

Analysis of In-Lieu Fee Programs in providing Wetland and Stream Compensatory
Mitigation

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ABSTRACT

The nation's §404 permitting program, of the Clean Water Act (CWA), represents one of the longest regulatory histories of designing and implementing credit trading programs to satisfy regulatory requirements. The role and the function of in-lieu fee (ILF) programs in supporting this regulatory structure have undergone a substantial change. For the first time in the history of the §404 program, 33 CFR Part 332 and 40 CFR Part 230, Subpart J (the "2008 mitigation rule" or "rule"), prioritizes the use of off-site mitigation over on-site-mitigation. Additionally, the rule prioritizes advanced, third-party mitigation; especially as achieved through mitigation banks; over any off-site compensatory mitigation provided by ILF programs (33 CFR §332.3(b)(1)). This new regulatory environment favors the use of commercial mitigation bank credits while acknowledging that the limited permittee demand of off-site mitigation credits, in particular areas, justifies the continuing need for ILF programs (Corps and EPA 2008, p.19606,19611). This research examines how regulatory officials use ILF programs under the 2008 mitigation rule, and, it determines the extent to which ILF programs are capable of fulfilling the role envisioned for them under the 2008 mitigation rule. Simulation results indicate that commercial mitigation banks cannot meet risk adjusted returns under limited credit demand conditions. ILF programs offer some additional financial capacity to fill the void in commercial bank coverage; but, this potential is limited in low demand conditions. Furthermore, empirical case studies of a Virginia and Georgia provide evidence that regulatory officials rely on ILF programs to provide off-site compensatory mitigation almost exclusively in the absence of private credit supply, as intended in the 2008 rule. Evidence in Georgia and Virginia also indicate that, in some situations, ILF programs face difficulties in providing mitigation under the constraints of limited demand and more stringent regulatory requirements.

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GENERAL AUDIENCE ABSTRACT

National permitting programs require people that impact wetlands or streams to offset unavoidable, adverse impacts by improving wetlands or streams elsewhere, a process called compensatory mitigation. A new regulatory rule, approved in 2008 (33 CFR Part 332 and 40 CFR Part 230, Subpart J), prioritizes that mitigation is provided at larger projects off-site of the impact. Key policy questions of “who should provide the mitigation?” and “when the mitigation should be provided” were an important part of the debate during the rule’s development. Wetland and stream mitigation may be provided by commercial (for profit) businesses, called mitigation banks. Commercial banks make wetland/stream improvement projects before permitted (adverse) impacts occur in anticipation of selling wetland/stream “credits” (quantified levels of improvement). Off-site mitigation may also be provided by in-lieu fee (ILF) programs operated by the government or nonprofit organizations. ILF programs first accept funds from permittees and then construct mitigation projects once sufficient funds have been collected, thus creating a lag between adverse impact and compensatory mitigation.

The 2008 regulatory rule favors the use of commercial mitigation bank credits over ILF credits, but allows regulatory officials, under certain circumstances, to use ILF credits when commercial bank credits of the appropriate type are unavailable. This research examines how regulatory officials use ILF programs, and it investigates the extent to which ILF programs are financially capable of providing off-site mitigation in situations where the appropriate commercial credits are unavailable. A financial simulation model is developed to examine the feasibility of mitigation projects under different costs and credit demand conditions. Results indicate that commercial mitigation banks cannot meet financial objectives under limited credit demand conditions. ILF programs offer some additional financial capacity to fill the void in commercial bank coverage, but ILF programs also face financial limitations under conditions with low

demand for credits. Empirical case studies of Virginia and Georgia provide evidence that regulatory officials rely on ILF programs to provide off-site compensatory mitigation almost exclusively in the absence of a private credit supply, as intended in the 2008 rule. However, evidence in Virginia and Georgia also affirm that ILF programs face difficulties in providing mitigation in some situations of limited demand and stringent regulatory requirements.

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Chapter 1: The Premise and Structure of the Compensatory Mitigation Market established by §404 of the Clean Water Act

Introduction

The nation's §404 permitting program, of the Clean Water Act (CWA), represents one of the longest regulatory histories of designing and implementing credit trading programs to satisfy regulatory requirements. Under this permitting program, parties that fill or impact wetlands or streams (defined as a part of the waters of the United States) are frequently required to offset adverse impacts. Third-parties that restore, enhance, preserve, or create wetlands in another location receive credits from the regulatory agency to then sell to permittees for regulatory compliance. The option of "in-lieu fee" mitigation is an important system designed into the credit trading program. The option of paying a fee *in-lieu* of securing credits theoretically advances the breadth of compliance options to permittees in regions with few offsite compliance options. However, in-lieu fee mitigation presents a risk by allowing an impact to occur before an offsetting enhancement. As the benefits and risks of in-lieu fee mitigation, as well as other forms of mitigation, have been debated and examined, the regulatory preferences of the §404 regulatory program have evolved. The role and the function of in-lieu fee (ILF) programs in supporting this regulatory program have undergone a substantial change.

For the first time in the history of the §404 program, 33 CFR Part 332 and 40 CFR Part 230, Subpart J (the "2008 mitigation rule" or "rule") prioritizes the use of off-site mitigation over on-site-mitigation. Additionally, the rule prioritizes advanced, third-party mitigation; especially as achieved through commercial mitigation banks; over any off-site compensatory mitigation provided by ILF programs (33 CFR §332.3(b)(1)). This new regulatory environment favors the use of mitigation bank credits while acknowledging that the limited permittee demand of off-site mitigation credits, in particular areas, justifies the continuing need for ILF programs (Corps and EPA 2008, p.19606,19611). ILF programs are expected to provide off-site mitigation in areas left unserved by commercial mitigation banks. The purpose of this research is to 1) examine how regulatory officials use ILF programs under the 2008 mitigation rule; and, 2)

determine the extent to which ILF programs are capable of fulfilling the role envisioned for them under the 2008 mitigation rule.

What is Compensatory Mitigation?

Wetlands¹ and streams provide value in both ecological and economic terms. They can be natural filtration systems. They remove sediments, pollutants, and excess nutrients from water as it passes through the aquatic ecosystem. This natural process improves overall water quality, benefitting the environment and society at no direct economic cost. Wetlands also stabilize shorelines by preventing soil erosion. They replenish groundwater aquifers, ease droughts, and protect communities from floods. Additionally, wetlands provide habitats to a diverse variety of fish, plants, and other wildlife:² an intangible economic benefit reflected through recreation, education, and aesthetics (Johnson 1995, NRC 2001).

Placement of dredge or fill material in waters of the U.S. (including wetlands and streams) are regulated under the Clean Water Act (CWA). Sec. 404 of the CWA establishes a permitting program, administered by the U.S. Army Corps of Engineers (Corps) and U.S. Environmental Protection Agency (EPA),³ to regulate any discharge of dredge or fill material into the “waters of the United States” (40 CFR §232.3(b)). As defined by the Corps and EPA, “waters of the United States” include many types of wetlands and streams (40 CFR §230.3).

When evaluating a permit application for a development project which may adversely affect a wetland, riparian area, or stream, Corps regulators apply a decision logic called *mitigation sequencing*. The first step of this sequencing requires the permit applicant to avoid any and all impacts to the aquatic environment to the most practicable

1. "Wetlands are 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" (U.S. Army Corps of Engineers (33 CFR §328.3) U.S. Environmental Protection Agency (40 CFR §230.3)).

2. This includes a majority of our nation's rare and endangered species (Johnson 1995).

3. The Corps holds primary authority to issue §404 permits but may only do so through the EPA-developed application process outlined by the §404(b)(1) guidelines.

extent possible.⁴ If avoidance is determined to be not possible at the discretion of the Corps regulator, the second step of the sequence calls for the minimization of the negative effect of the project⁵. The third and final step of the sequence is compensatory mitigation. The Corps may require permit applicants to offset their unavoidable negative impacts with compensatory mitigation (33 CFR §325.1(d)(7)). This compensatory activity is conducted pursuant to the national goal of “no net loss” of wetlands set forth by President Bush in 1989 (GAO 2001).

Compensatory wetland mitigation is the restoration,⁶ establishment (creation),⁷ enhancement,⁸ or preservation⁹ of a wetland designed to offset permitted losses to wetland functions (40 CFR §230.92). The ecological standards and requirements of compensatory mitigation are set forth and regulated by the Corps. The Corps assesses all compensatory activity initiated by mitigation providers to ensure the proper functionality of the restored, established, enhanced, or preserved aquatic resource. Subsequently, the Corps assigns the appropriate number of compensatory credits to each such project.

Compensatory mitigation can be provided in two general ways: permittee-responsible mitigation (PRM) and third-party mitigation. In PRM, the permittee undertakes the necessary compensatory mitigation required by the Corps’ permit. The

4. No impact is allowed to a wetland if there is a “practicable alternative to the discharge which would have less adverse impact on the aquatic ecosystem” (40 CFR §230.10(a)).

5. “No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem” (40 CFR §230.10).

6. Restoration is 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” (40 CFR §230.92).

7. Establishment is the “manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site” (40 CFR §230.92).

8. Enhancement is “the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain of aquatic resource area” (40 CFR §230.92).

9. Preservation is 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” (40 CFR §230.92).

permittee may choose to conduct the compensatory activities either on-site¹⁰ or off-site.¹¹ Near to the original formation of the offset market for aquatic resources, the Corps' officially-stated regulatory preference was for compensatory mitigation as close as possible to the site of wetland impact (NRC 2001, Scodari and Shabman 1995, Shabman and Scodari 1994). Therefore, historically, most compensatory mitigation requirements were fulfilled through PRM on the site of the impact (NRC 2001). However, given the small scale of the compensatory mitigation projects and costly nature of on-site mitigation, as well as its ineffectiveness in replacing lost wetland functions, the official on-site regulatory preference brought criticism from ecologists and economists alike (NRC 2001).

The second method by which compensatory mitigation may also be provided is through the actions of a third-party. Under third-party compensatory mitigation, an authorized permittee may choose to pay to transfer the responsibility of conducting compensatory activities to a third-party. These third-party compensatory mitigation providers create, restore, or enhance wetlands/streams strictly *off-site*, though, preferably in the same watershed. The compensatory mitigation activity conducted by a third-party is evaluated by a body known as the Interagency Review Team (IRT), a team established by the district engineer¹² and made up of representatives from the "U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration Fisheries, the Natural Resources Conservation Service, and other federal agencies, as well as representatives from tribal, state and local regulatory and resource agencies" (33 CFR §332.8(2)). The Corps, in consultation with other members of the IRT,¹³ assigns the third-party its transferable mitigation credits for the compensatory activities conducted. The Corps has been approving the development of mitigation credits and the sale of mitigation credits since the 1990s (Scodari and Shabman 1995).

10. Mitigation at the site of the permitted impact or adjacent to the impact site (40 CFR §230.92).

11. Another site deemed suitable by the Corps (40 CFR §230.92).

12. "The term "district engineer" refers to the District Commander and any of his or her designees (i.e., persons who are authorized to take actions on his or her behalf)" (Corps and EPA 2008, p.19608).

13. The IRT is chaired by the Corps and the exact make-up of the team is unique to each Corps' District.

The Benefits of Third-Party Mitigation

Off-site, third-party mitigation offers advantages over PRM and offers benefits to all involved: the mitigation provider, the Corps regulator, the permitted impactor, and the environment. Consolidated mitigation projects reduce compensatory mitigation costs through economies of scale (BenDor and Brozovic 2007). By focusing mitigation efforts in a single location, picked especially by a third-party for the exact purpose of wetland mitigation, these projects have an overall greater likelihood for ecological success (Corps and EPA 2008, p.19606). The ecological benefits are greater than “small, geographically separated, permittee-responsible mitigation” (Corps and EPA 2008, p.19611).

Frequently, PRM projects were fulfilled by permittees with little education or applicable experience regarding wetland mitigation methods. Consolidated, off-site, third-party mitigation allows for the compensatory activity to be executed by a proven entity with experience in providing compensatory wetland mitigation. With the proper specialized knowledge and appropriate resources, third-party mitigation actors can operate at both an effective level and at the least cost. By providing mitigation in advance of wetland impacts, third parties can select sites specifically to restore particular wetland functions. Contrastingly, when mitigation is conducted on-site through PRM, the functionality of the restored or created wetland is held to the limitations of the surrounding environment (Shabman and Scodari 2004).

The benefit of third-party mitigation for the regulator is realized in the form of reduced oversight costs as a result of only visiting one mitigation location instead of many (GAO 2001). Therefore, consolidated, off-site mitigation enables the regulator to *increase* oversight of a single location at a higher frequency. With increased monitoring, the likelihood of ecological success is also enhanced. Additionally, the availability of credits established by third parties in advance of permitted impacts may allow regulators to require offsetting mitigation to even the smallest impacts. This added benefit of consolidated, off-site mitigation further helps the nation towards the goal of no overall net loss (Shabman and Scodari 2004).

Permittees and commercial investors alike, also benefit by the transfer of compensatory requirements (liability) to third-parties. By moving the mitigation off-site and shedding the responsibility of achieving aquatic functionality, the permittee no longer

experiences uncertainty about the cost of mitigation, nor does the permittee have to reserve land on their development site for mitigation (Shabman and Scodari 2004). To the commercial investor, the authorization of third-party mitigation offers an entrepreneurial opportunity and a “strong financial incentive to provide effective, timely mitigation” (Corps and EPA 2008, p.19606).

Third-Party Mitigation Providers: ILF Programs and Commercial Banks

Third-party mitigation credit providers can take the form of either mitigation banks or in-lieu fee (ILF) programs.¹⁴ These two mechanisms typically differ by their source of capital, by their management structure, and by the timing of their credit sales (Corps and EPA 2008, p.19595, Scodari and Shabman 1995, Shabman and Scodari 1994). Most mitigation banks are established through entrepreneurial initiative and financed by private capital. Typically, mitigation bankers secure the land, develop plans, receive regulatory approval, and begin restoration activities before mitigation credits can be sold (Corps and EPA 2008, p.19595). In most cases, mitigation bankers must also secure financial assurances against the risk of ecological failure of the mitigation site (performance bonds, letters of credit, etc.) before credits can be sold from the mitigation bank. The Corps’ district engineer and the IRT typically require the mitigation banker to provide sufficient financial assurances to ensure that the compensatory mitigation project will be successfully completed (33 CFR §332.3(n)). These requirements ensure that mitigation projects will be in place or under construction in advance of permitted impacts.

ILF programs historically have been operated by nonprofit organizations or government agencies (33 CFR §332.2, 40 CFR §230.92). In the administering of a typical ILF program, a permittee pays a fee to the ILF program. The payment of fees fulfills the permittees’ regulatory obligation and transfers the obligation to the ILF program. The ILF program collects and then holds these fees in an account until a sufficient amount of fees are collected to begin a compensatory mitigation project. The fees paid by permittees

14. Commercial mitigation banks are the dominant form of mitigation banks however, single user banks such as those established for department of transportation make up nearly one-quarter of all mitigation banks (Vanderbilt, Martin, and Olson 2015).

represent the primary source of financing for ILF programs. Because of this financing structure, the wetland impacts compensated by ILF programs usually occur several years before the initiation of the offsetting mitigation activities. This “lag” in regulated compensation is known as a ‘temporal’ loss in aquatic function and services.

For reasons such as their financial structure, in lieu fee programs have been the subject of a number of criticisms since the beginning of the wetland program. Critics argue that ILF programs have limited incentives to produce “timely [and] successful mitigation” (Corps and EPA 2008, p.19599). ILF programs already allow temporal loss to the ecosystem by waiting to collect sufficient fees before initiating compensation, thus undermining the national goal of “no-net-loss” (Gutrich and Hitzhusen 2004)¹⁵

Moreover, some investigations reported instances of long delays in providing compensatory mitigation and incomplete wetland accounting that failed to tightly link fee revenue to timely completion of mitigation projects (ELI 2002, GAO 2001, Shabman and Scodari 2004). Given the nature and the characteristics of ILF revenue streams, ILF programs face the risk that collected fee revenue could be insufficient to construct a satisfactory offsetting amount of wetland mitigation. If fees are insufficient to fully offset permitted losses, then regulators may have few options to resolve the deficit. The commercial compensatory banking industry voices these exact concerns: that ILF program compensatory mitigation costs may not be reflected in ILF fees (e.g. not charging for overhead costs or opportunity costs of land on public mitigation sites), effectively subsidizing permitted impacts (Corps and EPA 2008, p.19599, ELI 2002, GAO 2001).

Nonetheless, ILF programs have been an element of the §404 compensatory mitigation program since its inception. ILF programs were created and have remained because they have been justified as an acceptable off-site compensatory mitigation option on a number of grounds. Commercial mitigation bankers may face certain economic conditions that are not conducive for investments in off-site compensatory mitigation

15. In several districts, like Jacksonville & Seattle, this is countered by the practice of applying discount factors to required compensation in order to adjust to temporal loss of functions. Also, a number of ILF programs; like MS Coastal, Everglades, NWFL WMD; all trade only in released credits; so, there is no temporal loss of function. Others, like MO CHF SSTF, utilize only released credits in most of the program service areas. Some ILFs; like VARTF, NC DMS, ME NRCP, NH ARM, and Pierce Co; have released credits available for debit in 1 or more program service area.

projects. For instance, wetland and stream compensatory mitigation markets are often characterized by limited demand (Madsen, Carroll, and Brands 2010, Scodari and Shabman 1995, Shabman and Scodari 2004). The demand for mitigation credits may be limited for several reasons. It could be limited due to the lack of development activity that requires §404 permits, a strict adherence to the regulatory preference for an avoidance of impacts,¹⁶ issued permits do not result in a significant loss of aquatic resources¹⁷, or a preference for on-site mitigation. An additional reason may be that the regulatory approval of off-site compensatory mitigation projects and sales places limits on the geographical extent to which credits can be transferred.¹⁸ Therefore, such a spatial limit on mitigation bank credit sales can also limit the availability of credits to permittees. If possible credit sales opportunities are too limited or too uncertain, commercial credits will not be provided. In such cases, ILF programs may provide the only financially feasible way to supply off-site compensatory mitigation.

ILF programs may be justified as another off-site compensatory mitigation option for other reasons, as well. Given that impacts occur in advance of compensation, ILF programs have potential to better match mitigation with the lost (impacted) ecosystem services. ILF programs also have the potential to provide mitigation in a more complete watershed approach by conducting a comprehensive assessment of watershed needs. Such an approach can target the location and type of mitigation activities that offer the

16. The wetland offset credit market exists because of the permitting program established in §404 of the CWA. Therefore, the value attributed to wetlands, their functions, and their restoration is directly assessed by the Corps and EPA. The regulator holds complete autonomy in the application and execution of the law. The processes regulators follow to approve and transact credits, directly affects the private investments entrepreneurs make in the mitigation market. If regulatory approval procedures are fulfilled with intense scrutiny by the Interagency Review Team (IRT), the private investor faces steep administrative costs, as well as larger investment opportunity costs. Still more added costs can also be applied by the regulator throughout the entirety of the credit establishment process.

