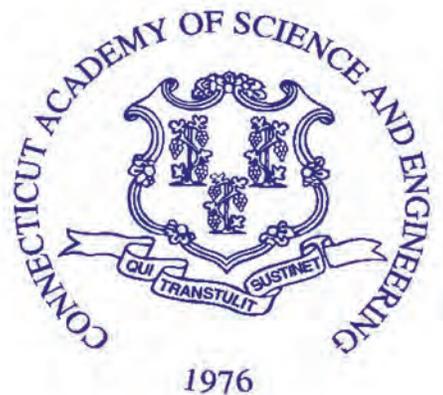


ENVIRONMENTAL MITIGATION  
ALTERNATIVES FOR  
TRANSPORTATION PROJECTS  
IN CONNECTICUT

SEPTEMBER 2010

A REPORT BY

THE CONNECTICUT  
ACADEMY OF SCIENCE  
AND ENGINEERING



FOR

THE CONNECTICUT DEPARTMENT OF  
TRANSPORTATION



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THE CONNECTICUT ACADEMY  
OF SCIENCE AND ENGINEERING

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This study was initiated at the request of the Connecticut Department of Transportation on August 12, 2009. The project was conducted by an Academy Study Committee with the support of Joseph Bushey, PhD, Study Manager; Eric Jackson, PhD, Research Associate; and Juan Pablo Correa, Research Assistant. The content of this report lies within the province of the Academy's Transportation Systems Technical Board. The report has been reviewed by Academy Members Robert J. Hermann, PhD and Brian J. Skinner, PhD. Martha Sherman, the Academy's Managing Editor, edited the report. The report is hereby released with the approval of the Academy Council.

Richard H. Strauss  
Executive Director

#### Disclaimer

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<b>16. Abstract</b> The objective of this study is to determine whether consolidated mitigation alternatives such as In-lieu Fee (ILF) and Wetland Banking (WB) programs are viable options to be implemented in Connecticut. Specifically, the study focuses on whether the Connecticut Department of Transportation (ConnDOT) may be able to develop such programs for their own use. ConnDOT is interested in the potential for alternative mitigation strategies to decrease costs and improve construction timing while potentially increasing wetland environmental benefits. To address this objective, published literature was reviewed concerning mitigation practices and surveys of other states and potential third parties were conducted to identify possible solutions. The primary study recommendation is for ConnDOT to more thoroughly evaluate the cost-benefits of implementing an ILF EMA program. As significantly less money is required up-front for an ILF program than that required for a WB program, it is recommended that an ILF program is the most appropriate mechanism to provide EMAs in Connecticut, and that ConnDOT consider developing an ILF program for its transportation projects. ConnDOT's decision to develop an ILF program should take into consideration potential cost savings and user and public relations benefits for eliminating construction delays associated with more timely mitigation approval, as well as the increased environmental benefits of larger, more contiguous mitigation projects. Furthermore, in Connecticut the regulation of private impacts by municipalities prevents the private sector from buying into an EMA program. Until state law is amended to allow for private participation in an EMA program, ConnDOT would need to establish an EMA program accounting for only state impacts, hoping that a successful program will serve to prompt the General Assembly to update the state's legal structure regarding wetland mitigation.			
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## EXECUTIVE SUMMARY

Wetlands are important aspects of ecosystems because of their rich biotic life as well as their role in chemical cycling. Wetlands also provide benefits to humans by creating wildlife habitat, recreation resources, flood control and the mitigation of nutrient contamination. However, these functions and services are compromised as wetlands and watercourses regularly are impacted by human development (Zedler and Kercher 2005, NRC 2001, ELI 2002). To offset the loss of wetlands, federal legislation was passed in 1972 requiring developers who may potentially impact wetlands to first avoid impacts when possible, second, minimize the unavoidable impacts, and lastly, compensate for the wetland functions lost. Ultimately, the purpose of the legislation is to achieve the goal of no net loss of wetlands.

Traditionally, permittee-responsible mitigation (PRM) has been the predominant form of compensatory mitigation, where the developer bears the responsibility to offset the wetland functions lost on or adjacent to the site where the impacts occurred. However, the high costs and the high number of unsuccessful PRM projects have led to changes in approach and the flourishing of environmental mitigation alternatives (EMA).

Two distinct programs have emerged as alternatives to provide permittees with increased flexibility when fulfilling permit requirements while increasing efficiency, the rate of success, and environmental quality:

1. A compensatory wetland banking (WB) program is administered by a state agency, a private entity or a nonprofit organization. A WB program acquires a site, independent of or related to a specific proposed regulated activity. The WB restores, enhances, creates or preserves a wetland, generating credits based on the type and quality of wetland improvement. Separately, in the course of seeking authorization for an activity that impacts wetlands, if on-site compensatory mitigation is deemed impracticable, the developer may satisfy their permit requirements by buying these generated credits from the WB. The WB has a limited amount of credits to sell, and this limit is determined when establishing the conditions with the different governmental agencies involved.
2. An In-lieu Fee (ILF) program is administered by a resource agency or a non-governmental organization and has the same function as that of the WB, previously described. The only fundamental difference between a WB and a ILF program is that a WB must have selected a consolidated mitigation site before it begins selling its credits, whereas an ILF program may sell credits even if no site has been built. In an ILF program, the funds are accrued until there is enough money to establish a mitigation site, creating lag time that can vary significantly from program to program

## STUDY PURPOSE

The objective of this study is to determine whether consolidated mitigation alternatives such as ILF and WB programs are viable options in Connecticut. Specifically, the study focuses on

whether the Connecticut Department of Transportation (ConnDOT) may be able to develop such programs for its own use. ConnDOT is interested in the potential for alternative mitigation strategies to decrease costs and improve construction timing while potentially increasing wetland environmental benefits. Determining an appropriate mitigation site for transportation projects impacting wetlands has caused long delays. If sites are not identified and a permit is not issued, construction projects are halted until such sites are selected. Project delays result in the loss of time and resources and proper programming of federal and state funds in a constrained capital program. This ultimately impacts the general public because much needed transportation projects are not constructed. EMAs represent the solution to such delays because they provide an option that may be used when mitigation projects are difficult for the permittee to develop on-site. Additionally, EMAs offer the opportunity for increased environmental functions and needs associated with larger, more contiguous natural areas. Many mitigation efforts from projects with relatively minor impacts result in small mitigated wetland areas with minimal ecological value. The goal of this report is to assess the potential for implementation of alternative compensatory mitigation and to make recommendations regarding current and future practices in Connecticut. To address this objective, published literature concerning mitigation practices was reviewed, and surveys of other states, and potential third parties were conducted to identify possible solutions. Based on this review and discussions with ConnDOT and the Connecticut Department of Environmental Protection (DEP), the Connecticut Academy of Sciences and Engineering (CASE) Study Committee has identified the following:

1. Alternatives available to conduct consolidated wetland mitigation based on information gathered from case studies and survey results.
2. Recommendations for ConnDOT that may improve the mitigation process. Additionally, the study provided recommendations regarding consolidated mitigation programs.

## CONCLUSIONS

Based on this study, a set of recommendations was developed for ConnDOT's consideration in addressing wetland mitigation challenges for transportation projects. The study committee concluded that an EMA program should be established in the state of Connecticut to provide an alternative to PRM—specifically, an ILF program. PRM has many limitations that EMA programs do not; these are discussed in this report. Two of the EMA programs discussed in this study and widely used throughout the United States are WB and ILF programs. Both programs provide wetland mitigation in consolidated sites. However, WB programs must secure, establish and demonstrate the success of a mitigation site in order to sell credits to permittees. ILF programs may sell credits before a site has been secured. This means that to establish a WB program, large amounts of money are needed to cover the up-front costs, a difficulty given the economic climate, the cost of land in Connecticut and the typical pattern through which ConnDOT receives funds from the Federal Highway Administration (FHWA). In an ILF program, a fraction of the funds are needed up-front because mitigation sites and construction are not performed until sufficient funds have been collected from permittees. As significantly less money is required up-front for an ILF program, the study committee recommends an ILF program as the most appropriate mechanism to provide EMAs in Connecticut, and that ConnDOT consider developing an ILF program for its transportation projects. A general overview of the cost for operating an ILF program is presented in this study. However, more specific values for the cost of land purchased

for mitigation by ConnDOT and the costs of mitigation project construction need to be assessed. Additionally, ConnDOT's decision to develop an ILF program should take into consideration potential cost savings and user and public relations benefits for eliminating construction delays associated with more timely mitigation approval, as well as the increased environmental benefits of larger, more contiguous mitigation projects.

Furthermore, in Connecticut the regulation of private impacts by municipalities prevents the private sector from buying into an EMA program. Therefore, the only current guarantee for an EMA sponsor in Connecticut would be the credits that ConnDOT and other state agencies would purchase, estimated to be about 3 acres per year (Alexander 2010). The relatively small amount of impacts does not provide economy of scale, and thus reduces incentive for the for-profit WB sponsors; this makes covering ILF operational costs more difficult for ConnDOT. However, if state law were changed to permit private impacts to be mitigated through an EMA, the mitigated area would increase significantly, with the ILF program definitively receiving sufficient payments to cover operational costs even if only a few municipalities participate. Concurrently, environmental quality will increase with mitigation at a larger scale and with increased flexibility in site selection. However, until state law is amended to allow for private participation in an EMA program, ConnDOT would need to establish an EMA program accounting for state impacts only, hoping that a successful program will serve to prompt the General Assembly to update the state's legal structure regarding wetland mitigation.

## RECOMMENDATIONS

The primary study recommendation is for ConnDOT to more thoroughly evaluate the cost benefits of implementing an ILF EMA program. The additional recommendations below follow from that recommendation, and are divided into three parts: general recommendations, which will benefit current environmental mitigation practices, regardless of whether an EMA program is developed; recommendations specific to the development of an EMA program; and recommendations specifically aimed at EMA programs and therefore only beneficial if such programs are established.

### *General Recommendations*

**Recommendation 1:** It is important that ConnDOT and DEP each develop cohesive and cooperative long-range plans articulating the following objectives, and provide for interagency review and comment through plan development.

1. Forecasting impacts
2. Classifying watershed goals
3. Prioritizing open space opportunities

**Recommendation 2:** ConnDOT and DEP should individually and collectively articulate the environmental goals and objectives of specific mitigation projects in written form. In doing so, each agency not only lays the groundwork for establishing future EMA, but also enhances the existing permitting processes.

**Recommendation 3:** In addition to the regular joint planning meetings between the two agencies, meetings focusing on a general discussion of wetland remediation approaches should be established. New Hampshire's survey response indicated that conducting monthly meetings proved to be valuable in the EMA project design process.

**Recommendation 4:** Evaluate the adequacy and efficacy of wetland impact documentation. If necessary, ConnDOT should improve the documentation of wetland impacts and DEP should improve documentation of the ecological success of wetland mitigation projects. According to the NCHRP (2002), many states are not properly documenting the mitigation process, leading to uncertainty as to whether the current mitigation options are effective and successful.

**Recommendation 5:** Work in cooperation with the Department of Economic and Community Development (DECD), and other state agencies as appropriate, to identify future project development areas that will impact wetlands.

### *Recommendations Specific to the Development of an EMA Program*

**Recommendation 6:** Identify potential service areas that could be appropriate for consolidated wetland mitigation. Having long-term plans in place for both ConnDOT and DEP is a necessary pre-requisite for determining the appropriate classification of mitigation boundaries. This recommendation should not be undertaken until there is certainty that an EMA program is feasible and ready to be established, because these actions imply that a thorough analysis of costs and the necessary steps towards program implementation have been conducted.

### *Recommendations Only if an EMA Program is to be Developed*

**Recommendation 7:** Inform municipalities and regional entities and other stakeholders of the opportunities provided by EMA programs, and evaluate the interest of the public and its representatives in altering the Connecticut General Statutes to permit towns to participate in a regional or statewide EMA program.

**Recommendation 8:** Identify potential sources of start-up financing for administrative development of a consolidated mitigation plan and instrument. Apply for federal (i.e., EPA) grants to assist in defraying costs of development.

**Recommendation 9:** Keep the USACE and other federal resource agencies including EPA, US Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) informed about the steps discussed above.

In summary, should compensatory mitigation be desired, Recommendations 6-9 will be necessary to establish the groundwork for initiating either a WB or ILF program. The first step in this process is to outline and document the processes regarding wetland mitigation. Long-term plans and efficient design processes regarding the stakeholders involved will be crucial for achieving program success. The next step is to obtain funding for developing a plan regarding the evaluation of ecosystem credits and long-term monitoring requirements. Finally, ConnDOT, along with DEP, should support legislation necessary to authorize the use of an EMA program, citing increased operational efficiency and environmental functioning.

***Recommendations Only if an EMA Program is Developed***

**Recommendation 10:** If an EMA is implemented, develop a means to include ecosystem services in project evaluation. Ecosystem services are services that wetlands provide directly to the public. A wetland that has been created or restored to be part of a park, for instance, creates recreation opportunities, wildlife viewing, flood control, etc., to the surrounding community. In short, ecosystem services generate a value to the public (Polasky and Segerson 2009), possibly reflected in increased property value, adding to the list of benefits consolidated mitigation programs could offer.

**Recommendation 11:** Mitigation options should be in-line with ecosystem goals established in DEP's long-term plan. Establishing a documented set of criteria and mitigation option rankings in-line with ecosystem goals provides transparency in the decision-making process.

**Recommendation 12:** Develop a means for long-term financing for administration of consolidated mitigation projects.



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## I: INTRODUCTION

Wetlands are important aspects of ecosystems because of their rich biotic life as well as their role in chemical cycling. Wetlands also benefit humans by providing wildlife habitat, recreation opportunities, flood control and mitigation of nutrient contamination. However, these services are compromised as wetlands and watercourses regularly are impacted by human development (Zedler and Kercher 2005, NRC 2001, Environmental Law Institute [ELI] 2002). Impacts result from private (e.g., driveways, parking lots) and public (e.g., state roads and public works) construction, with state transportation agencies impacting significant areas of wetlands each year. In Connecticut, impacts by the Connecticut Department of Transportation (ConnDOT), although <5% of the total annual impacted area, constitute the majority of the impacts to wetlands caused by state governmental agencies (CSC 2009). To maintain human quality of life and environmental quality, wetlands impacts should be avoided, or minimized if avoidance is not possible. When avoidance is not possible and all efforts have been made to minimize the impacts, remaining wetland losses and impacts must be compensated for either through enhancement of existing wetlands, restoration of degraded wetlands, creation of new wetlands or the preservation of existing wetlands, as mandated by state and federal regulatory legislation. Compensation can be achieved on-site or off-site by the party impacting the wetland. Alternatively, responsibility for compensation can be transferred to a consolidated wetland mitigation program. Such management strategies regarding wetland mitigation practices are designed to balance the economic benefits of development with the ecosystem services and societal benefits that wetlands provide.

Traditional mitigation approaches have involved on-site mitigation of impacts. However, off-site consolidated compensatory environmental mitigation alternatives (EMA), including wetland banking (WB) and in-lieu fee (ILF) programs, have been introduced as viable alternatives, offering cost (Ayres 2000) and environmental benefits relative to permittee-responsible mitigation (PRM). From the perspective of a transportation agency, for projects that require mitigation of impacts, EMA provides economies of scale that allow for a reduction in oversight and maintenance requirements, consistent and documented management decisions, and a decrease in construction delays (TRB 2002). Simultaneously, EMA also improves environmental functions and needs by providing larger wetland areas, increased and more consistent management, and enhanced scientific and technical input in the design and management (NRC 2001). While many other states in the United States, including some New England states, have adopted these mitigation approaches (ELI 2006), WB or ILF programs have yet to be implemented in Connecticut. At present, impacts to wetlands in Connecticut are compensated for primarily through PRM, often at a high cost because of the potential for construction delays involving state transportation projects (Alexander 2010). Often, the small scale and potential isolation of on-site mitigation sites render them ecologically insignificant. The state's legal structure of "home rule" further complicates the implementation of wetland mitigation alternatives in Connecticut by increasing the number of regulatory layers (BenDor and Brozovic 2007). Local towns have regulatory authority over wetland compensation by private entities within their jurisdiction, whereas state agencies report directly to the Connecticut Department of Environmental Protection (DEP) for regulatory approval. Hence, for WB or ILF programs in Connecticut under the current system of practice, separate credit systems would be required for state and private impacts (state impacts being regulated by DEP

and private impacts by municipalities), dramatically reducing (>95%) the total impacted acreage buying into alternative mitigation systems and increasing the cost per project over which operating costs would be distributed. Without an act of the legislature, it appears that towns could not choose to have permittees buy credits from a WB or pay fees to an ILF programs in lieu of PRM if the EMA is not town-run. Therefore, under the current system in Connecticut, ConnDOT would need to be able to support the establishment of an EMA for their purposes without support from private impacts. While the multi-layer regulatory system and relatively small annual impacts of ConnDOT may minimize the short-term cost and environmental benefits of EMA from being realized, the potential longer-term efficiencies and ecologically significant gains are expected to be of value in Connecticut.

ConnDOT has asked the Connecticut Academy of Science and Engineering (CASE) to assess the potential for the implementation of EMA with regard to transportation projects. ConnDOT is interested in the potential for alternative mitigation strategies to decrease costs and improve construction timing while potentially increasing wetland environmental benefits. The goal of this report is to assess the potential for implementation of alternative compensatory mitigation and to make recommendations regarding the current state of practice in Connecticut. To address this objective, published literature has been reviewed concerning mitigation practices and surveys of other states and potential third parties have been conducted to identify possible solutions. The study's recommendations also include outcomes of discussions with DEP and ConnDOT representatives. The report is presented in three sections. The opening section provides a background of the mitigation alternatives used throughout the United States, providing a basis for additional discussion of examples from other states as well as Connecticut. Some of the current US mitigation alternatives will be reviewed. Additionally, a discussion of compensatory wetland mitigation including both PRM, which compensates on or near the site where wetlands are impacted, and environmental mitigation alternatives (EMA), which compensate for impacts away from the impacted site through various methods, will be provided. EMA typically involve a WB or ILF program operated by a third party, although many state transportation agencies throughout the country sponsor WB programs. Both third-party and state transportation agency WB compensatory mitigation options are currently in use throughout the United States (TRB 2001), but have not been instituted as readily in the New England states (Ladd 2010).

The second part of this report addresses the results of the survey distributed to the different organizations involved with the compensatory mitigation of impacted wetlands. A comprehensive survey was distributed to environmental and transportation departments of New England states and several other states with established alternative mitigation programs. Additional surveys were distributed to regional planning authorities in Connecticut and to parties that have expressed interest in implementing compensatory mitigation in Connecticut. These surveys were followed by personal communication by CASE project researchers to solicit more detailed information. Based on the information gained, select case studies are presented as examples of state strategies involving the issue of compensatory mitigation.

The third section of this report presents a summary of how examples from other states apply to the Connecticut situation, and provides recommendations for ConnDOT to consider regarding the current state of practice in Connecticut and potential direction should ConnDOT wish to pursue alternative compensatory wetland mitigation. These recommendations were developed by the CASE Study Committee (CSC) based on the literature review, survey responses and meetings with state ConnDOT and DEP representatives.

## II: BACKGROUND

Wetlands have different definitions and are regulated differently under federal and state legislation. Therefore, it is important to differentiate these regulations to understand how they affect wetland mitigation. The following is a summary of some of the major aspects of the legislation and guidance for wetland mitigation provided by federal agencies. Before investigating the details of the federal legislation, it is crucial to have an understanding of the process in basic terms:

- A developer (e.g., state transportation agency, private developer) plans on building a structure that could potentially impact a wetland. For instance, a state transportation agency will add a lane to an existing highway, which results in wetland impacts.
- The developer must investigate if the project's impacts are avoidable. If they are avoidable, the necessary changes should be made to avoid such impacts.
- If all or some of the impacts are unavoidable, the next step is to minimize the impacts.
- After all unavoidable impacts are minimized, developers must mitigate any remaining impacts of significance. Developers may pay a fee to a consolidated wetland mitigation program, if available, to avoid doing the mitigation themselves. In instances where there is no consolidated mitigation program, the developer formulates a wetland mitigation plan through PRM, keeping the responsibility for mitigation. The US Army Corps of Engineers (USACE), a major regulating agency of wetland impacts, has established an administrative preference for off-site mitigation except for water quality and flood control considerations.

PRM projects are primarily carried out on-site. However, it is important to clarify that some of these projects may also be conducted off-site. Conversely, consolidated EMA projects are always conducted off-site.

### IMPORTANCE OF WETLANDS

Wetlands and watercourses are important elements in an ecosystem. Some of the ecological functions of wetlands include water quality improvement, flood control, providing habitat for a high level of animal and plant diversity, including endangered species, and groundwater recharge (Acharya 2000). Additionally, wetlands can be used to harvest fish, shrimp and a variety of plants. Some of the major benefits of wetlands to the environment and communities have been well documented (e.g., Manuel 2003). Studies have shown that wetlands benefit our everyday life; for instance, wetlands can sequester twice the amount of carbon in 17% of the land when compared to certain farmlands (Euliss et al. 2005). Constructed wetlands can be used to remove biochemical oxygen demand (BOD) and chemical oxygen demand (COD), both measures of oxygen depletion and pollution effect for wastewater treatment applications (Verhoevan et al. 1998). Wetlands also are capable of reducing hurricane wind damage in coastal areas prone to strong hurricanes, such as coastal Louisiana (Farber 1987). Additional critical aspects of wetlands valuation are the natural benefits that wetlands also provide to humans. In general, people have an appreciation for their wetlands, visiting them often and

assigning them an intrinsic value. A significant fraction of urban populations feels as though the presence of wetlands, although limited, plays an important role in their urban community (Manuel 2003). For example, Mahan et al. (2000) have investigated the effect of wetlands on property value in the Portland, Oregon, metropolitan area, determining that wetlands have great influence in residential property value for their ability to provide landscape, wildlife and a buffer against pollution. The value of properties increased with proximity to a wetland.

## GENERAL TRENDS IN WETLAND DEVELOPMENT

Impacts to wetlands by development have traditionally increased throughout the United States as population increases and urban centers expand. Highways and transportation projects have increased in the past decade in response to budgetary increases associated with the passing of the Transportation Equity Act for the 21<sup>st</sup> Century (Marble and Riva 2002). Therefore, impacts to wetlands due to transportation will continue to be an issue in the future. However, as development pressure impacts wetlands, the public awareness of wetland functions and value has been reflected in increased legislation, leading to a decrease in the amount of wetland acreage lost to development. In Connecticut, the amount of impacts to wetlands has decreased dramatically, from 453 acres in 1991 to 124 acres in 2003 (DEP 2010).

