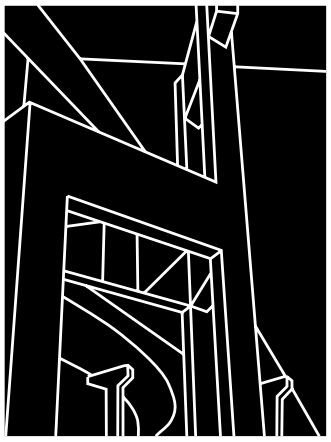
RESEARCH REPORT 1740-1

WETLANDS MITIGATION FOR HIGHWAY IMPACTS: A NATIONWIDE SURVEY OF STATE PRACTICES

Connie McConnell Hinojos, George H. Ward, and
Neal E. Armstrong



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16. Abstract

This report documents a review of Clean Water Act Section 404 mitigation projects undertaken in the contiguous United States that are applicable to highway development in Texas. In gathering the information about the experiences of transportation-related agencies across the nation regarding wetlands impact and mitigation, the researchers conducted a campaign that included telephone, fax, and email surveys.

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by

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Principal Investigators:
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TEXAS DEPARTMENT OF TRANSPORTATION

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FEDERAL HIGHWAY ADMINISTRATION

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June 1999

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The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of either the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation.

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Prepared in cooperation with the Texas Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration.

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Survey Strategy and Approach

One of the main goals of this project was to perform and document a review of 404 mitigation projects in the contiguous United States that are applicable to highway development in Texas. Much of the necessary information is in the form of "gray" literature, i.e., research reports, memoranda, and documents of limited distribution, if, indeed, it is published at all. Most of the information, however, is unpublished and lodged in the knowledge and experience of workers in federal and state agencies across the country who deal with wetlands regulation on a day-to-day basis. In order to gather information about the experience that transportation-related agencies across the nation have had with wetlands impacts and mitigation, surveys via telephone, fax, and email were conducted.

The initial concept of this task was to mail a questionnaire to state transportation agencies, natural-resource agencies, and federal agencies involved in the 404 process, e.g., U.S. Army Corps of Engineers district offices, regional offices of the Environmental Protection Agency, and district and regional offices of the U.S. Fish and Wildlife Service. Early in the project, some exploratory contacts with a sampling of these agencies made it clear that we were following a well-worn path. Previous projects addressing wetlands mitigation or related issues followed exactly the same strategy of a mail-out questionnaire. The staffs of these agencies were hostile about completing yet another questionnaire. These staffs seemed to be uniformly over committed, and the thankless, impersonal task of questionnaire completion would be assigned low (namely zero) priority.

We fell back, regrouped, and instead adopted the personal, direct approach of conducting telephone interviews with key personnel. This method was a labor-intensive approach to the information-gathering task, but promised to be much more productive as well. The time involved in conducting the surveys necessitated narrowing the scope, both in terms of the types of projects considered and in the agencies to be contacted. Moreover, during the early interviews, it became evident that the best source of relevant information would be the state transportation agencies, more so than the state and federal resource agencies; therefore, the focus group of the surveys was narrowed accordingly.

The surveys were conducted in a highly structured manner to ensure acquisition of the relevant information in the most time-efficient manner. Three increasingly detailed levels of survey (Level 1, Level 2A, and Level 2B) were formulated to obtain increasingly specific information from each participant. The survey contents were carefully constructed before the process began (and for the initial Level-1 contacts, we even devised a telephone script to facilitate the interview). Forms and tables were created in Microsoft Access Database software to compile the survey results. The organizational and query capabilities of this software aided in the analysis process. The analysis was based on the factors hypothesized by this study to influence the transportation agency's mitigation process, and the survey responses were used to validate the assumptions. The survey forms for each level are given in the Appendix.

Many state transportation agencies either declined to participate in one or more of the surveys or gave incomplete responses. Over the past several years, these agencies have been inundated with

surveys of various kinds and, as noted above, there is little motivation on their part to complete yet another. There is no doubt that our personal telephone interview approach achieved participation and obtained information that would not have been otherwise forthcoming. At the same time there were many staff members who, failing to see how these activities would directly benefit their immediate concerns and duties, felt the interviews represented simply another demand on their time.

These agencies are generally undersourced in their efforts to handle all the requirements that go along with the Clean Water Act (CWA) Section 404 regulations. That is, they, as well as the regulating agencies, are understaffed and underequipped to adequately perform all the tasks required by the CWA. It should be noted that the states expected to be most relevant to the Texas situation from the standpoint of similarity of wetlands biology — New Mexico, Oklahoma, Arkansas, Louisiana, and Mississippi — were some of the most difficult states to obtain information from. This fact demonstrates a major problem with the technical work on this project — the dependency on the timing and responsiveness of many external agencies over which there was no control. However, those states represented in this study include some of the more innovative approaches to wetlands mitigation strategies in the country and, therefore, from a procedural standpoint are quite relevant to the project objectives.