17. Mitigation must be for significant resource loss of importance to the environment. If that standard is not met, then mitigation cannot be required (33 CFR §320.4(r)(ii)(2)).

18. “The service area is the watershed, ecoregion, physiographic province, and/or other geographic area within which the mitigation bank or in-lieu fee program is authorized to provide compensatory mitigation required by DA permits. The service area must be appropriately sized to ensure that the aquatic resources provided will effectively compensate for adverse environmental impacts across the entire service area” (33 CFR §332.8(d)(6)(ii)(A)).

best opportunities to meet watershed objectives and offset impacts (Corps and EPA 2008, p.19599,19611, Robertson and Hayden 2008, NRC 2001).

The Role of ILF Programs under the 2008 Mitigation Rule

In 2008, the Corps and EPA approved new compensatory mitigation regulations (33 CFR §332, 40 CFR §230(j)). The new regulations maintain ‘avoid and minimize’ logic, but establish a new regulatory preference for off-site compensatory mitigation. In addition, the rule prioritizes compensatory mitigation in advance of the impact. When issuing §404 permits which require compensatory mitigation, Corps regulators must now consider this hierarchy of mitigation:

1. Mitigation credits from a mitigation bank¹⁹
2. Mitigation credits from an in-lieu fee program
3. Permittee-responsible mitigation under a watershed approach²⁰
4. Permittee-responsible mitigation through on-site and in-kind mitigation
5. Permittee-responsible mitigation through off-site and/or out of kind mitigation (33 CFR §332.3(b))

These new mitigation regulatory preferences closely follow the recommendations put forth by the National Resource Council (Vanderbilt, Martin, and Olson 2015, NRC 2001).

The Corps and the EPA prioritize off-site compensatory mitigation in advance of permitted resource losses in order to avoid temporal mitigation losses and to reduce the risk of compensatory mitigation project failure. During the development process of the

19. Released ILF credits generated from an ILF project (and only released credits) are explicitly considered equivalent to bank credits under this same section of the rule (33 CFR §332.3(b)).

20. “The 2008 Mitigation Rule emphasizes the use of an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. It involves consideration of watershed needs and how locations and types of compensatory mitigation projects address those needs. The goal of this watershed approach is to maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites. To support this goal, the 2008 Mitigation Rule emphasizes using existing approved watershed plans to inform compensatory mitigation decisions, when such plans are determined to be appropriate for use in this context. Where approved and appropriate watershed plans do not exist, the Rule describes the types of considerations and information that should be used to support a watershed approach to compensation decision-making” (Vanderbilt, Martin, and Olson 2015).

rule, numerous commentators also requested that ILF programs be phased out as a compensatory mitigation option for many of the same criticisms already reviewed (Corps and EPA 2008, p.19599). Despite the opposition, the Corps and EPA elected to retain ILF programs as a third-party mitigation option. The rule advances the idea that ILF programs provide the only feasible way to provide ecologically beneficial off-site compensatory mitigation in areas not served or underserved by mitigation banks (Corps and EPA 2008, p.19606,19611).

The 2008 rule added a number of additional ILF program requirements for transparency, cost accounting, and financial performance assurances so as to hold both mitigation banks and ILF programs to equivalent standard (33 CFR §332.8). The rule also formally established a definition for “advanced credits.” Advanced credits are now explicitly defined as credits sold to a permittee by (only) an ILF program before actual compensatory mitigation is implemented. The rule defines limits on the number of advance credits that can be sold and it places timelines for the fulfillment of such credits.

Problem Statement

ILF programs are now expected to serve off-site compensatory mitigation needs when conditions are unfavorable for mitigation banks. The expectation is that these areas are characterized by limited and infrequent demand. At the same time, regulatory rules place new limits on the financial ability of ILF programs to provide compensatory mitigation. The 2008 mitigation rule imposes regulatory conditions on ILF programs, such as cost accounting and financial assurances, which are intended to serve as equivalent standards to those regulatory conditions placed on commercial banks. Therefore, ILF programs may experience financial challenges in fulfilling their role within the compensatory mitigation program.

The rule also expects regulatory authorities to favor compensatory mitigation in advance of impacts, over ILF advance credits. Such preference is required in order to provide incentives for investment in compensatory mitigation projects in advance of impacts. A 2015 retrospective report about the implementation of the 2008 rule quoted some commercial mitigation bankers voicing concerns that this new preference hierarchy is not being observed (Vanderbilt, Martin, and Olson 2015). Within the structure of the

rule, however, regulators can exercise some discretion as to whether available credits are of the appropriate type and acceptable distance from permitted impacts. It is unclear the extent to which permitting authorities consider these factors in the presence of available off-site commercial mitigation bank credits. This evaluation is especially unclear when related to the tradeoff of temporary losses borne with ILF advanced credits.

Objectives

The 2008 rule provide an opportunity to examine the role and the function of ILF programs in securing off-site mitigation in a regulatory program with clear preferences for *advanced* off-site mitigation. The specific objectives of this research are to:

1. Evaluate the extent of the financial advantages that ILF programs have over commercial mitigation banks in providing compensatory mitigation under conditions of limited credit demand.
2. Examine the experience of implementation of the rule in two case study areas with active ILF programs and commercial mitigation credit programs in order to:
 - a. Examine the administration of and adherence to the mitigation hierarchy for third-party, off-site mitigation.
 - b. Identify to what extent ILF programs fulfill compensatory obligations in areas of limited credit demand.

Methods

To evaluate the extent of the financial advantages that ILF programs hold over commercial mitigation banks in providing compensatory mitigation under conditions of limited credit demand (objective 1), a financial simulation model will be used. The model will simulate the net present value²¹ of a hypothetical mitigation project. Only the demand conditions and the project sponsorship will be varied in the model to observe the difference in financial outcomes between an ILF program's approach to providing compensatory mitigation and a commercial mitigation bank's approach to providing

21. The NPV of any given project is the "difference between the present value of all cash inflows and present value of all cash out flows" (Bora 2015, p.65).

compensatory mitigation. The difference in net present value between each project sponsor will be compared and the financial advantage held by ILF programs will be quantified. The model is modified from a similar simulation used by Shabman et al (1998) to estimate the internal rate of return²² and net present value of a compensatory mitigation project.

A case study approach will be used to examine how ILF programs operate under the new regulations (addressing objective 2). This paper will study two Corps Districts; the Norfolk District, which regulates the Commonwealth of Virginia, and the Savannah District, which regulates the State of Georgia. Both of these districts are chosen for the in-depth case studies because of the prominence of an active ILF program and numerous mitigation bankers within their respective compensatory mitigation markets. These study areas include regions served by both commercial wetland bankers and an ILF program; and, the study areas also include regions only served by an ILF program and *not* by commercial wetland bankers. The interaction and isolation of ILF programs allow for the observance of regulatory preferences, as well as a variety of economic situations confronted by ILF program administrators. These study areas will be utilized to identify how regulatory preferences for advanced compensatory mitigation, under the rule, have been implemented in areas with active private banking and ILF programs. The case study will be completed by the use of quantitative and qualitative information.

First, a descriptive profile will be constructed for each ILF program in each study area for the purpose of better understanding ILF activity (objective 2). This profile will include background information, the objectives of each ILF program, and contextual data for credit transactions (when and where these transactions occurred). The case studies will then describe and summarize ILF advanced credit sales in relation to commercial mitigation banking activity in each case study area. ILF advanced credit approvals will be categorized by spatially identifying the frequency of the approval of ILF advanced credit sales relative to the supply of commercial mitigation credit sales. This will highlight the extent to which the regulatory preference for advance mitigation is followed.

22. A project's IRR is the "rate at which the sum of discounted cash inflows equals the sum of discounted cash out flows;" or, in other words, a rate of return for which the project's NPV equals zero (Bora 2015, p,65).

Next, once the descriptive profile has been formed, personal interviews with ILF administrators and regulators will be conducted. These interviews will be used to investigate how ILF program administrators manage mitigation activities in areas with and without a commercial mitigation credit supply (objective 2). The interview protocols will be semi-structured. A script of standard questions will be drafted; but, as more information is gathered during the interview it may be necessary to deviate from the script to investigate and expand upon unforeseen topics.

Regulatory officials will be interviewed to identify and verify the regulatory rationale for use of observed ILF advanced credit sales. ILF program administrators will be interviewed to identify and compare investment strategies that these administrators use in areas served by mitigation banks and areas not served by mitigation banks. The interviews of the regulators should verify the obvious hypotheses for advanced credit activity, i.e., there are no other options because development is slow or newly emerging; the impacts made were unique. Likewise, the answers given by ILF administrators will further corroborate any disparities in ILF operations based on the presence or absence of mitigation banks in the same service area.

Finally, this paper will conclude by comparing the outcome of the theoretical model (objective 1) to the empirical findings of the case study analyzes (objective 2). The implementation of ILF programs will be contrasted, including how these mitigation entities provide compensatory credits in advance of impacts. Limitations of data availability and spatial certainty will also be explored.

Chapter 2: The Impact of Limited Demand on the Financial Outcomes of ILF Projects and Commercial Mitigation Bank Projects

Introduction

ILF programs are retained in the 2008 mitigation rule because regulatory officials envision ILF programs providing off-site mitigation when commercial banks fail to provide sufficient credits in areas of limited demand (Corps and EPA 2008, p.19606,19611). This chapter further investigates the limits that third-party creditors face when providing off-site compensatory mitigation in areas with low credit demand conditions. Specifically, this chapter will examine 1) the extent to which commercial mitigation banks are able to provide financially successful mitigation in the face of limited demand, and 2) the extent of ILF programs' financial advantages when providing off-site mitigation in areas left unserved by commercial mitigation banks.

The 2008 mitigation rule grants ILF programs the authority to sell "advance" credits prior to the initiation of construction on a compensatory mitigation project. This ability to collect fees in advance of construction gives ILF programs a key financial advantage over commercial mitigation banks in providing off-site mitigation. This fundamental difference alters the cash flow of each mitigation project; and, as a result, alters the financial outcomes of each project.

Simultaneously, though, the rule also imposes new requirements on ILF programs that limit the potential to provide financially viable projects in the presence of limited demand. First, the rule places limits on the total number of advance mitigation credits that can be sold in each ILF service area (33 CFR §332.8(n)(1)). If these limits are met, an ILF program cannot sell any more advance credits until the release of approved credits from a mitigation project (33 CFR §332.8(n)(3)). Next, the rule places strict limits on the amount of time that an ILF program can collect fees before beginning construction on a compensatory mitigation project (33 CFR §332.8(n)(4)). Lastly, the rule requires equivalent standards for both mitigation banks and ILF projects regarding compensatory mitigation projects, such as financial assurance requirements and full-cost accounting (33

CFR §332.8(j)(1)). These regulatory requirements serve to create similar cost structures for both ILF programs and commercial mitigation banks.

The extent of the financial advantages that ILF programs have over mitigation banks in limited demand conditions will be determined through the use of a financial simulation model. The model will simulate the revenues and costs of a hypothetical, but realistic, wetland credit project. The project is representative of wetland mitigation projects in the Mid-Atlantic region. Only the demand conditions and the project sponsorship, by either an ILF program or a commercial mitigation bank, will be varied in the model to observe the difference in financial outcomes between the two third-parties' off-site compensatory mitigation approaches.

The Production Process of Wetland Mitigation Credits

To better understand the wetland mitigation credit production process, costs, and the inputs of the simulative model, I will first review the process required of an ILF program and commercial mitigation bank to establish a new wetland mitigation credit project. The production process will be used to inform the structure and data inputs of the financial simulation model.

Mitigation project establishment is a time-intensive process that requires substantial investments of time and capital. Broadly, the production process includes: (1) legal/regulatory approval costs and wetland planning, (2) purchases of land or conservation easements, (3) construction regarding wetland restoration or establishment, and (4) monitoring and quality control costs for perpetuity (BenDor and Riggsbee 2011). In several ways, the 2008 rule have leveled mitigation requirements between ILF programs and mitigation banks by establishing equivalent standards for all third-party mitigation providers. These equivalencies bind ILF programs and ILF projects to the same mitigation bank approval process used by commercial mitigation banks.

For both ILF projects and mitigation banks, the process of mitigation project establishment begins with the development of a project proposal document.²³ Each

23. Specifically, for any proposed ILF project, the project proposal must be based on the compensation planning framework found in an ILF program's approved instrument (33 CFR 332.8(n)). The compensation planning framework outlines a detailed watershed approach for compensatory mitigation to be followed by all proposed and initialized ILF mitigation projects (33 CFR 332.8(c)(i-xi)). For the

official draft of an ILF project proposal and mitigation bank proposal must include the following 12 elements of mitigation plans found in Table 1.

Table 1: 12 Elements of a Mitigation Plan (33 CFR §332.4(c)(2) through (c)(13))

1. Objectives	<i>“A description of the resource type(s) and amount(s) that will be provided, the method of compensation (i.e., restoration, establishment, enhancement, and/or preservation), and the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed, ecoregion, physiographic province, or other geographic area of interest.”</i>
2. Site Selection	<i>“A description of the factors considered during the site selection process. This should include consideration of watershed needs, on-site alternatives where applicable, and the practicability of accomplishing ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and/or preservation at the compensatory mitigation project site.”</i>
3. Site Protection Instrument	<i>“A description of the legal arrangements and instrument, including site ownership that will be used to ensure the long-term protection of the compensatory mitigation project site.”</i>
4. Baseline Information	<i>“A description of the ecological characteristics of the proposed compensatory mitigation project site and, in the case of an application for a DA permit, the impact site. This may include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a map showing the locations of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other site characteristics appropriate to the type of resource proposed as compensation. The baseline information should also include a delineation of waters of the United States on the proposed compensatory mitigation project site. A prospective permittee planning to secure credits from an approved mitigation bank or in-lieu fee program only needs to provide baseline information about the impact site, not the mitigation bank or in-lieu fee project site.”</i>
5. Determination of Credits	<i>“A description of the number of credits to be provided, including a brief explanation of the rationale for this determination.”</i>
6. Mitigation Work Plan	<i>“Detailed written specifications and work descriptions for the compensatory mitigation project, including, but not limited to, the geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water, including connections to existing waters and uplands; methods for establishing the desired plant community; plans to control invasive plant species; the proposed grading plan, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream compensatory mitigation projects, the mitigation work plan may also include other relevant information, such as plan for geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian area plantings.”</i>
7. Maintenance Plan	<i>“A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed.”</i>
8. Performance Standards	<i>“Ecologically-based standards that will be used to determine whether the compensatory mitigation project is achieving its objectives.”</i>
9. Monitoring Requirements	<i>“A description of parameters to be monitored in order to determine if the compensatory mitigation project is on track to meet performance standards and if adaptive management is needed. A schedule for monitoring and reporting on monitoring results to the district engineer must be included.”</i>

Continued on the following page.

framework, an ILF program must identify potential project sites and provide a preliminary evaluation of the mitigation activities (33 CFR 332.8(c)(2)(v-vi)). A mitigation bank has no such framework.

10. Long-term Management Plan

“A description of how the compensatory mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management.”

11. Adaptive Management Plan

“A management strategy to address unforeseen changes in site conditions or other components of the compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures. The adaptive management plan will guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success.”

12. Financial Assurances

“A description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with its performance standards.”

With these 12 elements outlined, the project proposal is submitted to the IRT for review and approval.

There is an “optional but strongly recommended” preliminary review offered by the IRT before official submission. This preliminary review lasts for 30 days and is intended to identify potential issues with the proposed project (33 CFR §332.8(d)(3)). The recommendation of this preliminary review comes strongly because of the detailed and extensive nature of the 12 elements outlined in Table 1. If potential issues are found in the preliminary review, the project sponsor can remedy these issues relatively quicker than if the proposal had first entered the longer, formal review process (Vanderbilt, Martin, and Olson 2015).

Upon official submission, the proposal enters a period of formal regulatory review and public comment (33 CFR §332.8(d)(4)). The proposal is subject to public comment for 30 days. After the end of the public comment period, the district engineer, the sitting chair of the IRT, prepares an evaluation of the project proposal.²⁴ This evaluation must be delivered to the bank sponsor within another period of 30 days²⁵ after the close of the public comment phase. In this written initial evaluation, the district engineer either approves the project sponsor to proceed with the drafting of the official site development plan or the district engineer must outline the necessary revisions for the sponsor to

24. This evaluation is not required for modifications of approved instruments including addition of sites to ILF programs or umbrella mitigation banks (33 CFR §332.8(d)(5)(iv)).

25. It is important to understand that these compulsory periods of 30 days are best case scenarios (Vanderbilt, Martin, and Olson 2015).

receive approval. If proposals are determined to not be potentially suitable at all, the district engineer will withdraw the proposal from further consideration.

If approval is granted in the initial evaluation, a thorough, detailed expansion of the original project proposal is developed (33 CFR §332.8(d)(5)(ii)). This new, larger document is known as a site development plan, also known as a mitigation plan (33 CFR §332.4(c), §332.8(j)). The site development plan and the conditions established in it remain effective throughout the operational life²⁶ of the bank. Approval of the site development plan is granted by the district engineer (33 CFR §332.4(c)(1)(ii)). Final approval is based on “site suitability, long-term sustainability, ... benefits to rare and endangered natural resources, and an acceptable mitigation plan” (i.e., proper accounting procedures) (TNC 2011d). The site development plan must pass another 30 day comment period in IRT review; and, ultimately, the district engineer will decide the fate of the site development plan 90 days after submission (33 CFR §332.8(d)(7)).

Both the development of the proposal and the development of the site plan come at a high administrative cost and are time-intensive (Shabman and Scodari 2004, 2005, NRC 2001) The mandatory timetables written into the legislation are intended to streamline the approval process; however, in actuality, limited regulatory resources hinder the expediency of the approval process (Vanderbilt, Martin, and Olson 2015). The time required to bring credits to market creates an opportunity cost that must be considered before proposal submission (Shabman and Scodari 2004).

