NO NET LOSS IN THE
U.S. ARMY CORPS SAVANNAH DISTRICT

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Executive Summary

In many ways, the United States Army Corps Savannah District has been a leader in compensatory mitigation for impacts to aquatic resources. It was one of the first Corps Districts to engage in stream mitigation and prioritized the use of mitigation banks well before this practice was recommended by national regulations. Unfortunately, the Savannah District’s current mitigation standards are failing to meet the national “no net loss” policy for streams. This report describes an analysis of the Savannah District’s achievement of this important policy and offers recommendations that can hopefully help guide the District in its current attempts to craft new mitigation standards.

The goal of the national no net loss policy is to protect the functions and services provided by wetlands, streams, and other aquatic resources. One of the primary mechanisms for achieving this goal is through compensatory mitigation activities under Section 404 of the Clean Water Act, which requires a permit for many physical impacts to the wetlands, streams, and other waters it covers. Through compensatory mitigation, § 404 permittees restore, create, enhance, or preserve aquatic resources in a way that is intended to compensate for the loss of functions from permitted impacts.

Section 404 is administered by the United States Army Corps of Engineers, and each of the Corps’ 38 Districts develop individual standards for compensatory mitigation. In Georgia, the Savannah District’s 2004 Standard Operating Procedure for Compensatory Mitigation utilizes a system of impact debits and mitigation credits. In Georgia, the vast majority of debits are satisfied through the purchase of credits from mitigation banks.

As this report will show, the Savannah District is achieving no net loss for wetlands, but is failing to do so for streams. The benchmark used for no net loss is a minimum 1:1 areal (i.e., acres and linear feet) mitigation to impact ratio for Savannah District § 404 permits. Although the overarching goal of no net loss is to avoid a net loss of aquatic resource functions and services, Corps Districts should on average achieve a minimum 1:1 areal mitigation to impact ratio. Under the § 404 program in Georgia, this ratio is met for wetlands (1.8:1), but is not met for streams (0.36:1).

1 Under the Clean Water Act, permits are required for a “discharge of dredge or fill material” into “waters of the United States.” 33 U.S.C. §1344(a) (2017).
Data and Permit Review

These ratios were calculated after a two-part data and permit review. The first part determined the average number of credits per acre of wetland and foot of streams provided to Georgia mitigation banks. Savannah District data was utilized for stream and wetland credits and wetlands acreage, but gaps and inconsistencies in data for streams length necessitated a GIS analysis for these figures. When the total number of wetland (45,733.85) and stream (7,694,683.95) credits were divided by the total number of wetland acres (17,818.646) and stream feet (967,772.8787), respectively, the result was an average of 2.56 credits per wetland acre and 7.95 credits per stream foot.

The second part of the data and permit review determined the average number of debits incurred by § 404 permittees for impacts to an acre of wetland or a foot of stream. Two Savannah District permit databases were reviewed, one containing approved permit records and the other credit purchases from mitigation banks. These databases contained a number of gaps, inconsistencies, errors, and other issues. After excluding problematic entries, there were 729 usable permits with an average of 4.7 debits per acre and 2.89 debits per foot.

The average credits per acre and foot and average debits per acre and foot were utilized to obtain the average mitigation to impact ratio in the Savannah District:

<table>
<thead>
<tr>
<th>Wetlands</th>
<th>Streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>(debits/acre)/(credits/acre)</td>
<td>(debits/foot)/(credits/foot)</td>
</tr>
<tr>
<td>4.7/2.56 = 1.84</td>
<td>2.89/7.95 = 0.36</td>
</tr>
</tbody>
</table>

1.8:1 ratio  
No net loss? Yes

0.36:1 ratio  
No net loss? No

Recommendations

Recommendations for ways the Savannah District can change its standards to achieve no net loss were placed in two categories: the first recommendation details steps the District can take to meet the minimum 1:1 areal ratio, and the second includes other recommendations that will, in general, help the District comply with other national compensatory mitigation standards and achieve a more functional replacement of resources. Summaries of these recommendations are as follows:

Recommendations for achieving minimum no net loss requirement:

- Develop debit and credit standards that support a 1:1 ratio. The Savannah District’s current standards for calculating credits and debits do not, on paper, support a 1:1 ratio for streams. Through the worksheets used to implement these standards, many more credits can be generated per foot of stream than debits can be incurred. Wetlands did, however, achieve a greater than 1:1 ratio through
worksheet scenarios. Because these results for streams and wetlands were supported by data analysis and permit review, it appears essential that the Savannah District’s new standards support at least a 1:1 ratio for both streams and wetlands on paper.

- **Track individual mitigation and impact permit ratios to determine whether average 1:1 ratio is being achieved.** Whether or not standards that support a 1:1 minimum ratio on paper are achieving it in practice will be difficult, if not impossible, to assess without accurate tracking of individual mitigation and impact permit ratios. This tracking can highlight successes and areas where changes might be advisable.

- **Ensure selected methodology can be administered with necessary oversight.** There are many ways that the Savannah District can craft its compensatory mitigation standards, from highly technical functional approaches to comparatively simple areal ones. It is in the interest of the party causing resource impacts to minimize incursion of debits and of the party conducting compensatory mitigation to maximize the production of credits, so the Savannah District should ensure that whatever methodology it selects can be administered with the necessary oversight.

- **Limit the availability of stream buffer credits.** The Savannah District’s current compensatory mitigation standards provide a disproportionately large number of credits for stream buffers. Under current standards, it is possible for the most substantial types of stream impacts, such as piping or filling a large stream, to be compensated for by restoring or preserving a buffer at a mitigation bank. Stream buffers are important and should be required or incentivized, but the Savannah District should carefully examine the number of credits provided for stream buffers and strongly consider reducing them. Other mechanisms, such as limiting the number of buffer credits that can be used to satisfy § 404 permit debits, should also be considered.

- **Eliminate gratuitous credit factors.** Mitigation credits are currently provided for some required activities under the current Savannah District standards; a 0.4 credit factor is provided for required stream channel restoration monitoring, for example. There is no need to incentivize required activities, and these gratuitous credit factors should be eliminated.

- **Consider alternative approaches for existing credits.** There are a large number of mitigation credits, particularly for streams, that will still be available for purchase when the Savannah District adopts new mitigation standards. For some time, § 404 permittees will be incurring debits under the new standards but purchasing credits that were awarded under the old standards. If the new standards still require fewer debits per foot than credits were awarded per foot at existing banks, the Savannah District will continue to fail to meet the 1:1 minimum ratio, and therefore no net loss, until existing credits are sold out (in some service areas, this may take many decades). This report identifies several approaches the Savannah District could take to address this issue.
Other recommendations:

- **Require a greater than 1:1 ratio when warranted.** A national mitigation rule specifies a number of situations where a greater than 1:1 ratio is likely warranted. Although the Savannah District could fulfill this requirement on a case-by-case basis via § 404 permits, many other Corps Districts explicitly include these considerations in their mitigation standards; the Savannah District should consider this approach as well.

- **Require in-kind mitigation.** In-kind mitigation, in which impacts are mitigated for with resources of a similar structural or function type, is preferred for compensatory mitigation overall and specifically recommended for some resources. The Savannah District currently only classifies credits and debits as stream or wetland. There are a number of ways that it could augment in-kind mitigation, including expanding its range of debit and credit classifications.
I. Introduction

This report details the U.S. Army Corps Savannah District’s achievement of the national policy goal of no net loss, which is intended to compensate for permitted impacts to aquatic resources. All Army Corps Districts are supposed to achieve no net loss through compensatory mitigation requirements under their Clean Water Act § 404 permitting programs, though each of the 38 Districts has its own mitigation standards. For this report, national regulations and policies regarding no net loss and mitigation were analyzed to determine the appropriate minimum benchmark for achieving no net loss. To determine whether the Savannah District is achieving this goal, its compensatory mitigation standards were assessed and an in-depth database and permit review was conducted. Once this analysis was complete, recommendations based on national regulations and other District approaches, were developed that, if implemented, would help achieve no net loss in the Savannah District.