Wetland impacts not only potentially decrease the value of the wetlands ecologically, but also affect the scale at which benefits are provided. Many of the benefits that wetlands provide are enjoyed at local spatial scales (BenDor et al. 2008). Therefore, eliminating wetlands due to the urbanization and development of rural areas, or shifting wetland location, can decrease social and economic benefits (the “intrinsic” valuation) within specific communities while adding equity in other communities in which wetlands are enhanced, created or preserved. Additionally, a major problem is created: the migration of wetland areas from urban centers to rural areas because of lower mitigation costs (Ruhl and Salzman 2006). Generally, the cost of rural land is much less than the cost of urban land. Moreover, large tracts of land are mostly available in rural areas. When choosing a site for a consolidated mitigation project, the WB or ILF sponsor will invest in a tract of land that has the appropriate size for the mitigation needs in the most economical way. Therefore, when EMA programs are established, wetlands tend to be restored, created, enhanced or preserved outside urban centers. The migration of wetlands has both advantages and disadvantages. The major disadvantage is the loss of wetlands in urban areas, depriving urban populations of recreational value as well as ecological functions such as stormwater management and flood control. However, EMA and the shift to larger, rural mitigation sites offer the advantages of an increased likelihood of successful wetland mitigation (Silverstein 1994). Many PRM mitigated wetland impacts are small in acreage, particularly in developed areas, reducing the benefit to the ecological functioning of the surrounding area. The agglomeration of small impacts into a larger site increases the ability of mitigated wetlands to provide environmental functions as well as for mitigation site managers to ensure the success of the wetlands in providing those benefits.

## FEDERAL LEGISLATION AND GUIDANCE

### *Wetland Definition:*

The US Environmental Protection Agency (EPA) defines a wetland as 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.” (EPA 1993). The US Fish and Wildlife Service (USFWS) has a similar definition, and adds that wetlands must also exhibit one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979). The US Army Corps of Engineers (USACE), a third federal agency involved in wetlands regulation, has a similar definition of a wetland.

### *Wetland Legislation:*

The impacts of development and transportation projects on wetlands and watercourses were neglected for decades until the passage of the Clean Water Act (CWA) in 1972. CWA, Section 404 requires those who seek to fill or destroy wetlands to first request a permit. Prior to granting approval for a permit, the regulatory agency must sign off on construction designs, including accounting for potential impacts to wetlands and/or watercourses according to a series of priorities. The Code of Federal Regulation (CFR) Title 40, Subpart B, Section 230.10(a) prioritizes avoidance of impacts to wetlands. When impacts cannot be avoided, the progression is to the minimization of impacts and finally, as last resort, to compensatory mitigation to account for any wetland area, and the associated services, that is being lost.

Understanding the meaning of avoidance, minimization, and compensatory mitigation as addressed in the CWA is crucial to environmental impact assessment (EIA), but can be misleading and often is misunderstood. The Memorandum of Agreement (MOA) between the USACE and EPA states that “[a]voidance... **allows permit issuance for only the least environmentally damaging practicable alternative. Section 230.10(a) requires that no discharge** of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.” Appropriate and practicable steps to minimize adverse impacts will be required through project modifications and permit conditions. CWA, Subpart H of Part 230 provides a list of measures which will help minimize the impacts caused by the discharge of dredged or fill materials. A few of these measures are listed below to provide a general understanding of how minimization may be achieved:

- locating and confining the discharge of dredged material to minimize smothering of organisms
- designing the discharge of dredged material to avoid a disruption of periodic water inundation patterns
- selecting a disposal site that has been used previously for dredged material
- selecting a disposal site at which the substrate is composed of material similar to that being discharged, such as discharging sand on sand or mud on mud
- designing the discharge of dredged or fill material to minimize or prevent the creation of standing bodies of water in areas of normally fluctuating water levels, and minimize or prevent the drainage of areas subject to such fluctuations

### ***Compensatory Mitigation:***

The Memorandum of Agreement (MOA) between the USACE and EPA addresses compensatory mitigation, stating that unavoidable impacts to wetlands and watercourses must be compensated for by appropriate and practicable mitigation. This can include the entire adverse impact or only those impacts remaining after all minimization has been considered. Traditionally, federal agencies had an administrative preference for on-site PRM projects that mitigated impacts through the restoration or creation of a wetland at or adjacent to the impact site. When such compensatory mitigation projects were not deemed to be practical or beneficial, then off-site, consolidated mitigation projects were advised. This was changed in 2008, when the USACE and EPA released rules and regulations on “Compensatory Mitigation for Losses of Aquatic Resources” (USACE 2008). The new rule acknowledges the advantages of EMAs and gives them an administrative preference over PRM except for those cases involving water quality or flood control when mitigating for aquatic losses. This applies if a WB is in the service area (area in which impacts are permitted to purchase credits in the WB) of the impact site. If WBs are not yet established or do not have any remaining credits available in the service area where impacts occurred, the next preference is given to ILF programs, if these are available in the service area where impacts occurred. If neither WB nor ILF programs are available, then water-based PRM, except to address water quality and flood storage functional losses, would need to be performed. It is important to understand that regardless of whether compensatory mitigation occurs through a consolidated EMA project or PRM, the compensatory mitigation order of preference listed below is usually followed:

1. Restoration of a previously existing wetland or other aquatic site.
2. Enhancement of an existing aquatic site’s functions.
3. Establishment (creation) of a new aquatic site.
4. Preservation of an existing aquatic site and/or upland which protects the functions of aquatic resources.

The reason why preservation is the least preferred option, after restoration, enhancement and creation, is because preservation does not contribute to the goal of “no net loss” of wetlands (CRS 2005). If a developer impacts a wetland area and mitigates for the loss of that area by preserving an existing wetland, it means that there is still a loss in the amount of wetland acreage. Additionally, the current environmental regulatory environment has the infrastructure in place to prevent additional losses of wetland acreage. Therefore, the focus of mitigation is not prevention, but rather restoration. However, small impacts frequently are best compensated by preservation rather than construction of a small and difficult to sustain long-term project.

The new rules (USACE 2008) also have provided additional guidance relating to compensatory mitigation. Site selection for compensatory mitigation projects should be aligned with the assessment of watershed needs, requiring compensatory EMA programs to have measures of ecological performance. These performance measures should be documented to provide openness in the regulatory process, to lay out a coherent direction for all stakeholders, and to evaluate the long-term success of a project. Additionally, the guidance calls for regular monitoring of sites and encourages the use of scientific expertise to evaluate compensatory EMA projects. Larger-scale compensatory EMA projects facilitate the incorporation of scientific expertise as compared to smaller PRM projects, as more resources are available.

## CONNECTICUT STATE LEGISLATION

### *Wetland Definition*

Connecticut has its own definition of a wetland, separate and in some ways more comprehensive than those of EPA and USACE. In 1972 and 1987, legislation was passed in Connecticut to protect wetlands and watercourses. The Connecticut statutory definition states that wetlands include “land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey, as may be amended from time to time, of the Soil Conservation Service of the United States Department of Agriculture. Watercourses are defined as rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and all other bodies of water, natural or artificial, public or private” (CT General Statutes 1972). Connecticut is unique in including flood plains in its wetland regulations.

### *Wetland Legislation*

In Connecticut, wetlands and watercourses are under the jurisdiction of municipalities (towns) for private considerations. Therefore, when water resources are impacted by development (e.g., buildings, roads) municipalities require developers to avoid and minimize impacts before mitigating for lost wetland or watercourse functions. However, the specific details of what constitutes “minimize” and “mitigate” have some flexibility for town wetlands boards/commissions. Additionally, the USACE will be involved in the permitting process when the wetland impacts are large (generally over 5,000 sq. ft.) in inland wetlands, except when there are secondary impacts associated with the project or when in or near a Wild and Scenic River, and other special circumstances). Conversely, state projects that impact wetlands (e.g., ConnDOT highway projects) are under the jurisdiction of only DEP and federal regulation, with local town authorities having no regulatory responsibilities. However, similar conditions with regard to avoidance, minimization, and mitigation apply.

The Connecticut Inland Wetlands and Watercourses Act (IWWA), enacted in 1972 and amended in 1987 (Connecticut General Statutes), created a unique feature that allows municipalities to regulate their wetlands. Specifically, IWWA, Section 22a-41(a)(4) gives authority to municipalities to consider wetland mitigation when needed. According to the law,

irreversible and irretrievable loss of wetland or watercourse resources which would be caused by the proposed regulated activity including the extent to which such activity would foreclose a future ability to protect, enhance or restore such resources, and any mitigation measures which may be considered as a condition of issuing a permit for such activity including, but not limited to, measures to (A) prevent or minimize pollution or other environmental damage, (B) maintain or enhance existing environmental quality, or (C) in the following order of priority: restore, enhance and create productive wetland or watercourse resource.

Part (A) requires municipalities to take measures to help “prevent or minimize” the degradation of wetlands, whereas Part (C) requires measures to establish compensatory mitigation. It is important to understand that while the IWWA provides autonomy to municipalities in

Connecticut, federal law, including mitigation requirements, also may apply, particularly for large projects. Therefore, municipalities are sometimes required to require design of mitigation projects that are consistent with federal regulations.

### ***Compensatory Mitigation Alternatives***

While wetland impacts in Connecticut are regulated under the IWWA, compensatory EMA have yet to be implemented in Connecticut. A few nonprofit agencies have expressed interest in establishing a program. As evidenced by the objectives of this report, DEP and ConnDOT are interested in exploring alternative options. However, each must operate within the regulatory goals and authorities of their specific state agencies. Additionally, the multi-layered jurisdictional system in Connecticut with respect to water resource regulations, the lack of large undeveloped parcels of land, and the prevailing support for environmental considerations of the public in the state make establishing alternatives to PRM, such as third-party consolidated mitigation, more difficult.

The IWWA does not specifically preclude private actions from inclusion in third-party mitigation. Section 22a-42 of the state code passes the responsibility to mitigate through DEP to municipalities, particularly town Inland Wetlands Commissions (IWC). However, two Connecticut Supreme Court cases have shaped the legal landscape regarding third-party mitigation alternatives. In *Red Hill Coalition, Inc. v. Conservation Commission* (212 Conn. 710, 715, 563 A.2d 1339; 1989), the Court determined that accepting funds in lieu of PRM did “satisfy the intent of the legislature” with regard to the IWWA by having a well-developed plan in place for the town to utilize those funds to perform in-kind mitigation elsewhere in the watershed. Two key factors in this decision were the presence of a well-developed plan and the town, which is in charge of overseeing the initial mitigation, performing the future off-site mitigation. Conversely, in *Branhaven Plaza, LLC v. IWC of the Town of Branford* (251 Conn. 269; 740 A.2d 847; 1999), the Court determined that accepting funds for future off-site, in-kind mitigation was not acceptable. The key factor in this determination was the unspecified, unplanned future mitigation which created the perception of impropriety on the part of the Branford IWC.

An informal, personal, oral opinion by an assistant attorney general expert in the state’s inland wetland laws advised caution in interpreting these decisions. Connecticut General Statute 22a-42, Section E does specify that “municipalities may come together to form a district” to regulate wetlands on a regional basis. However, while the ILF/WB program outlines a sufficient plan to satisfy the Court according to *Branhaven*, the formation of the district may not overcome the need for one of the towns involved to be the party directly performing the future in-kind mitigation as specified in *Red Hill*. Based on these cases and opinion, under current law compensatory mitigation alternatives may only be used if 1) there is a well-developed plan and 2) it is performed by the municipality (i.e., town). If this is the case, the only option for including private impacts in an ILF or WB program on a regional scale would be the adoption of a statutory amendment to the IWWA clearly providing such authorization.

## **COMPENSATORY MITIGATION ALTERNATIVES**

There are three mechanisms for providing compensatory mitigation that are allowed by the federal government (USACE 2008). These mechanisms are PRM, WB programs and ILF programs. Where available, WB and ILF programs provide an alternative to those developers that consider PRM to be impractical or when the regulatory agency(ies) determines such

# ENVIRONMENTAL MITIGATION ALTERNATIVES FOR TRANSPORTATION PROJECTS IN CONNECTICUT BACKGROUND

mitigation is not appropriate to compensate for the functions that will be lost. Where WB and ILF programs are not available, compensatory mitigation must be carried out by the permittee, generally on-site for the town and/or state but more likely to be off-site, or a combination of on-site and off-site, for the USACE.

While recent environmental awareness and wetland mitigation practices have increased compensation for wetland impacts, particularly restoration of existing wetlands, there is generally a lack of information regarding the success of mitigation efforts. As of 2002, sufficient data were available about project-specific mitigation, but the information about the success of consolidated mitigation options was incomplete (TRB 2002). Additionally, research has demonstrated that project-specific mitigation has some critical shortcomings, such as sites not being built once permits have been issued, a long lag time between impacts and functional mitigation, inappropriate hydrology, and discrepancies between proposed mitigation and the final outcome (TRB 2002, Silverstein 1994). Some of these issues could be better addressed by the increased scientific expertise available with the establishment of WB and ILF programs (USEPA 2010).

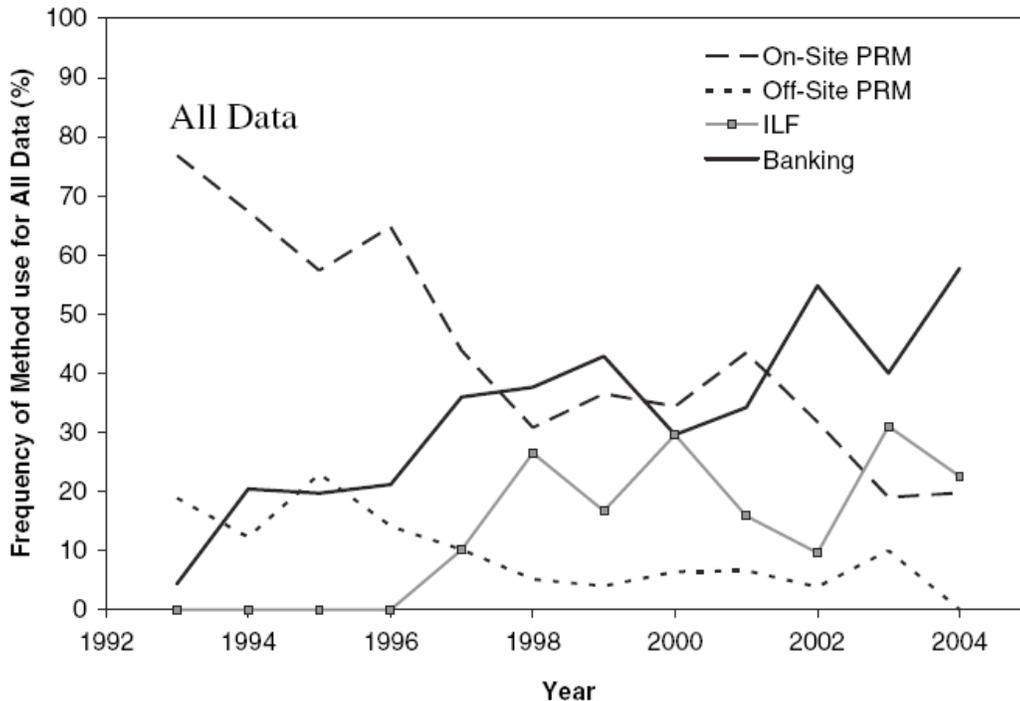
By 2002, the majority of states already were active in the wetland banking business, with approximately half of them having established state transportation agency WBs (Figure 1). Also, only a few states, predominantly New England states, had not implemented WB programs (Figure 1). Furthermore, 17 out of the 38 USACE districts had established ILF arrangements.



**FIGURE 1:** STATES USING COMPENSATORY MITIGATION BANKS (FIGURE FROM TRB 2002)

In general, the TRB (2002) report determined that poor monitoring information of state transportation agency mitigation programs hampered the evaluation of mitigation success. Survey responses from 55 state agencies (e.g., transportation agencies) and private banking entities suggested that appropriate site selection for banking purposes is one of the main determinants of a successful mitigation project.

Additionally, the political climate under which mitigation is carried out has shifted over the past 25 years to one favoring acceptance of WB and ILF (USACE and EPA 1995, NRC 2001, USACE 2008). Federal documents on mitigation practices have provided significant support for consolidated EMAs, resulting in their increased usage. BenDor and Brozovic (2007) analyzed data from the Chicago area that shows a significant change in compensatory mitigation practices (Figure 2). PRM dramatically decreased in the Chicago area, whereas third-party compensatory mitigation, such as WB and ILF programs, increased. In 12 years, wetland banking increased from almost non-existent to more than 50% of compensatory mitigation practices.



**FIGURE 2:** CHANGING FREQUENCY OF DIFFERENT MITIGATION METHODS EMPLOYED IN THE CHICAGO AREA FROM 1993 TO 2004. PRM = PERMITTEE-RESPONSIBLE; ILF = IN-LIEU FEE; (FROM BENDOR AND BROZOVIC 2007)

### *Permittee-Responsible Compensatory Mitigation*

On-site mitigation carried out by the permittee is the most common mechanism for compensatory mitigation nationwide and represents the largest yearly acreage of all compensatory mitigation mechanisms. This statement contrasts with the Chicago region data, where in 2004 PRM (on-site) accounted for only 20% of the mitigation methods utilized, because

Illinois legislation has recently encouraged the establishment of EMAs. As the current practice in Connecticut and the historical option prior to initiation of WB and ILF programs, PRM serves as the base case against which alternative wetland mitigation options are assessed. In this option, a permittee who has impacted a wetland or an aquatic resource is responsible for the compensatory mitigation. Therefore, the permittee must compensate and ensure that the compensatory mitigation is successful.

Although representing the dominant form of mitigation, in many cases PRM is the least preferred – as well as an impractical – option (USACE 2008). Many impacted sites are in developed areas. Therefore, land suitable for remediating the impacts directly is either unavailable or costly. PRM has many additional drawbacks. Most of the challenges associated with PRM practices are due to the small scale of the projects. Permittees may not have enough resources to conduct scientific studies of the ecological functions to be replaced or to establish monitoring and long-term management practices. According to Gardner et al. (2009), PRM is sometimes not conducted or mitigation is attempted and results in an unsuccessful project. Also, lacking the mitigation expertise consolidated mitigation sponsors often possess, PRM may fail to provide for the wetland functions lost. In PRM, permittees are seldom required to conduct long-term monitoring of the mitigated site, jeopardizing the long-term success of such sites (although the USACE now holds all mitigators to the same standards). Additionally, due to the large number of PRM sites, the USACE’s oversight is minimized. On the other hand, consolidated EMA programs, which use resources from combined mitigation projects in one consolidated site, have the capability to reduce the cost of mitigation projects, improve monitoring and long-term management, and facilitate USACE oversight of a few large mitigation sites as compared to many individual ones.

### ***Consolidated Compensatory Mitigation***

Compensatory mitigation is performed off-site and often requires the involvement of a third party to conduct the compensatory mitigation in order to fulfill the requirement of the permit obtained. This can involve compensation for either all of the impacts or only those impacts deemed to remain after PRM has been performed. In short, after the permittee has impacted a wetland, they may pay a third party to compensate for the acres impacted. Both WB and ILF programs are third-party (some state transportation agencies also own banks for their own use) options for performing mitigation for projects by restoration, enhancement, establishment and preservation, or a combination of these mitigation methods, depending on the circumstances and the land available. For instance, a third party involved in either a WB or ILF program may buy a tract of degraded wetlands or prior converted wetlands and undertake the design and permitting process to restore, create, enhance or preserve the wetlands to their natural state. The third party must take responsibility for the mitigation and must also monitor wetland performance to assure the site’s success (USACE 2008). Key differences between these consolidated EMA options and PRM are listed below in Table 1.

**TABLE 1: DIFFERENCES BETWEEN PRM AND CONSOLIDATED (WB AND ILF) EMAs.**  
OUTLINED ARE DIFFERENCES IN OPERATION AS WELL AS BENEFITS AND CHALLENGES OF EACH

	<b>PRM</b>	<b>Consolidated EMA</b>
<b>Operation</b>	<ul style="list-style-type: none"> <li>• Mitigation is carried out by the developer who impacted the wetlands.</li> <li>• Mitigation is performed on or adjacent to the site where the impact takes places.</li> <li>• Mitigation is performed on a project-by-project basis. Most of the time, first option to be explored.</li> <li>• Permittee is responsible in perpetuity.</li> </ul>	<ul style="list-style-type: none"> <li>• Mitigation is carried out by a third-party (non-governmental organization, commercial venture, state or local agency).</li> <li>• Mitigation is typically performed off-site and preferably within the same watershed.</li> <li>• Small project impacts are mitigated for in consolidated mitigation projects.</li> <li>• The sponsor (or other designated entity) is responsible in perpetuity.</li> </ul>
<b>Benefits and Challenges</b>	<ul style="list-style-type: none"> <li>• If practicable, essential to maintain ecological values directly in area impacted.</li> <li>• Keeps wetlands in developed areas.</li> <li>• May be too small, isolated to be meaningful ecologically.</li> </ul>	<ul style="list-style-type: none"> <li>• Economies of scale allow for a less costly, more functionally meaningful, process where resources are combined into one big project.</li> <li>• Increased expertise in consolidated mitigation projects allows for better quality wetlands as well as improved monitoring staff and techniques.</li> <li>• Removes the short- and long-term responsibility from the permittee.</li> </ul>

## COMPENSATORY MITIGATION BANKING

### *Background*

A wetland mitigation bank (WB) is an entity administered by a private organization, a state agency or a public interest group (non-governmental organization). A WB restores, enhances, establishes and/or preserves a wetlands area for the purpose of creating the asset, i.e., wetland credits, and then selling wetland credits in exchange for assuming permittee mitigation responsibility. Organizations or individuals who are required to compensate and do not wish to retain the responsibilities requiring compensation may buy wetland credits from the WB. When the credits have been purchased from the bank, responsibility to compensate for the impacted wetlands passes from the permittee to those operating the mitigation bank.

