Research Report
KTC-15-08/SPR13-458-1F
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Jurisdictional Roadside Ditches

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Kentucky Transportation Center
176 Oliver H. Raymond Building
Lexington, KY 40506-0281
(859) 257-4513
fax (859) 257-1815

www.ktc.uky.edu

Research Report
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JURISDICTIONAL ROADSIDE DITCHES

Authors

Sarah M. McCormack, MSC CTL
Research Engineer

Chris Van Dyke, PhD
Research Scientist

and

Doug Kreis, PE, MBA, PMP
Associate Director

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

in Cooperation with

Kentucky Transportation Cabinet
Commonwealth of Kentucky

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Federal Highway Administration
U. S. Department of Transportation

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16. Abstract Section 404 of the Clean Water Act (CWA) mandates that state agencies and other entities perform compensatory mitigation when their activities impair jurisdictional waters. In the Commonwealth of Kentucky, the Kentucky Transportation Cabinet (KYTC) is required to pay in-lieu fees or purchase stream mitigation credits when a roadside ditch is impaired or relocated as part of a road construction project. In-lieu fees and stream mitigation credits are costly, and ditches that have suffered degraded habitat and loss of hydrogeomorphic functionality are treated as total losses when they are impacted by construction and maintenance activities. This raises the question of whether the United States Corps of Engineers (USACE) would be receptive to alternative mitigation and monitoring practices that impose a less stringent financial burden on the Kentucky Transportation Cabinet, but which still comply with CWA regulations. This report discusses methodologies used to evaluate the quality of instream and riparian habitat, Section 404 of the CWA and its implications for mitigation of lost or damaged jurisdictional ditches, and the strategies that have been used by other states to fulfill their Section 404 mitigation requirements. We highlight mitigation practices that depart from the norm and which place a less onerous financial burden on state transportation agencies. KYTC officials presented this report's key findings to the USACE Louisville District Office in January 2015 in an effort to receive approval to experiment with novel restoration techniques. The USACE granted KYTC license to implement these techniques on a project-by-project basis. Before implementation on each project, the Cabinet must receive formal approval from USACE officials. Although this was not the blanket mandate that KYTC hoped for, it indicated the Louisville District is willing to study the effectiveness of alternative mitigation strategies. Despite the Cabinet's request, USACE officials did not approve a plan to reduce post-restoration monitoring requirements. KTC researchers suggested that KYTC perform exhaustive monitoring of the performance of completed project that used alternative mitigation techniques. Having information on the short-, medium-, and long-term performance of these sites could – if the results are promising – pave the way to the wider adoption of alternative mitigation practices and could eventually reduce the level of post-restoration monitoring required by the USACE.			
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The following individual contributed greatly to the successful completion of this project through their participation on the Study Advisory Committee:

Danny Peake .....Study Chair KYTC Division of Environmental Analysis

Executive Summary

Section 404 of the Clean Water Act (CWA) mandates that state agencies and other entities perform compensatory mitigation when their activities impair jurisdictional waters. In the Commonwealth of Kentucky, the Kentucky Transportation Cabinet (KYTC) is required to pay in-lieu fees or purchase stream mitigation credits when a roadside ditch is impaired or relocated as part of a road construction project. In-lieu fees and stream mitigation credits are costly, and ditches that have severely degraded habitat quality and hydrogeomorphic functionality are treated as total losses when they are impacted by construction and maintenance activities – which raises the question of whether the United States Corps of Engineers (USACE) would be receptive to alternative mitigation and monitoring practices that impose less of a financial burden to Kentucky while still complying with the regulations spelled out in the CWA. This completed report describes the findings of Kentucky Transportation Center (KTC) researchers. The report discusses methodologies used to evaluate the quality of instream and riparian habitat, Section 404 of the CWA and its implications for mitigation of lost or damaged jurisdictional ditches, and the strategies that have been used by other states to fulfill their mitigation requirements under Section 404. We highlight mitigation practices that depart from the norm and that place a less onerous financial burden on state transportation agencies. These findings were presented to the USACE Louisville District Office in January 2015 in an effort to receive approval to experiment with novel restoration techniques. The USACE subsequently granted KYTC to implement these techniques on a project-by-project basis. That is, before implementation, the Cabinet must receive official sanction from USACE officials. Although this was not the blanket mandate that KYTC hoped for, it at least indicate(d) a willingness on the part of the USAE to look at the effectiveness of alternative mitigation strategies that have been adopted elsewhere in the United States. Despite the Cabinet's request, USACE officials did not approve a plan to reduce post-restoration monitoring requirements. In response, we suggested that KYTC perform stringent and exhaustive monitoring of the post-restoration performance of completed projects that used alternative mitigation techniques. Having information on the short-, medium-, and long-term performance of these sites could – if the results are promising – potentially pave the way to adopt alternative mitigation practices on a more widespread basis as well as could reduce the amount of post-restoration monitoring time required by the USACE. The remainder of this summary describes the contents of each chapter.

Chapter 2 introduces the concept of compensatory mitigation, which is required under the Clean Water Act (Section 404) when a project impairs or destroys aquatic resources. Further, it outlines the various approaches that have been used by the USACE and other agencies to assess habitat quality of stream and riparian ecosystems. The focus here is on RBPs because future phases of the study would have relied upon them (RBPs) to conduct habitat assessments and to determine the effectiveness of the mitigation procedures proposed by KTC. Chapter 2 concludes with a brief discussion, including examples pulled from the scientific literature, of whether compensatory mitigation adequately replaces the habitat functionality lost when an ecosystem is damaged or destroyed. While there is no consensus in the scientific literature, it is clear that many scientists remain skeptical about mitigation successfully compensating for everything that is lost. In part, this is because streams and other ecosystems are sited, and thus function within a specific context. Performing mitigation, even within the same watershed, cannot substitute for the composition and structure present on the original site.

Chapter 3 expands on ideas from Chapter 2 and describes different mitigation procedures that are acceptable under Section 404 of the CWQ. Summarized in this section are the potential implications of a proposed rule change that would reinterpret what counts as a water of the United States.

Chapter 4 reports on the results of a survey conducted by KTC researchers. This survey, which was distributed to state officials via the AASHTO listserv, asked respondents if their states have collaborated with local USACE District Offices to implement in-kind, onsite mitigation (a form of permittee-responsible mitigation) to compensate for habitat losses suffered when small roadside ditches are

impaired or have their courses shifted to accommodate road construction projects. KTC received 30 responses from officials across the United States. Although some of the respondents indicated that all roadside ditches are subject to the same mitigation requirements as larger water features, a number indicated that local USACE offices had approved in-kind, onsite mitigation, sometimes at a ratio as low as 1:1. What this suggests is that there is clearly a precedent to mitigate for losses to jurisdictional ditches using more cost effective restoration practices. On the question of monitoring, most respondents noted their states were obligated to perform monitoring on restored sites for a minimum of five years, consistent with the guidance laid out in Section 404. However, two respondents remarked that their states have obtained an early release from monitoring after three years. The answers to this question, although not entirely uniform, signal that even if alternative mitigation strategies are deemed acceptable by the USACE, it is unlikely Kentucky – or any other state – will have the opportunity to significantly reduce the monitoring period.

After KTC researchers analyzed the survey results, they conducted follow-up interviews with a small number of state officials (Chapter 5). The focus was on officials from states where the USACE has shown flexibility with mitigation practices. A number of the officials we spoke with reinforced their previous answers. Some states are worth singling out; including Arkansas, Connecticut, and Oklahoma- given the broad reading their USACE District Offices use when interpreting Section 404 and the CWA more generally. For instance, the Little Rock District USACE Office in Arkansas has approved 1:1 mitigation ratios and has accepted in-kind restoration; the Memphis District, which oversees the western portion of Arkansas, rarely demands that impacted streams be mitigated for. Oklahoma, which falls under the exclusive jurisdiction of the Tulsa Office, is conducting a five-year study looking at whether natural succession (a form of passive restoration), produces mitigation outcomes. Even under current guidelines, the State of Oklahoma can use in-kind mitigation at a 1:1 ratio for restoration. In Connecticut, the New England District Office does not typically classify roadside ditches as jurisdictional – and when they are considered jurisdictional, there is not set of mitigation standards consistently applied to inform restoration. As with the findings presented in Chapter 2, the information gleaned from interviews reveals previous (and ongoing) instances of USACE District Offices not adhering to a single set of mitigation standards, which is appropriate given the enormous ecological and hydrogeomorphic diversity of ditches around the United States.

Chapter 6 includes the Year 3 work plan, a technical memorandum KTC researchers assembled – at the request of KYTC – for the Louisville District Office on alternative mitigation techniques currently sanctioned by USACE district offices around the country. This memorandum was sent to the Louisville District Office in preparation for a meeting between KYTC, KTC, and USACE officials. However, after the study advisory chair spoke with the Louisville District Office, all parties decided that an in-person meeting was not necessary. USACE officials agreed to investigate novel mitigation practices on a project-by-project basis. Chapter 6 also contains a follow-up memorandum that reports on the outcome of the discussions had by KYTC and USACE officials. Even though the Cabinet did not receive blanket approval to institute alternative mitigation practices – as was originally hoped – a promising agreement with Corps staff potentially sets the stage for widespread implementation later on if trial projects prove to be successful. KTC recommends closely scrutinizing the performance of projects that use novel mitigation strategies. If empirical evidence demonstrates these strategies are effective, the Cabinet will have a compelling argument to institute alternative mitigation techniques on a wider scale. However, if performance is lacking, it gives KYTC the baseline knowledge needed to determine what aspects of mitigation did or did not work. Using this information, KYTC could develop new mitigation strategies to evaluate, which is something Corps officials have said they would be open to.

Chapter 1 – Introduction

The purpose of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." As such, the CWA prohibits the discharge of dredged or fill material into wetlands, streams, and other aquatic resources without consent from the United States Army Corps of Engineers (USACE). 38 USACE Districts, ten regional EPA offices, ten U.S. Circuit Courts, and nine regions of the Fish and Wildlife Service, are responsible for administering Section 404, although the USACE issues permit decisions, makes jurisdictional determinations, develops policy and guidance, and enforces Section 404 provisions. To acquire a permit under Section 404, permittees must ensure they have taken all practical steps to either *avoid* or *minimize* the damage to the resource in question. If it is impossible to eliminate or minimize damage, permittees are required by law to perform compensatory mitigation. Stream mitigation is one form of compensatory mitigation. Broadly, stream mitigation entails altering the physical, chemical, and/or biological characteristics of a stream, wetland, or other aquatic resources with the goal of repairing or replacing its natural function (USACE Little Rock District 2008). Compensatory mitigation "involves actions taken to offset unavoidable adverse impacts to wetlands, streams, and other aquatic resources authorized by Clean Water Act section 404 permits and other Department of the Army Permits" (USACE and EPA 2008, p. 19594). Compensatory mitigation reduces the amount of damage inflicted upon aquatic ecosystems by permitted activities. While the USACE issues permits, the EPA has developed the criteria the USACE uses for its permitting decisions, and they have created guidelines for compensatory mitigation. This report discusses the implementation of alternative mitigation strategies and what strategies the Kentucky Transportation Cabinet (KYTC) could pursue to obtain permission from the USACE's Louisville District Office to use mitigation techniques that require a smaller financial commitment. State transportation agencies across the United States have been allowed to meet their mitigation requirements under Section 404 of the CWA using alternative practices.

Chapter 2 of this report introduces the concept of compensatory mitigation, which is required under the Clean Water Act (Section 404) when a project impairs or destroys aquatic resources. Further, it outlines the various approaches that have been used by the USACE and other agencies to assess habitat quality of stream and riparian ecosystems. The focus here is on rapid bioassessment protocols (RBPs) because they are used by the state and USACE to conduct habitat assessments and to determine what mitigation techniques are most appropriate in a given context. Chapter 2 briefly discusses whether compensatory mitigation adequately replaces habitat functionality lost when an ecosystem is damaged or destroyed. While there is no consensus in the scientific literature, it is clear that many scientists remain skeptical that mitigation successfully compensates for lost ecosystem structure and functionality. In part, this is because streams and other ecosystems are sited by function within a specific context. Performing mitigation, even in the same watershed, cannot substitute for the composition and structure present on the original site.

Based on a review of relevant court cases and an extensive interview with Dr. Morgan M. Robertson (an author of the 2008 rule change to Section 404 of the Clean Water Act), Chapter 3 discusses what practical options are available to implement alternative mitigation strategies. KYTC, before the start of this project, submitted a proposal to the Louisville District Office outlining a case for "self-mitigating" ditches. This initial approach – i.e. framing its activities as a form of direct replacement – transgressed the regulatory language (and therefore framework) contained in the Clean Water Act. This is not to suggest that KYTC's overall concept was untenable, but rather that it would need significant reframing before being presented to USACE officials. Instead of arguing for mitigation in the form of "direct replacement," this chapter argues that KTC must demonstrate that its proposed actions are consistent with the principles of *permittee-responsible mitigation*, a practice the USACE sanctions. Permittee-responsible mitigation is the most traditional and most commonly practiced form of mitigation. It accounts for the majority of compensation acreage established each year (in the context of wetlands restoration).

Chapter 2 also discusses the proposed rule change that will more clearly define what is counted as a water of the United States under the CWA. The rule, which was released for public comment on 21 April 2014, comes in the wake of several U.S. Supreme Court decisions that have adjudicated whether specific water features are protected under the CWA. The proposed rule appears to enlarge the CWA's scope. However, it does not substantively alter the regulation of roadside ditches. Most ditches will remain jurisdictional. Jurisdictional ditches *may include, but are not limited to, these features*: 1) altered natural streams (e.g. streams that have been channelized, straightened, or relocated); 2) ditches excavated into waters of the United States, including jurisdictional wetlands; 3) ditches with perennial flow; and 4) ditches that connect two or more waters of the United States. Only ditches that are excavated wholly into uplands, drain only into uplands, *and* have less than perennial flow (or features that do not directly contribute to a water of the United States) are excluded from the jurisdictional ambit of the CWA. As such, unless the EPA revises the proposed rule significantly, the requirements for the Commonwealth of Kentucky to mitigate for lost and damaged roadside ditch habitat will remain *unchanged*. Given that the EPA is unlikely to relax any aspect of the CWA, the best option to reduce KYTC's cost burden is to work directly with the Louisville District USACE Office to determine whether it is possible to institute a new set of mitigation practices that would be applied to extremely degraded, habitat-poor ditches.

Chapter 4 reports on the results of a survey conducted by KTC researchers on USACE-approved mitigation techniques. This survey, which was distributed to state officials via the AASHTO listserv, asked respondents if their states have collaborated with local USACE District Offices to implement in-kind, onsite mitigation (a form of permittee-responsible mitigation) to compensate for habitat losses suffered when small roadside ditches are impaired or are rerouted to accommodate road construction projects. KTC received 30 responses from officials across the United States. Although some of the respondents indicated that all roadside ditches are subject to the same mitigation requirements as larger water features, a number indicated that local USACE offices had approved in-kind, onsite mitigation, sometimes at a ratio as low as 1:1. This suggests that there is a clear precedent to mitigate for losses to jurisdictional ditches using more cost effective restoration practices. On the issue of monitoring, most respondents noted their states were obligated to perform monitoring on restored sites for a minimum of five years, consistent with the guidance laid out in Section 404. However, two respondents remarked that their states have obtained an early release from monitoring after three years. The answers on this question, although not entirely uniform, signal that even if alternative mitigation strategies are deemed acceptable by the USACE, it is unlikely that Kentucky will have the opportunity to significantly reduce the monitoring period.

After KTC researchers analyzed the survey results, they conducted follow-up interviews with a small number of state officials (Chapter 5). KTC focused on officials from states where the USACE has shown flexibility in mitigation strategies. A complete summary is beyond the scope of this introduction, however, a number of the officials that researchers spoke with reinforced their previous answers. A few states are worth singling out, including Arkansas, Connecticut, and Oklahoma, given the broad reading their USACE District Offices permit when interpreting Section 404 and the CWA more generally. For instance, the Little Rock District USACE Office in Arkansas has approved 1:1 mitigation ratios and has accepted in-kind restoration; the Memphis District, which oversees the western portion of Arkansas, rarely asks for mitigation for impacted streams. Oklahoma, which falls under the exclusive jurisdiction of the Tulsa Office, is conducting a five-year study looking at whether natural succession (a form of passive restoration), produces mitigation outcomes. Even under current guidelines, the State of Oklahoma can use in-kind mitigation at a 1:1 ratio for restoration. In Connecticut, the New England District Office does not typically classify roadside ditches as jurisdictional – and when they are considered jurisdictional, there is not set of mitigation standards consistently applied to restoration. As with the findings of Chapter 3, the information gleaned from interviews reveals previous (and ongoing) instances of USACE District Offices not adering to a single set of mitigation standards, which is appropriate given the enormous ecological and hydrogeomorphic diversity of ditches around the United States.

Chapter 6 includes the Year 3 work plan, a technical memorandum KTC researchers assembled – at the request of KYTC – for the Louisville District Office on alternative mitigation techniques currently authorized by USACE district offices around the US. This memorandum was sent to the Louisville District Office in preparation for a meeting between KYTC, KTC, and USACE officials. However, after the study advisory chair spoke with the Louisville District Office, all parties decided that an in-person meeting was unnecessary. USACE officials agreed to investigate novel mitigation practices on a project-by-project basis. This chapter also contains a follow-up memorandum that reports on the outcome of the discussions held between KYTC and USACE officials. Even though the Cabinet did not receive blanket approval to institute alternative mitigation practices – as was originally hoped – a promising agreement with Corps staff potentially sets the stage for widespread implementation of these strategies later on if trial projects prove successful. KTC recommends closely monitoring the performance of projects that use novel mitigation strategies to demonstrate whether they produce outcomes consistent with USACE expectations. If empirical evidence indicates these practices are effective, KYTC will have a compelling argument to institute alternative mitigation techniques on a wider scale. However, if performance is disappointing, it gives KYTC the baseline knowledge needed to determine what aspects of mitigation did or did not work. Using this information, KYTC could develop new mitigation strategies to implement, which Corps officials have said they would be open to.

Chapter 2 – Overview of Compensatory Mitigation

2.1 Defining Mitigation

Responsible parties perform compensatory mitigation by paying in-lieu mitigation fees, buying credits from approved mitigation banks, or executing permittee-responsible mitigation. Mitigation banks preserve, restore, or create wetlands, streams, or aquatic resources. They consolidate blocks of restored or unimpaired resources in a single area that permittees can buy. Permit applicants purchase credits from a bank to offset the negative impacts resulting from their project. Mitigation banks operate as an off-site compensation measure. Although off-site, mitigation banks should be located in the same watershed as the impact site, and permit applicants are required to purchase credits to offset the specific losses in habitat functionality/quality, habitat diversity, and hydrological alterations caused by a project. A primary goal of compensatory mitigation is to reproduce the lost function of degraded ecological resources, albeit at a site different from their original location.

In 2008 the USACE and EPA issued a new rule governing compensatory mitigation under Section 404 of the CWA. This rule establishes a preference for compensatory mitigation via mitigation banking, as the "use of a mitigation bank can help reduce risk and uncertainty, as well as temporal loss of resource functions and services" (USACE and EPA 2008, p. 19673). In the Commonwealth of Kentucky, the use of mitigation banking to offset the effects of stream damage has been uncommon. Rather, permit applicants have typically paid in-lieu fees to compensate for the negative ecological impacts of their projects. In-lieu fees work in a slightly different way than mitigation banks. With mitigation banks, a private firm (or in a few cases state governmental organizations) has already restored streams or wetlands, which lets permittees immediately purchase credits. The USACE and EPA look favorably upon mitigation banks because they are typically placed on larger, more ecologically valuable parcels than permittee-responsible mitigation projects. This increases the likelihood that restoration will yield long-term success. The level of scientific and technical analysis involved in the design and construction of mitigation banks is more rigorous than other forms of compensatory mitigation. Moreover, the "development of a mitigation bank requires site identification in advance, project specific planning, and significant investment of financial resources that is often not practicable for many in-lieu fee programs" (USACE and EPA 2008, p. 19673).

In-lieu mitigation programs are typically administered by a governmental organization or agency (although sometimes non-governmental entities do this kind of work as well). This agency collects fees from permit applicants whose projects cause irreversible damage to the sites they are working on. As the organization collects more money from different permittees, it eventually pools those resources to purchase land on which streams or wetlands will be restored, enhanced, preserved, or created. This satisfies the compensatory mitigation responsibilities of permittees. Like mitigation banks, the agency or organization managing the site is responsible for ensuring that it meets performance standards. These standards are set to ensure a restoration site adequately compensates for the ecological, biological, and hydrological functions lost or impaired by the permit applicant's project. Typically, mitigation banks and sites dedicated to in-lieu mitigation are monitored for five years after their development to certify performance standards are met. This period may be lengthened or shortened at the discretion of the USACE based on whether a site meets its targets. For aquatic resources that are slow to develop or recover, such as forested wetlands or bogs, a longer monitoring period is usually required. Standards, or success criteria, are the "minimum documented biological, chemical, or physical characteristics required to verify the success of compensatory mitigation project" (Doyle et al. 2013, p. 294). Although these performance standards are legally binding, it is extremely rare for the federal government to take legal action if a project fails to meet objectives.

