested with numerous floodplain wetlands, especially along the Mississippi river. Timber in the uplands consisted typically of numerous oak species and hickory, and in the alluvial floodplains it consisted of sycamore, maple, oak, hickory, walnut, buckeye, cottonwood, birch and other similar species. Prairie and savanna areas were spotty in the rolling uplands of the basin.

The earliest inhabitants of the area were members of several Native American tribes: the Delawares, Shawnees, and Cherokees lived in the southern portions of the EDU with the Osage tribe inhabiting the western lands. The first settlers came in the late 1700s, establishing trading posts in St. Louis, Ste. Genevieve, and Cape Girardeau, although settling lands away from the Mississippi River was difficult because of Osage Indian attacks. Settlers originally fended for themselves, living off the abundant wild game, wild honey, and wild fruits, and raising corn, flax and cotton for personal use in small fields; widespread agricultural efforts increased steadily such that by the time of the Civil War, farmers were raising a variety of crops and selling them, primarily in St. Louis. An influx of German settlers and the establishment of the Iron Mountain Railroad in the late 1800s (constructed primarily to haul mining products to processors but also provided a means of getting crops to market) spurred an increase in agriculture in the basin. However, the main interest in the area was mining, and agricultural pursuits really did not take off until much later. While much of the EDU remained rural, the northern part of the EDU saw a steadily-increasing trend of urbanization as St. Louis developed over several centuries from a small trading post to a large US city. The ultimate result of the steady conversion of forest, wetland and grasslands to buildings, streets, and other urban infrastructure eliminated habitats, depressed aquatic natural features, and destroyed natural stream, riparian and upland values.

While it is difficult to get good information on a general breakdown of historical land use for this EDU, the topography and characteristics of native communities were similar to that of other Ozark watersheds; therefore, it is likely that the area was predominantly forested (probably 60-75% basin wide, although some areas like St. Genevieve county were originally over 90% forested), with some interspersion of grasses (15-20%) and the remaining being wetland and other land uses. It is likely that Native Americans fostered a savanna-like grass understory with the use of fire in the uplands. Much of the virgin timber (pine first, followed by hardwoods) began to be removed in the early 1800s, and by late in the century, timber companies had harvested much of the basin's upland timber. As settlement increased, burning and grazing forests became common practices.

Early in the settlement of the basin, mining probably brought in more people than any other activity. Areas to the west of the basin, primarily in the Meramec EDU, contained large quantities of iron, zinc, and lead and the first mines were established in the early 1800s to tap these minerals. Some exploration and mining occurred in the Apple/Joachim basin on a small scale, but did not expand to the extent those west of the basin did. However, given its proximity to transportation (the Mississippi River), smelters, processors and mining transport hubs did spring up in the basin, and

continue to this day. A large lead smelter in Herculaneum in northern Jefferson County has been active since the late 1880s and continues today. Mining for stone (primarily limestone, sandstone, and granite as building materials and monuments, high-silica sand for glass around Crystal City), and gravel mining for construction materials also occurred in this EDU.

The first attempts at agriculture were by early settlers using the simplest of implements. Small tracts of corn, flax and cotton were cultivated for personal use. The growth of agriculture in the watershed was slow, except for areas in the Mississippi River floodplain, which had a history of being cultivated even by Native Americans. The growth of farming was fairly slow until the influx of German immigrants brought more farmers to the area. Livestock, barley, corn, oats, rye, wheat, potatoes, tobacco and orchard products were raised and sold locally or sent to St. Louis. Grapes were also cultured and used for winemaking.

The development of St. Louis grew steadily from its trading post status in 1764; to a riverfront town that was the second largest port in the U.S. in 1850; to post Civil War expansion that was marked by the 1904 World's Fair and by St. Louis being the largest producer of beer, shoes, stoves, wagons and other products in the country; to its post WWII status as the 10th largest city in the United States.

Current aquatic resource conditions in the Apple/Joachim Creeks EDU: This EDU currently has a hydrologically diverse landscape with an equal mixture of surface water and springflow-dominated streams. Riffle habitats are common in all streams, but decrease in occurrence as the channels approach the Mississippi River and eventually become virtually absent once the channels enter the floodplain. The average gradient across all stream size classes is 28 ft./mi. The Inner and Outer Ozark Border Ecological Subsections dominate the landscape of this EDU. These two subsections differ mainly in terms of bedrock geology and relief. The Outer Ozark Border, as it runs along the Mississippi River, generally has lower relief (150 feet) and is underlain by Mississippian limestone, which corresponds with the distributional limit of many Ozark aquatic species. The Inner Ozark Border has higher relief (150-300 feet) and is underlain by Ordovician dolomites.

In general, land use and land cover are reduced from the predominantly-forested condition of the past. The northern parts of the EDU (northern Jefferson County) has been rapidly urbanizing; areas surrounding the larger towns elsewhere, like Ste. Genevieve, Perryville, and Cape Girardeau, have also shown conversion of other land uses to houses and developments. The incidence of forest is much reduced, and is more concentrated in the northern half of the EDU. Current conditions in the southern portion of the drainage tend more to cropland and pasture-dominated agriculture. Wetlands have decreased dramatically, as drainage projects in floodplain areas have drained much of what was present prior to European settlement. The results of these land use changes have been an increase in nonpoint pollutants, erosion and sedimentation, and increasing nutrients from pasture runoff.

Grazing and row cropping have increased in upland areas and valley bottoms compared to historical conditions. Typical of the EDU as a whole, approximately 60% of Ste. Genevieve County is farmed, primarily in the uplands and floodplains; the farming breakdown is roughly half pasture and half row cropping. Forest is steadily declining and being converted to agricultural and urban land. The conversion from forest to agricultural lands increases erosion and sedimentation in streams within the EDU, and while the incidence of CAFOs is low compared to other EDUs, they contribute to nutrient enrichment and other water quality problems in the basin.

While the EDU was not as heavily mined compared to that occurring in the Big River watershed of the Meramec EDU, mining occurred, and some of the larger mine processing sites are found in the Apple/Joachim basin. A long-operating lead smelter continues to separate lead from other materials in Herculaneum. Lead smelting is not without problems contributing to heavy metals contamination, and the owner of the lead smelter in Herculaneum plans to cease smelting operations in the near future and renovate the site. There are a number of limestone mining operations, primarily in the Jefferson and Ste. Genevieve county area, and small-scale gravel mining in streams occurs. The Pittsburgh Plate Glass Company (PPG), long operated a large facility that produced glass in the Crystal City area; however, this facility closed in the early 1990s and no longer produces glass.

With the urbanization of the St. Louis area and the continued development of rural lands south of the city, stream degradation is occurring. Pollution-sensitive aquatic life declined in many of the streams near St. Louis; water quality and habitats also declined as watershed areas were converted to impervious surfaces like roads, parking lots and houses. Removal of forested and vegetated riparian areas along streams also occurred, removing the buffers than protected

streams from adverse impacts. Increased runoff from these areas contributed to altered hydrology, and changes to the thermal regimes of streams also occurred. A variety of water quality problems, including inadequate sewage treatment discharges, ~~and~~ increased municipal discharges to streams, and increased non point pollution events, combined with nutrient loading and pesticide problems from yards and gardens, also contributes to the degradation of biological communities. While these sorts of problems are currently concentrated in the northern portions of the EDU, rapid expansion of urban areas in the long term will continue to contribute problems.

A total of 121 fish, 23 mussels, and 5 crayfish either inhabit or at one time inhabited the Apple Joachim EDU. According to the Missouri Natural Heritage Program there are 8 globally listed (rare, threatened, or endangered) species and 19 state listed species. The fish assemblage is characterized by a mixture Ozark, Great River, and Lowland species and could be classified according to the dominant families as a Minnow/Darter/Sucker assemblage. Distinctive fish species include the Ozark minnow, Mississippi silvery minnow, bleeding shiner, western sand shiner, ghost shiner, crystal darter, sicklefin chub, sturgeon chub, pallid sturgeon, lake sturgeon, and Alabama shad. A distinctive feature of this EDU is the prevalence of Great River species in the lower sections of the major tributaries.

The most common mussel species are the giant floater, pondmussel, and fatmucket. The flat floater is a distinctive mussel species. The virile, spothanded, devil, and golden are the most common and distinctive crayfish species.

Aquatic resource goals for the Apple/Joachim Creeks EDU: Our major goals for the Apple/Joachim basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to, ghost shiner, Topeka shiners, troutperch, plains minnow, and western silvery minnow) and unique or depressed aquatic invertebrate populations (especially the spectacle case and flat floater mussels)
- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream

Prioritization strategy for selecting and implementing mitigation projects in the Apple/Joachim Creeks EDU: Mitigation projects in the Apple/Joachim EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process within the Apple/Joachim EDU, 8 areas of conservation opportunity that included at least two stream reaches where 58 target species of fish, mussel and crayfish endemic to the EDU were found, the following priority areas were identified: Apple Creek, Blue Spring Branch, Frenchman Creek, Isle du Bois, Joachim Creek, Pickle Creek, Seventy Six, and Stoples Hollow. These 8 areas represent the broad diversity of watershed and stream types that occur throughout

the basin. In total, the final set of stream reaches within the COAs constitutes 516 Km of stream. This represents just 13% of the total stream miles within the Apple/Joachim EDU. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in urbanizing areas

Preservation objectives for the Apple/Joachim Creeks EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Apple/Joachim basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Apple/Joachim EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Apple/Joachim Creeks EDU: As part of the siting of ILF project sites within the Apple/Joachim EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Apple/Joachim Creeks EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Apple/Joachim Creeks EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Black/Current Rivers Geographic Service Area

Ecological Drainage Unit name: Black/Current Rivers (HUCs: 11010007, 11010008, 11010009, 11010010, and 11010011)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Black/Current Rivers EDU. The Black, Current, Eleven Point, Jacks Fork and Spring rivers Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Black River:
http://extra.mdc.mo.gov/fish/watershed/black/contents/
Current River:
http://extra.mdc.mo.gov/fish/watershed/current/contents/
Eleven Point River:
http://extra.mdc.mo.gov/fish/watershed/elevenpt/contents/
Jacks Fork:
http://extra.mdc.mo.gov/fish/watershed/jcksfork/contents/
Spring River http://extra.mdc.mo.gov/fish/watershed/springr/contents/

Geographic service area: The Black/Current EDU lies in south-central Missouri and north-central Arkansas. It covers those portions of the Black, Current, and Eleven Point watersheds that fall within the Ozark Highlands. Streams flow southerly or southeasterly and empty into the White River in Arkansas. Overall there are 11,122 miles of primary stream channel within this EDU, of which 2,263 miles are classified as perennial.

The Black River originates in Reynolds and Iron Counties, MO and flows south through Wayne and Butler Counties and into Arkansas, emptying into the White River at Jacksonport, Arkansas. The Black River drains 1,756 square miles in Missouri. The upper subbasin lies in the Ozark Plateau and the lower subbasin lies within both the Ozark Plateau and the Mississippi Alluvial Plain.

The Current River is formed by the confluence of Pigeon Creek and the Montauk Spring complex near Montauk, Missouri. From its beginnings the river flows approximately 184 miles in a southeasterly to south direction before flowing into the Black River near Pocahontas, Arkansas. The Current River Watershed drains a land area of approximately 2,621 square miles in portions of 9 counties in Missouri (Texas, Dent, Reynolds, Shannon, Howell, Oregon, Carter, Butler, and Ripley) and 2 Counties in Arkansas (Randolph and Clay). Most of the watershed (95.9%) lies within Missouri.

The Jacks Fork is formed by the confluence of two streams: the North Prong (9 miles south of Raymondville, Missouri) and South Prong of the Jacks Fork (5 miles east of Cabool, Missouri). From this point, it flows in an easterly direction for 49.1 miles before joining the Current River northeast of Eminence, Missouri. The Jacks Fork watershed occupies a land area of 445 square miles (approximately 18% of the Current River watershed) in portions of Howell, Shannon, and Texas Counties and drains directly into the Current River. The Jacks Fork watershed is bounded to the South by the Eleven Point Watershed and to the West and Northwest by the North Fork and Big Piney Watersheds.

The Eleven Point River originates near the town of Willow Springs, located in northeastern Howell County. The river flows southeasterly across northern Howell and Oregon Counties and then south, crossing the Arkansas state line about

2.5 miles west of the southeast corner of Oregon County. From there it flows generally south through Randolph County, Arkansas, joining the Spring River approximately 3.7 miles above the Spring River/Black River confluence near Black Rock, Arkansas. Greer Spring also contributes significantly to the flow of the Eleven Point River, turning the river into a cold water stream. The Eleven Point Watershed, which lies in the Salem Plateau Subdivision of the Ozark Plateau Physiographic Region, drains approximately 1,024 square miles of five counties within Missouri (Howell, Oregon, Ripley, Carter, and Shannon). The watersheds bordering the Eleven Point Watershed include the Jacks Fork to the north, the Current to the east, and the North Fork of the White River and Spring River to the west.

The Spring River watershed is located southwest of the Eleven Point Watershed and is bounded to the west by the North Fork of the White River watershed. The longest of the Spring River tributaries in Missouri is the Warm Fork of the Spring River which originates north of West Plains, Missouri, and flows in a southeast to southerly direction for approximately 38 miles before crossing the Missouri/Arkansas border. The Warm Fork becomes the Spring River at the confluence of Mammoth Spring at Mammoth Spring, AR, and continues flowing southerly before emptying into the Black River near Black Rock, Arkansas. The Spring River watershed in Missouri occupies 480.3 square miles of area in the Ozark Plateau Physiographic Region. Approximately 39% of the total watershed of the Spring River is located in Missouri.

Threats to the aquatic resources in the Black/Current Rivers EDU: Overall, the quality of aquatic resources in the Black/Current EDU is quite good due primarily to federal and state ownership of a large portion of the watershed and the undeveloped nature of these holdings; however, there are some localized problems:

Aquatic Resource Problems

- Livestock access to streams causing stream bank erosion, sedimentation, and nutrient enrichment, either by cattle on privately-owned lands adjacent to headwater and tributary streams, or excessive horse trail use on public lands bordering tributary and main stem streams.
- Destruction of riparian vegetation from overgrazing, livestock use and development.
- Instream gravel mining operations on streams outside of public ownership cause an increase in stream bank erosion and sedimentation
- Channel alterations and levee construction in the lower sections of the Current and Black rivers depresses aquatic diversity
- Road and bridge construction and maintenance increases stream bank and stream bed erosion and sedimentation.
- Intensive recreational use
- Reservoir construction (Clearwater, Lower Taum Sauk lakes) have altered flow regimes and created problems for aquatic species with flowing water requirements.

Water quality problems

- In the upper Jacks Fork, Eleven Point and Spring river basins, lead prospecting or mining, either as mine discharges or through the erosion of tailings into the river system, can cause toxic effects of aquatic life and accumulate heavy metals in fish flesh.
- Waste water discharges from municipal sewage treatment facilities and improper septic tank installations can cause low DO, algal blooms and nitrate problems resulting in periodic high fecal coliform levels, nutrient loading, and increased sediment deposition, especially in karst areas where the potential for contamination of the ground water system by poorly constructed and/or maintained septic or municipal systems is high
- Intensive hog, cattle and poultry operations increase sediment and organic discharges into streams. Grazing practices along many streams contribute to stream bank instability, nutrient loading, and poor riparian conditions.
- Contamination of aquatic organisms, primarily lead and mercury, continues to plague portions of the basin and could be a potential future problem if lead prospecting that currently occurs in the Jacks Fork and Eleven Point basins leads to active mining.

While many of the water quality problems, especially those involving heavy metals and aquatic life contamination, will be difficult, expensive and complex to address, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects.

Historic aquatic resource loss in the Black/Current Rivers EDU: Historic~~al~~ land cover within the Ozark uplands primarily consisted of pine and mixed pine/oak forests. These forests were described as being primarily open, with little woody undergrowth and a dense herbaceous ground flora composed of bluestem and other wild grasses and non-woody species. Ridges with sandy, flint covered soils were covered with stands of shortleaf pine. White oak and black oak were often mixed with the pines on the ridges, and along with northern red oak, black walnut and shagbark hickory formed the dominant canopy of the side slopes. Along isolated stream valleys in this watershed, prairie openings were also observed. Occasional prairie and savanna openings were also common in some areas. Land cover of the side slopes consisted of oak and oak/pine forests with occasional glade and woodland type openings associated with exposed slopes and ridges having shallow soils. Valley bottom land cover consisted of mixed hardwood forest with occasional fen openings.

The earliest inhabitants of the Ozarks, the Native American Indian, are thought to have existed in the Ozarks as semi-nomadic tribes living in small, transient camps and subsisting on hunting and foraging. The Osage eventually became the predominant tribe in the Ozark uplands, and their use of fire is believed to have stimulated warm-season grasses such as bluestem and eliminated woody undergrowth thus creating open woodlands or savannas. Many of the early settlers came to the Ozarks after the Lewis & Clark expedition from the Appalachian states such as Tennessee, Kentucky, and Virginia where they had learned the skills necessary for survival in land similar to the rugged Ozark wilderness. In addition to hunting and fishing, early settlers survived by using the valley bottom land for gardens and row crops, and the wooded side slopes and natural grass of the uplands for grazing cattle, hogs, horses, and other livestock. This region remained isolated and only sparsely settled until the late 1800's, when the dwindling forest resources of the east forced loggers to find other sources for timber. Large-scale exploitation of the Ozark timber resource followed, as shortleaf pine trees were harvested for lumber, while a variety of sizes of hardwood trees were harvested for products such as railroad ties, charcoal, barrel staves, and flooring. For watersheds like the Current, Jacks Fork, Warm Fork of the Spring, and Eleven Point, shortleaf pine was what was sought; however, oaks and other hardwoods were cut as well. In the Black River basin, millions of oak, cypress, ash, and gum trees were cut and rafted down the Black River.

Prior to settlement, areas of the lower Black and Current River contained wetlands, and cane was a common site along rivers and streams in these lowland areas...so thick that streams and localities are named after the plant. Following settlement and the era of extensive timber harvest, lands in the lower Black and Current river watersheds were eyed as potential farmland. Draining of the southern part the Black River began in 1870 when the Butler County Court constructed a levee along the Black River and a ditch from Cane Creek to the Black River. The current system of north/south ditches at one mile intervals and a large levee along the western bank of the Black River followed in the early 1900's. This drainage system opened up the lands to the west of the Black River for farming, but at a huge cost in lost wetland values.

Little attention was paid to regeneration of the forest and by the 1930s the timber cutting boom was over and many of the settlers associated with the timber industry were forced to turn to subsistence farming as a means of survival. With little or no attempt to reforest cut-over areas, land which had previously been dominated by pine and mixed pine-oak forest began to regenerate to thick oak sprouts and wild grasses diminished in abundance. Continual burning, free-range grazing and the cultivation of marginal uplands caused further damage to the already degraded land. Rivers and streams filled with gravel and water quality declined as soils, especially those on the steep rocky hillsides, suffered from severe erosion. Ozark stream disturbance has been characterized by accelerated aggradation of gravel, especially in formerly deep pools, accelerated channel migration and avulsion, and growth of gravel point bars. However, the cause of Ozark stream degradation is not as simple as a result of clearing upland trees. Different types of land use changes have taken place on different parts of the Ozark landscape, and at different times, resulting in a complex series of potential disturbances that have affected parts of the hydrologic or sediment budgets or both.

During 1930s to 1970s, the Federal government began purchasing areas of the Ozarks, first by the U.S. Forest Service as part of the Mark Twain National Forest, and later by the National Park Service and the Forest Service as a national riverway and a scenic river. The result of this purchase, and the subsequent return of native vegetation to uplands and riparian areas, has resulted in some beneficial changes: channel instability seems somewhat decreased in areas where the

riparian woodland has recovered. But overall channel stability is still hampered by high sedimentation rates because of large quantities of gravel already in transport and the effects of instability in upstream reaches that lack a riparian corridor. It's likely these impacts will continue to be felt for decades.

Lead mining began in Missouri in the 1700's in the Old Lead Belt in St. Francois County south of St. Louis. As this source of ore began to be depleted, the New Lead Belt, or Viburnum Trend, was discovered in the upper watersheds of the Black and Current rivers. Stretching from southeast Crawford County southerly to the extreme northeast portion of Shannon county, a number of mining companies began to mine the area in the mid 1950's and by 1970, the area was the largest lead producing area in the world. The desire for additional sources increased interest in prospecting for lead in an area encompassing the entire Eleven Point and Jacks Fork basins as well as a portion of the Current River. Some exploratory work has occurred but mining has not yet been proposed.

Current aquatic resource conditions in the Black/Current Rivers EDU: The Black/Current EDU is the most physiographically, hydrologically, and biologically diverse EDU in the state, containing the entire Current River Hills Subsection and portions of three other subsections: Central Plateau, Black River Ozark Border, and the St. Francois Knobs and Basins. The Central Plateau Subsection, which dominates the Eleven Point River watershed, consists of some of the least dissected portions of the Ozark Highlands. It is dominated by a thick carbonate geology consisting mainly of cherty dolomites and some prominent sandstone components, all of Ordovician age. Soil textures consist of cherty or silt loam soils with moderate to slow infiltration rates. Fragipans are widespread in the subsoil. Relief in this portion of the EDU is generally 50-150 feet. Floodplains tend to be narrow and not extensive, with very gravelly soils. This area is minimally dissected and many of the streams are either ephemeral or intermittent. Stream gradients are relatively low compared to the rest of the EDU with correspondingly smaller substrates of silt, sand, and gravel. Mainly small springs are common in this low relief landscape. The Current River Hills is a deeply dissected landscape with steep slopes, narrow ridges, and narrow valley bottoms. Most of this subsection is underlain by thick, cherty dolomites, and sandstones of the Gasconade and Roubidoux formations of the early Ordovician. The high, gently rolling, dissected plains and hills are underlain mainly by resistant sandstones and dolomites of the Roubidoux Formation. More deeply dissected lands cut into the dolomites of the Gasconade Formation and the deepest valleys cut into the Cambrian Eminence-Potosi Formation. Weathering of the highly soluble dolomites has produced the karst landscape that dominates this subsection, including numerous large springs, losing streams, sinkholes and cave. Soils are formed in weathered bedrock and rock fragments are numerous. Surface soil textures consist of cherty soils and silt loams with moderate to slow infiltration rates. Relief is relatively high, ranging from 200-600 feet. Streams are very clear with extremely high gradients and gravel and cobble substrates. Extensive gravel bars are quite common within the active stream channel. Riffles and bluff pool habitats are abundant.

The northeastern corner of the Black River watershed falls within the St. Francois Knobs and Basins Subsection. The presence of exposed Precambrian bedrock and tremendously high relief (400-1,000 feet) make this portion of the EDU distinct. Before exiting the state the Current and Black Rivers cut through a transition zone known as the Black River Ozark Border. This landscape is quite similar to that of the Central Plateau, but has a slightly higher relief (300 feet). As streams approach the Ozark Escarpment their gradients decrease dramatically and the percentage of fine substrates increases, with silt often becoming dominant.

The average gradient across all stream size classes is 72 ft/mi. Average gradients (ft/mi) by size class are: headwater 95, creek 23, small river 8.5, and large river 4.2. Streams are largely surface-water dominated within the Central Plateau and Ozark Border Subsections with scattered small spring inputs, while streams in the remainder of the EDU are largely dominated by spring flow. Riffle habitats are common in all streams, but are most extensive in streams within the Current River Hills Subsection. Streams are clear and cool with several streams classified as coldwater, which sustain trout populations.

While much of the watersheds in this EDU are, at first blush, similar to that which existed prior to European settlement, changes have occurred. Approximately 65% of the entire watershed is forested, with the Jacks Fork and Current watersheds exceeding 75% (in some portions of the Current River watershed, forest constitutes greater than 95% of the land use). While much of this area was heavily logged in the late 1800's and early 1900s, most of the timber has returned, partially due to ownership by state and federal agencies. Grassland and row crops make up 35% of the EDU, more so in the lower Black and Current watersheds due to wetland drainage and elsewhere on private lands, conversion of some

historically timbered areas into fescue pasture. In the Black River watershed, 45%of the lands are in row crop and pasture, with soybeans, rice and corn the major crops. EDU-wide, most of the agriculture that occurs in the basin revolved around livestock (cattle and hog) production, although the density of confined animal feeding operations (CAFOs) is low. Conversion of timbered areas to fescue pasture was a common practice in the 1970's and 80's; such land use changes on private lands continue today, but at a slower pace.

With the exception of the upper Black River, streams in the EDU are largely undammed and unaltered. Only Clearwater Lake, impounding the Black River near Ellington, and Lower Taum Sauk Lake, impounding the Middle Fork of the Black River, are mainstem dams. Since the 1920's, the area has been promoted as being remote, beautiful, untouched, and perfect for tourism. Missourians put a high value on recreation; streams in this EDU are heavily used by floaters, fishermen, and vacationers as people from all over the US converge on these streams and their surrounding lands during the warmer weather months. Water quality impacts stemming from recreational use, including horse trails, are well documented, especially in the Current River watershed. Urbanization is not an issue in this EDU; most of the towns are small and impacts from extensive developments impacting a large and growing area are few.

While there are some issues with lead and zinc mining in the EDU, most are concentrated in the upper Current and Black watersheds in the Viburnum Trend area where mining has been occurring since the 1960's. Regulated prospecting for these minerals in the Eleven Point, Jacks Fork and portions of the lower Current River continues; to date new mine development has not been extensive due to the potential impacts of heavy water use and tailings disposal on recreational areas of the Forest Service and the National Park Service.