The findings of this report are particularly timely because the Savannah District is currently developing new compensatory mitigation standards for § 404 permits. The information provided herein should prove useful to Savannah District officials in ensuring these new standards achieve the critical national policy of no net loss.

This report is divided into seven sections. Section II provides an overview of the § 404 program and no net loss. Section III explains why a 1:1 mitigation to impact areal ratio is an appropriate benchmark for no net loss. Section IV describes the Savannah District’s standards for compensatory mitigation: the 2004 Standard Operating Procedure. The study’s database and permit review are described in Section V, which also includes results. Section VI lays out specific recommendations for how the Savannah District can, in standards currently under development, achieve no net loss. Section VII is the report conclusion.

II. Compensatory Mitigation and No Net Loss

Compensatory Mitigation Under Clean Water Act § 404

The federal Clean Water Act (CWA) was enacted “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”\(^2\) Section 404 of the Act regulates many physical impacts to many surface water resources\(^3\) by requiring a permit for activities such as draining or filling a wetland or impounding, piping, or filling a stream.\(^4\) Compensatory mitigation – required for most § 404 permits\(^5\) – aims to offset the

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\(^3\) The language of Section 404 describes these impacts as the “discharge of dredge or fill material” into waters of the United States. 33 U.S.C. § 1344 (2016). This language has been interpreted to apply to a wide range of impacts that negatively affect the chemical, physical, and biological integrity of the nation’s surface waters.

\(^4\) There are two main categories of permit obtainable under Section 404: general and individual permits. General permits are required for activities designated as having “minimal impacts,” and can be obtained with little delay or paperwork. Individual permits are required for all impacts not covered by a general

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negative impacts of the permitted activity on the larger aquatic ecosystem. This is accomplished by restoring, creating, enhancing, or preserving surface waters of the same kind as those impacted, preferably in the same watershed in which impacts occur. A § 404-permitted project that, for example, drains a wetland in the Upper Oconee River watershed in north Georgia could be compensated for by restoring another wetland in that watershed.

**Figure 1. Terminology – Restoration, Establishment/Creation, Enhancement, and Preservation**

The following definitions are from the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency’s 2008 rule on compensatory mitigation.⁶

**Restoration** means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

- **Re-establishment** means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

- **Rehabilitation** means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

**Establishment (creation)** means the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site.

**Enhancement** means the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s).

**Preservation** means the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

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⁵ In the Savannah District, all permanent impacts and most temporary impacts permitted under individual permits, and impacts of over 0.1 wetland acre or 100 feet of non-tidal stream permitted under general permits, have required mitigation since 2004. Email from David Crosby, Regulatory Division Deputy Chief, U.S. Army Corps of Engineers Savannah District, February 21, 2017 (on file with author).

Compensatory mitigation standards are established by the 38 U.S. Army Corps of Engineers (Army Corps) Districts. Each Districts’ standards are unique, but should comply with standards in federal regulations, discussed below. In Georgia, the Savannah District’s compensatory mitigation standards apply statewide.

There are three common mechanisms for compensatory mitigation: mitigation banks, in-lieu fee programs, and permittee-responsible projects. Mitigation banks are typically large sites, often owned by private businesses, that generate mitigation “credits” that can be sold to permittees. The majority of these credits are not released until the project work is complete and ecological goals are met. A mitigation banking company may, for example, generate credits by restoring a wetland that was drained for agriculture or a stream that has been heavily impacted by erosion. In-lieu fee programs are similar to mitigation banks, but instead of purchasing credits from an existing bank, permittees pay into a fund that is used to develop future mitigation projects in the area where the impacts occurred. There is, therefore, a “temporal gap” between impacts and mitigation. As the name implies, permittee-responsible mitigation occurs when § 404-permittees themselves conduct mitigation to compensate for their impacts to aquatic resources. A permittee who armors the banks of a stream reach may, for example, compensate for those impacts by restoring a different reach of the same stream or of another stream reach in the same watershed.

In recent years, mitigation banks have become the preferred method for mitigation in many Army Corps Districts, including the Savannah District. These preferences are typically premised on supposed advantages provided by the rigorous scientific and technical analyses involved in their selection, planning, and oversight; that they do not involve the time lag between impacts and mitigation common to in lieu fee projects; and the fact that they are typically larger, and potentially more ecologically valuable, than permittee-responsible projects.

No Net Loss

The § 404 mitigation program has been informed by a series of policies over the years. One of the most significant is the national goal, established by President George H.W. Bush, of “no net loss” of wetlands. The central objective of the no net loss policy, which

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7 33 C.F.R. § 332.3(b) (2016).
8 33 C.F.R. § 332.3(b) (2016); 40 C.F.R. § 230.93(b) (2016).
9 The fund and related mitigation projects are controlled by a governmental or nonprofit organization (in Georgia, this is the Georgia-Alabama Land Trust). See Georgia-Alabama Land Trust, Wetlands/In-Lieu Fee Program, at http://www.galandtrust.org/conservation/conservation-program-areas/wetlands-in-lieu-fee-program (last visited Feb. 21, 2017).
10 33 C.F.R. § 332.3(b) (2016); 40 C.F.R. § 230.93(b) (2016).
11 This goal stemmed from a recommendation of the 1987 Wetland Policy Forum; President George H.W. Bush supported it in his 1988 presidential campaign. See Philip Womble and Martin Doyle, The Geography of
has since been expanded to cover streams and other waters,\textsuperscript{12} is not to prevent impacts to these resources, but rather to replace their values and functions through compensatory mitigation activities.\textsuperscript{13} Subsequent Presidential administrations have supported this goal and advocated for net gains in aquatic resources through mitigation.\textsuperscript{14}

All compensatory mitigation standards, whether national regulations developed by the Army Corps or U.S. Environmental Protection Agency (EPA) or standards developed by individual Corps Districts, must be designed to achieve no net loss.\textsuperscript{15} A mitigation rule adopted by the Army Corps and EPA in 2008 (“the 2008 Rule”), which established national standards for § 404 mitigation, identifies three potential methods for achieving no net loss. They are (1) “appropriate functional or condition assessment methods,” (2) “other suitable metrics,” or, (3) “a minimum one-to-one acreage or linear foot compensation ratio.”\textsuperscript{16} The 2008 Rule does not specifically define these methods, but general descriptions can be gathered from its text.

\textit{Appropriate functional or condition assessment methods.} A functional or condition assessment method uses formal analyses to ensure specific functions or conditions at impact sites are replaced by mitigation. The 2008 Rule prioritizes these methods when they are

\textsuperscript{12} A 1990 Memorandum of Agreement between the Army Corps and EPA focused the goal of no net loss to wetlands only, but a 2008 mitigation rule developed by the agencies superseded provisions of that agreement “relating to the amount, type, and location of compensatory mitigation projects.” 33 C.F.R. § 332.1(f)(2), 40 C.F.R. § 230.91(c)(2) (2017). The purpose of this rule is to “establish standards and criteria for the use of … compensatory mitigation … to offset unavoidable impacts to waters of the United States,” 33 C.F.R. § 332.1, 40 C.F.R. § 230.91 (2017), which include streams and other surface waters besides wetlands. The rule does not utilize the term “no net loss,” but it establishes a goal of replacing aquatic resource functions through compensatory mitigation sites and the preamble notes that a 1:1 mitigation to impact ratio should typically be met for aquatic resources.

\textsuperscript{13} In 1990 the Army Corps and EPA clarified this goal as “no overall net loss of values and functions” as opposed to a purely acreage or other areal calculation. 1990 Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency entitled: The Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines, Feb. 6, 1990, available at http://water.epa.gov/lawsregs/guidance/wetlands/mitigate.cfm. Areal calculations are, however, an acceptable minimum threshold for achieving no net loss and are used, to varying extents, by many Army Corps Districts. The concept of functional versus areal standards will be discussed later in this report.