Permittee-responsible mitigation is the most traditional and frequently used form of mitigation (Wilkinson and Thompson 2006; see also Hough and Robertson 2009). Unlike in-lieu fee mitigation or

buying credits from a mitigation bank, permittee-responsible mitigation requires permittees to execute compensatory mitigation through the creation, restoration, preservation, or enhancement of a stream, wetland, or other aquatic resource, which the permittee oversees, manages, and monitors. Based on EPA and USACE regulations, it is strongly recommended that permittees accomplish this compensation on-site. If this is not possible the mitigation activity should take place within the same watershed as the impact site. Conducting mitigation activities within the same watershed in which the degradation takes place is the optimal way to ensure that the lost biological, ecological, and hydrological functions are re-created in close proximity to the impact site. While there are debates over the effectiveness of this procedure, and whether it is adequately compensatory, this is considered the best available mitigation practice. The main difference between permittee-responsible mitigation and the forms outlined above is that the permit applicant is permanently accountable for the performance of their mitigation site. With in-lieu fee mitigation and mitigation banking, a third party is responsible for achieving performance objectives.

The 2008 CWA rule change maintains a preference for on-site, in-kind mitigation. In-kind mitigation entails replacing a lost or impacted resource with a resource of a similar structural and functional type. Again, the intent behind this rule is to replace one set of ecological attributes with a similar set (e.g. a specific plant community) to recuperate whatever functionality is lost because of a permittee's action. The goal is to achieve functional equivalence. According to this rule change, the USACE and EPA have ranked mitigation activities in the following order (this list is ranked from most to least preferred):

1. Use of credits from an approved mitigation bank
2. Use of credits from an in-lieu fee program
3. Permittee-responsible compensatory mitigation developed using a watershed approach
4. On-site/in-kind permittee-responsible mitigation
5. Off-site/out-of-kind permittee-responsible mitigation

This rule change also mandates that all mitigation plans incorporate twelve principal components:

1. Objectives
2. Site Selection Criteria
3. Site Protection Instruments
4. Baseline Information for Impact and Compensation Sites
5. Method of Determining Credit Allocation
6. Mitigation Work Plan
7. Maintenance Plan
8. Ecological Performance Standards
9. Monitoring Requirements
10. Long-Term Management Plan
11. An Adaptive Management Plan
12. Financial Assurances

Mitigation banks and in-lieu fee mitigation sites should also be designed and constructed to ensure they are self-sustaining. Regulations are surprisingly unclear, however, on what a self-sustaining project looks like, and importantly, for what period of time it needs to be self-sustaining (USACE guidelines only state that restored sites should remain viable and sustainable into the "foreseeable future"). Although this can be achieved using a number of techniques, the 2008 rule recommends including a small number of active engineering features, such as pumps, to improve a site's prospect for self-sustainability. Mitigation sites should be designed to work with the broader landscape context where they are located. Context-sensitive design is a key component of any plan that aims for long-term sustainability. Working with the local landscape, including geomorphic, ecological, and hydrological forms and processes is an effective way of blending restoration efforts with the broader setting where a mitigation site is located (e.g. Brierley and

Fryirs 2009). If the restoration or creation of a wetland or stream fails to harmonize with the local geomorphic, ecological, and hydrological elements, it decreases the likelihood that a project becomes self-sustaining, thereby undermining the intent of compensatory mitigation. As noted above, the most common practice in the Commonwealth of Kentucky is in-lieu fee mitigation; the standards discussed above should be kept in mind when designing any alternative strategies to develop guidelines for compensatory stream/ditch mitigation.

The next section details Kentucky's previously unsuccessful efforts to receive a "stream mitigation exemption" for the relocation of a stream associated with a road construction project.

2.2 Previous Efforts to Establish Provisions for Self-Mitigation Guidelines

In April 2011, KYTC conducted a preliminary study to determine under what circumstances the relocation or reconstruction of ditches should qualify for a "self-mitigation exemption" from the USACE. At the time, the USACE Louisville District Office required KYTC to mitigate for the relocation of highly impaired roadside ditches and streams under the assumption that the relocation would lead to a total loss of habitat function and quality as well as degradation of geomorphic properties. As noted in Section 2.1, there are different options through which losses can be mitigated: in-lieu fee mitigation, stream mitigation banking, and on-site compensatory mitigation accomplished by the permittee. At the time, it was the position of KYTC that the mitigation requirements set out by the USACE were onerous because they required KYTC to *fully* mitigate for losses even when the ditches or streams impacted had minimal ecological or geomorphic value. A small survey conducted in 2011 revealed that a number of states treated relocated ditches as fully or partially self-mitigating – a position endorsed, presumably, by USACE district offices.

KYTC proposed a self-mitigation framework for a project in Hancock County, KY during the partial relocation of KY-69. The new roadway required several modifications to streams and ditches. First, it entailed relocating two intermittent streams. Second, it meant diverting a perennial section of a stream into a culvert. Each of the stream reaches in question functioned as *roadside ditches*. Further, these ditches were jurisdictional because they accepted and conveyed drainage from upstream jurisdictional waters or tributaries. In May 2009 and January 2011 KYTC Division of Environmental Analysis evaluated the stream quality of these reaches using the guidelines outlined in the USEPA Rapid Bioassessment Protocols (RBP) for low gradient streams (see below). All of the streams received very low scores, which attested to their poor ecological quality. At these locations low scores were due to the lack of epifaunal substrate, abundant sediment deposition, lack of sinuosity, channelization, and lack of evidence of a functional riparian zones.

When stream mitigation is required, KYTC usually pays an in-lieu fee to compensate for losses. The KY-69 project sparked interest and encouraged a reassessment of mitigation practices because of the uniformly poor quality of the streams that needed relocation. After a subpar habitat assessment, KYTC proposed the stream relocation required to complete the KY-69 project qualified as self-mitigating for most of the impacts. In this context, "self-mitigating" had a very specific meaning. The number of linear feet of stream affected by the project was 936. KYTC advanced a proposal that would relocate and reconstruct and manage 671 linear feet of stream (i.e. a form of permittee-responsible mitigation). Habitat quality and functionality in these reaches would have exceeded those of the original reaches lost due to road construction. KYTC argued the 671 feet of reconstructed stream should qualify as self-mitigating because of the ecological improvements. If approved, this meant that KYTC would not have to pay an in-lieu mitigation fee to compensate for the loss of those 671 feet. However, this left 265 linear feet of stream unaccounted for under the plan. To make up this difference, KYTC would have paid a small in-lieu fee to compensate for stream and habitat losses. Under this scenario, the in-lieu costs to replace the 265 linear feet would have amounted to approximately $36,000, whereas the in-lieu fee to compensate for the entire 936 feet of impacted roads and ditches was estimated at $218,000. Relocated ditches classified

as self-mitigating would not require the Commonwealth of Kentucky to pay additional in-lieu fees, while demonstrably improving habitat quality. The USACE rejected this proposal, however. Despite this, there is room to develop new guidance that specifies under what circumstances self-mitigation is permissible. Clearly, when ditches intended for relocation during a project have poor biological, ecological, and geomorphic attributes, and when the newly constructed replacement streams offer significant enhancements to these features a strong case can be made for a self-mitigation exemption. Not only is this a more cost-effective option, but it is also an ecologically sound one that gives KYTC greater flexibility.

2.3 Methods for Determining Compensatory Mitigation and Assessing Ecosystem Function

Compensatory mitigation requires that permittees offset the loss of structural and functional attributes of the ecosystems they damage at mitigation sites. Achieving this entails using a reliable, and repeatable system to measure the functional and structural attributes of ecosystems. Systems of this kind ensure that permit applicants balance ecosystem debits with the appropriate number of credits. This section outlines some of the methods used by different USACE district offices and other agencies to quantify the structural and functional properties of ecosystems. The calculations derived from these methods offer a representation of an ecosystem's integrity and functionality. The Hydrogeomorphic (HGM Approach) aims to "provide regulatory agencies, as well as other public and private interests, with an effective tool for assessing wetland function comprehensively in the context of development projects and their mitigation within an overall policy of 'no net-loss' of wetland function" (Hauer and Smith 1998, p. 520). Other methods discussed are rapid bioassessment protocols and the Rosgen system.

2.3.1 HGM Approach

Although originally intended to evaluate wetland functions, the HGM Approach has since been applied to streams and other ecosystems that may be subject to compensatory mitigation. The HGM Approach was "designed to assess project impacts by measuring changes in specific characteristics and processes of wetlands and their surrounding landscape" (Hauer and Smith, 1998, p. 526). This method is used to produce a hydrogeomorphic classification of wetlands using three factors that strongly influence wetland function: 1) hydrological sources, 2) hydrological regimes, and 3) geomorphic setting. It places critical importance on the hydrological and geomorphic controls of wetland structure and function. Geomorphic setting exerts a strong influence over the flow and storage of water. Hydrological sources control patterns of inundation, while the hydrological regime refers to the motion of water and its capacity to perform work – the movement of water and sediment are key agents for structure wetland (and stream/riverine) landscapes. As such, HGM Approach has an abiotic focus. This is not to deny the importance of plant community structures in influencing the spatial composition of landscapes, but to zero in on the underlying drivers of wetland function. The HGM Approach is a hierarchical classification system that, in the U.S., divides wetlands into seven distinct hydrogeomorphic classes. Within each region, however, there are a number of subclasses. Brinson (1993) cites two important reasons for classifying wetlands. First, it simplifies the concept of wetlands. While individual wetlands are situated in a unique set of circumstances, broadly comparable functional processes govern similar wetlands. Classification also helps researchers identify relationships between structure and function in wetland ecosystems. Consequently, the HGM Approach is adaptive- it can be modified according to the environmental context. The HGM Approach works as a classification system and establishes a system for identifying reference sites. Reference sites let researchers, property developers, and other stakeholders (e.g. government agencies) compare wetlands with one another. Restored or created wetlands can be compared to a reference site, which allows developers to determine the success of mitigation.

Wetlands contained in each subclass share similar structural features (e.g. kinds of vegetation), and perform similar functions. Underwriting the HGM Approach are logic models that describe relationships among wetland characteristics, governing processes, the landscape's functional capacity. Functional capacity refers to the ability of an ecosystem to perform a function. In turn, this is compared to the level of performance identified in reference ecosystems occupying the same subclass (Klimas et al. 2008). In

this context, a reference wetland does not refer to an area in a pristine or optimal condition; instead, reference sites are chosen to represent a range of functional conditions, from severely degraded to fully functional. Using reference wetlands lets scientists understand the range of variability that exists for a subclass of wetlands located in a specific region. Reference sites serve two additional purposes. They help researchers define what is characteristic and sustainable for a regional subclass. Second, they offer "a concrete physical representation of ecosystems that can be observed and measured" (Klimas et al. 2008, p. 7).

Data collected on different ecosystem functions serve as inputs into models. Each model variable has five components: 1) a name; 2) a symbol; 3) a measure of the variable and guidance for quantifying the measure directly, or indirectly if it is calculated based on other measures; 4) a set of variables generated by applying procedural statements; 5) the appropriate measurement units. The variables selected will vary across different reference sites. Table 2.1 (taken from Klimas et al. 2008) gives several examples of model inputs useful for quantifying stream function.

Table 2.1 – Examples of Variables Use in HGM Modeling for Streams

Name	Measure/Procedural Statement	Resulting Values	Units
Channel Substrate Size	Median size of the bed material	0.0 to > 100.0	Inches
Large Woody Debris	Number of Pieces of LWD	0.0 to > 100.0	Count
Soil Detritus	Percent Cover of Soil Detritus	0 to 100	Percent

For any variable a reference condition is established by looking at reference standard sites or reaches. If a variable approximates the range of conditions found in the reference site, it receives a variable subindex score of 1.0. But as conditions diverge from the reference site, progressively smaller values are allocated. This reflects a decreasing contribution to functional capacity. All of the variables contained in a model are aggregated into a functional capacity index (FCI), which takes on values ranging from 0.0 to 1.0. The FCI measures the "functional capacity of an ecosystem relative to reference standard sites or reaches in the reference domain" (Klimas et al. 2008, p. 9). Reference standard wetlands have an FCI of 1.0 for each of its functions. As Hauer and Smith (1998) point out, the value of the HGM approach lies in its capability to determine the functional capacity of a wetland (or stream), while giving researchers the tools to envision a number of development scenarios and what the functional consequences will be for ecosystems under those different circumstances. It gives stakeholders a repeatable technique to assess ecosystem function. Accurate information improves the soundness of mitigation and provides knowledge on the precise functions that are lost during any kind of ditch relocation/restoration project.

2.3.2 Rapid Bioassessment Protocols

Barbour et al. (1999) provide a thorough overview of rapid bioassessment protocols (RBP), which rely on a visual habitat evaluation that quickly establishes the level of degradation in a stream or ditch. While these quick forms of assessment can be useful, they are often supplemented by more detailed methods that closely examine the physicochemical properties of water and the complexities of stream structure that affect the composition of aquatic/riparian communities. RPBs focus on the physical characterization of habitat, with specific attention paid to: stream origin and type; riparian vegetation; channel morphology; and the measurement of in-stream flow parameters including width, depth, and substrate. Water quality measurements are taken on site using basic instruments that measure temperature, dissolved oxygen, and turbidity – parameters that significantly affect biogeomorphic function. More detailed evaluations are

warranted in some cases, but this document focuses on the procedures involved in RPB (Barbour et al. 1999 offers a detailed overview).

RPBs provide a quick evaluation of the stream by visual inspection. Each parameter is rated on a numerical scale from 1-20. After the assessment is finished the scores are added to assign a final score to the habitat. Higher scores indicate better quality habitat. The chosen parameters balance small-scale features of the stream (e.g. estimations of embeddedness), macro-scale details (channel morphology), and riparian/bank condition. Ten parameters are measured for RBPs. Importantly, the parameters assessed can be adjusted according to stream type. This means the evaluated characteristics differ for high-gradient streams versus low-gradient streams (although there are some overlaps). The parameters listed in Table 2.2 are those used to analyze low-gradient streams; the majority of roadside ditches and streams fall into this category.

For all evaluations, reference conditions "are used to scale the assessment to the 'best attainable' situation" (Barbour et al. 1999, p. 5-8). This provides a basis to compare the reach being studied to a reference reach, and sets the baseline for the best possible outcome. From the perspective of stream mitigation, ditches and streams with high scores would require more extensive (and costly) mitigation to offset losses or damage. RBPs are imperfect, as they sometimes introduce a subjective bias from the individual conducting the assessment. However, RPB's remain useful by delivering a holistic and rapid assessment of critical habitat characteristics, while providing an inexpensive method to do post-project monitoring. In turn, data from RBPs may be combined with other quantitative data to offer a fuller representation of an individual stream and its biological and geomorphic attributes, along with its temporal and spatial variability.

Table 2.2 lists and describes the parameters measured as part of the RPB of a low-gradient stream, along with a brief explanation.

Table 2.2 Parameters Used in RBPs

Parameter	*Explanation*
Epifaunal Substrate/Available Cover	Measures the relative quantity and variety of natural structures in the stream (e.g. cobble, large rocks, fallen trees, logs, branches, sites used for spawning/nursery functions of aquatic macrofauna). The loss of substrate and cover leads to habitat degradation and a loss of biodiversity.
Pool Substrate Characterization	This examines the type/condition of substrates located in the bottom of pools. Firm sediments like sand and gravel or rooted aquatic plants maintain a habitat capable of sustaining a variety of organisms.
Pool Variability	Rates the overall mixture of pool types based on size and depth. Streams with a variety of pool types support a wide range of aquatic species, while streams with little variation in pool quality are unable to support diverse aquatic life.
Sediment Deposition	The amount of sediment that has accumulated in pools and along the stream bottom due to deposition impacts habitat structure and function. High levels of sediment deposition typically signal an unstable environment that organisms are not

	equipped to handle.
Channel Flow Status	Measures how much water a channel is filled with. Flow status varies according to the channel morphology. As the amount of water available to a channel declines, there is less suitable substrate open for aquatic organisms. This parameter aids in the interpretation of biological condition.
Channel Alteration	This parameter evaluates any large-scale changes that have occurred to the shape of the channel. Streams that flow through urban areas, or that have been straightened, or have been diverted into concrete channels have fewer habitats for a variety of species. There are a number of morphological changes that can result as well (e.g. incision).
Channel Sinuosity	Channel sinuosity refers to the extent to which a channel meanders. Higher sinuosity expands the habitat available for diverse fauna. More sinuous streams can also absorb the energies of high flows more efficiently, which protects their overall integrity.
Bank Stability	This measures the steepness of banks and whether they are currently eroding. Over-steepened banks are vulnerable to collapse and erode faster than banks with more subtle slopes. Bank erosion often occurs where a disturbance has occurred, or in places that lack sufficient riparian vegetation to anchor the soil in place.
Bank Vegetation Protection	Quantifies the amount of vegetation in riparian areas that directly enhances stream bank stability. Roots help to keep soil in place, thus contributing to the overall resilience of channel morphology.
Riparian Vegetative Zone Width	Quantifies the width of natural vegetation from the fringe of the stream bank to the outer reaches of the riparian zone. This area provides a buffer that can filter out pollutants that would otherwise enter a stream. The riparian zone also slows erosion and provides habitat and nutrient inputs into the system. An undisturbed, relatively wide vegetation zone is optimal.

2.3.3 The Rosgen Classification System

Stream classification is a vexing topic, and while many efforts have been made over the years to develop a classification system that performs consistently, accurately capturing the morphological and functional attributes of streams/rivers remains a daunting task. There are serious questions over the merits of stream classification, especially if it relies on the formal attributes of streams to classify them (Juracek and Fitzpatrick 2003; Lave 2009). Despite lingering questions, the Rosgen classification system and its associated principles of natural channel design have grown popular over the past 25 years among non-profit and governmental agencies tasked with stream restoration. The Rosgen system (1994, 1996) bases classification largely on the morphological features of a stream (i.e. their structural attributes). Thus

determining how many linear feet of restored or new created channels are needed to offset the damage to impacted streams is a straightforward procedure and readily applied to mitigation banking.

The Rosgen classification system has four objectives (1994, p. 170):

- Predict a river's behavior from its appearance
- Develop specific hydraulic and sediment relations for a given morphological channel type and state
- Provide a means to extrapolate from site-specific data, collected on a given reach, to reaches located elsewhere that have similar properties
- Provide a standardized vocabulary for those working with river systems in a variety of professional disciplines

Rosgen's system can be used in a wide variety of contexts without modification. It assigns each river or stream an alphanumeric designation, a shorthand way to communicate what morphological properties a channel has. This system is a hierarchical one: classification moves through a sequence of four levels, with each level providing finer scale details about the river or stream being studied. Level I inventories identify the broad-scale morphological features of a stream and its geomorphic setting. Levels II-IV use dimensionless ratios to characterize river behavior and make use of simple geomorphic measurements such as channel pattern, width-to-depth ratio, channel material, and slope. Several states use Rosgen's approach to guide compensatory mitigation practices. For example, North Carolina conducts stream restoration on the basis of geomorphic classifications. The aim is to maintain a specific form, pattern, and profile, but this does not ensure stream replacement or restoration compensates for whatever *functions* are lost due to the relocation or elimination of a stream. Morphological measures, as opposed to functional measures, are easier to incorporate into a replicable accounting scheme. This suggests that, despite their shortcomings, morphological measures will continue to be used to inform compensatory mitigation.

2.4 Compensatory Mitigation – Is It Effective?

Judging whether compensatory mitigation is successful is not a clear-cut issue. There is not a set of universal performance objectives that are applied to all wetland permits. In some cases standards are set arbitrarily without making use of a reference site (Matthews and Endress, 2008). Given the difficulty of measuring the success of mitigation, this section looks at several studies that have examined whether replacement wetlands adequately compensate for the lost ecological functionality of impacted wetlands. Stream mitigation banking is in its infancy compared to wetland mitigation banking, which has been used since the 1980s. Thus, little formal literature exists on the effectiveness of applying compensatory mitigation strategies to streams and rivers. But the extensive literature on wetland mitigation banking illustrates much needed insights on the success rate of mitigation as well as its possible shortcomings. While not intended to be exhaustive, this discussion informs readers about the successes and failures that have been identified.

The track record of compensatory mitigation is inconsistent. One lingering question is whether creating or restoring a new wetland, or stream, in an offsite area – even in the same watershed –replaces the lost functionality of the habitats that are damaged or destroyed where development takes place. Studies indicate that in-kind replacement is not able to fully compensate for losses; when re-creating a wetland or stream in a different area, the unique geomorphic and hydrological conditions must be considered.