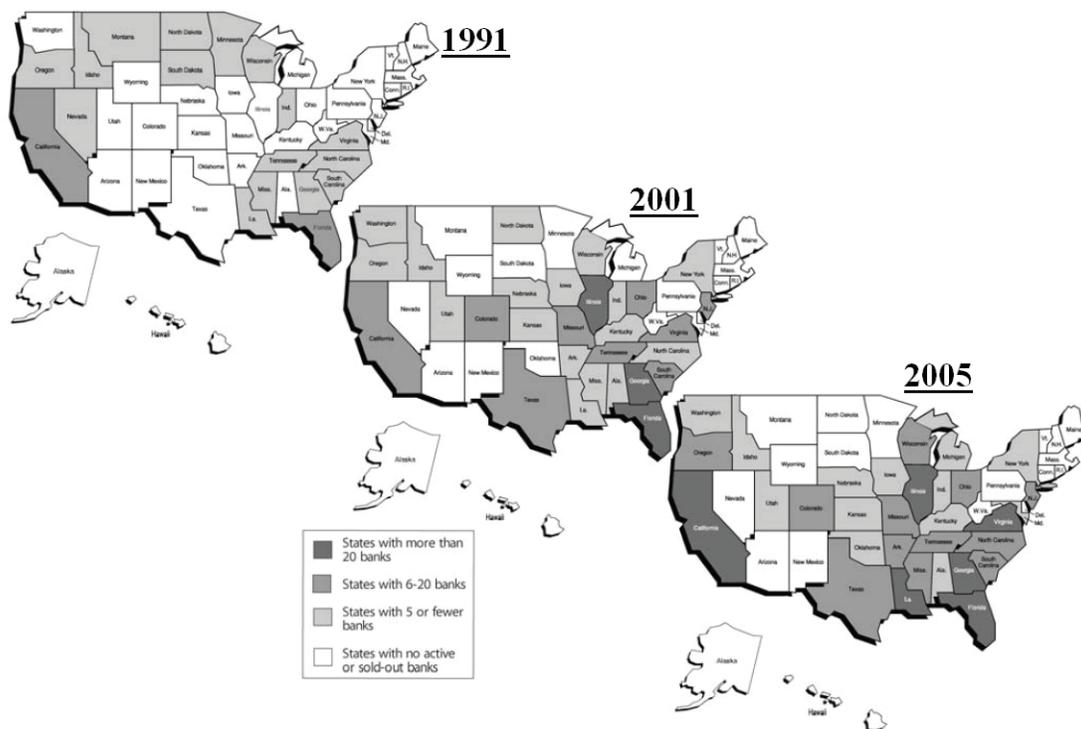
# ENVIRONMENTAL MITIGATION ALTERNATIVES FOR TRANSPORTATION PROJECTS IN CONNECTICUT BACKGROUND

There are two types of WBs:

1. **Commercial WB:** Third-party WBs are usually private ventures established by investors who sponsor the WB to make a profit. Such WBs are common in Illinois and Florida and many other non-New England states (Robertson 2004; TRB 2002; ELI 2005).
2. **State Transportation Agency WB:** These are consolidated mitigation programs created by state transportation agencies for their own use. In some states, however, other permittees are allowed to buy credits from state transportation agency WBs.

After the bank has been established and the wetland credits have been sold to permittees, the permittees are responsible for neither the compensatory mitigation nor the costs associated with maintenance or ecological success of the wetlands and/or other aquatic resources. The organization operating the WB assumes the responsibility and risk associated with achieving successful mitigation.

Figure 3 shows the increase of compensatory mitigation banking in the United States, depicting which states had WB programs as of 2005. As of 2009, no New England state had any mitigation banks (Ladd 2010) whereas in other states the number of mitigation banks increased considerably. Between 1991 and 2005 there was an increasing preference for this type of compensatory EMA. States with the greatest number of WBs such as California, Florida, Georgia, Illinois, Louisiana, and Virginia, and others are worth investigating to examine potential successes and failures of such programs.



**FIGURE 3:** NUMBER OF MITIGATION BANKS IN ALL STATES IN 1991, 2001 AND 2005.  
(ADAPTED FROM ELI, 2006)

## *Key Features*

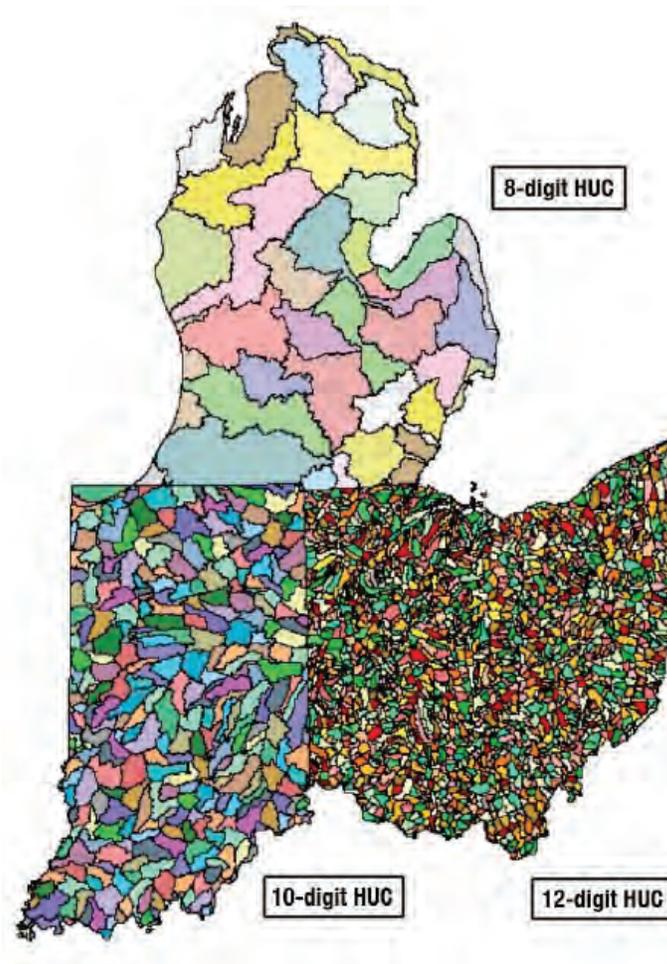
Robertson (2004) summarized some the key features associated with WB programs, which are important to understanding the basis for use of a WB. These include

- bank site: location of the wetland;
- bank instrument: an administrative document which establishes ecological criteria for USACE approval of bank credits, financial sureties the banker must provide to protect against site failure, the kind of ecological monitoring required, and other administrative details;
- service area: represents the geographic area in which credits from a consolidated mitigation project can be sold in exchange for wetland impacts within that established area;
- Interagency Review Team (IRT): a group composed of state and federal environmental agencies, Native American tribes, the soil and water conservation districts, and/or local planning departments. Additionally, scientists and/or experts in wetland mitigation who work for state and local offices of federal regulatory agencies are often included in the IRT. Their role is to assess the banker's restoration of a site, and to monitor the site's continuing ecological function performance. Their assessment determines how many credits the bank can sell, based on the site's continued success at meeting the functional standards described in the WB instrument.

When establishing consolidated mitigation projects, the service area is a key issue that must be addressed. Some states have adopted Hydrologic Unit Codes (HUC) established by the US Geological Survey (ELI 2009), which are often used to measure watershed boundaries. Some other states, such as Maine, use biophysical boundaries to define the service area of consolidated mitigation projects.

With respect to HUC levels, the different HUC designations represent watersheds of different sizes with HUC values increasing as the order of the stream decreases, a proxy for decreasing watershed size (Figure 4). For example, HUC 8 watersheds are larger than HUC 10 watersheds. In many cases, the 8-digit HUC is used to delineate these boundaries, allowing for increased flexibility in siting wetland mitigation alternatives. However, moving to larger watershed delineation for mitigation incorporates a larger number of local political entities and societal considerations in states with local regulatory authority.

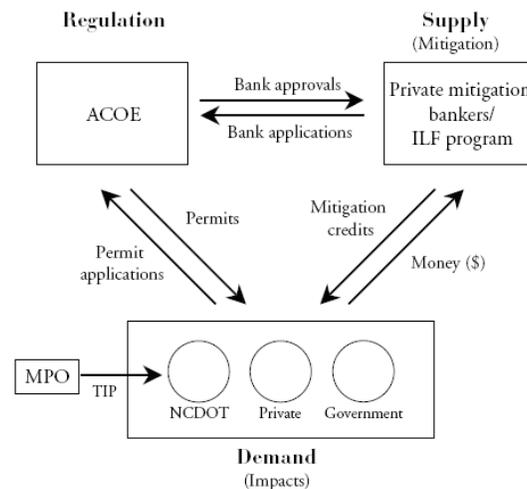
Another critical aspect of consolidated EMA projects is the establishment of replacement mitigation ratios, often defined in terms of relative areas. Replacement ratios are used by regulating agencies at the local, state and federal levels to adjust for the relative quality of impact sites and mitigation projects. Due to the shift from on-site to off-site mitigation, mitigation ratios are a mechanism to favor in-kind remediation of ecosystem attributes to maintain "no net loss" and to address watershed goals outlined in a compensatory agreement. Mitigation ratios are determined by the mitigated acreage to the impacted acreage. For instance, a 1:1 mitigation ratio means that 1 acre of wetland will undergo mitigation for each 1 acre of wetlands impacted. Similarly, a 15:1 mitigation ratio (a popular ratio for preservation, with a high ratio for having the lowest preference in the types of wetland mitigation) means that 15 acres of wetlands and/or upland must be preserved for each 1 acre of wetlands impacted.



**FIGURE 4:** THE THREE DIFFERENT SIZES OF HYDROLOGIC UNIT CODES AS ESTABLISHED BY THE US GEOLOGICAL SURVEY (ELI, 2009)

### *Steps for Implementation*

WB programs are commonly used throughout the United States. As shown in Figure 1, as of 2005 more than 50% of the states had at least one active WB. In order to assess the feasibility of implementing a WB in Connecticut, the process of establishing a WB will be described. A simple schematic of how compensatory mitigation works is presented in Figure 5. Before third-party mitigation alternatives become operational, the potential sponsor must first apply to and obtain approval from the USACE. WB programs supply credits to those institutions in need of mitigation alternatives to counter wetland impacts. In exchange, these permittees pay the established fee or pay the market price for the credit as established by the WB. Figure 5 also shows the more traditional PRM.



**FIGURE 5: SCHEMATIC OF THE INTERACTION BETWEEN PERMITTEES, REGULATORS AND SUPPLIERS OF THIRD-PARTY MITIGATION ALTERNATIVES (BENDOR AND BOYLE 2010)**

A WB sponsor must secure approval of its WB program from the USACE. This process includes the development of a WB prospectus and Mitigation Banking instrument (WB instrument). The first step in this process is the development of the prospectus, which is evaluated by the USACE and an IRT. The prospectus serves as a basis for WB program establishment and development of the WB instrument.

### 1. Prospectus

The WB prospectus should include (USACE 2008)

- program objectives;
- how the WB program will be established and operated;
- proposed service area;
- need and technical feasibility;
- proposed project site and long-term management strategy; and
- sponsor qualification: past experience of the sponsor which led to a successful mitigation project.

The WB prospectus addresses two additional aspects of WBs that differ from provisions of ILF programs:

- the ecological suitability of the site to achieve the objective of the proposed mitigation bank
- assurance of sufficient water rights to support the long-term sustainability of the mitigation bank

## 2. Mitigation Banking Instrument (WB Instrument)

If the USACE approves the consolidated mitigation prospectus, the next step is to create a WB instrument. The instrument can outline a plan for the creation of a specific site or a set of sites under an “umbrella” program. The instrument should be based on the approved prospectus with the addition of more detailed information. The following unique aspects of WBs must be specified in the instrument (USACE 2008):

- a. Mitigation plans, including:
  - i. Objectives: compensation method(s) (enhance, restore, create and/or preserve) and how the compensatory mitigation measures will address watershed needs.
  - ii. Site selection: factors considered during site selection.
  - iii. Site protection instrument: site ownership.;
  - iv. Baseline information: ecological characteristics of the WB site.
  - v. Determination of the amount of credits to be provided. Credits are units of trade used in consolidated mitigation programs as they are used in other environmental trade programs such as cap and trade (EPA, 2010a). In the case of a WB, a credit represents the amount gained from wetland mitigation and a debit represents the amount of wetlands lost. Therefore, a permittee debits credits from a WB to compensate for the lost function of a wetlands.
  - vi. Mitigation work plan: details of the WB project, including construction methods, plans to control invasive species, etc.
  - vii. Maintenance plans.
  - viii. Monitoring requirements.
  - ix. Long-term management plan.
  - x. Adaptive management plan.
  - xi. Financial assurances; description of the financial structure of the consolidated mitigation program to help determine if the financial condition of the program is adequate to provide compensatory mitigation.
- b. Credit release schedule: A credit release schedule is a timetable for the amount of credits that can be released for sale, based on certain WB program milestones. The percentage of credits that can be released is determined in the WB instrument and negotiated between the sponsor of the WB and the USACE, depending on the circumstances. The milestones are agreed to between the parties. Therefore, they can differ from one WB program to another. However, in general, the first set of credits cannot be “released” until the WB instrument is approved, the site has been secured and financial assurances have been provided.
- c. Additionally, for all compensatory mitigation alternative options (USACE 2008) the instrument must include the following required provisions:

- i. Description of the proposed geographic service area of the mitigation bank
- ii. Accounting Procedures: a WB sponsor must keep a ledger in which all credit transactions are recorded. Additionally, the sponsor must notify the USACE District Engineer (USACE DE) of any credit transaction.
- iii. A written acceptance of the shift in legal responsibility for providing the compensatory mitigation from the permittee to the sponsor as part of the credit purchase.
- iv. Reporting Protocols; the WB instrument must include timelines and details for reports that address the ledger account (credit activity), monitoring, and financial assurances (showing beginning and ending balances in the sponsor's accounts).

The instrument may be changed by the parties in order to reach an agreement. Once the WB prospectus and the WB instrument are approved, the sponsor is ready to restore, enhance, create or preserve wetlands and to sell credits to permittees.

## **IN-LIEU-FEE (ILF) COMPENSATORY MITIGATION PROGRAM**

### ***Background***

ILF mitigation programs are established between a regulatory agency (i.e., the USACE and, in some cases, a state wetlands program) and a third-party sponsor (i.e., a public agency, such as a state wetlands program, or a nonprofit conservation organization). In ILF programs, a permittee may pay fees to the sponsor in lieu of meeting their mitigation obligations through other means (Wilkinson and Thompson 2006). In contrast with WBs, fees generally are paid ahead of the actual establishment of the mitigation of the wetlands site. However, the transfer of responsibility and maintenance for the site for ILF programs is similar to that for WBs. ILF programs provide permittees with the ability to pay third-party sponsors when project-specific compensatory mitigation is not practical or when there is no WB from which to purchase wetland credits.

ILF programs are similar to WBs in providing consolidated compensatory mitigation for permittees in exchange for a fee. The difference lies mainly in the timing of mitigation projects. A WB project is usually developed (or being developed) before the WB can receive money from permittees, whereas an ILF program is allowed to collect funds before project development has started (Table 2).

TABLE 2: KEY DIFFERENCES IN OPERATION, BENEFITS AND CHALLENGES ASSOCIATED WITH WETLAND BANKS (WB) AND IN-LIEU FEE (ILF) PROGRAMS

	WB	ILF
<b>Operation</b>	<ul style="list-style-type: none"> <li>• Permittees buy credits to comply with the permit requirements from an already established mitigation site.</li> <li>• The WB sponsors provide the needed up-front capital (financial assurances) to start the mitigation project before permittees start paying for credits.</li> <li>• Usually administered by transportation agencies for their own use or by a third party (more common) which can be used by any permittee.</li> <li>• The third parties administering the WB can be state, local or resource agencies, or a private, for-profit venture.</li> <li>• A WB instrument is the long-term action plan of the program and needs to be approved before the operation of the site begins. Additionally, the instrument must specify the financial assurances necessary to conduct and monitor mitigation projects.</li> </ul>	<ul style="list-style-type: none"> <li>• Permittees buy “advance credits,” meaning that the wetland mitigation site has not yet been built.</li> <li>• The program accrues fees paid by permittees and when enough funds have been collected, consolidated mitigation projects are conducted.</li> <li>• Can only be administered by a state or resource agency or by non-governmental organization (non-profit).</li> <li>• The most common entities in charge of administering ILF programs include The Nature Conservancy, state environmental protection agencies, and watershed organizations.</li> <li>• An ILF instrument is the long-term action plan of the program, similar to that of a WB. However, as opposed to a WB instrument, this does not have to give details of the consolidated mitigation site or extensive financial assurances.</li> </ul>
<b>Benefits and Challenges</b>	<ul style="list-style-type: none"> <li>• Reduced amount of risk because the WB site is built before or while impacts are occurring.</li> <li>• Since WB programs require large up-front capital, state agencies often have difficulties obtaining the resources.</li> </ul>	<ul style="list-style-type: none"> <li>• ILF programs have a high risk and lag time between impacts occurring and mitigation because the funds are collected for some time (&lt;3 yrs) before being spent on mitigation projects.</li> <li>• ILF programs provide the opportunity to conduct consolidated mitigation in areas where WB is not available due to high start-up costs.</li> </ul>

Five key areas that distinguish an ILF program from a WB include (USACE, 2008):

1. Up-front planning. Unlike WB programs, ILF programs do not need to secure a site or establish a mitigation project plan in advance of collecting fees.
2. Financial Assurances: The financial requirements are less stringent for ILF programs than for WBs. However, the new mitigation rule (USACE 2008) requires enough financial assurances to ensure mitigation projects are carried out. Financial assurances may not be required if the ILF sponsor has had a successful experience in mitigation projects or if the sponsor provides a “formal, documented commitment from a government agency or public authority.” (USACE 2008)
3. Compensatory ratios: Ratios tend to be higher for ILF programs than for WBs because ILF programs have a lag time and a higher risk than WBs. Therefore, mitigation ratios help balance the higher risk of buying credits from an ILF when compared to a WB program.
4. Credit release schedule: The new mitigation rule (USACE 2008) allows an ILF program to sell a limited amount of credits before establishing a project. These credits are called “advance credits.”
5. Advance Credits: The number of credits an ILF program may sell once its instrument is approved is determined by the USACE with the assistance of the IRT. The number of credits is specified in the instrument and is based on the compensation planning framework, the experience of the sponsor with mitigation projects and the projected financing necessary to begin planning and implementation of ILF projects (ELI 2009). Additionally, it is important to understand that advance credits can be sold as soon as the instrument is approved, and therefore the mitigation site does not have to be secured. Once ILF project milestones are achieved (such as a mitigation site being built), the advance credits become released credits.

### *Key Features*

Key features of an ILF program as presented by ELI (2009) are as follows:

1. ILF program instrument.
2. IRT program review.
3. Service Area: The ILF service area can be described in terms of HUC watersheds or biophysical regions.
4. Compensation planning framework: This framework is included in the ILF instrument.
5. ILF program account: This account is used to keep track of the funds received from permittees and the funds used for mitigation projects.
6. Allocation of advance credits: Advance credits are those credits available for sale before an actual mitigation project has been established by the ILF program.

Several of the key features of an ILF program, identified as 1-4, above are shared with those of WBs.

### *Steps for Implementation*

The procedures involved in the establishment of an ILF program are very similar to those for a WB program. The ILF sponsor is required to submit a prospectus to the USACE (other state and/or federal agencies can also participate) for their review and approval. After the prospectus is approved, an ILF program instrument is developed by the sponsor for USACE review and approval. The following describes the steps needed to establish an ILF program.

#### **1. Prospectus:**

The first step for establishing an ILF program is the development and approval of an ILF prospectus. According to the USACE final rule on mitigation (2008), a prospectus should include the following:

- objectives of the ILF program
- how the program will be established and operated
- proposed service area
- need and technical feasibility
- proposed project site and long-term management strategy
- sponsor qualification: past experience of the sponsor which led to a successful mitigation project

Two additional aspects of an ILF prospectus are different from those required for WB programs (USACE 2008):

1. A compensation planning framework: The planning framework should include the following:
  - service area
  - a description of the threats to aquatic resources in the service area(s)
  - a statement of aquatic resource goals and objectives for each service area
  - a prioritization strategy for selecting and implementing compensatory mitigation activities
  - description of the parties involved in the plan development and implementation
  - long-term protection and management strategies
  - strategy for periodic evaluation and reporting on the progress of the program in achieving the goals and objectives
2. Description of the ILF program account

## 2. ILF Instrument:

Following USACE approval of the consolidated mitigation prospectus, the sponsor's next step is to create an ILF instrument. The instrument should be based on the approved prospectus with the addition of more detailed information. The following are several important provisions that should be included in the final ILF instrument (USACE 2008):

- description of the proposed geographic service area of the mitigation bank
- accounting procedures
- a provision stating that legal responsibility for providing the compensatory mitigation lies with the sponsor once the permittee secures credits from the sponsor
- reporting protocols

ILF programs have the following additional aspects that must be specified in the instrument:

- the compensation planning framework as explained in the prospectus
- specification of the initial allocation of advance credits, and a draft fee schedule for these credits"
- a methodology for determining future project-specific credits and fees
- a description of the ILF program account

## BENEFITS

In general, consolidated compensatory EMAs present many advantages that project-specific PRMs lack (GAO 2000, TRB 2002).

1. Compensatory mitigation options allow for economies of scale because many small impacts can be consolidated into one site, reducing the cost of maintenance and initial set-up costs (planning) as this only requires one team of experts to develop a single consolidated mitigation site. For example, in many cases, PRM projects lack the technical expertise of scientists for guidance to restore, enhance, create or preserve wetlands. This is partly because the permittee may not have the sufficient resources to hire experts, something more prevalent in WB and ILF mitigation (TRB 2002).
2. Another positive aspect of consolidated compensatory EMA programs is decreased time required for government oversight required to evaluate the performance of the restored, enhanced, created or preserved wetlands at one site as compared to smaller individual sites with project-specific PRM. The success of 200 different wetland mitigation sites is more difficult to evaluate and maintain than that of a few, larger consolidated sites. For example, quantifying site hydrology, species diversity and specific impacts is difficult even for a single site. The complexity regarding each site is only exacerbated when dealing with many individual smaller sites.

3. Having a readily-available mitigation option can potentially minimize costly delays in construction. If it is agreed that it is impractical to remediate through PRM, a permittee has an option to purchase credits from a WB or ILF program for off-site mitigation at a cost commensurate with PRM. In doing so, the permittee satisfies their legal responsibility to remediate impacts in an efficient manner while allowing construction to move forward without delay caused by resolution of PRM issues.

### ***Specific Benefits to WB programs:***

The new mitigation rule (USACE 2008) expresses the administrative preference for establishing WBs as a wetland mitigation practice. This decision was based on many factors. However, the primary basis for the decision is that WB programs are already established during or prior to the occurrence of the impacts. This is advantageous in comparison to PRM and ILF programs, which are usually performed after impacts have occurred, creating a lag time between impact and mitigation. Also, in cases where a WB has been operating effectively for an extended period, the remediation has an increased chance of success.

Additional key benefits of a WB program as compared to mitigating on an individual project basis as described by EPA (1995) are as follows:

- A WB may enhance the integrity of the aquatic ecosystem by consolidating compensatory mitigation into a single large parcel or contiguous parcels when ecologically appropriate.
- The establishment of a WB can bring together financial resources, planning and scientific expertise that is not practicable in many PRM proposals. This consolidation of resources can increase the potential for the establishment and long-term management of successful mitigation that maximizes opportunities for contributing to biodiversity and/or watershed function.
- The use of compensatory mitigation may reduce permit processing times and provide more cost-effective compensatory mitigation opportunities for qualified projects.
- Consolidation of compensatory mitigation within a WB increases the efficiency of limited agency resources in the review and compliance monitoring of mitigation projects, and thus improves the reliability of efforts to restore, create or enhance wetlands for mitigation purposes.
- The existence of mitigation banks can contribute towards attainment of the goal of no overall net loss of the nation's wetlands by providing opportunities to compensate for authorized impacts when mitigation might not otherwise be appropriate or practicable.

### ***Specific Benefits to ILF Programs:***

ILF programs have benefits that are similar to those associated with a WB program, as well as some additional key benefits that are specific to ILF programs (GAO 2001).