Sand and gravel mining in the Black/Current EDU continues, although required permits can stem some of the potential damages due to this use of stream. Sand and gravel mining occurs throughout the EDU on private land, but mostly through small, mobile operations. The presence of large, permanent gravel mining areas is few and generally restricted to the lower Black and Current rivers. The US Army Corps of Engineers through Section 404 of the Clean Water Act and the Missouri Department of Natural Resources (DNR), through its Land Reclamation Program, issue permits for the mining of stream sand and gravel. When followed, guidelines developed by state and federal agencies with input from the regulated community and used by the COE allow mining of gravel bars and floodplains while minimizing instream damages.

The Black/Current EDU is biologically rich and diverse. A total of 133 fish, 46 mussels, and 14 crayfish either inhabit or at one time inhabited the Black/Current EDU, which is the highest number of species in the state. Twenty two globally listed (rare, threatened, or endangered) species and 41 state listed species are found in the EDU. The fish assemblage is characterized by regionally and locally endemic, intolerant, species and could generally be classified according to the dominant families as a Minnow/Sucker/Sunfish/Darter assemblage. Distinctive fish species include the Arkansas saddled darter, Current darter, brook darter, sabine shiner, Ozark madtom, Ozark chub, Ozark shiner, Ozark minnow, and Ozark sculpin. One of the most distinctive features of this EDU is the prevalence of lowland species in the lower sections of the Current and Black Rivers. The golden and spothanded crayfish are the most widespread crayfish species. Six species of crayfish have a distribution in the watershed limited to the Little Black River. These include the Cajun dwarf, digger, shield, gray-speckled, red swamp, and vernal crayfish. Other distinctive crayfish species include the coldwater, Mammoth Spring, Ozark, and woodland crayfish. Common and distinctive mussels include the Arkansas brokenray, Curtis pearlymussel, fatmucket, pondmussel, giant floater, little spectaclecase, and Ouachita kidneyshell.

Aquatic resource goals for the Black/Current Rivers EDU: Our major goals for the Black/Current basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them.

- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to, ghost shiner, Topeka shiners, troutperch, plains minnow, and western silvery minnow) and unique or depressed aquatic invertebrate populations (especially the spectacle case and flat floater mussels)
- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream

Prioritization strategy for selecting and implementing mitigation projects in the Black/Current Rivers EDU: Mitigation projects in the Black/Current EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process within the Black/Current EDU, 14 COAs that contained all 114 target species were identified: Briar Creek, Buzzard Run Creek, Chilton Creek, Indian Creek, Leatherwood Creek, Little Hurricane Creek, Mayberry Creek, McKenzie Creek, Sinking Creek, South Fork Spring River, South Prong Little Black River, Spring Valley Creek, Taum Sauk Creek, and Warm Fork Spring River. In total, these COAs constitute 681 miles of stream, representing 7.6% of the total stream miles within the Black/Current EDU. Furthermore, the focus areas themselves represent an overall area of 416 square miles, which is only 7.6% of the region. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, Ozark National Scenic Riverway, Eleven Point Scenic River, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in urbanizing areas

Preservation objectives for the Black/Current Rivers EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Black/Current EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;
- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;

- The resources contribute significantly to the ecological sustainability of the watershed;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in riparian or floodplain areas may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Black/Current Rivers EDU: As part of the siting of ILF project sites within the Black/Current River EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands

Long term protection/management strategies for compensatory mitigation in the Black/Current Rivers EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

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Strategy for periodic evaluation and reporting in the Black/Current Rivers EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a

project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

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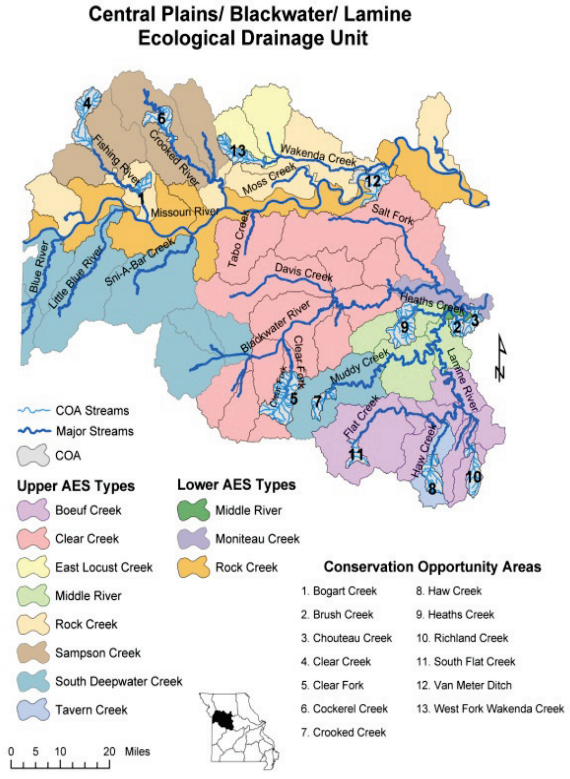


Blackwater/Lamine Rivers Geographic Service Area

Ecological Drainage Unit name: Blackwater/ Lamine Rivers (HUCs: 10300101, 10300103 and 10300104)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Blackwater/Lamine Rivers EDU. The Blackwater, Crooked, Blue and Lamine Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Lamine River:
http://www.mdc.mo.gov/fish/watershed/lamine/contents/

Blue River: http://www.mdc.mo.gov/fish/watershed/blue/contents/

Crooked River:
http://www.mdc.mo.gov/fish/watershed/crooked/contents/

Geographic service area: The Blackwater/Lamine EDU lies in west-central Missouri. The Lamine River Basin is located in Benton, Johnson, Morgan, Moniteau, Saline and Cooper counties. The Lamine River originates at the confluence of Richland and Flat Creeks in northern Morgan County, and flows 50 miles northward through Cooper County to its confluence with the Blackwater River. The Lamine River above its confluence with Blackwater River is a sixth order stream with an area of 1080 square miles. The Blackwater River flows eastward and is located in Saline, Cooper, Lafayette, Johnson, and Pettis counties. The Blackwater River is a sixth order stream and drains over 1400 square miles. The remainder of the EDU is made up of a section of the Missouri River and the streams it receives between the Kansas and the Chariton Rivers. These rivers occupy portions of Caldwell, Carroll, Cass, Clay, Chariton,

Clinton, Jackson, Lafayette, Johnson and Saline counties in western Missouri; almost 2600 square miles of watershed are located in Missouri.

Overall there are approximately 8600 miles of primary stream channel within this EDU, of which over 2300 miles are classified as perennial. This EDU contains an amazingly diverse landscape since it straddles the boundary between the Central Dissected Till Plains and the Ozarks and also borders the Missouri River. The majority of the EDU falls along the southeastern margin of the Central Dissected Till Plains Ecological Section as described by Bailey (1995), but also includes unglaciated sections of the Blackwater and Lamine drainages that are often labeled as Ozark Border.

Threats to the aquatic resources in the Blackwater/Lamine Rivers EDU: Overall, the quality of aquatic resources in the Blackwater/Lamine EDU is somewhat depressed compared to what they could be, mainly due to several problems:

Aquatic Resource Problems:

- Stream bank erosion as an unintended adverse effect due to inadequately-sized vegetated riparian corridors, channel alterations, row cropping in the Osage Plains sections of the watershed, and grazing.
- Destruction of riparian vegetation from construction, livestock use and row crop agricultural activities.
- With the exception of a large channelization project on the Blue River in Kansas City and a well-documented project on the Blackwater River, only small scale channel alterations due to stream straightening, levee construction, and attempts to control stream bank erosion are found in the basin.
- A few, small active and inactive gravel mining sites were present, especially in the Ozark border portions of the watershed.
- Watershed urbanization, especially in the upper reaches of the basin around Kansas City, has adversely impacted riparian corridors and increased stormwater runoff (which increases channel instability), as well as depressed aquatic species diversity.

Water Quality Problems:

- Excessive nutrients due to several sewage treatment plant effluents (especially in the urbanizing areas) and intensive livestock and poultry operations contribute to low DO; algal blooms; nitrate, nitrite, ammonia and phosphate discharges; and excessive sediment.
- Soil, stream bank and streambed erosion contributes excessive sediment to the stream especially in areas of inadequately-sized vegetated riparian corridors.
- Several small abandoned coal mined areas may cause localized problems with low pH, high sulfate and high iron levels in the receiving streams
- Contamination of aquatic organisms, primarily chlordane and mercury, continues to plague portions of the basin, especially in urban areas.

While many of the water quality problems will be difficult and cannot happen without involvement of public and private entities working together, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects.

Historic aquatic resource loss in the Blackwater/Lamine Rivers EDU: The area including the Blackwater/Lamine basin has been frequented by people for thousands of years based on archeological records. The Native Americans inhabiting the area at this time were primarily Sac, Iowa, and Osage. French and Spanish explorers were in the area as early as the 1500's. Spurred by the Lewis and Clark expedition, the Blackwater/Lamine river Basin was settled by white immigrants in the early 1800s, mostly from Tennessee, Kentucky and Virginia. The area was an officially recognized part of Missouri in 1821, and it was subject to troop movements, skirmishes, battles, and raids during, and for a brief period after, the Civil War.

In the 1800's, flora and fauna were reportedly diverse and abundant. Early descriptions of the basin indicate forests occurred along the stream valleys and steeper slopes leading to patchy prairies on the uplands. During the 1800's, common forest flora included hickory, oak, walnut, gum, elms, pecan, maples, cottonwood and others. As settlement continued, clearing of forests for cropland progressed, as did wetland drainage. Areas of prairie were interspersed between wooded areas. Estimates indicate less than half of the basin was historically prairie. Wildlife included bear, bobcat, wolf, fox,

turkey, bison, elk, deer, bobwhite quail, prairie chicken, ducks, geese, snipe, plover, rail, squirrels and rabbit. The fishes reported from the area were black bass, perch, catfish, buffalo fish, suckers, and pike. The water was considered clear and the fish numerous.

By the 1900's, tree cutting increased for fuel and building material and the land was drained as agricultural production expanded. Early agricultural activities were confined to the fertile valleys and the 5-mile wide Missouri River flood plain which was considered to have good natural drainage favorable to cultivation. With the rise of Kansas City as a city, urbanization began to increase on the western side of the basin. Elsewhere, as the land was changed to agricultural use, soil erosion and sedimentation increased. Analysis of historic aerial photos of the Lamine River in the region of the Lamine River Wildlife Area show dismal land practices within that portion of the basin in the late 1930's. Extensive overgrazing and gully formation on agricultural land are evident. Aerial photos taken in the 1950's and 1960's reveal abandoned pasture and cropland which was severely eroded. Much of the same land was cleared again in the 1970's for agricultural use. Similar changes can be assumed elsewhere in the basin.

Current aquatic resource conditions in the Blackwater/Lamine Rivers EDU: Within the Central Dissected Till Plains, the EDU straddles the Missouri River. Here the landscape is covered with thick to very thick loess deposits. Pennsylvanian shales, thin-bedded limestones, and some sandstone and coal deposits lie underneath the thick loess and glacial deposits and generally have little influence on surface features. Soils are primarily silty and clayey loams with moderate infiltration rates. Local relief ranges from 0 within the floodplains of the Missouri River to 50-250 feet in the uplands. Streams that are south of the Missouri River and east of the Lamine River (e.g., Gabriel and Richland Creeks) are cutting through older Mississippian limestones and dolomites throughout most their length. Relief in this region is generally 100-200 feet. The average gradient across all stream size classes is 39 ft/mi. Average gradients (m/km) by size class are: headwater 56, creek 13, small river 4.2, and large river 1.1. Streams in the western portions of this EDU are generally surface water dominated, turbid with sand and silt substrates. Streams in the south and east are clear, gravelly, and approach Ozark streams in character.

Land use in the smaller watersheds within the basin reflects the transition from Prairie to Ozark streams. In the 1980's, the upland forests were of the oak-hickory type with white oak, black oak, northern red oak, hickory, white ash, winged elm, hackberry and post oak being most common. Flood plain forests were narrow corridors restricted to creek and river margins, consisting primarily of cottonwood, green ash, silver maple, box elder, elms and hackberry. In the early 1980's, forest covered only ten percent of some of the more agricultural parts of the basin. Current watershed land use is 9% urban, 34% cropped, 26% pasture, 24% forest, and 7% other land uses; however, some watersheds in the Kansas City area exceed 90% urban development (e.g., the Blue River watershed). Livestock grazing occurs on approximately 90% of the forested lands in the basin. Land use is mostly cropland in areas of the basin in the Prairie region, while Ozark watersheds are predominantly forested. About 14 % of the forest grows on bottom lands. Most of the forest land in the basin is in poor hydrologic condition due to excessive grazing. A few major channelization projects (e.g., Blackwater and Blue rivers) have been completed in the basin, but as in most agricultural watersheds in Missouri, numerous small stream sections have been straightened by landowners in an attempt to slow erosion on their property. Drainage ditches and diversions are limited in the basin as are levees, especially on the larger rivers. Most drainage modifications were implemented to divert water from upland fields around bottom land fields which have drainage problems.

The fish community in the Blackwater /Lamine EDU is one of transition from Ozark to prairie fauna. In some of the eastern streams (Flat and Richland creeks), fishes more typical of Ozark streams such as longear sunfish, stonerollers, redbelly dace, and black and golden redhorse were found; elsewhere, fishes of more general distribution (largemouth bass, green sunfish, bluegill, and black bullhead) or preferring prairie habitats (common and red shiners) can be found. Twenty seven species of mussels and four species of crayfish can also be found. Of species of special conservation concern, the blacknose shiner and Topeka shiner have been collected in the basin, although not recently, and active pallid and lake sturgeon reintroduction programs are ongoing in the Missouri River. No threatened or endangered mussel or crayfish are found in the EDU.

Much greater detail on current aquatic resource conditions in the Blackwater/Lamine EDU is available in the three WIA documents cited under the Support Data section above, and readers are encouraged to download and read them.

Aquatic resource goals for the Blackwater/Lamine Rivers EDU: Our major goals for the Blackwater/Lamine basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas, headwaters, and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish (especially those whose management includes the Missouri River such as walleye, flathead catfish, and blue catfish) and native non game fishes (including, but not limited to, blacknose and Topeka shiners.) Preservation may be used to protect spawning/nursery or other areas important to the life history of this fauna.
- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Blackwater/Lamine Rivers EDU: Mitigation projects in the Blackwater/Lamine EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. Using the Aquatic Biodiversity Assessment, we were able to identify 13 areas of conservation opportunity that included at least two stream reaches where all fish, mussel and crayfish species endemic to the EDU were found: Bogart Creek, Brush Creek, Chouteau Creek, Clear Creek, Clear Fork, Cockerel Creek, Crooked Creek, Haw Creek, Heaths Creek, Richland Creek, South Flat Creek, Van Meter Ditch, and West Fork Wakenda Creek. These 13 areas represent the broad diversity of watershed and stream types that occur throughout the basin. In total, the final set of stream reaches within the COAs constitutes 469 miles of stream. This represents just 5.5% of the total stream miles within the Blackwater/Lamine EDU. Specific attention to, and more intensive conservation efforts within these 13 COAs provides an efficient and effective strategy for the long term maintenance of relatively high quality examples of the various ecosystem and community types that exist within this EDU. In addition to COAs, other priority sites (such as Elk Lick Spring in the Lamine River watershed) will be identified when a mitigation project is not possible in one of the above COAS:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes

- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in the urbanizing areas around Sedalia, Warrensburg, and Kansas City.
-

Preservation objectives for the Blackwater/Lamine Rivers EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Blackwater/Lamine basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Blackwater/Lamine EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Blackwater/Lamine Rivers EDU: As part of the siting of ILF project sites within the Blackwater/Lamine EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Blackwater/ Lamine Rivers EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the

new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Blackwater/Lamine Rivers EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary. The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Cuivre/Salt Rivers Geographic Service Area

Ecological Drainage Unit name: Cuivre/Salt Rivers (HUCs: 07110001, 07110002, 07110003, 07110004, 07110005, 07110006, 07110007, 07110008, and 07110009)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Cuivre/Salt EDU. The Cuivre, Salt, Fox, Fabius, North and Wyaconda River Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Cuivre River:
http://extra.mdc.mo.gov/fish/watershed/cuivre/contents/

Fabius River: http://extra.mdc.mo.gov/fish/watershed/fabius/contents/

Fox River: http://extra.mdc.mo.gov/fish/watershed/fox/contents/

North River: http://extra.mdc.mo.gov/fish/watershed/north/contents/

Salt River: http://extra.mdc.mo.gov/fish/watershed/salt/contents/

Wyaconda River: http://extra.mdc.mo.gov/fish/watershed/wyaconda/contents/

Geographic service area: The Cuivre/Salt EDU lies mainly in northeastern Missouri, but also covers portions of western Illinois and southeastern Iowa, draining the eastern margin of the Central Dissected Till Plains Ecological Section. Streams flow easterly or southeasterly and empty into the pooled portion of the Upper Mississippi River.

The Cuivre River is a seventh order river originating in Audrain and Pike counties and flows south-eastward through Pike, Montgomery, Lincoln, Warren and St. Charles counties to its confluence with the Mississippi River near Winfield, Missouri. The river drains 1,235 square miles of watershed.

The Salt River is a seventh order river draining 2,914 square miles of the northeastern Missouri counties of Adair, Audrain, Boone, Callaway, Knox, Macon, Monroe, Pike, Ralls, Randolph, Schuyler, and Shelby. The longest tributary is the North Fork of the Salt River, which flows 119 miles prior to its confluence with the South Fork in Mark Twain Lake. Mark Twain Lake, an 18,600-acre Corps of Engineers impoundment, is situated on the Salt River where the North, Middle and South forks meet, approximately 63 miles upstream from the river's junction with the Mississippi River.

The Fabius River is divided into three main sub-basins: the North Fabius sub-basin originates in Davis County, Iowa, and the Middle Fabius and South Fabius sub-basins originate in Schuyler County, Missouri. Approximately 6% of the watershed is in Iowa. The three principal streams flow in parallel relation southeasterly across northeastern Missouri, draining portions of eight counties (Schuyler, Scotland, Clark, Adair, Knox, Lewis, Shelby, and Marion). The Middle Fabius River joins the North Fabius in southeastern Lewis County. The North Fabius flows another 8.9 miles before merging with the South Fabius in northeastern Marion County to form the Fabius River. The Fabius River then flows only 3.5 miles before reaching its confluence with the Mississippi River in the Fabius Chute near River Mile 323. The Fabius watershed drains 1,543 square miles (988,900 acres) of land. The North Fabius River is a sixth order stream that is longer (105 miles) than fifth-order Middle Fabius River (75 miles long) and South Fabius River (81 miles long).

The Fox River basin is a relatively small system of streams, draining over 400 square miles in northeastern Missouri and southeastern Iowa. The largest stream in the basin is fifth order Fox River (52 miles long in Missouri. In Missouri, the Fox River and tributaries drain watersheds in Scotland and Clark counties before entering the Mississippi River downstream of Wayland.

The North River basin drains 381 square miles (243,857 acres) of northeastern Missouri covering parts of Knox, Shelby, Monroe, Marion, and Ralls counties. The order 6 North River is the longest stream within the basin, flowing 78 miles southeastward before entering the Upper Mississippi River at River Mile 321.

The Wyaconda River basin is located in the Glaciated Plains Natural Division of southeast Iowa and northeast Missouri, and drains 458 square miles of land, of which 336 square miles lie within the state of Missouri. The Wyaconda River, a fifth order stream, is the largest within the basin flowing 70 miles in Missouri before entering the Mississippi River above LaGrange, MO at River Mile 337.

Overall there are 15,297 miles of primary stream channel within this EDU, of which 5,063 miles are classified as perennial. Of the total, 11,738 miles (77%) falls within Missouri.

Threats to the aquatic resources in the Cuivre/Salt Rivers EDU: Overall, the quality of aquatic resources in the Cuivre/Salt Rivers EDU is variable; some watersheds are somewhat depressed compared to what they could be, mainly due to a couple of impacts, and others have major, chronic problems:

Aquatic Resource Problems:

- Stream bank erosion as an unintended adverse effect due to inadequately-sized vegetated riparian corridors, channel alterations, row cropping in the Till Plains sections of the watershed, and grazing.
- Destruction of riparian vegetation from construction, livestock use and row crop agricultural activities.
- Several large-reach channelization projects, especially in the North Fabius, Fox, North and Wyaconda watersheds, and many widespread small scale channel alterations due to stream straightening, levee construction, and attempts to control stream bank erosion are found in the basin.

Water Quality Problems:

- Excessive nutrients due to a few sewage treatment plants spread throughout the EDU and intensive livestock operations contribute to low DO; algal blooms; nitrate, nitrite, ammonia and phosphate discharges; and excessive sediment.
- Soil erosion from excessive livestock use and intensive row cropping in the watershed, and stream bank and streambed erosion in stream channels contributes turbidity and excessive sediment to the stream especially in areas of inadequately-sized vegetated riparian corridors.
- Contamination of aquatic organisms, primarily with mercury, continues to plague portions of the basin.

While many of the water quality problems will be difficult and cannot happen without involvement of public and private entities working together, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects.

Historic aquatic resource loss in the Cuivre/Salt Rivers EDU: Even though the French laid claim to the area as early as 1682, Native Americans of the Missouri, Osage, Fox, and Sac tribes were in undisputed possession of northern Missouri until the United States took ownership in 1803 as part of the Louisiana Purchase. Beginning in 1804, Native Americans made a series of treaties that eventually relinquished their claims to land in Missouri. The natives were taken to reservations around 1840. White settlers from Kentucky, Indiana, Ohio, Tennessee, Pennsylvania, and Virginia were already arriving by that time and quickly established farming as the region's economic base. Farming corn and winter wheat on the highly fertile land provided the economic base for the region. Human populations continued to increase in the basin's counties until the early 1900's.

Much of the presettlement landscape of the basin was prairie grasses, primarily big and little bluestem, Indian grass, and switchgrass and side-oats grama, broken by bands of timber that ran along the major streams. Prairies of the basin were usually long and narrow since they were located on the narrow uplands or ridges along streams. Wet, bottomland prairies occurred on nearly all floodplains. Wooded areas, generally of the oak-hickory type, were found across the steeper rolling hills and adjacent to streams. The proportion of prairie land in the region ranged from 30% to 75%, depending on the watershed. The most notable presettlement prairie in the basin was the Grand Prairie which covered nearly all of Audrain County and portions of Monroe, Ralls, and Pike counties. This prairie, once covered with massive expanses of native blue stem grass and roaming grounds for bison, elk and other wildlife, rapidly diminished with onset of row cropping and livestock grazing in the early 1800's. In 1865, just 10% of the land in Audrain County was cultivated. Both prairie and forest diminished rapidly with the commencement of land clearing for both row crops and livestock grazing.

Although agriculture has been the main economic base of the basin, mineral resources also contributed significantly to the economic development of the basin. Mining activities included coal, sand and gravel, limestone, shale, and fire clay. The lower reaches of the Cuivre River were substantially altered by channelization prior to 1927. Eight miles of stream were lost when a straight channel was cut across several meander loops near the mouth of the river.

Current aquatic resource conditions in the Cuivre/Salt Rivers EDU: The level, undissected, uplands in the western portion of the drainage are underlain mainly by horizontally bedded Mississippian and Pennsylvanian shales, while the more hilly and dissected topography to the east is underlain principally by Ordovician limestones and sandstones. A distinctive feature of this EDU is the "claypan region", which covers most of the west/southwest portion of the EDU. This region is a very flat plain underlain by claypan soils that have resisted postglacial stream erosion. Local relief in this region is generally less than 100 feet. Soils are deep and poorly

drained and harbor a perched water table in the winter and spring as a result of the claypan subsoils. Soil surface textures are mainly silty loams.

The average gradient across all stream size classes is 34 ft/mi. Average gradients (ft/mi) by size class are: headwater 54, creek, 14, small river 4.2, and large river 1.6. Streams in the west and north of this EDU are generally surface water dominated, turbid with sand and silt substrates. Streams in the south and east are clear, gravelly, and approach Ozark streams in character with springs locally abundant.

Today, almost all the areas covered by prairie grasses in the EDU have been cultivated with much of the timber removed near streams. Current watershed land use is approximately 30% forested and 70% is cultivated, pastured or otherwise developed. Soybeans are the most important row crop cultivated, followed by corn, wheat, and sorghum. Livestock production includes cattle and hogs. The forested areas are made up of maples, elms, oaks, black walnut and eastern red cedar. While a number of large channelization projects remain, small channelization projects continue to occur on private property or with road and bridge construction. Inundation by Mark Twain Reservoir and its reregulation pool adversely affect the flowing water characteristics of the Salt River, and runoff from abandoned coal mines also continue to impact streams in the southwestern part of the EDU.

From a basinwide perspective, the fish community includes species representative of the Prairie, Lowland, Ozark, and Big River faunal regions. The Cuivre/Salt EDU is home to 117 species of fish. The fish community in the southern portion of the EDU is a combination of Ozark border fauna (stonerollers, steelcolor, striped and bigeye shiners, redbelly dace, hogsuckers, redhorses, smallmouth bass, banded sculpin, orangethroat darters and logperch) and prairie fauna (red shiner, bigmouth shiner, suckermouth minnow, quillback, stonecat, orangespotted sunfish and blackside darter). As one goes farther north and west, prairie species become more dominant and Ozark species less so. The connection of streams with the Mississippi River also blends big river species such as gar, common carp, silver chub, emerald shiner, river carpsucker, buffalo, flathead catfish, channel catfish, white bass, white crappie, sauger, walleye and freshwater drum. The ghost shiner is a species of special conservation concern and could be found in patchy locations throughout the EDU. Fifty one species of freshwater mussels and 5 species of crayfish are also found in the EDU.