All information provided in these state summaries is applicable to the transportation agency surveyed and not necessarily to the trends in the corresponding state as a whole. For various reasons—reasons that involve politics as well as a lack of uniformity in official procedures—different developers are treated differently within a state. The reader should bear in mind that the following information is specific for highway projects and may not necessarily extrapolate to all development situations.

The Level 1 Questionnaire determined the general approach and strategy of the contacted agency to the problem of wetlands mitigation and that agency's overall experience with mitigation in recent years. This Level 1 survey also probed the information base at the contacted agency. In particular, the survey was designed to determine what 404 and/or wetlands data are already in a digital form at the contacted agency, what data may be independently documented in hard-copy format, and of these, what data could be obtained for the present study. Of special interest to us at this stage of the process was the availability of mitigation information in a summary format. The organization and availability of data were found to vary widely among the states; however, several are useful to this project. Based on the information obtained from the Level 1 Questionnaire, eighteen requests were made for hard-copy or magnetic-copy data on wetlands mitigation. As shown in Figure 1 below, forty-one state transportation agencies participated in the Level 1 Questionnaire. However, only eight entities provided summary mitigation information for this study (Figure 2).

Another source of summary mitigation data utilized by the present study was AASHTO's (American Association of State Highway and Transportation Officials) national biennial wetlands mitigation practices survey. This survey, conducted for AASHTO by the Georgia Department of Transportation (GDOT), had participation from twenty-six entities in 1993 and twenty-three in 1995 (Figure 3). Results from 1993 and 1995 were obtained for use in this

project. Unfortunately, the information is limited to only general matters and was not sufficiently specific or quantitative for direct use in this project.