### **ILF PROGRAM BENEFITS SIMILAR TO WB PROGRAM BENEFITS**

- ILF programs may enhance the integrity of the aquatic ecosystem by consolidating compensatory mitigation into a single large parcel or contiguous parcels when ecologically appropriate.
- The establishment of an ILF can bring together planning and scientific expertise that is not practicable for many project-specific compensatory mitigation proposals. The consolidation of resources can increase the potential for the establishment and long-term management of successful mitigation that maximizes opportunities for contributing to biodiversity and/or watershed function.
- The use of compensatory mitigation may reduce permit processing times and provide more cost-effective compensatory mitigation opportunities for qualified projects.
- Consolidation in an ILF program increases the efficiency of limited agency resources for the review and compliance monitoring of mitigation projects, and thus improves the reliability of efforts to restore, create or enhance wetlands for mitigation purposes.
- Consolidated mitigation projects by rule are regulated and therefore are monitored by the USACE whereas permittee-responsible mitigation projects often are under state and local jurisdiction.
- The existence of ILF programs can contribute towards attainment of the goal for no overall net loss of the nation's wetlands by providing opportunities to compensate for authorized impacts when mitigation might not otherwise be appropriate or practicable.

### **ADDITIONAL KEY BENEFITS SPECIFIC TO ILF PROGRAMS**

There are some additional benefits of ILF programs as compared to WB programs. According to a study by ELI (2009), some of these benefits include:

- Unlike WB programs, ILF programs are administered mostly by nonprofit organizations and land trusts. Such organizations often have ecological conservation values that will be reflected when establishing mitigation projects. For instance, acquisition of mitigation sites could be prioritized in terms of environmental value. Additionally, such organizations may have access to ecological information about wetlands (e.g., wetlands mapping, historical wetland data, information about parties interested in contributing to the mitigation process), and a disinterested approach (private ventures may be persuaded to find less costly mitigation projects rather than emphasizing the ecological values gained by the mitigation project) when conducting mitigation.
- These organizations also have experience working cooperatively with interagency groups and in managing other such programs.
- ILF programs provide an alternative to compensatory mitigation where WBs are not accessible and/or will not be developed. In the case of Connecticut, for instance, there has been limited interest in developing commercial WBs due to limited projected demand. However, an ILF program established by state agency or a nonprofit organization could provide alternatives to permittee-responsible wetland mitigation.

- An ILF program is a solution that attracts many development and resource agencies because it provides a mechanism to satisfy the permit requirements in order to continue project development, without the up-front costs required by WBs.

## CHALLENGES

Challenges also arise when consolidated EMA are implemented. Some of the challenges associated with consolidated EMA are shared by both WB and ILF programs:

1. The first challenge is in defining the service area; where can the established WB or ILF provide its services? The service area is determined in the prospectus agreement between the WB or ILF sponsor and the governmental agencies involved in the establishment process. Often, the service area of the consolidated program is a cause of disagreement between the parties; this may lead to an unsuccessful attempt to establish the mitigation alternative. The service area is an even greater challenge in Connecticut, where legislation allows municipalities to legislate wetlands mitigation. The jurisdictional layers that characterize Connecticut allow for more disagreement than in states where only state and federal layers exist. Some municipalities welcome development and, therefore, are willing to allow permittees more leeway in dealing with wetland impacts. However, other municipalities will not allow their wetlands to be mitigated for outside of their municipality boundaries. However, the issue of service area selection involves more than just small-scale differences among municipalities. For example, a WB program in Florida has a county-wide service area and has been criticized by other bankers for providing mitigation for impacts outside the drainage basin (USACE 2000). Similarly, environmental groups in Virginia have criticized the large service area of the consolidated mitigation programs in the state. Critics argue that compensating for impacts across watershed boundaries could lead to the failure of securing no-net-loss of wetlands acreage in a certain watershed. However, Illinois, North Carolina and Pennsylvania, among others, have established program service areas within 8-digit HUC watersheds and/or other regional watersheds. Conversely, Maine has defined their service area according to biophysical regions, basing separation on general habitat rather than specific watersheds.
2. The next challenge is related to the credit release schedule; when is the bank able to sell credits? It is widely thought that a WB sells credits after the bank is established. However, some mitigation banks are allowed to sell a portion of their credits even if the WB project has not been completed. Some states have passed regulations to limit the amount of credits to be sold prior to project completion. For instance, some WBs in Florida allow 15% of the bank's credit to be sold prior to construction while some WBs in Maryland and Washington allow for the release of 50% of credits after the construction of the WB and before the quality of the site is assessed (TRB 2002). As explained above, ILF programs are allowed to sell "advance credits" which are determined in the ILF instrument by the USACE DE. Since the number of advance credits is determined based on the mitigation experience of the sponsor, it is critical to find an agency or non-profit organization with mitigation experience to administer the program. The same applies to WB programs because their credit release schedule also is determined by the experience of the sponsor. For instance, a sponsor with a strong background in mitigation practices could have more credits released for sale early in

the project development than a sponsor with little experience, who will likely have less credits released for sale early in the project development. The credit release schedule is one the most important differences between a WB and an ILF program. An ILF program has the advantage of receiving fees in exchange for advance credits before a site has been secured. A WB program must have secured a WB site before selling credits. The latter is disadvantageous for regions that need an EMA but do not have the necessary up-front capital to start mitigation projects.

3. The credit ratio is another aspect of compensatory mitigation that varies between states. Some states have implemented higher mitigation ratios (e.g., 3:1 versus 1:1) when compensating via out-of-kind mitigation. For example, mitigation credit ratios in Washington differ depending on the types of mitigation alternatives, following the preference of mitigation. Restoration, creation, enhancement, and preservation have required ratios of up to 2:1, 5:1, 6:1 and 20:1, respectively. Establishing such ratios makes it more costly for developers to buy credits from WBs or pay fees to the ILF program. More often than not developers will have to pay for high mitigation ratios, particularly when impacted wetlands are not mitigated for in-kind. Moreover, ILF programs often have higher mitigation ratios than WB programs to account for the lag time between impacts and mitigation. Ratios also vary by region and state, with the ratio established by the regulating agency.
4. Monitoring requirements, specifically the length of time that the wetland needs to be monitored for ecological performance. The final mitigation rule (USACE 2008) states that mitigation projects must be monitored for at least 5 years. However, the length of the monitoring period generally depends on the individual mitigation project, and the time period can be modified by the USACE DE if deemed to be necessary. Monitoring reports should identify the progress of the mitigation site and should be submitted to the USACE DE. However, these requirements differ by state and sometimes by projects within a state. For example, Pennsylvania (PennDOT) WB projects are required to monitor sites until all credits have been sold, whereas Washington (WSDOT) monitors sites at 10-year intervals for 30 years after the performance standards are met. Many states require that banking entities transfer the responsibility of wetlands supervision to conservation organizations or land trusts for long-term management to ensure that WBs are not degraded after the monitoring phase is completed (TRB 2002). Such action must first be approved by the USACE DE. Regardless of requirements, many government organizations have determined that monitoring and reporting has been a shortfall of many mitigation projects, including both PRM and EMA (Harvey and Josselyn 1986; TRB 2002; NRC 2001).
5. State regulatory structures represent a major roadblock when establishing consolidated mitigation alternatives. The different legal structures in each state influence how likely it is that a program will be established. In Massachusetts and Connecticut, towns have authority over their wetland mitigation and no apparent interest in letting the wetlands migrate from their town boundaries into consolidated mitigation sites. Since the amount of wetlands impacted by state agencies (<5% of total statewide impacts) generally is not sufficient to attract investors to establish a commercial WB, as is the case in Connecticut, establishing a commercial WB without the involvement of municipalities would be a difficult task. In other words, the only defined client would be state agencies, primarily the state's transportation agency, or private applicants, who cannot provide adequate PRM acceptable to the USACE. On the contrary, states that provide for little local

authority over wetlands, such as Florida (Reiss et al. 2009) and Illinois (BenDor and Brozovic 2007), have been successful in fostering commercial WBs and other types of consolidated EMA because permittees of both private and state projects that impact wetlands are allowed to buy credits from such programs. Thus, the pool of potential clients for mitigation alternatives is larger.

6. In states where local regulation exists, private entities must accommodate local authority regarding compensatory mitigation of watercourses. It has been demonstrated that a multi-layered regulatory structure affects consolidated mitigation decision-making (BenDor and Brozovic 2007). However, this does not prevent WB and ILF programs from being effective, although limited by the political boundaries established for a particular state. In Connecticut, the local authority rests with town IWCs. While the regulations do not specifically prevent off-site compensatory mitigation following the fulfillment of all necessary avoidance, minimization and on-site mitigation steps, the Connecticut Supreme Court has interpreted the “spirit” of the law to specify that towns must carry out mitigation in lieu of a third party. Expert personal opinion with regard to the Supreme Court cases implies that the need for town-directed mitigation precludes Connecticut from implementing ILF programs for private impacts unless an amendment to the IWWA is adopted by the General Assembly.
7. A cooperative spirit among local, state and federal agencies helps increase the probabilities of establishing mitigation alternatives. This is also referred to as “integrated planning.” According to an interagency study, the following are some of its challenges (FHWA 2006):
  - a. Conflicting priorities and scales among agencies. For instance, the goal of a state environmental protection agency is to implement an ecological approach to wetland mitigation, where the restoration, enhancement, creation or preservation carried out by the permittee or the consolidated mitigation project helps retain the ecological values lost when impacts have occurred. On the other hand, the priority of a state transportation agency is to carry out development projects, such as highways and bridges, in a cost-effective, timely manner. Therefore, it is in the best interest of a transportation agency to minimize the time consumed in waiting for state environmental protection agency permits allowing them to impact wetlands in order to continue their work.
  - b. Inconsistent terminology and incompatible data and performance measures across agencies.
  - c. Conflicting geographic, ecological, and political boundaries, which are critical in defining the service area of a consolidated mitigation program.
  - d. Lack of plans or plans with differing levels of detail.
  - e. Long-term involvement.
  - f. Lack of trust among agencies

Some of the key challenges specific to ILF and WB programs are addressed as follows.

### *WB Challenges*

The primary challenge specific to establishing a WB is the need for upfront capital to start a mitigation project. This means that the WB sponsor must have sufficient funds to buy the necessary land (unless they already own it) to cover the mitigation expenses, to monitor the site and to manage the program. Therefore, WB programs are mostly undertaken by commercial bankers who have the capital needed to establish the bank. State WBs are often financed with state or federal funds, but are less common than their commercial counterparts. Both of these options have significant hurdles to overcome. The establishment of a WB as an investment is challenging in states that have little impacts to wetlands, like Connecticut and other New England states, because investors are not able to cover setup and operational costs within a practical timeframe. The challenge in establishing state-run WBs involves the issue of how to access the funds necessary to purchase, establish and manage the site.

### *ILF Challenges*

ILF programs also have their specific challenges (USACE 2000):

1. The lag time from when the funds are first released for establishing an ILF project and for site development can amount to delays of one year or more between impact and mitigation.
2. Given the delay in establishing actual ILF sites, a successful program must have a financial structure in place ahead of time to demonstrate how funds will be handled. An effective accounting structure is critical in ensuring the establishment of successful mitigation sites. Yet, given the speculation of future costs, calculation of appropriate fees relative to the ecosystem services that will be provided is difficult.
3. The purchase of mitigation credits prior to actual construction of a mitigation project increases the uncertainty that in-kind mitigation will occur. The specific ecological functions and needs impacted may not be available to be restored, enhanced, created or preserved within the service area, particularly for specific habitats.

### III: RESEARCH METHODOLOGY

The purpose of this study is to investigate different approaches used by other states to compensate for state transportation agency impacts on wetlands and to recommend whether Connecticut should pursue establishing an EMA program. Connecticut currently requires compensation for these impacts to be accomplished through PRM. Third-party, compensatory mitigation options (mitigation banking and in-lieu fee programs) are not currently being implemented.

A survey (Section IV) based on a literature review and study committee comments was developed to obtain information on how other states have addressed the issue of implementing alternative mitigation options. The survey was sent to governmental institutions (state transportation agencies and state environmental protection agencies, and federal FHWA, EPA and USACE-New England (USACE-NE) District offices) and included questions regarding policy (permitting, impacted acreage, etc.), administration and design of WB or ILF wetland projects (e.g., economics, limitations, etc.). Another survey was developed to determine the interest of local regional groups in participating in WB or ILF programs. This survey was implemented to better understand the dynamics of Connecticut, and whether municipalities would be amenable to participating in consolidated EMA programs. A third survey was developed to reach out to those mitigation banking organizations that have demonstrated an interest in developing mitigation banks in Connecticut. The main purpose of this survey was to identify the issues that have impeded the development of a mitigation bank within the state.

The agencies provided important feedback and identified issues and concerns when mitigating for unavoidable impacts. A follow-up phone conference with USACE-NE (Ladd 2010) provided additional information regarding compensatory mitigation programs recently established in New Hampshire and Maine.

The findings of the surveys, along with other information gathered through the literature review, were used by the project management team and the study committee to develop recommendations for ConnDOT's consideration (Section V) for implementing an alternative approach to compensating for the impacts to wetlands of transportation projects.



## IV: SURVEY RESULTS

A total of 15 states were contacted to participate in the survey: Florida, Illinois, Maine, Massachusetts, New Hampshire, New Jersey, New York State, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, Wisconsin and Washington. In each state, transportation agencies and environmental protection agencies were polled. Additionally, the survey was distributed to the New England EPA and USACE-NE district offices. A total of 14 surveys were completed, 1 having been completed by the USACE. Two different representatives of Ohio DOT responded to the survey. In many cases the responses were identical and were counted only once, yielding a total of 12 surveys from state agencies. In some states, both the state transportation agency and the state environmental protection agency responded to the survey. The 12 responses represent 9 of the 15 states (60%) contacted, and include 4 state environmental protection agencies, 7 state transportation agencies, and 1 FHWA district office (Table 1).

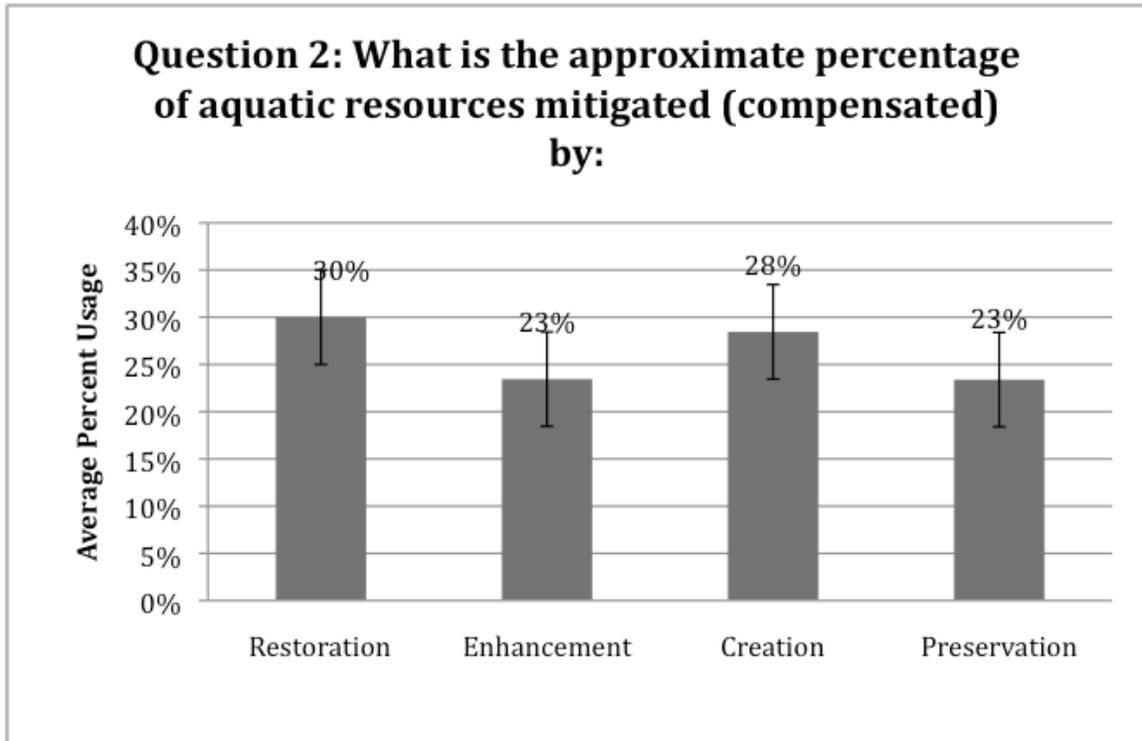
**TABLE 1: STATE AND AGENCIES COMPLETING THE ENVIRONMENTAL MITIGATION ALTERNATIVES SURVEY (QUESTION 1)**

STATES	STATE TRANSPORTATION AGENCY	STATE ENVIRONMENTAL PROTECTION AGENCY	FHWA
Florida	X	X	
Illinois	X		
Massachusetts	X		
New Hampshire		X	
New York	X	X	
Ohio	X		X
Vermont	X		
Washington	X		
Wisconsin		X	

The survey included a total of 28 questions. Some responses were determined to be of greatest importance to this study and are addressed and analyzed in this section. Remaining responses are summarized in Appendix A.

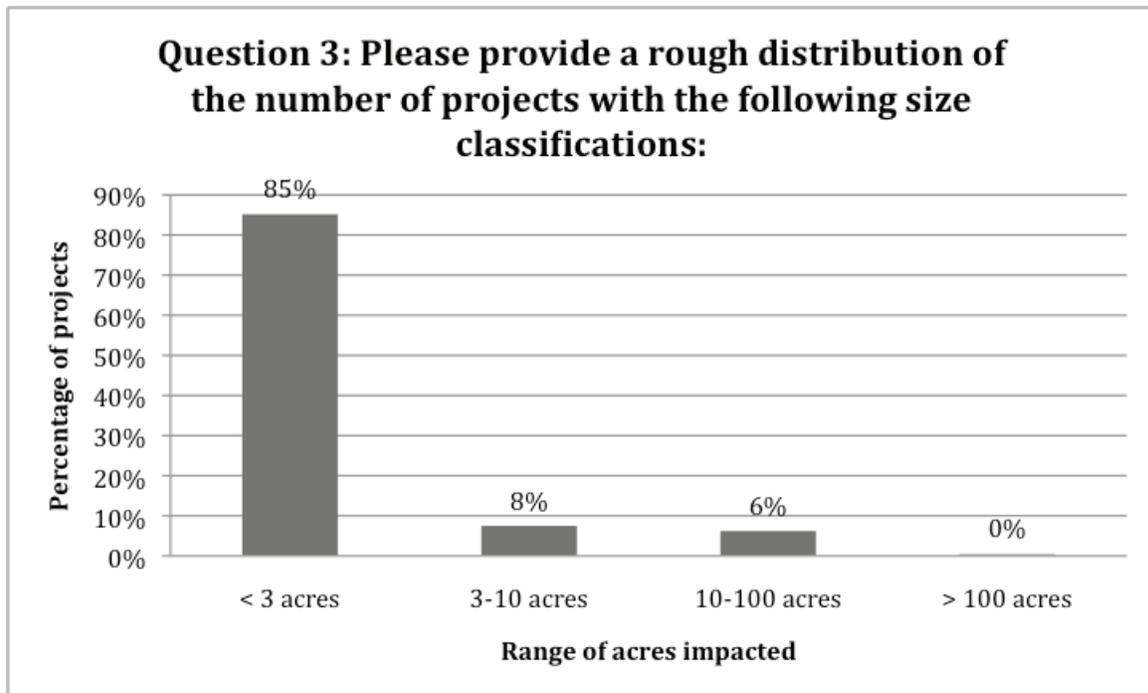
Responders were asked to identify the approximate amount (in percentage) of mitigation performed by each of the four types of remediation available (Figure 6). The CWA identifies a priority sequence, restoration being the most desirable, followed by enhancement, creation, and

preservation. The survey results follow the legal structure because on average, the states that responded to the survey used restoration most often.



**FIGURE 6: AVERAGE PERCENTAGE USAGE OF DIFFERENT TYPES OF COMPENSATORY MITIGATION BASED ON THE SURVEY RESULTS**

Figure 7 summarizes the size classification of remediation projects. Responders were asked to approximate the percentage of projects that impact the following sizes of wetlands: less than three acres, between three and 10 acres, between 10 and 100 acres and more than 100 acres. An overwhelming majority (85%) of the projects impact less than three acres of wetlands.

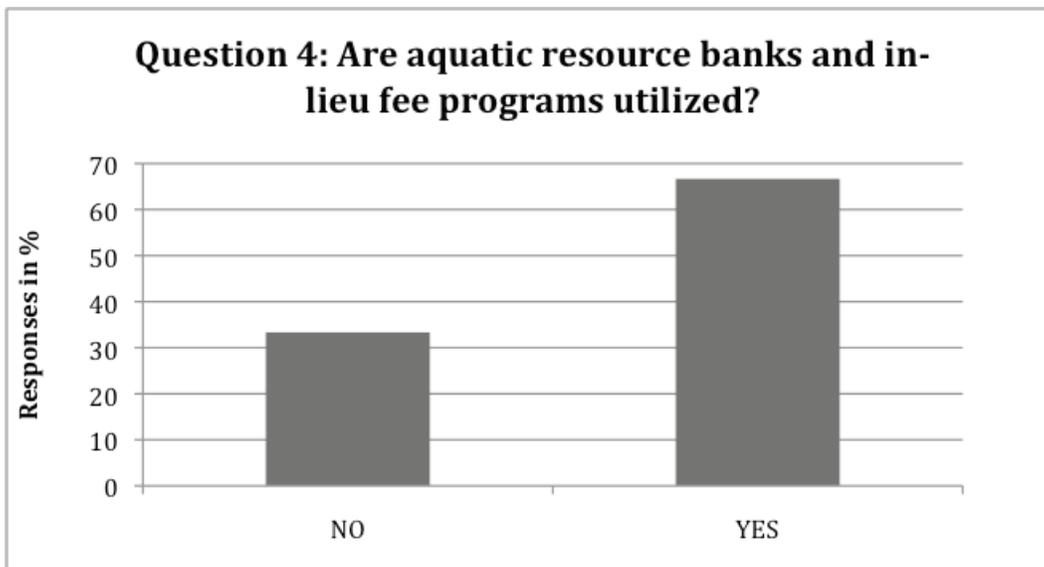


**FIGURE 7: PERCENTAGE OF PROJECTS THAT IMPACT DIFFERENT ACREAGE CRITERIA BASED ON THE SURVEY RESULTS**

The survey also asked agencies to describe their state’s mitigation programs. Some states addressed the different methods used to mitigate for wetland impacts, including consolidated EMA. New Hampshire and Maine (answered by USACE-NE) reported that their states recently established ILF programs. Illinois and Wisconsin reported the use of transportation agency WBs. The Illinois survey response was provided by the Illinois Department of Transportation (IDOT). Their response only addressed the IDOT WB. However, as reported in the case studies (below), Illinois makes use of commercial and transportation agency WBs as well as ILF programs. Florida reported the use of both ILF and WB programs and this is corroborated in the case study. Washington also reported the use of both WB and ILF programs. New York State and Vermont reported they do not have a consolidated mitigation program, although Vermont reported that it is in the initial discussions for the development of an ILF program. Additionally, USACE-NE also reported that Vermont is in the initial stages of establishing an ILF program with the nonprofit organization, Ducks Unlimited, as the sponsor.