Much greater detail on current aquatic resource conditions in the Cuivre/Salt EDU is available in the five WIA documents cited under the Support Data section above, and readers are encouraged to download and read them.

Aquatic resource goals for the Cuivre/Salt Rivers EDU: Our major goals for the Cuivre/Salt EDU are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation project planning may identify significant sources of these pollutants and strive to restore and stabilize them.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Areas in which development is concentrated and proceeding at a quicker-than-normal pace, headwaters, and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish (especially those whose management includes the Mississippi River such as walleye, flathead catfish, and blue catfish and areas with Ozark border fauna like smallmouth bass) and native non game fishes (including, but not limited to, ghost shiners.) Preservation may be used to protect spawning/nursery or other areas important to the life history of this fauna.
- In channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Cuivre/Salt Rivers EDU: Mitigation projects in the Cuivre/Salt EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. Using the Aquatic Biodiversity Assessment, we were able to identify 10 areas of conservation opportunity that included at least two stream reaches where all fish, mussel and crayfish species endemic to the EDU were found: Brushy Fork, Buck Run Creek, Grassy Creek, Lower Cuivre River, North Fork Salt River, Peno Creek, South Fabius River, Spencer Creek, Sugar Creek, and Turkey Creek. These 10 areas represent the broad diversity of watershed and stream types that occur throughout the basin. In total, these COAs constitute 317 miles of stream, representing 2.7% of the total stream miles within the Cuivre/Salt EDU Specific attention to, and more intensive conservation efforts within these 10 COAs provides an efficient and effective strategy for the long term maintenance of relatively high quality examples of the various ecosystem and community types that exist within this EDU. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in rapidly developing areas around towns and cities in the EDU.

Preservation objectives for the Cuivre/Salt Rivers EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Cuivre/Salt EDU will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Cuivre/Salt EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Cuivre/Salt Rivers EDU: As part of the siting of ILF project sites within the Cuivre/Salt EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Cuivre/Salt Rivers EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

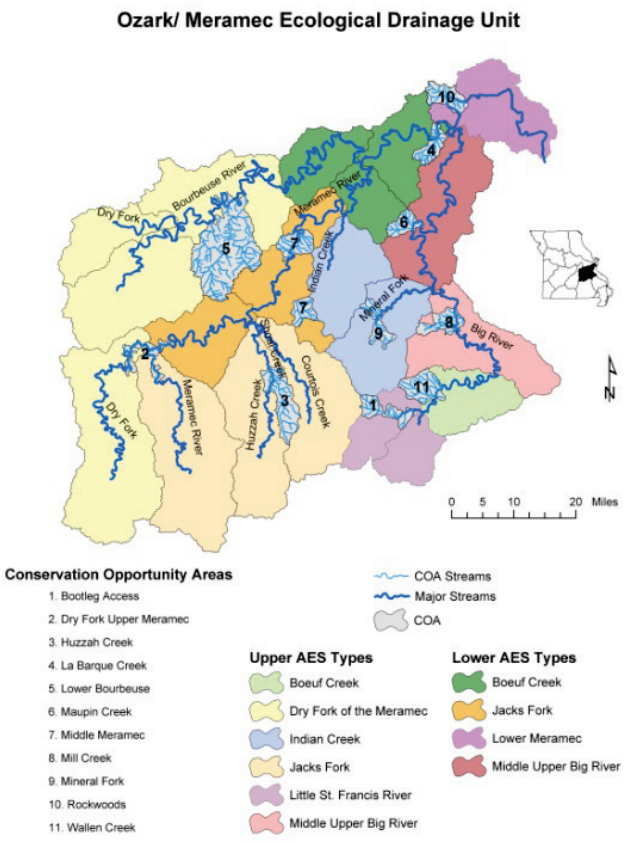
- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term (30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Cuivre/Salt Rivers EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is

inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary. The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.



Meramec River Geographic Service Area

Ecological Drainage Unit name: Meramec River (HUCs: 07140102, 07140103, and 07140104)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Meramec EDU. The Meramec, Big and Bourbeuse River Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Meramec River:
http://extra.mdc.mo.gov/fish/watershed/meramec/contents/

Big River:
http://extra.mdc.mo.gov/fish/watershed/big/contents/

Bourbeuse River:
http://extra.mdc.mo.gov/fish/watershed/bourbeus/contents/

Geographic service area: The Meramec River basin is located in east central Missouri in Crawford, Dent, Franklin, Iron, Jefferson, Phelps, Reynolds, St. Louis, Texas, Gasconade, St. Francois, and Washington counties. Found in the northeast corner of the Ozark Highlands, the Meramec River and its tributaries drain 2,149 square miles. The main stem of the Meramec's 218 linear miles carries water from the lightly populated, forested, and agricultural upper watershed north easterly to the heavily populated and urbanized lower watershed to enter the Mississippi River below St. Louis. Meramec tributaries of fifth order or greater include Courtois, Crooked, Dry, Dry Fork, Huzzah, and Indian creeks and the Little Meramec River. Meramec base flows are well sustained by springs characteristic of the region's karst topography and by drainage from the Big and Bourbeuse rivers, two major tributaries.

The Bourbeuse enters the Meramec at river mile 64.0, and the Big River enters the Meramec at river mile 35.7. The Bourbeuse River watershed is located within the northeastern quarter of the Ozark Highlands. The main stem of the Bourbeuse River winds northeasterly through Phelps, Gasconade, and Franklin counties to join the Meramec River, and its watershed additionally encompasses portions of Maries, Osage, and Crawford counties. The Bourbeuse River is 147 miles from mouth to headwaters, and the lower 132 miles have permanent flow. The Bourbeuse River watershed drains 843 square miles and is composed of a number of smaller watersheds including Spring Creek, Boone Creek, Brush Creek, Red Oak Creek, Dry Fork, Little Bourbeuse River, and the Lower Bourbeuse River. The Big River basin is located in east-central Missouri and drains 955 square miles of the Ozark Plateau in portions of six counties. Big River has eight, order five tributaries and flows northward for 138 miles until it reaches the Meramec River.

Because of their basic physical, chemical and biological similarity; the similarity of watershed land use and topography in all three basins; and the common downstream hydrologic endpoint, including the Meramec, Big and Bourbeuse rivers in one EDU for mitigation planning will allow similar approaches to watershed, riparian, and stream channel problems and opportunities.

Threats to the aquatic resources in the Meramec EDU: Overall, the quality of aquatic resources in the Meramec EDU is quite good; however, while mostly dispersed throughout the basin, there are a number of problems facing streams in the EDU:

Aquatic Resource Problems

- Livestock access to streams causing stream bank erosion and sedimentation
- Destruction of riparian vegetation from construction and livestock use
- Small-scale stream channelization due to bridge construction and replacement causing bank erosion, riparian destruction, and sedimentation issues downstream
- Several large-scale instream gravel mining operations and numerous unpermitted small-scale gravel mining operations cause an increase in stream bank erosion and sedimentation
- Watershed urbanization, especially in the lower reaches of the basin, has adversely impacted riparian corridors and increased stormwater runoff (which increases channel instability), as well as depressed aquatic species diversity.

Water quality problems

- In the upper Meramec and the Big river basin, lead, cadmium, copper, iron, barite, and zinc mining either as mine discharges or through the erosion of tailings into the river system, can cause toxic effects of aquatic life and accumulate heavy metals in fish flesh.
- Waste water discharges from sewage treatment infrastructure can cause low DO, algal blooms and ammonia from waste water discharges
- Intensive poultry and cattle operations, especially in the Bourbeuse River, increases sediment and organic discharges into streams.
- Contamination of aquatic organisms, primarily chlordane, heavy metals, and mercury continues to plague portions of the basin.

While many of the water quality problems, especially those involving heavy metals and aquatic life contamination, will be difficult, expensive and complex to address, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects. Preservation projects, especially in streams in rapidly urbanizing areas but still containing high quality aquatic communities (e.g., LaBarque Creek in Jefferson County), are particularly adaptable.

Historic aquatic resource loss in the Meramec EDU: Changes in stream morphology have taken place within the entire Ozarks and the Meramec River basin as a result of past large-scale land use changes. Pre-settlement conditions in the basin indicate that Ozark uplands were mostly prairie and oak savannah, while steep valley slopes and bottoms were dominated by thick deciduous and pine forests. Main-stem riparian zones were up to two miles wide on either side of the river. In upland areas different settings existed due to fires set by Native Americans, which resulted in expansive savannahs and glades. Written historic observations of early settlers and explorers do not suggest extensive gravel bars on Ozark streams as seen today; however, scientists working in the late 1800s, before significant land use, describe large quantities of gravel in stream banks and beds (Jacobson and Primm 1994). Early on, shortleaf pine logging practices created minimal erosional processes; from 1880 to 1920, the Ozarks were subject to heavy timber cutting, leaving large expanses of eroding uplands and valley slopes. Land clearing, road construction and floods from 1895-1915 coupled with upland burning, grazing of cut-over-valley-side slopes and open land, and using marginal land for cultivated crops after 1920 resulted in the gravel imbedded in banks and beds to be mobilized and delivered into stream channels. After 1920, as the large commercial logging interests sought better, higher quality forests to harvest outside the Ozarks, the local inhabitants turned to grazing livestock on the open ranges left in cutover areas. To prevent trees and shrubs from reclaiming the range, the basin residents burned seasonally. Oral-history accounts from residents describe seasonal

burning as necessary to maintain pasture; some recall extensive erosion in areas of the Ozarks due to the upland farming and grazing, and gully and sheet erosion were common sites. Wholesale land use changes from forests to openland, especially destruction of riparian vegetation on bottom lands, were probably the most disrupting force on stream channels (and aquatic habitat) in the Meramec basin. However, the cause of Ozark stream degradation is not as simple as a result of clearing upland trees. Different types of land use changes have taken place on different parts of the Ozark landscape, and at different times, resulting in a complex series of potential disturbances that have affected parts of the hydrologic or sediment budgets or both.

The original attraction to the Meramec River region was the lure of precious metals such as gold, copper, and silver. These metals were not found, but the first white settlers did find lead and iron ore, with the Big River basin containing much of the former. The first lead mine was established in 1797 by Moses Austin, at a site that is now the town of Potosi. Minimal surface mining began shortly thereafter and continued until 1864 when St. Joseph Lead Company (now St. Joe Minerals Corp.) began advanced lead mining and milling. Since 1920, Missouri has been a leading producer of lead for the United States. Lead mining in the Old Lead Belt ceased in 1972, after which barite mining began. As far as iron mining in the basin goes, one of the more well-known iron mines is the Maramec Iron Works, now on Maramec Spring Trout Park owned by the James Foundation. Thomas James and his business associate, Samuel Massey, both from Ohio, started the Maramec Iron Works in 1826. This operation attempted to haul iron on the Meramec River, but the numerous trees, snags, and gravel riffles were major obstacles. Although both lead and iron mining operations opened the Ozark wilderness to settlers, these operations caused instream pollution from tailings. Tailings were a source of sediment and toxic substances that adversely affected aquatic biota, as was air and water pollution from iron smelters. In addition, riparian woodlands were cleared to fuel the smelting furnaces.

Also, highly prized for clean sand and gravel, streams in the Meramec basin have been mined to provide construction materials. Since the early 1800s, the Meramec River has been recognized and utilized for its sand and gravel resources, primarily from quarry and instream locations. Sand and gravel were, and still are, important construction materials. Geologists found Meramec gravel samples to be clean and abundant. The Ozarks Region produced 20% of the state's sand and gravel during 1913, and by 1918, sand and gravel operations on the Meramec River were located at Valley Park, Drake, Sherman, Pacific, and Moselle (Some of these sites are still active today). At locations near St. Louis, instream mining involved using 15-inch centrifugal dredge pumps to load material from the Meramec River into waiting barges. Other methods included loading by hand into wagons or barges towed by gasoline-powered tugs, and loading by clam-shell dredge. The severity of impacts to the stream would vary with method, and usually involved sedimentation, stream bed destabilization, stream channel instability, and destruction of aquatic organism substrates.

Current aquatic resource conditions in the Meramec EDU: Some of the same forces affecting the past land-use periods still exist today. Recent land-use practices (1960-present) include greatly reduced intentional burning. Grazing and row cropping has increased in upland areas, and valley bottom lands are still being cleared for pasture and row cropping. Logging operations on valley slopes and uplands are better managed than during the Timber Boom and Post-timber Boom periods, but upland areas and valley slopes still have a slight increase in annual runoff, storm runoff, and upland sediment yield as compared to pre-settlement conditions (Jacobson and Primm 1994).

In general, land-use and land-cover estimates in the Meramec basin classify watershed areas as 4.5% cropland, 48% forest, 24% pasture, 1.3% rural transportation, 6.5% urban development, 15.7% water, minor and other land-use categories. In recent years, urban development in the lower Meramec has reduced the size of contiguous forest tracts. A similar breakdown is present in the Big and Bourbeuse watersheds (e.g., Big River basin land uses are currently dominated by forest [48%] and pastures [26%], with lesser amounts of urban areas [9%] row crops [7%], old fields [3%], roads [1%], reservoirs and streams [1%], and other [5%]). Most of the agriculture that occurs in the basin revolves around livestock (cattle) production, a trend which has been increasing. Hog production occurs, but there are no large scale confined feeding operations like those causing water quality and stream problems elsewhere in Missouri. Increased density of grazing cattle translates into greater populations of cattle per unit area, which can result in more stream-channel disturbance, caused by increased runoff and sediment. Field observations of basin streams show that cattle are noticeably impacting stream water quality, although steps to revegetate riparian areas, move livestock watering areas off channel, and excluding cattle from the streambed and banks show promise for restoring stream resource values.. Urbanization of the lower basin (via home building, paving, etc.) increases with population growth, which will reduce forest and agricultural use.

Many of the early lead and barite mining activities within the basin have ceased, but two iron mines and several lead and barite mines remain in operation. Of greater concern are the mine dams and numerous piles of tailings and mine waste that remain. Despite a dramatic decline in mining activity in the Big River basin, lead contamination remains, especially concentrated in fish flesh that has been included in the Missouri Department of Health and Senior Services' annual fish consumption advisory for a number of years. Stabilization of several of the more significant tailings piles has been undertaken. In spite of many of these efforts, "hot spots" of contamination remain.

Sand and gravel mining in the Meramec basin continues, although required permits helps ameliorate some of the damages produced by earlier mining operations. Sand and gravel mining occurs over a large area; a survey of stream sand and gravel mining sites in a 7-county area of east central Missouri (11 different streams) showed 71 permitted sites, most of them small. The Army Corps of Engineers (COE) through Section 404 of the Clean Water Act and the Department of Natural Resources (DNR), through its Land Reclamation Program, issue permits for the mining of stream sand and gravel. When followed, guidelines developed by state and federal agencies with input from the regulated community and used by the COE allow mining of gravel bars and floodplains while minimizing instream damages.

In 1998, a stream habitat quality evaluation was completed by MDC. Overall, these surveys revealed stream banks were in good condition. Overall, most basin stream banks showed minimal or no bank erosion. Trees and shrubs were the dominant types of stream bank protection. Instream habitat appeared to be good. That said, riparian corridor condition was generally fair to poor, which poorer riparian quality occurring in the smaller tributaries. Cattle grazing and hay production were more prevalent land uses around tributaries than the larger rivers. Corridor width is being reduced along streams with increasing amounts of urbanization as well. This suggests that the potential for soil erosion and nonpoint pollution may be greater from tributary and urbanizing streams due to poor riparian vegetative quantity and quality

Much greater detail on current aquatic resource conditions in the Meramec basin is available in the three WIA documents cited under the Support Data section above, and readers are encouraged to download and read them.

Aquatic resource goals for the Meramec EDU: Our major goals for the Meramec basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to, ghost shiner, Topeka shiners, troutperch, plains minnow, and western silvery minnow) and unique or depressed aquatic invertebrate populations (especially the spectacle case and flat floater mussels)
- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Meramec EDU: Mitigation projects in the Meramec EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process within the Meramec EDU, 11 COAs containing 103 target species were identified: Bootleg Access, Upper Fork Upper Meramec, Huzzah Creek, LaBarque Creek, Lower Bourbeuse, Maupin Creek, Middle Meramec, Mill Creek, Mineral Fork, Rockwoods, and Wallen Creek. In total, these COAs constitute 1,508 miles of stream, representing 8.8% of the total stream miles within the Meramec EDU, and their watersheds represent an overall area of 219,629 acres (8.7% of the EDU). In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in urbanizing areas

Preservation objectives for the Meramec EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Meramec basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Meramec EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Meramec EDU: As part of the siting of ILF project sites within the Meramec River EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/ management strategies for compensatory mitigation in the Meramec EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Meramec EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Moreau/Loutre Rivers Geographic Service Area

Ecological Drainage Unit name: Moreau/ Loutre Rivers (HUCs: 10300102, 10300200)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Meramec EDU. The Moreau River Watershed Inventory and Assessment (WIA) document was written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. This document is an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIA:

Moreau River:
http://extra.mdc.mo.gov/fish/watershed/moreau/contents/

Geographic service area: The Moreau/Loutre EDU lies in east-central Missouri and includes all of the smaller direct tributaries to the Missouri river downstream of the outlet of the Little Chariton River to the confluence of the Missouri and Mississippi Rivers; however, for the purposes of this Compensation Planning Framework, this EDU does not include the Missouri River proper. The EDU is primarily within the Ozark Highlands, however, the northern and western boundaries also extend into the Central Dissected Till Plains. This EDU is contained within Howard, Boone, Cooper, Morgan, Miller, Moniteau, Cole, Osage, Callaway, Gasconade, Montgomery, Warren, Franklin, St. Charles and St. Louis counties. Overall there are 8,109 miles of primary stream channel within this EDU, of which 2,338 miles are classified as perennial. Major streams include Bonne Femme Creek, Petite Saline Creek, Moniteau Creek, Perche Creek, Hinkson Creek, Cedar Creek, Moreau Creek, Middle River, Auxvasse Creek, Loutre River, Boeuff Creek, Charette Creek, St. Johns Creek, Bonhomme Creek and Coldwater Creek. Because this EDU straddles two major ecoregions, it is very physiographically, hydrologically, and biologically diverse. The EDU is mainly within the Inner and Outer Ozark Border ecological subsections, but also includes portions of the Prairie Ozark Border and the Claypan Till Plains subsections.

Threats to the aquatic resources in the Meramec EDU: Overall, the quality of aquatic resources in the Moreau/Loutre EDU is fair, with some areas of good quality and other areas of degradation. Given this diverse and large EDU, there are a number of common problems facing streams throughout the EDU:

Aquatic Resource Problems

- Livestock access to streams causing stream bank erosion and sedimentation, and overgrazing in floodplain and watershed pastures contributing to flashier runoff and sediment delivery to the stream.
- Destruction of riparian vegetation from row cropping too close to the stream, construction and livestock use

- Small-scale stream channelization due to bridge construction and replacement causing bank erosion, riparian destruction, and sedimentation issues downstream
- Small-scale instream gravel mining operations and small-scale attempts to remedy stream channel problems by pushing instream gravel around cause an increase in stream bank erosion and sedimentation
- Watershed urbanization, especially in the Columbia, Jefferson City and St. Charles areas as well as numerous small towns along the Missouri River, has adversely impacted riparian corridors and increased stormwater runoff (which increases channel instability), as well as depressed aquatic species diversity.

Water quality problems

- Waste water discharges from sewage treatment plants throughout the basin can cause low DO, algal blooms and ammonia from waste water discharges
- Point source municipal and industrial discharges are present, but do not now constitute a major problem
- Nutrient-loaded runoff from pastures, feedlots, septic drainage fields, and direct contamination to streams by free livestock contributes to increasing in-stream biological oxygen demand (BOD), suspended solids, fecal coliform counts, and algae growth.
- Contamination of aquatic organisms, primarily chlordane and mercury continues to plague portions of the basin.

While many of the water quality problems, especially those involving aquatic life contaminations, will be difficult, expensive and complex to address, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are an appropriate project that is addressable through the installation of mitigation projects. Preservation projects, especially in streams in rapidly urbanizing areas but still containing high quality aquatic communities, are particularly adaptable.

Historic aquatic resource loss in the Moreau/Loutre Rivers EDU: The first inhabitants of the basin were ancient "mound building" people. Evidence including burial mounds, skeletal remains and artifacts of their occupation was found near the mouth of the Missouri and Osage rivers and along the Moreau River. A number of Indian tribes used the lands in this EDU, but at the time of westward expansion, the land south of the Missouri River was occupied by Osage Indians and lands north of the river were frequented by Sac and Fox. In the late 1700's, French hunters and trappers sought the resources of the Moreau and Osage rivers, and some of the first settlements were fur trading posts directly on the Missouri River in the early 1800s. Following the Lewis and Clark expedition, white settlers began arriving primarily from Kentucky and Tennessee; large-scale immigration followed in the 1820's.

Early settlers found moderate tracts of prairie in the far western portions of the EDU in Morgan, Moniteau and Cooper counties, and smaller prairies dotting the uplands away from the Missouri River, primarily on ridgetops. The majority of the EDU was upland forests (for example, the river hills in Boone County were 90% forested in 1815, and 2/3 of Moniteau county was historically forested and 1/3 was in prairie) consisting of various oaks, or bottomland forests consisting of sycamore, cottonwood, maple, black walnut, butternut, hackberry, popular, and bur oaks. Several salt springs were reported along the Missouri River.

The advent of German settlers in the early to mid 1800s brought more intensive farming to the EDU. The steeper lands near the Missouri River were used for cultivating grapes for a growing wine industry; the soil elsewhere supported other crops. Forests began to be cleared and small prairie tracts were plowed. Early agricultural activities were confined to the fertile valleys and the Missouri River floodplain, where wetland drainage helped increase the amount of tillable acres. At the turn of the century, major crops included livestock, corn, wheat, oats, flax, tobacco and potatoes. Deposits of coal, lead and barites were also found. Lead and coal were mined in various locations throughout the EDU. Potters and firebrick clay were also mined.

As time went on, more settlers arrived and more land was changed to agricultural use. In the Boone County river hills region along the Missouri River, only 40% of the region was forested in the late 1930s as those working the land had converted much of the usable land to agriculture. Extensive row cropping and overgrazing occurred and agricultural land was severely eroded. Small scale channelization projects occurred, mainly to increase the size of bottomland fields. The

maximum extent of forest conversion seemed to occur during the Great Depression of the 1930s, after which abandoned farms and unproductive fields returned to a forested condition. While areas in the EDU containing more prairie landscapes continued to be used and converted to agricultural fields, those in the central and eastern portions of the EDU began to revert to forest or were swallowed up by increasing urbanization in the St. Charles, Columbia and Jefferson City areas.

Current aquatic resource conditions in the Moreau/Loutre Rivers EDU: Essentially there is an east to west and north to south gradient in environmental conditions within this EDU. The landscape in the north and west is more prairie in nature with lower relief (150-250 feet), deeper and more fine textured soils, underlain by Mississippian limestones, and fewer springs. The streams draining these landscapes are warmer and more turbid with a higher percentage of sand and silt substrates. Streams in the south and east are more Ozark in character; clear and cool with coarse substrates, higher gradients, and well-developed riffle-pool morphology. These conditions correspond with changes in physiography; higher relief, Ordovician dolomites, shallow cherty soils, and higher spring densities. The average gradient across all stream size classes is 53 ft/mi. Average gradients (ft/mi) by size class are: headwater 70, creek, 14, small river 3.1, and large river 2.1. Streams are largely surface-water dominated with scattered small spring inputs. Riffle habitats are common in all streams, but increase in occurrence as you move toward the south and east.

Consistent with the diversity of land classes, the uses of those lands varies, with over 70% of the areas in the north and west of the EDU used for row crops and pasture, dropping to 50% in the southern and eastern portions of the EDU. In the northern and western areas, row crop agriculture and livestock production are most prevalent. The sloping areas in the northern and western parts of the EDU and the flood plains along the Missouri River are conducive to cash-grain farming. Corn, soybeans, winter wheat, and grain sorghum are the primary cash crops. The deeply dissected areas in the southern and western parts of the EDU are primarily a mixture of pasture and timber, although limited row cropping occurs in alluvial valleys. Beef cattle, dairy cattle, and hogs are the dominant kinds of livestock. An increasing urbanization of some areas of the EDU, such as Columbia, Jefferson City, St. Charles, and many of the smaller towns, have also brought commercial, industrial, government, and tourism enterprises.

Most of the old coal and lead mines in the EDU are now closed; some active limestone quarries are present in the basin, and several small sand and gravel removal operations on streams can be found.