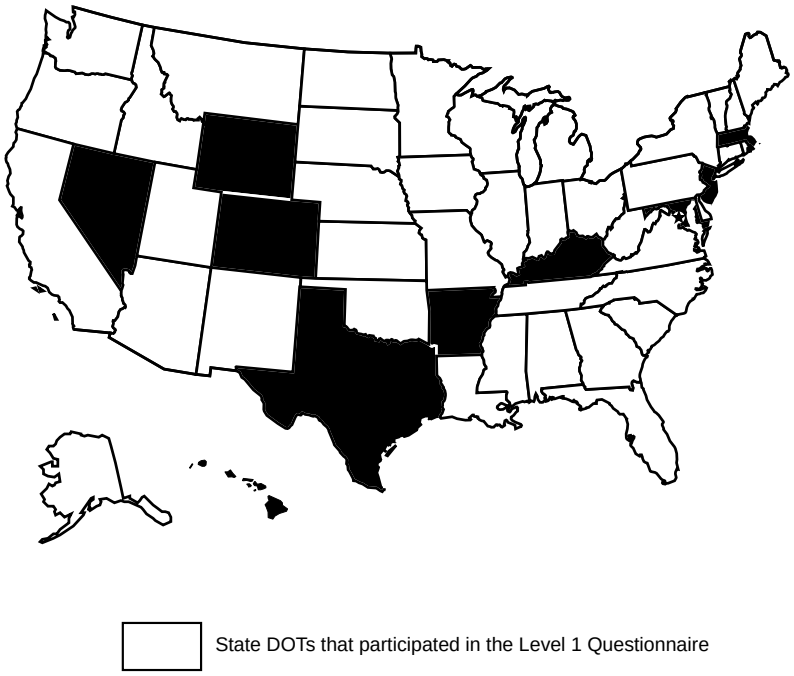


Figure 1: Level 1 Questionnaire Participants

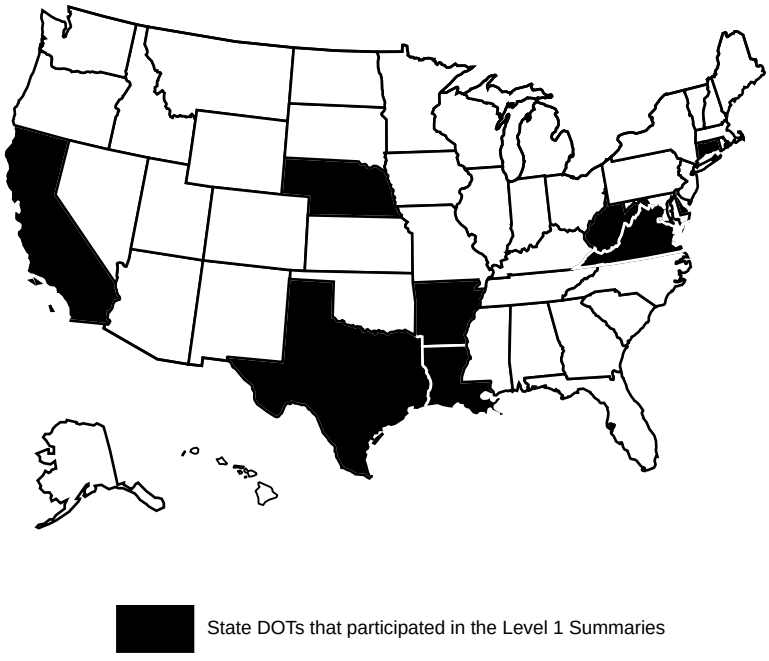


Figure 2: Level 1 Questionnaire Participants Contributing Summaries

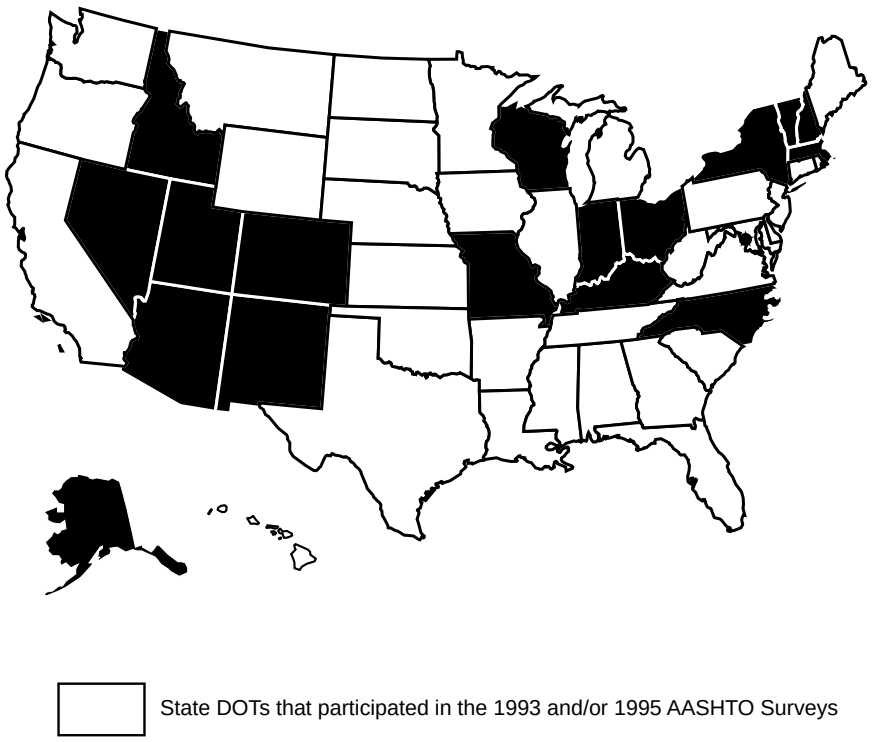


Figure 3: 1993 and/or 1995 AASHTO Survey Participants

The Level 2, Part A Questionnaire (see Appendix) dealt with the processes and methodologies used by each participating state transportation agency to successfully mitigate its wetlands impacts with the regulatory agency(s) in charge of determining appropriate wetlands compensation. The present study had participation from thirty-one entities, as shown in Figure 4.

The Level 2, Part B Questionnaire attempted to obtain specific mitigation project information. Of special interest to this study were three types of projects: spectacular successes, spectacular failures, and off-site projects whose proposals were successfully negotiated with regulators who preferred on-site, in-kind replacements. Participation in Part B dropped twofold as compared with participation in Part A, with information provided from fourteen state transportation agencies (Figure 5). In addition, the quantity and quality of the information varied widely among respondents.