For each compensatory wetland mitigation project, regulatory officials establish wetland mitigation performance criteria and credit release schedules (element #8 in Table 1, a required element of both the project proposal and site development plan) (33 CFR §332.8(j)). Performance standards are observable or measurable²⁷ attributes of the aquatic functioning for the mitigation site. Before mitigation project initiation, especially

26. “The operational life of a mitigation bank terminates at the point when (1) Compensatory mitigation credits have been exhausted or banking activity is voluntarily terminated with written notice by the bank sponsor provided to the Corps or NRCS and other members of the MBRT, and (2) it has been determined that the debited bank is functionally mature and/or self-sustaining to the degree specified in the banking instrument” (Corps et al. 1995).

27. Examples of quantifiable performance standards include: requirements for survival of planted stock, plant density, reliance on natural reference wetlands, or limits on the occurrence of exotic and nuisance plant species (NRC 2001).

in the case of a proposed restoration project, baseline functions (i.e., the status quo) are observed or measured. Then, in the site development plan, it is determined to what degree that these attributes will be improved. This improvement is the very essence of the asset being brought to market: a functional improvement in the aquatic ecosystem to offset the permitted impacts in another aquatic ecosystem.²⁸

The release of marketable credits is tied to meeting the performance criteria. In the case of commercial mitigation banks, the credit release schedule defines when credits are released for sale. Regulatory officials release a percentage of the total potential project credits when all of the appropriate documentation has been submitted and then that documentation has been approved by the IRT (33 CFR §332.8(m)). For wetland mitigation projects in the Mid-Atlantic, this initial credit release is typically 15% of a project's potential credits (Corps et al. 2010). Evidence of this practice is exhibited directly in the template for mitigation banking instruments provided by the Corps-Norfolk District and the Virginia Department of Environmental Quality (VDEQ) to potential commercial mitigation banks (2010). Following the initial credit release, a percentage of the remaining credits are released when certain performance milestones are reached (33 CFR §332.8(d)(6)(iii)(B)). A final release coincides when the site is deemed to be fully functional (33 CFR §332.8(o)(8)(i)). The Corps-Norfolk District and VDEQ template suggests this final release to be 10% of a project's potential credits.

The rule also requires ILF projects to adhere to a credit release schedule (33 CFR §332.8(j)(1)). ILF projects seem to typically follow the same credit release schedules as commercial mitigation banks (33 CFR §332.8(o)(8)(iii), TNC 2015a, b) . This equivalent standard now ensures that ILF projects must meet required performance standards before mitigation obligations are considered fulfilled or before additional credits may be sold.

The rule requires both ILF projects and commercial mitigation banks to provide financial assurances to reduce the risk of project failure. For ILF programs, this is a new requirement. Now, *all* project sponsors are required to provide “sufficient funds or other financial assurances to cover contingency actions in the event of bank default or [performance] failure” (Corps et al. 1995, § II.E.5). These financial assurances are

28. As administered by the regulatory body

quantitatively correlated to the risk assumed by each project – influenced by bank location, bank size, wetland type, and overall site design. There are several different financial assurances available for bank sponsors to utilize (Scodari, Martin, and Willis 2016).

Financial assurances allowed by the Corps for third-party mitigation banks include letters of credit, performance bonds, escrow agreements, and casualty insurance (33 CFR §332.3(n)(2)). Each assurance differs in availability, process of procurement, price, opportunity cost, term, renewal, claims, and performance. Letters of credit are reported to “have been used fairly extensively to assure mitigation obligations” (Scodari, Martin, and Willis 2016, p.19). According to the Institute for Water Resources (2016), “a letter of credit is a document issued by a financial institution (the issuer) on behalf of a mitigation provider (the account party) that provides for payment of the account party’s obligations to another party (or beneficiary) designated by the Corps who is willing to accept responsibility for completing or replacing the mitigation project” (Scodari, Martin, and Willis 2016, p.15). The issuer will require the account party to provide cash as collateral. The issuer will also charge a fee, typically a percentage of the letter of credit. Letters of credit are also considered to be “fairly readily available to qualified parties” (Scodari, Martin, and Willis 2016, p.19). However, some ILF programs elect to build financial assurances into advance credit prices or into the project budgets as a designated contingency fund. This would be an example of a Corps approved alternative to conventional financial assurances (Scodari, Martin, and Willis 2016).

Other costs that both ILF projects and mitigation banks must inevitably face are the costs of construction, post-construction monitoring and maintenance, as well as the cost of long-term site protection. The construction involved for each wetland project is unique to each specific site. Site-specific characteristics, like previous land use, topography, geology, vegetation, and to what degree these characteristics vary from the proposed mitigation, all affect the unique construction cost of each wetland bank (Louis Berger & Associates and Group 1997). The type of wetland being restored or created is dependent on the surrounding watershed and ecosystem. The type of wetland then dictates the necessary functions that must be constructed or restored. However, in the case of a wetland restoration project, the degree to which these functions must be restored

(i.e., how much time, capital, and labor must be utilized) is, again, solely dependent on the specific site and how degraded these functions may be.

It is of little surprise that the literature regarding ecosystem restoration costs ranges widely in reported costs. Cost analysts acknowledge that there are many hidden costs left unaccounted for in cost estimations (Zentner, Glaspy, and Schenk 2003, Wellman 2000, King and Bohlen 1994, Guinon 1989). The costs of planning and permitting, as well as the cost of overhead, are difficult costs to define in a general sense. Additionally, many of the consultants who conduct aquatic restoration activities either publish work infrequently or consider cost data as proprietary (Robbins and Daniels 2012, Holl and Howarth 2000).

General principles do carry from study to study, though. Construction generally entails earthwork (grading), the inclusion of sediment and erosion controls (e.g. planting), as well as the installation of water control structures (NRC 2001). Costs for construction vary between project types, i.e., restoration and creation projects are found to be more expensive than enhancement projects. Furthermore, construction costs are also logically tied to economies of scale. As the project size increases, the per acre cost decreases (King and Bohlen 1994).

After construction, ILF projects and mitigation banks must be monitored for specific performance standards for a limited period of time (as outlined in the site plan). In the Commonwealth of Virginia, performance monitoring is required for 6 of the first 10 years after bank establishment (Corps-Norfolk and VDEQ 2004). If the performance standards fail to be met, the mitigation project sponsor will need to undertake remedial activities and further monitoring will be required (Corps et al. 1995, § II.E.4).

Following the monitoring period, assuming the ILF project or mitigation bank has achieved performance success, the wetland (or stream) must now be protected in perpetuity. This protection can be arranged through conservation easements, non-profit conservation groups, or a title transfer to a Federal or State resource agency. For the long-term maintenance and management of the project, the bank sponsor must provide

stewardship funding at the time of transfer.²⁹ The details of such arrangements are outlined in each site plan (33 CFR §332.4(c)(11)).

ILF Advance Credits

ILF programs are allowed to sell advance credits pursuant to 33 CFR 332.8(n) of the rule. In each ILF program service area, the Corps-approved ILF program instrument specifies the number of advance credits that can be sold within a given area. The exact number of advanced credits allowed to be sold is at the discretion of the District engineer and the IRT. The approved number of advanced credits is determined by an ILF's compensatory planning framework, the size of the service area, the program's past performance, and the financing available to the program (33 CFR §332.8(n)).

As specific ILF mitigation projects are implemented, advanced credits are converted into 'released' credits (i.e., credits which fulfill the Corps' functionality requirements and officially offset the permitted impact). After this conversion, the sponsor can sell more advanced credits in that service area (33 CFR §332.8(n)). Any released credits produced in excess of the advance credits' obligations can be sold to any permittee. The hierarchy for third-party mitigation is not imposed on the sale of these credits (ILF released credits attributed to already-produced compensatory mitigation) (33 CFR §332.3(b)(2)).

To limit temporal losses, the rule establishes a three-year time limit³⁰ on all advanced credits sales. Pursuant to 33 CFR §332.8(n)(4), "Land acquisition and initial physical and biological improvements must be completed by the third full growing season after the first advance credit in that service area is secured by a permittee." As each in-lieu fee project is approved, a credit release schedule will be specified (33 CFR §332.8(o)(8)).

The regulatory allowance of ILF programs to sell advance credits before project initiation alters the mitigation project's cash flows in an advantageous way for an ILF

29. The 2008 mitigation rule refers to long-term management financing including (but not limited to) endowments (33 CFR §332.7(d)(3)).

30. Corps may grant extensions if necessary

sponsor. The revenue an ILF program receives from advance credit sales *before* any costs are incurred can raise the NPV of a potential mitigation project. This is because the time value of money dictates that any sum of cash is more valuable *today* than at any date in the future. Similarly, obtaining cash in-flows before incurring cash out-flows, lowers the amount of capital that must be borrowed to conduct compensatory activities. When the opportunity cost of capital (the cost of borrowing money) is high (i.e., the discount rate used in the calculation of NPV), ILF programs benefit from advance credit fees lowering the amount of additional cash necessary to complete a mitigation project.

The sale of advance credits also allow ILF programs to gauge the potential credit demand within a particular area before actually implementing a compensatory project. This advanced indication of potential demand may allow an ILF program additional insight into siting and sizing compensatory mitigation projects to permittee demand.

Financial Simulation Model

A financial simulation model will be used to specifically examine and compare the financial outcomes of ILF projects and mitigation banks under conditions of limited credit demand (objective 1). A hypothetical wetland restoration project, typical of the mid-Atlantic region, will be modeled in this financial simulation. The assumptions made for this hypothetical restoration project are taken in a generic way such that it could be designed, managed, or implemented by either an ILF program or a commercial mitigation bank. The differences in financial outcomes for the hypothetical restoration project, based on which third-party entity sponsors the project, will be compared to evaluate the extent of the financial advantages that ILF programs have over commercial mitigation banks.

The model calculates the net present value (NPV) and the internal rate of return (IRR) for a commercial wetland mitigation project. The NPV of any given project is the sum total of all future revenues and costs, discounted in value based on how far into the future they occur (Sowell 2015). The formula to solve for NPV is shown below.

$$NPV(r, N) = \sum_{t=0}^N \frac{R_t - C_t}{(1 + r)^t}$$

Where R_t = all of the revenues collected at year t of the project, and C_t = all of the costs incurred at time t . The discount rate is represented by r , and N = the project duration in years. The discount rate considers the time value of money as well as the risk associated with future cash flows.

A project's internal rate of return (IRR) is the "rate at which the sum of discounted cash inflows equals the sum of discounted cash out flows;" or, in other words, a rate of return for which the project's NPV equals zero (Bora 2015, p,65). Both financial terms, NPV and IRR, are widely accepted measures of investment feasibility and financial success (Ryan and Ryan 2002). The IRR will be used strictly to determine the plausibility³¹ of an entrepreneurial investment in a commercial mitigation bank. The NPV will be used to compare the financial outcomes of each bank sponsor and quantify the extent of ILF programs' financial advantage.

If the modeled project is sponsored by an ILF program, the project will gain the advantage of an allowance of advance credits to sell, the ability to size the project based on potential demand, and the approval and use of an alternative financial assurance. Any hypothetical project sponsored by a commercial mitigation bank will not receive the same structural advantages. Additionally, both project sponsors will have different preferences for time and risk with regards to their investment in the modeled restoration project.

First, the model will determine the internal rate of return for a commercial investment in a mitigation project under different credit demand scenarios. Internal rates of return will be calculated under different credit price conditions and potential volume of annual credit sales. Next, the model will be used to calculate the NPV for an ILF-sponsored project and a commercial bank-sponsored project. The analysis provides insight into the financial capacity and limits that ILF programs have in providing off-site compensatory mitigation in limited demand conditions. A sensitivity analysis will be conducted on the ILF-sponsored project to explore the degree to which the project's NPV can be improved in low demand conditions (all prices are reported in 2014 dollars).

31. A reference hurdle rate will be used to indicate the likelihood of a commercial mitigation bank investing in an area with conditions of limited demand.

Model Wetland Restoration Credit Project

An ILF and commercial bank sponsor is initially assumed to implement a wetland restoration mitigation project representative of conditions existing in the mid-Atlantic region. Across all financial simulations, the following costs and production characteristics are held constant (See Table 2). The initial project size is assumed to be 50 acres. The regulatory approval process for both ILF projects and mitigation banks is assumed to be 2 years, from start to completion. The approval process includes site identification, restoration design, and the review conducted by the IRT. It is assumed to take \$75,000 at a minimum for this administrative work (Shabman, Stephenson, and Scodari 1998). An additional \$1,500/acre will added for the varying project size. This additional per-acre planning cost is meant to account for the increasing complexity of larger projects. The restoration site that is to be assumed for this model will be found on a plot of land 1.5 times the size of the prescribed wetland restoration area. This tract is assumed to be purchased outright by ILF programs and mitigation banks for the purposes of this simulation.³² The cost of this purchase will be \$4,320/acre, the average value per acre of farm real estate in the Commonwealth of Virginia in 2014 dollars (USDA 2015). The land will be acquisitioned only after the site development plan is approved (i.e., after pre-construction costs are undertaken).

Construction costs, as well as post-construction costs of monitoring and maintenance, will be the same for both ILF projects and mitigation banks. Construction costs benefit from economies of scale (King and Bohlen 1994). This means that the per-acre, additional construction cost diminishes as project size increases. Construction is assumed to take one year. Pursuant to recommendations from the Corps-Norfolk District and VDEQ, monitoring will occur in six of the ten years following the completion of construction. These six years will assume the typical pattern followed by Virginia mitigation projects. Monitoring will occur in years 1, 2, 3, 5, 7, and 10 following the completion of construction (Corps et al. 2010, VI.(B), Corps-Norfolk and VDEQ 2004, IV.(1)). The maintenance fund will be financed through a deposit of a sum equal to 20%

³² Many ILF programs also procure land through conservation easements and donations. Either such alternative would inflate the results of estimated NPV ILF-sponsored mitigation projects in this financial simulation.

of construction costs. This deposit is to occur in the same year as the first credit (CDFW 2008).³³ One-tenth of that deposit will be returned following the final year of.

All performance criteria will be assumed to be met; and, therefore, all credits will be released. It is assumed that one acre of restoration will yield one credit; and, it is assumed that all credits generated by the project will be sold. Upon the approval of the site development plan and the posting of the proper financial assurances, an initial 15% of the total potential credits of the project are released (typical of Virginia). As performance metrics are met with each year of monitoring, this model will assume a uniform release of additional credits (15% of potential credits every *monitoring* year). After the 10th year of monitoring, the final 10% of potential credits, reserved only for the satisfactory completion of all performance standards, will be released (Corps et al. 2010, V.(F)(2)). This schedule for credit release will remain constant for either project sponsor.

Table 2: Cost Assumptions for both ILF Project and Mitigation Bank Sponsorships

Cost Assumptions (2014\$)	
<i>Pre-construction:</i>	
<i>Site selection, Site design, Permitting</i>	Minimum \$75,000/project, plus \$1,500/ac
<i>Land acquisition:</i>	
	\$4,320/acre
<i>Construction Costs:</i>	
	$30,706 * (\text{Acres}^{-0.396}) * (\text{2014\$ Price Conversion})^\dagger$
<i>Maintenance fund:</i>	
	Sum equal to 20% of construction costs, 10% returned following the final monitoring year
<i>Post-construction:</i>	
<i>Monitoring, Maintenance</i>	\$2000/yr. minimum, plus \$120/ac/yr.

†All prices are reported in 2014 dollars.

Model Assumptions of Demand

The demand conditions faced by either project sponsor in the model will be the same. Demand conditions are varied by the level of potential demand and credit prices.

33. Many Corps districts, like Seattle, Sacramento, Mobile, Buffalo and New Orleans require performance security to generally be in the vicinity of 20% of construction costs. Virginia is currently revising MBI standards to reflect this growing consensus (Martin 2017).

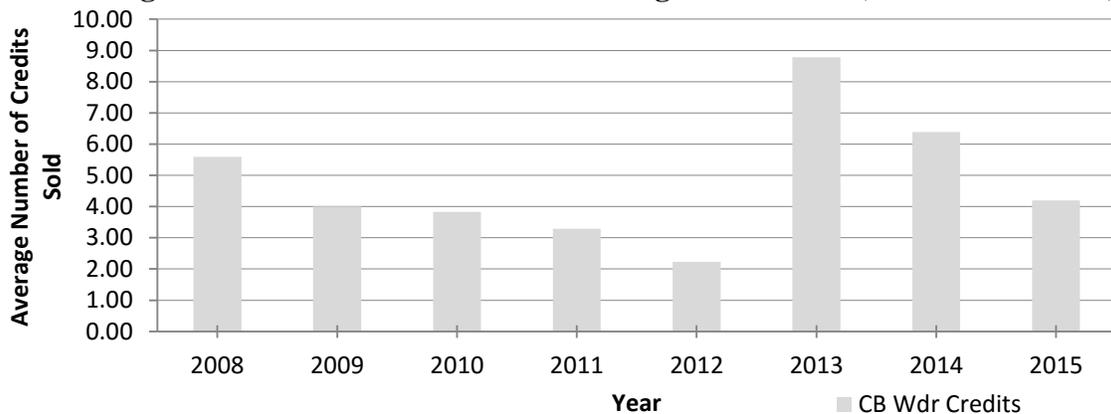
In this model, potential demand is the maximum annual number of credits buyers are prepared to purchase from a third-party credit provider within the service area. Note that potential credit demand is not the same as the total number of credits sold during a financial simulation. Credit sales are the function of both potential credit demand and the number of credits the ILF project or commercial bank has available to sell in any given year.

See Table 3 for the range of potential credit demand levels and credit prices. The levels of potential demand are considered low relative to what might be found in areas with active commercial bank supply. For instance, the average quantity of non-tidal wetland credit sales per commercial mitigation bank (with available non-tidal wetland credits) in Virginia, since 2008, is approximately 5 credits per year (see Figure 1) (RIBITS 2016). Credit prices are based on the fee schedule published by a Mid-Atlantic ILF program (TNC 2011d, Exhibit D).³⁴ The prices found in Table 3 represent the range of realistic credit prices for non-tidal wetland credits that will be used in this model.

Table 3: Model Demand Conditions

<i>Potential Demand/Year:</i>	Possible Conditions			
	1 Credit	2 Credits	3 Credits	4 Credits
<i>Credit Price:</i>	\$45,000	\$60,000	\$75,000	

Figure 1: Conditional-Average Commercial Bank Credit Sales per Bank in areas of Virginia with Available Commercial Mitigation Credits (non-tidal wetland)



Source: RIBITS 2016

34. Commercial mitigation bank credit sales are private. Therefore, there is not enough empirical evidence with which to base commercial mitigation bank credit prices.