A total of 113 fish, 26 mussels, and 6 crayfish either inhabit or at one time inhabited the Moreau/Loutre EDU. The fish fauna of the Moreau basin reflects a blending of Ozark-Missouri and Prairie-Lower Missouri aquatic fauna; species diversity is good and numerous intolerant species of fish are widely distributed among streams. There are 8 globally listed (rare, threatened, or endangered) species and 20 state listed species. The fish assemblage is characterized by a distinct mixture of Prairie, Ozark, and Great River species and could be classified according to the dominant families as a Minnow/Sucker/Darter assemblage. One of the most distinctive features of this EDU is the prevalence of Great River species in the lower sections of the major tributaries. Several streams contain, or have the potential to contain, unique species such as Topeka shiner, common shiner, blacknose shiner, plains topminnow, ghost shiner, Ozark sculpin, and southern redbelly dace. The most common mussel species are the giant floater, pondmussel, and fatmucket, with the black sandshell being locally rare. The virile, spothanded, papershell, and devil are the most common crayfish species.

Aquatic resource goals for the Moreau/Loutre Rivers EDU: Our major goals for the Moreau/Loutre basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas, headwaters, and those with excessive livestock use will be targeted.

- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish (especially those whose management includes the Missouri River such as walleye, flathead catfish, and blue catfish) and native non game fishes (including, but not limited to, blacknose, ghost and Topeka shiners, and the plains topminnow.) Preservation may be used to protect spawning/nursery or other areas important to the life history of this fauna.
- In channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Moreau/Loutre Rivers EDU: Mitigation projects in the Moreau/Loutre EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. Using the Aquatic Biodiversity Assessment, we were able to identify 9 COAs that contain 61 target species: Creve Coeur Creek, Fish Creek, Harrison Branch, Loose Creek, Lost Creek, Moniteau Creek, Moreau River, Whetstone Creek, Wieneke Branch. In total, these COAs constitutes 531 miles of stream, representing 6.5% of the total stream miles within the Moreau/Loutre EDU. Furthermore, the focus areas themselves represent an overall area of 346 square miles, which is only 6.9% of the region. Specific attention to, and more intensive conservation efforts within these 9 COAs provides an efficient and effective strategy for the long term maintenance of relatively high quality examples of the various ecosystem and community types that exist within this EDU. In addition to COAs, other priority sites (such as tributaries of the Moreau River that historically contained Topeka shiners) will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in the urbanizing areas around Columbia, Jefferson City and St. Charles.
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Preservation objectives for the Moreau/Loutre Rivers EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Moreau/Loutre basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Moreau/Loutre EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a

permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated

Public and private stakeholder involvement in compensatory mitigation in the Moreau/Loutre Rivers EDU: As part of the siting of ILF project sites within the Moreau/Loutre EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Moreau/Loutre Rivers EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Moreau/Loutre Rivers EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data

collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Nishnabotna/Platte Rivers Geographic Service Area

Ecological Drainage Unit name: Nishnabotna/Platte Rivers (HUCs: 10240001, 10240004, 10240005, 10240010, 10240011, 10240012, and 10240013)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Nishnabotna/Platte EDU. The Nodaway and Platte river Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Nodaway River:
http://www.mdc.mo.gov/fish/watershed/nodaway/contents/
Platte River:
http://www.mdc.mo.gov/fish/watershed/platte/contents/

Geographic service area: The Nishnabotna/Platte EDU lies mainly in northwest Missouri and southwest Iowa, but also covers a small portion of eastern Kansas and Nebraska. The Missouri portion of the EDU is contained within Platte, Clinton, Clay, DeKalb, Buchanan, Andrew, Gentry, Holt, Atchison, Nodaway, and Worth counties and contain the major watersheds of the Nodaway River, the One Hundred and Two River, the Platte River, the Tarkio River and a number of smaller streams that drain directly into the Missouri River. It is bound on the east by the Grand River basin, on the south and west by the Missouri River, and the north by the Iowa state line. The basin is entirely contained within the Central Dissected Till Plains Ecological Section. Streams flow primarily in a southerly direction and empty into the Missouri

River. Overall there are 14,884 miles of primary stream channel within this EDU, of which 5,088 miles are classified as perennial. Of the total, 5,026 miles (34%) falls within Missouri. Because of their basic physical, chemical and biological similarity; the similarity of watershed land use and topography in each basin; and the common downstream connection with the Missouri River, including all of these streams in one EDU for mitigation planning will allow similar approaches to watershed, riparian, and stream channel problems and opportunities.

Threats to the aquatic resources in the Nishnabotna/Platte Rivers EDU: Overall, the quality of aquatic resources in the Nishnabotna/Platte EDU is widespread and depressed. There are a number of problems facing streams in this EDU:

Aquatic Resource Problems

- Destruction of riparian vegetation from row cropping, livestock use and construction
- Large scale channelization has significantly degraded instream habitats. For example, in the Platte River basin, about 20% of stream miles in the basin have been lost to channelization; 7 of the 11 fifth order streams and 41 of 74 fourth order streams have been channelized. This results in down-cutting of channels, sedimentation and channel filling, elimination of stream length and fish habitats, depression of invertebrate populations, and a significant loss of fish standing crop.
- Stream thermal regimes have been adversely impacted due to the shallow nature and weak base flows in basin streams, impacting fish and fish spawning success.
- CAFOs and runoff from feedlots, as well as direct access of livestock to stream channels, causes nutrient enrichment and the lack of adequate vegetation or buffer strips between feedlots or holding facilities and the stream allows runoff to carry waste and soil directly to streams, causing increases in sedimentation.
- Watershed urbanization has adversely impacted riparian corridors, increased stormwater runoff (especially in the Kansas City and St. Joseph areas) and depressed aquatic species diversity.
- With the erosive nature of area soils and the increased water velocities due to channelization, channel stability is a concern, especially in areas with bridges, roads, and pipelines.

Water Quality Problems

- Intensive livestock operations and a large amount of row crop agriculture increases sediment discharges and fertilizer/livestock wastes in runoff adversely affects stream water quality with increased nitrate levels, which are heightened by weak base stream flows. Basin streams often have manganese and fecal coliform levels that are commonly above Missouri water quality criteria. These have also caused localized drinking water problems relating to excessive total dissolved solids, nitrates, iron, manganese, chloride, and/or sodium.
- Notable point source concerns in the basin are those associated with municipal waste near three major urban areas and pollution from Kansas City International Airport (especially industrial effluents and fish kills associated with runway de-icing using ethylene glycol). Another threat to fish populations throughout the basin has been the improper management of municipal sewage and the subsequent runoff into receiving streams. Problems associated with Maryville and St. Joseph have been addressed; however, municipal effluent from the Kansas City -Todd Creek STP has been a chronic problem in Todd Creek since 1976.
- Contamination of aquatic organisms, primarily with chlordane and mercury
- Non-point source pollution has the greatest negative influence upon water quality within the basin. The most common problems associated with non-point sources are low dissolved oxygen, high levels of turbidity, fecal coliform bacteria, phosphorus, nitrates, ammonia nitrogen and other organic nutrients, all of which are influenced by excessive runoff and extended low flows, primarily due to channelization, intensive row cropping, and livestock operations (including CAFOs and land applications of livestock waste associated CAFOs).

While some of these problems, especially those due to channelization and contamination, will be difficult, expensive and complex to address, many of the problems resulting in riparian destruction, stream bank erosion, and sedimentation are appropriate projects addressable through the installation of mitigation projects. Preservation projects, especially in areas that have escaped channelization and in rapidly urbanizing areas that still contain high quality aquatic communities, are particularly adaptable.

Historic aquatic resource loss in the Nishnabotna/Platte Rivers EDU: Little direct evidence on the physical condition of presettlement streams in the basin exists, but we can infer a little. Basin streams were thought to be naturally meandering and sinuous in their channel configuration. One of the major streams in the EDU is the Nodaway River,

which derives its name from the Native American word "Nadowa", a term found in many Native American languages. The term was often associated with snakes, generally thought to be massasauga rattlesnakes. The application of the name to the Nodaway River is believed to have described it as being twisted or sinuous like a snake. In addition, it is probable that the streams in northwest Missouri were historically turbid during and after periods of high discharge due to the nature of the soils in the area.

Prior to settlement, prairie grasses such as big and little bluestem, Indian grass, buffalo grass, blue and hairy grama, and switch grass dominated the landscape, covering an estimated 50-80% of the basin. Timber, primarily elm, ash, and cottonwood along streams and oak-hickory forest types on the slopes and uplands, was generally confined to deep, narrow ravines or along major tributaries. Ravines or minor tributary draws opening to the east had less timber than those opening to the west. In addition, along the major south-flowing streams the woodland corridor was very narrow or absent on the west side, but was thicker on the eastern side. This asymmetry was thought to be related to eastward moving fires that were stopped by the river channel firebreak.

Native American tribes inhabited the region prior to the 1830's and included the Sauk, Fox, Otoe, Ioway, Missouri, Pottawattamie, and Sioux. Settlers of the region began arriving in the early 1830's, and most were from the eastern states of Kentucky, Tennessee, Georgia, Virginia, Ohio, and Indiana. Settlement first took place in forested areas, and the adjoining prairies were used as free range for cattle. Initially the soils in the woodland areas along the tributaries were cultivated because newcomers to the region did not believe that land supporting only grass had any value other than for grazing. Preferred sites were those on the edge of the timber with close association to both water and native prairie. The settlement of prairies soon followed the settlement of forested lands. Settlement of wet prairies was avoided due to their reputation for producing fevers and respiratory ailments, but they were used as wintering areas for cattle. Native grasses were also cut for hay (Schroeder 1982). However, settlers soon found that the deep, dark-colored prairie soils produced superior crops, and intensive breaking of the prairie sod began. Intense cultivation soon followed on these lands and did not cease until nearly all of the land was converted to agricultural production. Corn was the primary crop, but wheat, oats, tobacco, hemp, flax, cotton, fruit trees, cattle, and hogs were also grown in the region.

The first railroads, built in the 1870's, increased the momentum of the agricultural movement by providing easy access to plows, reapers, and fencing. This enabled settlers to aggressively convert native prairie to cropland. The last areas cultivated were the wet bottom lands. Building ditches and draining these areas helped convert them to agricultural production. This opened up large new areas for settlement. The arrival of more people and cattle, along with the arrival of commercialized farming, marked the beginning of the end for native prairies in the basin. Destruction of the native prairie can be attributed to three main factors: plowing and overgrazing eliminated large areas of native prairie, and fire control contributed to the change in composition of native prairies and eventual domination by invading woody species.

Groups of farmers began stream channelization in the early 1900's, and a large part of the basin was channelized by the 1930's, although relatively few channel alterations were made in the narrower downstream valley reaches. This increased the amount of tillable acreage, intensified erosion, and permanently altered the natural quality of the basin's aquatic resources.

Current aquatic resource conditions in the Nishnabotna/Platte Rivers EDU: The most characteristic feature of this EDU is the thick to very thick loess deposits that occur in the western and central sections. Pennsylvanian shales, thin-bedded limestones, and some sandstone and coal deposits lie underneath the thick loess and glacial deposits and generally have little influence on surface features. Soils are primarily silty and clayey loams with moderate infiltration rates. Local relief ranges from 0 within the floodplains of the Missouri River to 50-250 feet in the uplands. Some streams occupy narrow, steep-sided, valleys while others occupy extremely wide valleys, which reflect the glacial history of the area.

The average gradient across all stream size classes is 42 ft/mi. Average gradients (ft/mi) by size class are: headwater 62, creek 13, small river 4.2, and large river 2.1. Streams are surface-water dominated, and springs are extremely rare and those that do exist have minimal discharge and many are saline. Riffle habitats are rare and often completely absent. Streams are also very turbid with substrates mainly of sand and silt.

The basin is best characterized as rural with portions of the watershed lying within the cities of St. Joseph, Kansas City, and Maryville. The fertile soils and favorable climate of the basin make it an outstanding grain producing area. The majority of basin lands are in cultivation. Current land use within the basin continues to be dominated by row cropping

and grazing of pasture land: land use within the basin is dominated by agriculture and is comprised of approximately 70% row crop production, 20% pasture, and 10 % forest. This leads to increases in both upland and stream bank erosion and delivers high sediment loads and agricultural chemicals directly to basin streams. The Conservation Reserve Program (CRP) has removed some of the highly erodible land from production; however, the impacts remain severe. Forest resources are of minor importance to landowners in this basin. Most of the forest is found in fence rows, narrow riparian corridors, and areas of terrain that cannot be cultivated, and are generally in poor condition. Most trees remain on the poorest soils and have growth rates that are far below those expected from intensively managed stands. More than half of the basin's forested lands are grazed.

In a recent survey, stream habitat in the Missouri portion of the Platte River basin was described as homogenous. In areas that were not channelized, stream banks generally were more stable and over 50% of the stream bank vegetation consisted of trees and shrubs, but these conditions were the complete opposite in channelized reaches. Most streams throughout the basin have little or no woody stream corridor, and fencing to exclude cattle from the stream corridor was rare. When cattle were present they usually had free access to the streams causing further habitat degradation. Land use at over half of the sites surveyed consisted entirely of row crop production, and crops were often planted up to the edge of the stream bank.

Channel conditions throughout the basin were generally poor. For example, in the Platte River basin, channelization within the basin has resulted in about 250 miles of lost stream length and a 19.4% reduction in total stream miles from fourth order and larger streams. In the Nodaway River, 94 of the original 105 miles of the Nodaway mainstem within Missouri have been channelized. Only the lower 11 miles of river remain unchannelized. Stream banks along channelized reaches were highly susceptible to erosion resulting in poorly vegetated (generally herbaceous vines with shallow root systems), high vertical stream banks. Channelization and siltation have eliminated much of the riffle-pool complex in most of the streams within the basin. Loss of quality pool habitats, instream habitat, large woody debris, and riffles, are serious habitat related problems in the basin. Substrates were varied, but sand generally dominated substrate composition; silt and clay substrates were also relatively common. When larger substrate was present, it was often covered with silt, and interstitial areas were often reduced or eliminated due to siltation.

A total of 71 fish, 23 mussels, and 4 crayfish either occur or historically occurred within this EDU. Unfortunately, a fair number of these 98 species have likely been locally extirpated (e.g., common shiner, Topeka shiner, hornyhead chub, and johnny darter). The fish assemblage is characterized by wide-ranging, tolerant, species. Red shiner was the most abundant species overall, and was also the most common species collected, accounting for over two thirds of the fish population. The second most common species was sand shiner, accounting for over 10% of the fish population. Other common species include bigmouth shiner, central stoneroller, creek chub, fathead minnow, green sunfish, channel catfish, bluegill, yellow bullhead, common carp, largemouth bass, and river carpsucker. Given a shifting sand/silt substrate, it is not surprising that bottom-dwelling species were the most lacking group in terms of diversity and numbers within the basin. There are 5 globally listed (rare, threatened, or endangered) species and 16 state listed species of conservation concern. The Topeka shiner and flathead chub are two of the few species of conservation concern that may still be present in the EDU, although neither species have been collected in the basin in decades.

A 1913 survey of northern Missouri rivers found that the Platte River and its tributaries held a considerable number of mussels of commercial value, and the resource was in demand due to mussel depletions from the Missouri and Mississippi rivers. The mussel resources in the Platte River basin were soon depleted, but recently a few streams in northern Missouri were found to contain mussels, including the flat floater and rock pocketbook, that were once thought to be eliminated. Sixteen species of freshwater mussels historically occurred in the basin. The northern crayfish (Orconectes virilis) is the most abundant crayfish found in the basin, followed by the papershell crayfish (O. immunis) and the prairie crayfish (Procambarus gracilis), respectively. The devil crayfish (Cambarus diogenes) has not been collected in the basin but may occur undetected because of its habit of spending most of its life underground and its general distribution throughout the region.

A detailed survey of benthic macroinvertebrates was conducted in 1974 and 1976 on the Little Platte River (river mile 34) prior to impoundment of Smithville Lake. A high density of pollution tolerant species was found. Macro-invertebrates were also collected in Camp Branch and Crows Creek, both tributaries of the Little Platte River; densities were similar to those found on the mainstem, but community diversity was higher, with several pollution intolerant taxa present. Silt

deposition and loss of habitat due to extensive channelization are the major limiting factors in this region along with marginal dissolved oxygen levels and increased nutrient loads.

Aquatic resource goals for the Nishnabotna/Platte Rivers EDU: Given that so much of the basin has been degraded, attention will be placed on priority areas rather than over the entire basin. Our major goals for these areas in the Nishnabotna/Platte basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects, primarily on private lands (since 99% of the basin is in private ownership), will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU :

- Watershed uplands in critical areas should have minimal sources of eroded soil and other non point water quality problems; mitigation planning in priority areas may identify significant sources of these pollutants and strive to restore and stabilize them, using revegetation and leveraging the resources of other appropriate agencies such as the soil conserving responsibilities of the Natural Resources Conservation Service and other, similar agencies.
- Well vegetated riparian areas will be restored, expanded and maintained, especially in areas with high diversity of aquatic life, presence of species of conservation concern, areas managed for specific species or communities, and those identified as priority areas. Urbanizing areas north of Kansas City, and around St. Joseph and Maryville, as well as priority areas that are excessively row cropped and/or with excessive livestock use will be targeted.
- In-channel hydraulics will be restored (e.g., by managing streambed degradation in channelized reaches with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of priority streams. Careful project assessments (including involvement of MDC engineers) will be undertaken to make sure that only projects that will be successful are chosen and those with a higher probability of continued degradation in spite of the project are avoided.
- Restore instream habitat (targeting stable pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to Topeka shiners and flathead chubs) and unique or depressed aquatic invertebrate populations (especially the rock pocketbook and flat floater mussels).

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Nishnabotna/Platte Rivers EDU: Mitigation projects in the Nishnabotna/Platte EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process within the Nishnabotna/Platte EDU, we were able to identify 9 COAs that contained all 24 target species: Deroin Bend Access, Jowler Creek, Little Platte River, Malden Creek, McElroy Creek, McGuire Creek, Muddy Creek, Parma Woods and Rock Creek. In total, these COAs constitute 327 miles of stream, representing 6.5% of the total stream miles within the Nishnabotna/Platte EDU. Furthermore, the focus areas themselves represent an overall area of just 248 square miles, which is only 6.7% of the region. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources

- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity or high value, unchannelized habitats, especially in urbanizing areas. Castile Creek and portions of Honey Creek in the Platte River basin, and Florida, Nichols and Smith Creeks as well as the unchannelized lower Nodaway River in the Nodaway basin are examples.

Preservation objectives for the Nishnabotna/Platte Rivers EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Nishnabotna/Platte basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Nishnabotna/Platte EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Nishnabotna/Platte Rivers EDU: As part of the siting of ILF project sites within the Nishnabotna/Platte EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Nishnabotna/ Platte Rivers EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the

Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity

- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Nishnabotna/Platte Rivers EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

Osage River Geographic Service Area

Ecological Drainage Unit name: Osage River (HUCs: 10290106, 10290107, 10290109, 10290110, and 10290111)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the Osage EDU. The Osage, Pomme de Terre, Niangua, and Sac rivers Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

Osage River:
http://extra.mdc.mo.gov/fish/watershed/eosage/contents/
Pomme de Terre River:
http://extra.mdc.mo.gov/fish/watershed/pomme/contents/
Niangua River:
http://extra.mdc.mo.gov/fish/watershed/niangua/contents/
Sac River:
http://extra.mdc.mo.gov/fish/watershed/sac/contents/

Geographic service area: The Osage EDU lies in south-central Missouri and encompasses the lower portion of the Osage River watershed, including and downstream from the junction of the Pomme de Terre and Sac rivers to the junction of the Osage and Missouri rivers. This EDU falls within the Ozark Highlands and covers a portion or all of Cole, Osage, Maries, Miller, Pulaski, Camden, Morgan, Laclede, Dallas, Webster, Greene, Christian, Lawrence, Dade, Polk, Barton, Cedar, St. Clair, Hickory, Benton and Henry counties. Streams flow in a northerly or northeasterly direction and empty into the Missouri River. Overall there are 10,286 miles of primary stream channel within this EDU, of which 24,979 miles are classified as perennial. The Osage River, for which this EDU is named, is the third largest river in Missouri and is a tributary to the Missouri River. Other major streams within this EDU include the Sac, Pomme de Terre, and Niangua Rivers

Threats to the aquatic resources in the Osage River EDU: Overall, the quality of aquatic resources in the Meramec EDU is quite good; however, while mostly dispersed throughout the basin, there are a number of problems facing streams in the EDU:

Aquatic Resource Problems

- Drowning of stream channels by large dams (Bagnell, Truman, Pomme de Terre, Stockton, Tunnel, Fellows, McDaniel) and subsequent operations have caused a number of problems related to rapid flow fluctuations, extended bankfull flows, frequent and unnaturally low flows, erosion and siltation in the Osage basin and its tributaries, increased channel instability, loss of riparian corridor, loss of wetlands, reduced habitat availability for a variety of aquatic biota, barriers to fish migration, limited spawning habitat for fish, physical damage to large fish, lowered water temperatures, low dissolved oxygen, gas supersaturation, reduction of mussel populations, and fish kills due to low dissolved oxygen levels, impingement of fish on turbine intakes, and entrainment of fish through the turbines.
- Livestock access to streams causing stream bank erosion, sedimentation, and nutrient enrichment.
- Destruction of riparian vegetation, accompanied by increased stream bank erosion and nutrient enrichment, from construction and livestock use

- Small-scale stream channelization, primarily due to bridge construction and replacement, causes bank erosion, riparian destruction, and sedimentation issues downstream
- Several large-scale instream gravel mining operations and numerous unpermitted small-scale gravel mining operations cause an increase in stream bank erosion and sedimentation, increased turbidity, increases in local stream gradient, increased water temperature, and a decline in habitat quality for aquatic life
- Watershed urbanization, especially in the lower reaches of the basin, has adversely impacted riparian corridors, destroyed vegetative cover, increased impervious surfaces, and increased stormwater runoff (which increases channel instability), all increasing erosion, sedimentation, and contamination by sediment-borne chemicals, as well as depressed aquatic species diversity.
- High utilization of groundwater in and around the Springfield metropolitan area has caused a cone of depression to form in the water table. As the human population increases, this cone of depression will expand, may causing shallow wells to go dry, increasing pumping costs for groundwater users in the area, and negatively affecting springfed aquatic habitats.

Water quality problems

- Nonpoint pollution problems related to the discharge of untreated sewage, fertilizer, and animal manure off of agricultural, residential and commercially-developed lands (including land-applied sewage) causing high levels of nitrates, phosphates, and fecal bacteria and fecal viruses, especially during high flow events.
- In some watersheds in the Sac river basin, ongoing coal mining impacts streams with the potential for acid drainage to reduce water quality, and past mining of lead, zinc, and iron, although currently inactive, has the potential for old mine shafts and mine tailings creating water quality problems with leaching of materials or by providing avenues for mixing of surface waters with groundwater.
- Waste water discharges from sewage treatment infrastructure can cause low DO, algal blooms and ammonia from waste water discharges, especially near some of the larger cities and towns in the EDU
- Contamination of aquatic organisms, primarily mercury, continues to plague portions of the basin.
- Continued growth of the Lake of the Ozarks area results in increased urban and commercial development that has increased sewage discharges from improperly functioning septic tanks, runoff, and wastewater discharged to the lake, resulting in excess algal and bacterial growth from nutrients discharged into the lake.
- Groundwater contamination by improper sewage treatment, leaking storage tanks and agricultural runoff or wastewater discharges to losing streams, especially in karst areas.
- Contamination of streams from poorly managed confined animal feeding operations that discharge harmful amounts of animal waste into spring branches and streams thereby increasing nitrate levels and degrading the water quality of those water bodies
- Buried pipelines transporting crude oil, diesel fuel, and fertilizer cross portions of the basin and pose a threat to groundwater as well as streams in the watershed. A pipeline break in a karst area of the EDU with sinkholes and losing streams inside and outside the watershed can cause problems well beyond the spill site.

Historic aquatic resource loss in the Osage River EDU: Land cover in the basin before European settlement was a mosaic of prairie, savanna, and forest. The undissected uplands were dominated by patches of prairie and savanna with high grasses and large post oaks. Areas of greater relief and narrow ridgetops were dominated by oak-hickory forest with occasional patches of prairie in the bottomland.

The first inhabitants of the basin were Native Americans, primarily Osage, Delaware and Kickapoo tribes. These people had little influence on their environment by today's standards with one exception. Native Americans in the Osage basin used fire to combat their enemies, to scare animals to points of easy capture, and attract wild game. The new succulent vegetation that would grow a few weeks after a fire would attract wildlife and increase the value of hunting grounds. Burning had the major influence of suppressing the forest ecosystem and stimulating, expanding, and maintaining a prairie/savannah/glade based ecosystem over the areas of the basin where burning was practiced.

The first Europeans to explore the area were the French in the early 1700s, who were interested in trading furs and establishing fur trading routes. Trading posts and small settlements were established along rivers, the main transportation arteries of the time. When the first settlers moved into the Osage basin in the early 1800s following the Lewis and Clark expedition, they found magnificent stands of timber inhabited by forest game. Furbearers were abundant, as were

grassland birds and mammals. Buffalo and elk were common to the basin as were black bear, wolves, and mountain lions. Passenger pigeons inhabited the woodland areas. Many of these animals played an important role in the pioneer economy of the basin in the form of food to eat and fur to trade. Fur trading was a major economic activity in the basin.

Bottomland timber was soon cleared in order to grow crops in the fertile soils. The combination of available open range in the uplands and abundant grain production in the bottomlands proved appealing to livestock growers. As the backwater areas were drained to be used as farmland, steep slopes were plowed for crop production, and the timber harvested for various uses, many of the species which depended on these habitats either persisted as best as they could or dropped out of the picture all together. Many species which could not cope with the habitat changes and/or hunting pressure brought about by increasing numbers of settlers and disappeared from the basin entirely. Sturgeon were once plentiful in the Osage River as were paddlefish and walleye.