Figure 8 shows that 66.6% of the states surveyed reported that they have established consolidated mitigation programs such as a WB or ILF program. In addition, some of the agencies commented on the details of their programs. Ohio DOT (ODOT), for instance, reported that they developed a transportation agency WB exclusively for their own use. This means that credits are sold only to ODOT and not to other permittees such as private developers. Florida’s agencies reported that any type of permittee (private developer, state agency) is allowed to buy credits from any of the consolidated mitigation programs (WB and/or ILF). The ILF programs established in New Hampshire and Maine may sell credits to any type of permittee (state or private). In order for the permittees to be able to buy credits from these ILF programs, they must have impacted more than 10,000 square feet (0.23 acres) and 15,000 square feet (0.34

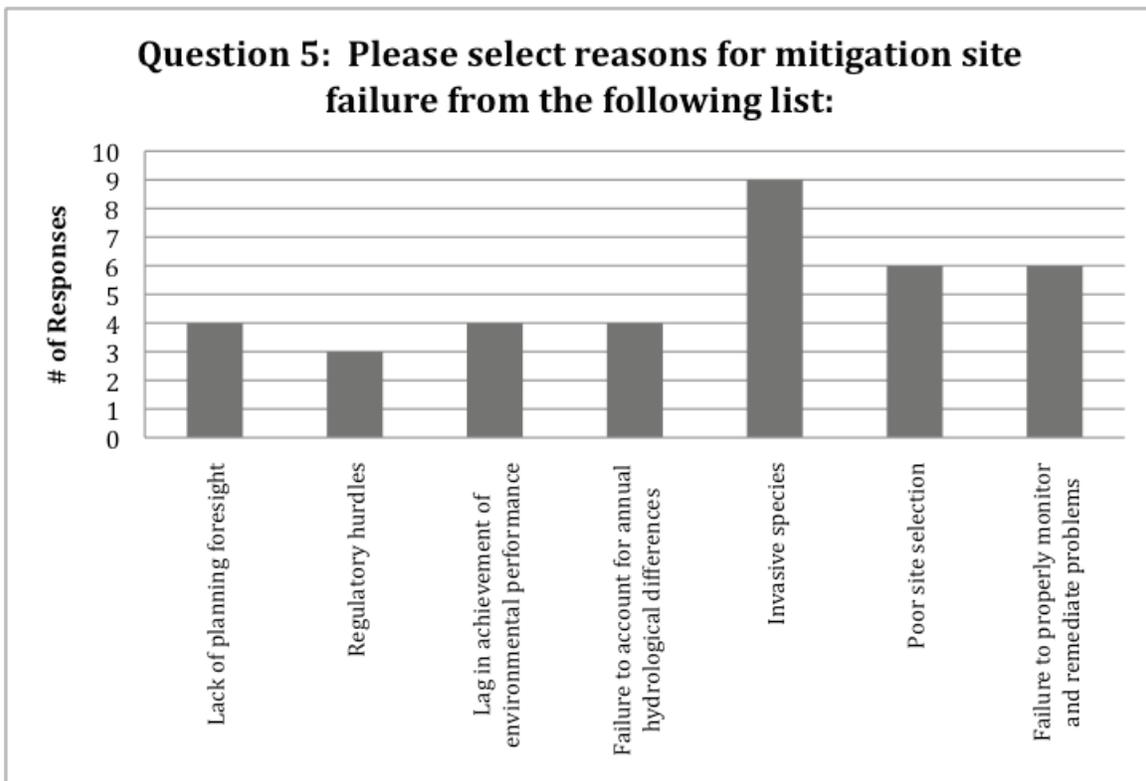
acres), respectively. In Washington, any permittee within the service area is able to make use of the consolidated mitigation programs. IDOT is the sponsor of several WB programs for transportation projects. However, in northeast Illinois, IDOT also buys credits from commercial WB programs.



**FIGURE 8: PERCENTAGE OF RESPONSES FROM NINE STATES REGARDING THE USE OF CONSOLIDATED MITIGATION ALTERNATIVES**

States were asked to identify some of the roadblocks associated with consolidated mitigation programs. Many of the responses to this question reflect the challenges associated with consolidated EMA programs addressed in Section II of this report. New York State identified the greatest roadblock as the difficulty of achieving multi-agency agreement when making decisions of service area, mitigation ratios and long-term maintenance of a consolidated EMA program. Similarly, Vermont and Florida identified the service area as a major roadblock; Vermont added that the lack of availability of land for mitigation purposes may be an issue. The lack of harmony across state and federal regulations as a potential roadblock was identified by the Massachusetts DOT. According to the USACE-NE, and corroborating the information included in the background section of this report, Connecticut and Massachusetts share a major challenge: compensatory EMA projects can only be carried out in the towns where the impacts occurred. In general, the establishment of a consolidated EMA program is not an easy task; it involves negotiations among many parties with different priorities, legislation challenges (e.g., local jurisdiction over wetlands), and a thorough analysis of the service area, mitigation ratios and project maintenance.

Additionally, Figure 9 shows some of the challenges and roadblocks associated with establishing a consolidated mitigation project. The question asked responders to identify some of the reasons for mitigation site failure. The responses show that invasive species, poor site selection and lack of monitoring are the most important factors in determining site failure. However, lack of planning, regulatory hurdles, time lag, and lack of hydrological considerations were also considered to be important reasons for mitigation site failure.

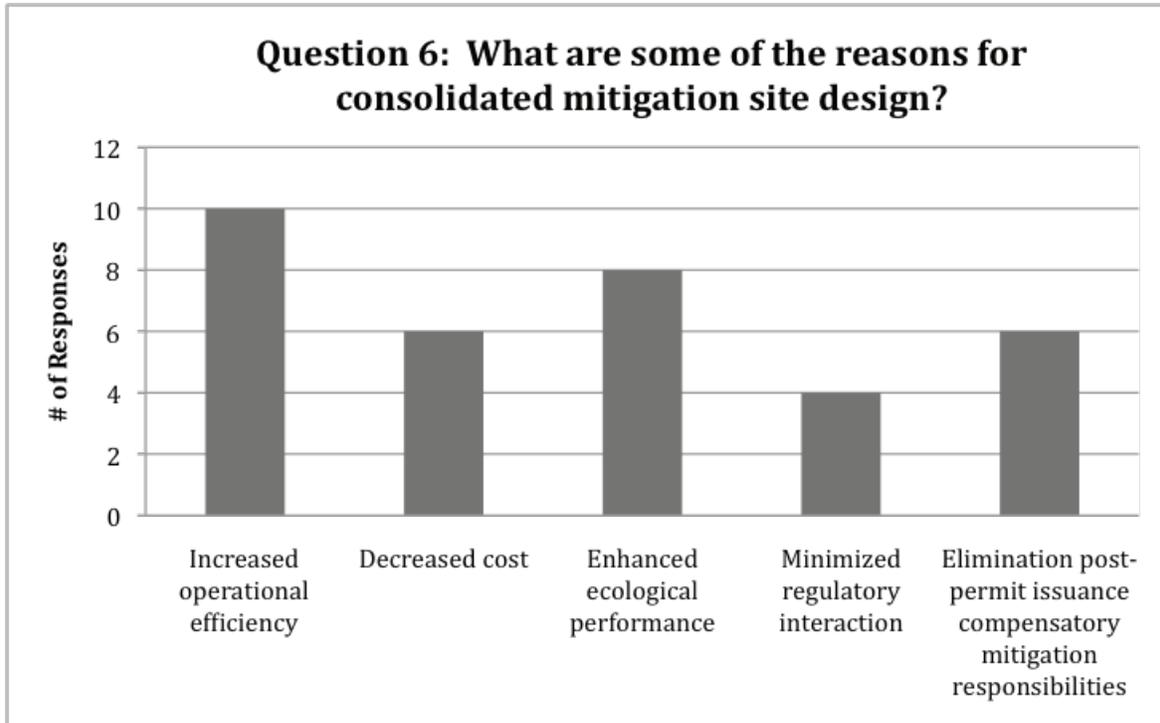


**FIGURE 9:** NUMBER OF RESPONSES FOR EACH OF THE REASONS FOR MITIGATION SITE FAILURE

One additional question was included in the survey regarding mitigation challenges. The question asked responders to list some of the reasons for mitigation program failure; among these, the disconnect between the goals of the sponsor and the regulatory agencies, the lack of large land parcel availability, and site selection were listed most often. Once again, these responses reflect the challenges described in the background section of this report, further identifying the need for solutions that address these issues. Federal reports (GAO 2000, TRB 2001, FHWA 2006) describe the need for cooperation among agencies to achieve better mitigation projects. Two questions regarding cooperation among agencies were included in the survey. One question asked responders to explain how the agencies involved in mitigation projects worked together. The responses varied, with some states having established oversight committees or interagency committees that meet regularly to discuss the direction of the program. Other states suggested their agencies do not often work cooperatively because of their disagreement on mitigation measures. This question was followed up with an additional five-question email survey to solicit more specific information regarding cooperation among agencies. One of the questions asked responders to rate the level of cooperativeness in a scale of 0 to 10, where 10 is excellent cooperation. The results showed a diverse set of responses, ranging from 9 (Florida DOT) to 5 (IDOT) with an average of 7. Another question asked if there were any established (written) guidance to handle wetland mitigation decision-making between a state’s transportation agency and its state environmental protection agency. Only Ohio DOT and Florida DOT (with their Uniform Mitigation Assessment Method, UMAM) responded “yes.” However, when asked if having written guidance to handle wetland mitigation decision-

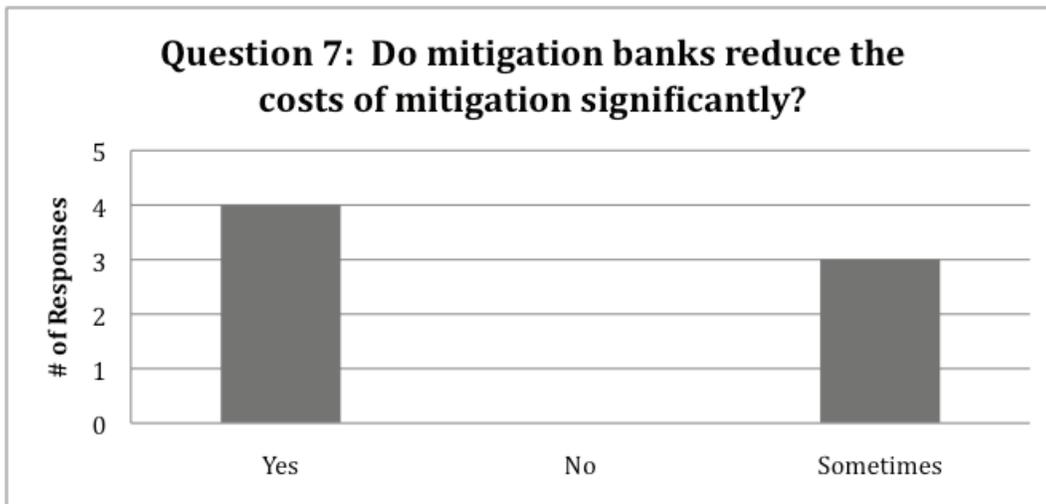
making helped to develop more harmonious cooperation, all five responses were “yes.” Additionally, it was expressed that written guidance establishes an overall framework, provides consistency and predictability for the applicants, and helps solve differences of opinion.

The survey also addressed the potential advantages of consolidated EMA programs. States were asked to list some of the motivations for establishing a consolidated EMA site. As expressed in the benefits of consolidated wetland EMA in the background section of this report, the responses suggested that consolidated EMA sites have an increased operational efficiency, enhanced ecological performance, and decreased cost (Figure 10).



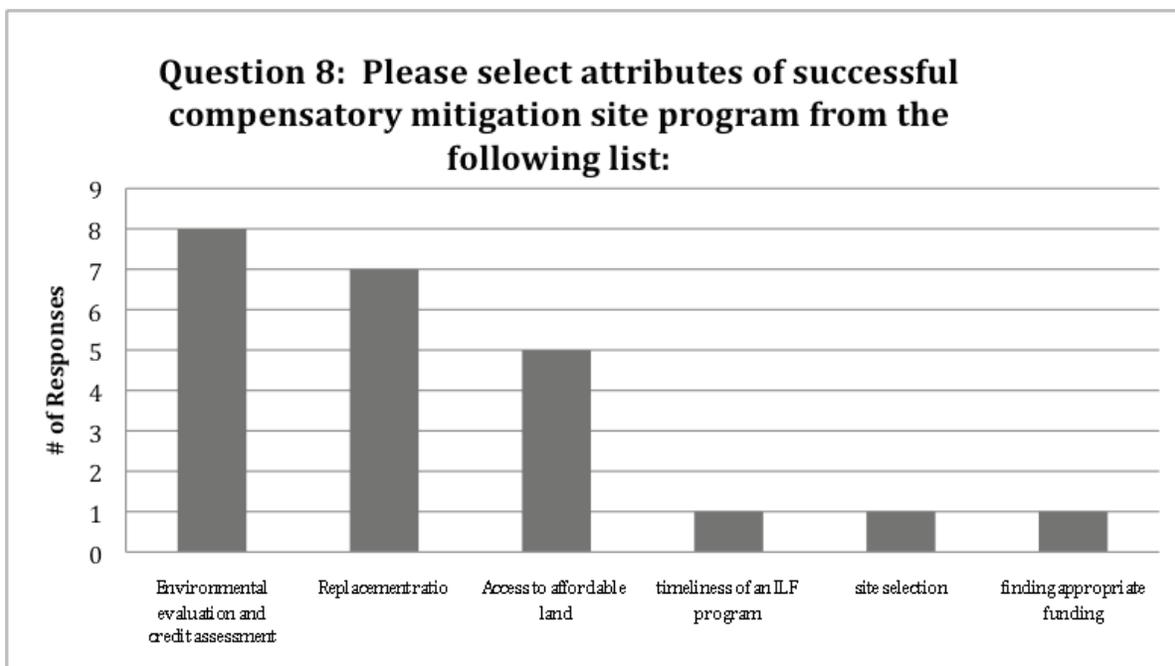
**FIGURE 10:** MOTIVATIONS FOR ESTABLISHING A CONSOLIDATED MITIGATION SITE OR PROJECT

The question of whether consolidated EMA programs have reduced costs when compared to PRM has been widely discussed. In fact, federal guidance and reports (GAO 2000, TRB 2001) have expressed the view that consolidated EMA programs are less costly to run than individual projects. Economies of scale help alleviate some of the costs by using shared resources (e.g., scientific expertise, monitoring equipment, etc.) that could otherwise be very costly. Figure 11 demonstrates that most of the agencies that responded to this question agree that consolidated EMA programs (WB in this case) help reduce the costs of mitigation significantly. Some other responses implied that this is true in certain circumstances. For instance, some state agencies expressed that a WB can reduce mitigation costs depending on adequate site selection and project management. The USACE-NE responded that consolidated mitigation should cost the same as a PRM project to the permittee. However, the costs to the sponsor are usually lower than for a PRM project as economies of scale are introduced.



**FIGURE 11:** RESPONSES TO THE QUESTION OF WHETHER WBs REDUCE MITIGATION COSTS

Respondents also were asked to list some of the attributes of a successful compensatory EMA program (Figure 12). Three main attributes include environmental evaluation and credit assessment, mitigation (replacement) ratios, and access to affordable land. Additionally, timeliness of an ILF program, successful site selection and availability of funding were listed by a state agency as attributes of successful programs.



**FIGURE 12:** ATTRIBUTES FOR A SUCCESSFUL COMPENSATORY MITIGATION PROGRAM

The final part of the survey focused on the financial aspects of setting up a consolidated EMA program. Establishing a WB requires up-front capital, while an ILF program, although to smaller scale, also requires some up-front capital to pay staff to initiate the establishment of a program. No matter which program is utilized, there needs to be an initial financial commitment from a state agency, private entity or nonprofit organization to at least cover staffing expenses.

Most agencies were not aware of the average project cost percentage budgeted for compensatory mitigation, although some responded with a figure between 5% and 10%. States were more aware of the financing mechanisms for consolidated EMA projects. The responses reflected the different methods for financial assistance for consolidated EMA programs used by different states. In states where commercial WBs are popular, private investors provide the up-front capital needed to establish a WB program. In Illinois, Ohio, and Florida for instance, responses demonstrated that WBs are mostly a private commercial venture. IDOT also reported utilizing the “roadway fund” for the establishment of wetland mitigation WB sites. Additionally, IDOT reported that monitoring is performed under a statewide contract with the Illinois Natural History Survey (INHS) and Illinois State Geological Service (ISGS). In-house expertise is used in the selection, planning, design and construction supervision of WB sites as well as PRM sites. Washington DOT reported using a statewide WB site fund to finance consolidated EMA projects in addition to individual transportation projects that buy the credits from the WBs.

## CONNECTICUT REGIONAL PLANNING AGENCIES SURVEY

A second survey was distributed to the 15 Regional Planning Agencies (RPAs) in Connecticut. This survey was intended to obtain feedback from the RPAs with respect to consolidated wetland mitigation. Only two out of 15 RPAs responded to the survey: the Central Connecticut RPA (CCRPA) and the South Western RPA (SWRPA). The lack of response suggests that either RPAs are not aware of compensatory EMA or that compensatory EMA are not a priority. The CCRPA represents seven municipalities and the SWRPA represents eight municipalities. The SWRPA is a key region because it is highly populated and land is more costly than in the rest of the state, making wetland mitigation very costly. Some of the highlights of the survey include the following:

1. CCRPA expressed a large disconnect between municipalities, and that municipalities lack knowledge about the different EMA and their advantages.
2. SWRPA stated that there is a stronger connection among the municipalities in this region and some willingness (estimated to be 40% to 50%) to establish EMA.

### *Third Party Groups Survey*

An additional brief survey was distributed to four third-party groups who have demonstrated an interest in developing consolidated EMA projects in Connecticut. Two out of the four responded to the brief survey: The Nature Conservancy Group (TNC) and the Virginia-based Watershed Strategies, LLC (WS). Some of the highlights of the survey are the following:

1. TNC and WS expressed that they could consider designing, developing and/or managing a consolidated EMA program in Connecticut.

2. TNC considers the cost of running a program, given the small amount of acreage requiring mitigation, to be a major roadblock in Connecticut. WS considers the lack of availability of land with degraded wetlands/stream systems that could be mitigated to be a major roadblock in establishing EMA.

## EXAMPLES OF STATE MITIGATION PROGRAMS

Individual states have developed specific EMA. The following summary of specific examples of individual states will elucidate the key features, processes of implementation, benefits and challenges that come with compensating for unavoidable impacts in other states and how challenges have been, or are being, addressed. Furthermore, this review provides an understanding of the regulatory system in different states as well as the EMA being implemented by state transportation agencies (TRB 2002).

### *Maine*

Maine had one of the highest mitigation costs in the country at about \$150,000 an acre (in 2001). To attempt to lessen mitigation costs, Maine passed legislation allowing and supporting WBs. However, no commercial or transportation agency WB has been developed, mostly due to a lack of interagency agreement. In response to this roadblock, a study recommended that improving methods of cost accounting for mitigation, better forecasting of mitigation needs, a pursuit of unconventional transportation agency banking, and the development of a fee-based compensatory mitigation program based on watershed management initiatives may facilitate alternative mitigation practices (TRB 2002). One key improvement for Maine was Maine DOT's 2-year, 6-year and 20-year planning effort, which forecasts the amount of compensatory wetland mitigation needs. An outcome of the report was the establishment of an ILF program in 2007 as an alternative for wetland mitigation. According to the *Maine In-Lieu Fee Program Annual Report* (2009), from January 2008 to January 2009 (the first year of operation), about \$500,000 in fees were collected from four different biophysical regions (service areas). By January 2010, 19 payments had been made to the fund in seven different biophysical regions totaling about \$2,500,000 in fees collected.

## COMPENSATORY PROGRAMS

As in many other states, permittee-responsible mitigation remains the most common practice in Maine. If wetland mitigation is deemed to be impractical on-site, then an ILF program is available to any private or state permittee.

## MECHANISM AND KEY FEATURES

1. The fees are paid to the Maine DEP for mitigation in the different service areas (biophysical regions) and are calculated based on town land assessment and the estimated cost of wetlands creation for each town where impacts have occurred (Table 3). The ILF program is administered by the Nature Conservancy (TNC). TNC calls for mitigation project proposals to attract different organizations willing to establish a consolidated mitigation project. TNC then evaluates and selects the most promising mitigation proposal(s) and releases the funds to the applicant(s) for mitigation project establishment.

2. Mitigation ratios are applied based on the quality of the wetlands. For instance, a 2:1 ratio is used when mitigating for impacts of more than 20,000 square feet of aquatic vegetation, emergent March vegetation or open water, and coastal wetlands (Maine DEP 2010).
3. The final fee is calculated differently for different types of wetlands. Equation 1 (Maine DEP) is the most commonly used method for calculating ILF mitigation fees:

$$\text{WCF DWI} \times (\text{WCC} + \text{ALV}) \times \text{MR} \quad (1)$$

where,

WCF - wetland compensation fee / sq. ft.

DWI - direct wetland impact / sq. ft.

WCC - wetland creation cost / sq. ft.

ALV - assessed land valuation / sq. ft.

MR - mitigation ratio

4. The mitigation alternative can only be used by the permittee to mitigate for impacts larger than 15,000 sq. ft. unless the USACE requires mitigation when the Maine DEP does not.
5. The service area of the ILF program is determined by the 18 biophysical regions that exist in the state.

County	Wetland Creation/sq. ft.	Assessed Land Value/ sq. ft.	Assessed Coastal Land Value/sq. ft.
Androscoggin	3.28	0.11	N/A
Aroostook	2.74	0.01	N/A
Cumberland	3.28	0.53	1.47
Franklin	2.74	0.03	N/A
Hancock	2.74	0.13	0.22
Kennebec	3.28	0.09	0.13
Knox	3.28	0.26	0.36
Lincoln	3.28	0.23	0.43
Oxford	3.28	0.04	N/A
Penobscot	2.74	0.04	0.24
Piscataquis	2.74	0.02	N/A
Sagadahoc	3.28	0.2	0.27
Somerset	3.28	0.03	N/A
Waldo	3.28	0.06	0.16
Washington	2.74	0.02	0.04
York	3.28	0.37	1.04

TABLE 3: COMPENSATION RATES FOR MAINE ILF PROGRAM (MAINE DEP, 2010)

## **BENEFITS AND CHALLENGES**

The ILF instrument between the Maine DEP, the USACE and TNC expounded on some of the benefits the ILF program is intended to produce:

- Consolidated mitigation projects often provide increased ecosystem functions. The ILF program as expressed in the ILF instrument, is intended to increase the quality of mitigation (restore, enhance, create and preserve) when compared to other traditional forms of compensatory mitigation
- The ILF program provides flexibility to permittees when on-site mitigation is deemed impracticable.
- The competition to acquire funds from the ILF program to conduct mitigation projects helps to increase the likelihood of a successful program. Several projects with different characteristics are proposed and the ILF administrators are able to choose those that are most practical.
- Additionally, the ILF program brought together different agencies to agree on the matter of compensatory wetland mitigation, overcoming one of the toughest challenges (interagency cooperation) when establishing a consolidated mitigation program.
- As the program is in the early stages, challenges will likely arise. However, the toughest challenges have been overcome and the mitigation program has been established. The next challenge will be to create functional projects that provide the benefits that are expected (e.g., increase ecological quality).