\textsuperscript{15} See 33 C.F.R. 323.3(ef)(1) (2016); 40 C.F.R. § 230.93(f)(1)(1) (2016) (“if … mitigation is necessary to offset unavoidable impacts to aquatic resources, the amount of required compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions. In cases where appropriate functional or condition assessment methods or other suitable metrics are available, these methods should be used where practicable to determine how much compensatory mitigation is required. If a functional or condition assessment or other suitable metric is not used, a minimum one-to-one acreage or linear foot compensation ratio must be used.”)

available.\textsuperscript{17} It defines function as “the physical, chemical, and biological processes that occur in ecosystems,”\textsuperscript{18} and condition as “the relative ability of an aquatic resource to support and maintain a community of organisms having a species composition, diversity, and functional organization comparable to reference aquatic resources in the region.”\textsuperscript{19} The preamble to the 2008 Rule uses hydrogeomorphic (HGM) assessment methods and indices of biological integrity (IBI) as examples of appropriate functional and conditional methods, respectively,\textsuperscript{20} though methods vary among resource type and sometimes by regional categories such as ecoregion or physiographic region.\textsuperscript{21}

\textit{Other suitable metrics.} “Other suitable metrics” were included in the 2008 Rule as another method for achieving no net loss because in some places, appropriate functional assessments are not available\textsuperscript{22} or practicable,\textsuperscript{23} and regulators may be able to devise other suitable means of determining adequate compensation. The preamble encourages regulators to use science-based assessment methods.\textsuperscript{24}

\textit{A minimum one-to-one acreage or linear foot compensation ratio.} If functional or condition assessments or other suitable metrics are not used to determine appropriate compensatory mitigation, “a minimum one-to-one acreage or linear foot compensation ratio must be used.”\textsuperscript{25}

\section*{III. Measuring No Net Loss}

In this report, we measure the Savannah District’s achievement of no net loss using an average 1:1 areal ratio. According to the 2008 Rule, no net loss can be achieved in two ways – (1) replacement of aquatic functions through a functional or conditional analysis or other suitable metric or (2) a minimum 1:1 areal (i.e., acres and linear feet) ratio.\textsuperscript{26} Only through a functional or conditional assessment or other suitable metric may a less than 1:1 ratio occur,\textsuperscript{27} but this should not be standard practice.\textsuperscript{28} The 2008 Rule specifies...
a number of situations where a greater than 1:1 ratio is likely warranted (see Section VI, Recommendations), and the preamble to the rule specifically states that “[e]ven in cases where functional or condition assessment methods are used, these will not usually result in less than one-to-one ratios, because of the other factors (uncertainty, temporal loss) that must be considered.” Therefore, Army Corps Districts should maintain at least an average 1:1 mitigation to impact areal ratio even if a functional or conditional analysis or other suitable metric is used. As such, when assessing whether the Savannah District is meeting no net loss in this analysis, a 1:1 areal ratio was utilized as a baseline.

This report is not recommending that the Savannah District’s standards should be crafted to get as close to a 1:1 ratio as possible. Indeed, it is very likely that higher average ratios are justified. The 2008 Rule specifically notes that streams are difficult to restore; available restoration methods result in smaller gains in aquatic resource function. In addition, many factors applicable to both streams and wetlands are identified in the 2008 Rule as potentially warranting higher ratios, and many of these are common in mitigation plans for § 404 permits. A factor that deserves particular attention is when mitigation occurs via preservation. Preservation does not result in a gain of function or area (see Figure 1), so to the extent that mitigation credits are from preservation projects, a 1:1 ratio would be insufficient. Many Corps Districts attempt to account for this by requiring higher ratios for preservation (Wilmington, for example, requires between a 2.5:1 and 5:1 ratio). Information on wetland preservation acres at mitigation banks is included in Savannah District databases; approximately 19% of the wetland credits at the banks covered in this report are from preservation. Based on these numbers, if a 2:1 ratio were required for preservation, a minimum no net loss ratio for wetlands would be 1.2:1; a 5:1 preservation ratio would result in a wetland minimum no net loss ratio of 1.76:1.

29 33 C.F.R. § 323.3(f)(2) (2016); 40 C.F.R. § 230.93(f)(2) (2016) (These situations include: When the mitigation method used is preservation (functions are not compensated for but are preserved through permanent protection of the site); To account for the likelihood of success (i.e., to account for the risk that the mitigation site will not perform as intended and adequately compensate for lost functions); When the functions lost at the impact site are different than those at the compensation site; To account for temporal losses of aquatic functions (i.e., when a mitigation project will be conducted or completed after the impact so that there is a time lag between function losses and gains); To account for difficulty in restoring or establishing the desired aquatic resource type and functions; To account for the distance between the impact and compensation sites). These other factors should be considered regardless of the mitigation method utilized; i.e., a greater than 1:1 ratio should be used even if a functional or conditional or other suitable metric approach is used. The agency preamble to the Rule states that the amount of compensatory mitigation is “dependent on the method of providing the compensation, as well as other factors,” and references the factors listed above. Department of Defense & Environmental Protection Agency, Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,594, 19633 (2008) [emphasis added].


31 33 C.F.R. § 332.3(e)(3) (2016); § 40 C.F.R. § 230.93(e)(3).

32 U.S. ARMY CORPS OF ENGINEERS HEADQUARTERS, DETERMINING THE AMOUNT OF COMPENSATORY MITIGATION REQUIRED FOR DEPARTMENT OF THE ARMY PERMITS 49 (June 20, 2014).

33 Supra, FN 32.
Preservation data for stream mitigation is only available in individual Banking Instruments; the time-consuming task of parsing this data out was not conducted for this report. Overall, it is important to recognize that the 1:1 ratio is a very conservative baseline.

IV. The Savannah District’s Standard Operating Procedures for Compensatory Mitigation

The Savannah District began its wetland mitigation program in the early 1990s, and approved Georgia’s first mitigation bank in 1992. It was one of the first Army Corps Districts in the country to include streams in its program in 2000. In 2004, the Savannah District adopted its current Standard Operating Procedure (2004 SOP) for wetland and stream mitigation. There have been at least two attempts to amend the 2004 SOP in the last decade, and another revision is underway as of the drafting of this report.

Mitigation under the 2004 SOP is based on a system of credits and debits (see Figure 2). Debits are usually satisfied by purchasing credits from mitigation banks. A § 404 permittee who incurred 1,000 stream debits for piping a stream would, for example, typically satisfy these debits by purchasing at least 1,000 stream credits from a mitigation bank. Credits and debits are calculated using eight worksheets.34 Each worksheet contains a variety of factors that are summed to determine the number of debits or credits for every foot or acre of impacts or mitigation. The worksheets contain scaled values for factors so that more significant impacts incur more debits and more beneficial mitigation generates more credits. Piping 100 feet of a large, fully functional perennial stream would incur more debits than armoring 100 feet of streambank on an intermittent stream. Likewise, restoring the channel of a 100-foot stream would generate more credits than stabilizing 100-feet of streambank. Appendix A contains all of the 2004 SOP’s stream and wetland worksheets.

Geographic restrictions on credit purchases in the Savannah District are imposed using mitigation bank Service Areas. When a mitigation bank is established, it is assigned a Service Area in which it may sell credits. These Service Areas are based on 8-digit Georgia Hydrologic Unit Map Cataloging Units (HUC-8), which are loosely based on watershed boundaries (see Figure 3). When a § 404 permittee incurs debits, they may only satisfy them through purchase of credits from a bank whose Service Area includes the specific location where the impacts occur. Mitigation banks are also assigned “Secondary” Service Areas, but use of credits in those areas is limited to Nationwide Permits and enforcement actions.35

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35 Id. at Attachment E.
**Figure 2. Terminology – Credits and debits**

**Credits** are the environmental benefits generated by mitigation projects. The 2008 Rule defines credit as “a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the resources restored, established, enhanced, or preserved.”