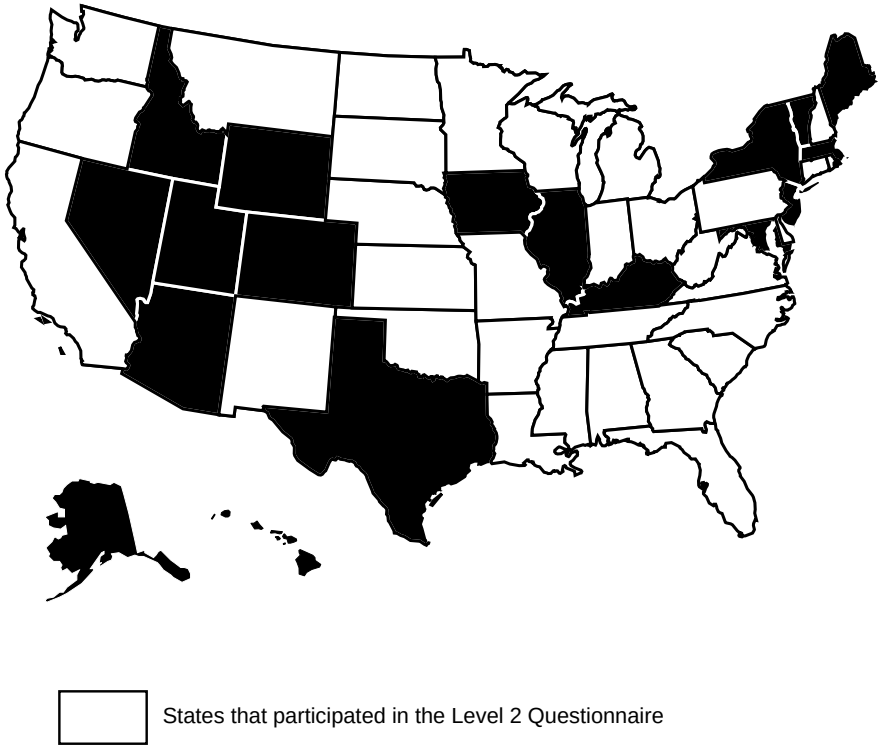


Figure 4: Level 2 Questionnaire Participants (Part A)

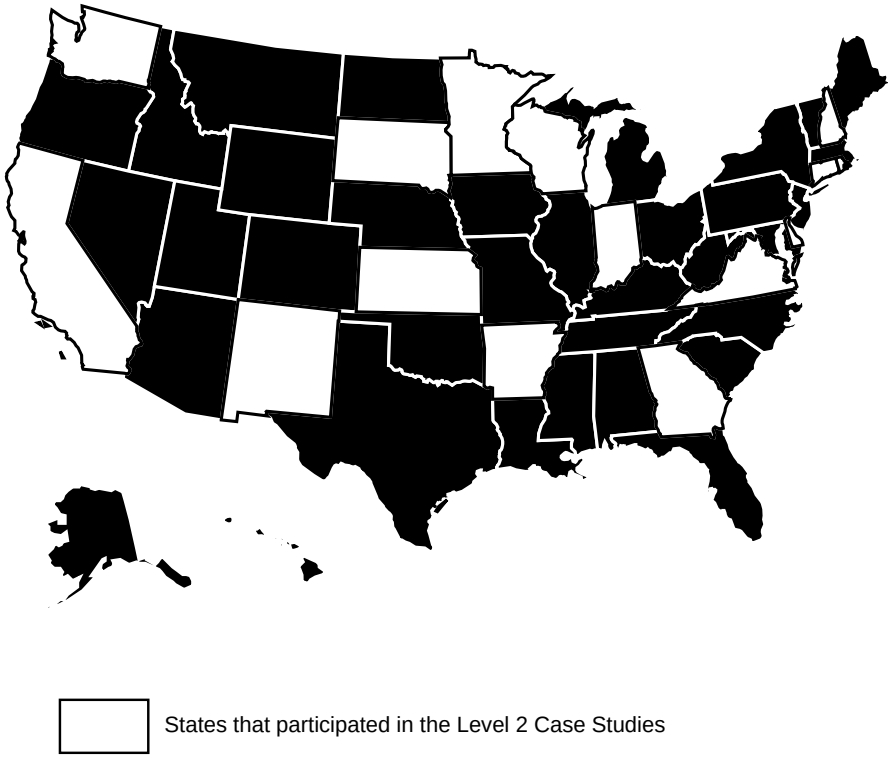


Figure 5: Level 2 Case Study Participants (Part B)

Presentation of State Survey Results

As noted above, many state transportation agencies either did not participate in one or more of the surveys or gave incomplete responses. Therefore, not all fifty states are represented in the following presentations. The limited information obtained from the states neighboring Texas was particularly disappointing. Nevertheless, the states that are presented represent a more complete depiction of wetlands mitigation practices relevant to highway construction than we were able to find in the open literature. (This analysis is presented in the main technical report for this project.)

The information is presented alphabetically by state. Also, the presentation is designed so that each state discussion is an autonomous document that can be read independently of the others. While it can lead to a certain amount of repetition and redundancy in the individual texts, this approach will be problematic only for the Spartan soul who attempts to read the document straight through. (Such readers will find the same presentation problems in dictionaries, encyclopedias, and telephone books.)