Suding (2011) provides an overview of restoration ecology, covering both the criticisms leveled at its practice and the likelihood that restoration projects will prove self-sustaining. Compensatory mitigation does not always entail restoration (it also allows the creation or enhancement of wetlands or streams), however, we can apply lessons learned from restoration ecology to determine the utility of mitigation practices. Suding lists some of the problems that critics of restoration have identified – it is ad hoc, occurs

on a site-specific basis, and often is not underpinned by a coherent theoretical or conceptual framework. A further difficulty presented by restoration practice is that it often relies on outdated theories of ecological succession, the idea that ecological recovery will occur in an orderly, monotonic fashion (i.e. early colonizers are gradually replaced by species that emerge later in the process as a community moves towards a climax). This has implications for compensatory mitigation. Mitigation sites are defined by contingent circumstances that affect the recovery of wetlands or streams. These contingencies may derail progressive ecological succession, which could present problems if planners and developers have based their mitigation designs on assumptions about succession unfolding in a deterministic sequence. Further, restoration projects can be hampered by invasive species colonizing newly opened restoration sites. Suding concludes that restoration is often partially effective at repairing damaged ecosystems, however, it often fails to bring the restored area up to the standards present at reference sites, or to what existed before an ecosystem was damaged. With respect to compensatory mitigation, Suding (2011, p. 32) writes that, "Even when the area restored is larger than the area lost, compensation seldom succeeds in restoring structure, composition, or function." It is critical to recall that recovery times vary significantly among landscapes. Even if a project succeeds, based on short-term assessments, this does not guarantee an ecosystem will continue on a long-term pathway toward full recovery. Another factor to consider is the difference between compliance success, which is a regulatory matter, and ecological success, which is a matter of functionally restoring biogeomorphic form-process relationships. Often, the success of mitigation projects is based on whether it complies with the stated goals, instead of determining success based on the quality of habitat restored (Matthews and Endress, 2008).

A brief survey of studies concerned with the successes and failures of compensatory mitigation further clarifies where it does and does not live up to expectations. Spiels (2005) assessed the performance of mitigation banks used to replace impacted wetlands. Often, mitigation banks or large-scale restoration projects are touted because they are able to consolidate reparative activities in a single area. Whether this is the most efficient procedure remains unclear, given that it can possibly lower ecological heterogeneity, which in turn reduces ecosystem performance. Further, Spiels notes that performance measures are frequently tied to vegetation indices. This is problematic because indices do not accurately gauge ecosystem performance in complex environments such as wetlands, or streams with an extensive riparian community. Observing that mitigation results are inconsistent and can depend on what kind of criteria are used to define restoration success, Spiels emphasizes that "Mitigation banks, which ostensibly should be held to higher standards, do not seem to be dramatically more successful than individual mitigation projects" (p. 62).

Brown and Veneman (2001), in a study of compensatory mitigation in Massachusetts wetlands, found that restoration projects encompassing large areas are typically planned with greater care and are more likely to comply with regulations. However, they also demonstrated that plant communities found in replacement wetlands rarely matched up with the plant communities that inhabited the original wetlands. This study focused on whether sites satisfied state requirements, and in 75 percent of the cases they failed to. Kettlewell et al. (2008) obtained similar results for mitigation projects in the Cuyahoga River Watershed, Ohio. While mitigation produced a net gain in wetland area, much of this was attributable to off-site mitigation; the Cuyahoga Watershed actually experienced a *net loss* of wetland. Supporting the idea that consolidated restoration projects do not constitute an in-kind replacement of small wetlands, Kettlewell argued that mitigation negatively impacted landscape heterogeneity, while also disrupting metapopulation dynamics. The most important finding from this study is the temporal lag time associated with restoration. Restoration sites experienced a significant temporal loss for 12-18 years following restoration activities. In some cases these losses extended for longer periods. This loss of function applied not only to ecological processes, but also to hydrological, biogeochemical, and geomorphic processes (see also Zedler and Callaway, 1999).

Stefanik and Mitsch (2012) used statistical analyses to compare the performance of mitigation sites to reference sites. They found that mitigation sites and reference sites were statistically similar with respect to species diversity, but there were also substantial differences. Aboveground net primary productivity and species richness were each lower in mitigation sites. Hoeltje and Cole (2007) used the HGM Approach to quantify functional losses in mitigation wetlands, and uncovered differences in hydrological functioning between impacted wetlands and replacement wetlands. For example, when mitigation replaced wetlands characterized by a dry hydrological regime, regulatory agencies were reluctant to approve restoration plans that recreated them exactly, preferring instead wetlands that performed best under long-term inundation. Compared to the original, impacted wetlands, created wetlands were more vulnerable to disturbance and more fragmented. Vulnerability to disturbance can be problematic in this context because wetland landscapes in which disturbances commonly occur can experience higher sedimentation rates, eutrophication, and contamination. Importantly, Hoeltje and Cole (2007) also observed that "established" mitigation sites (i.e. older ones) do not resemble reference sites any better than recently created wetlands, dispelling the logic of succession implicit in many restoration designs. Sudol and Ambros (2002) reached similar conclusions to the studies that are outlined above. After assessing the success of mitigation sites in Orange County, California, they discovered net losses in wetland habitat. Many of the sites fulfilled the requirements set out in USACE permits, but as noted above, these requirements are rarely based on making qualitative habitat assessments, which the 2008 Compensatory Rule Change aimed to alleviate (for another large-scale evaluation of mitigation success, see Tischew et al. 2010).

Remaining is an extensive amount of unreviewed literature on ecological restoration and compensatory mitigation. , but there is a general consensus that these practices at least partially offset the ecological damage caused by various development projects. Whether mitigation *perfectly* replaces the lost ecosystem structure and function of impacted wetlands and streams remains another question entirely – one that we can answer in the negative. This is not an argument against restoration or mitigation, but simply a reminder to remain cautious about what it can and cannot do. This is especially relevant in the context of stream restoration. As Stokstad (2008) reports, many researchers harbor skepticism about the effectiveness of stream mitigation because stream restoration science is a new field. There is no definitive evidence that an engineered stream can replace the functionality of a natural one that has been impaired or destroyed. There is still no consensus on what criteria can reliably measure the success of stream restoration. Geomorphic stability alone does not encompass all of the full range of a stream's ecological and geomorphic functions; early research into stream restoration hints that aquatic life suffers and that engineered streams have difficulty retaining nutrients (Lave et al. 2008).

Because so little time has passed since the 2008 rule change there is little information on post-rule change stream mitigation practices and how it will impact the results of restoration in the future. But the case studies looking at wetland performance should be illustrative. It is probable that restoring or creating new streams can partially offset the natural functions lost at impacted sites, but it will be impossible to faithfully replicate these functions. Mitigation, in whatever form it takes, should attempt to recuperate as many functions as possible while using an approach that is context-sensitive and adopts a watershed approach to restoration.

2.5 Conclusion

This chapter reviewed the conceptual premises underlying compensatory mitigation as well as the actions required of developers, state agencies, or other entities that damage or destroy wetlands or streams during a project. Section 404 of the Clean Water Act mandates that unavoidable impacts to wetlands and streams be offset through some form of mitigation – compensatory mitigation, in-lieu fee mitigation, or permittee-responsible mitigation. The 2008 rule change establishes a clear preference for compensatory mitigation that is transacted via mitigation banks (though it retains the earlier mitigation sequence). As noted, there are a number of methods available to assess the ecosystem impairment that results from a road project.

Brief summaries were provided of the HGM Approach, RBPs, and the Rosgen classification system. Although many states have adopted the Rosgen method for the purpose of stream mitigation, the USACE often employs RBPs or the HGM Approach. Lastly, this chapter addressed the question of whether compensatory mitigation actually works. This track record is spotty, and many scientists remain uncertain whether a lost wetland or stream can be replaced with a functionally equivalent one. However, this is not to suggest mitigation is a pursuit fraught with folly. Any mitigation project will be imperfect, and while a repaired or created stream, ditch, or wetland is unlikely to precisely replicate the lost structure and form of impacted sites, mitigation is necessary to regain ecosystem services lost via infrastructure projects.

Chapter 3 Interpreting Section 404 of the Clean Water Act

3.1 Strategies for Obtaining Ditch Mitigation Approval under Section 404

In 2008, the EPA issued a final ruling to amend Section 404 of the Clean Water Act (CWA), which prescribes the mitigation procedures the U.S. Army Corps of Engineers (USACE) use to determine the appropriate compensatory action for the loss of wetlands, streams, and other jurisdictional waters. The rule formalized long-standing practices that had not previously been codified in federal law. It has significant bearing on this project, as Section 404 puts into place a mitigation sequence that all USACE district engineers rely upon to determine the appropriate form of mitigation for a specific restoration project.

While the CWA guides compensatory practices nationwide, how it is applied varies from place to place. This is because 38 USACE Districts, ten regional EPA offices, ten U.S. Circuit Courts, and nine regions of the Fish and Wildlife Service are responsible for administering Section 404. Doyle et al. (2013) classify this delegation of powers as a form of environmental federalism. Federalism, more broadly, is the idea that in a large democratic state, "geographic subdivisions should substantially control how nationally articulated principles affect decision making" (Doyle et al. 2013, p. 290). For environmental policy, this means that laws that have nationwide applicability are enforced in a spatially uneven manner because offices that operate beneath the federal level have responsibility for setting and enforcing regulations. As such, the interpretation and application of federal laws occurs within specific geographic contexts. As Doyle et al. (2013) demonstrate, there is considerable variability in how Section 404 is administered across USACE Districts with respect to stream mitigation. Comparing regulatory documents from across the U.S., they found that "there is no consistent national practice or policy implementation for stream mitigation assessment" (p. 297). This is consequential because it suggests that even following the amendment of Section 404, USACE Districts retain the authority to develop stream mitigation guidelines consistent with the CWA, but which also are fitted to the specific climatic, ecological, fluvial, and anthropogenic conditions dominant in a particular locale. As such, the principle of environmental federalism enables the formulation of region-specific policies that will ensure governance and regulatory frameworks that take into account the spatial variability of river and stream systems. This knowledge conditions our interpretation below, which holds it is within the Louisville District's purview to develop an agreement with the Commonwealth of Kentucky that enables a less onerous form of stream mitigation than is currently required, but one that remains faithful to the core tenets of the CWA.

The amended rule has significant implications for how the Kentucky Transportation Cabinet (KYTC) frames its approach to the problem of jurisdictional roadside ditch mitigation. Originally, the aim of this project was to objectively determine, using biological metrics (rapid bioassessment protocols, or RBPs), whether direct replacement of roadside ditches would fulfill compensatory mitigation requirements stipulated by the CWA. Kentucky Transportation Center (KTC) researchers were tasked with determining under what circumstances it is possible to obtain a mitigation exemption from the USACE. Would direct replacement exempt the Commonwealth of Kentucky from having to perform more extensive mitigation for the impairment caused during ditch relocation and reconstruction? Most commonly, the Commonwealth of Kentucky pays in-lieu mitigation fees to offset the ecological damages caused when ditches are moved as part of road construction projects.

As the project is currently framed, several problems make it difficult for KYTC to receive the USACE's approval. KYTC has operated under the assumption that it may be possible, under the CWA's mandate, to directly replace jurisdictional ditches of uniformly poor ecological quality and obtain mitigation exemptions that would relieve it of any obligation to perform further mitigation. While KYTC's request is reasonable, it is also unworkable because of the structure and language of the CWA for several reasons. First, the CWA does not contain *explicit* language about "direct replacement" or "mitigation exemptions." Because the CWA does not make allowances for these practices, nor does it define or recognize them,

KYTC should not frame its proposal in these terms when interacting with the USACE. As these terms lack legal standing under the CWA, the USACE could not approve any project that introduces new concepts not recognized in federal law. Asking the USACE to do otherwise is tantamount to requesting they operate outside of the legal framework put into place by the CWA.

Beyond this issue, a second problem with KYTC's proposed approach is that direct replacement suggests a like-for-like replacement. This form of replacement is not licensed by the CWA. For example, if a ditch that will be moved as part of a road construction project receives a score of 35 using a RBP, it will not be permissible to create a new or restored ditch that attains a similar score. A principal aim of Section 404 of the CWA is to ensure that compensatory mitigation results in a *net improvement* to habitat. To accomplish this, USACE officials set functional assessment ratios for a given project. Functional assessment ratios are often in the range of 1.5:1, although 2:1 is also common. The district engineer has the discretion to impose more stringent (e.g. 2:1) or less stringent ratios depending on the magnitude of impacts, landscape sensitivity, and other contingent factors. For example, suppose that a ditch scores 30 points on a RBP before relocation. If a 2:1 replacement ratio is set by the district engineer this means the new ditch must score at least 60 points for compliance. The reason functional mitigation ratios in excess of 1:1 are used is to offset temporal losses that accrue when a ditch is moved or restored (although some district offices have granted states' request to use 1:1 ratios; see Chapter 5). A temporal loss refers to the time elapsed between the beginning of mitigation and the restoration of full ecological functionality. As such, the USACE would likely obligated to reject any proposal that puts forward a like-for-like replacement – some improvement is always necessary (though, based on follow-up discussions with other states, it may be possible to implement a 1:1 restoration ratio).

During preliminary discussions, the question of monitoring emerged as a concern for KYTC. Long monitoring periods (up to five years), in the view of the state, are unwarranted given that the restoration target is ditches of extremely poor ecological quality, with RBP scores less than 50 in most cases. Some ditches are completely devoid of aquatic life. Section 404, however, mandates that all projects receive monitoring for *five years* at a minimum. Again, the district engineer can increase the required monitoring time in some cases. But what is important to note is that the five-year period is *non-negotiable* the majority of the time. While this does present a hurdle, there are no strict definitions on what constitutes proper monitoring, and a monitoring plan is developed and agreed to with the district engineer and state officials collaborating. It is likely that repeat RBPs would be sufficient to monitor the mitigation project performance, however, the exact details of monitoring are subject to negotiation. The suggestion that RBPs would be sufficient is based on what is currently practiced (but see below).

The goal of this project, moving forward, should be to determine strategies to achieve the objectives originally envisioned by KYTC, but in such a way that does not attempt to work around or transgress the CWA's legal framework. Productive discussions with the USACE should focus on questions of procedure, on how to achieve the state's desired goal while not violating any aspects of the CWA. Conversations should not focus on results alone, or take the tone of the Commonwealth of Kentucky imposing solutions on the USACE; conversations must work towards solutions KYTC and the USACE find mutually agreeable, and which can be implemented throughout the state on a consistent basis.

The remainder of this chapter describes potential ways of approaching this problem. It begins by revisiting Section 404's prescribed mitigation sequence and what bearing this has on KYTC's proposal. Further, it uses a close reading of language contained in the CWA to argue that what KYTC proposes is legally sanctioned by the CWA – if framed using the appropriate language. Next, it examines the impact of *Rapanos v. United States*, a Supreme Court case that dealt with making jurisdictional determinations under the CWA. Although there is language in *Rapanos* to suggest that some of the roadside ditches that fall under the purview of this research are not in fact jurisdictional, the EPA has not yet issued a final rule responding to the decision. However, the draft guidance that has been released hints at a more

conservative approach, with more restrictive standards used to make jurisdictional determinations. Many of the ideas and recommendations elaborated below were discussed with Dr. Morgan Robertson, who is currently an Associate Professor in the Department of Geography at the University of Wisconsin – Madison. He also co-authored the 2008 rule change to Section 404.

3.2 Section 404 Details

When projects require compensatory mitigation, USACE district engineers are required to follow a mitigation sequence to identify what form of action is most appropriate for a given situation. There are two sequences to consider. First, Section 404 mandates that projects should, if possible, *eliminate* adverse impacts. If this is not possible, projects should *minimize* negative impacts. However, if neither elimination nor minimization is practical, stakeholders are legally obligated to perform *compensatory mitigation*. For the purposes of this research, it is assumed that elimination or minimization of impacts is not possible, and that compensation is required.

Successful compensatory mitigation must meet a number of criteria. Section 404 states that "the required mitigation should be located where it is most likely to successfully replace lost functions and services, taking into account such watershed scale features as aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources (including the availability of water rights), trends in land use, ecological benefits, and compatibility with adjacent land uses" (USACE and EPA 2008, p. 19673). To realize these goals, Section 404 outlines a mitigation sequence that district engineers work through to decide the most appropriate form of compensatory action. As per the 2008 rule change, the district engineer "shall consider the type and location options in the order presented in [404(b)(2)] through [404 (b)(6)]" (p. 19673). That is, certain kinds of mitigation are privileged over others. More specifically, this requires that district engineers give priority to mitigation banking. If mitigation banking is not an option they can consider the following compensatory methods: 1) in-lieu fee program credits, 2) permittee-responsible mitigation under a watershed approach, 3) permittee-responsible mitigation through on-site and in-kind mitigation, and 4) permittee-responsible mitigation using off-site and/or out-of-kind mitigation.

Section 404 establishes a preference for mitigation banking; however, the district engineer has the authority to select another option if it is most likely to successfully replace lost ecological functionality. KYTC currently pays significant in-lieu fees to compensate for unavoidable impacts. In part, this implies that purchasing mitigation bank credits is not a viable option, and that there are an insufficient number of banks to generate the number of credits needed to mitigate for losses. *What KYTC seeks to obtain, therefore, is approval for permittee-responsible mitigation, either through a watershed approach or through on-site, in-kind mitigation. As such, KYTC wants to change the mitigation sequence as stipulated by Section 404(b)(1) guidelines*. Indeed, the salient issue here is that the language contained in Section 404 (b)(4), which lays out the conditions under which permittee-responsible mitigation will be accepted by the USACE: "Where permitted impacts are not in the service area of an approved mitigation bank or in-lieu fee program that has the appropriate number and resource type of credits available, permittee-responsible mitigation is the only option" (p. 19673). In keeping with the compensatory mitigation sequence, this language suggests that permittee-responsible mitigation is only allowable if mitigation banking or in-lieu fee programs are unavailable.

On the one hand, this appears to discount permittee-responsible mitigation if mitigation banking or in-lieu fee payments are workable options. On the other hand, language elsewhere in Section 404 indicates a possible workaround consistent with the CWA. Elsewhere it states that district engineers decide on the type of mitigation needed to issue a DA (Department of the Army) permit "based on what is practicable and capable of compensating for the aquatic resource functions that will be lost as a result of the permitted activity. *When evaluating compensatory mitigation options, the district engineer will consider what would be environmentally preferable*." Moreover, "in making this determination, the district

engineer must assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed, and the costs of the compensatory mitigation project" (p. 19672; emphasis added). This language has several crucial implications for ditch mitigation.

First, there is the issue of what is going to be sustainable ditch mitigation, and therefore environmentally preferable. One strategy to pursue is demonstrating that permittee-responsible mitigation is the most ecologically effective way to meet these goals. However, a better tactic is – if evidence supports it – to argue that permittee-responsible mitigation is more appropriate for the small-scale restoration projects associated with ditch mitigation than in-lieu fees. Newly built ditches are located proximate to the ones they replace; therefore, if they are constructed to meet the functional assessment ratios required by the district engineer, it is more likely they will effectively mitigate for the ecological functionality lost during the relocation or restoration process. Proximate replacement is also more consistent with a watershed/landscape approach because it will ensure ecological functionality is compensated for in the location where it was originally lost from.

Further, this passage, although ambiguous, requires that district engineers take into account the cost of the compensatory mitigation project. If it is possible to achieve functional improvements through permittee-responsible mitigation at a fraction of the cost of banking or in-lieu fees, KTC researchers can convincingly argue that more cost prohibitive means of mitigation fail to generate the significantly improved outcomes that would justify additional expense. Another rationale could be mobilized on behalf of this argument. A primary aim of Section 404 is to create restoration projects that improve on the ecological functionality and integrity of the original, degraded site. As noted, establishing robust functional assessment ratios are used to accomplish this goal. But recall that functional assessment ratios compensate for temporal losses that occur during restoration. While paying in-lieu fees eliminates temporal losses because "replacement" is immediate, there is a strong case that permittee-responsible mitigation that performs restoration activities close to the original impact zone would a) minimize temporal losses *and* b) temper the costs the Commonwealth of Kentucky would have to pay. Any restoration plan will also have to show that it can yield a self-sustaining landscape that can maintain its health (at least through the monitoring period, although Section 404 is unclear, more broadly, when it comes to defining sustainability; see below). This can work to KYTC's advantage. Mitigation banking sites and blocks of land set aside for in-lieu fee programs are likely to meet these criteria because they are carefully monitored. While banks are located in the same watershed as the streams that are impacted by a project, they cannot replicate the spatial context of the original ditches. If replacement ditches are located within a few hundred feet (or less) of the original ditch, better outcomes will be achieved, and the landscape, though altered, will remain in a similar state to its previous condition. It could be argued that with an appropriate monitoring regime in place, permittee-responsible mitigation represents the method most likely to create a self-sustaining landscape because monitoring occurs within the original landscape subject to mitigation. Although this represents a form of compensatory mitigation, adopting this strategy would also *minimize* the overall impacts of the project – a clear requirement of Section 404.