**Debits** are the environmental impacts of activities permitted under § 404 permits. The 2008 Rule defines debit as “a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the loss of aquatic functions at an impact or project site. The measure of aquatic functions is based on the resources impacted by the authorized activity.”

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36 *Id.* at 8.
V. Is the Savannah District Meeting No Net Loss?

With adequate, accurate information, determining whether the Savannah District is meeting a 1:1 mitigation to impact areal ratio is straightforward. As described above, the Savannah District uses a system of credits and debits to determine impact and mitigation values per foot of stream or acre of wetland. If, on average, more credits per foot or acre are generated by mitigation projects than debits are incurred per foot or acre of permitted impacts, the Savannah District is falling below a 1:1 mitigation to impact areal ratio and is not achieving no net loss. If an equal number or less credits are generated per foot or acre than debits are incurred, the 1:1 ratio is met or exceeded and the Savannah District is achieving no net loss. (This ignores the preservation issue discussed in Section III, above.)

Consider the following hypothetical. If, on average, § 404 permittees incurred 5 debits for every foot and acre of stream and wetland impacts, and mitigation projects generated 10 credits for every foot or acre of mitigation, one foot or acre of impact would only equate to \( \frac{1}{2} \) foot or acre of mitigation. Because one foot or acre of mitigation generated 10 credits, a permittee who used 5 of those credits to satisfy 5 debits would only be mitigating \( \frac{1}{2} \) foot or acre for one full foot or acre of impacts. The areal mitigation to impact ratio would be 1:2. If the numbers were reversed, and the average number of debits incurred and credits generated per foot or acre were 10 and 5, respectively, the ratio would be 2:1. If debit and credit averages were equal, the ratio would be 1:1.

There are two ways to assess the Savannah District’s achievement of the 1:1 areal ratio. The first method is to evaluate the 2004 SOP. Examining the range of possible credits and debits generated through different worksheet scenarios provides the potential credits and debits per foot and acre for impacts and mitigation. Solely utilizing the SOP worksheets to come to this conclusion may, however, fail to provide an accurate assessment because this only shows potential ratios. It is possible that, in practice, the Savannah District is requiring a greater than 1:1 ratio.

To account for the potential that the SOP worksheets do not mirror actual ratios required by the Savannah District, a second assessment method is necessary. In this second approach, data from permits and other records and GIS show how many credits and debits have, in practice, been required and provided per acre or foot.

2004 SOP Scenarios

One way to assess whether the Savannah District is achieving no net loss is to run hypothetical scenarios through the 2004 SOP worksheets to generate mitigation to impact ratios. Here, ratios were created using maximum, minimum, and intermediate values for credits and debits (for a full accounting of the values utilized, see Appendix E). For example, in Table 1 the maximum ratio for streams with buffers results from comparing the maximum number of credits generated through stream channel restoration to the maximum number of debits incurred through stream impacts.
Table 1. Results – 2004 SOP Scenarios

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<th>Intermediate</th>
<th>Minimum</th>
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</tr>
</tbody>
</table>

As Table 1 shows, the 2004 SOP does not support the minimum 1:1 areal ratio for streams. The scenario that comes the closest would only result in 0.64 feet of mitigation for every foot of impacts. A 1:1 ratio is, on the other hand, supported for wetlands. Under wetland scenarios, at least two and as many as 5.6 acres are mitigated for every acre impacted.

These results also highlight a potentially significant issue with the 2004 SOP – the number of credits provided for stream buffers. Mitigation projects can achieve as many as 8 credits per foot of stream buffer, which alone is greater than the total number of debits that can be incurred per stream foot under the 2004 SOP. This issue is discussed in the Recommendations section of this report.

The ratios in Table 1 provide values for situations where maximum, intermediate, and minimum impacts are compared to maximum, intermediate, and minimum mitigation, respectively. The minimum streams with buffers ratio of 0.4 : 1, for example, results from comparing the fewest number of credits that can be generated at a stream mitigation site with buffers to the fewest number of debits that can be incurred at a stream impact site. There are, however, an immense range of potential ratios that can occur in practice. A maximum level stream impact (6.7 debits per foot) could be compensated for through purchase of credits from a mitigation bank with the minimum level of restoration (1.95 credits per foot). In this situation, the ratio of mitigation to impacts would be 3.4 : 1. If a minimum level stream impact (0.95 debits per foot) were compensated at a maximum level mitigation bank (18.6 credits per foot, with maximum buffer credits), the ratio would be 0.05 : 1. So although the 2004 SOP does not support a 1:1 ratio for streams, it is possible that, in practice, the Savannah District is achieving this minimum standard for no net loss. In addition, the 2004 SOP is a “basic written framework,” and the Savannah District’s district engineer can consider each permit on a case by case basis and modify requirements. For a true no net loss analysis, it is therefore necessary examine actual bank and permit data.

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Permit and Data Review

The permit and data review consisted of two components: (1) an analysis of how many credits per foot or acre are awarded to mitigation banks, and (2) an analysis of how many debits per foot or acre are incurred by § 404 permittees. Comparing credits per foot or acre to debits per foot or acre shows whether, in practice, the Savannah District is achieving the minimum 1:1 areal ratio and, therefore, no net loss for streams and wetlands.

Mitigation credit analysis. The first step in determining the Savannah District’s average mitigation to impacts ratios is to assess how many stream and wetland credits mitigation banks are awarded per foot or acre of mitigation.

Mitigation banks were the only type of mitigation project assessed because they account for the vast majority of mitigation for § 404 permits in the Savannah District (see Figure 4). This has been the case since at least 2004, when the current SOP was adopted, with a slight increase in the use of mitigation banks after 2008, when the 2008 Rule established them as the preferred method of mitigation (see Figure 4).41 Because mitigation bank credits almost exclusively satisfy § 404 permit debits, focusing solely on banks gives an accurate picture of whether the Savannah District is achieving no net loss.

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**Figure 4. Requested Use of Mitigation Banks to Satisfy § 404 Permits in the Savannah District**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mitigation Bank</strong></td>
<td><strong>Mitigation Bank</strong></td>
</tr>
<tr>
<td>82%</td>
<td>90%</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td><strong>Other</strong></td>
</tr>
<tr>
<td>18%</td>
<td>10%</td>
</tr>
</tbody>
</table>

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41 33 C.F.R. § 323.3(b) (2016); 40 C.F.R. § 230.93(b) (2016).
42 Information on type of mitigation utilized for § 404 permits is available in the ORM database, which only records the type of mitigation proposed for these permits. These figures are almost certainly representative, however – Savannah District personnel maintain that mitigation banks are used for the vast majority of mitigation required under § 404 permits. Indeed, the numbers here do not reflect instances where permittees proposed multiple types of mitigation for a project including mitigation banks, so the percentage of impacts satisfied with mitigation banks is likely even higher than shown.
This assessment was limited to approved, constructed banks with available and reliable records and for which streams on site could be accurately measured. These parameters left 84 out of the 155 mitigation banks in Georgia for assessment (see Figure 5).

Figure 5. Location of Mitigation Banks Analyzed

Once the list of assessable banks was created, the next step was to calculate the number of linear feet of streams and/or acres of wetlands at each bank and the total number of stream and/or wetland credits each generated. Credit information was simple to obtain; the Savannah District keeps accurate records of this information and includes it both on the Regional Internet Bank Information Tracking System (RIBITS) and in individual Banking Instruments. Information on wetland acres at banks is also readily available in these resources and is reliable. The average number of wetland credits generated per acre was 2.56 (see Figure 6).