## *New Hampshire*

### **COMPENSATORY MITIGATION PROGRAM**

New Hampshire's experience is very similar to that of Maine. The state recently (2007) established an ILF program as a wetland mitigation alternative. To lay the groundwork for the program, the New Hampshire Department of Environmental Services (NH DES) received a \$50K one-year grant that provided funding for staff to establish mitigation ratios, watershed priorities and an ILF instrument. This period allowed NH DES to take critical steps to outline the mechanism for mitigation in advance of program implementation.

### **MECHANISM AND KEY FEATURES**

1. The ILF program is administered by NH DES. Fees are paid into the fund in exchange for credits that the permittees need to satisfy their mitigation responsibilities. Similarly to the Maine ILF program, the New Hampshire program collects and releases funds based on the Hydrological Unit Code 8 (HUC 8) as a measure of watershed boundaries. Fees paid in a designated watershed remain in that watershed account and accrue until a two-year period has been reached, at which time the funds are distributed via an RFP. However, efforts are being made to change the funding release to an unspecified time when the fund has enough resources to conduct a viable mitigation project (Sommer 2010).
2. Before funds are released, there is a call for mitigation project proposals. The proposals

are analyzed and the funds are released to the best proposed mitigation project(s), as in the case of the Maine ILF program.

3. NH DES charges fees based on three values:
  - a. The cost that would have been incurred if a wetland of the same type were constructed with the ratios listed in Table 4, based on a construction price of \$65,000/acre of established wetlands,
  - b. The impacted wetlands acreage multiplied by the cost to purchase land where the impact has occurred.
  - c. An administrative cost of 5% of the added values of (a) and (b), above.
4. In 2009, 14 projects used the ILF program to satisfy permits. These projects impacted a total of 6.234 acres of wetlands generating \$823,243.64 in accrued funds.
5. In April 2009, \$650,000 that was accrued in the Merrimack River Watershed was made available to perform mitigation projects. A call for mitigation projects proposals attracted eight applicants, of which four were selected (NH DES 2010).

Resource Type	Creation	Restoration	Preservation of Upland Buffer
<b>Bog</b>	N/A	2:1	15:1
<b>Tidal Wetlands</b>	3:1	2:1	15:1
<b>Forested</b>	1.5:1	1.5:1	10:1
<b>Undeveloped Tidal Buffer Zone</b>	N/A	2:1	3:1
<b>All other Jurisdictional Areas</b>	1.5:1	1:1	10:1

TABLE 4: NEW HAMPSHIRE MITIGATION RATIO FOR DIFFERENT MITIGATION AND WETLAND TYPES (NH AND USACE 2008)

## BENEFITS AND CHALLENGES

The benefits and challenges of the New Hampshire ILF program are very similar to those given in the Maine case study and referenced in the background section of this report. The main challenge to date associated with the NH ILF program has been the overhead rate required to cover the administration costs. Currently, a 5% overhead rate is charged in addition to the mitigation fee. However, an increase in the fee to 20% is being considered to provide for hiring of an additional staff member to assist with the growing program (Sommer 2010).

It is important to note that New Hampshire is perhaps the state most similar to Connecticut in terms of the amount of impacted wetlands. Permittees bought roughly 6 acres per year worth of credits to offset permit requirements, about half of which were private impacts and the other half state transportation impacts (Sommer 2010). This does not represent a large program when compared to other states where commercial and transportation agency WBs and ILF programs are utilized. However, the program receives sufficient funds to cover operational costs and to

effectively mitigate impacts. The annual 6- acre impacted area compares favorably to annual ConnDOT impacts of 3 acres.

## *Illinois*

### **COMPENSATORY MITIGATION PROGRAMS**

The state of Illinois has several mitigation alternatives in place. WB programs are the most popular and are administered both the by IDOT and by private investors. Moreover, DuPage County established an ILF program in 2000 (Wilkinson 2009). The IDOT has established six WB projects in different watersheds throughout the state. Three large consolidated sites have been built to serve the transportation wetland impacts, in addition to the three IDOT mitigation sites that act as WBs. Private WB programs serve those permittees who are required to offset mitigation losses after avoidance and minimization have been exhausted. In certain regions where DOT WBs have no service area, the IDOT buys credits from such commercial WB programs.

### **MECHANISMS AND KEY FEATURES**

In the vast majority of the state, the IDOT offsets wetland losses through WB projects. Three large projects have been established: the Morris, La Grange and the Sugar Camp Creek sites. These three projects provide services to different biophysical regions that are determined according to the site acreage and watershed location. As shown in Figures 13a and 13b, the service areas of the Morris and the La Grange sites comprise several watersheds; therefore, impacts that occur within the service area may be offset by paying for the mitigation services of the WB site. However, impacts occurring outside the watershed where the site is located must use higher mitigation ratios. For example, impacts outside of the Sugar Camp Creek watershed (Figure 13c) would have a higher mitigation ratio at the Sugar Camp Creek site when buying credits from the WB (IDOT 2010).

A seventh mitigation project is being proposed in Laurence County and a prospectus has been prepared for the future site.

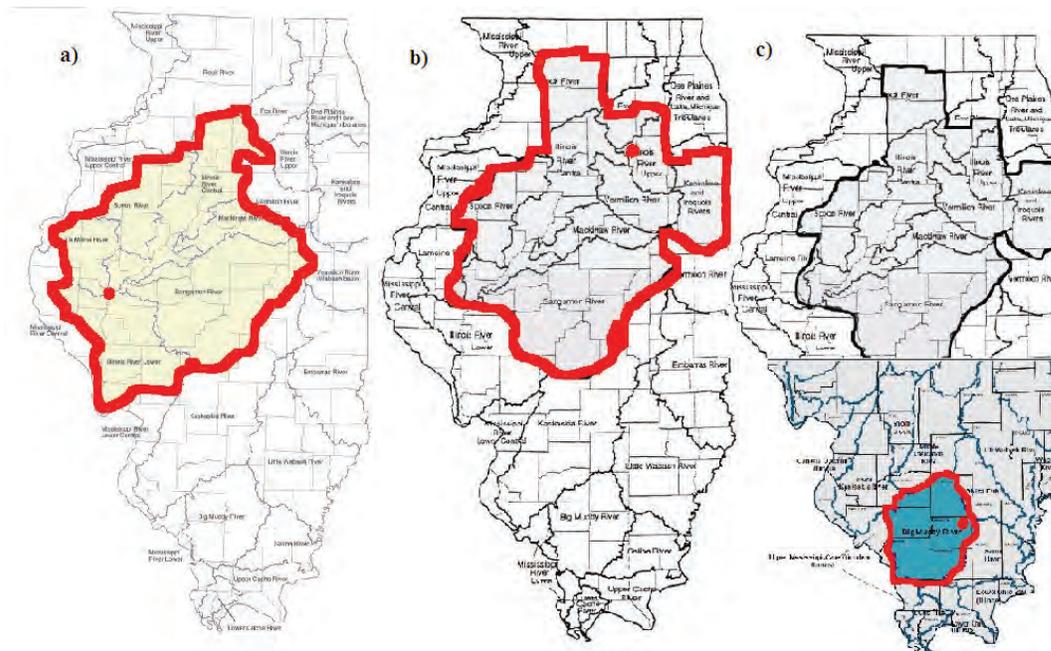


FIGURE 13: THREE DIFFERENT MITIGATION PROJECTS AND THEIR RELATED SERVICE AREAS.  
 A) LA GRANGE SITE B) MORRIS SITE C) SUGAR CAMP SITE (MODIFIED FROM IDOT  
 2002, 2004, 2009)

## BENEFITS AND CHALLENGES

Illinois has enhanced advantages over other states in that two types of consolidated mitigation programs (ILF and WB) are available through the state. WB program services are provided by both IDOT and commercial WBs, so that when an IDOT WB service area is not included where impacts have occurred, a commercial WB may be available for IDOT projects. The flexibility that the IDOT has when choosing compensatory mitigation alternatives is comparable to that of a few states, including Florida.

Compensatory mitigation programs have been demonstrated to be successful in Illinois. However, the major IDOT WBs have very large service areas, and although cross-watershed wetland mitigation results in higher ratios, impacts may be compensated for far from the impacted site. Therefore, choosing the service area seems to be the main issue when establishing consolidated mitigation projects in Illinois.

## Florida

### COMPENSATORY MITIGATION PROGRAMS

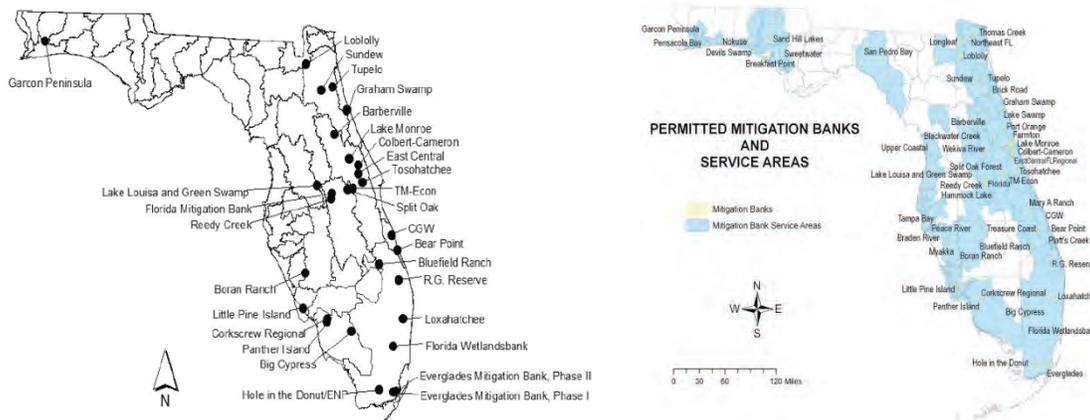
In Florida, on-site PRM was determined to be unsuccessful according to a study conducted by the Florida Department of Environmental Protection (FL DEP). The study found that of 40 PRM required projects, about half were never constructed, mainly because of the minimized oversight of regulatory agencies over the numerous individual projects. Therefore, legislation was adopted to support the development of compensatory mitigation banks. This legislation passed the responsibility of mitigating for transportation project impacts from Florida DOT

(FDOT) to five Water Management Districts (WMD). Mitigation is funded through FDOT projects. In Florida, WBs are a commercial venture and eligible parties may purchase credits in watersheds where WBs are available and which have remaining credits to sell. According to the latest reports (ELI 2010), Florida has 35 WBs and 4 ILF programs approved and functioning.

**MECHANISMS AND KEY FEATURES**

In the case of FDOT transportation projects, where mitigation is required, WMDs locate mitigation projects that better address the functional values lost from roadway project impacts. WMDs have many options from which to choose when selecting appropriate compensatory mitigation (Figure 14). The process is flexible and provides the WMDs the opportunity to choose the most cost-effective mitigation option. After the WMDs select the mitigation alternative appropriate for the transportation impact, the FDOT pays for the cost of mitigation. One important factor to consider is that every May, FDOT must forecast for the following year the amount of wetlands to be impacted in future transportation projects (TRB 2002).

ILF programs that have been established in Florida are referred to as Regional Mitigation Areas (RMAs). These programs differ from the typical ILF programs described in this report in that project sites are identified before credits are sold as compared to being identified after credits are sold.



**FIGURE 14:** A) 29 WB sites are shown. The state is divided into watersheds determined by the Hydrologic Unit Codes (Reiss et al. 2009); B) WB service areas (FL DEP 2010)

**BENEFITS AND CHALLENGES**

One advantage particular to Florida is that FDOT’s priority to develop roads and other transportation projects is not slowed down by permitting issues as in the case of ConnDOT projects (Alexander 2010). Since the WMDs are responsible for searching for mitigation alternatives that are most beneficial for the specific impacted area, the only responsibility FDOT has is to provide the funding needed to purchase the credits. This facilitates transportation project construction by reducing the amount of time being spent in stalemates that often occur between agencies during permitting.

Despite the high success of mitigation options in Florida, some challenges have been created by the introduction of RMAs. The main issue is that WB programs and RMAs compete against each other. Bankers have complained that RMA programs are approved to function as mitigation alternatives with less assurances than WB programs. This has the effect of making RMAs easier to establish and providing them with a competitive advantage as compared to WBs.

### *Louisiana*

One of the first mitigation banks in the United States was created by the Louisiana Department of Transportation and Development (DOTD) in an agreement with the USFWS and the Louisiana Department of Wildlife and Fisheries for only DOTD use. The DOTD bank, developed in the early 80s, was forbidden to sell credits by USACE because of a lack of funding to pay for administration costs. DOTD has not created another mitigation bank since. Reasons cited for this include a lack of DOTD staff to help administer such banks. As of 2001, Louisiana had 55 approved commercial WBs and 21 waiting for approval. According to ELI (2005), Louisiana had 96 WBs, either active, pending or sold out as of 2005. For DOTD, any bank established for their own use would need to be economically competitive with private banks already established (TRB 2002).

### *California*

#### **COMPENSATORY MITIGATION PROGRAMS**

California has the second most mitigation banks of any state in the country. California has established transportation agency and commercial WB programs, as well as several ILF programs.

#### **MECHANISMS AND KEY FEATURES**

State agencies in California have developed a plan that is intended to facilitate interagency collaboration. The concept is modeled after EPA Level 1-2-3, in which three main steps must be taken to ensure a more organized mitigation process. In Level 1, an inventory of wetlands must be performed. Level 2 provides advice on how to measure the environmental conditions of a wetland, with the detailed analysis possible in less than a half day in the field. California Rapid Assessment Methods (CRAM) is a tool that helps provide assessment of the quality of virtually any type of wetlands, including consolidated projects such as WBs. California also provides a user-friendly website ([www.CRAMwetlands.org](http://www.CRAMwetlands.org)) that guides those who need to assess the status of a wetland. Another useful website ([www.wetlandtracker.org](http://www.wetlandtracker.org)) is intended to help locate wetlands for mitigation project planning. Level 3 deals with the standardization of monitoring techniques that can be implemented and are compatible with CRAM. In recent years, California has been working to improve its mitigation alternatives in order to have a more sustainable and organized process. (SCCWRP 2007)

#### **BENEFITS AND CHALLENGES**

There have been studies that confirm that in the early 1990s many WBs were failing to satisfy permit obligations. According to some of the reports, this was due to the lack of a statewide banking policy that guides institutions on how to create and manage successful WBs. There

were some key issues that prevented the California Department of Transportation (Caltrans) from establishing more WBs, with the lack of interagency collaboration key among them. Other issues involve the lack of funds to monitor sites and site selection. More recently, however, Caltrans has started improving relations with other agencies to make the process of mitigation easier. They have established conditions under which they will work with other agencies on transportation and environmental planning, and hold routine interagency meetings to improve relations that will help both parties agree on key issues (TRB 2002).

## *North Carolina*

### **COMPENSATORY MITIGATION PROGRAM**

North Carolina has a very diversified wetland mitigation portfolio. The multiple options that exist include “in house” project-specific mitigation, the Wetland Restoration Program (WRP) and the Full Delivery Program (FDP).

### **MECHANISMS AND KEY FEATURES**

In their “in house” program, the North Carolina Department of Transportation (NCDOT) hires consultants to help identify potential mitigation sites for specific impacts (FHWA 2010). NCDOT’s responsibilities include the planning, design and remaining components necessary for the mitigation of project impacts.

The WRP is essentially an ILF program managed by the NC Department of Natural Resources (NCDNR). However, the program only operates in one-third of the state; with eight different regions (service areas) that are identified by the HUCs. Currently the ILF program charges a fee of \$12,000/acre for non-tidal mitigation and \$125,000/acre for tidal mitigation.

A third mitigation option that was developed by NCDOT, the Full Delivery Program (FDP), provides for NCDOT to pay third-party consulting companies to assist with mitigation efforts. These consulting companies are given the task to locate, develop, and manage good wetland mitigation sites in specific watersheds (TRB 2002). After the consultant has achieved the initial phase of development, the NCDOT assumes responsibility of the site for long-term monitoring. The three mitigation alternatives provide flexibility to the NCDOT, but most of the mitigation funds (80%) are still being used for “in house” project-specific mitigation projects, with only 12% being spent on FDP projects and 8% on the WRP projects.

### **BENEFITS AND CHALLENGES**

NCDOT has developed ingenious ways of performing wetland mitigation. They have developed numerous alternatives that allow for flexibility when selecting a mechanism to mitigate for transportation impacts.

One of the key disadvantages in the North Carolina compensatory mitigation system is linked with the different perceptions of the parties involved in wetland mitigation decision-making, namely, the USACE and NCDOT. The NCDOT believes that increasing the funds that go into the FDP will be beneficial to them because of the time and financial savings involved with such a program.

## *Pennsylvania*

### **COMPENSATORY MITIGATION PROGRAMS**

Pennsylvania also has a diverse wetland mitigation portfolio. Eligible permittees are able to buy credits from ILF programs, and the Pennsylvania DOT (PennDOT) is able to purchase credits for transportation projects from transportation agency WBs.

In an effort to help private landowners, the Pennsylvania Department of Environmental Protection (PA DEP) created the Wetland Creation Fund. This fund was used to charge a compensatory fee that could be affordable, and only for small impacts. Half-an-acre of impact costs \$7,500 and 0.05 acres cost \$500, whereas compensation for impacts less than 0.05 acres are not required (TRB 2002).

### **MECHANISMS AND KEY FEATURES**

PennDOT has a similar situation to Connecticut and some other New England states in that the majority of the impacts on wetlands are small because most of their transportation projects involve work on existing roads, highways and bridges. For instance, in a 2-year period PennDOT only impacted 17.1 acres of wetlands and each of the wetland impacts was particularly small. PennDOT had been working to create a better understanding of consolidated mitigation alternatives, such as WB and ILF, and in the late 1990s established four WBs. The WBs were state-funded and used a local work force, making the sites very affordable at \$3,000 per acre. The initial intent was to extend mitigation WB practices throughout the state. However, issues were encountered when deciding who would assume the long-term management responsibility and negotiations stagnated. More recently, a statewide mitigation banking instrument was developed, and so far one PennDOT site has already been built and is selling credits. Six other sites are under construction; however, none has been reported to be a private venture. The state is also running one ILF program which is operated by PA DEP.

### **BENEFITS AND CHALLENGES**

PennDOT has excellent opportunities for consolidated mitigation alternatives. By forecasting impacts according to a 12-year schedule, PennDOT can plan based on the anticipated impacts of its projected projects. Furthermore, many of the wetland impacts of PennDOT projects are small, which according to the Guidelines for Selecting Compensatory Wetlands Mitigation Options, makes consolidated mitigation alternatives a perfect option for offsetting impacts. This can be related to the case of Connecticut, for which the majority of wetland impacts for ConnDOT projects also are relatively small.

A major roadblock to establishing commercial WBs in Pennsylvania is the fact that the state is limited in the number of large, contiguous tracts of quality wetlands acreage (FHWA 2010). Additionally, interagency disagreement on long-term management of the mitigation sites has caused negotiations to stagnate, halting the progress of wetland mitigation alternatives.

## V: CONCLUSIONS

Wetlands possess important ecosystem and societal functions that were neglected until federal and state legislation was passed to achieve the goal of no-net-loss of wetlands. Federal and state regulations aim to decrease the amount of wetlands lost to development (e.g., roads, bridges, commercial property) and require permittees to first avoid, then minimize and compensate for wetlands lost. Compensation methods include both PRM and EMA. A literature review of EMA practices and a survey of relevant states have demonstrated the benefits and challenges of EMA program establishment. Among the many benefits is one that is of particular interest to ConnDOT: increased efficiency in the mitigation process for the permittee. ConnDOT has expressed interest in EMA due to the increased productivity with decreased construction delays and economy-of-scale use of resources. According to ConnDOT (Alexander 2010) and DEP (Gilmore 2010), determining an appropriate mitigation site for transportation projects impacting wetlands has caused long delays. If sites are not identified and a permit is not issued, construction projects are halted until such sites are determined. To ConnDOT, the delays translate into wasted salaries and costs incurred until the project restarts. To the public, delays mean that transportation upgrades are not being built. To DEP, delays consume personnel resources. EMAs, therefore, are crucial for a more flexible system that does not result in delays due to mitigation issues. Additionally, EMAs offer the opportunity for increased environmental functions and needs associated with larger, more contiguous natural areas.

ILF and WB programs are two of the most common EMAs and are used throughout the United States. The establishment of such programs, however, has been hampered in Connecticut by the inability of the private sector to buy credits (WB) or pay a fee (ILF) due to the multi-layered regulatory structure. Therefore, the only current guarantee for the sponsors in Connecticut would be the credits that ConnDOT and other state agencies would purchase. A WB program requires large up-front capital in order to secure a site. With tight state budgets and deficits resulting from the recent economic downturn, securing sufficient startup funding to establish a WB program would be difficult. Additionally, the relatively small amount of impacts by ConnDOT, estimated to be about 3 acres per year (Alexander 2010), fails to incentivize private WB sponsors to invest in a WB project in Connecticut. If legislation were changed and private impacts were allowed to be mitigated for off-site and through an EMA, the mitigated area would increase significantly. However, until legislation is altered, ConnDOT would need to initiate the establishment of an EMA program accounting for only state impacts.