The following concepts, words, and terms, when used in this summary, shall have the following meanings unless the context clearly indicates otherwise.

> **Wetlands impact** — The physical or chemical alteration of a wetlands through anthropogenic activity on or near the wetlands.
>
> **Mitigation** — For purposes of Section 404, and consistent with the Council on Environmental Quality regulations, Section 404(b)(1) Guidelines, and the Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines, *mitigation* means sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts.
>
> **Compensatory mitigation** — The restoration, creation, enhancement, and/or preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse anthropogenic impacts. Compensatory mitigation is required after all appropriate avoidance and minimization of wetlands impacts has been achieved.
>
> **Creation** — The establishment of a wetlands or other aquatic resource where one did not previously exist. A distinction is made between *created* wetlands and *constructed* wetlands. The objective of the former is establishment of wetlands where one did not exist for the purpose of providing the ecological function of wetlands, i.e., habitat, nursery, seston or nutrient fluxing, and so forth. The objective of the latter is establishment of wetlands where one did not exist for a nonecological purpose, e.g., waste treatment or flood protection.

Enhancement — Activities conducted in existing wetlands or other aquatic resources that increase one or more aquatic functions.

Restoration — Re-establishment of wetlands or other aquatic resource characteristics and functions where they have ceased to exist.

Preservation — The protection of ecologically important wetlands or other aquatic resources in perpetuity through the implementation of appropriate legal and physical mechanisms. Preservation can include protection of upland areas adjacent to the wetlands as necessary to ensure protection of the aquatic ecosystem.

Out-of-kind compensation — Replacement of a specific wetlands type with wetlands possessing different physical and biological characteristics.

Function — Any number of physical or biological processes that take place in wetlands areas. Commonly recognized functions include food chain production, provision of fish/wildlife habitat, shoreline protection, storm and floodwater storage, groundwater recharge/discharge, and water quality maintenance.

Impact file — A file kept by the developer, in this case a state department of transportation, in either printed or digital format concerning information on their construction project's impact on the wetlands that they are going to alter.

Mitigation file — A file kept by the developer, in this case a state department of transportation, in either printed or digital format concerning information on its efforts to compensate for the wetlands that it has altered during its construction project.

404 permit — The permit required by the federal government and granted by the Environmental Protection Agency through the U.S. Army Corps of Engineers for construction projects in wetlands areas (a section of the federal Clean Water Act).

PREC — An acronym for the four primary strategies of wetlands mitigation: preservation, restoration, enhancement, and creation.

"Receiving input from other agencies" — This phrase is a question from the Level 1 Questionnaire (see Appendix) that seeks to determine if the DOT obtains wetlands information from other federal or state agencies, which would help it in evaluating its construction projects.

"Reorganize and summarize data" — Continuing the above concept, this question asks if the DOT reorganizes and/or summarizes the information obtained from other agencies for use in its wetlands mitigation decision-making process.

Site visit — To obtain wetlands mitigation information from the DOT, one must travel to the DOT's headquarters in person. This situation usually occurs when information is not

organized and the DOT staff does not have time to search all the miscellaneous files in order to gather the specific data that are desired. You, however, are more than welcome to come to their office and conduct the search yourself. This activity was not within the budget of this project.

"Replacement ratios and their basis" — This term describes the amount of wetlands that is used to compensate for the impacted wetlands. It can be simply based on generic wetlands acreage, where a ratio of 2:1 means 2 acres of compensation wetlands are required for every acre of impacted wetlands. The basis for replacement can also be a bit more complex by including a factor based on the type of wetlands, the quality of the wetlands, and/or the mitigation technique (PREC) utilized to decide how many acres must be replaced (i.e., bottomland forests are replaced at a ratio of 4:1, while freshwater marsh is replaced at 2:1; or, high quality wetlands must be replaced at 8:1, while low quality impact ratios are 1:1; or, preservation requires a 10:1 replacement ratio, and restoration requires a 2:1 ratio of compensatory acres to impacted acres). The most difficult concept to base replacement on is the function and value of the wetlands. In this case, it is the replacement of the function that is required regardless of the acreage involved. These mitigation ratios are specific to the DOT and may or may not apply to other developers in a particular state. Each developer who applies for a Section 404 permit enters into a separate Memorandum of Agreement (MOA) with the Corps of Engineers, and these mitigation ratios are specified in that document.

"Percent of the time a mitigation technique is used in wetlands mitigation" — The options are preservation of pristine wetlands, restoration of drained or altered wetlands, enhancement of degraded wetlands, and creation of new wetlands where none existed previously (PREC). A single mitigation project can contain a mixture of these options so that the total percentage of time all of these are used will be greater than 100 percent. An example would be to say that 100 percent of the time restoration is used, preservation 2 percent, and 50 percent for creation and enhancement together. This statement means that restoration is used in every single mitigation project. In addition, the other three options may be utilized to varying degrees.