Figure 6. Results – Wetland Credits per Acre

45,733.85 (total number of mitigation bank wetland credits) / 17,818.646 (total number of mitigation bank wetland acres) = 2.56 credits per acre

43 Banks approved under both the 2004 SOP and an earlier 2000 SOP were included in this analysis. The 2000 SOP was very similar to the 2004 SOP, but it did not provide mitigation credits for in-stream (i.e., stream channel) restoration. Because of the similarities between the 2000 and 2004 SOPs and the fact that some banks established under the 2000 SOP still have credits available for sale, we decided to include these older banks in our analysis. If we had limited the analysis to only post-2004 banks, the no net loss ratios would have been slightly better for wetlands and slightly worse for streams (2.1:1 and 0.25:1, respectively).
Information on linear feet of streams at individual banks is, unfortunately, unreliable in both RIBITS and in individual Banking Instruments. It was, therefore, necessary to analyze banks using GIS to determine how many linear feet of streams exist at individual banks. (The GIS analysis is described in Appendix B.)

There are two components of the linear feet calculation that deserve mention. First, all streams on a mitigation bank site were digitized and calculated towards the total number of linear feet at that bank, even if they did not generate any stream credits. This means that, at banks that contain streams that generated no credits, a lower estimate of credits per foot results. This puts the Savannah District closer to achieving no net loss for streams. The East Swift mitigation bank in Upson County, Georgia, for example, was calculated as having 7,454 linear feet of streams on site. In reality, only 4,557 of those stream feet generated any mitigation credits, a difference of 2,897 feet. There are 9.10 credits per foot at the bank when all 7,454 feet are counted, which is the method that was used for this report. When only credit-generating streams are counted, East Swift has 14.88 credits per foot. (All streams on a bank site were counted because, with the information at hand, the effort it would have taken to identify only credit generating stream segments on a site would have been so time-consuming as to be impractical.)

The second linear feet calculation that deserves mention concerns streams that are part of a mitigation bank’s boundary. In these cases, only one side of the stream is actually in the mitigation bank (in Georgia, property rights extend midstream in boundary streams). For these boundary streams, buffers and occasional streambank stabilization are the only activities that occur on the mitigation bank-side of the stream, and activities on the opposite bank cannot be controlled. The neighboring property owner could, for example, have an agricultural property where cattle are allowed to access the stream, or engage in other land uses that could impact stream health or function. (Some Corps Districts, such as Fort Worth, do not allow mitigation banks to generate in-channel or buffer credits unless the bank sponsor owns or controls both banks of the stream, including a buffer on both sides.44) Because of the one-sided nature of these boundary streams, in this analysis their stream length was calculated at 50% of the total length of the stream segment. A 100-foot boundary stream segment would, for example, be counted as 50 feet. This calculation had an observable, but small, impact on total credits per stream

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44 U.S. Army Corps of Engineers Fort Worth District, Public Notice: Fort Worth District Mitigation Banks 3 (July 5, 2016).
foot. Counting boundary streams at 50% of their stream length resulted in an average of 7.95 credits per foot (see Figure 7), while counting them at 100% of their length resulted in an average of 7.21 credits per foot.

**Figure 7. Results – Stream Credits per Linear Foot**

\[
\frac{7,694,683.95 \text{ (total number of mitigation bank stream credits)}}{967,772.8787 \text{ (total number of mitigation bank stream feet\(^*\)}} = 7.95
\]

\*All streams included regardless of credit generation; boundary streams calculated at 50\% total length.

**Impact debit analysis.** The second step in determining whether the Savannah District is achieving at least a 1:1 ratio of mitigation to impacts for streams and wetlands is to assess how many debits per foot or acre of stream or wetland impacts are incurred by § 404 permittees.

Two databases were analyzed to obtain impact debit averages. In both, analysis was limited to permits that were issued after 2004, when the current SOP went into effect.\(^{15}\)

The OMBIL\(^{46}\) Regulatory Module (ORM) is a database of approved § 404 permits. Pertinent information in ORM includes the total number of debits incurred by a permit and the total number of feet and/or acres impacted by a permit project. ORM does not provide information on how many debits incurred by a permit are for streams and how many are for wetlands.

The second database analyzed was the RIBITS credit purchases report, which provides information on stream or wetland credits purchased from mitigation banks.

Information from both of these databases was required to obtain “usable” permits, i.e., permits for which the number of debits incurred per foot or acre of impact is available. Obtaining these figures requires the total number of feet or acres impacted, the total number of debits incurred, and which of these debits were for stream or wetland impacts. When permit records in ORM were merged with purchases records in RIBITS, this information was available for 729 individual permits (see Appendix B).

When analyzing these 729 permits, it quickly became apparent that a number of permit “outliers” with high or low debits per foot or acre could be skewing the averages. While it is true that district engineers can vary debits incurred by a permit on a case-by-case basis, many of these permits seemed so out of the ordinary that it appeared necessary to exclude them from the analysis to prevent rare, extreme values from distorting the overall average.

\(^{15}\) The date range for permits analyzed was March 1, 2004, to June 29, 2016.

\(^{46}\) OMBIL stands for Operations Maintenance Business Information Link.
After consultation with regulatory personnel at the Savannah District, a method of contending with outliers was adopted whereby all permits with debits per foot or acre that fell outside of the minimum and maximum values of the SOP worksheets were excluded. The reasoning here was that, in the vast majority of situations, it was likely that debits incurred under a permit would fall somewhere within the ranges possible through the SOP worksheets, so excluding values falling outside the SOP would provide a more accurate average. This outlier exclusion method did not have much of an impact on stream debit averages, raising them from 2.22 per foot to 2.89 per foot (see Figure 8). This indicates a larger impact from outliers with low debit per foot figures. For wetlands, however, there was a much more pronounced impact. Including outlier permits, debits per acre was 15.84; excluding them, debits per acre dropped to 4.7 (see Figure 8). This can be attributed to the higher number of wetland impact permits with high, and sometimes exceptionally high, debits incurred per acre. There were, for example, three wetland permits with debits per acre of 11,312, 9,635, and 7,996.47

\[\text{Figure 8. Outlier Permits}^{48}\]

<table>
<thead>
<tr>
<th>Stream Permits</th>
<th>Wetland Permits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outliers</strong></td>
<td><strong>9%</strong></td>
</tr>
<tr>
<td><strong>Within SOP Limits</strong></td>
<td><strong>91%</strong></td>
</tr>
<tr>
<td><strong>16%</strong></td>
<td><strong>16%</strong></td>
</tr>
</tbody>
</table>

- **Streams average debits per foot:**
  - With outliers: 2.22
  - Excluding outliers: 2.89

- **Wetlands average debits per acre:**
  - With outliers: 15.84
  - Excluding outliers: 4.7

**Results**

When the average debits incurred and credits awarded from the permit and data review are compared, it becomes clear that the initial suppositions based on the SOP worksheets bear out – the Savannah District is achieving no net loss for wetlands, but is failing to do

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47 Permit numbers SAS-2012-00592, SAS-2012-00143, and SAS-2002-05950, respectively.

48 Histograms depict the distribution of values for number of wetland credits per purchased per acre of impact and number of stream credits purchased per foot of impact. The right skewed distribution of the wetland histogram indicates the mean value may not be a good representation of center. For this reason, outlier thresholds were applied based on simulated SOP maximum and minimum values. Tail values could represent special cases (such as enforcement actions) or database errors.
so for streams. For every acre of wetland impacted, 1.8 acres are mitigated, but for every foot of stream impacted, only 0.36 feet of stream is mitigated (see Figure 9).