In 1837, the first steamboat ascended the basin to bring in more settlers and to deliver crops and timber to downstream markets. However, low water hindered navigation by steamboats. River navigation improvement projects, snag removal, and the cutting of overhanging trees that were hazards to the high smokestacks of the steamboats was common on the mainstem Osage River. Navigational projects were common on the river until the Civil War, after which railroads began to become more important for travel in Missouri. The coming of the railroads signaled the beginning of the end for steamboat travel in Missouri.

As more settlers moved into the basin, they continued to cut timber to clear fields, but also began to cut timber to aid in the expansion of railroads, delivering the trees downstream to larger towns. Timber was cut for railroad ties and assembled into rafts and floated to the railhead at Bagnell, Missouri. Railroad ties were cut from as far back as 15 miles from the river. The basin was part of the largest timber producing region in the nation at the end of the 1800s.

By the end of the 1880s, several railroads were established and grain crops transported to large commercial centers such as Kansas City. As more settlers moved in, the open rangeland was fenced into partitions which resulted in overgrazing. The annual prairie fires that played such an important role in defining the landscape were suppressed, resulting in the encroachment of brush and trees.

In 1906, a lock and dam was constructed on the Osage River to facilitate river travel. By the late 1920's, the forest of the basin had become exhausted of its resources. All that was left over much of the basin were rocky, barren hills. Disturbances associated with logging, land clearing, burning, and overgrazing affected stream habitats of the basin and their fish faunas in the late 1800s and the early 1900s. These disturbances increased the bedload of gravel and finer sediments carried by the streams, resulting in higher turbidity, channel instability, and the filling of stream pools and backwaters. Grain production continued to be the dominant agricultural practice in the Osage EDU until the early 1900s. Reduced soil fertility and productivity, declining grain prices forced producers to change farming practices to be more diversified, and the Great Depression.

It wasn't long before people began looking for ways to harness Osage basin rivers for human use. In 1912, Ralph W. Street of Kansas City began to study the concept of damming the Osage River. In the fall of 1924, a permit was issued for the project and construction of Bagnell Dam began immediately. Lake of the Ozarks was completed in 1931. Electric service began on Christmas Eve of that year, commercial navigation to the lower 82 miles of the Osage River ceased, and the recreational potential of the lake began to take off. In the 1950s, 60s, and 70s, additional large lakes like Stockton Lake, Pomme de Terre Lake, and Truman Lake were built to capitalize on the potential for power generation as well as provide flood control to area farmers.

Approximately 50% of the original forest in the state was converted to pasture by 1947 (MDC, 1980). Conversion to pasture was most prevalent in areas with low relief, such as headwater reaches and wide valleys. The decline of forests were attributed to high cattle prices in the 1960s that prompted farmers, who owned over 50% of the commercial forest in Missouri, to convert forest to pasture

Current aquatic resource conditions in the Osage River EDU: The landscape of this EDU is nearly equally divided among three ecological subsections; the Central Plateau, Osage River Hills, and Springfield Plain. The southern and

eastern portions of the Osage EDU fall within the Central Plateau Ecological Subsection and are some of the least dissected portions of the Ozark Highlands. It is dominated by a thick carbonate geology consisting mainly of cherty dolomites and some prominent sandstones; relief in this portion of the EDU is generally 50-150 feet; floodplains tend to be narrow and not extensive, with very gravelly soils; the area is minimally dissected and many of the streams are either ephemeral or intermittent with lower gradients than streams elsewhere in the EDU; water is warmer and more turbid; and only a few small springs are found. The northern portion of the EDU falls within the Osage River Hills Ecological Subsection, composed of hilly to rugged lands bordering the Osage River and the lower mainstems of the principle tributaries. Cherty dolomites and sandstones of the Gasconade and Roubidoux formations underlie the area; karst features are very prevalent in those areas underlain by dolomite; springs are abundant; relief is quite high as is stream gradient; riffles are well developed with extensive bars consisting of cobbles and gravels; and waters are generally very clear and often cool. The southwestern portion of the EDU falls within the Springfield Plain. This ecological subsection is mainly underlain by very cherty Mississippian limestones, with some smaller inclusions of more resistant Pennsylvanian sandstone and shale deposits, which tend to form ridges that rise above a generally flat plain. Streams have an Ozark-border character, with moderate gradients and spring influence; waters are fairly clear; stream substrates are mainly chert gravel and cobble, with well-defined riffles; and springs and other karst features (sinkhole ponds/caves) are quite abundant. Local relief is generally 100 to 200 feet, and gravel and sand bars are quite prevalent in streams. The average gradient across all stream size classes is 63 ft/mi. Average gradients (ft/mi) by size class are: headwater 83, creek, 19, small river 5.3, and large river 1.6.

Agriculture and tourism are the two major industries within the Osage River EDU. Basin land use changes from a historic forest/prairie/savanna composition to one of agricultural dominance have taken several centuries to occur. Agriculture in the basin has experienced a shift from a crop-based system in the earlier days of settlement to a livestock-based system today. Major current agricultural activities for counties in the basin are livestock production and crop production. Many concentrated animal feeding operations (CAFOs), currently exist within the basin. Important tourist activities include fishing, canoeing, and boating.

Overall, land cover within the basin is half grassland, with forest making up most of the remainder (approximately 40%); cropland makes up less than 5% and urban areas even less. Major crops include corn, soybeans, sorghum, fescue seed, hay and wheat. Major livestock commodities within the basin are beef and dairy cattle, milk, hogs, and poultry. Native grasses such as big bluestem, little bluestem, side oats grama, and Indian grass are still found in prairie, glade, and savannah areas of the basin in relatively small amounts, especially in the western parts of the basin that lie in the Osage Plains.

Urbanization within the basin will continue to occur, especially as Springfield, residential areas in and around the Lake of the Ozarks area, and smaller towns like Lebanon and Bolivar expand. Residential and industrial development, waste water treatment, and increases in impervious areas continue to expand at the expense of forest and grasslands.

Mining has not been a major activity in the basin, with only minor coal mining activities occurring in the far western portions of the basin. While small, localized problems currently occur, these are not major habitat problems across the EDU. Not so with sand and gravel mining, which occurs in most of the EDU, especially in streams draining Ozark Highlands areas. Gravel mining is widely practiced, since gravel is easily obtained from stream gravel bars, and numerous small and a few large commercial gravel operators exist throughout the basin. Most of the gravel mining operations in the basin are non-commercial operations and therefore are not required by MDNR to have permits.

In the late 1990's, a stream habitat quality evaluation was completed by MDC at various locations in the basin. Overall habitat values throughout the basin are generally good. Stream bank erosion was a problem in all streams sampled, especially in reaches where little or no wooded riparian zone and poorly vegetated banks existed. These often were where streams flowed through pastures. In stream fish cover in pools consisted mainly of snag habitat such as rootwads and logs. Woody cover was limited along those reaches where there was little or no riparian zone present. At sites where overgrazing was evident water clarity was poor and an abundance of algae was noted, probably from nutrient enrichment.

Few channel alterations and stream channelization projects were present, usually in the form of old mill dams; however the basin is the site of several large dams. Lake of the Ozarks, Stockton Lake, Pomme de Terre Lake and Tunnel Dam have all turned flowing water into lakes, thus negatively affecting each stream's ability to function as a stream. In

addition, water releases from some of these dams for a variety of reasons (mostly hydropower production) have caused changes in the biota, resulted in a few problems related to physical damage of biota, and has adversely affect water quality (oxygen supersaturation, low dissolved oxygen, thermal regime changes, etc.). Operational changes at several of the dams have lessened some of these problems.

The basin has a rich diversity of animal and plant species within its boundaries. The Osage EDU contains a unique combination of species that are characteristic of neighboring EDUs in the Ozarks and Central Plains. Several natural communities/features in the basin are listed in the MDC Natural Heritage Database. These features include: dolomite glades, caves, dry-mesic chert prairie, acid seeps, deep muck fens, dry limestone/dolomite cliffs, creeks and small rivers, springs, Ozark headwater streams, prairie headwater streams, large Ozark rivers, Ozark sloughs, Ozark cave streams, freshwater marshes, pond marshes, mesic bottomland forests, hardpan prairies, dry chert forests, sandstone glades, limestone glades, sandstone savannas, sandstone talus, dry sandstone cliffs, dry-mesic limestone/dolomite prairies, dry-mesic sandstone/shale prairies, dry-mesic sandstone forests, effluent caves, and xeric sandstone forests.

There are 116 fish, 46 mussel, and 6 crayfish that either inhabit, or at one time inhabited, the Osage EDU, including 17 globally listed species of concern and 32 state listed species. Some of the fish species of conservation concern include the Niangua darter, bluestripe darter, blacknose shiner, lake sturgeon, and Ozark cavefish. Freshwater mussels were plentiful in the basin prior to the boom of the commercial button industry in the 1880's, but populations were soon depleted. Still today, mussel populations continue to decline due to declines in populations of fish species used by mussels as larval hosts, changes in water quality, habitat degradation (gravel mining, urbanization, stream channelization, and dam construction), and introduction exotic species. The pink mucket, scale shell, hickorynut, black sandshell, spectaclecase, rock-pocketbook, giant floater and elephant-ear mussels are species of conservation concern. Given the high diversity of other aquatic organisms, the Osage River EDU has a low diversity of crayfish. The basin is home to the bristly cave, northern, devil, golden, Salem cave, and virile crayfish.

Much greater detail on current aquatic resource conditions in the Osage River EDU is available in the four WIA documents cited under the Support Data section above, and readers are encouraged to download and read them.

Aquatic resource goals for the Osage River EDU: Our major goals for the Osage basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them, especially near confined animal feeding operations, land-applied sewage effluent areas, and nonpoint pollution sources.
- Well vegetated riparian areas will be restored, expanded and maintained using bottomland forest species (when adapted to the site, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to, ghost shiner, Topeka shiners, troutperch, plains minnow, and western silvery minnow) and unique or depressed aquatic invertebrate populations (especially the spectacle case and flat floater mussels).
- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams. An emphasis area will be the removal of the Osage Lock and Dam
- Operational changes to discharges downstream from dams will be modified to restore historic hydrologic and hydraulic conditions, improve water quality, and reduce physical damage to aquatic life, especially downstream of Bagnell, Stockton, Pomme de Terre and Tunnel dams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the Osage River EDU: Mitigation projects in the Osage River EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process, within the Osage EDU, 12 COAs containing 89 target species were identified: Bear Creek, Bennett Spring, Billies Creek, Bluff Springs, Cadet Creek, Cedar Creek, Goodwin Hollow, Little Niangua River, Maries River, Pomme de Terre, Saline Creek, and Stinking Creek. In total, these COAs constitute 927 miles of stream, representing 9% of the total stream miles within the Osage EDU. Furthermore, the focus areas themselves represent an overall area of just 680 square miles, which is only 8.5% of the region. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern, especially those in the Maries, Upper Niangua, and Little Niangua rivers and Tavern Creek in the historical range of the Niangua darter.
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in urbanizing areas

Preservation objectives for the Osage River EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the Osage basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the Osage River EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the Osage River EDU: As part of the siting of ILF project sites within the Osage River EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as

appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the Osage River EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the Osage River EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project

condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

White River Geographic Service Area

Ecological Drainage Unit name: White River (HUCs: 11010001, 11010002, 11010003, and 11010006)

Support Data: The information in this section of the Compensation Planning Framework is a summary of a much more complete treatment of the problems and opportunities for managing the flowing water resources in the White River EDU. The James, North Fork White, and White river Watershed Inventory and Assessment (WIA) documents were written as part of a broader watershed planning and management effort by the Missouri Department of Conservation. These documents are an integral part of the Compensation Planning Framework and must be considered incorporated by reference. For more detail, including tabular and graphic supportive data, the reader is directed to the following WIAs:

James River:
http://extra.mdc.mo.gov/fish/watershed/james/contents/

North Fork White River:
http://extra.mdc.mo.gov/fish/watershed/northfrk/contents/

White River:
http://extra.mdc.mo.gov/fish/watershed/whriver/contents/

Geographic service area: The White River EDU lies in the Ozark Highlands in southern Missouri and northern Arkansas within the Ozark Plateau physiographic region and in portions of the Springfield and Salem plateaus. It encompasses the White River watershed, including several major tributaries in Missouri (James River, North Fork of the White River). The Missouri portion of this EDU covers parts of Barry, Christian, Douglas, Ozark, Stone, Taney, Webster, and Wright, Howell, Texas, and Greene counties. The White River in Missouri is impounded, but used to flow in an easterly or southeasterly direction; tributary streams in Missouri flow in a southerly direction. The Missouri portion of the watershed is bound from west by the Elk and Spring river basins, from the north by the Gasconade, Pomme de Terre, Sac and Niangua river basins, from the east by the Eleven Point and Spring river basins, and from the south by the Arkansas state line. Overall there are 12,975 miles of primary stream channel within this EDU, of which 3,283 miles are classified as perennial. Of this total 7,675 miles (59%) falls within Missouri.

Threats to the aquatic resources in the White River EDU: Overall, the quality of aquatic resources in the Meramec EDU is quite good; however, while mostly dispersed throughout the basin, there are a number of problems facing streams in the EDU:

Aquatic Resource Problems

- Drowning of stream channels by large dams (Beaver, Table Rock, Powersite, Lake Springfield, and Bull Shoals) and subsequent operations have caused a number of problems related to rapid flow fluctuations, extended bankfull flows, frequent and unnaturally low flows, erosion and siltation in the White river basin and its tributaries,

increased channel instability, loss of riparian corridor, loss of wetlands, reduced habitat availability for a variety of aquatic biota, barriers to fish migration, reduced diversity of aquatic life by the loss of intolerant species, limited spawning habitat for fish, physical damage to large fish, lowered water temperatures, low dissolved oxygen through hypolimnetic discharges, gas supersaturation, reduction of mussel populations, and fish kills due to low dissolved oxygen levels, impingement of fish on turbine intakes, and entrainment of fish through the turbines. Several small dams (Dawt Mill [North Fork of the White River], Noblett Lake Dam [Noblett Creek], Rockbridge Dam [Spring Creek], Althea Spring Dam [Althea Spring], Lindenlure Dam [Finley Creek], Ozark Dam [Finley Creek], Riverdale Dam [Finley Creek], Hurley Dam [Spring Creek] Calton Mill Dam [Little Flat Creek], and McDowell Mill Dam [Flat Creek]) have caused similar, but smaller-scale problems in their respective streams.

- Livestock access to streams causing stream bank erosion, sedimentation, and nutrient enrichment.
- Destruction of riparian vegetation, accompanied by increased stream bank erosion and nutrient enrichment, from construction and livestock use
- Sedimentation from disturbed watershed areas related to row crop agriculture.
- Small-scale stream channelization, done in the name of bridge construction and replacement, urban growth, gravel removal and stream bank erosion control, causes bank erosion, riparian destruction, and sedimentation issues downstream
- Numerous unpermitted small-scale gravel mining operations cause an increase in stream bank erosion and sedimentation, increased turbidity, increases in local stream gradient, increased water temperature, and a decline in habitat quality for aquatic life
- Watershed urbanization, especially in the Springfield, Branson, and Table Rock Lake area of the basin, has adversely impacted riparian corridors, destroyed vegetative cover, increased impervious surfaces, and increased stormwater runoff (which increases channel instability), all increasing erosion, sedimentation, and contamination by sediment-borne chemicals, as well as depressed aquatic species diversity.
- High utilization of groundwater in and around the Springfield and Branson areas has caused a cone of depression to form in the water table. As the human population increases, this cone of depression will expand, may causing shallow wells to go dry, increasing pumping costs for groundwater users in the area, and negatively affecting springfed aquatic habitats.

Water quality problems

- Nonpoint pollution problems related to the discharge of untreated sewage, fertilizer, power plant coal pile runoff, and animal manure off of agricultural, residential and commercially-developed lands (including land-applied sewage) causing high levels of nitrates, nitrites, phosphates, and fecal bacteria and fecal viruses, especially during high flow events, can cause both water quality and human health issues.
- Small scale limestone mining causing localized problems in streams, primarily due to sedimentation. Inactive open pit iron and lead mining areas also dot the watershed that can provide problems in kart areas with the potential for introducing pollutants directly into groundwater.
- Statewide levels of mercury contamination in aquatic organisms are present at various locations in the basin, but there are no health advisories specific to the White River EDU.
- Continued growth of the Springfield and Branson areas results in increased urban and commercial development that has increased sewage discharges from improperly functioning septic tanks, runoff, and wastewater discharged to the lake, resulting in low dissolved oxygen, excess algal and bacterial growth from nutrients discharged into water bodies.
- Groundwater contamination by improper sewage treatment, leaking storage tanks and agricultural runoff or wastewater discharges to losing streams, especially in karst areas.
- Contamination of streams from poorly managed confined livestock and poultry feeding operations that discharge harmful amounts of animal waste into spring branches and streams thereby increasing nitrate levels, fecal coliform levels, turbidity, other bacterial loading, and degrading the water quality of those water bodies
- Buried pipelines transporting crude oil, diesel fuel, and fertilizer cross portions of the basin and pose a threat to groundwater as well as streams in the watershed. A pipeline break in a karst area of the EDU with sinkholes and losing streams inside and outside the watershed can cause problems well beyond the spill site.

Historic aquatic resource loss in the White River EDU: Land cover in the basin before European settlement was a mosaic of prairie, savanna, and forest. The undissected uplands were dominated by patches of prairie and savanna with high grasses and large post oaks. Areas of greater relief and narrow ridgetops were dominated by oak-hickory forest with occasional patches of prairie in the bottomland. Tall grass prairie was present in areas of lesser relief and was composed of big blue stem and other prairie grasses as well as herbs such as dittany oats grass, pussy toes, lespedeza, and cinquefoil. Eastern red cedar was also found on limestone glades.

The first inhabitants of the White River basin were Native Americans living in small, transient camps and surviving mainly on animal foods. The rugged geography of the region allowed early Native Americans to continue their ways in the region for several hundred years beyond that of tribes on the fringe of the Ozarks, who began to settle in larger villages and use more plant food. Their most notable effect on the lands of the region was a result of their use of fire, which was set to improve grassland for grazing of large animals, aid in hunting, and harass enemies. Fires were also thought to have been significant in determining the plant distribution of the region.

European settlement of the Ozark fringe began in the early 1700's under French and, later, Spanish political control. After the Louisiana Purchase of 1803, American settlers began moving into the same areas earlier occupied by the Spanish and French, settling the narrow valleys and building their homes near springs. Many of the earliest pioneers were from Kentucky and Tennessee and were attracted by the watershed's abundance of game and fish, rather than by its farming possibilities. The vegetation was lush; Schoolcraft described the upper portion of the North Fork of the White River as being “wholly composed of springs which gush at almost every step from its calcareous banks" and the water as "very pure, cold, and transparent". He mentions bottomland forests covered with elm, beech, oak, maple, sycamore, ash, shrubs, vines, cane, and greenbriar. The nearby uplands were described as open, with very little timber, or under-brush, and generally level. The broader, more gently sloping uplands are believed to have been composed of open woodlands with occasional prairie and savanna openings with post oak and black oak . The land cover of the more dissected landscape nearer the North Fork River and Bryant Creek are believed to have been primarily composed of oak and oak-pine forest with a mixture of hardwoods in the bottoms.

The region remained sparsely settled until the mid to late 1800s. Farming began shortly after the arrival of the first settlers as valley bottom forests and cane stands were replaced with cultivated fields and pastures; however, the annual practice of burning was continued by early settlers in order to enhance the livestock forage of the uplands. Early settlers raised livestock which grazed on the open range of the slopes and uplands in the summer. In the winter, livestock were fed from forage crops cultivated and harvested from the bottom lands. As the population of the area increased, more settlers were forced to settle the uplands and fenced pasture began to replace the practice of open range. Suppression of wildfires in the uplands during the same period allowed an increase in understory growth in woodlands and losses of native grasslands and savannahs. The clearing of valley bottoms was probably responsible for some direct stream disturbance, but the suppression of fires in the uplands probably offset sediment yield. This region remained sparsely settled until the late 1800's, when the economic values of the vast timber resources were discovered.

In the late 1800s and early 1900s, commercial timber harvest began in earnest as the demand for railroad ties increased. The distribution of the first extensive commercial timber cutting in the Ozarks was limited by the distribution of shortleaf pine and transportation routes provided by rivers and railroads. Early logging operations used livestock to skid out oak and pine sawlogs, and cutting on the steeper slopes was avoided. This helped to minimize the effects of the early logging period. Continued clearing and road building coupled with extreme regional flooding between around the turn of the century initiated a moderate stream disturbance. As the logging industry began to decline in the area, residents turned increasingly toward farming as a means of survival, increasing the cultivation of corn and wheat where the topography allowed. Although a complex series of factors are responsible, land use during the post-timber-boom (1920-1960), played the largest role in stream disturbances that are evident today. Annual burning and cutting of upland timber to open more grazing land brought changes in upland and riparian zone vegetation that decreased storage and flow resistance, which resulted in small streams having a higher discharge for a longer period of time, resulting in significant gravel influxes into streams.

During the early settlement period and throughout most of the timber boom, hogs were the dominant livestock in the area, only to be replaced by cattle beginning in the 1920s. Early cattle were grazed on free range, which allowed them to concentrate in valley bottoms and destroy riparian vegetation and understory along stream banks. This destruction of riparian vegetation, coupled with the clearing and grazing of uplands, probably initiated headwater channel migrations,

resulting in the extension of drainage networks and the accelerated release of gravel into small streams. In the mid 1900s (the largest increase in livestock populations occurred in the 1970s), increases cattle herds and large-scale conversion of forest to pasture continued the trend of stream degradation.

Current aquatic resource conditions in the White River EDU: The landscape of this EDU largely falls within the White River Hills Ecological Subsection, but also includes portions of the Central Plateau and Springfield Plain subsections. A distinctive feature of this EDU is the extremely high density of springs and the relatively high gradient of the streams across all size classes. The upper portions of the James River and Finley Creek watersheds fall within the Springfield Plain subsection. Local relief is generally only 100-200 feet. This area is mainly underlain by limestones, which results in high groundwater contributions to streams within this area, and springs and caves are quite abundant. Some of the highest densities of sinkholes and losing streams can be found here. Streams are generally Ozark in character and occupy narrow valleys separated by relatively broad ridges compared with other portions of the EDU. Streams are clear, with high base flows, and low suspended sediment loads. Substrates are mainly chert gravel and cobble, with well-defined riffles, gravel bars and bluff pools quite prevalent. Extensive stretches of bedrock channels also exist. The steep slopes combined with the moderate to slow infiltration rates of the soils results in the streams having a flashy hydrograph with flooding common during and after intense rainfall events, which bypass the karst drainage system.

The White River Hills subsection is mainly underlain by dolomite and local relief is generally quite high, ranging from 300 to 800 feet. Streams are very Ozark in character and occupy very narrow valleys separated by very narrow ridges compared with other portions of the EDU. Streams are clear, with high gradients and base flows, and very low suspended sediment loads. Substrates mainly chert gravel, cobble, with well-defined riffles, gravel bars, sand bars and bluff pools are quite prevalent. Extensive stretches of boulder-laden and bedrock channels exist. Springs are numerous, and streams have high groundwater contributions, but many of the smallest stream channels are ephemeral due to losses to the underlying karst drainage. The steep slopes combined with the moderate to slow infiltration rates of the soils results in the streams having a flashy hydrograph with flooding common during and after intense rainfall events.

The average gradient across all stream size classes is 96 ft/mi. Average gradients (ft/mi) by size class are: headwater 127, creek, 29, small river 7.9, and large river 3.2.

The White River basin is predominantly rural. Forest land comprises the greatest percentage of land use/land cover types in the watershed at an estimated 50%, followed by grass/cropland (45%), and urban (4%). Forest land primarily consists of second growth oaks, common on ridges, uplands, and uphill slopes on drier, more acidic soils in the eastern and southern portions of the basin. Some of the other trees associated with the oak/hickory complex include blackjack oak, black oak, white oak, post oak, black hickory, and shagbark hickory. The area now has cleared glades and fewer orchards. The primary agricultural activity in the EDU is livestock production, primarily cattle with a few hogs and poultry operations. The virgin oak/hickory forest is almost gone, and most of the prairie has been lost to cattle grazing and agriculture.

Urbanization within the basin will continue to occur, especially as Springfield, Branson and other towns in the vicinity, as well as residential areas in and around the Table Rock Lake area, and smaller towns like Ava and Marshfield expand. Residential and industrial development, waste water treatment, and increases in impervious areas continue to expand at the expense of forest and grasslands.

Historically, lead mining was the most common mineral activity throughout the watershed, but no lead mining is ongoing today. The same is true for iron. Old open pit mining sites have the potential for localized degradation, but little has documented in the basin. There are also a few limestone quarries operating within the basin, with the potential for discharging lime into surface and groundwater, but these impacts, too, are minimal. Sand and gravel mining is the most common type of mining activity in the basin; hundreds of small operations occur throughout the basin, although more occur in the eastern and southern portions of the basin where the gravel resource is higher quality and more abundant. The Army Corps of Engineers (COE) through Section 404 of the Clean Water Act and the Department of Natural Resources (DNR), through its Land Reclamation Program, issue permits for the mining of stream sand and gravel. When followed, guidelines developed by state and federal agencies with input from the regulated community and used by the COE allow mining of gravel bars and floodplains while minimizing instream damages.