Model Assumptions which differ by Project Sponsorship

ILF and commercial banks face different capacities to address these low demand conditions. In this simulation, ILF programs have the ability to sell a limited number of advanced credits prior to construction. In addition, ILF and commercial banks have different ways to provide financial assurances against the risk of mitigation failure. These differences are reflected in the model.

The ILF program is assumed to have an allowance of 5 advance credits to sell before compensatory activities must be undertaken. Consistent with the 2008 rule, the ILF sponsor must begin construction of a compensatory project within three years after an advance credit sale. Depending on potential credit demand, this may mean that not all 5 advance credits are sold before it becomes compulsory that compensatory construction is undertaken. Nevertheless, an ILF project sponsor will be allowed to size the modeled project based on the potential demand shown for compensatory credits in the hypothetical market. The potential sizes of the hypothetical project are 10 acres, 20 acres, 30 acres, 40 acres, or 50 acres. Each of these differing model assumptions are found in Table 4.

A hypothetical project sponsored by an ILF program will also post the same Corps-approved alternative financial assurance as that of the ILF program operating in the Corps-Norfolk District (Virginia Aquatic Resources Trust Fund (VARTF)). This allowance is in theme with the financial simulation's intent to model a hypothetical, but realistic, restoration project in the Mid-Atlantic region. The alternative financial assurance approved by the Corps, for the VARTF, is an 'earmarked' set of funds held through the duration of the post-construction monitoring period. This financial assurance amounts to 20% of the full cost of the project. This is calculated as 20% of the present value of all construction and post-construction monitoring and maintenance costs. After the post-construction monitoring period, a portion of the 'earmarked' funds will be used to finance the long-term management of the mitigation project site (Scodari, Martin, and Willis 2016, TNC 2015c, 2013). In the model, this payment to the long-term management fund will occur in the eleventh year following the completion of construction. Any remaining funds from the financial assurance will be released as revenue, also, in the eleventh year following the completion of construction.

If the modeled project is hypothetically sponsored by a commercial mitigation bank, the sale of credits will not be allowed until the initiation of bank construction and the deposit of the appropriate financial assurances. For a commercial mitigation bank, the required financial assurance will assume the most used and most readily available type: a letter of credit (Scodari, Martin, and Willis 2016). This letter of credit will be sufficient to secure the entire initial release of credits, plus collateral (Corps et al. 2010, IV.D.1 and V.F.1(b)). The initial release is 15% of the total potential credit yield. The letter of credit will be posted as a cost in the year of construction and released as revenue in the year following the completion of construction. Also, because a commercial mitigation bank must wait to sell credits, the potential demand in the market cannot serve as a gauge with which to determine the proper size of the mitigation project. The long-term management of the mitigation project will be funded through the deposit five, equal installments occurring each of the first 5 years after MBI approval (Corps et al. 2010, IV.D.3.b.). The total sum of the long-term management fund will be assumed to cost \$100/acre (Hough and Thomas 2017).

Table 4: Different Model Assumptions by Project Sponsor

	ILF Project	Commercial Bank Project
<i>Advance Credit Sales:</i>		
	An allowance of 5 Adv. Credits	No ability to sell Adv. Credits
<i>Project Size:</i>		
	10, 20, 30, 40, or 50 acres	50 acres
<i>Financial Assurances:</i>		
	20% of full project cost (sans pre-construction and land acquisition)	Letter of credit, 3% fee for 15% of value of initial credit release, <i>plus collateral</i>
<i>Long-term Management Fund:</i>		
	An amount equal to \$100/acre will be deposited into the fund at the release of the financial assurance	\$100/acre will be deposited into the fund during the first 5 years after MBI approval
<i>Determination of Project Investment:</i>		
	NVP > \$0	IRR ≥ 20%

Simulation Scenarios

Two sets of simulations are modeled. First, a project sponsored by a commercial mitigation bank will be simulated. In this scenario, IRR will be the financial indicator simulated. Projects sponsored by commercial mitigation banks will use a reference IRR

of 20%, an appropriate rate for an investment of such risk, to determine the likelihood of commercial investment in the modeled project (Zenner, Junek, and Chivukula 2014, Hook and Shadle 2013, BenDor, Riggsbee, and Doyle 2011, BenDor and Riggsbee 2011, Ross 1986, Brigham 1975).

Second, projects sponsored by either a commercial mitigation bank or an ILF program will be simulated. In these scenarios, NPV will be used as the financial indicator because of the non-conventional cash flows attributed to the sale of advance credits. Because of the non-profit nature of ILF programs, only a positive NPV will be used as a hurdle to determine the feasibility of an ILF-sponsored mitigation project. In this second set of simulations, the discount rate will vary from a relatively risk-free rate of 5% to a more moderate discount rate of 10%. The low discount rate is used for the purpose of a theoretical comparison of cost structures. The higher discount rate is used to produce relatively more accurate financial outcomes given the risky nature of mitigation.

Model Results

Internal Rates of Return for Commercial Banks in Conditions of Limited Demand

First, a hypothetical wetland restoration project of 50 acres, sponsored by a commercial bank, is simulated. The financial measure for this simulation is IRR. The simulated IRRs for a commercial bank's 50 acre hypothetical wetland restoration project are found in Table 5. Using the reference IRR of 20%, this simulation suggests that a commercial mitigation bank would not sponsor this project if potential credit demand was 4 credits per year or less, regardless of the range of viable credit prices. Only with the highest credit prices or highest demand conditions, may a commercial mitigation bank begin to consider investment. For example, at a credit price of \$75,000 and potentially 3 credits demanded per year, a commercial bank-sponsored mitigation project with the given assumptions, can expect an adequate IRR of approximately 18%.

**Table 5: Internal Rate of Return for a Commercial Mitigation Bank Project
(Project Size =50 ac., 2014\$)**

Credit Price	Potential Demand			
	1 Credit	2 Credits	3 Credits	4 Credits
\$45,000	2.59%	5.28%	8.06%	10.95%
\$60,000	4.20%	8.59%	13.18%	17.96%
\$75,000	5.64%	11.56%	17.76%	24.27%

If a commercial bank sponsor were to reduce project size to 25 acres, thereby reducing all related project sizing costs, the simulated IRRs do increase (see Table 6). However, even with a smaller hypothetical project, the simulated results still indicate a barrier to market-entry for commercial sponsors in areas of very limited demand (potentially 1 credit demanded per year). Again, this simulation suggests that only the highest credit prices and most moderate demand conditions are conducive to commercial mitigation bank sponsorship. With potentially 3 credits demanded per year, or more, and credit prices of \$60,000 or more, commercial investment becomes plausible.

**Table 6: Internal Rate of Return for a Commercial Mitigation Bank Project
(Project Size =25 ac., 2014\$)**

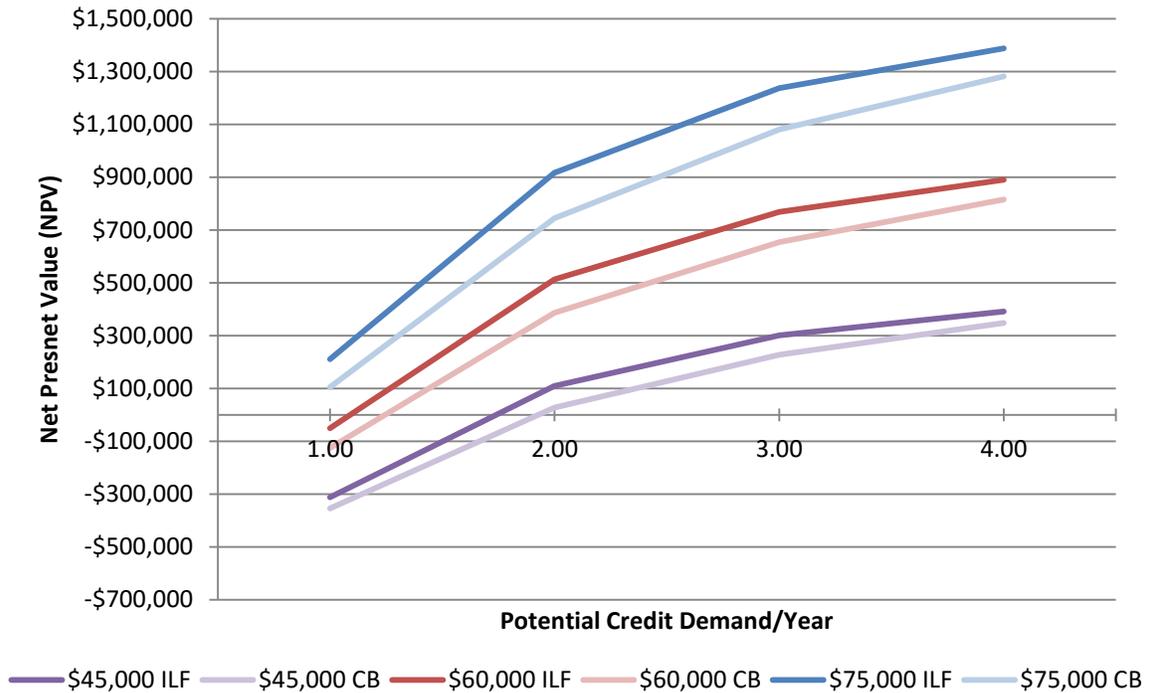
Credit Price	Potential Demand			
	1 Credit	2 Credits	3 Credits	4 Credits
\$45,000	3.05%	6.25%	8.94%	10.00%
\$60,000	5.98%	12.37%	18.08%	20.75%
\$75,000	8.58%	17.83%	26.50%	31.05%

These results illustrate the limits facing commercial mitigation banks trying to achieve financially-successful advance compensatory mitigation in areas of limited demand. The results in Table 5 and Table 6 corroborate the empirical data displayed in Figure 1.

NPV of ILF Projects and Commercial Mitigation Banks in Limited Demand

Next, the financial simulation will be used to determine the NPV of a hypothetical project sponsored by either an ILF program or a commercial mitigation bank. The simulated NPVs for a hypothetical wetland restoration project of 50 acres are found in Figure 2. The demand conditions faced by the hypothetical project range from potentially 1 credit demanded per year to potentially 4 credits demanded per year. A low, moderate, and high credit price portrays the bounds of the expected financial outcomes.

Figure 2: Net Present Value for a Wetland Restoration Project (Project Size =50 ac., 5% discount rate, 2014\$)



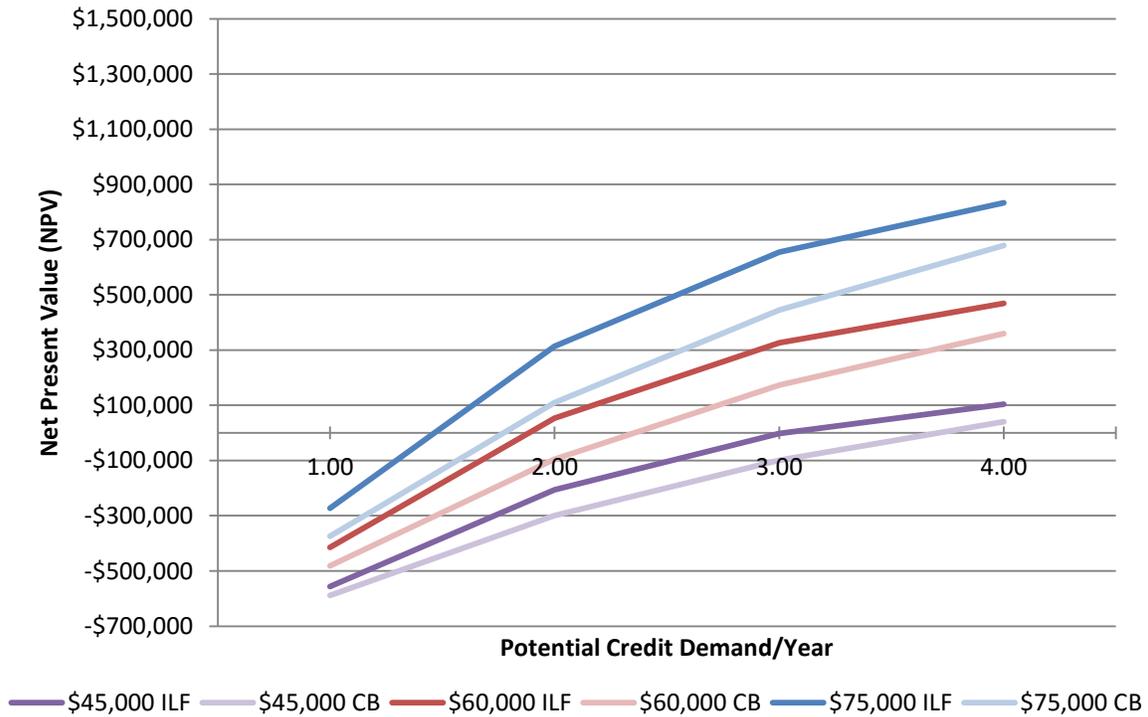
This simulation of NPV at a low discount rate produces generally positive net returns at demand conditions of 2 credits demanded/year or greater. However, even with a low discount rate, in very limited demand conditions (potential credit sales of 1 per year) both ILF program-sponsored projects and mitigation bank-sponsored projects cannot provide financially viable compensatory mitigation. Only the highest credit price of \$75,000/credit offers a chance at financially feasible mitigation.

The potential to sell advanced credits offers the ILF program some financial advantages. At a credit price of \$60,000, ILF-sponsored projects expect an approximately \$97,000 greater average NPV across all levels of potential demand shown in Figure 2. The relative magnitude of the advantage, however, is not particularly large; and, at low discount rates, commercial banks, too, can generally produce positive net present values in most limited demand scenarios. This is perhaps unsurprising since the low discount rate implies a low opportunity cost of tying up capital until sales revenues start.

Assessing the financial outcome of a hypothetical wetland restoration project under the condition of a higher discount rate (i.e., a higher cost of borrowing money) is

important because of the risky nature of mitigation. Figure 3 charts the simulated NPVs for a hypothetical wetland restoration project of 50 acres, sponsored by either an ILF program or a commercial mitigation bank, assuming a 10% discount rate.

Figure 3: Net Present Value for a Wetland Restoration Project (Project Size =50 ac., 10% discount rate, 2014\$)



With a higher discount rate (higher opportunity cost of capital), in many instances, the ILF program cannot generate a positive NPV while implementing this wetland mitigation project. At any of the credit prices, with the above assumptions, ILF programs could not provide financially feasible compensatory mitigation under demand conditions of only 1 credit per year. In demand conditions of 2 credits per year and 3 credits per year, it still remains impractical for ILF programs to provide compensatory mitigation at the lowest credit price and the above assumptions.

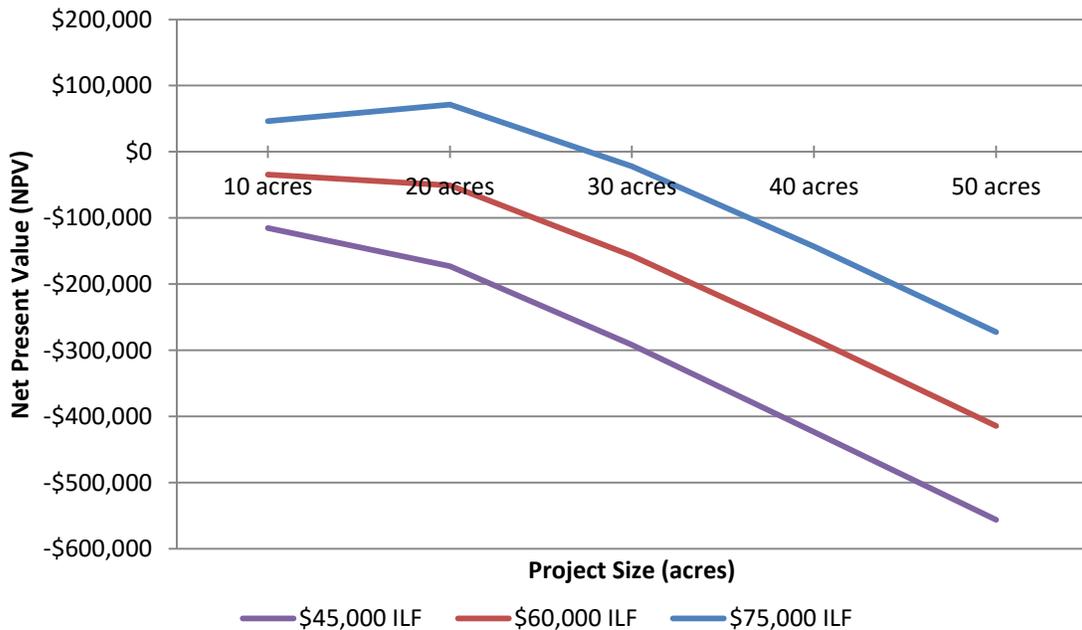
In the simulated conditions of higher discount rates, the financial advantage held by ILF programs over commercial mitigation banks is only slightly more pronounced. At a credit price of \$60,000, ILF-sponsored projects expect an approximately \$120,000 greater average NPV than the commercial mitigation bank-sponsored alternative, across all levels of potential demand shown in Figure 3.

Sensitivity Analysis: ILF Financial Returns to Project Size

By collecting fees prior to construction, ILF programs may have some additional flexibility to scale project size to meet the potential demand of the market. An ILF program can gauge the potential demand that exists in the market through the sale of advance credits. The sensitivity of the present value of net returns under limited demand conditions (1 credit per year), relative to project size (in acres), is shown in Figure 4. Such demand conditions are not conducive for an ILF program to provide compensatory mitigation at a project size of 50 acres (as seen in Figure 3).

With the advantage of being able to adjust project size though, ILF programs could increase the hypothetical project’s expected NPV by reducing the project size. With the given assumptions, the optimal project size appears to be 20 acres. However, just as there are limitations on the advantage of advance credit sales, there are also limitations on the advantage of project scaling. As seen in Figure 4, with the assumptions of this model, there is no credit price at which an ILF program could provide financially feasible compensatory mitigation at a project size of 30 acres or greater.

Figure 4: Net Present Value of an ILF Project by Project Size (Demand =1 credit/year, 10% discount rate, 2014\$)



Sensitivity Analysis: ILF Financial Returns to Regulatory Conditions

If the regulatory assumptions used to shape this model are altered, an ILF project can conceivably be financed in the most limited demand conditions and lowest credit prices. Such an alteration must, in some way, increase the revenue that ILF programs collect before project initiation or lower the cost of mitigation. The regulator is capable of influencing these two factors by either loosening the requirement of compensation within 3 years or lowering the cost of approval

Table 7 shows the effect of changing the regulatory deadline for mitigation implementation on the expected NPV of an ILF-sponsored project in demand conditions of 1 credit per year and credit prices of \$60,000. In these conditions, considering the given assumptions of this model, the regulator can practicably make an ILF-sponsored mitigation project more financially feasible. However, overall, the effect of such a regulatory alteration is minor from year to year.