Section 404 does not specify particular best practices for monitoring. As with other matters that have been discussed, the district engineer may exercise considerable discretion. Likewise, there is enough flexibility in Section 404's language that monitoring does not have to entail costly, time-consuming follow-up studies. However, this issue merits a bit more scrutiny. Section 404 requires that all mitigation plans carry a set of performance benchmarks that can be used to evaluate whether the restoration is achieving its objectives. There is no universal set performance benchmark; metrics should be chosen that give stakeholders the ability to *objectively evaluate* the project to determine if a site is progressing towards its targeted state. What Section 404 emphasizes is that performance standards "must be based on attributes that are objective and verifiable. Ecological performance standards must be based on the *best available science that can be measured or assessed in a practicable manner*" (p. 19678). Given that the USACE

currently uses RBPs, there is no reason to believe these do not count as a legitimate tool to monitor performance. Any proposals advanced by KYTC should emphasize that initial assessments and follow-up monitoring will rely upon RBPs.

One countervailing possibility is that because KYTC wants to bypass steps in the mitigation sequence the USACE could in fact demand more strenuous monitoring of the restored ditches. Keeping in mind these are very low quality water bodies, §332.6 (Monitoring) points towards an argument that could be leveraged in response to this demand. This section reads, in part: "The submission of monitoring reports to assess the development and condition of the compensatory mitigation project is required, *but the content and level of detail for those monitoring reports must be commensurate with the scale and scope of the compensatory mitigation project, as well as the compensatory mitigation project type*" (pp. 19678-19679). In large-scale projects (such as wetland banks), it is reasonable to expect more detailed monitoring to take place. The key phrase to highlight is "commensurate with the scale and scope" of the project – ditch mitigation encompasses small-scale projects that impact small pieces of the landscape, which should make less intensive monitoring protocols acceptable. Arguably, under any circumstances RBPs are suited to *objectively* evaluate the progress of a ditch mitigation project (thus meeting the objectivity criteria). RBPs lack the detail of more comprehensive methodologies, but there is no compelling rationale to argue for more intensive monitoring on minor projects without demonstrating that doing so would produce significantly better restoration outcomes. There is no evidence to suggest RBPs are ineffective, and since the USACE routinely employs them, it speaks to the confidence the organization has in their capacity to impartially assess habitat quality and functionality.

Multiple factors weigh on this issue. It is the responsibility of KTC researchers, and KYTC, ultimately, to demonstrate that permittee-responsible mitigation addresses the legal requirements set out in the CWA. As Hough and Robertson (2009, p. 24) write, permittee-responsible mitigation is the most traditional form of compensation, "and *still represents the majority of the compensation acreage* [for wetlands] *provided each year*."

3.3 – Relevance of *Rapanos v. United States*

In 2005, the Supreme Court of the United States rendered judgment in the case of *Rapanos v. United States*. This case centered on the issue of jurisdictional determinations (i.e. under what circumstances are waters protected by the CWA). In 2008, the EPA issued interim guidance based on the decision. This decision was especially complex because of the divergent opinion of the court, although Justice Kennedy's opinion has generally been treated as the controlling one (a plurality opinion was issued by four other justices, which does overlap to some extent with Kennedy's). Following up on interim guidance, the EPA released new draft guidance in summer 2011. Not all of the guidance is relevant to this research. However, this guidance lays out explicit rules that define when roadside ditches do and do not receive protection under the CWA: "Non-tidal ditches (including roadside and agricultural ditches) [are] not tributaries except where they have a bed, bank, and ordinary high water mark; connect directly or indirectly to a traditional navigable or interstate water; and have one of the following five characteristics":

1. Natural streams that have been altered (e.g. channelized, straightened or relocated)
2. Ditches that have been excavated in waters of the U.S., including wetlands
3. Ditches that have relatively permanent flowing or standing water
4. Ditches that connect two or more jurisdictional waters of the U.S.
5. Ditches that drain natural water bodies (including wetlands) into the tributary system of a traditional navigable or interstate water

These are key distinctions because the Court's opinion (both Kennedy's and the plurality), as well as the draft guidance, confer authority to the EPA and USACE to assert jurisdiction over tributaries (EPA 2008, p. 11). Under this reading of the draft guidance, it is unlikely that relocated or reconstructed ditches *would*

not qualify as a jurisdictional water body. While this is a sweeping claim based on the guidance available, in most cases roadside ditches possess a bed, bank, and ordinary high water mark, connect to another water of the U.S., and have undergone some form of alteration (e.g. relocation). However, in some cases there may be no apparent connection between a roadside ditch and traditional navigable waters or interstate waters. If there is uncertainty on this question, agencies are required to perform a significant nexus analysis. A significant nexus analysis is used to determine if a water body "either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity or traditional navigable waters or interstate waters" (p. 7). This is an exceptionally broad standard. Currently there are no standards proposed that quantitatively specify the threshold conditions necessary to delineate a significant nexus, and this issue will likely remain in the hands of the district engineers, given the difficulty of using a uniform set of standards for *all* ecoregions. Although the interim guidance issued by the EPA in 2008 noted that the EPA and USACE would claim jurisdiction of "non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally [i.e. at least three months]," intermittent or ephemeral flows do not necessarily exempt streams or ditches from protection under the CWA. Any stream with discontinuous flow must undergo a significant nexus analysis to determine its connection to other water bodies. As such, the results of this analysis are more salient to determining jurisdiction. Jurisdictional evaluations, ultimately, cannot be based on flow characteristics alone because a channel with discontinuous flow can still significantly affect the chemical, physical, or biological integrity of traditional navigable waters or interstate waters. In short, given the *Rapanos* decision, and the forthcoming rule, which is likely to be conservative in its application of the Supreme Court ruling, it is *highly unlikely* that the Commonwealth of Kentucky could demonstrate that the kinds of roadside ditches that are the focus of this research *do not* fall under the jurisdiction of the CWA.

3.4 Proposed Rules Changes to the Clean Water Act

On 21 April 2014, the Environmental Protection Agency (EPA) released for public comment a proposed rule that would clarify and redefine the scope of waters that fall under the protection of the Clean Water Act (CWA). This proposed rule change stemmed from a series of cases argued before the United States Supreme Court that questioned what conditions are necessary for a water to come under the CWA's jurisdiction (i.e. the cases sought to determine what qualifies as a jurisdictional water). The resulting decisions from the Supreme Court provided guidance on this question; however, they did not provide adequate clarity. In an effort to correctly apply the Supreme Court's interpretation of the CWA, EPA officials worked toward publishing a rule that would: 1) clearly spell out what constitutes a jurisdictional water under the CWA, 2) improve enforcement of the CWA, and 3) offer unambiguous guidance to the public regarding what kinds of waterbodies fall under the CWA's purview. As such, the proposed rule offers a more straightforward definition of what waters qualify as waters of the United States, and which are regulated and managed accordingly. The purpose of this section is to summarize the rule and the potential implications it has for stream and ditch mitigation protocols currently required under Section 404 of the CWA. It is critical to note this is only a *proposed* rule change. It has not yet been codified. The public comment period closed on 14 November 2014. Because this is a relatively fraught issue, it is likely that the EPA will receive a large number of comments, suggestions, and critiques (much as it did when Section 404 was amended in 2008). Consequently, it is unlikely the proposed rule will go into effect in the immediate future. It is probable that a final rule will not be published until late 2015 or early 2016. Appendix A contains the complete text of the proposed rule change.

The proposed rule change applies to all sections of the CWA, and it defines waters of the United States as:

- All waters that are currently used, were used in the past, or may be susceptible to use in interstate or

foreign commerce, including all waters that are subject to the ebb and flow of the tide (a)(1)[1]
- All interstate waters, including interstate wetlands (a)(2)
- All impoundments of a traditional navigable water, interstate water, the territorial seas or a tributary (a)(3)
- All tributaries of a traditional navigable water, interstate water, the territorial seas or impoundment (a)(4)
- All waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment or tributary (a)(5)

On a case-specific basis, waters of the United States would include other waters or wetlands if those features by themselves, or in combination with other waters in the same region, have a significant nexus to a traditional navigable waterway, interstate water, or the territorial seas. "Other waters" includes a number of *surficial* water features, however, they are considered jurisdictional only if they have a significant nexus to the waters listed in subparagraphs (a)(1) through (a)(3) (see Appendix [A] for the full text of the new rule; waters in subparagraphs (a)(1) through (a)(3) are those listed in the first three bullets above). The rule provides basic guidelines to identify where a significant nexus exists. Very simply, a significant nexus is present if a water (including wetlands), either in isolation or in combination with similarly placed waters in the same region, significantly affects the chemical, physical, or biological integrity of the waters listed in paragraphs (a)(1) through (a)(3). While this appears like a relatively straightforward metric, the rule is less clear when it comes to what counts as a significant connection.

A second section of the proposed rule change specifies what waters are not considered waters of the United States – i.e. non-jurisdictional waters. The waters listed below would be excluded from this category, even if they would otherwise be included in the categories described in (a)(1) through (a)(7). Non-jurisdictional waters are:

- Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act
- Prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act the final authority regarding Clean Water Act jurisdiction remains with EPA
- Ditches that are excavated wholly in uplands, drain only uplands, and have less than perennial flow
- Ditches that do not contribute flow, either directly or through another water, to a traditional navigable water interstate water, and the territorial seas or a jurisdictional impoundment
- Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease
- Artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing
- Artificial reflecting pools or swimming pools created by excavating and/or diking dry land
- Small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons
- Water-filled depressions created incidental to construction activity
- Groundwater, including groundwater drained through subsurface drainage systems
- Gullies and rills and non-wetland swales

Two classes of ditches are included among those waters not covered by the CWA (see discussion below). The other exempted waters describe above do not apply to this study. Understanding some of the rule's finer points, such as what constitutes a tributary or the evidence of a significant nexus analysis relies upon, is critical to getting at the proposal's implications for mitigation. The proposed rule does not

[1] This corresponds to the paragraph number in the proposed rule change. The remainder of this chapter frequently refers to (a)(1) through (a)(5) waters, and their definition corresponds to those listed here.

address mitigation per se, but in redefining what constitutes a water of the United States, it will have significant bearing on what features must comply with Section 404.

The proposed rule suggests that for an effect to be significant, that effect must be substantiated empirically. That is, a significant nexus cannot be identified on the basis of speculation or insubstantial evidence. The proposed rule states there are a large number of peer-reviewed publications attesting to how streams (individually and cumulatively) strongly influence the character and functionality of downstream. The rule further claims that: "All tributary streams, including perennial, intermittent, and ephemeral streams are chemically, physically, and biologically connected to downstream rivers via channels and associated alluvial deposits where water and other materials are concentrated, mixed, transformed, and transported" (FR 2014, p. 22222). Similar findings hold for many wetland areas.. Despite the scientific justification for conducting significant nexus analysis, the proposed rule does not contain clear guidance on acceptable methods to determine if a significant nexus links two waters. The dominant flow regime of a tributary is irrelevant for determining whether it falls under the jurisdictional purview of the CWA. Streams with perennial, ephemeral, or intermittent flow, as long as they eventually drain into – or are a part of – a network of tributaries emptying into an (a)(1) through (a)(4) water are classified as jurisdictional. Returning to the question of identification, the proposed rule states that tributary connections "may be traced using direct observation or U.S. Geological survey maps, aerial photography, or other reliable remote sensing information, or other appropriate information" (FR 2014, p. 22202). Empirical markers that signify the presence of a tributary include defined bed and banks and an ordinary high water mark. These indicators demonstrate that flow moves through a water feature; they can result from perennial, ephemeral, or intermittent flows.

But there is considerable interpretive leeway in implementing this definition. Although the rule change's stated purpose is to eliminate regulatory ambiguities, arguably the application of the rule will vary across the U.S. – there is no guarantee, for example, that USACE Districts will coalesce around a unified understanding of what counts as a tributary. Indeed, the proposed rule, while purporting to clarify what count as jurisdictional waters, does not offer concrete evaluative standards. It is unclear whether the EPA plans to elaborate on this point in a future rule, or if the U.S. Army Corps of Engineers and other agencies will be tasked with enforcing different sections of the CWA. Although the rule defines all tributaries as jurisdictional, deciding if a particular feature is a tributary will be subjective. The EPA is intentionally vague in the methods and indicators that are appropriate to determine whether a feature qualifies as a tributary, and this could potentially encourage the use of variable, ad hoc methods to perform significant nexuses analyses. This would translate into a checkered and inconsistent regulatory landscape.

Tributaries are a primary area of focus in the new regulations, as noted. The EPA, as discussed above, generally classifies tributaries as jurisdictional, particularly where a significant nexus is present. The working definition of a tributary is: "a longitudinal surface feature that results from directional surface water movement and sediment dynamics demonstrated by the presence of bed and banks, bottom and lateral boundaries, or other indicators of OHWM [ordinary high water mark]" (FR 2014, p. 22202). However, later on in the rule, the EPA makes clear that it is not essential for a tributary to have all of these elements. The second definition offered of tributaries is: a feature "physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through another water identified in paragraphs (a)(1) through (a)(4). *In addition, wetlands, lakes and ponds are tributaries (even if they lack a bed and bank or ordinary high water mark) if they contribute flow, either directly or through another water to a water identified in paragraphs (a)(1) through (a)(3*)" (FR 2014, p. 22201, emphasis added). Given this, the primary standard in making a jurisdictional decision is whether or not a surface water feature contributes flow, directly or indirectly, to (a)(1) through (a)(3) waters. If this is the case, it is unclear if the issue of functional connectivity or morphological indicators takes precedence in resolving jurisdictional questions. Indeed, the EPA's interpretation of the rule holds that physical indicators are useful benchmarks to make a determination. But some tributaries may lack

well-defined beds, lateral definition, or an ordinary high water mark (e.g. dryland streams) – even so, a functional connection to waters of the United States may exist. As such, based on the standard applied to wetlands, lakes, ponds, and other adjacent waters (see below), it appears that decisions will ultimately hinge on functional connectivity. That is, whether a tributary or non-tributary contributes flow to a jurisdictional water. Clearly, this is one possible interpretation of the new regulation. And the final rule, after comments have been received, may be tweaked to provide additional clarification. Between uneven application, the vague standards for determining a significant nexus, and the EPA's comments about connectivity and flow, it seems inevitable the new rule will not provide the clarity the EPA aims for.

A number of artificial and humanly constructed features can be classified as tributaries, including: wetlands, rivers, streams, lakes, ponds, impoundment, canals, and ditches that are not excluded in paragraph (b)(3) or (b)(4) of the proposed rule. Because the CWA has sought to protect interstate waters, waters of the United States will include tributaries that drain into interstate waters, waters adjacent to interstate waters, waters adjacent to tributaries of interstate, and "other waters" having a significant nexus to interstate waters. The only circumstances under which a tributary would be considered a non-jurisdictional water are if it is excluded under section (b) (see below for a list of waters that fall under this designation). The EPA's reasoning behind this decision is that tributaries perform critical ecological functions in watersheds that reverberate through the chemical, physical, and social integrity of traditional navigable waters, interstate waters, and territorial seas. This decision, if retained in the final rule, has far-reaching implications. Tributaries, as defined under the proposed rule, have a significant nexus to traditional navigable waters, interstate waters, or territorial seas. Critically, "under this proposal any water that meets the definition of tributary (and is not excluded under section (b) of the proposed rule) is a 'water of the United States,' and the agencies would only need to determine that a water meets the definition of 'tributary'" (FR 2014, p. 22201). What this means is that agencies, in making jurisdictional determinations about tributaries, would only need to verify the water meets the definition of "tributary" proposed by the rule. Further, for a water to be designated a tributary does not require that it *directly contribute flow* to waters in paragraphs (a)(1) through (a)(4). The definition offered in the rule stipulates that a water can contribute flow directly or may supply flow to another water or waters that eventually flow into an (a)(1) through (a)(4) water. It can be part of a broader tributary that feeds into the jurisdictional waters listed above. Again, this raises questions about significant nexus analysis, and seems to validate a reading of the rule that underscores hydrological connectivity as opposed to physical or morphological indicators to make jurisdictional determinations.

In the rule's interpretive section, there is a discussion of whether tributary networks have a significant nexus to other waters of the United States. Here, the EPA underscores that distance from small tributaries, even those with infrequent flow or those located far away from the nearest (a)(1) through (a)(3) water are nevertheless integral components of tributary networks. Even at a significant distance from an (a)(1) through (a)(3) water, they are likely to significantly impact the chemical, biological, and physical integrity of those waters. Thus, "[when] their functional contributions to the chemical, physical, and biological conditions of down stream waters are considered at a watershed scale, the scientific evidence supports a legal determination that they meet the 'significant nexus' standard" outlined by Justice Kennedy in his *Rapanos* decision (FR 2014, p. 22206). While this project generally focuses on ditches, it is important to note several other components of the rule change that may influence road projects. For example, the proposed rule will eliminate "adjacent wetlands" as a jurisdictional category because it neglects waters not classified as wetlands, but which nevertheless maintain similar ecological and hydrological functions. In its place, the rule proposes the category of "adjacent waters" – and adjacency is determined using the definition in paragraph (a)(6). Like tributaries, adjacent waters are tightly coupled with (a)(1) through (a)(5) waters – physically, chemically, and biologically. That is, they have a significant nexus to them. The practical implications of this change are that features such as ponds, oxbow lakes, and wetlands that are adjacent to jurisdictional waters are waters of the United States. In this context, "adjacent" refers to a water that borders, is contiguous with, or neighbors another jurisdictional

water. As with other terms, "neighboring" acquires a specific meaning in this context – neighboring waters include those situated within the riparian area or floodplain of (a)(1) through (a)(5) waters. Waters that maintain a confined surface or shallow subsurface hydrological connection are also deemed jurisdictional. "Adjacent" encompasses waters, such as wetlands, that are separated by waters of the United States by humanly constructed dikes or barriers, natural river berms, and beach dunes (FR 2014, p. 22207). The treatment of adjacent and neighboring waters supports the "connectivity reading" of the rule, as do the other sections of the rule that speak to the role of direct and indirect flow. Indeed, if there is any flow connectivity at the surface or shallow subsurface level, envisioning a situation where the waters involved *are not* jurisdictional is nearly impossible.

From the perspective of this study, the most critical aspect of the proposed rule is its explicit discussion of ditches and whether they fall under the CWA's jurisdiction. The proposed rule recommends excluding ditches from waters of the United States if they: 1) are excavated entirely in upland areas; exclusively drain those upland areas; and do not have a perennial flow regime, or 2) do not feed water, either directly or through another water, to the waters named in paragraphs (a)(1) through (a)(4). This represents a continuation of guidance that had been issued following the adjudication of cases by the U.S. Supreme Court. In the proposed rule, the EPA places a great deal of emphasis on perennial flow – while it is straightforward to identify upland ditches conveying flow perennially, the EPA would like agencies to submit comments on the type of flow regime for a ditch excavated in uplands or draining uplands that would be necessary to omit a feature from jurisdictional consideration. If a ditch does not meet the requirements for exclusion (as outlined in paragraphs (b)(3) and (b)(4), then it is classified a water of the United States. Any ditch excluded under these criteria cannot, under any circumstances, be recaptured and retroactively deemed jurisdictional. If a ditch *does not* fulfill the conditions outlined in (b)(3) and (b)(4) it would be classified as a tributary if it meets the definitional requirements of a tributary (i.e. defined bed and banks, the presence of an identifiable ordinary high water mark, and contributing water to (a)(1) through (a)(4) waters. Jurisdictional ditches *may include, but are not limited to, these features*:

- Altered natural streams (e.g. streams that have been channelized, straightened, or relocated)
- Ditches excavated into waters of the United States, including jurisdictional wetlands
- Ditches that have perennial flow
- Ditches that connect two or more waters of the United States

Ditches that perennially flow but do not contribute flow to the tributary system of traditional navigable waters, interstate water, or territorial seas are not waters of the United States. Often, road construction projects involve manipulating the flow or course of natural ditches. If modifying natural waters that qualify as waters of the United States produces a ditch, it would be treated as a jurisdictional water so long as it conveys water into other jurisdictional waters. The only situations under which a ditch is not jurisdictional, under the proposed rule, are the two conditions outlined above (although see above the brief discussion of significant nexus analysis). Effectively, because all tributaries under the rule are viewed as having a significant nexus with traditional navigable waters, if it goes into effect, the majority of ditches affected by road construction projects in the Commonwealth of Kentucky would be jurisdictional. As a result, if a project moves, impairs, or destroys habitat, Kentucky would have the responsibility of mitigating for all losses according to the procedures laid out in Section 404. Given the requirements currently imposed by the Louisville District USACE, from a regulatory perspective the situation will remain unchanged since roadside ditches will remain jurisdictional. Tightening the definition of jurisdictional waters is more likely to negatively harm states that have comparatively lax standards enforced by local USACE District Offices. Pragmatically, this means that if KYTC officials want to utilize alternative mitigation strategies to compensate for losses, they will have to collaborate with USACE personnel to identify a workable solution that relaxes mitigation and monitoring standards for ditches with poor habitat.