Few channel alterations and stream channelization projects are located in the basin, usually in the form of old mill dams; however the basin is the site of several large dams. Dams at Beaver, Table Rock, Powersite, Lake Springfield, and Bull Shoals lakes have all turned flowing water into impoundments, thus negatively affecting each stream's ability to function as a stream. In addition, water releases from some of these dams for a variety of reasons (mostly hydropower production) have caused changes in the biota, resulted in a few problems related to physical damage of biota, and has adversely affect water quality (oxygen supersaturation, low dissolved oxygen, thermal regime changes, etc.). Operational changes at several of the dams have lessened some of these problems.

The White River watershed contains one of the most diverse assemblages of fish species in the state of Missouri. There are 89 fish, 48 mussel and 9 crayfish species that either inhabit, or at one time inhabited, the White EDU. There are 21 globally listed (rare, threatened, or endangered) species and 29 state listed species including Ozark cavefish, checkered madtom, Ozark shiner, longnose darter, eastern slim minnow, highfin carpsucker, crystal darter, bluntface shiner, American brook lamprey, Salem cave crayfish, Meek's crayfish, and purple lilliput.. The fish assemblage is characterized by regionally and locally endemic, intolerant, species; distinctive fish species include the duskystripe shiner, Ozark cavefish, and the yoke darter. Common and distinctive mussel species include the Arkansas brokenray, curtis pearlymussel, fatmucket, giant floater, Neosho mucket, and pondmussel. Another mollusk, the Tumbling Creek cavesnail, is also a federal candidate species; it is only known from a single stream in Tumbling Creek Cave in Taney County. The crayfish assemblage is the most distinct in the state, with several locally endemic species including the bristly cave, longpincered, Meek's, Ozark, ringed, and William's crayfish. The most commonly encountered crayfish species include the Ozark, ringed, and spothanded.

A large number of unique natural communities are present in the White River basin: Wet Pit Cave, Effluent Cave, Creeks and Small Rivers, Dolomite Glade, Dry Chert Forest, Dry Limestone/Dolomite Cliff, Dry-Mesic Bottomland Forest, Dry-Mesic Limestone/Dolomite Forest, Dry Limestone/Dolomite Prairie, Dry-Mesic Chert Forest, Dry-Mesic Chert Prairie, Chert Savannah, Dry-Mesic Sandstone Forest, Fen-8, Fresh Water Marsh, Headwater Stream (Ozark), Mesic Limestone/Dolomite Forest, Moist Limestone/Dolomite Cliff, Moist Sandstone Cliff, Pond Shrub Swamp, Prairie Fen and Shrub Swamp.

Much greater detail on current aquatic resource conditions in the White River EDU is available in the three WIA documents cited under the Support Data section above, and readers are encouraged to download and read them.

Aquatic resource goals for the White River EDU: Our major goals for the White River Basin are improved water quality, better riparian and aquatic habitat conditions, the maintenance of diverse and abundant populations of native aquatic organisms and sport fish, and increased public appreciation for the stream resources. Periodic aquatic invertebrate and fish samples will be collected and appropriate habitat surveys will be conducted in priority areas to determine and delineate project sites. Onsite habitat improvement projects on federal, state, and local government lands and those of private landowners will focus on improving stream channel and riparian area stability in priority areas (see prioritization strategy below) in the EDU:

- Watershed uplands should have minimal sources of eroded soil and other non point water quality problems; mitigation planning may identify significant sources of these pollutants and strive to restore and stabilize them, especially near confined animal feeding operations, land-applied sewage effluent areas, and nonpoint pollution sources. Special emphasis will be placed on caves, springs, sinkholes, and their recharge areas.
- Well vegetated riparian areas will be restored, expanded and maintained using bottomland forest species (when adapted to the site, especially in areas with high diversity of aquatic life, presence of species of conservation concern, and areas managed for specific species or communities. Urbanizing areas and those with excessive livestock use will be targeted.
- Restore instream habitat (pools with woody debris, boulders and/or aquatic vegetation) in areas of management emphasis to benefit resident sportfish, native non game fishes (including, but not limited to, checkered madtom, Ozark shiner, longnose darter, eastern slim minnow, highfin carpsucker, crystal darter, bluntface shiner, American brook lamprey, Salem cave crayfish, Meek's crayfish, and purple lilliput) and unique or depressed aquatic invertebrate populations.

- In-channel hydraulics will be restored (e.g., by managing streambed degradation with riffle structures, installing biotechnical and other stream bank stabilization structures in areas of priority need, etc.) to balance the hydrological and in channel physical conditions of streams.
- Operational changes to discharges downstream from dams will be modified to restore historic hydrologic and hydraulic conditions, improve water quality, and reduce physical damage to aquatic life, especially downstream of Beaver, Table Rock, Powersite, Bull Shoals and Lake Springfield dams.

Enforcement of existing water quality and other stream related regulations and necessary revisions and additions to these regulations will help reduce violations and lead to further water quality improvements. Working with related agencies to promote public awareness and incentive programs and cooperating with citizen groups and landowners will result in improved watershed conditions and better stream quality.

Prioritization strategy for selecting and implementing mitigation projects in the White River EDU: Mitigation projects in the White River EDU will be located in areas that provide physical, chemical and/or biological improvements to stream ecological values of the basin, and are technically feasible and appropriate to install at the project site. Of highest priority are areas of biodiversity that have been deemed Conservation Opportunity Areas using the assessment by the interagency Missouri Resource Assessment Partnership (MoRAP). COAs, when taken collectively, represent the priority areas required to maintain Missouri's current biodiversity levels. By using the MoRAP conservation assessment process, within the White River EDU, 9 COAs representing 88 target species were identified: Bennetts Bayou, Blue Creek, Bridges Creek, Cane Creek, Crooked Branch, Roaring River, Tory Creek, Upper James River, and Woods Fork. In total, these COAs constitute 395 miles of stream, representing 5.1% of the total stream miles within the White EDU. Furthermore, the focus areas themselves represent an overall area of just 232 square miles, which is only 4.9% of the region. In addition to COAs, other priority sites will be identified when a mitigation project is not possible in one of the above COAs:

- Two miles upstream and downstream of all MDC, state park and other local, state or federally-owned public areas managed for natural resource or public recreation purposes.
- 303 (d) listed waters
- Stream reaches identified as State Outstanding Resource Waters by the Missouri Department of Natural Resources
- Stream reaches managed as special management areas by the Missouri Department of Conservation
- Stream reaches containing state or federal species of conservation concern, especially those in the James River basin in the historical range of the Ozark cavefish and the Tumbling Creek cavesnail.
- Greenway corridors proposed or managed by federal, state, or local entities for public recreation or habitat improvement/protection purposes
- Areas of high aquatic mussel, invertebrate or fish community diversity, especially in urbanizing areas, Crane and Spring Creek watersheds, cave and spring sites and their recharge areas, and sinkholes.

Preservation objectives for the White River EDU: Preservation projects are an important part of watershed management, in that critical stream reaches, unique habitats, and protection of important water quality areas of the White River basin will contribute to sustaining ecological functioning over the long term. However, the priority of projects will continue to be on restoration and establishment; preservation will be used in the White River EDU when:

- The resources to be preserved provide important physical, chemical and/or biological functions for the watershed;
- The resources contribute significantly to the ecological sustainability of the watershed;
- Preservation is appropriate, practicable, and has the support of the IRT and the Corps
- The aquatic resources in question are under threat of destruction or degradation; and/or
- The preserved site will be permanently protected through fee-title transfer to MDC or a permanent easement held by MDC or a valid not-for-profit natural resources land trust;

The credit value of preservation projects is less than that of restoration or establishment projects; however, the lower weighting of preservation projects is a feature of the Missouri Stream Mitigation Method of credit calculation and no additional "discounting" of preservation project credits will be undertaken. It is possible that some preservation projects

will contain wetland values; however, the Stream Stewardship Trust Fund is a stream mitigation program and will not be involved in mitigating wetlands. Therefore, the presence of a high quality wetland in a riparian or floodplain area may factor into a decision on whether a particular preservation tract is acquired, but wetland values will be included along with other land uses and will not carry any additional weight when project credits are calculated.

Public and private stakeholder involvement in compensatory mitigation in the White River EDU: As part of the siting of ILF project sites within the White River EDU, MCHF will seek out local input from federal and state agencies, municipalities, landowners, natural resource management groups and advisory groups within the watershed as appropriate. The ILF program will work with any willing public agencies to prioritize watersheds for ILF projects. ILF project sites will not be placed on public lands.

Long term protection/management strategies for compensatory mitigation in the White River EDU: The Stream Stewardship Trust Fund has several legal mechanisms whereby its ILF Program compensatory mitigation projects would receive long-term protection and management:

- A project area is purchased from a willing seller and becomes a part of the land holdings of the Missouri Department of Conservation (MDC) with MDC being the deed owner. MDC agrees to manage the area consistent with best management practices for streams and streamside areas.
- A project with a landowner or other entity is protected by perpetual easement, where the landowner donates, sells or otherwise transfers an easement in perpetuity to the Missouri Department of Conservation, natural resource-oriented federal, state or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity.

In addition, in rare instances with COE approval and the consent of the IRT where a high priority project cannot be secured through fee title acquisition or a perpetual easement, the following mechanisms for long term protection and management may be considered:

- A project with a landowner who does not want to be involved in a perpetual easement can choose a long term(30-year) easement by donating, selling or otherwise transferring an easement for a 30 year period to the Missouri Department of Conservation, natural resource-oriented federal, state, or local government agency, or a natural resource-oriented land trust like the Nature Conservancy, Ozark Regional Land Trust, Greenbelt Land Trust or similar not-for-profit entity
- A project with a landowner or other entity that does not want to be involved with an easement can choose a special maintenance agreement, a formal contractual arrangement between the MCHF and a landowner or other entity where the landowner or other entity promises to meet specified maintenance conditions for a 30-year period. These projects are transferred to a new owner in the event of sale. If the landowner does not do so, or the new landowner refuses to sign a new agreement, the maintenance responsibilities (and the penalties for violating them) are retained by the original landowner.

Under the SSTF Program, the management agreement or terms of a conservation easement would describe the conservation values and permitted/prohibited uses for each property. On all properties, MDC would perform annual stewardship monitoring with onsite field observations, reporting, and enforcement actions, as appropriate.

Strategy for periodic evaluation and reporting in the White River EDU: Evaluation, monitoring, and reporting is required of all compensatory mitigation projects to determine if the project is meeting its performance standards and if additional measures are necessary to ensure that the compensatory mitigation project is accomplishing its objectives. Project specific mitigation plans (see Appendix C) will detail the parameters to be monitored, the length of the monitoring period, the dates that the reports must be submitted, the party responsible for conducting the monitoring, the frequency for submitting monitoring reports to the Corps, and the party responsible for submitting those monitoring reports to the Corps and the IRT. Unless otherwise specified in the approved project-specific mitigation plan, data collection for performance objectives will occur once during the year and will be reported in an annual report until a project has been shown to meet performance standards (no less than five years). The level of detail and substance of the reports will be commensurate with the scale and scope of the compensatory mitigation project. Compliance monitoring will also be conducted annually until performance standards are met and will be reported in the annual report. After a project has met performance standards, the frequency of all monitoring will decrease to a term not to be less than once every five years. Changes in

reporting may be required by the Corps and the IRT as necessary to accommodate adaptive changes in the project, natural disasters, environmental changes, etc.

Evaluation and reporting will concentrate on those metrics involved in performance standards and will not include species or community biotic sampling until late in the project cycle, if at all. Temporal improvement of biota and their communities often lags restoration projects by years, and sometimes decades, and biological sampling often is inconclusive as to whether a project has improved biotic communities. At the conclusion of a project (defined as that point where the performance standards are met, and aquatic resources appear healthy and self-sustaining in a relatively mature condition), aquatic invertebrate and/or fish diversity indices may be calculated and compared to the before-project condition and to reference indices obtained from stable streams of similar type, order, and size elsewhere within the watershed, if the biologist in charge of the project determines it is necessary.

The Corps is required to provide monitoring reports to interested federal, tribal, state, and local resource agencies, and the public, upon request.

APPENDIX C

DRAFT MITIGATION PROJECT APPLICATION

MISSOURI CONSERVATION HERITAGE FOUNDATION

STREAM STEWARDSHIP TRUST FUND – GRANT PROGRAM

REQUEST FOR FUNDING FORM

The Stream Stewardship Trust Fund is available to restore, enhance, and/or protect stream systems and associated riparian habitats. Proposed projects will be prioritized and funded by the Foundation based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. Proposed projects should be located within the ecological drainage unit (EDU) where participating stream impacts occurred. Approval will be limited to projects that restore, enhance, or preserve Missouri's diverse stream systems.

This request form will be used by MCHF Board members assigned to the Stream Stewardship Trust Fund – Grant Program Action Team. Proposals submitted for funding consideration need to clearly explain elements of stream-based projects listed below which warrant consideration during the approval process.

The Goal of the MCHF's Stream Stewardship Trust Fund is to provide an innovative tool for the restoration, enhancement, and protection of Missouri's streams and aquatic resources.

1) Project Title_____ Landowner Name_____

2) The proposed project is located in _____County in _____ MDC region.

3) Project objectives_____
_____
_____
_____

4) The project submitted for consideration is in _____watershed and is considered a priority by MDC for the following reasons (include how project achieves watershed objectives and describe the rationale for site selection). _____
_____
_____
_____
_____

5) Site protection instrument (circle):

Acquisition Perpetual easement 30-year easement Special management agreement

6) Describe the details of the site protection instrument (ownership, legal arrangements, how the instrument assures the long term protection of the proposed mitigation site):

_____
_____
_____
_____
_____

7) Baseline information
   a. Describe the ecological characteristics of the proposed project site:

      _____
      _____
      _____
      _____
      _____

   b. Historic and existing plant communities, hydrology and soils of the proposed project site:

      _____
      _____
      _____
      _____

   c. Project application must include maps identifying the proposed project boundary with lat/long boundaries in decimal degrees and a GIS shape file with metadata of the delineated boundary
   d. Describe existing hydro-system connectivity between the stream project site and any wetlands or other waters including tributaries connecting to receiving waters:

      _____
      _____
      _____
      _____

8) Determination of credits as determined by the Missouri Mitigation Method:
   a. Number of stream channel credits_____
   b. Number of riparian credits_____
   c. Stream type (circle): Ephemeral Intermittent Permanent

9) Mitigation work plan
   a. Specifications of the project (geographic boundaries, construction methods, timing, sequence):

      _____
      _____
      _____
      _____

   b. Methods for establishing desired plant community (species composition and type, control of undesirable species, size of plants used, control of wildlife damage):

      _____
      _____
      _____

   c. Grading plan and elevations of constructed features (describe or attach engineering design plans):

      _____
      _____
      _____
      _____

d. Describe or attach drawings showing existing stream channel cross sections, proposed alterations to the stream channel and/or banks, a description of in-stream structures including materials used for improvements, dimensions and elevations, and riparian plantings:

_____
_____
_____
_____

10) Maintenance plan:

a. Description and schedule of maintenance following initial construction:

_____
_____
_____
_____

b. Mowing frequency and timing:

_____
_____

c. Herbicide applications (chemical used, method, timing, frequency):

_____
_____

d. Irrigation plan (include source of water):

_____
_____

e. Passive water control and instream structure description and required maintenance (type and frequency):

_____
_____
_____

11) Performance standards

a. Description of the performance standards used (include metrics for determining project success):

Riparian:_____
_____
_____

Stream Channel:

_____
_____
_____

Reference stream(s) used (if any):

_____
_____

b. Describe how the performance standards relate to the objectives of the mitigation site (include description of the desired resource type, expected functions or services being measured, or any other applicable metrics):

_____
_____
_____
_____

12) Describe the method and frequency of project monitoring to determine when performance standards are being met (project site must be monitored for an appropriate period not less than 5 years after initial

construction/planting), who will be conducting the monitoring, and the frequency monitoring reports will be submitted:

_____
_____
_____
_____

13) Long-term management plan:
    a. Describe how the project site will be managed after performance standards have been met:
    _____
    _____
    _____
    b. Annual cost estimate for management: $_____
    c. Funding mechanisms will be used to finance long term management (including responsible party:
    _____
    _____
    _____
    d. Long term management responsibilities transferred to (include description of their long term management plan and a written stewardship commitment that includes a financing plan):
    _____
    _____
    _____

14) Adaptive management plan (due to inability to construct project in accordance with approved plans, monitoring revealing that the project is not meeting performance standards, remedial measures resulting in project modifications, design changes, revisions to maintenance requirements, revised monitoring, etc):
    a. Description of strategy to address unforeseen changes in the project:
    _____
    _____
    _____
    _____
    b. Party (ies) responsible for implementing adaptive management:
    _____
    _____

15) Financial Assurances:
    a. Describe the financial assurances that will be provided to assure that the project will be completed:
    _____
    _____
    _____
    _____
    b. Amount of financial assurances (include rationale to include all applicable costs including acquisition, planning and engineering, legal fees, equipment mobilization and construction, monitoring, and maintenance):_____
    _____
    c. Type of financial assurance and by whom:
    _____
    _____
    _____

16) Total cost of the project is estimated at $_____. SSTF Resources are requested in the amount of $_____.

17) Partner funds in the amount of $_____ are being contributed by: (if applicable):_____
_____

18) Total stream length of the project _____. Total Riparian corridor acreage_____
_____.

19) Total cost per credit (including all costs) estimated at $_____.

20) If the project is leveraged with contributions from others, SSTF Resources are requested to fund which practices/products/costs activities?
_____
_____
_____

21) Schedule for project completion and/or installation:
_____
_____
_____

Note: Proposal must include appropriate on-site photographs, county maps locating the proposed project, related topographic, soils, or other maps, drawings and materials necessary to describe planned activities. In order to reproduce color photographs and maps, a complete electronic file is requested with project proposals.

MDC Region:_____ Date:_____

Name of project leader, and Division:_____

Lead Division Regional Supervisor Approval:_____ Date_____

Lead Division Administrator Approval:_____ Date:_____

MDC Director Approval:_____ Date:_____

Please return to the Executive Director of the Missouri Conservation Heritage Foundation.

MCHF Approval:_____ Date:_____

APPENDIX D

COPY OF CREDIT TRANSACTION LETTER

MC HF
MISSOURI CONSERVATION HERITAGE FOUNDATION

June 21, 2010

Ms. Jaynie G. Doerr
St. Louis District, Army Corps of Engineers
1222 Spruce Street
St. Louis, MO 63103-2833

Re: Bob Rockhold – Rock Lake Project
Permit # MVS-2009-97
Adair County

Dear Ms. Doerr:

This correspondence serves to notify the Corps of Engineers that Mr. Rockhold has fulfilled off-site mitigation for 2,126 credits related to the above project through participation in the Stream Stewardship Trust Fund. Associated funds will be handled in accordance with our Memorandum of Understanding.

The Missouri Conservation Heritage Foundation is committed to providing and implementing this "in-lieu-fee" mitigation alternative in a manner that best serves Missouri's stream resources and the regulated public. The Stream Stewardship Trust Fund is truly an innovative approach that: (1) offers aquatic resource benefits; and (2) considers development needs within Missouri.

If you have any questions, please contact me at 800/227-1488, extension 3193.

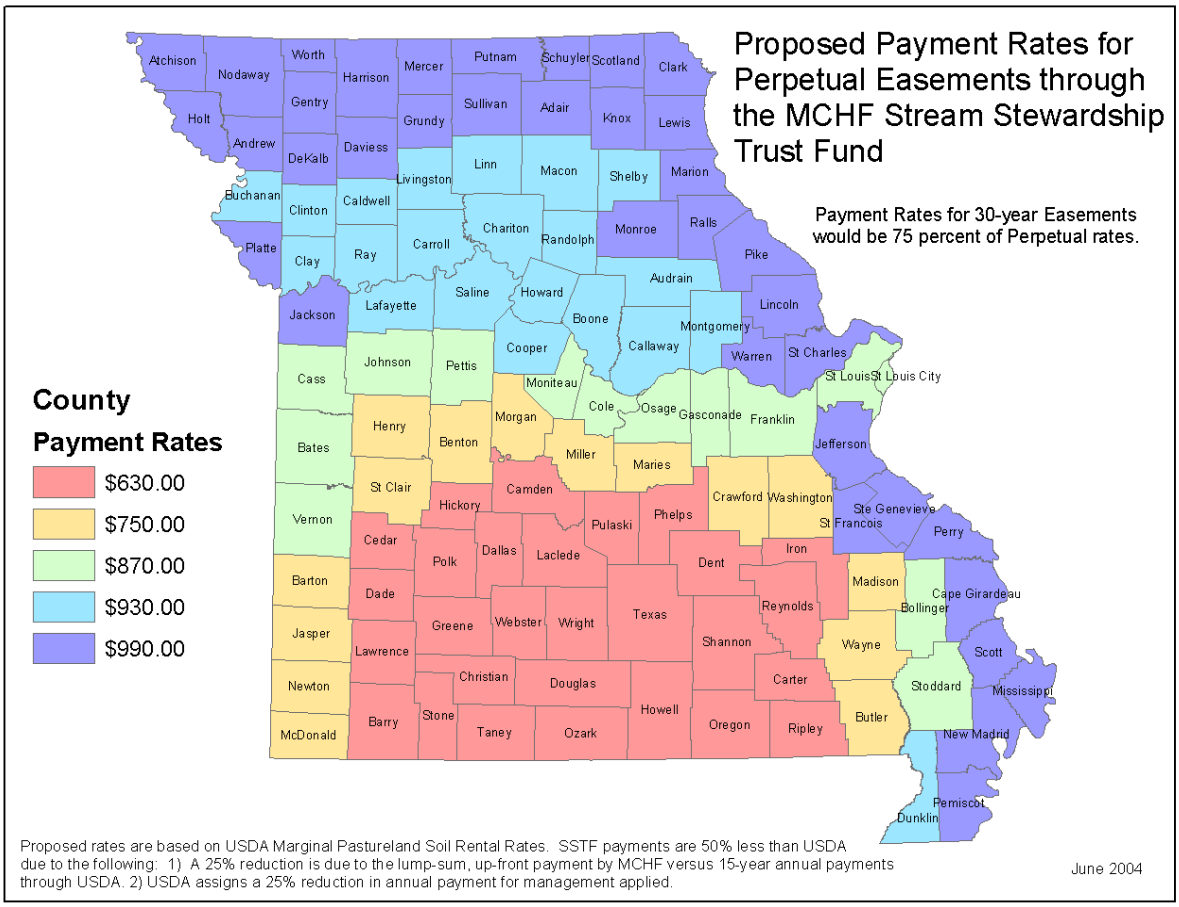
Sincerely,

Richard Thom
Executive Vice President

c: Ms. Carrie Schulte, Missouri Department of Natural Resources
Mr. Bob Rockhold

APPENDIX E

PAYMENT RATES FOR PERPETUAL EASEMENTS FOR SSTF PROJECTS



Proposed rates are based on USDA Marginal Pastureland Soil Rental Rates. SSTF payments are 50% less than USDA due to the following: 1) A 25% reduction is due to the lump-sum, up-front payment by MCHF versus 15-year annual payments through USDA. 2) USDA assigns a 25% reduction in annual payment for management applied.

June 2004

APPENDIX F

LONG TERM MANAGEMENT INSTRUMENTS

TEMPLATE

STREAM STEWARDSHIP TRUST FUND

CONSERVATION EASEMENT

THIS EASEMENT, is made by and between _____ and _____, husband and wife, hereinafter referred to as "Landowners", and the CONSERVATION COMMISSION OF MISSOURI, an agency of the State of Missouri, hereinafter referred to as "Commission" with a mailing address of 2901 W. Truman Blvd.,

P.O. Box 180, Jefferson City, Missouri, 65102-0180.

WITNESSETH:

WHEREAS, the Landowners are the owners in fee simple, with clear and marketable title, not subject to limiting liens or claims that would preclude conveyance of an easement, of a tract of land fronting _____ in _____ County, Missouri, said tract being fully described below and hereinafter referred to as the "area"; and

WHEREAS, the Commission in accordance with its Article IV, Sections 40-46 constitutional authority over the fisheries, forestry and wildlife resources of the State of Missouri, desires to ensure the management, preservation and protection of said resources of the area and to promote the wise use of these resources and

WHEREAS, both parties desire to ensure the preservation of the area in a condition that will sustain the fish, wildlife, forest and riparian values and assure the protection and maintenance of the watercourse associated with said tract of land in perpetuity;

NOW, THEREFORE, in consideration of the mutual promises and covenants herein contained, the parties hereto agree as follows:

In consideration of the sum of $1.00 and other good and valuable consideration for the easement, the receipt and adequacy of which is hereby acknowledged, _____ and _____, husband and wife, ("Landowners") do hereby grant, bargain and sell, convey, and confirm unto the CONSERVATION COMMISSION OF MISSOURI, an agency of the State of Missouri ("Commission"), its successors and assigns, a perpetual conservation

easement to the below-described land, to ensure the proper conservation management, protection and preservation of the area more particularly described as:

(Legal description here)

TERMS AND CONDITIONS:

THE LANDOWNERS AGREE:

1. No permanent or temporary buildings, billboards, or other permanent or temporary structures will be placed on the area described herein, except that deer stands may be placed within the easement boundary.