Alabama Department of Transportation:

Level 1: Organization and Information

The Alabama Department of Transportation (ALDOT) has approximately one hundred wetlands impacts and forty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact, and one mitigation project can compensate for multiple wetlands impacts. ALDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Alabama Department of Environmental Management (ALDEM), the Alabama Game and Fish Department (ALFGD), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS). Impact files contain printed information from delineations, environmental impact statements (EIS), and environmental assessments (EA). Impact data include area, location, type, and extent of impact, as well as the impacted wetland's function and value.

All the DOT permits require mitigation, and mitigation is routinely required and performed for the permits involving wetlands impacts. The strategies utilized by the DOT have included on-site, off-site, and banking. Mitigation files contain information on the area, location, type, and replacement ratio. Printed impact and mitigation information is available by informal written or telephone request, as well as printed summaries. ALDOT has had experience with off-site compensation.

There are two Corps districts with jurisdiction in Alabama — the Nashville District and the Mobile District. The Nashville District covers the areas of Alabama that fall under the Tennessee Valley Authority, while the Mobile District covers the remainder of the state, which is basically southern Alabama. There is one mitigation bank in the Nashville District that covers 80 acres and has been in operation since 1991. For the Mobile District, there is an agreement among all state agencies that a mitigation bank will be established for each of the eleven major watersheds found in this district. To date, three banks have been established. Until the other eight are established, the major watershed areas that are currently without mitigation banks may borrow credits from the three that do exist. However, they may not borrow from the bank in the Nashville District.

ALDOT's wetlands mitigation program is now based entirely on the banking system. The Mitigation Bank Review Team (MBRT) consists of the Memorandum of Agreement (MOA) signatories, which include ALDOT, Federal Highway Administration (FHWA), FWS, EPA, Alabama Department of Conservation and Natural Resources, ALDEM, and the Corps (chair). Wetlands credits are based on acreage in combination with the mitigation technique used (PREC). Two acres of restored wetlands, 3 acres of created wetlands, and 4 acres of enhanced wetlands will each be equal to one Wetlands Credit. The ratio for preservation is determined on a case-by-case basis, with preservation used only for special circumstances.

By this system, one Wetlands Credit will be debited for each impacted acre of wetlands requiring mitigation under the National Environmental Policy Act (NEPA) and/or the Clean Water Act

(CWA). Credit and debit exchange will consist of similar wetlands types. Out-of-kind exchange may occur only with signatory approval and at increased ratios. Upland buffers may be given wetlands mitigation credit when they are important to overall ecosystem functions with case-by-case ratio determinations. Long-range management plans, success criteria, monitoring schedules, and a legally enforceable mechanism for protection of the bank site in perpetuity are required. ALDOT conducts follow-up monitoring with personal evaluations of the mitigation site. When the program first began, agency personnel were simply going out to count the number of trees that survived the process; they are now progressively adopting more sophisticated methods, such as transect analyses. Summaries were requested, and the 1998 Banking Credit/Debit Summary was received from ALDOT, as well as the 1996 MOA for Wetlands Mitigation Banks. In addition, 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by the ALDOT staff and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

For the four established mitigation banks in the Tombigbee, Lower Mobile, Coosa, and Conecuh River Basins, the following table provides summary information from ALDOT's Banking Summary for each bank's credit history, as of 22 January 1998. No information is available within this summary on the mitigation techniques used. Two of these banks are relatively small in size, and, together, slightly more than half of the credits have already been utilized. The other two medium-sized banks only have approximately 15 percent of their credits available for mitigation. It is interesting to note that ALDOT is allowed to borrow credits outside the watershed until new banks can be established in nearby areas.

River Basin	Beginning Credits	Credits Within	Borrowed Credits	Bank Balance
Tombigbee	119.00	7.60	33.01	78.39
Lower Mobile	163.75	3.75	0.00	160.00
Coosa	40.00	10.80	0.50	28.70
Conecuh	32.00	23.34	0.00	8.66
TOTALS:	354.75	45.49	33.51	275.75

The quantity and/or quality of data obtained from the AASHTO and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by ALDOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the summary data provided show that enhancement was ALDOT's favored choice for mitigation. It was utilized approximately 1.5 times as often as restoration and more than twice as often as creation. Preservation was not utilized at all from 1991 through 1994. The 1998 survey demonstrates the more organized trends of exclusively using banks. Restoration and enhancement are utilized in every case, and creation has approximately the same relative use rate. Preservation has now become a viable option for mitigation; however, it is used relatively infrequently.