Table 7: Net Present Value of an ILF-Sponsored Project with Longer Implementation Periods (Price = \$60,000, Demand =1 credit/year, 5% discount rate, 2014\$)

Project Size	Regulatory Deadline for Mitigation Implementation			
	3 Years	4 Years	5 Years	6 Years
10 acres	\$25,384.54	\$27,139.35	\$28,810.60	\$30,402.26
20 acres	\$115,591.13	\$118,258.31	\$120,798.48	\$123,217.69
30 acres	\$104,488.25	\$107,895.55	\$111,140.61	\$114,231.13
40 acres	\$42,212.54	\$46,266.46	\$50,127.32	\$53,804.34
50 acres	-\$50,900.49	-\$46,261.67	-\$41,843.74	-\$37,636.19

Table 8 presents the effect of discounted approval costs on the expect NPV of an ILF-sponsored project in demand conditions of 1 credit per year and credit prices of \$60,000. In these conditions and with the given assumptions of this model, again, the regulator could practicably make an ILF-sponsored mitigation project more financially feasible. This result of such a regulatory alteration is considerably more pronounced from year to year.

Table 8: Net Present Value of an ILF-Sponsored Project with Discounted Approval Costs (Price = \$60,000, Demand =1 credit/year, 5% discount rate, 2014\$)

Project Size	Approval Costs			
	Normal	25% Reduction	50% Reduction	75% Reduction
10 acres	\$25,384.54	\$46,302.91	\$67,221.28	\$88,139.65
20 acres	\$115,591.13	\$139,995.90	\$164,400.66	\$188,805.42
30 acres	\$104,488.25	\$132,379.40	\$160,270.56	\$188,161.72
40 acres	\$42,212.54	\$73,590.10	\$104,967.65	\$136,345.20
50 acres	-\$50,900.49	-\$16,036.55	\$18,827.40	\$53,691.35

Conclusion

The financial simulation used in this chapter examined 1) the extent to which commercial mitigation banks are able to provide financially successful mitigation in the face of limited demand, and 2) the extent of ILF programs' financial advantages when providing off-site mitigation in areas left unserved by commercial mitigation banks.

The results of the financial simulation conclude that commercial mitigation banks generally have limited financial incentives to invest in areas of limited demand. Using construction costs and time requirements of a representative mitigation project, credit demand of less than 4 credits will generally fail to provide an adequate risk adjusted rate of return on investment. ILF programs could generate positive discounted net returns for a variety of low credit demand conditions under low discount rates. At varying discount rates, an ILF-sponsored project could generate only modest improvements in average NPV of between \$97,000 and \$120,000 greater than similar projects sponsored by commercial banks. However, the NPV expected by ILF sponsored projects was still relatively low when compared to approval and construction costs alone. In fact, this model found there to be limits on the extent to which ILF programs can provide financially feasible mitigation. ILF programs can use tools, like project scaling, to push these limits further; and, regulators also possess tools to shape the financial feasibility of ILF projects. But, limits are still inevitably reached. The main advantage held by an ILF program is not the early sale of advance credits; however, it is an ILF program's willingness to assume low returns for a risky investment and a low time preference that is its advantage.

Chapter 3: The Role of ILF Programs in Implementing Compensatory Mitigation: A Case Study of Virginia and Georgia

Introduction

ILF programs were retained in the 2008 mitigation rule to serve a specific role. As a provider of third-party off-site mitigation, second in preference to mitigation banks, regulators envisioned ILF programs fulfilling the demand for compensatory credits in the areas of the market left unserved by commercial mitigation banks (Corps and EPA 2008, p.19606,19611). To identify whether this vision of the third-party mitigation hierarchy is being implemented in areas with active commercial banking and ILF programs, a case study research method will be used (objective 2a). Furthermore, these case studies will examine to what extent ILF programs fulfill compensatory obligations in areas of limited credit demand (objective 2b).

The case study areas used to evaluate the implementation of the regulatory preference hierarchy contained in the 2008 mitigation rule comprise of both a relatively vigorous commercial banking sector and an established ILF program. The Commonwealth of Virginia and the State of Georgia both meet these criteria. Virginia and Georgia each have long-standing, mature off-site compensatory mitigation permitting programs. Both states have active, well-developed ILF programs authorized under the 2008 mitigation rule. And, both states contain diverse ecological and economic conditions that give rise to diversity in commercial mitigation bank and ILF activities. For these reasons, Virginia and Georgia will serve as the case study areas for this research.

A case study research method, which employs a combination of quantitative³⁵ and qualitative data, will allow insight to be drawn into regulatory adherence to the third-party mitigation preference hierarchy. For each state, a profile describing each ILF program is presented. Each profile will begin with background information and the

35. The quantitative data reviewed in the following sections was obtained from the Army Corps of Engineers' website, Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS). The raw credit transaction data was obtained on June 21, 2016.

objectives of each ILF program. Contextual data (the where and the when) for advance credit transactions, as well as statistics regarding ILF year-to-year activity, will be used to identify conditions under which ILF advance credit sales are approved. The location, the timing, and the frequency of these approvals, especially in relation to the supply of commercial mitigation credits, are important in explaining when regulators allow advance credit sales. Personal interviews with ILF administrators and Corps regulators will also be used to understand the implementation of the hierarchy for third-party, off-site mitigation in the case study areas.³⁶

Virginia and the Virginia Aquatic Resources Trust Fund (VATRF)

The Virginia Aquatic Resources Trust Fund (VARTF), an in-lieu fee compensatory mitigation fund operational in the Commonwealth of Virginia, was originally established in 1995 by a memorandum of understanding (MOU) between The Nature Conservancy (TNC) and the Corps.³⁷ The VARTF is administered by TNC and is regulated by the Norfolk District of the Corps (TNC 2016). The VARTF was originally known as the Virginia Wetlands Restoration Trust Fund. The name changed in 2003 when the MOU was amended to extend the scope of the program to address stream impacts (TNC 2012). In 2011, the VARTF was again amended, this time with a new operating agreement written in accordance with the 2008 mitigation rule (TNC 2011d).

TNC's stated mission in the VARTF program instrument is to "preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive" (TNC 2011a, p.3). Using a "science-based" approach, TNC administers the VARTF to protect and enhance the water quality within the Commonwealth, implementing "large-scale watershed efforts" (p.3).

36. Information obtained in personal interviews with VARTF Administrator, Karen Johnson (conducted on July 12, 2016), and Corps-Norfolk Regulator, Jeanne Richards (conducted on August 25, 2016) is used to corroborate the contextual characteristics of VARTF credit activity. A personal interview with GLT-ILF Administrator, Alex Robertson (conducted on August 22, 2016), is used to corroborate the contextual characteristics of GLT-ILF credit activity.

37. Only one other ILF program has been approved in Virginia. This second ILF program is the Living River Restoration Trust, approved in 2004 for specific service to the small Elizabeth River watershed in southeastern Virginia (ELI 2006). Two more ILF programs, the Department of Environmental Quality Wetland and Stream Replacement Fund and the Southwest Virginia In Lieu Fee Program, have been proposed and are still in the review process (VDEQ 2014, RC&D 2011).

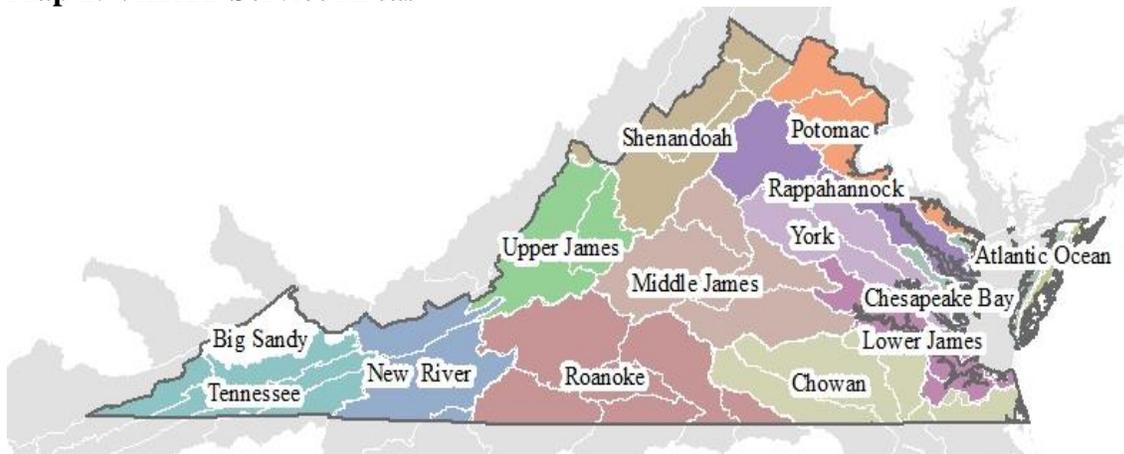
Though there is no limit to the size impact that the VARTF may mitigate, typically, the VARTF is used to mitigate “impacts of less than three acres of wetland and/or less than 2,000 linear feet (lf) of stream channel” (TNC 2012). TNC reserves the right to reject payments for any impacts exceeding those thresholds (TNC 2011d). The VARTF conducts its own planning and implementation of compensatory construction to fulfill the implicit mitigation obligations transferred through the sale of credits.³⁸

The VARTF has delineated Virginia into 14 service areas (see Map 1). These geographic service areas reflect aggregations of 8-digit hydrologic unit codes (HUCs), also known as the hydrological level of a sub-basin. The service areas are determined by both terrestrial ecoregions (as defined by Bailey and the USFS) and freshwater ecoregions (developed by the World Wildlife Fund (TNC 2011a). TNC further stratifies the combination of these ecoregions to develop what is called an ecological drainage unit (EDU) – roughly a large watershed in the range of 3,000 to 10,000 square miles. It is within the boundaries of EDUs, or just about, that TNC aggregates Virginia’s forty-eight 8-digit HUCs into its 14 service areas (TNC 2011a). Some service areas share the same boundaries with EDUs; like the Shenandoah, the Upper James, the New River, and the Tennessee. Other service areas encompass multiple EDUs or only partial EDUs; like the Roanoke, the Chowan, the York, the Rappahannock, and the Middle James (TNC 2011a). The VARTF is authorized by its banking instrument to sell advance mitigation credits in all but 1 service area, the Big Sandy³⁹ (an area the VARTF elected not to serve and where no mitigation banks are established).

38. In one recorded instance, the VARTF fulfilled a mitigation obligation through the purchase of stream credits from a mitigation bank (VARTF project RO-7) (ELI 2016). TNC issued a request for proposals for 2,500 to 3,500 stream credits, and “it was decided that 2,500 stream credits would be purchased from the Roanoke River Stream and Wetland Mitigation Bank” (TNC 2016).

39. The VARTF previously provided mitigation activities in this service area. Currently, however, the VARTF no longer accepts fees for compensatory mitigation activities. The VARTF does hold compensatory obligations in the Big Sandy to maintain the regulatory goal of no-net loss. These obligations were undertaken before the 2008 rule (ELI 2016).

Map 1: VARTF Service Areas



Sources: RIBITS 2016, USGS 2016

The Code of Virginia (§62.1-44.15:23(A)(i)) requires off-site mitigation to be conducted “within the same 8 digit HUC Catalog Unit or adjacent HUC Catalog Unit in the same river basin” (Corps-Norfolk 2008). Therefore, in VARTF service areas that incorporate non-adjacent 8-digit HUCs; like the Potomac, the Shenandoah, the Chowan, the Roanoke, the New River, and the Tennessee; some VARTF mitigation projects will not provide compensatory coverage to the entire service area.

The VARTF ILF instrument specifies the number of advance credits for each service area (see Table 9). As the rule stipulates, these advance credit allowances are determined by, 1) the VARTF’s compensation planning framework, 2) TNC’s past performance for implementing compensatory mitigation in the proposed service area, as well as other areas, 3) the estimated financing necessary to begin the planning and implementation of ILF projects, and 4) the availability of the mitigation bank credits in each service area (TNC 2011d). The advance credit prices, also found in Table 9, are determined by the expected costs associated with compensatory activities in each specific service area. The expected costs are derived from the full-cost accounting methods required in the rule (33 CFR §332.8(o)(5)(ii)).

Table 9: VARTF Advance Credit Allowances and Credit Prices

Service Area	Non-tidal Wetland		Tidal Wetland		Stream	
	# of Credits	Price	# of Credits	Price	# of Credits	Price
Atlantic Ocean	5	\$65,000	2	\$500,000	5,000	\$400
Big Sandy	0	n/a	0	n/a	0	n/a
Ches. Bay	20	\$100,000	2	\$450,000	5,000	\$400
Chowan	5	\$30,000*	2	\$550,000†	5,000	\$400
Lower James	20	\$50,000	2	\$500,000	10,000	\$500
Middle James	10	\$55,000	0	n/a	5,000	\$500
Upper James	10	\$65,000	0	n/a	5,000	\$400
New River	5	\$65,000	0	n/a	5,000	\$375
Potomac	5	\$100,000	2	\$600,000	10,000	\$700
Rappahannock	5	\$70,000	2	\$500,000	7,500	\$500
Roanoke	5	\$75,000	0	n/a	5,000	\$400
Shenandoah	5	\$70,000	0	n/a	10,000	\$400
Tennessee	5	\$75,000	0	n/a	5,000	\$400
York	10	\$65,000	2	\$400,000	5,000	\$400

*Advance Non-Tidal Wetland Credits in the Chowan are only available in HUCs: 03010201, 03010202, 03010204

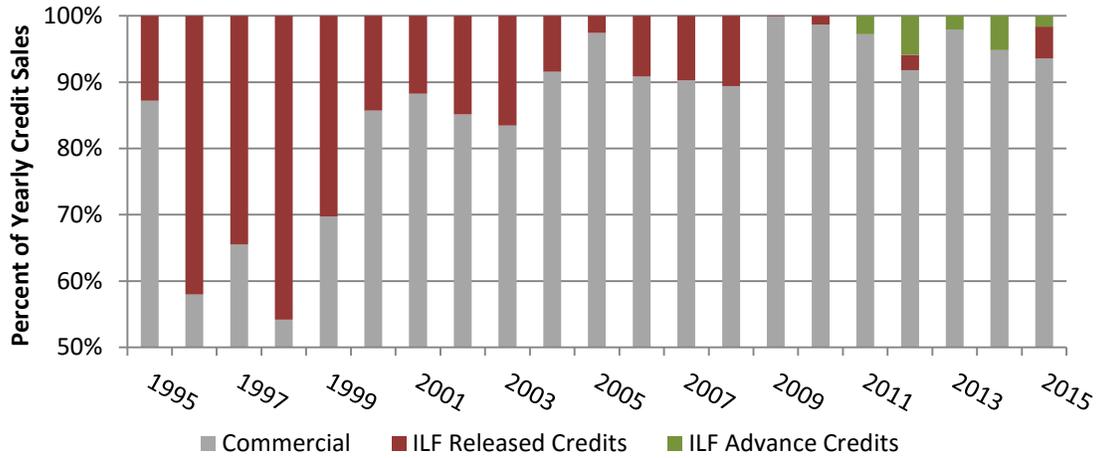
†Advance Tidal Wetland Credits in the Chowan are only available in HUC: 03010205

Source: TNC 2011b, c

History of Third-Party Compensatory Mitigation in Virginia

Virginia has one of the longest and most active histories in the §404 permitting program. Commercial mitigation banks and the VARTF have been providing third-party compensatory mitigation throughout Virginia since the beginning of the program. See Figure 5 for the distribution of third-party, compensatory wetland credit sales in Virginia since 1995. This distribution, over time, shows the maturation of an environmental market, becoming dominated by commercial mitigation banks. At the beginning of the permitting program, in the mid to late-90s, VARTF credit sales captured a large portion of total sales. However, as the commercial banking industry began to grow at the turn of the century (even before the formal establishment of the third-party, off-site mitigation hierarchy), the vast majority of wetland credit sales in Virginia became conducted by commercial mitigation banks even prior to the 2008 mitigation rule. The distribution of market activity suggests a regulatory preference for commercial credits prior to 2008 and a possible acceleration of the trend toward commercial banks post 2008. Since 2008 approximately 97% of all third-party wetland credit sales in Virginia were conducted by commercial mitigation banks.

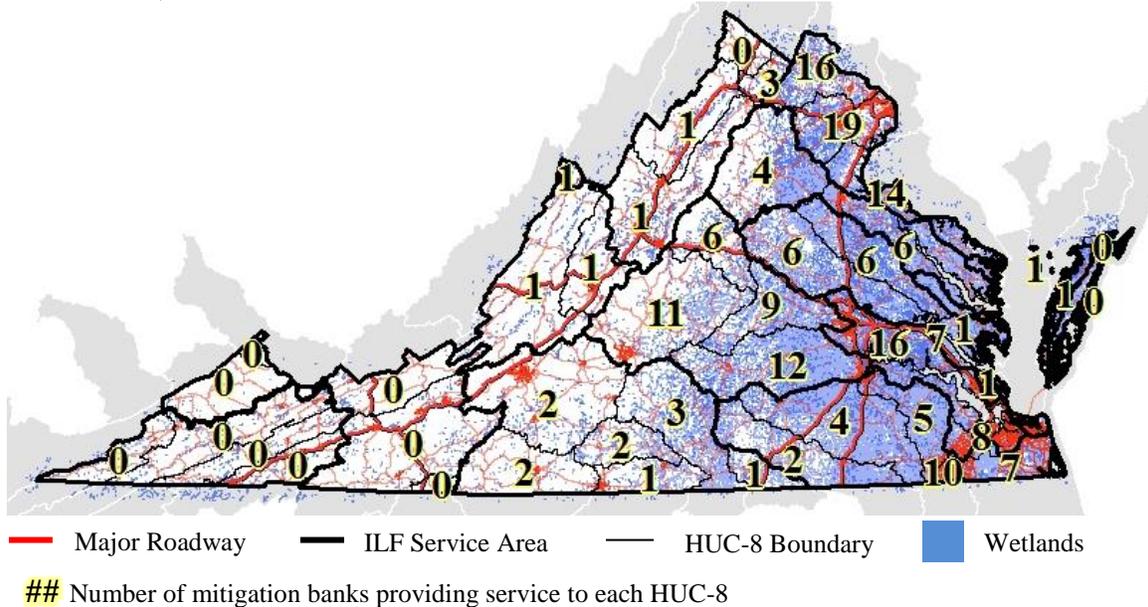
Figure 5: Percent of Third-Party Non-tidal Wetland Credit Sales (Virginia)



Source: RIBITS 2016

However, commercial wetland mitigation banks do not serve the entire Commonwealth of Virginia. As observed in Map 2, wetland commercial mitigation banks are mostly concentrated in the eastern half of the commonwealth. The highest concentrations of commercial banks coincide with the highest concentrations of wetlands and urban development. This correlation is of no surprise because the confluence of wetlands and development pressure equals a higher likelihood of permitted impacts. Areas with less development pressure tend to be in the southern and western regions of Virginia. Wetlands are present in these areas but in diminishing concentrations. These areas are left mostly unserved by commercial mitigation banks.