<table>
<thead>
<tr>
<th>Wetlands: (debits/acre)/(credits/acre)</th>
<th>Streams: (debits/foot)/(credits/foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.7/2.56 = 1.8</td>
<td>2.89/7.95 = 0.37</td>
</tr>
</tbody>
</table>

**Figure 9. Results – No Net Loss (Mitigation to Impact) Ratios**

<table>
<thead>
<tr>
<th>1.8:1 ratio</th>
<th>0.36:1 ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>No net loss? Yes</td>
<td>No net loss? No</td>
</tr>
</tbody>
</table>

VI. Recommendations

The recommendations in this section are divided into two subsections: the first are those that would help the Savannah District achieve a minimum 1:1 ratio; the second are other recommendations, including instances where a greater than 1:1 ratio would be warranted. Many recommendations in this section were influenced by a review of mitigation standards in six other Army Corps Districts and two states where standards have been developed in cooperation with the Corps. All Districts in the South Atlantic Division, which includes Savannah, were assessed.

Recommendations for achieving a minimum 1:1 areal ratio. At the very least, the Savannah District should ensure that new SOP achieves the minimum no net loss requirement: an average 1:1 mitigation to impact areal ratio. (Indeed, a greater than 1:1 ratio is likely warranted; see Section III above.) There are a number of steps that the Savannah District can take to ensure this standard is met.

*Develop debit and credit standards that support a 1:1 ratio.* As described in Section V, the Savannah District’s 2004 SOP does not support a 1:1 mitigation to impact ratio for streams. Data analysis shows that this bears out in practice, indicating that the ratios available through the SOP are largely controlling despite district engineer discretion on individual permits. The Savannah District should, therefore, craft its new SOP to ensure it supports at least a 1:1 ratio, i.e., the number of credits that can be achieved for mitigation of one linear foot or acre should not exceed the number of debits that can be incurred. This ratio should be supported at varying levels of mitigation and impact (e.g., minimum, intermediate, and maximum).

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49 The Districts reviewed were Mobile, Charleston, Jacksonville, Oregon, Pennsylvania, Little Rock, Norfolk, and Wilmington. Most of these standards would likely be characterized as “other suitable metrics,” but two (Oregon and Pennsylvania) utilize functional approaches.
Monitor individual mitigation and impact permit ratios to determine whether average 1:1 ratio is being achieved. Keeping track of the average ratio as permits are issued will allow Savannah District officials to track success and identify issues. As described in Section V, data required to easily track ratios is often lacking. Recommendations for administrative and database protocols, detailed in Appendix C, will help remedy these issues.

The Savannah District should consider tracking permit ratios at multiple geographic scales. Achieving no net loss at a national or state level, as it is generally tracked, “would be ineffective if certain regions become devoid of aquatic resources and other, distant regions equalize these losses through gains in aquatic resources.” The Savannah District may want to track permit ratios in Service Areas, HUCs, watersheds, physiographic provinces or ecoregions, or other spatial scales (see Figure 10).

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**Figure 10. Potential Spatial Scales for Tracking Permit Ratios**

Images illustrating potential spatial boundaries for credit and debit tracking. From left to right: current U.S. Army Corps of Engineers Savannah District Service Areas, Level III EPA ecoregions of Georgia, and HUC-6’s of Georgia.

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Ensure selected methodology can be administered with necessary oversight. All mitigation methods require oversight because it is in the interest of the party causing resource impacts to minimize the incursion of debits and of the party conducting compensatory mitigation to maximize the production of credits. When more complicated methodologies are used to calculate credits and debits, there is greater opportunity for manipulation to achieve these ends and hence a greater need for oversight.

Of the mitigation methodologies included in the 2008 Rule, areal methods are the least complicated and functional or conditional approaches are the most complicated. Other

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suitable metrics, which typically utilize aspects of areal and functional or conditional methods, fall somewhere in between.

The Savannah District is presumably working towards more of a functional approach in its new SOP. Officials should ensure that regulatory staff are proficient in the technical analyses utilized in the new SOP and can conduct reviews in a timely fashion. Officials may want to consider incorporating areal components into a functional methodology for the new SOP. This approach, like the one used in the Wilmington District (see Figure 11), uses a 1:1 areal replacement as a baseline, ensuring that functional assessments do not result in areal losses.

<table>
<thead>
<tr>
<th>Stream Quality</th>
<th>Restoration</th>
<th>Enhancement I</th>
<th>Enhancement II</th>
<th>Preservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor to Fair</td>
<td>100 lf</td>
<td>100 to 150 lf</td>
<td>150 to 250 lf</td>
<td>250 to 500 lf</td>
</tr>
<tr>
<td>Good</td>
<td>200 lf</td>
<td>200 to 300 lf</td>
<td>300 to 500 lf</td>
<td>500 to 1000 lf</td>
</tr>
<tr>
<td>Excellent</td>
<td>300 lf</td>
<td>300 to 450 lf</td>
<td>450 to 750 lf</td>
<td>750 to 1500 lf</td>
</tr>
</tbody>
</table>

U.S. Army Corps of Engineers Wilmington District, Stream Mitigation Guidelines Table 3 (2003)

District officials may also want to consider using complementary worksheets or formulas to assess impact and mitigation sites. This approach, used in the Jacksonville and Wilmington Districts, makes comparing impact and mitigation sites, and overall program administration, easier. Including buffer credit calculations with other restoration calculations, as is done in Charleston and Norfolk, can also ease administrative burdens. The Savannah District’s 2004 SOP places these calculations in separate worksheets; combining them would result in a more streamlined approach and may make it easier to gauge the effect of buffer credits on the total credits generated at mitigation sites.

Limit the availability of stream buffer credits. The high number of credits available for stream buffer mitigation is one likely culprit in the Savannah District’s failure to achieve no net loss for streams. As many as 8 credits per foot are available for stream buffer restoration under the 2004 SOP, while the maximum number of debits that can be incurred for stream impacts is 6.7 per foot. The Savannah District does not currently categorize credits beyond “stream” or “wetland,” so this means that impacts to a stream channel could be compensated for entirely by replanting a buffer at a mitigation site. Stream buffers are important, and the Savannah District should likely continue to incentivize their restoration and preservation at mitigation sites through the provision of mitigation credits. The Savannah District should, however, carefully examine the number of credits provided for stream buffers and strongly consider reducing them.

The 2008 Rule states that riparian buffers may generate mitigation credits only when they “are essential to maintaining the ecological viability of adjoining aquatic
resources.” The Rule also states that credits must be provided for any buffers that are required at a mitigation site, but provides no limits or other guidance.

Most mitigation approaches analyzed for this report provide buffer credits (see Appendix D). No other approach offers as many stream buffer credits as the Savannah District, however, and the approach that came closest to Savannah (the Mobile District) provides for far fewer in-stream mitigation credits. The Mobile District also places other limits on buffer credits, such as prohibiting buffer preservation from accounting for more than 30% of total credits generated at a mitigation site.

In addition to limiting the total number of stream buffer credits available at a mitigation site, the Savannah District may want to consider limiting the number of buffer credits that can be used to satisfy mitigation requirements for a § 404 permit. The 2004 SOP states that no more than 50% of project debits can be satisfied by stream buffers, but the Savannah District has not been able to implement this requirement administratively.

Eliminate gratuitous credit factors. Gratuitous credit factors provide credits for activities that are requirements under the 2004 SOP or that are discouraged under the 2008 Rule. Because these activities are already required or are discouraged, they do not need to be incentivized through provision of credits. There are several examples:

- **Mitigation timing.** All banks are required to engage in “Schedule 2” mitigation timing, under which “[n]o more than 5% of the total credits are released upon recording a restrictive covenant over the bank site and at least 25% of the total credits are held until final determination of success.” Schedule 2 provides a 0.1 credit factor for stream channel restoration, a 0.2 credit factor for stream buffers, and a 0.3 credit factor for wetland establishment and restoration/enhancement.

- **Monitoring and contingencies.** The 2004 SOP requires mitigation banks to provide various levels of monitoring, ranging from “Excellent” for in-channel stream restoration (1.0 credit factor) and wetlands establishment (0.4 credit factor) to “Moderate” for stream buffer preservation (0.3 credit factor). There is no monitoring factor for wetland preservation and wetland buffers.