3.5 Conclusions

Arguably, the proposed rule change enlarges the EPA's regulatory mandate. As described above, a number of issues remain to be worked out, however, it is abundantly clear that the overwhelming majority of ditches moved, impaired, or destroyed in the course of road construction fall under jurisdiction of the CWA. The more expansive definition of tributaries and adjacent waters makes it difficult to foresee a scenario in which ditches are routinely exempted from Section 404 mitigation requirements. Only ditches excluded under paragraphs (b)(3) and (b)(4) of the proposed rule would not be subject to the strictures imposed by the CWA. Although the proposed rule brings all tributaries under the CWA's ambit, as discussed above, uncertainty remains over how agencies will decide if a feature operates as a tributary (or adjacent water). Because of hydrogeomorphic and ecological variability that is present from watershed to watershed in the U.S., developing a universal standard is impractical because what a significant nexus looks like in an arid, ephemeral setting differs from how it looks and operates in a humid region, where streams flow perennially or intermittently. Physical indicators may be useful to guide interpretation in areas where tributaries are well defined; however, poorly defined streams often lack the physical markers mentioned in the rule's (preliminary) interpretation. This point is especially salient in arid regions. In the Commonwealth of Kentucky, physical indicators will likely be reliable, however; this is a generalization and may not apply to all cases. The EPA will likely receive a large number of comments on the question of whether physical indicators or functional connectivity determines a feature's jurisdictional status. Based on the rule's treatment of adjacent waters, which highlights the importance of surface and subsurface hydrological connections, it is likely that the jurisdictional standing of a water will encourage the question of whether a feature contributes flow to waters of the United States.

As noted in the previous chapters, there is already considerable variability in USACE District Offices' mitigation procedures. Arguably, this rule – given that it will have an effect on Section 404-related activities – will do little to correct for these. District offices, seemingly, would continue to have leeway on their interpretations of the CWA. Uneven mitigation practices will have biological, hydrological, and ecological consequences, but because of wide-ranging applications of the CWA and Section 404, U.S. states under the authority of different USACE District Offices will have to negotiate an uncertain regulatory terrain. In cases where USACE District Offices follow a more stringent and narrow reading of the CWA, states will have to comply with more restrictive mitigation practices. These may not differ from current requirements. However, there is little evidence in the new rule to suggest that mitigation responsibilities will become less onerous. That said, it is *extremely unlikely* the proposed rule will jurisdictionally exempt roadside ditches. As such, forging a collaborative relationship with the Louisville District USACE Office offers KYTC the most promising opportunity to devise new mitigation procedures that reduce costs to the state from ditch relocations, impairments, or losses. The survey results discussed in the next chapters indicate there is room to improvise mitigation strategies so that restoration is less expensive but so it also complies with the CWA. Citing other states that enjoy relaxed mitigation standards from their District Offices may help in this regard – although USACE officials are under no obligation to adopt practices from another District. Perhaps the best way to proceed is with a pilot project – one the Louisville District must approve – that takes advantage of alternative mitigation practices. Demonstrating these practices would offer comparable or even better performance than would be achieved by paying in-lieu fees or by purchasing mitigation bank credits, and would offer evidence that they are a credible alternative. KYTC, in making this argument, should underscore the benefits of *in situ* restoration. That is, restoration that does on-site repairs of impacted sites. Although in-lieu fees and mitigation banking no doubt have many benefits, taking restoration offsite means that the ecological and hydrological functionality that has been lost is not replicated – it is moved elsewhere. Doing so can have significant effects on a watershed's hydrogeomorphic and ecological relations. This argument is a compelling one, and is in keeping with the CWA's objectives.

Chapter 4 – Survey Results for Mitigation Practices

To understand the mitigation requirements other states are required to abide by, KTC researchers developed a brief survey that queried state transportation agency (STA) officials about how various USACE District Offices interpret and enforce Section 404 of the Clean Water Act. In 2011, KYTC personnel sent out a request to AASHTO members asking for information on mitigation practices; this effort yielded a limited number of responses. The survey (and results) described in this chapter sought to build on this preliminary knowledge database by eliciting a larger number of responses from a geographically diverse sampling of states. Survey questions focused mainly on whether states' lead USACE offices mandate the use of mitigation to compensate for impacts on low quality roadside ditches that are impaired during construction projects. At the outset, KTC researchers drafted a preliminary survey that was then provided to the study advisory committee (SAC). Advisory committee members reviewed the survey and offered recommendations on rewording and reframing some of the questions so that respondents would not have any difficulties interpreting the questions' intent. Once KTC researchers incorporated the changes suggested by committee members, the survey draft was finalized and distributed on AASHTO's email listserv. The survey contained nine questions, five of which pertained directly to states' mitigation practices. Appendix B contains a copy of the survey and the full set of responses the survey garnered. This chapter highlights some of the more salient and interesting replies for each question. As such, the focus is primarily on answers that indicate states have been permitted by District USACE Offices to engage in alternative mitigation practices consistent with those proposed by KYTC (primarily Questions 4-9). This chapter is broken into subsections that analyze responses for each question. Overall, the survey results affirm the fact that a patchy regulatory landscape exists – Section 404 is enforced differently throughout the United States. A number of USACE Districts have allowed mitigation procedures than are less stringent than those currently imposed by the Louisville Office for low quality roadside ditches.

a. Question 4
- Does your state's lead USACE Office require mitigation for impacts to extremely low quality ephemeral streams that function as roadside ditches?

A majority of District Offices require some form of mitigation to compensate for losses due to road construction. Respondents noted that if a stream is jurisdictional or eventually connects to a downstream navigable waterway, or presumably a water of the United States, that states are legally obligated to perform mitigation. Proposed changes to the Clean Water Act (see Chapter 3) would maintain this requirement given that all tributaries, which drain into jurisdictional waters, would be regulated. Despite the near-uniformity of the responses there are some notable exceptions. For example, in the States of Nevada and Nebraska, USACE District Offices do not require mitigation if the total amount of habitat impacted is less than 1/10 acre. Arguably, most of the streams/ditches that KYTC will need to mitigate for would exceed this threshold, so it is unlikely an argument for more permissive restoration practices could be made on the basis of total affected area. In a similar vein, several respondents noted their USACE Offices mandate restoration if the total length of impacted stream exceeds 300 linear feet. Based on the 2011 case study KYTC officials put together, as well as the scale of road construction and maintenance projects in the Big Sandy Watershed, the likelihood of meeting these conditions is exceedingly small. Respondents from eight states asserted they were not charged with mitigating for losses. These states included: Virginia, Iowa, New York, Georgia, Arkansas, Pennsylvania, Arizona, and Colorado. For example, Iowa's lead office – Rock Island, IL – does not claim jurisdiction over roadside ditches. It therefore has no mitigation rules in place. Similarly, the lead office in Pennsylvania does not ask for mitigation of low quality ephemeral streams because they often have an upland source – i.e. surface runoff and not a jurisdictional water. The response from Pennsylvania raises a critical issue. Question 4, as framed, does not specifically reference "jurisdictional," substituting instead more ambiguous – from a legal or regulatory standpoint – terms, "ephemeral" and "low quality." Several

respondents who noted that their USACE District Offices did have mitigation requirements in place also commented that non-jurisdictional streams were not subject to the same standards. Some of these issues were clarified in follow-up interviews (see Chapter 5), however, this wording could have partially compromised some of the responses. Another case that stands out is Minnesota. There, the St. Paul District Office requires mitigation for ditches that have wetlands at their base. When the state uses in-kind mitigation – i.e. laterally moving the stream course by excavating a non-wetland area – the USACE classifies the newly created ditches as self-mitigating.

Because Questions 4 and 5 were nearly identical, their responses largely mirrored one another. In some cases, the respondents cut and pasted their answers from Question 4 into Question 5. Therefore, the research team decided to bypass analysis of Question 5.

b. Question 6

- When relocating or rebuilding ditches or streams that are extremely poor in quality, has your state received permission to bypass traditional compensatory measures? If so, which mitigation techniques did the USACE approve for use?

Like Questions 4 and 5, Question 6 yielded a mixed bag of responses. A number of states have received permission from the USACE to use alternative mitigation practices, however, most have not been allowed to bypass mitigation entirely. Many individuals responding to this question affirmed they had been granted the opportunity to bypass the traditional mitigation sequence, however, those who responded positively described practices that are consistent with permittee-responsible mitigation. Nevertheless, it does appear that there is room to negotiate with USACE District Offices on procedures, especially on the question of mitigation ratios. Numerous respondents remarked that USACE officials have accepted on-site mitigation practices that replace streams or ditches at a 1:1 ratio. For example, the State of Missouri is able to relocate streams and plant vegetation in riparian corridors to mitigate for losses. But if a project shortens a stream or ditch, the state is assessed in-lieu fees to make up the difference. This response is a key one because the practices mirror those outlined in KYTC's 2011 proposal to combine in-kind, in-situ mitigation with the payment of in-lieu fees. The State of Iowa has had a number of mitigation techniques approved by USACE officials, including planting native grasses and installing woody buffer, placing splash basins at the inlet and outlets of culverts, and creating in-stream geomorphic units such as riffles to compensate for losses. The Oklahoma DOT can use in-kind and in-situ mitigation that replaces lost functionality at a 1:1 ratio.

Other respondents shared similar experiences. In Connecticut, the USACE allows mitigation that relocates streams or ditches to comply with Section 404 requirements as long as steps are taken to improve the quality of the relocated watercourse (e.g. in-stream habitat improvement). In Utah, relocation of a roadside ditch is considered temporary and would require no mitigation, but the respondent hedged on their answer, stating that if the ditch conveys perennial or ephemeral flow the State would have to adhere to more stringent mitigation strategies. Arkansas has used permittee-responsible mitigation in most cases, particularly if mitigation credits were unavailable. Pennsylvania also appears to have significant leeway in mitigation practices; here, if impacts to a ditch or stream are unavoidable, riparian buffer plantings and stream bank rehabilitation has been used. In some cases, stream location has taken place, but it is unclear from the response if this occurred using a 1:1 mitigation ratio or if other performance criteria were required. The answers offered for Question 6 clearly indicate the USACE is open – at the district level – to mitigation practices that skew from the norm. Like Question 4, this question made no mention of "jurisdictional," which could have influenced some answers. For example, some respondents said their states have not been granted permission to bypass traditional mitigation practices. The respondent from Georgia mentioned that if a ditch is jurisdictional its mitigation proceeds like any other jurisdictional water. Using the word "bypass" could have added to the confusion. Perhaps a better way to frame the question would have been to ask whether USACE District Offices allowed alternative

mitigation sequencing (e.g. jumping straight to in-kind, on-site mitigation as opposed to mandating the purchase of bank credits). Nevertheless, the responses from this question offer some evidence that states can have room to maneuver on these issues.

c. Question 7
- What assessment techniques has the USACE required for replaced/relocated ditches?

For this question, nine respondents indicated their District Offices did not require a formal assessment to verify the quality of restored habitat. That is, they did not mandate the use of a particular assessment system. For states where assessment is necessary, a number of techniques have been used – there is no uniformity. In some cases, the USACE asked states to perform rapid bioassessments or use the hydrogeomorphic method approach to assess habitat quality. Some states, through collaboration with their local USACE offices, have developed proprietary methods to evaluate habitat and hydrogeomorphic functionality. For example, in Virginia, the Department of Environmental Quality and the USACE Norfolk District developed the Unified Stream Methodology (USM) for stream quality assessment. North Carolina, Missouri, Arkansas, Pennsylvania, and West Virginia also have local stream evaluation methods in place that have been approved by local USACE District Offices. A few states perform assessments on a more *ad hoc* basis, relying on measures such as the number of linear feet replaced to determine if a project complies with Section 404. Georgia uses ecologists (often consultants) to conduct assessments, while New York has been given a free hand by the USACE to use whatever assessment approach it sees fit (e.g. Rosgen; Schumm Channel Evolution Model; New York State Quality Classifications; and biological sampling).

d. Question 8
- Has your state ever used modest, cost-effective practices like planting riparian vegetation onsite to satisfy Section 404 mitigation requirements? If so, how long did you state have to monitor these sites?

Many states reported having to monitor restored sites for the 5 years mandated by Section 404. Although in some cases the monitoring period extended up to 10 years depending on the scope and complexity of the project. However, Missouri has been released from monitoring requirements, for some sites, in 2-3 years. However, their respondent also commented that other sites, which did not perform up to expectations, led to longer monitoring periods. Connecticut is the only state that reported not having monitoring requirements for projects that have minor impacts (although it is unclear what design considerations are put in place to avoid this); however, other relocated streams/ditches are subject to the 5-year monitoring period.

The use of alternative mitigation strategies is mixed. Although some states have adopted practices (e.g. geomorphological improvements; letting low quality streams recover through natural succession; riparian plantings) to perform onsite mitigation, it seems that there has been movement toward more offsite practices and an increased reliance on mitigation banking (a few respondents noted the USACE had grown stricter in this area). For those respondents that replied the USACE has permitted onsite mitigation, many did not clarify the exact strategies their states use.

Conclusions

As might be expected, not all USACE District Offices read, interpret, and apply Section 404 regulations identically. Districts have a fair amount of discretion in the enforcement of mitigation requirements and practices. While it is clear some USACE Districts are more lenient in their application of the law, some form of mitigation is necessary when road construction damages or destroys stream and ditch habitats. Inopportune wording (as noted above) on some of the questions may have influenced respondents –

particularly the omission of “jurisdictional” in questions that asked about using alternative mitigation strategies. Nevertheless, survey responses do indicate that states can find way to reduce costs or use less burdensome mitigation practices. It is also clear that strategies must be worked out with USACE District Offices. After analyzing the results, KTC researchers compiled a list of states they wanted to follow up with to gain a better understanding of the mitigation practices used there. The results of these discussions are outlined in the next chapter.

Chapter 5 – Follow-Up Conversations with Selected STA Officials

During the analysis and summary of survey results, the research team identified states where practices diverged from those enforced by the Louisville District USACE office under Section 404. As discussed in the previous chapter, it appears individual USACE offices exercise significant discretion in their application of Section 404 regulations, which is understandable given that states are nested in particular ecological and geomorphic contexts. This in turn requires that mitigation practices be tailored to suit the needs of individual watersheds or ecoregions. Based on survey results, the KTC project team conducted follow-up interviews with a number of state officials to acquire more information about the specific mitigation practices that have been approved by the USACE offices they work with. Because states often fall within the jurisdiction of multiple USACE districts, mitigation procedures are not always consistent throughout an entire state. However, the critical takeaway message from these interviews (as with the survey) is that diverse mitigation strategies have been put into place with sanction of USACE offices – this suggests that KYTC does have a legitimate ground from which to pursue conversation with the Louisville District USACE office. Moving forward, one approach to discussions with the Louisville office is to present evidence from other districts of mitigation practices authorized under Section 404. This can serve as a starting point to brainstorm alternative mitigation strategies that work with the biogeomorphic conditions to repair, restore, and improve habitat affected during road construction and maintenance activities in the Big Sandy Watershed. What follows are brief synopses of each conversation that KTC researchers had with state transportation officials. Organizing this overview into discrete bullet points, while somewhat mechanistic,, efficiently communicates the most important points from each discussion. Summaries note the state in question and the name of the individuals KTC spoke with.

Connecticut Department of Transportation – Mark Alexander

The New England District USACE is responsible for overseeing all mitigation in the State of Connecticut. While they have this oversight, Corps officials have provided minimal guidance over mitigation. Likewise, there is no standard protocol for conducting post-restoration monitoring. Most of the guidance used within Connecticut originates from the state's Department of Environmental Protection. While the state imposes regulations on mitigation activities, it appears that the USACE is largely unengaged. In part, this stems from jurisdictional roadside ditches not being a major source of concern in the state. For example, if a ditch only conveys flow – or is wetted – after a rain event, it is not considered jurisdictional. These waterbodies are quite common in Connecticut whereas there are very few ditches that would fall under the purview of Section 404. Even for those ditches classified as jurisdictional, it does not seem that the USACE requires specific mitigation practices. Mr. Alexander is a member of AASHTO's Standing Committee on the Environment; he mentioned that the issue of drainage ditches is a particular source of concern for committee members, and that they are closely following any rule changes proposed by the USACE. Shannon Eggleston is the point of contact at AASHTO (email: seggleston@aashto.org) for this matter. Currently, Ms. Eggleston is pulling together on the Notice of Proposed Rulemaking (NPRM) introduced in April 2014 related to this issue – this NPRM attempts to clarify the definition of "Waters of the United States" under the Clean Water Act. All comments should be submitted to her by July 21st.

Missouri Department of Transportation – Buck Brooks

Currently, Missouri has to navigate interactions with five USACE Districts – Rock Island, Little Rock, Kansas City, St. Louis, and Memphis. Because of this, mitigation practices are not consistent because each office enforces Section 404 according to distinct interpretations. As such, there is significant variability both within and between districts. Mitigation can thus be a complex issue given that often the application of Section 404 hinges not just on a district-based interpretation, but the person the state consults with on given projects. One example of the divergent approaches taken across Missouri is the use of the Missouri Stream Mitigation Method (MSMM), which was originally developed – and still used – by the St. Louis District. However, the Little Rock District has not adopted this method, and it does not

appear there is movement in this direction. Mr. Brooks commented that the Missouri DOT believes the MSMM works well under most circumstances, however, ambiguities in its applications emerge during project. This is not an uncommon occurrence as each project takes place in a unique setting that is subject to particular constraints. Overall, the state views the MSMM favorably because it reduces the amount of subjectivity involved in the mitigation process, ensuring some degree of consistency. In his survey response, Mr. Brooks noted that the State of Missouri has been able to obtain early release from its monitoring requirements. During KTC's interview with Mr. Brooks he qualified this statement – for sites that show positive development trends during the first three years of monitoring, the state asks for a release. While releases have been granted, the state must demonstrate to the USACE that a site has recovered ecologically and geomorphically. Mr. Brooks, in the survey, indicated that in many cases it is more beneficial to pay in-lieu fees rather than rely on permittee-responsible mitigation. The primary reason for this is that the DOT has collected data on numerous mitigation sites to determine how much the state invests in their management and upkeep. This effort revealed there are growing liabilities and increased maintenance costs associated with preserving sites in a functional state. Paying in-lieu fees, which shifts the burden of mitigation, maintenance, and monitoring to a third party would make the most economic sense for the state. To date, Missouri has not considered roadside ditches as candidates for mitigation. Waterbodies adjacent to infrastructure are mitigated for, however, when possible these sites are avoided because they introduce management and maintenance challenges that are onerous and costly.

Oklahoma Department of Transportation – Dawn Sullivan

The State of Oklahoma deals exclusively with the Tulsa District USACE Office. Recently, the state entered into a pilot a study that examines whether allowing natural succession to occur on a site is adequate for mitigation. This study has delineated ecoregions within Oklahoma, and examines the process of succession in riparian environments to determine if a passive approach to restoration following disturbance (e.g. road construction) produces acceptable outcomes. By partitioning the state into ecoregions, STA personnel will be able to identify what environments are most appropriate for the natural succession strategy. It is possible to foresee this approach being successful in some ecoregions but not others – thus spatially disaggregated into separate regions would prevent Oklahoma from having to commit to a single restoration framework throughout the state. After a five-year trial period the DOT will evaluate the outcome of this study. If natural succession does not produce outcomes that are consistent with Section 404 requirements, the DOT will return to traditional mitigation activities in those ecoregions where they failed. Currently, when a road construction project disturbs or impairs a jurisdictional ditch, the Oklahoma DOT perform in-kind mitigation at a 1:1 ratio.

Arkansas State Highway and Transportation Department – John Fleming

The State of Arkansas works with three USACE Districts – Memphis, Little Rock, and Vicksburg. According to Mr. Fleming, the Memphis District has been the easiest one to work with, imposing the least restrictive demands of the three. What distinguishes Arkansas from a number of other states is that it has a USACE liaison – a USACE employee paid by the state. The liaison collaborates with USACE districts across the state, and is based in the Vicksburg Office because it is the largest (geographically) district in Arkansas. Funding for this position, as well as the liaison's responsibilities, was established through a memorandum of understanding (MOU) between Arkansas and the USACE. The USACE and the state's Highway and Transportation Department conduct annual meetings to review the position and the MOU to determine if it is necessary to revise the liaison's job responsibilities. With respect to mitigation, practices vary according to USACE District. The Memphis District has the most hands-off approach, rarely asking for mitigation. The Little Rock District mandates that state perform mitigation when the ditch being impaired is a *natural stream*. Even then, district officials only require a 1:1 mitigation ratio, and it is permissible for the state to perform like-for-like (i.e. in-kind). When an impacted ditch passes through a forested riparian zone, the Little Rock office directs the state to replant a vegetation buffer and monitor the site for 5-10 years. When a naturally existing ditch is replaced with a new channel that is lined with concrete, the Corps requires the payment of in-lieu fees to compensate for losses.