Map 2: Concentration of Commercial Wetland Mitigation Banks and Wetlands (VA, 2015)

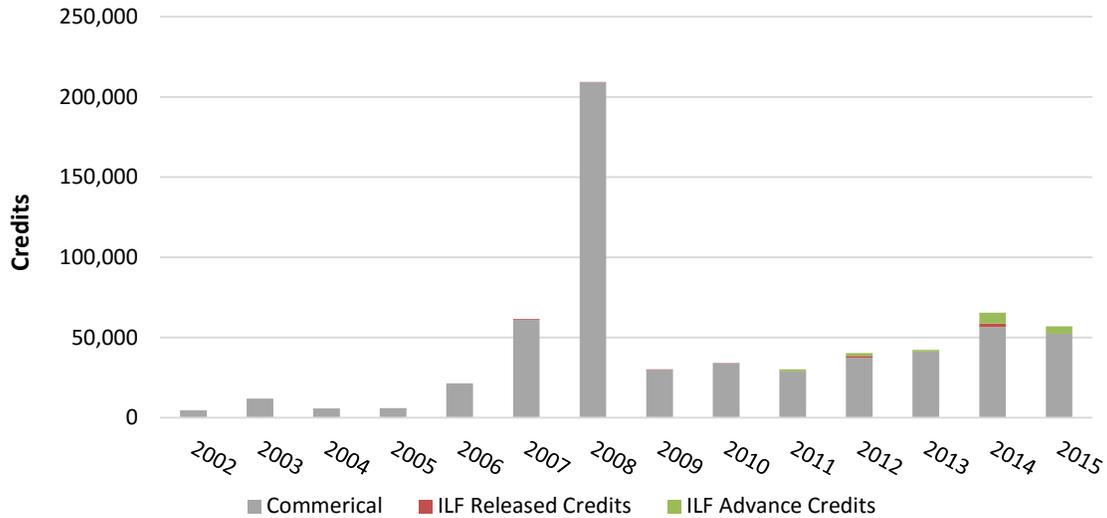


Source: VDOT 2017, FWS 2017, RIBITS 2016

Virginia’s market for compensatory stream credits follows a similar trend to the market for wetland credits. However, the stream mitigation market is relatively younger and less mature than the wetland market.⁴⁰ Figure 6 shows that the total volume of commercial stream credit sales are mostly trending upward year-to-year. These stream credit sales are concentrated in the areas of Virginia with a higher frequency of development, like areas between northern Virginia and the Richmond region (see Map 3). In these concentrated areas, many streams and rivers do exist. But, a similar level of stream prevalence remains throughout the entire commonwealth. Areas with numerous streams and rivers are left unserved or underserved by commercial mitigation banks. These areas are in the New River, the Tennessee, and the Shenandoah. Demand in these areas remains limited because they are majority rural communities with trends for out-migration.

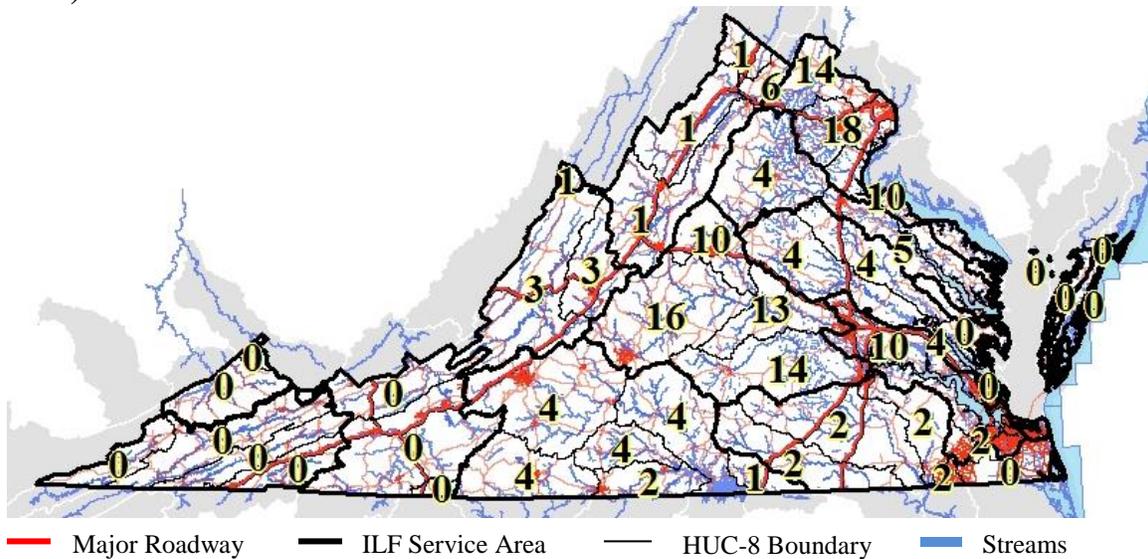
40. The VARTF did not begin stream mitigation until 2001. Later, in 2003, the VARTF amended their operating agreement, with a MOU, to officially provide stream mitigation (TNC 2012).

Figure 6: Third-Party Stream Credit Sales (Virginia)



Source: RIBITS 2016

Map 3: Concentration of Commercial Stream Mitigation Banks and Streams (VA, 2015)



Source: VDOT 2017, RIBITS 2016, USGS 2016

VARTF Advance Credit Sales (2011-2015) and the Application of the Third-Party Mitigation Hierarchy

The intention of the 2008 mitigation rule is for ILF programs to provide consolidated off-site third-party compensatory mitigation in areas left unserved by commercial banks. In fact, a current VARTF administrator has acknowledged that a

main focus of the VARTF is to provide mitigation in these unserved and underserved areas (Johnson 2016). Yet, the VARTF remains authorized to sell advance credits throughout Virginia; and, the VARTF still receives Corps-approval to sell advance credits throughout Virginia. See Table 10 and Table 11 for a summary of third-party credit sales in Virginia from 2011 to 2015, categorized by VARTF service area. The sales figures highlighted in both green and gray identify the service areas which only sold VARTF advance credits or sold and produced commercial credits exclusively during the years 2011-2015, respectively. The sales figures highlighted yellow indicate service areas where VARTF advance credit sales coincided with an availability of commercial mitigation bank credits.

Table 10: VARTF Advance Credit Sales and Commercial Bank Credit Sales and Production (Non-Tidal Wetland, 2011-2015)

Service Area	Non-Tidal Wetland					
	VARTF Adv. Credit Sales		Commercial Bank Credit Sales		Commercial Bank Credit Production	
Atlantic Ocean	4.68	(18%)	0.0	(0%)	0.00	(0%)
Chesapeake Bay	0.93	(4%)	33.7	(4%)	52.44	(1%)
Chowan	4.99	(19%)	265.1	(30%)	1939.28	(37%)
Lower James	0.00	(0%)	232.4	(26%)	1175.33	(23%)
Middle James	0.00	(0%)	152.5	(17%)	492.48	(9%)
New River	4.95	(19%)	0.0	(0%)	0.00	(0%)
Potomac	0.00	(0%)	139.7	(16%)	987.06	(19%)
Rappahannock	0.00	(0%)	27.1	(3%)	110.90	(2%)
Roanoke	4.79	(18%)	8.5	(1%)	76.20	(1%)
Shenandoah	1.78	(7%)	0.0	(0%)	59.42	(1%)
Tennessee	2.28	(9%)	0.0	(0%)	0.00	(0%)
Upper James	2.05	(8%)	0.0	(0%)	0.00	(0%)
York	0.05	(0%)	34.8	(4%)	300.39	(6%)
Total	26.52	(100%)	893.8	100%	5193.50	(100%)

*Green highlights indicate service areas that exclusively dealt in VARTF credit sales during the time period; Gray highlights indicate service areas that exclusively dealt in Commercial Bank credits; Yellow highlights indicate service areas that must be further reviewed

Source: RIBITS 2016

Table 11: VARTF Advance Credit Sales and Commercial Bank Credit Sales and Production (Stream, 2011-2015)

Service Area	Stream					
	VARTF Adv. Credit Sales		Commercial Bank Credit Sales		Commercial Bank Credit Production	
Atlantic Ocean	0	(0%)	0	(0%)	0	(0%)
Chesapeake Bay	312	(2%)	0	(0%)	0	(0%)
Chowan	195	(1%)	4,147	(2%)	24,163	(3%)
Lower James	1,690	(11%)	0	(0%)	6155	(1%)
Middle James	0	(0%)	51,792	(25%)	153,875	(19%)
New River	4,615	(31%)	0	(0%)	0	(0%)
Potomac	0	(0%)	115,680	(56%)	460,748	(58%)
Rappahannock	306	(2%)	11,583	(6%)	22,266	(3%)
Roanoke	3,410	(23%)	18,661	(9%)	47,081	(6%)
Shenandoah	2,036	(13%)	0	(0%)	9,056	(1%)
Tennessee	2,534	(17%)	0	(0%)	0	(0%)
Upper James	0	(0%)	600	(0%)	5,586	(1%)
York	0	(0%)	3,689	(2%)	66,092	(8%)
Total	15,098	(100%)	206,152	(100%)	795,022	(100%)

*Green highlights indicate service areas that exclusively dealt in VARTF credit sales during the time period; Gray highlights indicate service areas that exclusively dealt in Commercial Bank credits; Yellow highlights indicate service areas that must be further reviewed

Source: RIBITS 2016

The figures in both tables inform general observations about the application of the third-party mitigation hierarchy. The areas of Virginia which dealt exclusively in either VARTF advance credits or commercial bank credits represent areas where the third-party mitigation hierarchy is unquestionably being followed. These service areas correspond exactly with the regions of Virginia with less development pressure. However, as seen in the tables, the Corps has continued to approve the sale of VARTF advance credits in regions also served by commercial mitigation banks. This coincidence compels further scrutiny of the adherence to the third-party mitigation hierarchy in Virginia.

The service areas with corresponding figures highlighted in yellow represent the areas that need further elaboration. Only the exact characteristics of compensatory credit supply and location at the time of each VARTF advance credit sale allows for the compliance of the mitigation hierarchy in Virginia to be accurately evaluated. To understand the exact location of each VARTF advance credit sale in relation to the availability of commercial bank credits, each sale transaction was sorted by the 8-digit HUC in which it occurred. This was accomplished through the use of RIBITS, VARTF annual reports, and GIS software. Then, the number of mitigation banks serving each 8-

digit HUC and the number of mitigation credits available in each of those banks at the time of the advance credit sale were determined. This was accomplished through the use of the interactive-banking feature and credit-tracking feature on RIBITS and GIS software. The examination of transaction level data revealed that many commercial bank service areas only cover a portion of the VARTF service areas in which advance credit sales had occurred (e.g., the Roanoke, Shenandoah, and Chowan Service areas).⁴¹ Some commercial mitigation banks even only serve just a portion of particular 8-digit HUCs, like the Dundee Wetland bank, the York River bank, and the Pamunkey Farms bank.⁴² Temporary commercial bank sell-outs of mitigation credits also were revealed through this further analysis.

Through the sorting and mapping of VARTF advance credit sales, it was confirmed that 96.5% of non-tidal wetland advance credit sales and 97.1% of stream advance credit sales clearly adhered to the hierarchy for third-party, off-site mitigation. The remaining 3.5% and 2.9% of non-tidal wetland and stream advance credits, respectively, seemingly were approved in situations where commercial credits were available at the time of the ILF advance credit sale. Though these exact situations will remain unconfirmed, a couple of explanations are plausible. First and foremost, the 2008 mitigation rule states plainly that the third-party mitigation hierarchy “does not override a district engineer’s judgement as to what constitutes the most appropriate and practicable compensatory mitigation based on consideration of case-specific circumstances” (Corps and EPA 2008, p.19628). Second, and related to the first, it is not uncommon practice in the Virginia market for commercial credits to be “promised” to future buyers. Such a situation would not be discernable from the transaction data on RIBITS; but, it would be information available to the district engineer overseeing the sale of credits. Nevertheless, it is clear that the hierarchy for third-party, off-site mitigation established by the rule is being followed very closely in the Commonwealth of Virginia.

41. All three service areas were found to not have exclusively dealt in either VARTF advance credits or commercial bank credit sales and production; and, all three are all service areas containing non-adjacent 8-digit HUCs. Remember §62.1-44.15:23(A)(i) of the Virginia Code.

42. Each bank only serves a portion of HUC 02080106 (RIBITS 2016).

VARTF Program Activity in Conditions of Limited Demand

ILF programs are the primary provider of compensatory services in areas of limited demand. The financial simulation in Chapter 2 suggests that there are limitations to the extent to which ILF programs can feasibly provide these services in particular areas of especially limited demand. This next section will evaluate the available empirical evidence to determine the extent to which the VARTF is providing compensatory mitigation in areas of limited demand. Deficiencies attributed to the VARTF in a recent program audit will be examined and discussed.

Pursuant to 33 CFR §332.8(i)(4), the VARTF was recently audited by the Environmental Law Institute (ELI). The ELI's report, delivered in March 2016, concluded a five-year audit of the VARTF in which the VARTF's performance was measured against the many requirements of the rule. ELI reviewed the VARTF's comprehensive planning framework, the content of their mitigation plans and projects, their financial assurances, their method of credit accounting and tracking, as well as their compliance with the requirements of advance credit sales. ELI found that the VARTF was compliant with all but one requirement of the rule (ELI 2016).

ELI concluded that the VARTF failed to meet the three-year implementation rule for advance credit sales on several occasions.⁴³ Specifically, ELI determined that the three-year rule was not adhered to in 5 of the VARTF's service areas: the New River (a deficiency in implementation of non-tidal wetland credits), the Lower James and the Tennessee (stream credits), and the Atlantic Ocean and Chesapeake Bay (non-tidal and tidal wetland credits). In two more service areas, the Roanoke and the Rappahannock, initiated projects were discovered within the appropriate timeframe; however, these particular projects may not produce the necessary off-setting credits.

ELI also found that the VARTF has received *initial* approval for 9 projects since 2011 to meet these mitigation obligations. Of the 9 projects with initial approval, 4 site development plans have been submitted to the Corps and only 1 of those plans have been officially approved for construction. The one approved site development plan is for the

43. As interpreted by the ELI, "any advance credit sales occurring prior to March 2013 would need offsetting by the end of 2015" (ELI 2016).

VARTF's Chickahominy River (LJ-11) (Wilson) project in the Lower James service area (ELI 2016). The submission of project proposals suggests an intention by the VARTF to meet their compensatory obligations rather than negligence to fulfill their responsibilities.

The VARTF staff reports that one contributing factor to their failure to provide timely compensatory mitigation is the IRT review process (Johnson 2016). While the Corps expects the approval process to take approximately 7 to 9 months under ideal conditions, the Corps has no quantitative data to evaluate adherence to this timeline (Vanderbilt, Martin, and Olson 2015, Johnson 2016). The VARTF reports that the process seems to be actually taking approximately 2 to 3 years (Johnson 2016). There are several reasons, though, why the decision-making timeline, defined in the rule (33 CFR §332.8(d)), may be extended (33 CFR §332.8(f)). Such reasons may be special and extended consultation regarding §7 of the Endangered Species Act or the potential effects of the proposed mitigation activities in relation to "historic and cultural resources" (33 CFR §332.8(f)(1)(i), Vanderbilt, Martin, and Olson 2015, p.58). Also, a failure to provide the necessary information pertinent to the mitigation project's review will result in a delay of the decision-making timeline (33 CFR §332.8(f)(1)(iii)). However, it is compulsory that an official delay in the decision-making timeline is noted to the sponsor by the district engineer pursuant to 33 CFR §332.8(f)(2).

No such official notices of approval-delay from the Corps exist on RIBITS. Deficiencies in the VARTF project proposals and site development plans do not seem to be the reason for the approval-delay (ELI 2016). Though the approval of at least 3 VARTF projects (of the 9 projects to be granted initial approval) has stipulated specific revisions from the Corps, all of these projects have been recommended to move forward with the draft of the site development plan (Corps-Norfolk 2012a, b, c). Furthermore, ELI finds VARTF site development plans to be "substantially consistent" with the requirements of the rule, 33 CRF 332.4(c)(2)-(14) (ELI 2016, p.10). In the conclusion of the ELI audit, ELI suggests that the Corps and VDEQ "consider reviewing their operating procedures and priorities to ensure that timely review will occur as more plans enter the review and approval process" (ELI 2016, p.36).

Another contributing factor to the VARTF's failure to provide timely compensatory mitigation in some service areas may be the isolation of small permitted

impacts. For example, in the Chowan service area, the VARTF simultaneously maintains both a surplus of released credits and a deficiency in compensatory credits to satisfy standing advance credit obligations. The released credits available for sale are located in HUC 03010205 on the eastern edge of the Chowan River Basin. The outstanding advance credits are located in HUC 03010204⁴⁴ on the opposite, western side the Chowan River Basin⁴⁵ (ELI 2016). Because Virginia law limits approved compensatory activities to the same or adjacent 8-digit HUC as the permitted impact and these 8-digit HUCs are not adjacent, the VARTF's available released cannot be used to offset the permitted impacts for which the advance credits were sold (§62.1-44.15:23(A)(i)). Therefore, the VARTF must initiate a new mitigation project in the Chowan service area to fulfill their compensatory obligations.

Given the results from the financial simulation in Chapter 2, the VARTF may find limits to their ability to provide financially feasible mitigation in an outlying 8-digit HUC. Additionally, ELI finds that the outstanding compensatory obligations in HUC 03010204, of the Chowan, amounts only to approximately a single non-tidal wetland credit (ELI 2016, p.32). This sale occurred in 2011 and no further advance credit sales have garnered any additional fee collection. The results from the financial simulation in Chapter 2 demonstrate the financial challenges of providing compensatory mitigation in such situations.