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52 33 C.F.R. § 332.3(i) (2016); § 40 C.F.R. § 230.93(i) (2016).
53 The Mobile District provides for as many as 7.02 buffer credits per stream foot, but only 6.21 credits per foot for in-channel restoration. The Savannah District provides for as many as 11.0 credits per foot for in-channel restoration.
55 Email from David Crosby, Regulatory Division Deputy Chief, U.S. Army Corps of Engineers Savannah District, January 3, 2017 (on file with author).
57 The 2004 SOP requires “Excellent” monitoring for all banks, but notes that “Substantial M&C credit cannot be generated for Riparian Buffer Preservation or Habitat Improvement.” Id. at Attachment C, 5. Standing practice at the Savannah District is to require a “Moderate” level of monitoring for these
Control. A restrictive covenant is the minimum legal protection of mitigation sites; the SOP provides a 0.1 credit factor.

Out-of-kind mitigation. The 2008 Rule encourages in-kind restoration, and the 2004 SOP provides an 0.6 credit factor for in-kind mitigation. It also, however, provides an 0.2 credit factor for out-of-kind mitigation, providing a small, but still relevant, incentive.

Consider alternative approaches for existing credits. When the Savannah District’s new SOP is adopted, there will be a period of time during which § 404 permittees incur project debits under the new SOP, but purchase credits from mitigation banks established under the 2004 SOP. Even if application of the new SOP would meet a 1:1 mitigation to impact ratio, if permittees are incurring less debits per foot than the credits per foot existing banks were awarded, the 1:1 ratio, and no net loss, will not be met.

If the new SOP does not achieve the 1:1 ratio for existing credits, stream impacts will likely exceed mitigation in most Georgia river basins for many decades. In some cases, the number of existing credits is extreme. At current sales rates, for example, the Altamaha, Etowah, Middle Chattahoochee, Tennessee, and Ogeechee River Basins have stream credit supplies to last for 60, 89, 88, 125, and 252 years, respectively.

There are several ways to address this issue:

- Establish debit per foot and acre values that meet or exceed average credit per foot and acre values at existing banks. When determining whether the 1:1 ratio is met, the total number of credits or debits for a bank or project is essentially meaningless when viewed independently. What matters is the ratio between credits and debits. The new SOP could be crafted so that at least 7.95 stream and 2.56 wetland debits would, on average, be incurred per foot and acre, respectively, which would ensure that the minimum 1:1 ratio would be met for purchases from existing banks. It would also be necessary to ensure that the average credits per foot and acre provided to new banks did not exceed these averages; if they did, purchases from new banks would fail to meet the 1:1 minimum ratio.

- Require purchases from existing banks to achieve a 1:1 ratio. The following options are only two potential methods that would ensure purchases from existing banks achieve a 1:1 ratio. Other methods could include setting credit per foot or acre averages for varying geographic regions, such as service areas, ecoregions, or watersheds.

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59 It should be noted that it is possible that existing credits in some service areas would remain unsold if new banks were established there and permittees were not required to first purchase credits from existing banks.
- *Require purchases to meet average credit per foot ratio from at existing banks.* The Savannah District could require purchases from existing banks to meet the 2004 SOP credit per foot averages identified in this report. If a § 404 permittee was impacting 100 feet of streams, for example, they would be required to purchase a minimum of 900 credits from an existing mitigation bank. This would ensure a 1:1 ratio based on the averages identified in this report, but depending on the actual credit per foot ratio of individual banks, the 1:1 ratio may not be met in every situation.

- *Require purchases to meet actual credit per foot ratio at individual existing banks.* For a more precise method of ensuring that purchases of existing credits meet the 1:1 ratio, the Savannah District could require debits to meet the actual credits per foot ratio at individual banks. If, for example, a § 404 permittee was impacting 100 feet of streams, and purchasing credits from a bank that received 12 credits per foot, the permittee would be required to purchase a minimum of 1,200 credits from that bank. If they used a bank that received only 8 credits per foot, they would be required to purchase a minimum of 800 credits from that bank. One advantage of this approach is that the amount of mitigation achieved through preservation at individual banks could also be factored into purchase requirements (see recommendation regarding preservation, below). If, for example, the Savannah District required a 2:1 ratio for preservation credits, a § 404 permittee compensating for 100 feet of stream impacts by purchasing credits from a bank that received 12 credits per foot and had 50% of its stream credits from preservation would have to purchase a minimum of 1,800 credits.

**Other Recommendations**

*Require a greater than 1:1 ratio when warranted.* The 2008 Rule states that district engineers must require a greater than 1:1 areal ratio where necessary to account for a number of specific situations. Although the Savannah District could fulfill this requirement on a...

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This would be the case if a requirement of achieving a 1:1 ratio at existing banks meant that permittees would be buying more credits at those banks than at new ones. New mitigation banks take years to approve, and credits are released over time, so the impact here may not be significant in many cases. In addition, the market would likely adjust in any situation to even out prices. This is, however, an issue that the Savannah District should consider if considering this approach for existing credits.

Under this approach, when service areas contained multiple existing banks with varying credit per foot totals, it is possible that the banks with lower credits per foot would be more attractive to § 404 permittees. It is, however, highly possible that banks with higher credits per foot would lower the price of their credits to even the playing field.

The rationale for these ratios must also be documented in the administrative record of the permit. Although this subsection states that district engineers “must” require a greater than 1:1 ratio in these situations, that language is couched by the term “where necessary.” Because the goal of mitigation, and the 2008 Rule, is to replace the aquatic functions lost through § 404 permits, “where necessary” likely refers to instances where a 1:1 ratio or less would not...
case-by-case basis via § 404 permits, many other Corps Districts incorporate these situations into their mitigation standards; the Savannah District should consider this approach as well. These situations are:

- **When mitigation is achieved via preservation:** Preservation does not result in an increase in aquatic resource function or area. Many Army Corps Districts address this issue through special conditions for preservation. The Wilmington District, for example, requires preservation of 250 to 500 feet of stream for impacts to 100 feet of a poor to fair quality stream, compared to requiring 100 feet of restoration for the same type of impact (see Figure 11). Some Districts (Mobile and Norfolk) do not provide any credits for in-stream preservation. In order to implement many of these options, the Savannah District will have to more effectively categorize mitigation credits. The 2004 SOP states that no more than 50% of permit debits can be satisfied by wetland or stream preservation, but this requirement has only been applied to permittee-responsible mitigation. If the Savannah District does require greater credit purchases for preservation (see Figure 12), it should also continue to limit the percentage of preservation credits at individual banks (banks are currently limited to 50% preservation credits). This ensures that restoration, which does result in an increase in aquatic resource function and area, accounts for at least half of the compensatory mitigation occurring in Georgia.

- **To account for likelihood of success/risk:** In the Jacksonville District, mitigation risk is specifically factored into credit calculations, with risk scores available at 0.25 point increments depending on ecological factors. Credit factors such as these must, however, be carefully considered and constructed because regulators risk discouraging mitigation of important resource types or functions that may be difficult to accomplish.

- **When there are differences between the functions lost at impact site and gained at mitigation site:** Compensating for a difference in function requires comparison of the impact and mitigation sites, entailing classification according to HGM or some other suitable method.

- **To account for temporal losses:** Some Districts, like the Jacksonville District, incorporate time lag into their credit calculations; mitigation that takes longer to achieve (i.e., functions that take longer to restore) will receive fewer credits. As with mitigation risk, regulators must be cautious that credit discounts such as these replace lost functions. The goal to replace lost functions is, however, itself couched by the term “to the extent practicable.” 33 C.F.R. §332.3(f)(1) (2016); 40 C.F.R. §230.93(f)(1) (2016). District engineers, therefore, retain a good deal of discretion when determining how much mitigation is required when these specific situations occur.