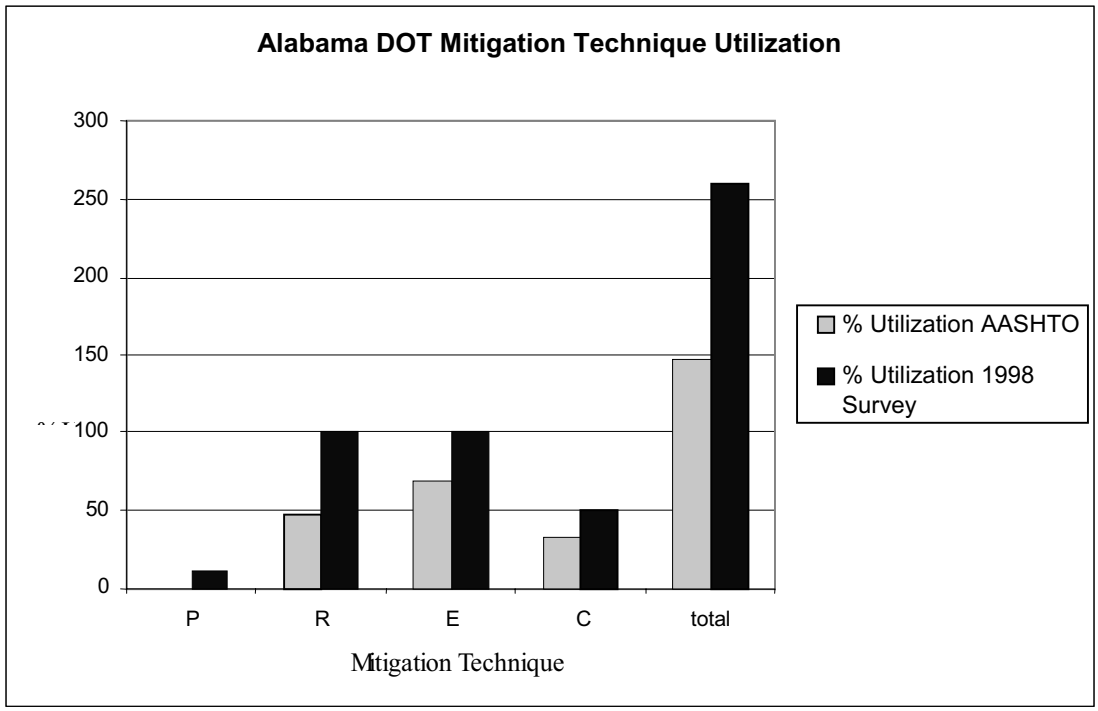
The summary data also show that, for mitigation proximity, banking was used more than 2.5 times as often as off-site mitigation; there was also approximately 13 times more mitigation than on-site mitigation between 1991 and 1994. The 1998 survey demonstrates ALDOT's conversion to exclusively using mitigation banks.

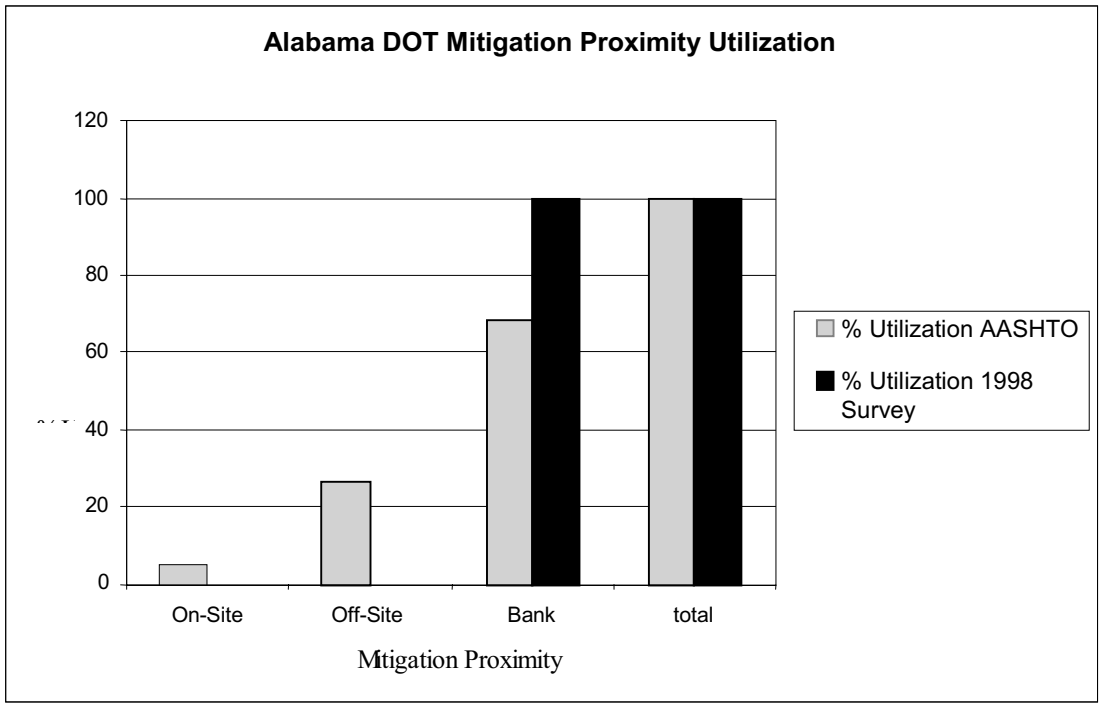
The table and two charts provided below illustrate these ALDOT trends.