Georgia and the Georgia Land Trust In-Lieu Fee Program (GLT-ILF)

In 2013, the Georgia Land Trust In-Lieu Fee Program (GLT-ILF) was established as the new in-lieu fee program in the Corps-Savannah District.⁴⁶ The GLT-ILF received

44. A Corps-Norfolk regulator acknowledges a particular challenge in providing compensatory mitigation by ILF programs in this exact 8-digit HUC (Richardson 2016).

45. As delineated by TNC, HUC 03010205 is located in the Albemarle-Pamlico Coastal Plain EDU and HUC 03010204 is located in the Albemarle-Pamlico Piedmont/Fallzone EDU. The VARTF Roanoke Service Area also serves the Albemarle-Pamlico Piedmont/Fallzone EDU (TNC 2011a).

46. Prior to the passage of the 2008 rule, the only in-lieu fee program operating in service to the Corps-Savannah District was the Georgia Wetland and Stream Trust Fund, established in 1998 by the Georgia Land Trust Service Center, a program of the Georgia Land Conservation Center (GLCC). During its operational life, the primary focus of the Trust Fund was the preservation of "the best and highest functioning wetlands and streams in Georgia" (Corps-Savannah 2008). In 2008, about 5% of all compensatory mitigation activity in the Corps' Savannah District was conducted by the Trust Fund (Corps-

approval from the Corps after over two years of revisions and close collaboration with the Corps-Savannah District. The original draft program prospectus of the GLT-ILF was submitted in August 2011 and the final operating instrument was signed into effect on November 26, 2013 (GLT 2013). The GLT-ILF's first full year of operation was 2014.

The GLT-ILF is designed specifically to operate within the compensatory mitigation preference hierarchy in the 2008 rule (Robertson 2016). The GLT-ILF program goal is as stated:

“The core goal of the GLT-ILF is to provide a mitigation option for permittees, where in the discretion of the DE it is determined to be a suitable option due, for example, to lack of mitigation bank credits or where a large permitted impact exceeds the credits available for the resource type(s) in that service area” (GLT 2013, p.4)

The GLT-ILF program instrument continues on to identify specific goals, one of which reads: “Within the hierarchy of mitigation options ..., provide a mitigation option to replace functions and services lost through permitted impacts” (GLT 2013, p.4)

Most other ILF program instruments do not specifically mention the mitigation preference hierarchies. Rather, most ILF program goals are more generally stated as providing quality off-site compensatory mitigation.⁴⁷ For instance, the stated goal of the VARTF is “to provide an additional mechanism for compensatory mitigation” (TNC 2011d, p.2). This contrast in written goals is important because it represents a stated intent by the GLT-ILF to explicitly serve the third-party mitigation hierarchy. Other ILF programs feel that adherence to the hierarchy is solely the responsibility of the regulator (Johnson 2016).

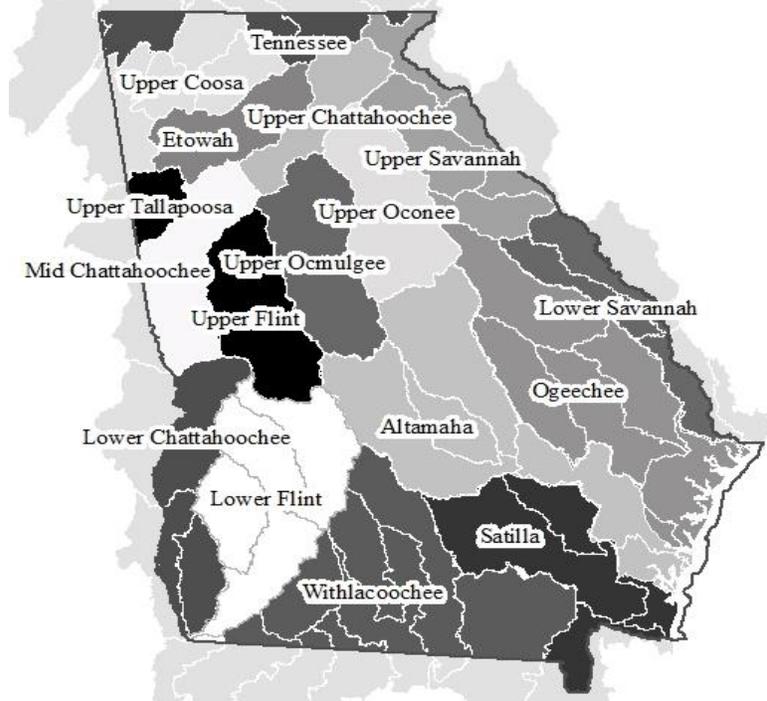
The Corps-Savannah District delineates 17 primary standardized service areas across the State of Georgia for §404 permittees and compensatory mitigation providers (Corps-Savannah 2011) (see Map 4). For each primary service area, a secondary service

Savannah 2010). The GLCC pursued reauthorization of the Trust Fund's program instrument in accordance with the rule; however, given the new emphasis on restoration (as opposed to preservation) in the rule, the Trust Fund was ultimately terminated (Corps-Savannah 2010, 2008, Robertson 2016).

47. Many ILF programs across the country are organized around broad goals like the following: to “provide an alternative to permittee responsible Compensatory Mitigation by implementing In-Lieu Fee (“ILF”) Projects adequate to meet current and expected demand for Credits in the Service Area” (AGFD 2013, Conservancy 2014, County 2013, CVCC 2014, MRT 2013, OVLC 2013, PCPA 2013, RCRC 2012, SALT 2013).

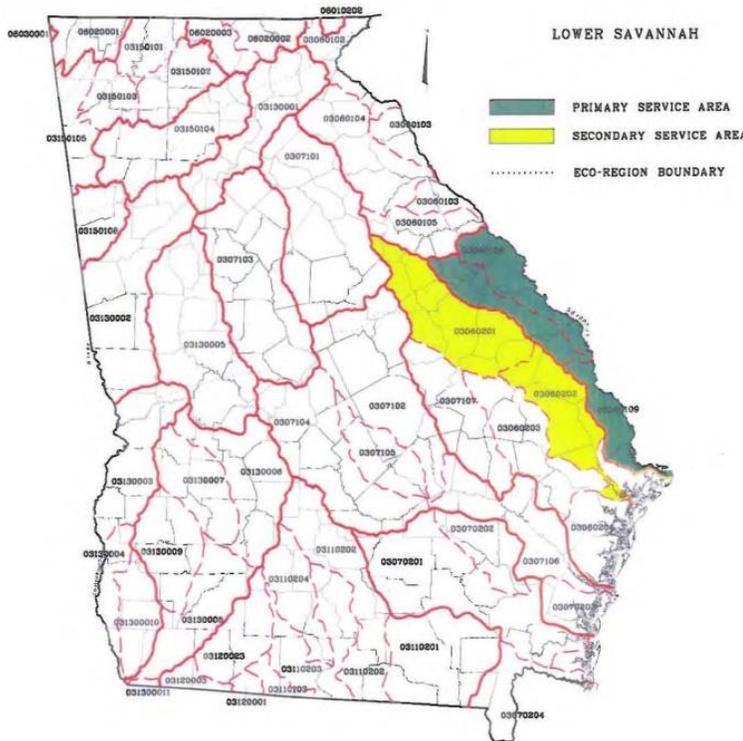
area is specifically defined. In many cases, this secondary service area includes only the 8-digit HUCs adjacent to each primary service area, not the entire adjacent primary service area (an example is included in Map 5). When evaluating options for fulfilling mitigation requirements, the Corps-Savannah District considers credits available within primary service areas preferable over any credits available in a secondary service area (Corps-Savannah 2011). *The Draft Guidelines to establish and Operate Mitigation Banks in Georgia*, published in 2011, indicate that primary service areas have a priority for providing compensation for all permits. Secondary service areas can only be used when there are no available credits for banks whose primary service areas cover the permitted impact location (Corps-Savannah 2011, p.8, 38, 39). If no available commercial bank credits can be found in either the primary or secondary service area, then the permittee can purchase advance credits from the GLT-ILF (Robertson 2016).

Map 4: Corps-Savannah Standardized Service Areas



Source: RIBITS 2016, USGS 2016

Map 5: Example of Primary and Secondary Service Areas for the Lower Savannah
Primary Service Area



Source: GLT 2013

The GLT-ILF has been approved for the sale of advance credits in 10 of the 17 standardized Georgia service areas (see Map 6). The GLT-ILF is only approved for the sale of advance wetland credits in the mountain and piedmont regions of Northern Georgia, where the population of wetlands decreases and the developmental pressures imposed on wetlands also decreases (see Table 12 for the allowed advanced credit limits⁴⁸ per service area and the fee schedule for each service area; see Map 7⁴⁹ for the concentration of wetlands and commercial mitigation banks). With this lower concentration of wetlands, the number of the commercial wetland mitigation banks decreases in the northern-most services.⁵⁰ The low supply of wetlands, combined with the low projected demand for wetland credits, is the reason that the GLT-ILF is

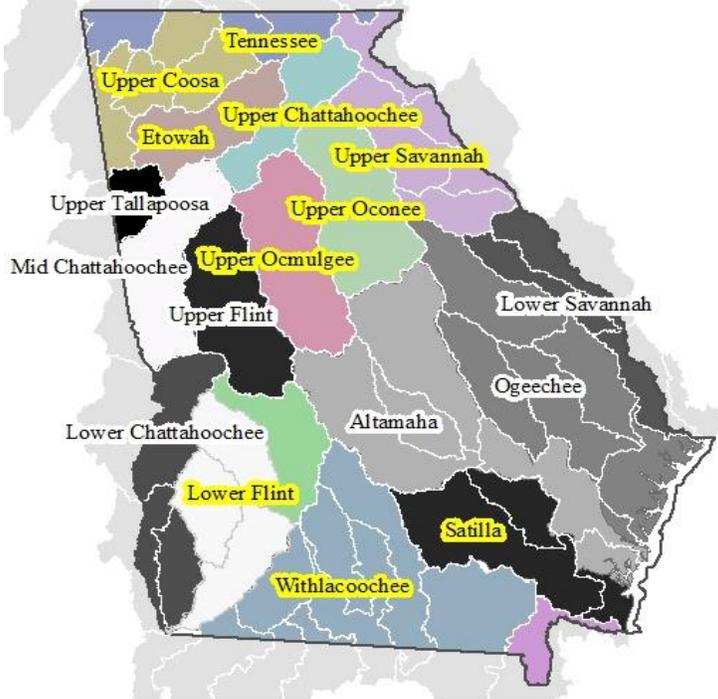
48. It is important to note that the Corps-Savannah district defines credits differently than the Corps-Norfolk District. Therefore, credits cannot be compared one-to-one from district to district.

49. Secondary service areas are included in the coverage depicted in this map and Map 8.

50. The urban area of Atlanta does maintain a relatively high commercial wetland mitigation bank population.

authorized to sell advance wetland credits in these particular service areas. The highest concentration of streams in Georgia exists in the northern region (see Map 8). Therefore, the thin coverage provided by commercial stream mitigation banks in southern Georgia and the Tennessee service area, again, coupled with low demand pressure, explains the GLT-ILF's authorization to sell advance credits in these service areas. The GLT-ILF is not approved to sell advance credits to compensate impacts to tidal wetlands or saltwater marshes.

Map 6: GLT-ILF Service Areas Authorized to Sell Advance Credits



*Service areas highlighted in yellow represent those service areas authorized to sell adv. credits
Source: RIBITS 2016, USGS 2016, GLT 2013

Table 12: GLT-ILF Approved Advance Credit Limits and Fee Schedule (2017)

Service Area	Non-tidal Wetland		Stream	
	# of Credits	Price	# of Credits	Price
Etowah	120	\$44,000		
Lower Flint*			16,400	\$121.00
Satilla†			5,000	\$88.00
Tennessee	24	\$44,000	854	\$121.00
Upper Chattahoochee	64	\$55,000		
Upper Coosa	359	\$44,000		
Upper Ocmulgee	63	\$49,500		
Upper Oconee	50	\$49,500		
Upper Savannah	70	\$44,000		
Withlacoochee			133,245.65	\$104.50
Total	750		155,499.65	

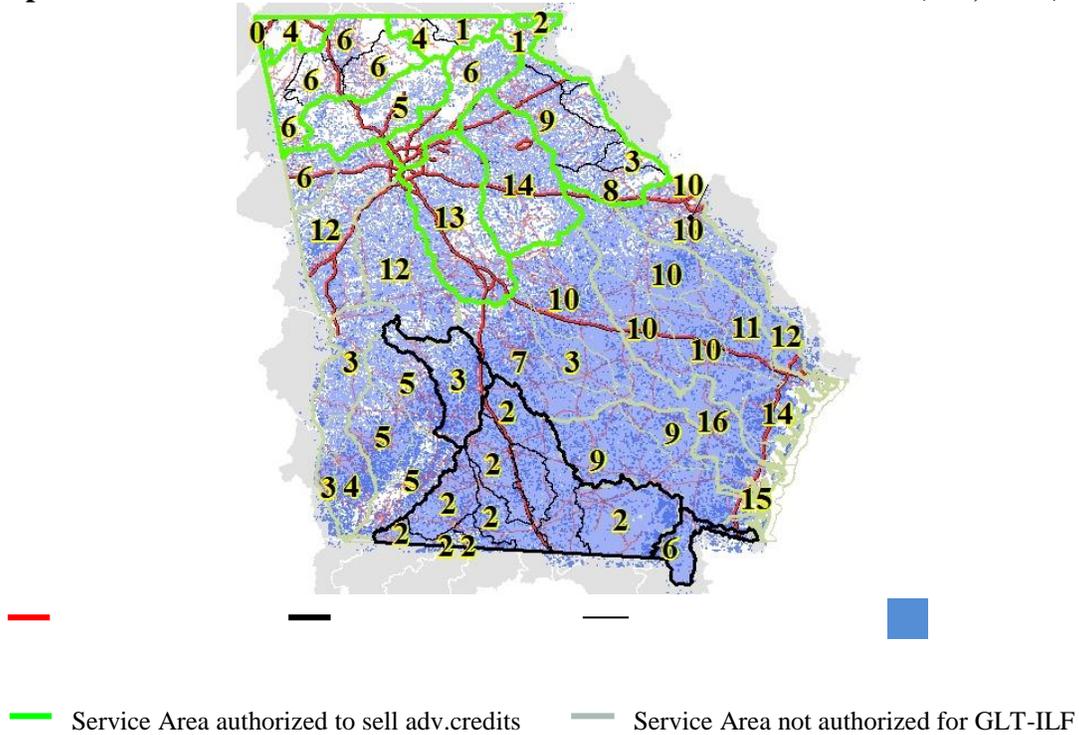
Blanks indicate no advance credit sales authorized for particular cowardin type in particular service area

*Advance Credits only available for sale in HUC 03130006

†Advance Credits only available for sale in HUC 03070204

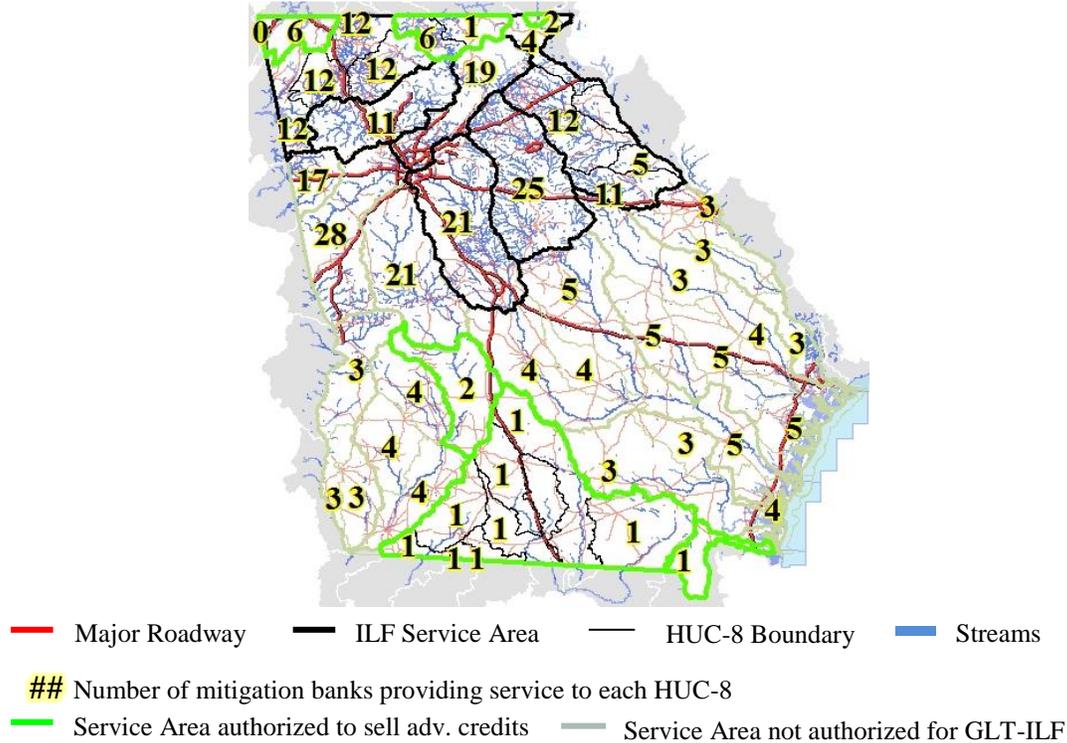
Sources: GLT 2017, RIBITS 2016

Map 7: Concentration of Commercial Wetland Banks and Wetlands (GA, 2015)



Source: GDOT 2017, FWS 2017, RIBITS 2016, GLT 2013

Map 8: Concentration of Commercial Stream Mitigation Banks and Streams (GA, 2015)



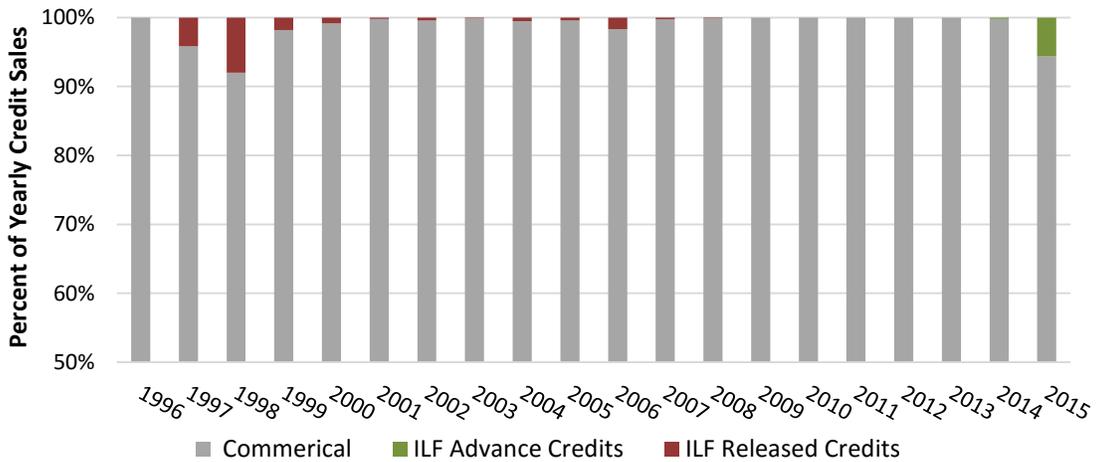
For each approved advance credit sale, the GLT-ILF applies a two-tier advance credit fee schedule. Fees for smaller impacts are set at a standardized price and the fees are accumulated until sufficient funds are collected to purchase offsetting commercial bank credits. For larger impacts, the GLT-ILF reserves discretion to set a “cost-competitive [price] with permittee-responsible mitigation” (GLT 2013, p.34). Additionally, for all impacts, the GLT-ILF administers a temporal loss fee of 5% of each total advance credit sale (GLT 2013).