An ILF program does not require the significant up-front costs associated with site construction as a WB. Additionally, some of the construction costs for the ILF sites could be distributed through request for proposals (RFPs). Due to the uncertain mitigation and funding climate at the present time, ILFs offer a less risky option for ConnDOT to pursue. Yet, to establish a successful ILF program, the sponsor needs to have an assurance that enough permittees will buy credits from their programs in order to obtain enough funds to appropriately conduct mitigation and to cover the necessary overhead costs. ConnDOT impacts about 3 acres per year, which is considered a low amount to create a consolidated project. Based on the similar demographics and setup for the New Hampshire ILF program, a basic comparison can be performed to assess whether a similar pricing mechanism may be viable for Connecticut, and to

provide insight into the financial feasibility of an EMA program. For approximately 3 impacted acres per year, and assuming a mitigation ratio of 2:1, the purchase of 6 acres of wetlands credit would be required. Based on the New Hampshire and Maine ILF programs, fees can be estimated using three components:

1. Cost of the construction of the wetlands that would have been constructed, multiplied by the ratio. Assuming average construction costs of \$76,000/acre and a mitigation ratio of 2:1 (It is noted that this value will vary for each mitigation project), this cost will amount to \$152,000/acre.
2. The method for calculating the equalized average cost of land per acre in each town needs to be assessed for Connecticut. A process has been developed by the New Hampshire Department of Revenue Administration for the purpose of comparing municipal land values in New Hampshire. Using a similar method for Connecticut, the average value of undeveloped acreage can be estimated for each town. Two possible options for determining the average cost of land per acre include:
  - The Connecticut Office of Policy and Management maintains a listing of the equalized net grant value for property by town (<http://www.ct.gov/opm/cwp/view.asp?a=2984&q=383170>). However, the equalized net grant value is not optimal, since personal property, vehicles and the value of buildings are included. However, this is one method of providing a rough estimate. The average cost of an acre is \$182K with approximately 12% due to vehicles and personal property. Assuming that land represents 35% of the property value, then the average cost of an acre would be approximately \$56,000. With a mitigation ratio of 2:1, this cost to the permittee will be \$112,000/acre.
  - An alternative, and likely more appropriate, method for estimating the cost of land purchase for EMA purposes is to evaluate the average cost of purchases through the Connecticut Land Use Acquisition Program (CLAP) operated by DEP. A list of purchases from 2000-2010 was obtained and analyzed, excluding gifts and interdepartmental transfers, to obtain an average cost per acre purchased. Accounting for an average inflation rate over that period of 2.5%, the value in 2010 dollars is \$23,600/acre for a value with the 2:1 ratio of \$47,200/acre impacted. However, this value may be low relative to that experienced for mitigation purchases, as CLAP purchases reflect land contributed for water access, state parks, and/or state forests. In many instances, this land may be purchased below market value.
3. Overhead costs are calculated as a percentage of the land and construction costs. The New Hampshire ILF program currently charges a 5% overhead. However, New Hampshire is currently discussing the possibility of increasing the overhead charge to 20% (Sommer, 2010). Using the CLAP estimate of \$47,200/acre and a 10% overhead would add a \$19,920/acre overhead fee to cover administrative costs, and a 20% overhead would add a \$39,840/acre fee.

Therefore, given a mitigation ratio of 2:1 and a total impact size of 3 acres/year (assuming all 3 acres impacted by ConnDOT are mitigated for through the ILF program) and based on the cost for wetlands construction, above, and land valuation utilizing land values determined through DEP's CLAP program, approximately \$597,600/year in fees will be paid to the ILF program. If 20% overhead is used, then the fund would receive \$119,520/year to cover operational

costs. The overhead percentage may be adjusted as needed to cover the staff expenses. From discussions with other states, approximately 1.5 staff will be required to operate the program, for a cost to cover salary and benefits of approximately \$150,000 annually. This cost estimate suggests that an ILF program may be viable, even with the limited wetland impacts for Connecticut.

This simplified cost analysis only focuses on the direct costs associated with establishing EMA projects. The analysis should also consider other offsetting benefits such as increased operational efficiency of ConnDOT, decreased construction delays, public project transportation benefits of constructing specific projects, and increased environmental functioning of larger, more contiguous EMA projects. The question for ConnDOT is whether these additional benefits exceed the operational cost overhead of 20% to operate the EMA ILF program. Yet, establishing such a project appears to be financially possible. Therefore, it is recommended that ConnDOT pursue the establishment of an ILF EMA program and perform a more specific cost-benefit analysis to determine the economic impacts for ConnDOT of establishing an ILF program.

The incorporation of the credits from private impacts that municipalities regulate would significantly increase the credit purchase from the WB or ILF program. Currently, municipalities do not have the option nor are they aware that such an option exists. Depending on individual situations, some municipalities may allow their local permittees to purchase credits from a consolidated mitigation program in lieu of PRM. However, communication based on expert personal opinion suggests that this would require a change in Connecticut state statutes. Assuming that such a mechanism were in place, private impacts would more than make an ILF program feasible. If only those impacts >0.23 acres (10,000 sq. ft.) were included, based on the New Hampshire case study, approximately 72 additional privately impacted acres annually would be eligible for the ILF program (Zimmerman 2010). While this value likely is overestimated due to inaccuracies in the self-reported acreage from IWCs of Connecticut towns, the area impacted is significantly greater than that impacted by ConnDOT. Additionally, an average of 16 and 3 projects per year were reported for impacts of greater than 1 and 3 acres, respectively. These estimates also ignore the potential benefit of a mitigation ratio which would further increase the funds paid into the ILF. The distribution of the impacts would affect the potential benefit to specific mitigation areas. The magnitude of the private wetland impacts suggests that permitting private buy-in to an ILF program would be beneficial to Connecticut. With private impacts included, the onus on the impacts by ConnDOT to support such a program would be diminished. Therefore, it is recommended that ConnDOT pursue securing legislation to permit private participation in an EMA program for wetlands.

Even if Connecticut determines that a state-run ILF program is economically beneficial, defining the ILF instrument will be a challenge. Key steps to the development of the instrument require that distinct watershed goals exist and are recognized by all parties involved. The mitigation ratios and wetlands criteria will need to be defined for the multiple types of impact-mitigation pairs, specifically, what type of ecosystem functions have been lost and which are proposed in the mitigation. Additionally, funding will be necessary to support the establishment of the ILF instrument. EPA grants can provide financial assistance to perform the necessary tasks to establish a program. Funds might also be procured through the Long Island Sound Initiative for watershed planning or through CT 319 funding. If towns decide to form watershed districts, then funding may be available through the Connecticut DECD. Funding may also be provided by "in house" services from state agencies, such as ConnDOT and DEP, for the development

of an EMA program given the benefits for transportation construction and for achieving environmental functions and needs in mitigation projects.

Up-front planning and interagency agreement are keys to successful ILF programs. Should ConnDOT wish to establish an ILF program, regular meetings with DEP focused on the development of an EMA program are suggested to facilitate a collaborative relationship between the staffs of each agency. DEP will play a key role in establishing a compensatory EMA program. Therefore, regular meetings will serve to outline a mutually-agreed upon agenda and path that will be required to achieve each agency's specific goals. Additional challenges impacting the development of an EMA program will also be able to be explored, specifically, the availability of open land for mitigation and the quantity of ConnDOT impacts.

## KEY FINDINGS

Although Connecticut exhibits these two characteristic challenges to EMA program establishment—insufficient funds and small total area of wetland impacts—the establishment of an ILF program is possible, and it is recommended that ConnDOT pursue such a path. However, to establish an ILF program, more specific program objectives will need to be established by both ConnDOT and DEP regarding the forecasting of impacts, watershed goals and the land available for such large EMA projects. Connecticut is a highly developed state with few large tracts of land available, few opportunities for wetland mitigation remaining, and small-scale transportation project impacts. Additionally, Connecticut is one of two states, along with Massachusetts, to be hampered by municipal control over wetland mitigation. With private impacts able to contribute to the ILF, EMA definitely would be possible. The establishment of an ILF program, if successful, may provide the necessary momentum for securing adoption of legislation to allow for private participation.

### *Benefits and Drivers*

- Increased operational efficiency
- Enhanced ecological performance
- Flexibility to developers when selecting wetland mitigation options
- Reduced costs as economies of scale are achieved
- Reduced monitoring requirements and inefficiencies

### *Keys to success*

- State agency coordination in developing, designing and carrying out mitigation projects is crucial. All parties must operate in sync to recognize economic and ecological benefits from compensatory mitigation.
- Outlined watershed goals, both ecologically and with respect to transportation planning. Transparent, agency-specific goals facilitate communication and the reaching of a common understanding between agencies when addressing compensatory mitigation.
- Having a complete implementation plan for the mitigation program facilitates decision-making to achieve optimal conditions. The plan lays out the financing structure,

cost accounting, criteria for credit evaluation, ecological directives, the setting of mitigation ratios, proposal evaluation, and long-term monitoring. Selection of the most cost-effective sites, with a complete hydrologic evaluation, and those proposed by experienced sponsors is crucial for design success.

- State agencies should work cooperatively with the USACE to reach an agreement of mitigation requirements. This will prevent permittees from being required to conduct separate (double mitigation) compensatory mitigation projects due to different agency requirements.

### *Challenges*

- The price of land is of concern and is a distinct challenge for implementing a compensatory mitigation program in Connecticut. The price of land in rural areas/states (see the North Carolina case study) is generally lower than that in urban areas. As the impacts usually are compensated for in the same 8-digit HUC watershed, urban wetlands would require compensation in an area in close proximity to development, driving up the price of land with respect to mitigation, similar to what occurs with PRM. However, EMA still would permit more flexibility with respect to PRM.
- Selection of service area represents a major challenge when establishing a consolidated mitigation project. If the service area is too large, as in the case of IDOT WBs, several watersheds may be included as part of the service area and cross-watershed mitigation (although at higher mitigation ratios) may be used to compensate for functions lost.
- Agency agreement is critical, particularly in the development of the EMA instrument. Given the differing agendas of the agencies involved, interagency relationships may pose impediments to efficiency.



## VI: RECOMMENDATIONS

The following recommendations were developed by the study committee and study management team based on the literature review, survey responses and CSC meeting discussions. These recommendations are intended to assist ConnDOT in decision-making with regard to the development of a plan regarding compensatory EMA as pertaining to transportation projects. The primary recommendation is for ConnDOT to more thoroughly evaluate the cost benefits regarding efficiency and decreased delays associated with implementing an ILF EMA program, and pursue such an implementation. The additional recommendations below follow from the primary recommendation, and are separated into three categories:

1. General Recommendations that will benefit current environmental mitigation practices, regardless of whether an EMA program is developed.
2. Recommendations Specific to the Development of an EMA Program.
3. Recommendations Only if an EMA Program is Developed that are specifically aimed at EMA programs and therefore are only beneficial if such programs are established.

### GENERAL RECOMMENDATIONS

**Recommendation 1:** It is important that ConnDOT and DEP each develop cohesive and cooperative long-range plans articulating the following objectives, and provide for interagency review and comment through plan development.

- **Forecasting impacts:** ConnDOT should forecast target areas of future transportation impacts to wetlands. Other states have ten-year transportation plans that allow them to forecast opportunities for compensatory mitigation implementation (e.g., NH DOT 2009). While ConnDOT has a ranking of individual transportation projects, a comprehensive assessment of long-term impacts to wetlands has not been established. Such a plan regarding future impacts will be possible given the existing project ranking and will help target large areas of impacts where a consolidated mitigation program may be most appropriate and in-line with DEP ecosystem goals.
- **Classifying watershed goals:** Wetlands location maps currently are being updated by DEP. Additionally, a set of clearly defined watershed goals should be established (e.g., preservation of a particular habitat niche, type of wetlands). Ecosystem planning and ecosystem functions are articulated within multiple DEP programs. However, a comprehensive plan will serve to establish common goals and provide for an open, unified direction throughout the state which can serve to support DEP practices and decisions.
- **Prioritizing open space opportunities:** Having clearly defined objectives and future plans in place will facilitate the identification and ranking of the remaining open spaces

in the state, particularly large, contiguous tracts. These parcels represent opportunities available to be acquired and enhanced or preserved as part of mitigation projects. Consolidated mitigation options require significant tracts of land, a scarce commodity in Connecticut. If ConnDOT and/or DEP decide to create a WB or an ILF program, land would eventually need to be purchased. Long-term plans are critical to identifying, prioritizing and maximizing the ecological functions and needs available in specific watersheds. ConnDOT must be able to predict areas of impact in concert with DEP in identifying tracts able to achieve watershed ecosystem goals.

**Recommendation 2:** ConnDOT and DEP should individually and collectively articulate the environmental goals and objectives of specific mitigation projects in written form. In doing so, each agency not only lays the groundwork for establishing future EMA, but also enhances the existing permitting processes. By establishing written goals, the following improvements can be achieved:

- Providing a framework within each agency for decision-making regarding permitting will help each agency in understanding decisions in the context of their respective program goals.
- Implementing a structure of processes and decision-making will increase productivity while decreasing the chances of overlooking important considerations.
- Limiting the potential for influence by outside political pressures will enable the agencies to better defend and support decisions with respect to achieving overall, defined goals and objectives.
- Enhancing the transparency in the decision-making process, since everything is documented and standardized, not only increases the public trust but also develops trust with other state agencies, facilitating interactions between DEP and ConnDOT.

These points will eventually lead to the development of mutual goals among the parties involved with respect to aquatic resource mitigation as well as the enhanced efficiency of the individual programs in achieving individual goals.

**Recommendation 3:** In addition to the regular joint planning meetings between the two agencies, meetings focusing on a general discussion of wetland remediation approaches should be established. New Hampshire's survey response indicated that conducting monthly meetings proved to be valuable in the EMA project design process. Frequent and earlier joint planning meetings focused on decision-making processes could dramatically improve the design process by

- Improving the utilization of resources. Because the parties will be meeting more frequently and will be better informed of agency goals and practices, time will not be wasted by proceeding with project designs that would need to undergo redesign at a later date due to oversight of key criteria.
- Limiting last-minute stress when trying to apply for a permit. For instance, if DEP is informed of ConnDOT plans, and DEP objects, ConnDOT will have time to update designs or seek alternative solutions. Additionally, DEP will not feel pressured by

reviewing last-minute design plans. However, this may not be possible given the funding timing between the Federal Highway Administration and ConnDOT.

- Reducing last-minute changes requiring costly overtime.
- Resulting in more frequent quality interagency communications and an improved relationship among the stakeholders as the design process becomes a consistent team process with the development of a mutuality of goals with regard to environmental mitigation.

**Recommendation 4:** Evaluate the adequacy and efficacy of wetland impact documentation. Improve the documentation of wetland impacts and the ecological success of wetland mitigation projects, as necessary. According to the NCHRP (2002), many states are not properly documenting the mitigation process, leading to uncertainty as to whether the current mitigation options are effective and successful.

- Create an inventory of compensatory projects achieved; this would help keep track of successes and potential challenges for mitigation sites.
- Record and document the project success or failure based on ecological functions and needs as outlined by the new mitigation rule (USACE 2007).
- Develop a similar system to the CRAM of California to have standard procedures to assess the success or failure of mitigation projects. This will not only make the process simpler but will also help create uniformity and increase the accuracy of the process.

**Recommendation 5:** Work in cooperation with the DECD, and other state agencies as appropriate, to identify future project development areas that will impact wetlands.

- By identifying future projects, such as an expansion of the Bradley International Airport, a consolidated mitigation program plan can be drafted if such projects involve sufficient (greater than 4 acres) impacts to wetlands, which could involve a sufficient amount of funds to establish a consolidated mitigation project.
- Coordination with state agencies involved in forecasting development patterns and regional community efforts promotes the inclusion of environmental considerations in regional development discussions. Coordination with planning and economic development approaches may open potential opportunities for land designation for conservation purposes.

## RECOMMENDATIONS SPECIFIC TO THE DEVELOPMENT OF AN EMA PROGRAM

**Recommendation 6:** Identify potential watershed areas that could be appropriate for consolidated wetland mitigation. Having long-term plans in place for both ConnDOT and DEP is a necessary pre-requisite for determining the appropriate classification of mitigation boundaries.

- In agreement with regulatory agencies, define if 8-digit HUC, soil conservation districts, biophysical regions, or others of the sort, would be appropriate to define service areas for consolidated wetland mitigation projects (WB or ILF programs). It has been thoroughly discussed in this report that choosing the service area represents a major roadblock when establishing EMAs. Therefore, identifying the potential service areas of consolidated EMA projects is imperative to understanding the feasibility of an EMA.
- Based on a forecast of impacts, rank the regions with respect to the potential for compensatory EMA implementation based on impacted area, available resources and cost of mitigation. Determine how well the predicted ranking coincides with available land tracts from DEP predictions.
- Identify future ConnDOT projects, such as the I-95 highway corridor, that will have a higher acreage of impacts to wetlands. Based on prior case studies, ConnDOT can determine if there will be sufficient acreage impacted to create a consolidated mitigation option specific to a particular service area.
- Regardless of the service area, the EMA should be established as an umbrella program in which all of the mitigation regardless of region is administered by the same EMA.

This recommendation should not be undertaken until there is certainty that an EMA program is feasible and ready to be established, because these actions imply that a thorough analysis of costs and the necessary steps towards program implementation have been conducted.

## RECOMMENDATIONS ONLY IF AN EMA PROGRAM IS TO BE DEVELOPED

**Recommendation 7:** Inform municipalities and regional entities and other stakeholders of the opportunities provided by EMA programs and evaluate the interest of the public and its representatives in altering the Connecticut General Statutes to permit towns to participate in a regional or statewide EMA program.

- The incorporation of private impacts would make the solvency of an EMA program much more likely. An estimate of private annual impacts of 74 acres for 2006 is significantly greater than those from ConnDOT of 3 acres per year.
- ConnDOT should support changes to the state statutes regarding the IWWA to allow EMA.
- Given the increased success of replacing ecological functions and needs for EMA relative to PRM, and the enhanced performance related to economy of scale, DEP should also support the incorporation of private impacts into an EMA program.

**Recommendation 8:** Explore external funding options and evaluate potential benefits for allocating existing personnel to defray the cost of program development. There is a need to hire additional staff or a consultant to develop a consolidated mitigation program. In New Hampshire for instance, the NHDES received a grant that funded the salary of one employee

for a year for the purpose of establishing an ILF program, collecting funds from permittees and keeping track of the program accounts. Apply for federal (i.e., EPA) grants to assist in defraying costs of development.

**Recommendation 9:** Keep the USACE and other federal resource agencies including EPA, USFWS, and the National Marine Fisheries Service (NMFS) informed about the steps discussed above.

In summary, should compensatory mitigation be desired, Recommendations 6-9 will be necessary to establish the groundwork for initiating either a WB or ILF program. The first step in this process is to outline and document the processes regarding wetland mitigation. Long-term plans and efficient design processes regarding the stakeholders involved will be crucial for achieving program success. The next step is to obtain funding for developing a plan regarding the evaluation of ecosystem credits and long-term monitoring requirements. Finally, ConnDOT, along with DEP, should support legislation necessary to authorize the use of an EMA program, citing increased operational efficiency and environmental functioning.

## RECOMMENDATIONS ONLY IF AN EMA PROGRAM IS DEVELOPED

**Recommendation 10:** If an EMA is implemented, develop a means to include ecosystem services in project evaluation. Ecosystem services are services that wetlands provide directly to the public. A wetland that has been created or restored to be part of a park, for instance, creates recreation opportunities, wildlife viewing, flood control, etc., to the surrounding community. In short, ecosystem services generate a value to the public (Polasky and Segerson 2009), possibly reflected in increased property value, adding to the list of benefits consolidated mitigation programs could offer.

- Criteria for evaluating ecosystem services should be developed. There should be a clear understanding of how these affect the economical analysis of designing a wetland mitigation site, including the establishment of the cost of a credit.
- A process should be developed in which not only the ecological functions and needs of the wetlands are accounted for, but also the economics associated with community valuation.

**Recommendation 11:** Mitigation options should be in-line with ecosystem goals established in DEP's long-term plan. Establishing a documented set of criteria and mitigation option rankings in-line with ecosystem goals provides transparency in the decision-making process.

**Recommendation 12:** Develop a means for long-term financing for administration of consolidated mitigation projects.

- There is a preference for recommending an ILF program, as large up-front capital investment is not required as it is with a WB. Therefore, the availability of funding may be a driving force in determining the mitigation alternative strategy that is selected for implementation.

- After program initiation, the specific overhead rate for Connecticut would need to be evaluated based on projected operational costs, but would likely be approximately 15-20% given the recent changes in the rates applied in NH and ME.
- Explore opportunities to utilize other state land acquisition programs and funding sources to establish an initial bank for critical state projects either as a stand alone or in conjunction with ILF program development.

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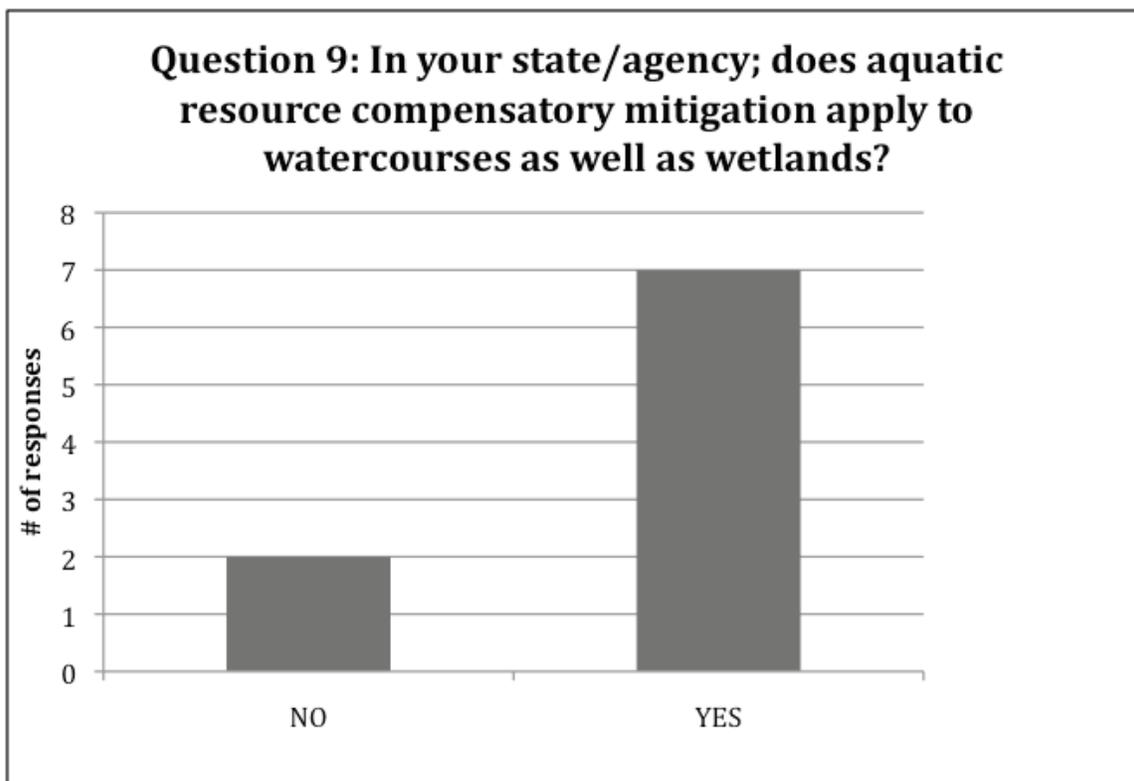
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## APPENDIX A SURVEY RESPONSES

A total of 15 states were contacted to participate in the survey: Florida, Illinois, Maine, Massachusetts, New Hampshire, New Jersey, New York State, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, Wisconsin and Washington. In each state, transportation agencies and environmental protection agencies were polled. Additionally, the survey was distributed to the New England EPA and USACE-NE district offices. A total of 14 surveys were completed, 1 having been completed by the USACE. Two different representatives of Ohio DOT responded to the survey. In many cases the responses were identical and were counted only once, yielding a total of 12 surveys from state agencies. In some states, both the state transportation agency and the state environmental protection agency responded to the survey. The 12 responses represent 9 of the 15 states (60%) contacted, and include 4 state environmental protection agencies, 7 state transportation agencies, and 1 FHWA district office (see Table 1, p. 10).