2. Not to farm, graze, or crop the area, except that hay may be cut as needed from the landward portion of the easement, defined as being more than 100 feet from the top of the stream bank.

3. To refrain from filling, excavating or dredging, removing topsoil, sand, gravel, rock or other materials or building any roads or making any change in the topography of the easement area in any manner, except that sand and gravel may be harvested from gravel bars for personal use as long as state sand and gravel guidelines are followed.

4. To refrain from removing, damaging or cutting of trees or plants except under the direction of a forest stewardship plan provided by a Missouri Department of Conservation resource forester or their designate and that only A-grade logs may be removed from the first 20 feet from top of stream bank.

5. To refrain from using the area to water livestock and to maintain the easement boundary fence in such a manner as to exclude livestock.

6. To refrain from spraying herbicides and/or pesticides except to control noxious plants or pests, and then only approved herbicides or pesticides may be used in accordance with label directions.

7. To refrain from dumping of ashes, trash, household wastes, tires, vehicles or farm equipment, hazardous wastes, toxic chemicals or materials, garbage or other unsightly, foreign or offensive material on the area.

8. To refrain from changing, manipulating or altering natural water courses, backwaters, marshes or other water bodies within the area, or engaging in activities or uses detrimental to water quality of the area. Landowners shall not create and maintain any low water crossings not already existing on the area without first obtaining written approval from the Missouri Department of Conservation.

9. To refrain from operating, allowing, or giving permission to others to operate, any motor driven land or amphibious conveyance within the area except for equipment used in agricultural practices or in the pursuit of fishing, hunting, camping, or other compatible forms of recreation, provided that such activity does not create areas devoid of vegetative cover which are vulnerable to erosion within the conservation easement area.

10. To manage all properties currently enrolled in the Conservation Reserve Program (CRP) and within the conservation easement boundary in accordance with the terms of this agreement to the maximum extent permitted by the current CRP contract, and fully in accordance with this agreement once the current CRP contract expires.

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11. To permit the Conservation Commission of Missouri and the Missouri Department of Conservation, their agents, representatives, or licensees to enter on the area at reasonable times to inspect and enforce the provisions of this agreement.

12. To allow the Missouri Department of Conservation and the Missouri Conservation Heritage Foundation, or either of them, to conduct limited tours of the easement area for educational purposes relative to stream and riparian management demonstrations.

13. To place of record any release or subordination agreement from any lienholder (other than road and utility easement holders) necessary to give this easement priority over any and all existing mortgages, deeds of trust or liens on or affecting the property conveyed hereunder.

THE CONSERVATION COMMISSION OF MISSOURI AGREES:

1. To grant the Landowners the rights to any agricultural products, timber, or firewood that might be removed from the area. Such removals, however, may only take place under the conditions outlined in a forest stewardship plan approved by, or with written permission from, the Missouri Department of Conservation.

2. To recognize existing utility easements and their holder’s responsibility to maintain these easement properties, but that they will be encouraged to maintain ground cover on these properties.

3. To provide the Landowners with at least a one week prior verbal or written notice of plans to conduct a tour of the easement area.

IT IS MUTUALLY AGREED BY THE PARTIES HERETO:

1. The easement shall commence upon the date of execution by both parties.

2. The covenants agreed to and the terms, conditions, restrictions, and purposes imposed with this grant shall not only be binding upon the Landowners, but shall be deemed to run with the land and therefore bind also their agents, personal representatives, heirs and assigns, and all other successors to them in interest and shall continue as a servitude running with the land in perpetuity.

3. If any provision of this easement or the application thereof to any person or circumstance is found to be invalid, the remainder of the provisions of this easement and the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, shall survive and not be affected thereby.

4. The Conservation Commission of Missouri and the Missouri Department of Conservation, or either of them, may enforce the terms of this easement by inspection, viewing, letter, claim, demand, or suit at law or in equity, and shall have standing for such suit or suits and may bring same in the Circuit Court of Cole County, Missouri, the parties agreeing that venue shall be proper in that county and circuit.

5. If the Landowners fail to abide by any of the terms and conditions of this agreement (and fail to correct the infraction within 60 days of a written notice), the Conservation Commission of Missouri and its successor or assign may at its sole election either enforce the terms of the agreement as above, or terminate this agreement for cause. If this agreement is terminated by the Commission pursuant to the provisions of this paragraph, Landowners will:

(a) forfeit all rights to payments under this contract; and

(b) refund all payments previously issued, together with interest thereon, at the then-existing prime interest rate plus 3%, which interest shall begin to accrue 30 days from the date that Landowners receive notice of such termination if such refund of all payments previously issued is not paid prior to thirty days after such receipt of notice of termination. Any refund of payments shall be payable to the Missouri Conservation Heritage Foundation.

6. That given the dynamic nature of streams and the resulting changes in the adjacent land, both parties mutually agree to develop, amend or change and implement a Stream Stewardship Trust Fund (SSTF) Plan in writing whenever necessary to achieve the stated purposes of this Easement.

7. No right of access by the general public to any portion of the real property described herein is conveyed by this Easement.

8. Nothing herein shall be deemed to place upon the Conservation Commission of Missouri or the Department of Conservation any obligation or duty to supervise or manage the subject property, but this shall not limit their ability to electively monitor and enforce this easement as provided herein.

IN WITNESS WHEREOF, the parties have entered into Easement agreement on the last date written below.

LANDOWNERS:

_____

_____

_____

Date

CONSERVATION COMMISSION OF MISSOURI

By: _____

John Hoskins, Director

_____

Date

Approved as to Form:

_____

Deputy Counsel

ACKNOWLEDGMENT

STATE OF MISSOURI)

) ss.

COUNTY OF _____)

On this _____ day of _____, 2009, before me personally appeared _____ and _____, his wife, to me known to be the persons described in and who executed the foregoing instrument, and acknowledged that they executed the same as their free act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal in the County and State aforesaid, the day and year first above written.

_____

Notary Public

My commission expires: _____

STATE OF MISSOURI)

) ss.

COUNTY OF COLE)

On this _____ day of _____, 2009, before me appeared John Hoskins, to me personally known who, being by me duly sworn, did say that he is Director of the Missouri Department of Conservation, and that the foregoing instrument was signed on behalf of the Conservation Commission of the State of Missouri by authority vested in him by such Commission, and the said John Hoskins acknowledged said instrument to be the free act and deed of the Commission.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal in the County and State aforesaid, the day and year first above written.

_____

Notary Public

My commission expires: _____

THE MISSOURI CONSERVATION HERITAGE FOUNDATION

STREAM STEWARDSHIP TRUST FUND - GRANT PROGRAM
WATERSHED LANDOWNER PAYMENT REQUEST FORM AND MAINTENANCE AGREEMENT

_____ _____

_____ _____

Landowner Name(s) (Last, First, Middle I.) Address(es)

The above-named landowner(s) ("Landowner") hereby makes application for financial assistance from the Missouri Conservation Heritage Foundation ("MCHF") to implement a Stream Stewardship Trust Fund ("SSTF") project ("the Project") for the area(s) or property adjoining _____, a stream in _____ County, Missouri, and located in Section ____, Twp. ____, Range ____ and/or described by field(s) as shown in my conservation plan as approved by the Soil and Water Conservation District and Natural Resources Conservation Service.

A DESCRIPTION OF THE PROJECT, TOGETHER WITH MAPS, PHOTOS, PERMITS, ETC., IS ATTACHED.

Upon project approval by the Missouri Department of Conservation ("MDC") and approval of this application by MCHF, the Landowner and MCHF acknowledge that this instrument shall be a legally binding Maintenance Agreement and agree as follows:

- MCHF will provide grant funds not to exceed $_____ that have been approved for the Project, to be paid _____.
- Once the Project practices are installed, Landowner will maintain the Project practices according to standards and schedules specified by the MDC, acting as technical advisors for the MCHF, which Landowner has read, understands, and which are attached hereto and made part of this Maintenance Agreement.
- Upon prior notification, Landowner will allow access to MCHF or MDC personnel, or their representatives or designees, to monitor and evaluate the Project's status and implementation for the duration of the Project's maintenance period of **thirty (30) years**.
- Landowner and Landowner's heirs and personal representatives will refund to MCHF a pro-rated amount of grant funds that were expended for implementation of the practices called for by the Project if the practices are not properly maintained, are destroyed, or are altered to such extent that, in the sole opinion the MCHF President or his designee, the practices as altered no longer provide viable stream protection per the standards specified by MDC, unless the alterations were made with the written approval and consent of MDC. Landowner further understands and agrees that MCHF may modify the Maintenance Agreement by adding or substituting certain practices when the installed practices have deteriorated because of conditions beyond Landowner's control.
- This Maintenance Agreement is binding upon Landowner and Landowner's heirs and personal representatives and is not assignable without first obtaining the consent of the MCHF. Landowner further understands and agrees that Landowner and Landowner's heirs and personal representatives will be responsible for Project maintenance compliance for the duration of the Maintenance Agreement period of thirty (30) years unless the MCHF consents to Landowner assigning the Maintenance Agreement and releasing Landowner from the obligations herein. **(Note: Landowner and Landowner's heirs and personal representatives are encouraged to make such request in the event the land is sold or otherwise transferred).**

_____

Landowner Signature Date

_____

Landowner Signature Date

Project Approved by MDC:

Authorizing Signature_____

Date_____

Application Approved by MCHF:

Authorizing Signature_____

Date_____

FOR MDC USE ONLY

PROJECT INSTALLATION COMPLIANCE

The project described herein has been properly installed according to established MDC standards and specifications. The Project's practices will accomplish the intended conservation function if maintained according to schedules and standards developed for the Project.

MDC Field Representative Signature	Division	Date

APPENDIX G

2000 STREAM STEWARDSHIP TRUST FUND MEMORANDUM OF UNDERSTANDING BETWEEN THE MCHF AND THE COE

COPY

Missouri Conservation Heritage Foundation
Stream Stewardship Trust Fund

MEMORANDUM OF UNDERSTANDING BETWEEN THE MISSOURI CONSERVATION HERITAGE FOUNDATION AND THE U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT

This is a Memorandum of Understanding (MOU) between the U.S. Army Corps of Engineers, St. Louis District (hereinafter "Corps") and the Missouri Conservation Heritage Foundation (hereinafter "Foundation") to implement the establishment of the Stream Stewardship Trust Fund (hereinafter "Trust Fund"), as described below. The Trust Fund will provide an additional option to compensate for stream impacts caused by Corps-regulated activities in Missouri and to provide greater flexibility to Corps permittees. The Corps and the Foundation agree to follow the In-Lieu-Fee Mitigation (ILF) procedures set forth below.

1. **Purpose**

The purpose of this MOU is to create the Stream Stewardship Trust Fund, which will provide an additional stream impact compensation alternative for Corps permittees. The goal of this Trust Fund is to provide certain permittees more flexibility in meeting their stream mitigation requirements, while creating a financial source to restore, preserve, and enhance stream systems within Missouri. The Trust Fund will be used in permit actions involving Corps Nationwide Permits (NWP) as set forth in the Code of Federal Regulations, St. Louis District Corps Regional General Permits and in other permit actions if accepted by all involved parties. The use of this Trust Fund for compensatory mitigation may occur only after the relevant permitted activity has complied with Corps regulations and policy regarding avoidance and minimization.

2. **Program Operation**

The Trust Fund is a compensatory mitigation option in permit approval cases where the Corps has determined that the requirement to avoid and/or minimize stream impacts is not applicable (in the case of nationwide permits), impossible, impractical, or not in the best interest of the environment, and that the Corps will allow off-site mitigation for impacts to "waters of the U.S." caused by the issuance of Section 10 of the Rivers and Harbors Act and/or Section 404 Clean Water Act permits. In these cases, the Foundation, as described below, will act as a passive recipient of the mitigation resources, which are required of the permittee by the Corps. The Foundation will play no role in the Corps' decision to approve or deny a permit or whether mitigation is a necessary condition of any such permit. Once mitigation funds are received by the Foundation, the Foundation will evaluate, prioritize, and financially support select stream restoration, enhancement and preservation projects sponsored by the Missouri Department of Conservation. Proposed projects will be prioritized and funded by the Foundation based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. The Trust Fund and all of its actions

will operate separately from the Corps regulatory actions except as specified in these ILF mitigation procedures. Required compensatory mitigation payment amounts are based on market forces and the anticipated cost of stream mitigation projects (e.g., restoration, enhancement, preservation) in the area where stream impacts were permitted. The compensatory mitigation payments are based on average cost estimates to correct activity-specific impacts to stream resources.

3. **Mitigation Resources**

Mitigation resources shall consist of funds offered as mitigation by applicants to compensate for stream impacts in connection with issuance of Corps permits. These mitigation resources will be delivered to the Foundation in cash or by certified check. The Foundation will receive and expend mitigation resources in the manner and with the limitations described below.

4. **Mitigation Activities**

The Trust Fund will be used to support stream projects sponsored by the Missouri Department of Conservation. Stream benefits will result from the projects supported by the Trust Fund because of the Missouri Department of Conservation mandate, staff expertise regarding stream systems, resources (i.e., equipment, staff, regional knowledge of stream needs/priorities), statewide coverage, and willingness to cooperate with the Foundation. The Foundation will evaluate, prioritize, and financially support select stream projects proposed by the Missouri Department of Conservation. A minimum of 50% of Trust Fund resources will be spent within the Missouri Department of Conservation Management Regions in which an individual permittee's compensatory mitigation requirement occurred. However, if priority projects cannot be located within the Missouri Department of Conservation Management Regions, then a minimum of 50% of Trust Fund resources will be spent within the Missouri Department of Conservation Management Units (i.e., Missouri River, Mississippi River, Ozark) in which an individual permitte's compensatory mitigation requirement occurred. Proposed projects will be prioritized and funded by the Foundation based on regional stream needs, maximum return on expended monies, level of threat to the stream system, and overall anticipated benefits to stream resources. All other factors being equal, preference will be given to mitigation in the order of restoration, then enhancement, then preservation. Approval will be limited to projects that restore, enhance, or preserve Missouri's diverse stream systems. Trust funds may be used to manage stream resources that are acquired in fee or easement, i.e., reasonable cost of ongoing management may be included in projects that acquire stream resources, either in fee or easement. The Foundation shall incorporate necessary measures to ensure the longevity of funded projects (e.g., contract, easement). The Foundation shall be responsible for full and successful completion of funded projects.

5. **Geographical Scope**

The Trust Fund will be used only to restore, enhance and/or protect stream systems and associated riparian habitats in Missouri. Diverse stream types, ranging in size from ephemeral headwater reaches to the Mississippi River, serve important functions within Missouri. Stream needs and priorities will be identified by consulting the Missouri Department of Conservation and with consultation at least annually by the Corps. The Foundation recognizes the valuable functions provided by stream systems and will operate the Trust Fund to restore, enhance, and preserve these resources.

6. **Consultation and Approval**

The Foundation will expend Trust Fund resources on stream projects proposed by the Missouri Department of Conservation. All proposed projects will be reviewed and prioritized by the Foundation. Collected Trust Fund resources will be tracked and at least 50% will be spent within the Missouri Department of Conservation Management Regions in which an individual permitte's compensatory mitigation requirement occurred. However, if priority projects cannot be located within the Missouri Department of Conservation Management Regions, then a minimum of 50% of Trust Fund resources will be spent within the Missouri Department of Conservation Management Units (i.e., Missouri River, Mississippi River, Ozark) in which an individual permitte's compensatory mitigation requirement occurred. All expenditures of Trust Fund resources are subject to the Foundation policies and procedures.

7. **Financial Controls**

The Foundation shall hold any mitigation resources collected pursuant to these ILF mitigation procedures in an interest-bearing escrow account, in an investment instrument, or banking institution so as to earn interest while maximizing the safety and preservation of the principal amount of funds in the account. The Foundation shall account for the funds so held, and the account shall be subject to audit by the Corps from time to time. The Foundation will provide the Corps with an account statement annually which states the balance of the Trust Fund, investment instruments in which the Trust Fund invests, and a list of stream projects and associated costs supported by the Trust Fund. Interest earned through investments and assets left over from mitigation projects will remain with the Trust Fund for future mitigation projects and administrative costs in accordance with ILF mitigation procedures.

8. **Administrative Overhead and Interest**

The Foundation will receive an overhead fee for each acquisition project at the rate of 3% of the first $500,000, 2% for the second $500,000, and 1% for amount greater than $1,000,000 in purchase price for the acquisition of property. For all Trust Fund projects (except for acquisition costs) a 10% fee will be paid to the Foundation for administrative overhead. The acquisition and/or 10% project overhead can only be collected as an expense of implementing a mitigation project.

9. **Time Frame**

All monies from the Trust Fund are to be allocated to specific projects within three years of the date received. If more than three years pass from the date funds are received, the Corps may request funds be allocated to another Foundation project or another non-profit entity. The Corps may grant an extension of the three-year time limit on a case-by-case basis.

10. **Good Faith**

The Corps and the Foundation both intend to implement these procedures to the maximum extent they are legally authorized.

11. **Amendment and Termination**

These ILF mitigation procedures may be changed by written amendment signed by the Corps and the Foundation. These ILF mitigation procedures may be terminated by either the Corps or the Foundation by giving ninety (90) days written notice to the other. Prior to termination, the Foundation shall provide an accounting of funds and shall complete payment on existing project contracts and any expenses incurred on behalf of the Trust Fund. Upon termination, the Corps' direction of Trust Fund resources as set forth in Section 9 will apply.

12.. **Authority to Sign**

The signers of this MOU represent that they have the requisite authority to enter into this agreement on behalf of their respective organizations.

13. **Execution**

This MOU has been executed in two duplicate originals on this 5th day of October, 2000.

THE MISSOURI CONSERVATION HERITAGE FOUNDATION

By: _____

William A. R. Dalton, President
Board of Directors

U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT

By: _____

Michael R. Morrow
Colonel, Corps of Engineers
District Engineer

APPENDIX H

MDC WATERSHED STRATEGIES

Strategies for Watershed Management

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Prepared for:

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NOTE: The entire "Strategies for Watershed Management" document, with appendices, is available at http://mdc.mo.gov/node/10193

January 2010

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Foreword

Stream management should really be termed watershed management. This approach better describes where opportunities to improve our water resources exist. These resources include streams, lakes, reservoirs, groundwater, wetlands, springs, sinkholes, and all of the associated biotic and abiotic forms associated with them. Often we tend to focus management efforts on the water resource directly, forgetting the interconnectivity of all the parts of the watershed that make the resource sustainable over the long term.

A stream system and all of the land that drains into it is called a watershed. A watershed approach addresses the five elements of a watershed. These are: the uplands, the floodplains, the riparian corridors, ground water, and the stream channels. The uplands shed water and sediment down the slopes and when fully functional, maintain a natural deliver rate of each to the stream. The floodplain is the portion of the valley floor submerged by flood waters during periods of heavy runoff; to be fully functional it should be sufficiently vegetated and available to the stream at high flow events. The riparian (stream side) corridor is a continuous strip of land that parallels both sides of the stream. This strip of land is very important because, when properly vegetated, it buffers the stream from the rest of the watershed and provides important fish and wildlife habitat functions. This is true even in headwater streams, which may not have a floodplain. Precipitation infiltration throughout the watershed recharges groundwater and reduces flooding during wet seasons. In turn, groundwater is essential to a watershed by providing base flows to some stream channels during dry periods. Stream channels convey water and sediment down the valley and if they and their watersheds are mostly unaltered, they provide natural habitats. The channels are the smallest portions of the watersheds but often receive the most attention, yet the condition of the stream channel is primarily a reflection of its watershed (uplands, floodplains, riparian corridors, and groundwater) and the activities occurring within it.

The watershed management approach is a multi faceted strategy, as there are numerous, often conflicting interests and land use practices that are occurring across multiple spatial and temporal scales. Thus, a long term perspective is necessary to managing land and water resources. Landowners and other stakeholders should be considered in a comprehensive management plan. Highly contentious or technically complex issues in watersheds such as instream flow, contaminants, impoundments, etc. may need the additional support of the Stream Program Coordinators and/or Policy Coordination. This document outlines Fisheries Division strategies for prioritizing and working within watersheds.

All of the State's watersheds are important but they cannot all be addressed simultaneously; therefore a prioritization process is necessary which includes both watersheds that have been designated as aquatic-oriented Conservation Opportunity Areas (ACOA's) and those that have not. Concentrating on priority watersheds will allow more time to get local citizens participating in and taking ownership of their watershed's health. With leadership and support from the local public, our collaborative role is to serve as a catalyst, provide education, technical expertise (science), and assist with administration including identifying partners and resources. There are many decisions to be made throughout the watershed strategy development process. Each step of this process should follow structured decision making:

- Problem Definition- What is the management decision that needs to be made? What is the timeline and geographic scope of the topic?
- What are the objectives and how well have they been formed by stakeholder involvement? If stakeholder input is yet to be obtained, proceed with the discussion with the understanding that this input must be gained before final management decisions should be made. It is not uncommon to go through this collaborative process once to obtain the benefits of brainstorming in preparation for

obtaining stakeholder input. However, a more thorough final decision making process must occur after obtaining appropriate stakeholder input. Objectives should be quantifiable and trigger points should be set for initiating subsequent actions.

- Brainstorm all the possible management actions and the associated consequences of those actions. In this brainstorming session identify and deal with the uncertainty of the topic, gauge the risk of the various alternatives and make decisions on the tradeoffs.
- Take the time to look beyond the scope of your immediate topic to evaluate how your decision may affect other Department decisions, stakeholders and resources.

The basic outline of most regional watershed strategies should look something like this (Fig. 1):

Step 1: Evaluate and Prioritize Watersheds Regionally
Step 2: Comprehensive Watershed Characterization
Step 3: Stakeholder Involvement
Step 4: Goal and Objective Development
Step 5: Strategies for Meeting Goals and Objectives
Step 6: Acquire Resources to Implement Program
Step 7: Implement
Step 8: Evaluate/Monitor (and repeat steps 4-8 if necessary)

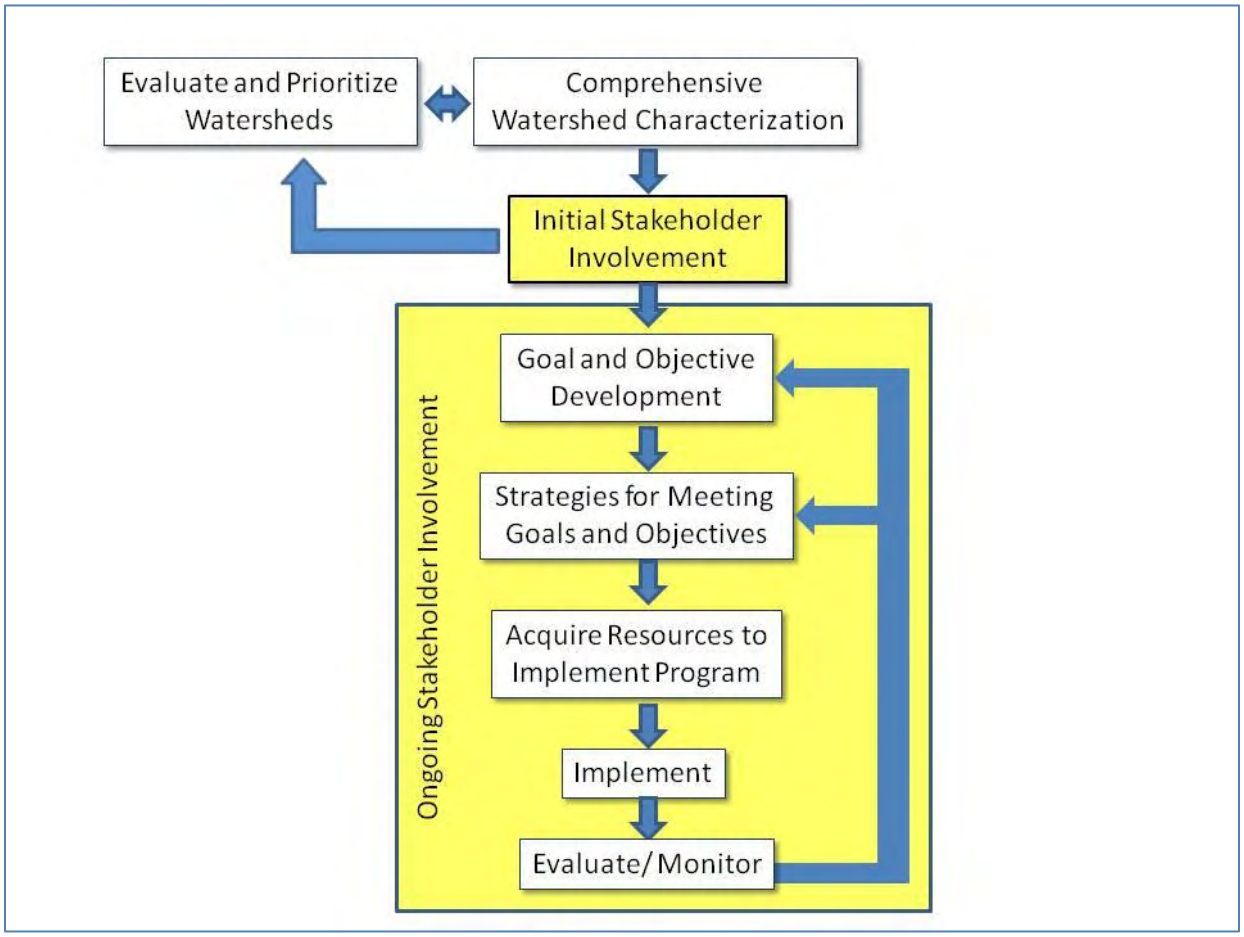

Figure 1. Regional watershed strategy step process. All steps in the yellow box require communicating with diverse watershed stakeholders and seeking their input.