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63 Email from David Crosby, Regulatory Division Deputy Chief, U.S. Army Corps of Engineers Savannah District, January 3, 2017 (on file with author).
do not discourage mitigation of important resource types or functions that take longer to realize.

- **For difficult to establish or restore resources or functions:** The 2008 Rule specifies a number of resources as difficult to establish or restore, including streams. It states that compensatory mitigation for these resources should be provided through in-kind rehabilitation, enhancement, or preservation. These methods of mitigation produce smaller gains in aquatic resource functions than restoration achieved via re-establishment, and this should be reflected in the amount of compensatory mitigation required to offset permitted impacts. Other factors not specific to individual resource types may also require more mitigation to offset permitted impacts. A 2014 report by U.S. Army Corps Headquarters notes specific site characteristics, such as the degree of the degradation or disturbance of the mitigation site, land use and land cover changes, pollutant discharges, the impacts of mining and other resource activities, loss of biodiversity, climate change and other man-made and natural disturbances might only make it possible to “restore some intermediate level of function … that would require a larger acreage to be restored to provide a sufficient amount of compensatory mitigation to offset the permitted impacts.”

- **To account for distance between impact and compensation site:** The larger the distance between impact and compensation sites, the less likely it is that impacts are being offset. This commonly occurs when impacts in urban areas are compensated for in rural areas. Mitigation is typically more cost-effective in rural areas where land is cheaper and larger scale projects are easier to implement, but rural projects are unlikely to compensate for loss of aquatic functions in urban areas. This can be dealt with in several ways, including requiring more debits for impacts to urban resources or providing more credits for their mitigation. There are downsides to each. Requiring more debits should result in a greater than 1:1 ratio of mitigation to impacts, but may still fail to compensate for urban impacts. Providing more credits will incentivize mitigation closer to actual impacts, but may result in less than a 1:1 ratio if many more credits are provided than debits are required. The preamble to the 2008 Rule specifically addresses the importance of aquatic resources in urban settings, so it will behoove the Savannah District to consider how to address this and other issues related to distance.

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65 33 C.F.R. §332.3 (e)(3) (2016); 40 C.F.R. § 230.93(c)(3). The agency preamble to the Rule specifically addresses stream restoration and state that “the science of stream restoration is still evolving and … more research is needed.” Department of Defense & Environmental Protection Agency, Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,594, 19,596 (2008).


67 U.S. ARMY CORPS OF ENGINEERS HEADQUARTERS, DETERMINING THE AMOUNT OF COMPENSATORY MITIGATION REQUIRED FOR DEPARTMENT OF THE ARMY PERMITS 49 (June 20, 2014).

68 Id. at 48.

69 Department of Defense & Environmental Protection Agency, Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,594, 19,604 (2008) (“We recognize that aquatic resources in urban settings can provide important functions and services, and we believe it is important that urban areas not
Because preservation does not result in a gain in aquatic resource function or area, using it as a mitigation method presents quite a conundrum for the no net loss policy. Technically speaking, no matter how many acres of wetland or feet of stream a permittee preserves, it will not compensate for impacts. Preservation can, however, be important for protecting highly valuable resources and maintaining the integrity of a mitigation site, particularly by preventing direct impacts to other areas. As noted above, some Corps Districts provide no credits for preservation; those that do typically require higher compensation ratios.

It is likely that the Savannah District will continue to provide credits for preservation in its new SOP. The District should craft its standards to reflect that preservation will not result in a gain of area or function, but how? One attractive approach is found in the Wilmington District’s Stream Mitigation Guidelines, where preservation ratios range from 2.5:1 to 5:1, depending on the quality of the resource impacted (see Figure 11). At the very least, this approach ensures that more than two times the areal measure of stream impacted is preserved, and requires more preservation for impacts to high quality streams.

**Require in-kind mitigation.** The 2008 Rule defines “in-kind” as “a resource of a similar structural and functional type to the impacted resource.” It states that some difficult to replace resources, including streams, should be mitigated in-kind, and the preamble notes that “in general, in-kind mitigation is preferable to out-of-kind mitigation because it is more likely to compensate for the functions and services lost at the impact site.” If mitigation is out-of-kind, the district engineer must include the basis for this in the administrative record of the § 404 permit. Prior to the 2008 Rule, many Army Corps Districts compensated for stream impacts with wetland mitigation, so in-kind provisions of that regulation were largely concerned with ensuring stream to stream mitigation. The Savannah District was one of the first to require compensation for stream impacts with stream mitigation, but more precise in-kind approaches are available that could improve mitigation outcomes, including:

- **Include more debit and credit classifications or in-kind selection criteria.** The Savannah District could include other classifications that would more precisely reflect
structural or functional impacts and mitigation. The 2004 SOP worksheets, for example, include credit factors for intermittent streams, large and small perennial streams, and five types of wetlands. Credits and debits could be categorized according to these or other classifications, and permittees could be required to purchase credits that matched their debit classifications. Another potential method would be to require permittees to abide by in-kind selection criteria. This approach, utilized in the Wilmington District, requires permittees to base mitigation on three selection criteria for stream order and location, habitat designation, and physiographic region and threatened and endangered species (see Figure 13).

### Figure 13. The Wilmington District’s Mitigation Selection Criteria

Selection Criteria 1. Mitigation should be accomplished within one stream order of the impacted stream, within the same subbasin 8 digit HUC and as close to the impacted stream as possible. For the purpose of mitigation, intermittent streams will be treated like 1st order streams.

Selection Criteria 2. Stream mitigation should be performed on streams with similar habitat designations (cold, cool, and warm water as defined in WRC habitat guidance, see Appendix I). Mitigation will be conducted in trout waters if any trout species are found in project stream reaches.

Selection Criteria 3. Mitigation should be performed within the same Physiographic Region (Appendix III) and priority should be given to mitigation sites that have the potential to improve habitat for state or Federally threatened and endangered (T & E) species.

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- **Require all stream debits to be satisfied by stream credits.** Currently, the Savannah District uses wetland credits to satisfy impacts to ephemeral streams. Although in many instances a wetland mitigation site would be more functionally valuable than an ephemeral stream, the 2008 Rule does recommend in-kind mitigation and the Savannah District should consider requiring ephemeral stream impacts to be satisfied by stream mitigation.

- **Require impacts to coastal resources to be mitigated in coastal watersheds.** The 2008 Rule specifically states that “[c]ompensation for impacts to aquatic resources in coastal watersheds (watersheds that include a tidal water body) should also be located in a coastal watershed where practicable.” Currently in the Savannah District, many impacts to coastal resources are mitigated by purchases of credits far inland. For example, a project that impacted 25.9 acres of freshwater wetlands adjacent to the

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\[75\] 33 C.F.R. § 332.3(b) (2016); 40 C.F.R. § 230.93(b) (2016). Practicable means “available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.” 33 C.F.R. § 332.1(c)(2) (2016); 40 C.F.R. § 230.91(c)(2) (2016).
marshes of the Little Satilla River in Glynn County, was compensated for by the purchase of credits from a bank on the Oconee River roughly 180 miles inland.\textsuperscript{76} The Savannah District should consider either limiting the service areas of new inland banks so that they cannot service coastal resources, or placing specific requirements on coastal impacts so that they can only be compensated by mitigation in coastal watersheds.

\section*{VII. Conclusion}

The Savannah District has, in many ways, been at the forefront of compensatory mitigation in the U.S. It was one of the first Districts to include streams in its mitigation program, and has prioritized the use of mitigation banks since at least 2004, well before the 2008 Rule recommended that approach. The District does, however, have significant issues with its current SOP, particularly the fact that it is not achieving no net loss for streams. Fortunately, the current development of a new set of compensatory mitigation standards for the Savannah District means that officials can rectify this issue and ensure all § 404-permitted aquatic resource impacts are being adequately compensated for in the state of Georgia. This report should act as a useful guide during that endeavor.

\footnote{\textsuperscript{76} Army Corps permit no. SAS-2011-00707.}