The GLT-ILF solicits competitive bids from additional third-parties to fulfill these advance credit obligations. The GLT-ILF itself is not structured to conduct compensatory activities. Proposals are officially selected by the GLT-ILF for implementation on the basis of expected project success and alignment with watershed objectives (GLT 2013, Robertson 2016). As contingencies, the GLT-ILF program instrument allows for the purchase of existing commercial bank credits, a discretionary deferment (an extension of the 3 year timeline), or the fulfilment of credit obligations through preservation (GLT 2013).

History of Third-Party Compensatory Mitigation in Georgia

The maturation of the Georgia third-party wetland credit market follows a similar trend to the wetland credit market found in Virginia. Commercial mitigation banks have historically led these markets. This fact, combined with authorization to operate in only several service areas, leaves GLT-ILF advance wetland credit sales to represent only a small portion of all third-party wetland credit sales (see Figure 7). The GLT-ILF accounted for just 3.04% of all third-party credit sales across both 2014 and 2015.

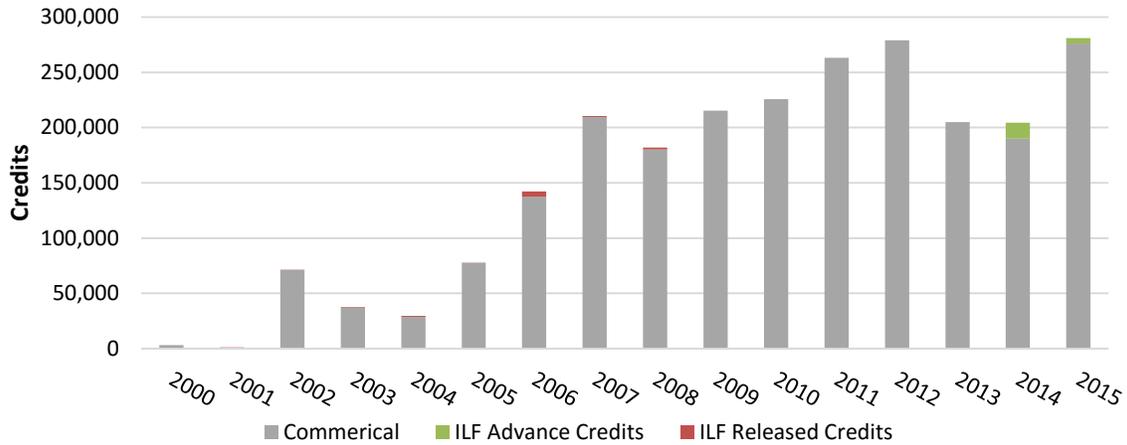
Figure 7: Percent of Third-Party Non-Tidal Wetland Credit Sales (Georgia)



Source: RIBITS 2016

Again, similar to Virginia, the credit market for third-party compensatory stream credits is growing (see Figure 8). Advance stream credits sold by the GLT-ILF still only amounted to 3.95% across 2014 and 2015. There is not yet a long enough record of GLT-ILF advance credit sales to observe a clear trend or a clear regulatory preference.

Figure 8: Third-Party Stream Credit Sales (Georgia)



Source: RIBITS 2016

GLT-ILF Advance Credit Sales (2014-2015) and the Application of the Third-Party Mitigation Hierarchy

The third-party hierarchy of the 2008 mitigation rule leaves few areas for the GLT-ILF to operate within. Nearly the entire state of Georgia is served by commercial mitigation banks. There are few areas absent of commercial mitigation credit coverage, leaving mostly only areas of *thin* coverage⁵¹ to be served by the GLT-ILF. Those areas of thin coverage are the only areas that the GLT-ILF is authorized by the Corps-Savannah District to sell advance credits.

Yet, because of the prevalence of commercial mitigation banks in every region of Georgia, it is paramount that each GLT-ILF advance credit sale be examined for adherence to the third-party regulatory preference. Table 13 and Table 14 show the distribution of GLT-ILF advance credit sales and commercial bank sales in 2014 and 2015. Both tables also consider the historical distribution of commercial credit production in each service area. The figures highlighted in both green and gray respectively identify the service areas which only sold GLT-ILF advance credits or produced commercial credits exclusively during the years 2014 and 2015. Historic commercial credit production is also highlighted accordingly for the service areas that

51. i.e., Areas where credits in the primary and secondary service area may easily be exhausted and advance credits may be sold.

have not sold or are not authorized to sell a GLT-ILF advance credits. The sales data indicate that 95.14% and 98.57% of all commercial wetland and stream credits, respectively, in 2014 and 2015, were sold in service areas that did not sell a single advance credit. The third-party mitigation hierarchy was clearly applied in these service areas.

Table 13: GLT-ILF Advance Credit Sales and Commercial Bank Sales and Production (Non-Tidal Wetland, 2014-2015)

Service Area	Non-Tidal Wetland					
	GLT Advance Credit Sales (2014-15)		Commercial Bank Credits Sold (2014-15)		Total Commercial Bank Credit Production (1992-2015)	
Etowah	7.4	(7.57%)	24.6	(0.79%)	376.6	(0.96%)
Lower Flint			0.0	(0.00%)	153.5	(0.39%)
Satilla			315.1	(10.11%)	4214.6	(10.77%)
Tennessee	1.9	(1.94%)	0.0	(0.00%)	0.0	(0.00%)
Upper Chattahoochee	0.0	(0.00%)	11.9	(0.38%)	76.6	(0.20%)
Upper Coosa	46.3	(47.39%)	3.2	(0.10%)	122.0	(0.31%)
Upper Ocmulgee	7.2	(7.37%)	37.1	(1.19%)	1105.9	(2.83%)
Upper Oconee	9.7	(9.93%)	56.3	(1.81%)	479.8	(1.23%)
Upper Savannah	25.2	(25.79%)	30.2	(0.97%)	87.7	(0.22%)
Withlacoochee			1159.3	(37.20%)	7630.5	(19.50%)
Altamaha			473.0	(15.18%)	7662.1	(19.58%)
Lower Chattahoochee			20.2	(0.65%)	1013.3	(2.59%)
Lower Savannah			308.8	(9.91%)	2282.0	(5.83%)
Middle Chattahoochee			66.4	(2.13%)	858.6	(2.19%)
Ogeechee			416.7	(13.37%)	5702.8	(14.57%)
Upper Flint			193.9	(6.22%)	7361.7	(18.81%)
Upper Tallapoosa			0.0	(0.00%)	0.0	(0.00%)
Total	97.7	(100.00%)	3116.4	(100.00%)	39127.7	(100.00%)

*Green highlights indicate service areas that exclusively dealt in GLT-ILF credit sales during the time period; Gray highlights indicate service areas that exclusively dealt in Commercial Bank credits; Yellow highlights indicate service areas that must be further reviewed

Blanks indicate no advance credits authorized for sale

Source: RIBITS 2016

The yellow highlighted figures in Table 13 and Table 14 indicate service areas where GLT-ILF advance credit sales coincided with an availability of commercial mitigation bank credits. In these service areas where advance wetland credits have been sold, the volume of commercial bank credit sales is still 150% higher than the cumulative advance credits sold. For stream credit sales, the only point of overlap in commercial

credit sales and advance credit sales was found in the Withlacoochee service area. Here, the GLT-ILF sold their vast majority of advance stream credit sales. However, historic commercial bank production in the service area ranks as the third lowest by over 20,000 credits. In terms of recent credit sales combined in 2014 and 2015, the Withlacoochee ranks as the second lowest. In 2015, there was only 1 commercial mitigation bank operating in the Withlacoochee service area.

Table 14: GLT-ILF Advance Credit Sales and Commercial Bank Sales and Production (Stream, 2014-2015)

Service Area	GLT Advance Credit Sales (2014-15)		Stream Commercial Bank Credits Sold (2014-15)		Total Commercial Bank Credit Production (1996-2015)	
Etowah			120,233	(25.79%)	480,626	(9.59%)
Lower Flint	4,201	(21.91%)	0	(0.00%)	0	(0.00%)
Satilla	0	(0.00%)	112	(0.02%)	1,383	(0.03%)
Tennessee	0	(0.00%)	0	(0.00%)	26,229	(0.52%)
Upper Chattahoochee			66,188	(14.20%)	475,582	(9.49%)
Upper Coosa			21,987	(4.72%)	392,845	(7.84%)
Upper Ocmulgee			22,202	(4.76%)	575,208	(11.48%)
Upper Oconee			22,455	(4.82%)	492,901	(9.83%)
Upper Savannah			35,825	(7.69%)	256,035	(5.11%)
Withlacoochee	14,976	(78.09%)	6,647	(1.43%)	29,409	(0.59%)
Altamaha			29,101	(6.24%)	716,130	(14.29%)
Lower Chattahoochee			8,830	(1.89%)	283,827	(5.66%)
Lower Savannah			20,877	(4.48%)	125,290	(2.50%)
Middle Chattahoochee			57,939	(12.43%)	739,369	(14.75%)
Ogeechee			10,972	(2.35%)	50,101	(1.00%)
Upper Flint			42,771	(9.18%)	367,606	(7.33%)
Upper Tallapoosa			0	(0.00%)	0	(0.00%)
Total	19,177	(100%)	466,139	(100%)	501,2543	(100%)

*Green highlights indicate service areas that exclusively dealt in GLT-ILF credit sales during the time period; Gray highlights indicate service areas that exclusively dealt in Commercial Bank credits; Yellow highlights indicate service areas that must be further reviewed

Blanks indicate no advance credits authorized for sale

Source: RIBITS 2016

Where ILF advanced credits and commercial bank sales overlap, the exact characteristics of compensatory credit supply and location at the time of each GLT-ILF advance credit sale is necessary to more accurately evaluate how the mitigation hierarchy is used in Georgia. To understand the exact location of each advance credit sale in relation to the availability of commercial bank credits, each sale was sorted by the 8-digit HUC in which it occurred, just as the advance credit sales in Virginia were sorted. The

locations of the credit sales were used as a filter to more precisely examine the timing of the advance credit sales. The examination of the timing of each advance credit transaction confirmed that, in all but two advance credit transactions, commercial credits were available in neither the primary nor secondary service areas on the date of the advance credit transaction. The first unconfirmed advance credit sale occurred in the Withlacoochee service area. This transaction seemed to be brought about by a commercial mitigation bank lacking a sufficient number of available credits to fulfill the obligations demanded by the credit sale. The second unconfirmed advance credit sale occurred in the Upper Ocmulgee service area and remains unconfirmed. However, even in this unconfirmed instance in the Upper Ocmulgee, it cannot be concluded that the preference hierarchy was not followed. In some instances, commercial banks with available listed credits may have already promised to another permittee. Regardless, the evidence overwhelming confirms that the hierarchy for third-party, off-site mitigation established by the rule is being followed in the Corps-Savannah District.

GLT-ILF Program Activity in Conditions of Limited Demand

The GLT-ILF has yet to establish an extensive record of fulfilling advance credit obligations. However, even in its short operational history, the GLT-ILF has already demonstrated a couple of important techniques to achieve compensatory requirements. In December 2015, the GLT-ILF fulfilled advance wetland credit compensatory obligations by purchasing an existing 7.78 commercial mitigation bank credits (GLT 2016). This exchange occurred in the Etowah service area (the primary service area associated with both the permitted impact and approved compensation). The second technique deployed by the GLT-ILF occurred earlier in 2015. On this occasion, the GLT-ILF issued a request for proposals (RFP) to fulfill stream mitigation obligations in the Withlacoochee service area (Corblu 2015). The accepted proposal was prepared by a private mitigation bank, and submitted to the GLT-ILF. This process will entirely off-set the compensatory obligation of the advance credit sale. A GLT-ILF administrator approximated that the approval process, through the Corps-Savannah District, took 14 months for this project (Robertson 2016). In this second instance, it was not seemingly possible to purchase

existing mitigation credits because the Withlacoochee service area is only currently served by one commercial bank and not enough credits were available for purchase.

Thus far, the GLT-ILF has not documented any difficulties in fulfilling the obligations of advance credit sales. However, future challenges are being anticipated. One GLT-ILF administrator foresees possible difficulties in fulfilling advance credits sales in areas of limited demand and no available commercial credits (Robertson 2016). Within the last year, the GLT-ILF has revised its wetland advance credit prices to align more accurately with the latest prices and costs exhibited in the commercial credit market (Robertson 2016). This is positive evidence of the willingness and ability of the GLT-ILF to adapt to current and changing dynamics in the market. Meeting future problems will be challenging, but not impossible for the GLT-ILF.

Case Study Conclusion

The ILF advance credits from the VARTF and the GLT-ILF are utilized in similar ways in their respective areas of service. The sale of advance credits from each ILF program is regulated with close adherence to the third-party mitigation hierarchy outlined in the 2008 mitigation rule. Though the compensatory mitigation services provided by the VARTF and the GLT-ILF only amount to a fraction of the total third-party services being conducted in each market, this ILF activity is occurring in crucial areas. Both of these ILF programs are serving regions either left entirely unserved by commercial mitigation banks or left underserved by commercial mitigation banks. This is exactly the role intended for ILF programs to fill by the design of the 2008 mitigation rule.

The VARTF and the GLT-ILF provide these compensatory services in two different ways, though. The VARTF conducts its own compensatory construction and oversees the mitigation process from the beginning through perpetuity. The GLT-ILF, on the other hand, relies on the commercial mitigation banking industry and a full-service, competitive bidding process to meet compensatory obligations. The VARTF was found to be experiencing difficulties in delivering actual mitigation in more than one service areas. The difficulties appear to stem from the approval process, the bounds of the service areas, and the general level of extremely low demand. The GLT-ILF has not yet been operating for a long enough period of time to establish a tangible trend.

In conclusion, ILF programs are facing the emerging challenge of providing compensatory mitigation to areas routinely assessed by commercial banks as financially infeasible to serve. In these marginalized areas of the wetland compensatory market, small, isolated impacts are prevalent. Without the advantage of economies of scale, but with the same, high approval costs and service areas, ILF programs are left by the preference hierarchy of the 2008 mitigation rule to operate in difficult environment.

Chapter 4: Conclusions

ILF programs serve an important role in the meeting compensatory mitigation requirements for permittees even in regions with a well-developed commercial banking sector. The case studies in Virginia and Georgia show that the hierarchy for third-party, off-site mitigation established by the 2008 mitigation rule is being strictly followed; and, ILF programs are, in fact, providing mitigation in areas of limited demand. However, ILF programs do face significant challenges in providing compensatory mitigation in areas of low demand. The financial simulation in Chapter 2 produced results outlining the limitations of ILF programs to provide financially feasible mitigation under particularly limited demand conditions. The case study of Virginia reveals that the VARTF is experiencing difficulties in providing compensatory mitigation in several service areas.

The implications of these findings suggest that policies should be shaped to either enable more initial capital to be raised by ILF programs or capital investments should be lowered. Either solution works to minimize the barrier to enter the compensatory mitigation market. More initial capital will encourage larger projects at a lower per acre cost (BenDor and Brozovic 2007). These larger projects have a higher likelihood of success and additionally provide more advance mitigation to offset future impacts (Corps and EPA 2008, p.19611). Lower capital investments, achieved through lower regulatory and upfront costs, lowers the opportunity cost of investment and encourages market entry.

Limitations of this Research

The Corps operates in 38 distinct districts across the United States. The research conducted in this thesis only examined two of these districts. Additional research is necessary in each of the remaining districts to build a more comprehensive view of how ILF programs are being administered and used. Additionally, several direct limitations of this research are in association with the raw credit transaction data available to the public through the Army Corps of Engineers' website, Regulatory In-Lieu Fee and Bank

Information Tracking System (RIBITS). The raw credit transaction data was obtained on June 21, 2016.

Several gaps in the national transaction data persisted though the date at which the transaction data was obtained was several months after the Institute for Water Resources (IWR) officially finished a wide-ranging data update on RIBITS. For example, data from the North Carolina Division of Mitigation Services, a program which utilizes competitive bidding much like the GLT-ILF, still remain unavailable. Such data from North Carolina would have been particularly interesting to this thesis because of its direct relatability to the GLT-ILF and its shared river basins with the Commonwealth of Virginia.

Another problem with the data used in this thesis is related to the GIS shapefiles used for the spatial analysis. In many cases, for example in the Lower James River watershed in Virginia, the upper limits of the service areas are at administrative boundaries (Chesterfield-Prince George and Henrico-Charles City County boundary) rather than HUC-8 boundaries. Considering that the intention of the §404 permitting program is to provide compensatory mitigation within the same watershed, the use of administrative boundaries is incongruent (33 CFR §332.3(b)). Similar situations can be seen in other areas, such as the Middle James Basin. With the creation of more perfect service area shapefiles and the addition of geographic coordinates for permitted impacts, the possibilities for in-depth studies into the trades-offs of space and time that exist within the mitigation market would be extraordinary.

Finally, many of the new ILF programs approved in the aftermath of the 2008 rule only recently were approved, such as the GLT-ILF. In several years, once a longer history of transaction data is established in Georgia and across the country, a more rich investigation of national ILF advance credit approval trends will be possible.

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Appendices

Appendix A

Supplementary Data File

Description:

The accompanying Excel spreadsheet shows the simulation of costs and revenues used to calculate the net present value of the hypothetical wetland mitigation project used in Chapter 2. The spreadsheet labels indicate the various simulation types and the various sensitivity analyses outlined in the *Model Results* section of Chapter 2.

Filename:

ILF Wetland Credit Model (2k17) 5.0.xls