Arizona Department of Transportation – Julia Manfredi
Arizona falls under the jurisdiction of the Los Angeles District, however, there is a local office in Phoenix. Like Arkansas, Arizona has a liaison whose position is funded by the DOT – the liaison's base is the Phoenix office, however, they only work on projects with federal funding because the FHWA channels financing for the position to Arizona. The USACE, and not the state, designates who occupies this office. What distinguishes Arizona from other states is its arid, extremely dry climate. Unlike states in the U.S. Midwest or Southeast, where most ditches and streams flow perennially, many rivers, streams, and ditches in Arizona are ephemeral, conveying flow only after significant rainfall events. Consequently, the type of work conducted in Arizona is dissimilar from other states. Most activities focus on identifying zones of erosion and washes (gullies or arroyos with ephemeral flow). The USACE generally processes permits for road construction quickly, in part because they are brought into project development during the planning and design stages. Other than improving the working relationship between Arizona and the USACE, this arrangement has conferred a sense of ownership over projects to the Corps, motivating it to see projects succeed.

Colorado Department of Transportation – Rick Willard
The Denver USACE Office has oversight over the entire state, and while each district of the Colorado DOT has a good working relationship with Corps staff, no special relationships or agreements have been put in place. Mr. Willard lacked much information about programmatic details.

Georgia Department of Transportation – Doug Chamblin
For projects that require Section 404 permitting, the State of Georgia works exclusively with the Savannah USACE District. However, for projects involving disturbances to lentic ecosystems, the Mobile District sometimes exercises oversight. Currently, the Georgia DOT funds three USACE liaison positions, which cover the entire state. This program was established ten years ago and has proven beneficial for the state for streamlining its interactions with the USACE. Two liaison positions were instituted at the program's beginnings, with the third coming online within the last two years. Issues of consistency have arose because of liaisons operating with different standards. However, annual training events are now held for DOT staff and the liaisons, which are used to address any issues or policy changes.

Virginia Department of Transportation – Steve Begg
The Norfolk District USACE Office issues all permits related to Section 404 activities. While Virginia does not have a liaison position, since the 1970s the DOT has conducted monthly interagency meetings that bring together DOT personnel and USACE representatives. The purpose of these meetings is to discuss any upcoming projects or issues that need to be addressed. Maintaining open communication has been beneficial for the Virginia DOT, particularly in terms of streamlining the permitting process.

New York State Department of Transportation – Brandon Greco
The New York City and Buffalo District Offices have jurisdiction over the State of New York. Despite previous efforts, the state does not have a liaison because management at the DOT felt the costs of funding such a position outweighed the potential benefits. The USACE has dedicated staff that is responsible for reviewing DOT projects. The relationship between the state and the Buffalo District is particularly collegial, with the USACE holding biannual meetings that provide DOT officials with the opportunity to discuss upcoming projects. These meetings establish a basis for conversation that has proven useful for resolving any issues or problems the USACE has identified with specific plans. However, the New York District does not hold similar meetings (this district encompasses much of eastern New York).

Vermont Agency of Transportation – Glenn Gingras

The New England District oversees all Section 404 activities in Vermont. Like several other states, the USACE has an in-state liaison that the Agency of Transportation coordinates with and conducts meetings at least bimonthly. In his survey response, Mr. Gingras indicated that the New England Office views the use of best management practices (BMPs) as an acceptable substitute for more extensive mitigation practices. When asked to elaborate on what constitutes BMPs, Mr. Gingras commented these related to erosion and sedimentation practices; construction specifications; environmental conditions supplemental; and environmental engineering being included during the construction process to ensure project compliance.

Chapter 6 – Implementation Planning

6.1 Year 3 Work Plan

I. PROBLEM STATEMENT

Acting under the mandate of the Clean Water Act (CWA), the U.S. Army Corps of Engineers (USACE) requires that states perform compensatory mitigation when jurisdictional roadside ditches are relocated, impaired, or disturbed during a road construction or maintenance project. The Kentucky Transportation Cabinet (KYTC) has typically mitigated for losses by paying in-lieu fees or purchasing credits from an approved mitigation bank. However, given the poor quality of habitat that is lost – and the USACE's view that relocating or replacing ditches leads to a complete loss in function and quality of the original ditch – the financial burden KYTC faces seems disproportionately large. Consequently, KYTC is interested in pursuing a memorandum or understanding with the Louisville District USACE Office to devise strategies that would reduce the financial obligation the state incurs while still restoring and improving habitat that is lost. Under the CWA, accomplishing this would entail performing some form of in-kind, on-site permittee responsible mitigation. Previously, Louisville District officials have expressed a reluctance to approve these kinds of procedures on a widespread basis. With this in mind, KYTC has decided to focus its efforts on the Big Sandy Watershed, an area in which numerous road construction and maintenance projects are located. The ecological and geomorphic quality of ditches impacted in the Big Sandy is also very low. Bearing this in mind, KYTC wants to collaborate with USACE personnel to develop mitigation practices targeted for this region that comply with Section 404 of CWA and that are consistent with the Louisville District's interpretation and application of the law. Work during Years 1 and 2 of this project focused primarily on background research and understanding how various USACE District Offices around the country enforce the CWA.

In Year 3 of this project, researchers from the Kentucky Transportation Center (KTC) will facilitate interactions between KYTC and the Louisville District Office to determine if there is any possibility of putting into place a long-term agreement that will permit in-kind, onsite mitigation in the Big Sandy Watershed. The benefits of performing mitigation onsite are numerous. Most importantly, they reproduce the ecological and hydrogeomorphic functions within the original context. When KYTC pays in-lieu fees or purchases stream mitigation credits, that money may go toward offsetting losses, but at times in settings far removed from the original site. While technically constituting replacement, this can disrupt the original ecosystems by leaving them in a state of disrepair. In-kind and on-site mitigation is context sensitive, and therefore more closely approximates what has been lost. Drawing on previous work, including a survey of state departments of transportation around the United States, KTC researchers have evidence that this form of mitigation has been used successfully elsewhere, and with the approval of local USACE offices. Although this evidence does not obligate the Louisville District to alter its practices, it does provide KYTC with a credible argument for shifting its mitigation strategies.

II. BACKGROUND

The Year 1 report from this project surveyed methods used to assess the ecological and geomorphic condition of streams and ditches (as these are commonly used to inform mitigation practices), discussed the procedures used by KYTC to compensate for habitat losses, and looked at the kinds of mitigation that are permissible under Section 404 of the CWA. Year 2 took this work as a point of departure and, with the assistance of the study advisory committee, developed a brief qualitative survey that was distributed via AASHTO's listserv. This survey sought to identify what mitigation practices are used by state departments of transportation and determine whether any local USACE offices have sanctioned the kind of mitigation KYTC would prefer to execute. The survey results indicated there is some room to modify

current practices, given that interpretation of the CWA varies among districts. Another component of the Year 2 report was a close examination of the proposed changes to the CWA.

The proposed rule, which attempts to clarify what constitutes a water of the United States, is unlikely to significantly affect what water features come under the jurisdiction of the CWA. It is possible that the EPA's regulatory mandate will expand, and that a larger number of features will be classified as jurisdictional. The proposed rule change will not reclassify most roadside ditches as non-jurisdictional. The rule exempts only a fraction of ditches from current CWA rules, such as those that are wholly excavated into upland areas and do not have a significant nexus with downstream waters of the United States. The comment period for the proposed rule change does not end until 21 July 2014. It is unlikely that any changes would go into effect in the near future, or that the EPA would substantively reconsider its position on the question of whether ditches are jurisdictional features. Indeed, language on ditches in the proposed rule mirrors language contained in the current regulation. And as long as it can be shown ditches, streams, or wetlands influence the physical, biological, and chemical integrity of downstream waters (a significant body of scientific literature confirms this), the EPA is unlikely to revisit its position.

Based the research team's previous findings, work during Year 3 will shift toward forging a relationship between KYTC and the Louisville District USACE Office that will focus on reworking mitigation practices. Because there is precedent for using in-kind, onsite mitigation to offset the loss of poor quality ditches, there is the potential for KYTC to negotiate a memorandum of understanding with the Louisville District. Rather than asking for a wholesale change to mitigation throughout the state, the focus area will be the Big Sandy Watershed. Because of the abundant road construction projects that are ongoing in the Big Sandy, KYTC can potentially realize significant cost savings if the USACE is willing to let the Cabinet implement alternative mitigation practices. Beginning on a small scale is also advantageous because KYTC will be able to closely monitor the performance of restoration areas. Collecting data on these sites, using a method mutually agreed to by KYTC and the Louisville District, will highlight whether in-kind, on-site mitigation effectively replaces the lost functionality of ditches that have been relocated or disturbed. The following objectives and tasks have been designed to maximize the likelihood that Louisville District officials could be persuaded to authorize KYTC's proposed mitigation strategies.

III. TASKS AND OBJECTIVES

1. **Meeting with SAC –** At the beginning of Year 3, the KTC research team will convene a meeting with the study advisory committee to develop an approach for conversations between KYTC and Louisville District officials. Preliminarily, the research team recommends that an initial meeting with the Corps focus on three major topics: 1) survey results, which will demonstrate the variety of practices used around the country to comply with Section 404 requirements on roadside ditches; 2) a discussion of practices which have been used in other states to cooperate with USACE offices – which include developing memoranda of understanding between departments of transportation and local USACE offices, and states funding a dedicated USACE staff person to handle interactions between state agencies and the District Office on mitigation issues; and 3) developing restoration plans for selected sites that represent the approach KYTC envisions taking where mitigation is required[2]. However,

[2] Arguments could be leveraged for and against developing sample restoration schemes. The research team would argue that KYTC is requesting the Louisville District significantly alter its enforcement of Section 404, and it is not unreasonable to expect officials will want to have a full picture of what in-kind, on-site mitigation implies. Coming into the meeting with the USACE having a concrete example of how this mitigation will work could influence what the Corps ultimately decides. While it is important to emphasize questions of policy and procedure, as well as the prospect of funding a USACE staff position, ultimately this project boils down to satisfying mitigation requirements specified under Section 404. Clearly, funding a staff position will be helpful in this regard, but the Corps will have

there are other options to consider, which include forging a better relationship between and the Louisville District through monthly or quarterly meetings and performing a monitoring study focused on the Big Sandy Watershed, which examines the efficacy of mitigation strategies. The suggestions advanced here serve as a starting point – the final approach will be negotiated at this meeting, with KTC researchers implementing the plan of action the study advisory committee feels it most appropriate. The purpose of Task 1 is thus to explore different options potentially available to KYTC, to determine which make the most sense, and to develop a cohesive strategy for conducting meetings with the Louisville District that will establish the best chance to realize a positive outcome.

2. **KYTC Approval –** After finishing Task 1 and adopting an approach to move forward with, researchers and SAC members will seek upper management approval from KYTC officials. Once upper-level officials consent to this plan of action, the research team will set up a meeting with the Louisville District Office.
3. **Meeting with Louisville District –** At this meeting, KTC researchers will present the results of their survey and discuss management and monitoring protocols. The presentation to USACE will highlight areas the study advisory committee deemed most appropriate during Task 1. If the Corps is receptive to a KYTC-funded staff position, the research team will assist KYTC in understanding the details of arrangements that have been hammered out by doing follow-up interviews with state transportation agencies that currently have them in place.
4. **Memorandum of Understanding –** Depending on the outcome of Task 3, the KTC research team will assist KYTC as it drafts a memorandum of understanding with the Louisville District USACE. While the research team will be ready to assist with aspects of this task related to questions about restoration procedures and monitoring, since a memorandum of understanding is a formal legal agreement, this task will fall primarily into the hands of legal staff at KYTC and the USACE.
5. **Final Report –** KTC researchers will assemble a final report detailing the project's outcomes. The final report, in addition to highlighting the Year 3 outcomes, will include findings from Years 1 and 2. As the project wraps up, researchers will work with the SAC members to disseminate the findings and outcomes to any relevant parties. During Year 2, researchers had conversations with state officials who expressed an interest in the outcome of this project. Thus, if KYTC is able to successfully negotiate an agreement with the USACE, it could potentially reverberate throughout the US by modifying how state departments of transportation mitigate for low-quality ditches impaired by road projects.

6.2 Technical Memorandum Prepared for Louisville District USACE Officials (Summary of Findings)

- The purpose of KTC's research has been to identify potential mitigation strategies the State of Kentucky could use to offset stream habitat losses due to road construction, and which would reduce the state's financial burden while ensuring the mitigation procedures conform with the requirements specified in Section 404 of the Clean Water Act. What the state would like to pursue qualify as **permittee-responsible, on-site and in-kind mitigation** techniques, which the Clean Water Act/Mitigation Guidelines sanctions.

- To determine whether other states used alternative compensatory mitigation practices when a jurisdictional roadside ditch is impacted by roadwork, KTC conducted a survey of state transportation agencies. Although some of the respondents indicated that all roadside ditches are subject to the same

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an interest in whether in-kind, onsite mitigation fulfills Section 404 mitigation rules – which will entail, at some point, empirically demonstrating that KYTC's proposals meet those criteria.

mitigation requirements as larger water features, a number indicated that local USACE offices had approved in-kind, on-site mitigation, sometimes at a ratio as low as 1:1. The following table summarizes key responses from respondents and the onsite mitigation techniques they claimed are permitted for extremely low-quality jurisdictional roadside ditches. KTC also conducted follow-up conversations with officials from the state agencies responded to the survey.

Table 6.1 Results of State Agency Survey

State	Practices and Notes
Missouri	- On-site mitigation that replaces streams or ditches at a 1:1 ratio. If a project shortens a ditch, the state must pay in-lieu fees to make up the difference. - Complex regulatory picture because five separate USACE Districts oversee different portions of the state - Released from monitoring responsibilities in 2-3 years (in some cases) if a site demonstrates adequate geomorphic and ecological recovery
Iowa	- Onsite mitigation using a variety of techniques, such as planting native grasses, installing woody buffers, building splash basins near culverts' inlets and outlets, and creating instream geomorphic units
Oklahoma	- On-site mitigation at a 1:1 ratio - Working with the Tulsa USACE office on a pilot project determine if natural succession can mitigate losses
Arkansas	- Varies by district - Memphis office takes a hands-off approach and is not stringent about mitigation requirements - Little Rock office allows onsite mitigation at a 1:1 ratio using in-kind restoration (monitoring required for 5-10 years)
Connecticut	- No specific mitigation practices required for impaired jurisdictional ditches

- A number of other state representatives mentioned they were not required by their USACE offices to mitigate for losses on extremely low-quality ditches. Taken together, these results suggest the possibility of mitigating for losses using less financially burdensome strategies as long as the state is vigilant with its monitoring practices.
- Complete survey results and interview summaries are available upon request.

6.3 Implementation Strategy and Moving Forward

Years 1 and 2 of this study used background research to understand the interpretation and application of the Clean Water Act – Section 404, which describes mitigation options for agencies that injure or destroy a jurisdictional water as part of any project. The Year 2 report summarized the findings of a survey KTC conducted to identify alternative mitigation strategies used in other states that have been approved by the U.S. Army Corps of Engineers (USACE). Alternative practices included performing mitigation at reduced compensation ratios, testing whether or not natural succession enables satisfactory ecological and geomorphic recovery, and in two cases not doing any form of restoration at all. The latter, entirely hands-off approach was a rarity and not deemed a practical alternative for the State of Kentucky given the

stringent requirements that have been previously enforced by the USACE's Louisville District Office. To gain a better understanding of the assessment criteria used for evaluating the habitat quality of roadside ditches, KTC researchers visited several field sites in September 2014. The purpose of these visits was to gain on-the-ground familiarity with the kinds of ditches typically mitigated for during the course of road construction projects. In addition to learning how rapid bioassessment evaluations are executed in the field, KTC researchers were able to identify what alternative mitigation techniques held the most promise for the state. The scoring sheets and field notes taken during this visit are included in Appendix C. After conducting the site visits and identifying new road projects that would potentially be amenable to an alternative mitigation strategy, KTC researchers developed a memorandum that could be sent to the Louisville District Office. Below is a step-by-step account of KTC's work on an implementation plan.

1. **Identification of alternative mitigation strategies**
    - Based on the Year 2 survey results, KTC summarized the practices currently used by other states to accomplish on-site, permittee-responsible mitigation. KTC then targeted strategies that would be practical given KYTC's past experience working with the Louisville District Office. Originally, KTC envisioned proposing the use of these mitigation techniques in the Big Sandy Watershed, where there is widespread road construction and maintenance requiring the injury or loss of jurisdictional waters.
2. **Rapid Bioassessment Protocol Field Visits**
    - In September 2014 KTC researchers participated in fieldwork that conducted rapid bioassessments of three roadside ditches in central Kentucky. Included among the sites were: 1) Meadow Lane, a road situated off of KY 245; 2) KY 245; and 3) the U.S. 68 Bridge. The USACE had cited the latter location for violating mitigation standards. KTC researchers observed the scoring process, which was conducted by the project's study advisory chair. Rapid bioassessments are largely qualitative in nature given they do not require field sampling. Listening to justifications for why different scores were assigned based on observational data gave KTC researchers a better handle on how USACE personnel would interpret and apply Section 404 requirements in the field. All of the sites received low-moderate scores (i.e. < 90). Appendix C includes the scoring sheets and field photos taken by KTC researchers. Also during this fieldwork, the study advisory chair brought KTC researchers to a couple candidate sites that would be appropriate to test out alternative mitigation strategies. These sites were located on roads slated to undergo widening during the 2015 construction season. There was no final determination made on potential test cases, as the study advisory chair felt directly consulting with the USACE constituted the next logical step.
3. **Memo Preparation for USACE**
    - At the request of the study advisory chair, KTC researchers prepared a memorandum highlighting the most salient findings from its survey of state transportation agencies. In the memorandum, KTC researchers described survey results and information gleaned from follow-up conversations with agency personnel. Researchers emphasized states such as Missouri and Oklahoma, where the USACE had relaxed mitigation standards. For instance, in Missouri, the state is allowed to use a 1:1 mitigation ratio to offset habitat losses. In Oklahoma, the Department of Transportation can mitigate for losses onsite at a 1:1 ratio as well. Additionally, the Tulsa District Office currently has a test project studying the effectiveness of natural succession to mitigate for habitat losses. Both of these options appeared promising for KYTC and its efforts to find workable alternatives. Once the memorandum was finished it was forwarded to the study advisory chair. He recommended slight revisions be made. KTC researchers made the requested corrections and returned the memo to the study advisory chair. He then forwarded it to the Louisville District so officials could consider the proposal's merits.
4. **KYTC Conversation with the Louisville District Office**

- Although the Year 3 work plan recommended KTC researchers and KYTC personnel coordinate a joint meeting with Louisville District Officials, the Louisville Office did not see the matter as warranting an in-person discussion. As such, the study advisory chair spoke with Lee Anne Devine, the Chief of the South Section Regulatory Branch. Ms. Devine read the memorandum that KTC had prepared and noted that she would be willing to consider any mitigation options going forward. However, she only agreed to consider them on a project-by-project basis. This means the Cabinet would be unable to establish an agreement with the USACE that would let it to perform all mitigation activities in a designated location (e.g., the Big Sandy Watershed) using alternative means. The study advisory chair viewed this as a promising outcome. Another goal of this project was to obtain an early release from monitoring responsibilities. Ms. Devine, however, said she is not willing to negotiate on monitoring, and that current monitoring regimes will remain in place – including the mandatory five-year period over which all projects are kept under observation. It is unclear if, like some other states, she would eventually consider reducing the monitoring period. KTC researchers would recommend that Cabinet personnel keep detailed records of all upcoming projects (as well as previously completed projects) and their subsequent monitoring on a year-by-year basis. This would let KYTC highlight temporal trends in ecological and geomorphic recovery. If the Cabinet is able to demonstrate that recovery asymptotically peaks before the end of the five-year monitoring period using extensive empirical data, the USACE may be willing to reconsider its stance on mandatory monitoring. Lastly, Ms. Devine communicated to the study advisory chair that the Louisville District would potentially let KYTC apply alternative mitigation that were unsuccessful. Thus, even if a technique fails in one location it should not be written off entirely. Although this SPR project did not reach the endpoint originally envisioned by the study advisory committee (i.e. a memorandum of understanding with the Louisville District Office), it was successful insofar as the Cabinet is now able to test alternative mitigation practices on a case-by-case basis. Perhaps a more far-reaching agreement is possible in the future if test projects show promising results.