Step 1: Evaluate and Prioritize Watersheds Regionally

Continued decline of aquatic biota, coupled with the limited human and financial resources dedicated to conservation, necessitates the establishment of geographic priorities. Without focus, limited resources could likely be used in a piecemeal, fragmented manner and not be sufficient to produce desired results, especially given the many other services and areas that MDC maintains.

Prioritization should begin within the regions because of regional knowledge of the local resource and stakeholders. Watersheds should be selected based on resource concerns, landowner interest, and potential partners. Watersheds that overlap regional boundaries will require effective communication and cooperation among all involved.

The overall goal of prioritizing watersheds regionally is to develop local interest across the state that will aid in the formation of citizen led watershed protection statewide. This regional prioritization approach also allows other partnering groups to align their resources with local projects which may be of primary interest to them. Many of these groups, including other agencies, continually rely on our expertise for identifying priority areas for their stream resource work.

Based on MDC's mission, the watershed prioritization should be based on two guiding objectives; conserving biodiversity, and providing quality areas and opportunities for outdoor recreation. Some significant aquatic areas have already been identified in the Conservation Wildlife Strategy process that identified 158 ACOA's based on a representation of the diversity of watersheds, aquatic systems, and species of Missouri. However, there are other watersheds that meet the biodiversity and recreational prioritization objectives that are not ACOA's; so a broader approach which includes these watersheds in the prioritization process will be necessary. Once candidate watersheds have been identified, there are other mandatory aspects that will need to be considered in the process: **1) is there enough existing local interest/participation in a designated target watershed or can interest be generated (local buy-in); 2) can the most significant watershed goals be addressed in a reasonable fashion (feasibility); and 3) can multiple priorities be met in overlapping areas?** Three considerations for candidate watersheds are listed below. *See Appendix A for Watershed Prioritization Strategies.*

ACOA's

The ACOA's offer a good starting point for consideration in the prioritization process. Regional discretion of current conditions is required in order to assume whether an ACOA should be a regional priority, and how it ranks as compared to other non-ACOA priority watersheds. The aspects of local buy in, feasibility, and overlap outlined in the above paragraph should assist in narrowing down priorities in regions with many ACOA's.

MDC Streams and Impoundments (Lakes)

Streams and impoundments (lakes) owned or managed by MDC provide public recreation opportunities and support for conservation. These lakes are heavily used and require significant management resources, both time and money, to maintain them. Significant savings from reduced sedimentation and nutrification could be achieved by considering them in the watershed prioritization process. Many watershed landowners use these areas and place a personal value on that resource, making local buy-in easier to achieve in these areas. Many of these watersheds are relatively small

compared to other priority landscapes and therefore significant outcomes from targeted watershed management may be easier to achieve.

High Profile Recreational Areas
Heavily recreated rivers and reservoirs are also areas to consider when prioritizing watersheds. These areas draw large numbers of Missouri citizens and non-residents to our water resources, which generate strong support for conservation and local economies. The visibility and importance of these areas to the public and established stakeholder groups should assist with local watershed improvement efforts. The size and condition of the watershed surrounding some of these areas could be daunting. All of these aspects must be considered in the regional prioritization process.

The outcome of this prioritization process is not meant to be an exclusive list of the only watersheds the Department will consider doing projects within. Watersheds that have existing, active stakeholder groups or those of primary interest to the region for other reasons should be included in the prioritization process. It is important to realize that not all priority watersheds will need the same amount of staff time or resources. Private and agency requests for assistance outside of priority watersheds may still be addressed, but resources will be concentrated towards target watersheds. *See Appendix B for more information on non-priority watershed stream assistance.*

Step 2: Comprehensive Watershed Characterization
Once target watersheds have initially been identified for prioritization, an inventory of existing watershed specific conditions should be conducted. This inventory should include the experience and expertise of Fisheries Division staff, working with a multidisciplinary team from MDC, state and federal agencies, and local interests familiar with the resources of the area. Further analysis should be conducted to verify conditions and diagnose watershed changes that may affect these conditions. Comparison of time series aerial imagery and topographic maps using GIS, along with driving through the watershed and documenting on the ground conditions should be done first. This inventory offers a generalized view of the watershed's current and recent past conditions. All physical, biological, and chemical data that is available for the watershed over time should be taken into account and included. *See Appendix C for Comprehensive Watershed Characterization.* Some candidate priority watersheds may be lacking biological and or water quality data required to make a good assessment of current conditions, if so, further inventories may need to be conducted. (*See Appendix G for Monitoring and Assessment Strategies and Techniques.*) The results of this data gathering and review process can be compared with existing WIA's management plans to see if the opportunities and goals are still relevant to that watershed (sub-watershed). If not, the new goals identified should be used to update the watershed's WIAs, as these will become valuable reference tools for watershed groups and funding sources like the Stream Stewardship Trust Fund (SSTF). The results of this characterization will help to identify the management and policy issues that will need to be addressed or trigger a re-prioritization of the watershed.

Another important part of characterizing the watershed is using human dimensions and census data to understand the history, culture, and memes of the citizens that live in the watershed and may influence their behaviors. Instructions on how to gather and use this data are included in *Appendix E.*

Step 3: Stakeholder Involvement
Before involving local stakeholders, it is important to understand the human dimension of a watershed. This includes understanding the social attitudes, cultural history, and behaviors that helped to shape the land use of the watershed over time. An important part of human dimensions is not just collecting the data through

census information and other sources, but listening to watershed landowners, considering their goals and concerns for their own communities and resources. Early information sharing efforts within the watershed are required before the results of the historical, physical, biological and chemical characterization are communicated with the local stakeholders. This includes familiarizing stakeholders with basic watershed principles and defining terminology that may be used throughout the process to reduce misconceptions and confusion. Local stakeholders could include landowners, county commissions, water municipalities, road and bridge workers (MODOT and County), agricultural associations, city boards, etc. Fundamentals on how to coordinate an effective watershed-based program can be found in "Achieving Private-Sector Involvement and its Implications for Resource Professionals", and "Getting in Step: Engaging and Involving Stakeholders in Your Watershed" *see Appendix D*. Contacting Stream Teams within the watershed to encourage their involvement and help identifying other stakeholders is also an important step. *See Appendix E for more information on Effective Marketing Techniques.*

Continuing the many important aspects of this step throughout the watershed management process cannot be emphasized enough. A lack of stakeholder or landowner involvement and agreement should trigger the need to re-evaluate and adjust marketing approach or, if necessary, drop a watershed to a lower level of prioritization.

Step 4: Goal and Objective Development

The results of the regional watershed characterizations should help to identify and define goals and objectives, but stakeholder involvement is crucial in this step. There must be local participation and ownership in forming the goals and objectives for the watershed. The results of the characterization can be used to help direct attention to goals, but ultimately it will have to be a mutual goal of the watershed landowners and resource agencies/stakeholders to be successful. Remember that the goals will be the overall intentions for the watershed project and the objectives will be the precise steps needed to meet the goals.

All watershed project goals should ultimately address ecosystem health and resiliency. These are a product of connectivity, diversity, and temporal dynamics of ecosystem processes. Connectivity refers to the unimpeded movement of abiotic and biotic factors in an upstream and downstream direction; as well as, connectivity of the stream to riparian corridors, floodplains and groundwater. Conserving diversity requires attention to a broad perspective of abiotic and biotic factors from geologic features to vegetative, invertebrate and vertebrate species in the watershed. Addressing temporal dynamics in a watershed entails first identifying the varying conditions needed at specific times and locations to accommodate the interwoven life cycles of aquatic organisms; and then assessing potential or current threats to those conditions. The objectives to reach ecosystem health and resiliency goals will be vast and varied. Most objectives should attempt to influence one or more of the five factors of stream biotic health listed by Karr et al. (1986), those being: water chemistry, stream flow, physical habitat, biotic interactions, and energy sources. Long-term goals and objectives such as maintaining aquatic biodiversity will require a longer-term assessment than is commonly associated with grants and other funding sources. Short-term objectives related to altering sources of stressors within the watershed should be developed for most grants and similar funding sources.

Step 5: Strategies for Meeting Goals and Objectives

Management activities and practice development should specifically address the watershed objectives identified in Step 4.

Practices: Protection, Enhancement, and "Restoration"

The most effective and cost efficient way to achieve watershed health is to protect areas that are already functional, healthy and intact. The second method would be to enhance areas that could easily be rehabilitated to provide full watershed function. Typically, the least effective and cost efficient methods of achieving watershed-wide health are in-channel "restoration" efforts. As such, watershed project practices should reflect these principles. The term restoration infers that an area can be brought back to its original unaltered state. Most restoration efforts in stream literature would more aptly be referred to as renovations rather than restorations, as a completely new condition is created with the intent of providing functions that were assumed to have been there before alterations.

Protection

A large majority of protection practices will be in the form of watershed wide educational efforts. These efforts should be watershed-specific, explaining the causes of the existing condition both spatially and temporally, and how to best protect the watershed. Other examples of practices that would fall under protection would be riparian protection easements, greenways, storm water codes, sewer and septic standard codes, etc. Even though these practices often take a long time to accomplish and are not very showy; ultimately it is these protection practices that should be emphasized because they are the foundation of long term watershed health.

Enhancement

Enhancement practices can be used in conjunction with protection practices (i.e. educational efforts, riparian easements, and riparian corridor re-establishment). Again, by developing practices around specific watershed conditions, results are more readily achieved. Examples of enhancement projects include improving and restoring riparian buffers, livestock fencing, alternative watering, improving roads, retrofitting existing wastewater facilities, removing fish passage barriers, grade control, etc. These projects require large scale landowner participation in order to have marked watershed results.

"Restoration"/Renovation

In-channel restoration/renovation practices should be considered only after the causes of the adverse stream conditions have been addressed successfully. These practices tend to treat the symptoms rather than the cause, and therefore do little to improve watershed health when used without widely adopted protection and enhancement practices. Examples of these practices include structural stream bank stabilization, in-stream habitat structures, and reach channel restorations/renovations. Often, these practices are unnecessary if protection and enhancement practices are successfully implemented and the system is allowed to recover on its own. *Refer to Stream Improvement Certification and Rock-Based Bank Stabilization and Grade Control Policies when considering these practices Appendix H.*

Step 6: Acquire Resources to Implement Program

Because of the specificity of the objectives and practices that may be unique to a given watershed, new resources outside of, and in addition to, existing programs may need to be acquired. The watershed group should work together to research grants, donors, and other potential sources of support for the program. *See Appendix F for links to potential funding resources.*

Step 7: Implement

An implementation plan should also be developed to pinpoint targets within a watershed where specific practices should be used. These practices developed with a marketing process, will then need to be

successfully administered to their target audience. *(Refer back to Appendix E for Effective Marketing Techniques if necessary.)*

Step 8: Evaluate (and repeat steps 4-8 if necessary)

Monitoring and evaluating the watershed project is an essential step to this entire effort. With monitoring much can be learned from project successes and failures, which will aid in prospective watershed projects. Monitoring and evaluation should be focused primarily on management efforts, stakeholder participation/satisfaction, and watershed condition. A straightforward method of monitoring is to monitor the sign up rate for practices in a target watershed. A more difficult way attempts to demonstrate a measurable change in the target watershed's conditions, presumably from the new watershed practices. This could be a direct measure of the condition, or an indirect measure, such as biological monitoring, or both. Ideally, both of these monitoring and evaluation techniques would be done prior to the installment of the watershed project practices, as well as at certain time periods within the project. Because watershed-specific practices will vary from one watershed to the next, monitoring protocols may be somewhat different depending on the outcomes to be measured. Another important evaluation is stakeholder satisfaction. The outcome of this evaluation can help to streamline current and future stakeholder watershed management building efforts. *For Monitoring and Assessment Strategies and Techniques see Appendix G.*

Conclusion

By prioritizing watersheds, MDC can take a proactive approach in establishing cooperation amongst stakeholders by offering watershed-specific education, assistance, and resources. Every watershed project is likely to be somewhat unique, which requires flexibility and innovation. To facilitate regional staff with the adoption of this approach to watershed management, various training courses will be developed and provided. This approach not only allows local citizens to be responsible for their stream resources, it also provides more partnering opportunities in the way of financial resources. Some watershed projects may not get off of the ground because of lack of common local interests. Others may already be well on their way, with little need of MDC's assistance. Because of this, it is important to remember that this is a dynamic process that must continually be re-evaluated for relevance within a watershed with regards to the interest of all of the watershed stakeholders. It is also important to remember that this document and especially its appendices, which contain the strategies of watershed management, should be considered living documents and updated with new and more relevant information as it becomes available.

Literature Cited

Karr, James R., K.D. Fausch, P.L. Angermeier. P.R. Yant, I.J. Schlosser. 1986. Assessing Biological Integrity in Running Waters a Method and its Rationale. Illinois Natural History Survey. Special Publication 5.

APPENDIX I

MITIGATION CREDIT HISTORY 2007-2011

Mitigation Credit History 2007-2010

Year	Project/Permit Number	Development/ SSTF Project	Applicant	Project Description	Stream Name	County	EDU	MDC Region	COE District	Rec'd Credits	Met Credits	Rec'd $$	Spent $$
2009	P-2712	Development	City of Frontenac	Construction of stormwater improvements	Unnamed trib to Twomile Creek	St. Louis	Apple/Joachim	St. Louis	St. Louis	3073	0	$76,835	
							Apple/ Joachim			**3073**	**0**	**$76,835**	
2007	200700028	Development	MoDOT	Route 60 additional lanes	Pike Creek & tribs	Shannon	Black/Current	Ozark	Little Rock	4362		$152,670	
2009	2001-17280-2	Development	Cripple Creek Transportation Development District	Shelby Road Project	Pike Creek	Butler	Black/Current	Southeast	Little Rock	2291		$57,275	
2009	SSTF0056	SSTF Project	Erwin/Thiema Bauman Trust	Acquisition	Little Black River	Ripley	Black/Current	Ozark	Little Rock		22337		$182,875
2009	SSTF0063	SSTF Project	Shannon County	Low water bridge replacement	Mahans Creek	Shannon	Black/Current	Ozark	Little Rock		810		$23,600
2010	SSTF0067	SSTF Project	Allen Wayne Gibbs	Streambank stabilization and riparian protection	Pine Valley Creek	Carter	Black/Current	Ozark	Little Rock		12547		$118,567
							Black/ Current			**6653**	**35694**	**$209,945**	**$325,042**
2007	2007-365	Development	City of Independence	Phase 4 Little Blue Parkway between 39th and Mize Road	Crackerneck Creek	Jackson	Blackwater/ Lamine	Kansas City	Kansas City	1601		$56,035	
2008	NWK-2007-808	Development	City of Lee's Summit / MODOT	I-470 & Strother Rd Project; fill material in Little Blue River	Little Blue River	Jackson	Blackwater/ Lamine	Kansas City	Kansas City	2567		$89,845	
2008	NWK-1994-1524	Development	MoDOT	Realignment of 3.1 miles of Route 13 southeast of Lexington in Lafayette County	Lick Fork	Lafayette	Blackwater/ Lamine	Kansas City	Kansas City	3110		$108,850	
2009	NWK-2009-1417	Development	MoDot	kclcon Project in Kansas City, MO	Missouri River	Jackson/Cla	Blackwater/ Lamine	Kansas City	Kansas City	738.16		$18,454	
2010	NWK-2009-0042	Development	APAC - Missouri, Inc.	Individual Permits - Actual 404 permit & 401 water quality certification pending	Marshall Quarry		Blackwater/ Lamine		Kansas City	5040		$126,000	
2008	SSTF0052	SSTF Project	Phillip/Dixie Corson	Cattle exclusion, riparian establishment, riparian protection	Clear Fork Creek	Johnson	Blackwater/ Lamine	Kansas City	Kansas City		50351		$117,524
							Blackwater/ Lamine			**13056**	**50351**	**$399,184**	**$117,524**
2010	MVS-2009-97	Development	Bob Rockhold	Rock Lake project - private lake within unnamed tributary to Bear Creek	Unnamed trib to Bear Creek	Adair	Cuivre/ Salt	Northeast	St. Louis	2126		$53,150	
							Cuivre/ Salt			**2126**		**$53,150**	

2009	SSTF0059	SSTF Project	Scott/Gail Jones	Streambank stabilization	Woods Fork Gasconade	Wright	Gasconade	Ozark	Kansas City		6529		$59,000
2010	SSTF0070	SSTF Project	Ralph Haslag	Riparian easement	Unnamed tributary to Spring Creek	Phelps	Gasconade	Ozark	Kansas City		1694		$23,785
							Gasconade				**8223**		**$82,785**
2010	2010-01441	Development	MoDOT	Route T Bridge	Sampson Creek	Daviess	Grand/Chariton	Northwest	Kansas City	1392		$34,800	
							Grand/ Chariton			**1392**		**$34,800**	
2008	SSTF0054	SSTF Project	Kim Gardner	Acquisition	LaBarque Creek	Jefferson	Meramec	St. Louis	St. Louis		6055		$138,000
2010	SSTF0068	SSTF Project	Charles Hodges	Streambank stabilization	Little Dry Fork	Phelps	Meramec	Ozark	St. Louis		6154		$21,587
							Meramec				**12209**		**$159,587**
2007	2007-670	Development	MoDOT/ City of Columbia	Highway 63 Interchange	Gans Creek	Boone	Moreau/Loutre	Central	Kansas City	5787		$202,545	
2008	2007-01762 NWP39	Development	Jeffrey E Smith Co - ENTRIX Consultant	Nifong Blvd Extension / Mill Creek	Mill Creek	Boone	Moreau/Loutre	Central	Kansas City	1650		$57,750	
2008	MVS-2007-704 NWP39	Development	Prairie Farms Dairy, Inc - Richard O'brien	Facilities Expansion impacting unnamed tributary of Coldwater Creek	Coldwater Creek	St. Louis	Moreau/Loutre	St. Louis	St. Louis	1312		$45,920	
2009	P-2683	Development	City of Maryland Heights	Re-development of office / warehouse - Millwell Green Development / new government center	Unnamed tributary of Fee Fee Creek	St. Louis	Moreau/Loutre	St. Louis	Kansas City	2095		$52,375	
2010	MVS-2008-651	Development	Florissant Real Estate Investors	Garden Plaza Project - Construction of independent / assisted living community	Unnamed tributary of Coldwater Creek	St. Louis	Moreau/Loutre	St. Louis	St. Louis	299		$7,475	
2010	NWK-2010-0077	Development	Franklin County, Division of Public Works	Road repairs along Little Tavern Creek in St. Albans, MO	Little Tavern Creek	Franklin	Moreau/Loutre	St. Louis	Kansas City	399		$9,975	
2010	MVS-2009-787	Development	H.B. Realty Corp	Laurel Bluffs Residential Development	Unnamed tributaries to Cowmire Creek	St. Louis	Moreau/Loutre	St. Louis	St. Louis	809		$20,225	
2008	SSTF0051	SSTF Project	Margaret Rogers	Dam removal, stream reestablishmen, and riparian protection	Hominy Branch	Boone	Moreau/Loutre	Central	Kansas City		16654		$32,000
2009	SSTF0057	SSTF Project	Yale/Alicia Muhm	Riparian easement	Tributaries of Tuque and Charette creeks	Warren	Moreau/Loutre	St. Louis	Kansas City		23737		$49,850
							Moreau/ Loutre			**12351**	**40391**	**$396,265**	**$81,850**
2008	SSTF0047	SSTF Project	Jerry McKnight	Grade control structures	Center Creek	Lawrence	Neosho	Southwest	Little Rock		16933		$50,000
2009	SSTF0055	SSTF Project	Matthew Taylor	Streambank stabiliztion	Indian Creek	McDonald	Neosho	Southwest	Little Rock		1556		$5,156
2009	SSTF0064	SSTF Project	Aaron Walker/Lakeview Farms	Livestock exclusion and riparian protection	Shoal Creek	N ewton	Neosho	Southwest	Little Rock		5130		$30,725
							Neosho				**23619**		**$85,881**

2008	NWK-2007-1928	Development	Briarcliff Development Co.	Roadway interchange Tullison and NW Briarcliff	tributary to Missouri River	Platte	Nishnabotna/ Platte	Northwest	Kansas City	3744		$131,040	
2009	NWK-2008-1239	Development	St. Joseph School District	Construction of new elementary school	Unnamed tributary of One Hundred Two River	Buchanan	Nishnabotna/ Platte	Northwest	Kansas City	2211		$55,275	
2010	NWK-2010-376	Development	MoDot	Widening of Route 45 near Parkville, MO	Rush and Walnut creeks	Platte	Nishnabotna/ Platte	Kansas City	Kansas City	2262		$56,550	
2008	SSTF0050	SSTF Project	Joe/Laura Robinson	Riparian easement	Little Platte River	Clinton	Nishnabotna/ Platte	Northwest	Kansas City		2776		$1,564
							Nishnabotna/ Platte			**8217**	**2776**	**$242,865**	**$1,564**
2008	SSTF0048	SSTF Project	Alberta Armfield	Streambank stabilization	Little Wilson Creek	Polk	Osage	Southwest	Kansas City		1752		$50,000
2008	SSTF0049	SSTF Project	Gordon Clayton	Grade control structures	Cracker Neck Branch	Lawrence	Osage	Southwest	Kansas City		17351		$50,000
2009	SSTF0058	SSTF Project	Tom Berry	Acquisition adjacent to Berry Bluff and Lead Mine Cas	Niangua River	Dallas	Osage	Southwest	Kansas City		21175		$170,018
2009	SSTFS0065	SSTF Project	Dallas County Commission	Low water bridge replacement--Williams Ford	Niangua River	Dallas	Osage	Southwest	Kansas City		12930		$50,000
2009	SSTF0066	SSTF Project	Dallas County Commission	Low water bridge replacement--School Road	Little Niangua River	Dallas	Osage	Southwest	Kansas City		3232		$50,000
2010	SSTF0071	SSTF Project	Dallas County Commission	Low water bridge replacement--Prosperity Road	Little Niangua River	Dallas	Osage	Southwest	Kansas City		7220		$80,000
							Osage				**63660**		**$450,018**
2008	MVS-2007-552	Development	Parkland Health Center	Expansion impacting willow creek	Willow Creek	St. Francois	St. Francois/ Castor	Southeast	St. Louis	1600		$56,000	
2009	MVS-2006-655	Development	MoDOT	Route 67 Project	Frazier Creek	Madison/ Butler/ Wayne	St. Francois/ Castor	Southeast	St. Louis	2380		$59,500	
2010	MVM-2009-383	Development	MoDot	Construction of new outer road east of Interstate 55 in Scott City, MO	Ramsey Creek Diversion Channel	Scott	St. Francois/ Castor	Southeast	Memphis	2825		$70,625	
2009	SSTF0060	SSTF Project	Adrian Wills	Streambank stabilization	Whitewater River	Cape Girardeau	St. Francois/ Castor	Southeast	St. Louis		7782		$65,285
2010	SSTF0069	SSTF Project	James Johnson	Streambank stabilization	Whitewater River	Cape Girardeau	St. Francois/ Castor	Southeast	St. Louis		5642		$44,800
							St. Francois/ Castor			**6805**	**13424**	**$186,125**	**$110,085**
2009	2008-00322	Development	Overland Property Group	Apartment complex - Bee Creek tributary	Tributary to Bee Creek	Taney	White	Southwest	Little Rock	1365		$34,125	
2009	SSTF0062	SSTF Project	David Daymen	Riparian easement at Subblefield Access CA	Flat Creek	Barry	White	Southwest	Little Rock		567		$700
							White			**1365**	**567**	**$34,125**	**$700**
								GRAND TOTAL		**55038**	**250914**	**$1,633,294**	**$1,415,036**

APPENDIX J

MITIGATION BALANCES FOR 2007-2010 PROJECTS WITH CREDITS

Mitigation Balances for 2007-2010 Projects With Credits

EDU	Credits Received	Credits Met	Credit Balance	Future Credit Needs for Projects	Total Credit Balance for New Program
Apple/Joachim	3,073	-	(3,073)	3,000	6,948
Black/Current	6,653	35,694	29,041	15,000	15,000
Blackwater/Lamine	13,056	50,351	37,295	7,500	7,500
Cuivre/Salt	2,126	-	(2,126)	3,000	2,126
Gasconade	-	8,223	8,223		
Grand/Chariton	1,392	-	(1,392)		
Meramec	-	12,209	12,209	15,000	15,000
Moreau/Loutre	12,351	40,391	28,040	20,000	20,000
Neosho	-	23,619	23,619		
Nishnabotna/Platte	8,217	2,776	(5,441)	7,500	12,941
Osage	-	63,660	63,660	20,000	20,000
St. Francis/Castor	6,805	13,424	6,619		
White	1,365	567	(798)	7,500	8,298
TOTAL	**55,038**	**250,914**	**195,876**	**98,500**	**107,813**

Balance available for additional uses = 195,876 - 107813 = 88,063

EXCECUTION

IN WITNESS WHEREOF, the parties have executed this in-lieu fee Instrument on the date herein below last written by the District Engineer.

SIGNATURE PAGES PREPARED BY USACE