The survey included a total of 28 questions. Responses to Questions 1-8 were determined to be of greatest importance to this study and are presented and analyzed in Section IV: Survey Results. Remaining responses (Questions 9-28) are summarized as follows:



- YES (WA, NH, WI, NY, FL, OH, VT)
- NO (IL, MA, OH)
- Note: Ohio FHWA answered NO, While Ohio DOT answered YES
- Note: Both NY DEP and DOT answered YES
- Note: Both FL DEP and DOT answered YES
- FINDINGS: In most states aquatic resource compensatory mitigation applies to both watercourses and wetlands.

***Question 10: What is range of impacted acres for permitted projects?***

- NO ANSWER: WI DEP, OH FHWA, FL DEP, NY DEP
- After taking the average of range of impacts - It can be from 1 acre to about 70 acres
- FL has a range from 1 to 500 acres
- NH and MA from 1 to 10 acre impacts

***Question 11: Does your state have a compensatory mitigation program, and if so, what is allowed under your compensatory mitigation program? (permittee-responsible wetland banks and/or in-lieu fees?)***

- YES
  - NH ILF
  - ME ILF
  - IL DOT banks
  - WA DOT banks
  - WI DOT Bank
  - FL ILF and Banks
- NO
  - NY
  - VT Initial discussions for ILF

***Question 12: Who administers the bank or the in-lieu fee program?***

- NO ANSWER: MA, VT, NY
- DOT: IL(Banks), WA (Banks), WI (Banks), OH (Banks)
- DEP: NH (ILF), FL (Banks)

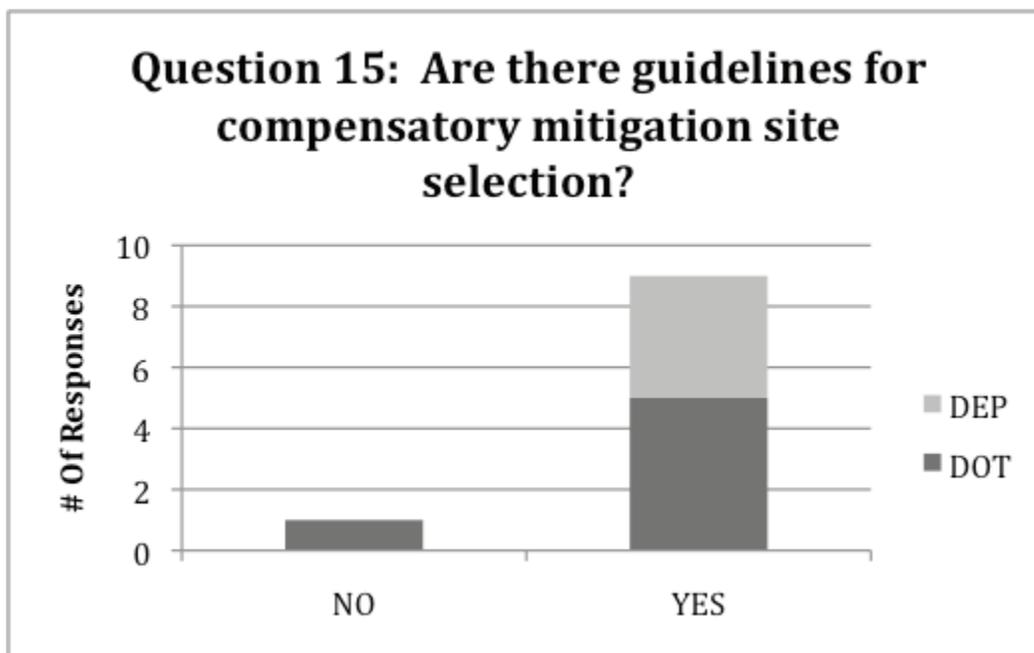
- NONPROFIT: ME (ILF), WA (ILF)
- PRIVATE: WA (Banks), FL (Banks)

**Question 13: What organizations (public or private) are eligible for using the bank or in-lieu fee program?**

- FINDINGS: The mitigation alternatives are sometimes created for specific purposes, for instance Ohio DOT and Illinois DOT banks are for the use of DOT only. Private and other state banks can be used by anyone who qualifies.

**Question 14: Who manages the acquired aquatic resource bank and its associated maintenance costs during:**

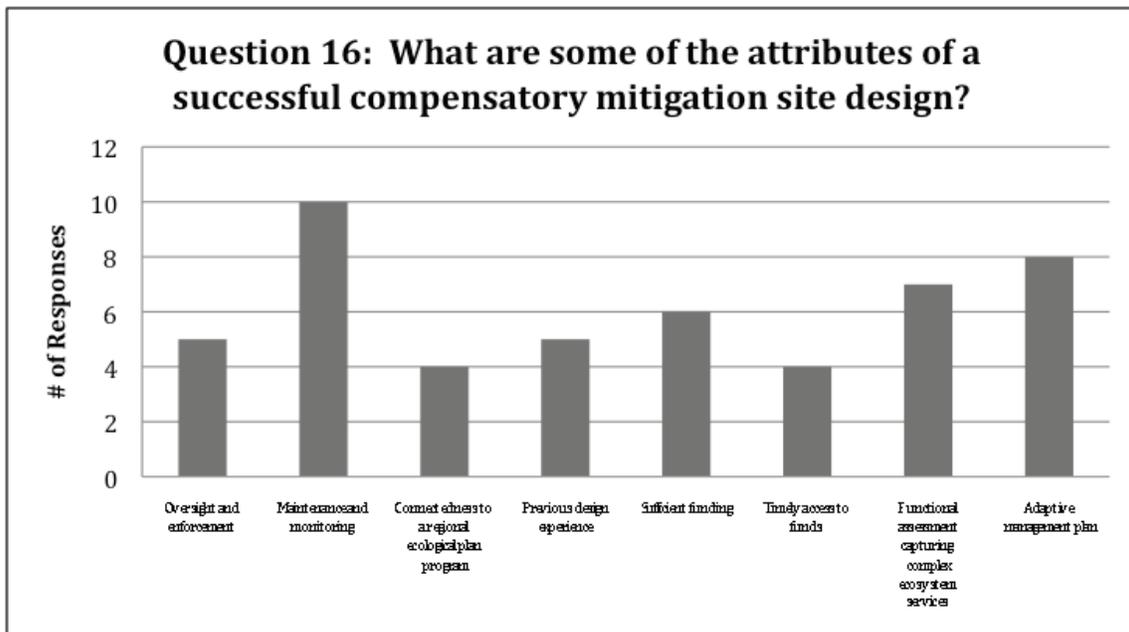
- Construction: Most answers reflect - Permittee/Banker.
- Monitoring: Most answers reflect - Permittee/Banker.
- Long-Term: Most answers reflect either: permittee/banker, third parties (land trust, conservation group).



- NO ANSWER: OH FHWA, MA
- YES: FL, IL, NH, NY, VT, WA, WI
- FINDINGS: Most states have established guidelines for compensatory mitigation site selection.

**Question 16: What are the potential roadblocks in compensatory aquatic resource mitigation alternatives? Are these roadblocks real or perceived?**

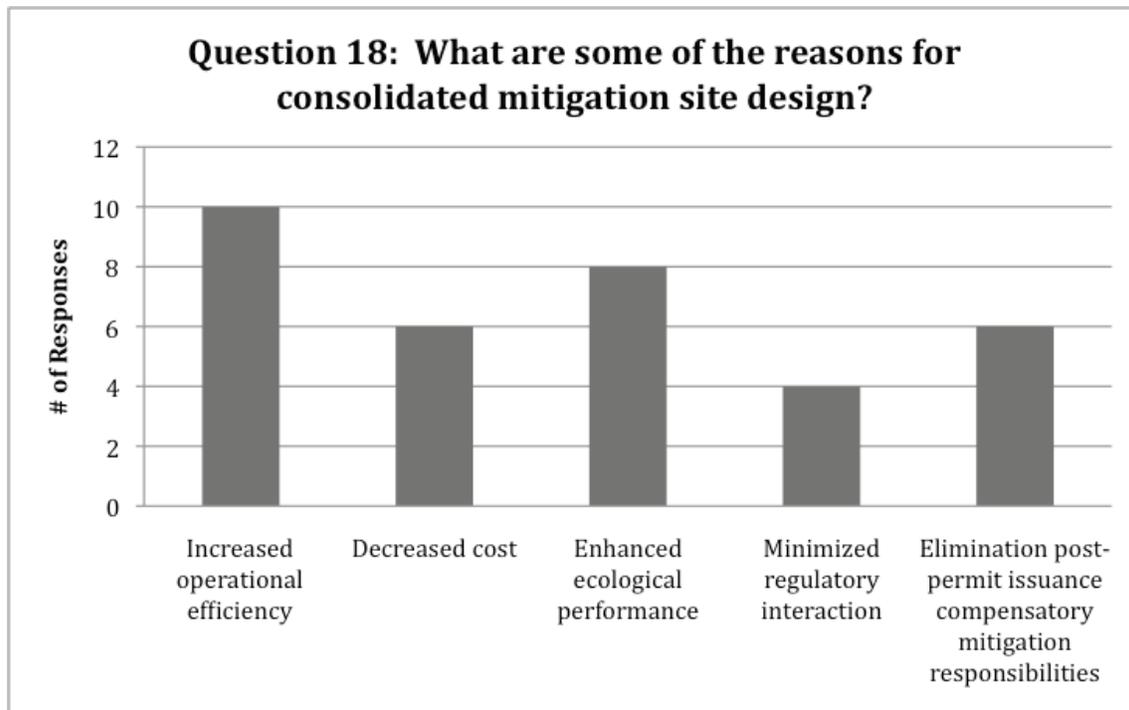
- MA: no harmony between state and federal regulations
- NY: difficulty achieving multi-agency agreement for
  - Service area
  - Cost/benefit ratio
  - Long term maintenance
- VT: unavailable land for service area
- FL: Service area
- MA and CT: compensation can only be done in the town where impact occurred.
- FINDINGS: the lack of land for service areas seems to be a major issue among the answers.



- NOTE: FL DEP added that the mitigation site design is preferred to be part of a regional plan.
- NOTE: WA DOT added that all of the attributes play an important role.
- FINDINGS: Maintenance and monitoring is an important attribute for a successful site design.

**Question 17: Does a demand/preference exist for third-party mitigation (i.e., aquatic resource banks and in-lieu fee programs)?**

- **FINDINGS:** All states express that there is a demand for third party mitigation (both for ILF and Banks).



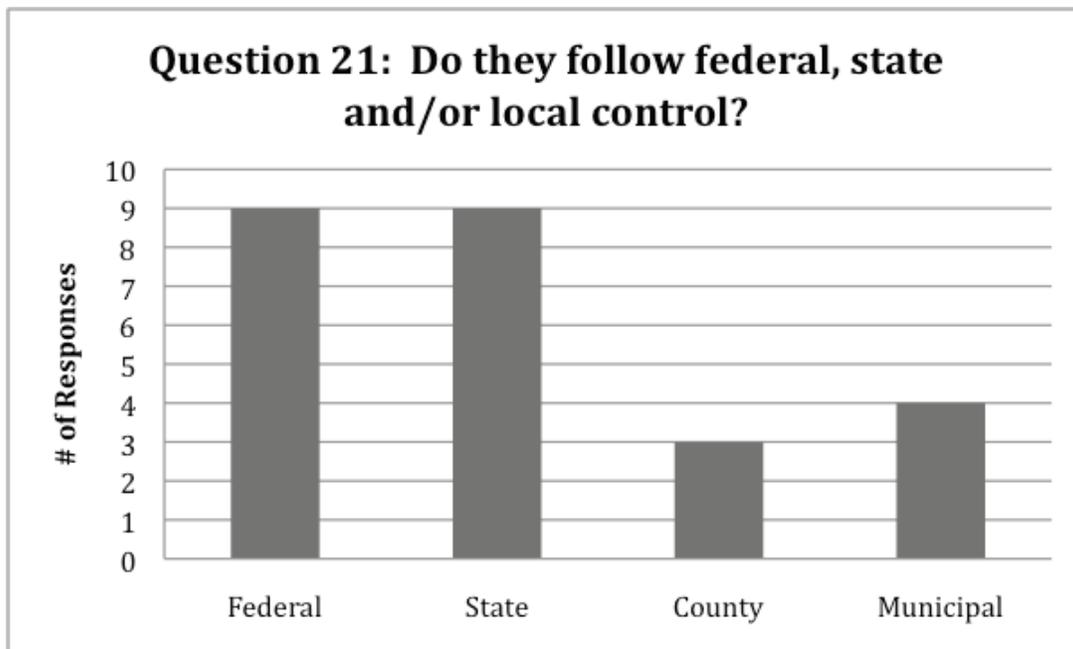
- **FINDINGS:** Increased Operational efficiency and enhanced ecological performance are the most common reasons for develop a consolidated mitigation project.

**Question 19: Which government agencies are important for the aquatic resource mitigation decision-making?**

- **FINDINGS:** Most states say that federal (USACE, EPA) and state (DEP, USFWS, etc) agencies. Moreover, MA and CT have municipalities and/or towns playing a role in decision-making.

**Question 20: How do the respective agencies work together?**

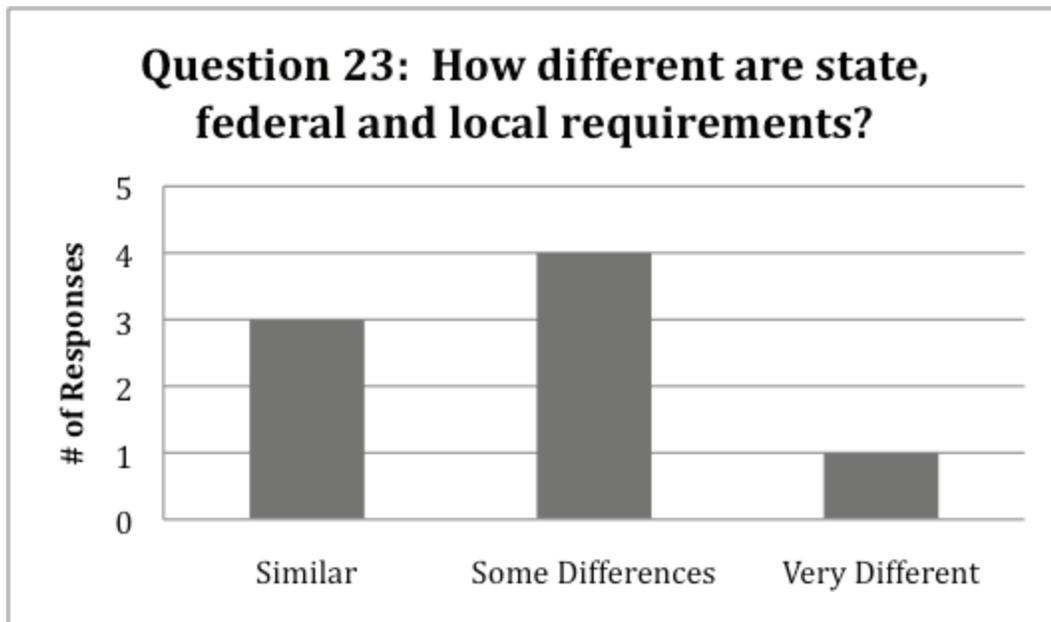
- **FINDINGS:**
  - Coordination among agencies: WSDOT (through oversight committee and interagency banking committee), NH (Monthly meetings or as needed), Wisconsin (WISDOT/WDNR Cooperative agreement), NY DOT, Florida DEP (Agencies generally work well with each other), Ohio DOT (IRT team), Vermont (some projects they work well, some others not so much).
  - Disagreement in coordination: MA (Disagreement on mitigation measures).



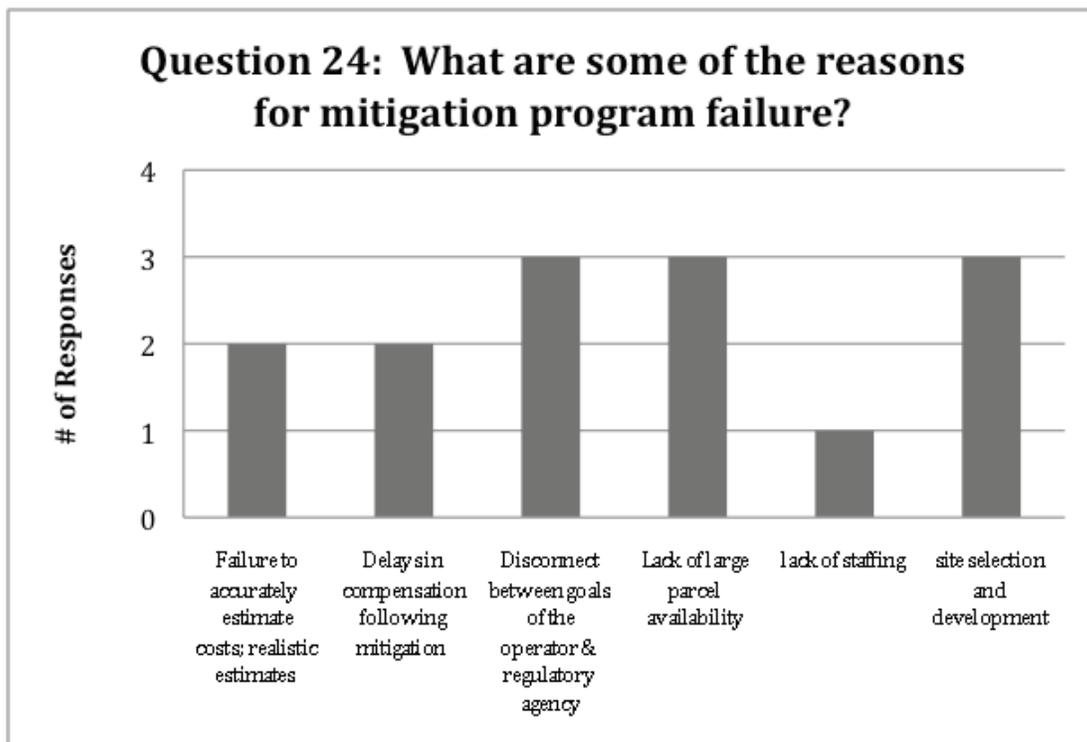
- NO RESPONSE: OH FHWA
- All states: Federal and State requirements
- FL, NY, WA, MA: County and Municipal requirements in addition to Federal and State.
- FINDINGS: All states have federal and state requirements, whereas only a few states have additional county and/or municipal requirements.

*Question 22: Who regulates state transportation projects with respect to aquatic resources?*

- FINDINGS: Most states express that USACE and state agencies (e.g., DEP and USFWS) regulate environmental impacts of transportation projects



- Similar: NH, NY, WI
- Some Differences: OH, FL, IL, VT
- Very Different: MA
- FINDINGS: Some states identify discrepancies among the federal, state and local requirements.



- **FINDINGS:** Many of the respondents omitted this question, either because the question was not understood or because these were not the main reasons for mitigation program failure

***Question 25: Is the price of land a concern?***

- **FINDINGS:** With the exception of Florida DEP and Ohio FHWA, all (11) responses were yes. Land price is therefore a concern when establishing a mitigation bank or ILF program.

***Question 26: What is the average cost of an acre of land in your state?***

- **FINDINGS:** All responses express that the cost of an acre varies from rural to urban areas with urban areas having a higher cost per acre ranging from \$1,000 to \$100,000s.

***Question 27: What is the average percent of project cost budgeted for aquatic resource remediation?***

- **FINDINGS:** Most agencies are unaware of this information. However, the following represent a few of the responses:
  - WA DOT: Our studies show that projects with wetland impacts have averaged 7.1% of project costs but the range is wide (1% to 30%)
  - NE USACE: rule of thumb is 10%
  - NY DOT: <5%

***Question 28: How is compensatory mitigation banking property appraised for purchase?***

- **FINDINGS:** Most states responded fair market value was used for property appraisal for purchase.

## APPENDIX B GLOSSARY

**Advance Credits:** the number of credits an ILF program may sell once its instrument is approved is determined by the USACE with the assistance of the IRT. The number of credits is specified in the instrument and is based on the compensation planning framework, the experience of the sponsor with mitigation projects and the projected financing necessary to begin planning and implementation of ILF projects (ELI, 2009). Additionally, it is important to recognize that advance credits can be sold as soon as the instrument is approved, and therefore the mitigation site does not have to be secured. Once ILF project milestones are achieved (such as a mitigation site being built), the advance credits become released credits.

**Bank site:** location of the wetland

**Commercial WB:** third-party WBs are usually private ventures established by investors who sponsor the WB to make a profit. Such WBs are common in Illinois and Florida and many other non-New England states (Robertson, 2004; TRB, 2002; ELI, 2005).

**Compensatory Ratios:** ratios tend to be higher for ILF programs than for WBs because ILF programs have a lag time and a higher risk than WBs. Therefore, mitigation ratios help balance the higher risk of buying credits from an ILF when compared to a WB program.

**Credit release schedule:** the new mitigation rule (USACE, 2008) allows an ILF program to sell a limited amount of credits before establishing a project. These credits are called “advance credits.”

**Environmental Mitigation Alternatives (EMA):** the party impacting wetlands purchases credits in exchange for mitigation responsibility for conducting and overseeing wetland mitigation from either a wetland bank (commercial or nonprofit) or in-lieu fee (ILF) program. EMA are off-site.

**Financial Assurances:** the financial requirements are less stringent for ILF programs than for WBs. However, the new mitigation rule (USACE, 2008) requires enough financial assurances to ensure mitigation projects are carried out. Financial assurances may not be required if the ILF sponsor has had a successful experience in mitigation projects or if the sponsor provides a “formal, documented commitment from a government agency or public authority” (USACE, 2008).

**Instrument (WB or ILF):** this is a document that outlines the operational plan of the WB or ILF program in order to accomplish the goal of replacing the wetlands lost due to development impacts.

**Interagency Review Team (IRT):** a group composed of state and federal environmental agencies, Native American tribes, the Soil and Water Conservation Districts, and/or local Planning Departments. Additionally, scientists and/or experts in wetland mitigation who work

for state and local offices of federal regulatory agencies are often included in the IRT. Their role is to assess the banker's restoration of a site, and to monitor the site's continuing ecological function performance. Their assessment determines how many credits the bank can sell, based on the site's continued success at meeting the functional standards described in the WB instrument.

**Out-of-kind Mitigation:** out-of-kind mitigation is a special type of compensatory mitigation in which the adverse impacts to one habitat type are mitigated through the creation, restoration, or enhancement of another habitat type.

**Permittee-Responsible Mitigation (PRM):** the party impacting wetlands maintains the responsibility for conducting and overseeing wetland mitigation. PRM can be on-site or off-site.

**Service Area:** represents the geographic area in which credits from a consolidated mitigation project can be sold in exchange for wetland impacts within that established area.

**State Transportation Agency WB:** these are consolidated mitigation programs created by state transportation agencies for their own use. In some states, however, other permittees are allowed to buy credits from state transportation agency WBs.

**Up-front Planning:** unlike WB programs, ILF programs do not need to secure a site or establish a mitigation project plan in advance of collecting fees.

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