Appendix A – Text of Proposed Rule Change to the Clean Water Act

Waters of the United States or *waters of the U.S.* means:

(a) For purposes of all sections of the Clean Water Act, 33 U.S.C. 1251 *et seq.* and its implementing regulations, subject to the exclusions in paragraph (b) of this definition, the term ‘‘waters of the United States’’ means:

(1) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(2) All interstate waters, including interstate wetlands;

(3) The territorial seas;

(4) All impoundments of waters identified in paragraphs (a)(1) through (3) and (5) of this definition;

(5) All tributaries of waters identified in paragraphs (a)(1) through (4) of this definition;

(6) All waters, including wetlands, adjacent to a water identified in paragraphs (a)(1) through (5) of this definition; and

(7) On a case-specific basis, other waters, including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a water identified in paragraphs (a)(1) through (3) of this definition.

(b) The following are not ‘‘waters of the United States’’ notwithstanding whether they meet the terms of paragraphs (a)(1) through (7) of this definition—

(1) Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the Clean Water Act. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States.[1]

(2) Prior converted cropland. Notwithstanding the determination of an area’s status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act the final authority regarding Clean Water Act jurisdiction remains with EPA.

(3) Ditches that are excavated wholly in uplands, drain only uplands, and have less than perennial flow.

(4) Ditches that do not contribute flow, either directly or through another water, to a water identified in paragraphs (a)(1) through (4) of this definition.

(5) The following features:

(i) Artificially irrigated areas that would revert to upland should application of irrigation water to that area cease;

[1] At 45 FR 48620, July 21, 1980, the Environmental Protection Agency suspended until further notice in § 122.2, the last sentence, beginning ‘‘This exclusion applies . . .’’ in the definition of ‘‘Waters of the United States.’’ This revision (48 FR 14153, Apr. 1, 1983) continues that suspension.

(ii) Artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;

(iii) Artificial reflecting pools or swimming pools created by excavating and/or diking dry land;

(iv) Small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons;

(v) Water-filled depressions created incidental to construction activity;

vi) Groundwater, including groundwater drained through subsurface drainage systems; and

(vii) Gullies and rills and non-wetland swales.

(c) Definitions—

(1) *Adjacent.* The term *adjacent* means bordering, contiguous or neighboring. Waters, including wetlands, separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are ‘‘adjacent waters.’’

(2) *Neighboring.* The term *neighboring,* for purposes of the term ‘‘adjacent’’ in this section, includes waters located within the riparian area or floodplain of a water identified in paragraphs (a)(1) through (5) of this section, or waters with a shallow subsurface hydrologic connection or confined surface hydrologic connection to such a jurisdictional water.

(3) *Riparian area.* The term *riparian area* means an area bordering a water where surface or subsurface hydrology directly influence the ecological processes and plant and animal community structure in that area. Riparian areas are transitional areas between aquatic and terrestrial ecosystems that influence the exchange of energy and materials between those ecosystems.

(4) *Floodplain.* The term *floodplain* means an area bordering inland or coastal waters that was formed by sediment deposition from such water under present climatic conditions and is inundated during periods of moderate to high water flows.

(5) *Tributary.* The term *tributary* means a water physically characterized by the presence of a bed and banks and ordinary high water mark, as defined at 33 CFR 328.3(e), which contributes flow, either directly or through another water, to a water identified in paragraphs (a)(1) through (4) of this definition. In addition, wetlands, lakes, and ponds are tributaries (even if they lack a bed and banks or ordinary high water mark) if they contribute flow, either directly or through another water to a water identified in paragraphs (a)(1) through (3) of this definition. A water that otherwise qualifies as a tributary under this definition does not lose its status as a tributary if, for any length, there are one or more man-made breaks (such as bridges, culverts, pipes, or dams), or one or more natural breaks (such as wetlands at the head of or along the run of a stream, debris piles, boulder fields, or a stream that flows underground) so long as a bed and banks and an ordinary high water mark can be identified upstream of the break. A tributary, including wetlands, can be a natural, man-altered, or man-made water and includes waters such as rivers, streams, lakes, ponds, impoundments, canals, and ditches not excluded in paragraphs (b)(3) or (4) of this definition.

(6) *Wetlands.* The term *wetlands* means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

(7) *Significant nexus.* The term *significant nexus* means that a water, including wetlands, either alone or in combination with other similarly situated waters in the region (i.e., the watershed that drains to the nearest water identified in paragraphs (a)(1) through (3) of this definition), significantly affects the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (3) of this definition. For an effect to be significant, it must be more than speculative or insubstantial. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently close together or sufficiently close to a ''water of the United States'' so that they can be evaluated as a single landscape unit with regard to their effect on the chemical, physical, or biological integrity of a water identified in paragraphs (a)(1) through (3) of this definition.

Appendix B – Complete Results of Year 2 Surveys

My Report

Last Modified: 06/17/2014

1. Respondent's Name:

Text Response
Jason Jurgens
Judy Gates
Buck Brooks
Todd Nichols
Noel Ardoin
Mark Alexander
Terry Johnson
Sean Connolly
Tony Shaddix
Glenn Gingras
Colin M. Greenan
Jason Perock
Gary Birch
Dawn Sullivan
Steve Begg
Brandon Greco
Peter Healey
Doug Chamblin
Matt Perlik
Mark S Gaydos
Paula Scelsi (Responding on behalf of Elkins Green)
John Fleming
Gary C. Fawver
Tom Martin
Julia Manfredi
Luara A. Conley-Rinehart
Rick Willard
Julia Manfredi
Sarma Straumanis
Danny Peake

Statistic	Value
Total Responses	30

2. Respondent's State Organization:
Text Response
Nebraska Department of Roads
Maine Department of Transportation
Missouri Department of Transportation
Maryland State Highway Administration
Louisiana Department of Transportation and Development
Connecticut Department of Transportation
Utah Department of Transportation
SCDOT
ALDOT
VTrans (VT Agency of Transportation)
Iowa Department of Transporatation
Nevada Department of Transportation
Wisconsin DOT
Oklahoma DOT
Virginia Department of Transportation
New York State Department of Transportation
Rhode Islans Dept. of Transportation
Georgia Department of Transportation
Ohio DOT
ND Department of Transportation
New Jersey Department of Transportation
Arkansas State Highway and Transportation Department (AHTD)
Pennsylvania Department of Transportation
Montana Department of Transportation
Arizona Department of Transportation
WVDOT, Division of Highways
Colorado Department of Transportation
Arizona Department of Transportation
MInnesota Depertment of Transportation
Kentucky Transportation Cabinet

Statistic	Value
Total Responses	30

3. Respondent's Position within State Organization:
Text Response
Envrionmental Section Manager
Director, Environmental Office
Wetland Coordinator
Division Chief of Environmental Programs
Environmental Engineer Administrator
Transportation Assistant Planning Director
Senior Landscape Architect/Wetlands Program Manager
Environmental Permitting Division Manager
Biologist/Asst. Env. Coordinator
Environmental Biologist
Environmental Specialist Sr. - responsible for getting 404 permits for highway projects
Environmental Scientist
Ecologist-Central Office, Madison, WI
Division Engineer, Environmental Programs
Natural Resources Program Manager
Environmental Specialist, Main Office - Office of Environment
Chief Civil Engineer
Ecology Manager
Assistant Environmental Administrator
Director, Environmental and Transportation Services
Environmental Specialist 4
Section Head - Special Studies, Environmental Division
Chief, Environmental Policy and Development Section
Environmental Services Bureau Chief
Clean Water Act Sections 404/401 Program Coordinator
Assistant to the State Highway Engineer
Hydrologic Resources Unit lead
404/401 Program Coordinator
Wetland Program Coordinator
Stream and Wetland Mitigation Coordinator and SEction 404/401 Permit Coordinator

Statistic	Value
Total Responses	30

4. Does your state's lead USACE office require mitigation for impacts to extremely low quality ephemeral streams that function as roadside ditches?
Text Response
Yes. Any feature that remotely satisfies stream or wetland parameters requires mitigation in Nebraska. If the total impacts per project are less than 1/10th acre, then our USACE office would not require mitigation. If the ditch wetland/ephemeral stream channel area is isolated, then our USACE office would consider the area not under their jurisdiction, no mitigation required. If the ditch has any remote semblance of a connection to a down gradient stream (via other ditches), the ditch area is considered jurisdictional and mitigation is required accordingly.
If a ditch carries a stream that meets the state definition of a "river, stream, or brook", avoidance, minimization and potentially mitigation are required under 404 as implemented by our USACE Maine Field Office. This applies whether the stream is perennial or intermittent (runs less than 6 months per year by state definition). There are a number of criteria for determining whether a ditch is a stream. A constructed and maintained ditch not meeting two or more criteria is not treated as jurisdictional. Maine does not have a definition for "ephemeral". Criteria include: mineral bottom, aquatic plants, aquatic organisms, runs 6 or more months a year, defined channel.
We mitigate for most ephemeral streams (assuming that they have a defined bed & bank). We don't generally mitigate for manmade roadside ditches unless they in fact captured a natural drainage.
In Maryland we have both State and Federal Requirements. The Maryland Department of Environment (MDE) and USACOE issues permits for wetlands/stream impacts and mitigation is usually the same. MDE - No USACOE - Yes, sometimes
I'm not sure what type of impacts you are referencing. Yes, we are required to mitigate if impacting wetlands associated with these ditches which is typically the case here. Two of four Corps districts have required stream bank mitigation for similar projects.
In Connecticut we have a USACE Programmatic General Permit for impacts to regulated areas. Mitigation is required when impacts are above 5,000 sf. When assessing the impacts to roadside ditches we attempt to mitigate by replicating the functions of the ditch by creating a similar ditch.
Yes. If the ditch conveys ephemeral flows that connect downstream to a traditional navigable waterway.
If jurisdictional; SCDOT attempts to demonstrate no functional loss and if successful no mitigation is required.
If it is a jurisdictional "stream", then yes.
No
Traditionally, our lead USACE office (Rock Island, IL) does not take jurisdiction of roadside ditches and therefore, does not require mitigation for unavoidable impacts. If an ephemeral or intermittent stream (as defined by having an OHWM by RGL No. 05-05) enters our right of way and acts as both a stream and part of the roadside ditch, then impacts to this stream would require mitigation. In many cases, ephemeral and intermittent streams have migrated into our right of way and began to erode the highway embankment. We have developed projects to moved these channels back to their pre-existing location and have performed stream mitigation. Stream mitigation for these types of impacts typically include rock grade control structures at locations where the new channel connects with the old channel as well as installation of rock riffle structures.
Yes, if we are dredging or placing fill over 1/10 or 1/2 acre trigger points depending on the Nationwide Permitting obtained. Typically NDOT obtains Nationwide Permits 3 and 14.
We use the definition of a wetland. If the area meets the definition of a wetland (14 days, hydrology, vegetation), it is mitigated for, no matter the quality. HOWEVER, if the ditch is simply a creation of road geometrics (e.g., was upland before road construction), mitigation is not required. Unlike Kentucky, most of Wisconsin's streams, even ephemeral ones, are low gradient and have wetlands surrounding them. Therefore, almost all ephemeral streams are compensated for.
yes, if they are channelized blue lines.
Mitigation for impacts to extremely low quality ephemeral streams functioning as roadside ditches may be required if impacts are greater than 300 linear feet. Projects are evaluated on a case-by-case basis.
No.
Yes
No, typically they do not take jurisdiction over ephemeral roadside ditches.
Yes, if required by the NWP or IP.

Yes, on a case by case basis - Impacts greater than 300 ft will be mitigated if wetland impacts also require mitigation.
The New Jersey Department of Environmental Protection (NJDEP) has assumed the Section 404 process from the US Army Corps of Engineers (USACE) and has sole jurisdiction for most non-tidal waterbodies/wetlands in New Jersey. The USACE retains jurisdiction over tidal waterbodies/wetlands, wetlands within 1000 feet of either side of a tidal stream up to the head of tide, and waterbodies used for interstate commerce (e.g., the Delaware River). (These areas are also regulated by the NJDEP.) Regarding ditches (or ephemeral or intermittent streams that function as ditches), the USACE would only have jurisdiction over a ditch if it were tidal (or within 1000 feet of either side of a tidal stream up to the head of tide). If a ditch under the USACE's jurisdiction were impacted, the USACE would require compensatory mitigation unless the impact was below the mitigation threshold of a Nationwide Permit.
No.
Pennsylvania and the US Army Corps of Engineers have a Statewide Programmatic General Permit that covers most activities in the state. The lead Corps District for Pennsylvania does not typically require mitigation for low quality ephemeral streams because they are usually surface runoff fed.
Mitigation could potentially be required depending on the magnitude of the impact. Our Montana office has developed a procedure to comply with the requirements for mitigation found in 33 CFR parts 320 and 332. The procedure is intended to provide a method for calculating compensatory mitigation debits and credits that will provide predictability and consistency for applicants. We are still learning the "rules" per se, but the written procedure is helping us understand what our local office is expecting of us. The guideline is available on the web at: http://www.nwo.usace.army.mil/Portals/23/docs/regulatory/MT/Mitigation/MTSMP-Revised-February%202013.pdf
Not usually. Some compensatory mitigation may be required if permitted under an individual permit.
Roadside ditchlines that intercept and carry a jurisdictional stream to another jurisdictional stream would be considered jurisdictional and would require mitigation for impacts that exceed "mitigation required" thresholds. Roadside ditchlines that do not intercept and carry a jurisdictional stream would not be considered jurisdictional and do not require mitigation for impacts to them.
No
We don't have any ephemeral streams that functions as ditches that I know of. Typically the function is not combined here in AZ.
The term "low quality ephemeral stream" is not used by the St. Paul Corps District in conjunction with roadside ditches. The St. Paul Corps District requires mitigation for "wetlands that have developed in the bottoms of ditches." Wetland quality is not a factor, unless a unique resource is involved, which in the case of roadside ditches is rare. If the affected roadside wetland ditches are replaced "in-kind" (i.e. "moved over" by excavating into non-wetland), the Corps considers them to be "self-mitigating."
yes, if over a defined threshold

Statistic	Value
Total Responses	30

5. Does your state's lead USACE office require mitigation for impacts to extremely low quality intermittent streams that function as roadside ditches?
Text Response
Yes, as above.
See answer above.
We mitigate for literally all intermittent streams, regardless of quality or functionality. Again, we don't generally mitigate for manmade roadside ditches unless they in fact captured a natural drainage.
MDE - Yes USACOE – Yes
Again, I'm not sure what type of impacts you are referencing. Yes, we are required to mitigate if impacting wetlands and/or other waters in these cases. Two of four Corps districts have required stream bank mitigation for projects.
As with roadside ditches, mitigation of impacts to intermittent streams are most times mitigated by replicating or bettering the function of the stream as part of a project element rather than a true mitigation proposal. Seldom do we have intermittent streams classified as functioning as roadside ditches.
No, unless the roadside ditch has developed into a jurisdictional wetland.
SCDOT attempts to demonstrate no functional loss and if successful no mitigation is required.
Same as above.
No
See answer to ephemeral stream question. Our lead USACE office does not generally discriminate between ephemeral and intermittent streams.
Yes, if we are dredging or placing fill over 1/10 or 1/2 acre trigger points depending on the Nationwide Permitting obtained. Typically NDOT obtains Nationwide Permits 3 and 14.
We do not mitigate for wet ditches that were created through construction. If there is a direct connection (nexus) with other streams/wetlands (the usual case), mitigation required.
yes, see above.
Mitigation is typically required for impacts greater than 300 linear feet to low quality intermittent streams.
No. Mitigation of intermittent streams is typically required for impacts to high quality intermittent streams or for new impacts to undisturbed reaches (e.g., new highway alignments).
Yes
Yes
Yes, if required by the NWP or IP.
Yes, on a case by case basis - Impacts greater than 300 ft will be mitigated if wetland impacts also require mitigation.
The New Jersey Department of Environmental Protection (NJDEP) has assumed the Section 404 process from the US Army Corps of Engineers (USACE) and has sole jurisdiction for most non-tidal waterbodies/wetlands in New Jersey. The USACE retains jurisdiction over tidal waterbodies/wetlands, wetlands within 1000 feet of either side of a tidal stream up to the head of tide, and waterbodies used for interstate commerce (e.g., the Delaware River). (These areas are also regulated by the NJDEP.) Regarding ditches (or ephemeral or intermittent streams that function as ditches), the USACE would only have jurisdiction over a ditch if it were tidal (or within 1000 feet of either side of a tidal stream up to the head of tide). If a ditch under the USACE's jurisdiction were impacted, the USACE would require compensatory mitigation unless the impact was below the mitigation threshold of a Nationwide Permit.
Mitigation has been required for intermittent streams that function as roadside ditches. Determinations have been made on a case by case basis by the USACE project manager depending on quality of the streams and level of impacts.
The lead Corps District for Pennsylvania does typically require mitigation measures for low quality intermittent streams because there is usually a subsurface base flow component.
Mitigation could potentially be required depending on the magnitude of the impact. Our Montana office has developed a procedure to comply with the requirements for mitigation found in 33 CFR parts 320 and 332. The procedure is intended to provide a method for calculating compensatory mitigation debits and credits that will provide predictability and consistency for applicants. We are still learning the "rules" per se, but the written procedure is helping us understand what our local office is expecting of us. The guideline is available on the web

at: http://www.nwo.usace.army.mil/Portals/23/docs/regulatory/MT/Mitigation/MTSMP-Revised-February%202013.pdf
Not usually. Some compensatory mitigation may be required if permitted under an individual permit.
Roadside ditchlines that intercept and carry a jurisdictional stream to another jurisdictional stream would be considered jurisdictional and would require mitigation for impacts that exceed “mitigation required” thresholds. Roadside ditchlines that do not intercept and carry a jurisdictional stream would not be considered jurisdictional and do not require mitigation for impacts to them.
No
NA
See above narrative.
yes, if over a defined threshold

Statistic	Value
Total Responses	30

6. When relocating or rebuilding ditches or streams that are extremely poor in quality, has your state received permission from the USACE to bypass traditional compensatory measures (e.g. payment of in-lieu fees, purchase of mitigation bank credits)? If so, what mitigation techniques did the USACE approve for use?

Text Response
If there is a parallel ditch that is considered a jurisdictional stream, we would try first to avoid the area by shifting the alignment if possible. NDOR has a wetland mitigation bank system but these were generally not set up for "steam channel" mitigation; therefore, we would design and construct on-site mitigation to replace the impacted stream channel at a 1:1 ratio. The USACE requires 50 ft. of flat buffer on each side of the relocated channel segment. There are no in-lieu fee programs in Nebraska.
Yes, provided that the existing stream was re-located away from the toe of slope of the road so it did not receive stormwater runoff or winter sand/salt and habitat quality was overall improved.
In the past we have simply completed the stream relocation and done some riparian corridor plantings to provide compensation. If we shortened the stream reach that we modified, we would generally pay the in-lieu fee program for the difference in length. This process was prior to the development of a stream assessment methodology.
Generally - roadside ditches conveying streams or containing wetlands are usually mitigationed "in kind" by recreating the ditch to provide the same/similar conveyance. Sometimes the mitigation may come in the form of additional stormwater management. Sometimes mitigation is required off site through functional replacement by additional stream restoration or riparian buffer plantings. In-lieu fee is acceptable if no other options and generally for very small impacts only.
The quality along with relocation/rebuilding are considered when computing mitigation requirements. If we need to mitigate, we generally purchase credits from mitigation banks.
In Connecticut we have only recently had the use of an In-Lieu Fee available. Most impacts to poor quality ditches and stream are mitigated through projects elements that improve the quality of the relocated watercourse. Design elements such as fish passage improvements and planting the banks of the watercourse to provide shading are incorporated.
Varies. If simply relocating the roadside ditch, then the impacts would be seen as temporary and therefore no mitigation would be required. However, it the ditch had ephemeral or perennial flow and the project wanted to pipe the ditch, then mitigation would likely be required.
We discuss no loss of function and therefore no mitigation required. Coming at it from a functional assessment has for been successfull for SCDOT
We have not bypassed. We mitigate.
Ditches--Mitigation would not be required for these activities. Most of the time these would be activities covered under the COE VT General Permit and would not pose adverse impacts to the aquatic environment. BMP's would be used during the construction of these facilities. Streams--We typically do not relocate or rebuild streams. These would be very limited in nature and if this was the case we would use natural channel design techniques to minimize impacts to the aquatic environment.
There are no in-lieu fee programs or stream mitigation banks in Iowa so we have not had to bypass the mitigation rule. Mitigation techniques the USACE office have approved for use include native grass and woody buffers, splash basins at the inlets and outlets of culverts, in-stream structures like rock riffles, and offsite re-meandering of straightened streams.
Typically no. There are no In-Lieu fee programs in most of the State of Nevada. There are 2 In-Lieu fee programs which can be utilized in the Las Vegas Valley area. To qualify impacts to jurisdictional waterways must be in the same hydrologic basins so options are little to none. The Reno regulatory field office has indicated that In-Lieu Fee programs will not be an option in the future.
There may be a few cases where USACE bypassed usual measures but these are extremely rare. I do not know of any. The real catch for WisDOT is not the Corps., it is state wetland regulations which are more inclusive than federal regs.
Replace in kind/on-site is typical mitigation, at a 1:1 ratio
Based on the quality of streams impacted, the USACE has in the past allowed riparian plantings and, for extremely low quality streams, did not require mitigation based on size of impact.
No. Where stream mitigation was required, NYSDOT used traditional compensatory measures. One of the two

existing in-lieu fee programs in New York State offers stream mitigation credits, but NYSDOT has not yet utilized it for such.
We have utilized alternative mitigation, but not necessarily for poor quality waterways. Specifically, we upgraded fish ladders in the same macro-watershed in lieu of creating new wetlands to offset riverbank wetland impacts.
No. If the Savannah District takes jurisdiction over a roadside ditch, the mitigation is handled just like any other stream.
We use a flow chart to determine when a ditch is a stream, wetland, jurisdictional ditch, or non-jurisdictional ditch. No mitigation has ever been required for non-jurisdictional ditches. Streams that are "captured" in the ROW in a ditch are considered "captured streams" and permitted and mitigated as such. Jurisdictional ditches are accounted for in acreage impact thresholds for NPWs and if required will be mitigated.
No
To our knowledge, we have not received permission to bypass traditional compensatory measures.
AHTD has utilized permittee responsible mitigation in the past for most mitigation needs, when mitigation bank credits where unavailable. The state does not currently have an in-lieu fee program.
Yes, if the stream cannot be avoided we have performed riparian buffer plantings, stream bank rehabilitation within the watershed and in some cases relocated of the stream itself
No. Mitigation, if triggered according to the procedure must be executed in accordance with the requirements in 33 CFR 320 and 332.
Not applicable. Most of our roadside ditches are not considered jurisdictional. We have a project coming where the Corps took jurisdiction over the ditches, which parallel an ephemeral wash, both of which will be impacted and permitted under an individual permit. In this case, they have agreed to work with us regarding minimizing in-lieu fees required due to poor quality ephemeral washes. We are in the early stages of this discussion.
The West Virginia Division of Highways (WVDOH) has generally been required to mitigate for impacts to all jurisdictional streams that exceed “mitigation required” thresholds either through on the ground mitigation, the payment of in-lieu fees, or the purchase of mitigation bank credits. Generally, the “mitigation required” thresholds for stream impacts occur on projects that require an Individual 404 Permit. Mitigation Banks, In-lieu Fees, mitigation designee & construction on &/or off site.
No mitigation is required
Compensatory mitigation isn't always required for this. We try to maintain flows. If it is due to impacts triggering an individual permit, compensatory mitigation may be incorporated, though.
Quality is not a factor, thus there is no bypass of traditional measures. Minnesota has a robust private & public banking system (for more information go to the homepage for MInnesota's "Board of Water and Soil Resources" (BWSR), which oversees the state's banking system). The St. Paul District and BWSR are developing an in-lieu fee system for Minnesota. Currently, BWSR is tasked (by the state legislature) with providing wetland replacement for local road projects involving the four Rs (repair, rehabilitation, reconstruction or replacement). Minnesota's banking system requires MnDOT to provide for its own replacement, although MnDOT achieves this by paying BWSR for access to wetland credits in the public side of the state bank.
No.

Statistic	Value
Total Responses	30

7. What assessment techniques (e.g. rapid bioassessment protocols, hydrogeomorphic method approach) did the USACE require to verify the quality of the stream or ditch replaced under these circumstances?
Text Response
Our state USACE office has developed a stream assessment methodology/guidance document but they have not required its use (it hasn't been officially distributed for use by applicants). We follow the parameters generally set in existing USACE guidance and regulations.
To date, federal agencies have only used the state criteria. Laymen can evaluate these as well as professional biologists.
The Corps and state of Missouri developed and adopted the Missouri Stream Mitigation Method (MSMM) in 2007. This protocol allows the permittee to assess the functional value of the impacted stream versus the assessed value of the proposed stream mitigation. From those comparisons, one can measure if the mitigation proposal effectively compensates for the project impacts.
None.
I don't know the answer.
We normally do not have to prepare a formal assessment technique for impacts to a roadside ditch. We use a professional qualitative assessment.
We have not been required to use an functional assessment method on roadside ditches, but there is some benefit to using an assessment method since typically the roadside ditch would likely score lower than the proposed mitigation.
Survey data; SOP Stream assessment worksheets, Stream Stability, Are we maintaining pre-construction flows North Carolina Methodology for ID of Intermittent/Perennial Streams & Their Origins; Virginia Unified Stream Methodology
Ditches-none, Streams-a full hydraulic analysis is completed on stream/road crossings.
Our lead USACE office has not required the use of any assessment techniques to verify the quality of the stream replaced, although the USEPA has repeatedly suggested using adjoining states established stream mitigation methods (i.e. Missouri, Kansas, and Illinois). We do not feel it appropriate to use these states' methods as the stream hydrogeology and ecology of these states is different than those of Iowa. A stream mitigation method for the state of Iowa is currently under development.
Rapid bioassment protocols, and hydrogeomorphic method approach. Basically if there is a presence of an Ordinary High Water Mark, defined bed and bank which connects to a Waters of the US downstream of the project site is considered jurisdictional to the USACE.
Usually, USACE in Wisconsin rely on our state DNR for determinations. DNR determinations are done in conjunction with DOT people. Usually rapid assessments are employed and agreements reached quickly. If there is disagreement (an unusual event), a third party consultant is sometime employed, or the USACE will come and make a determination.
Not sure. Follow up if information is needed.
The USACE-Norfolk District and Virginia DEQ jointly developed the Unified Stream Methodology (USM) for assessing stream quality in impact areas. The method considers channel alteration, condition of riparian buffers, in-stream habitat and channel condition to develop a score to be used to determine compensation requirements. For ephemeral streams, an abbreviated USM form was developed that considered the condition of riparian buffers only.
USACE has allowed NYSDOT to choose any assessment approach that is appropriate for the project at hand. NYSDOT does not have a standard procedure for assessment of stream quality. Various methods and metrics have been used including the Natural Resources Conservation Service Stream Visual Assessment Protocol, Rosgen stream classification, Schumm Channel Evolution Model, NYS Water Quality Classifications, and any existing fisheries/macrobenthic survey data.
N/A
They typically have left it to the judgment of the ecologist who surveyed the site (GDOT or our Consultant), and conduct their own site visits if requested. Their guidance to us is to call a roadside ditch jurisdictional if it contributes significantly to the chemistry and biology of a perennial downstream reach.
If stream, then we use linear feet and the QHEI or HHEI. If jurisdictional ditch, we use acreage.
No assessment techniques are used.

N/A
The Little Rock COE District has developed their own functional assessment protocol in conjunction with the IRT. They use the Little Rock Stream Method based on the Mobile District Stream Assessment Method.
The quality of streams is determined by a ranking system by the Pennsylvania Department of Environmental Protection (DEP). Any stream that has a hydrologic connection to a designated stream would be determined to have that designation as well.
Ongoing self-monitoring and reporting is required. The below link will take you to the most recent stream mitigation monitoring MDT completed and provides insight to the types of assessment techniques MDT uses on stream restoration projects: http://www.mdt.mt.gov/publications/brochures/stream-mitigation.shtml
Not currently applicable, may have more info in future.
The West Virginia Stream and Wetland Valuation Metric (WVSWVM) is used to access the existing stream condition and the proposed mitigation condition for on the ground mitigation. It is also used to determine the in-lieu fee or mitigation bank credits that would be required to mitigate for impacts to jurisdictional waters. The WVSWVM utilizes the Hydrogeomorphic (HGM) Approach for high gradient ephemeral and intermittent streams; the USEPA Rapid Bioassessment Protocols (RBPs) for the physical condition of the stream; specific conductivity, pH, and dissolved oxygen for the chemical condition or water quality of the stream, and the West Virginia Department of Environmental Protection (WVDEP) West Virginia Stream Condition Index (WVSCI) for the biological condition of perennial or intermittent streams.
N/A
NA
Quality is not a factor in determining replacement. Areas delineated as wetland require replacement at prescribed ratios based on wetland type and location of major watershed of impacts vs. replacement credits.
2 different functional assessment tools are used depending on location in the state

Statistic	Value
Total Responses	30

8. Has your state ever used modest, cost-effective practices like planting riparian vegetation for onsite mitigation to satisfy Section 404 mitigation requirements? If so, how long did your state have to monitor these mitigation sites?

Text Response
No, but we have been exploring those options with support from our USFWS office. At this point, our USACE office has been very ridgid about staying with "traditional" stream channel mitigation practices.
Yes. Typical monitoring is 5 to 10 years.
Historically, riparian establishment was really our primary means of stream mitigation for the majority of our construction projects. Typically, the Corps would require 5 years worth of monitoring. For many of these sites, we have received release from monitoring from the Corps in 2-3 years. Some of these sites we have struggled to meet the success criteria, and it has been well beyond 5 years before we gained release from the Corps. Similar to permitting, it varies greatly between Corps districts how these type of mitigation areas are handled. We have a number of stream mitigation sites scattered across the state. Given the problems with assuring long term success/protection (encroachment by adjacent landowners or by our own maintenance forces) and providing noxious weed control, we now see that we probably would have gained a greater benefit from paying the extra money to the in-lieu fee program and avoiding the headaches and cost associated with the long term O&M on these sites.
Yes - up to five years (over a 10 year period).
In some cases, we have committed to replanting areas disturbed during construction and monitoring is usually short, 1-5 years. For offsite mitigation, we typically purchase credits from bank to avoid having to monitor or maintain the site ourselves.
If the resource being impacted was of limited quality and the project included design elements to offset the impacts we seldom have monitoring requirements. However, if the relocated watercourse is part of a larger Mitigation Plan we receive a requirement to monitor for 5 to ten years depending on the project.
Yes, we have a Regional General Permit that allows small impacts to streams and these permits typically require mitigation through installing riparian vegetation.
No
We used to do some on-site mitigation, but not anymore because of the new monitoring rules, problems with utilities on our right-of-ways, etc.
We have had to preserve and restore a riparian buffer once around a channel that was reconstructed use natural channel design techniques. This riparian buffer was part of the mitigation package and was purchased and preserved in perpetuity as well. Monitoring was required for 5 years after construction. We had to monitor the effects upstream and downstream (roughly 500 ') as well.
Yes, in fact we typically use cost-effective practices for on-site mitigation, especially for impacts to ephemeral/intermittent streams. Examples include rock splash basins, rock riffle structures, cross vane weirs, and herbaceous/woody riparian buffers. The monitoring period has generally been 5 years although in the case of wooded buffers the monitoring period can be up to 10 years.
Yes when required. 5 years.
On-sites were done quite often in the past. Recently, off-site (wetland banks) are used more often. We found that on-site mitigation was of low value and often forgotten about, including monitoring. Monitoring our bank sites is more cost effective instead of running all over the country looking for small on-sites. We can drive to one bank of several hundred acres and monitor for many projects at once. Length of monitoring depends on type of wetland; if open wet meadows, five years; if wooded, ten years. If we meet wetland performance standards before these periods, we can cease monitoring (not the usual case).
Yes. Minimum 5 years is current practice. New innovation, USACE is allowing a "test-case" for natural succession, with monitoring to attempt to demonstrate that certain low quality streams within R/W will recover without plantings...This approach is being tested where the COrps agrees it has a good chance of success, in a variety of ecoregions, with documented monitoring and reporting. If it fails, we will perform planting at the end of the montoring period.
Yes, some projects utilized this technique with annual monitoring required of the buffers to determine success/mortality of riparian vegetation.
Onsite planting of riparian vegetation is typically not done to satisfy mitigation requirements, but rather as a

design element or permit condition.
The aforementioned fishway restoration was a cost effective solution. It involved the replacement of wooden baffles in two Denile fishwaysto modify the hydraulic gradient. The effort was low cost. All other Army Corps mitigation work has involved wetlands creation or restoration.
The Savannah District has discouraged our use of on-site mitigation over the last 5 or so years. When we have done on-site mitigation, we've had to monitor for 7 years.
yes. typically 5 years
Yes, out of kind mitigation has been allowed i.e. creation, restoring wetland basins with temporary or seasonal hydrology for stream impacts.
No
Yes. Typically 5 years.
Yes. The ACOE and DEP require that all newly established riparian buffers are required to be monitored for 5 years.
Yes. Our on-site revegetation and restoration efforts factor into the Montana Stream Mitigation Guidelines at the link above.
We have incorporated this type of measure into design to reduce our impact and reduce or avoid formal compensatory mitigation.
Riparian plantings have been included as a part of on the ground mitigation, but not as a stand-alone practice to offset required stream mitigation except as enhancement for preservation or protection of waters of the state as mitigation. The required monitoring period for on the ground mitigation sites has generally been five years.
N/A
We have included planting on-site as part of the design to ensure reduction in impacts and avoid in-lieu fees. This was for a very small impact to a wetland (o.025 acre), and not in a ditch.
We have occasionally used revegetation of hydric trees/shrubs for mitigation, but have found it neither cost-effective nor very successful. Monitoring periods for woody vegetation plantings are typically 7 to 10 years. MnDOT is currently funding a research project that is investigating the restoration of woody vegetation communities in abandoned borrow areas (we are in about year 5 of 10).
No.

Statistic	Value
Total Responses	30

9. Would you be open to a follow up conversation with the Kentucky Transportation Center regarding the answers you have provided?

#	Answer		Response	%
1	Yes		30	100%
2	No		0	0%
	Total		30	100%

Statistic	Value
Min Value	1
Max Value	1
Mean	1.00
Variance	0.00
Standard Deviation	0.00
Total Responses	30

Appendix C – RBP Examples

pdf Ky DTS

Appendix A-1 High Gradient Stream Data Sheet

STREAM NAME: Meadow Lane	LOCATION:
STATION #: 1st site on right side of rd MILE:	BASIN/WATERSHED:
LAT.: LONG.:	COUNTY: USGS 7.5 TOPO:
DATE: TIME: ☐AM ☐PM	INVESTIGATORS:

TYPE SAMPLE: θ P-CHEM θ Macroinvertebrate θ FISH θ BACT.

WEATHER: Now Past 24 hours — Has there been a heavy rain in the last 7 days?

θ θ Heavy rain — θ Yes θ No

θ θ Steady rain — Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in.

θ θ Intermittent showers — _____ % Cloud Cover

θ θ Clear/sunny

P-Chem: Temp(°C)_____ D.O. (mg/l)_____ %Saturation_____ pH(S.U.)_____ Cond._____ θ Grab

INSTREAM WATERSHED FEATURES:

Stream Width _____ ft

Range of Depth _____ ft

Average Velocity _____ ft/s

Discharge _____ cfs

Est. Reach Length _____

LOCAL WATERSHED FEATUREES:

Predominant Surrounding Land Use:

θ Surface Mining — θ Construction — θ Forest

θ Deep Mining — θ Commercial — θ Pasture/Grazing

θ Oil Wells — θ Industrial — θ Silviculture

θ Land Disposal — θ Row Crops — θ Urban Runoff/Storm Sewers

Hydraulic Structures:

θ Dams θ Bridge Abutments

θ Island θ Waterfalls

θ Other

Stream Flow:

θ Dry θ Pooled θ Low θ Normal

θ High θ Very Rapid or Torrential

Stream Type:

θ Perennial θ Intermittent

θ Ephemeral θ Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa

Dominate Type:

θ Trees θ Shrubs

θ Grasses θ Herbaceous

Number of strata ____

Canopy Cover:

θ Fully Exposed (0-25%)

θ Partially Exposed (25-50%)

θ Partially Shaded (50-75%)

θ Fully Shaded (75-100%)

Channel Alterations:

θ Dredging

θ Channelization

(θFull θPartial)

Substrate θEst. θP.C.	Riffle_____%	Run_____%	Pool_____%
Silt/Clay (<0.06 mm)			
Sand (0.06 – 2 mm)			
Gravel (2-64 mm)			
Cobble (64 – 256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks, and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score **NOTES/COMMENTS:**

66

Appendix A-1 High Gradient Stream Data Sheet

STREAM NAME: West of Hospital	LOCATION:
STATION #: Ditch/Spring along MILE: Northside of Ky 245	BASIN/WATERSHED:
LAT.: LONG.:	COUNTY: USGS 7.5 TOPO:
DATE: TIME: ☐AM ☐PM	INVESTIGATORS:

TYPE SAMPLE: θ P-CHEM θ Macroinvertebrate θ FISH θ BACT.

WEATHER: Now Past 24 hours — Has there been a heavy rain in the last 7 days?

θ θ Heavy rain — θ Yes θ No

θ θ Steady rain — Air Temperature ____ °C. Inches rainfall in past 24 hours ____ in.

θ θ Intermittent showers — ____ % Cloud Cover

θ θ Clear/sunny

P-Chem: Temp(°C)_____ D.O. (mg/l)_____ %Saturation_____ pH(S.U.)_____ Cond._____ θ Grab

INSTREAM WATERSHED FEATURES:

Stream Width _____ ft
Range of Depth _____ ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATUREES:

Predominant Surrounding Land Use:

θ Surface Mining — θ Construction — θ Forest
θ Deep Mining — θ Commercial — θ Pasture/Grazing
θ Oil Wells — θ Industrial — θ Silviculture
θ Land Disposal — θ Row Crops — θ Urban Runoff/Storm Sewers

Hydraulic Structures:
θ Dams θ Bridge Abutments
θ Island θ Waterfalls
θ Other

Stream Flow:
θ Dry θ Pooled θ Low θ Normal
θ High θ Very Rapid or Torrential

Stream Type:
θ Perennial θ Intermittent
θ Ephemeral θ Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa
Dominate Type:
θ Trees θ Shrubs
θ Grasses θ Herbaceous
Number of strata ____

Canopy Cover:
θ Fully Exposed (0-25%)
θ Partially Exposed (25-50%)
θ Partially Shaded (50-75%)
θ Fully Shaded (75-100%)

Channel Alterations:
θ Dredging
θ Channelization
(θFull θPartial)

Substrate θEst. θP.C.	Riffle_____%	Run_____%	Pool_____%
Silt/Clay (<0.06 mm)			
Sand (0.06 – 2 mm)			
Gravel (2-64 mm)			
Cobble (64 – 256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Sow is < 0.3 m s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment: 5-30% (20-50% for low-gradient) of the bottom affected: slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8.Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score **NOTES/COMMENTS:**

83

4-192.2 US 68 Bridy/Violation site

Appendix A-1 High Gradient Stream Data Sheet

STREAM NAME:	LOCATION:
STATION #: MILE:	BASIN/WATERSHED:
LAT.: LONG.:	COUNTY: USGS 7.5 TOPO:
DATE: TIME: ☐AM ☐PM	INVESTIGATORS:

TYPE SAMPLE: 0 P-CHEM 0 Macroinvertebrate 0 FISH 0 BACT.

WEATHER: Now Past 24 hours — Has there been a heavy rain in the last 7 days?

0 0 Heavy rain 0 Yes 0 No

0 0 Steady rain Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in.

0 0 Intermittent showers _____ % Cloud Cover

0 0 Clear/sunny

P-Chem: Temp(°C)_____ D.O. (mg/l)_____ %Saturation_____ pH(S.U.)_____ Cond._____ 0 Grab

INSTREAM WATERSHED FEATURES:

Stream Width _____ ft
Range of Depth _____ ft
Average Velocity _____ ft/s
Discharge _____ cfs
Est. Reach Length _____

LOCAL WATERSHED FEATUREES:

Predominant Surrounding Land Use:

0 Surface Mining 0 Construction 0 Forest
0 Deep Mining 0 Commercial 0 Pasture/Grazing
0 Oil Wells 0 Industrial 0 Silviculture
0 Land Disposal 0 Row Crops 0 Urban Runoff/Storm Sewers

Hydraulic Structures:
0 Dams 0 Bridge Abutments
0 Island 0 Waterfalls
0 Other

Stream Flow:
0 Dry 0 Pooled 0 Low 0 Normal
0 High 0 Very Rapid or Torrential

Stream Type:
0 Perennial 0 Intermittent
0 Ephemeral 0 Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa
Dominate Type:
0 Trees 0 Shrubs
0 Grasses 0 Herbaceous
Number of strata ____

Canopy Cover:
0 Fully Exposed (0-25%)
0 Partially Exposed (25-50%)
0 Partially Shaded (50-75%)
0 Fully Shaded (75-100%)

Channel Alterations:
0 Dredging
0 Channelization
(0Full 0Partial)

Substrate 0Est. 0P.C.	Riffle_____%	Run_____%	Pool_____%
Silt/Clay (<0.06 mm)			
Sand (0.06 – 2 mm)			
Gravel (2-64 mm)			
Cobble (64 – 256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Sow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr.) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks, and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8.Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score **NOTES/COMMENTS:**

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