total # mitigation projects AASHTO 1993 & 1995	19
total # acres impacted 1993 & 1995	47.20
average # acres impacted per project '93 & '95	2.48
total # acres mitigated '93 & '95 (10 projects)	38.70
average replacement ratio '93 & '95 (10 projects)	2.05

	P	R	E	C	total
% Utilization AASHTO	0	47.37	68.42	31.58	147.37
% Utilization 1998 Survey	10	100	100	50	260

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	5.26	26.32	68.42	100
% Utilization 1998 Survey	0	0	100	100


Alabama DOT Mitigation Technique Utilization
300
250
200
150
100
50
0
P
R
E
C
total
% Utilization AASHTO
% Utilization 1998 Survey
Mitigation Technique


Alabama DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
On-Site
Off-Site
Bank
total
% Utilization AASHTO
% Utilization 1998 Survey
Mitigation Proximity

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to ALDOT for wetlands mitigation. The preference ranking is R and E, then C, and finally P. Economics is the deciding factor between R and E, and all projects include at least R or E. Together they have been used 100 percent of the time. Mitigation projects can utilize a mixture of PREC; as such, creation has been utilized 50 percent and preservation 10 percent of the time in wetlands mitigation. Off-site mitigation is desired and actually used by the DOT 100 percent of the time because of its exclusive use of mitigation banking. The wetlands mitigation banks also have allowed for 100 percent in-kind replacement.

As stated in the MOA between the Corps and ALDOT, the replacement ratios are based on acreage in combination with the mitigation technique used (PREC). The DOT is satisfied with this method of ratio determination and intends to stay with this, as opposed to going to a function/value system. The unofficial ratio for preservation replacement has been 10:1. The DOT contact stated that ratios were not specified in the MOA, but rather were agreed upon unofficially. However, the MOA does give ratios for restoration, creation, and enhancement. Only the ratio for preservation is unofficial. The primary agency involved in the mitigation negotiation process is the USACE, followed by the FWS (to a much smaller degree). It is estimated that less than 5 percent of the time ALDOT submits a mitigation plan that differs from agency expectations, and of these ALDOT's plan overrides 90 percent of the time. The Corps resolves any conflicts between the signatory agencies and ALDOT. Agencies seldom request changes to ALDOT's mitigation plan because ALDOT is utilizing the mitigation banking system and is also getting agency input at the very early proposal stage before buying land.

Replacement Ratios

Preservation	10:1	Restoration	2:1
Enhancement	4:1	Creation	3:1

ALDOT's mitigation plan design methods employ mainly precedence, but when problems arise, the plan incorporates innovative ideas. As an example, when a problem arose with beavers destroying newly planted trees, ALDOT decided to raise the trees in protective tubes. Wetlands type does not affect the design methods utilized. ALDOT purchases enough land to have many wetlands types occur in the bank area; therefore, all impacts are taken care of. ALDOT considers the effects of proximity to development on mitigation to be profound, and that this type of mitigation is a waste of time. Utility trucks drive through the mitigation sites to maintain equipment in the area; public trespassing associated with fishing is common.

The Alabama DOT currently has a fairly subjective monitoring program in place; however, it is trying to make it more scientific by using test plots and transects. ALDOT is also in the process of obtaining a new computer program that will track and compare data over time. This program, entitled Land Condition — Trend Analysis (LCTA), is a Microsoft Access database program used for inventory, monitoring, and evaluation of natural resources on army lands.

Access LCTA takes full advantage of the Windows environment in producing a very user-friendly program. Land managers can collect, store, retrieve, and analyze such data as topographic features, soil characteristics, climatic variables, vegetation, and wildlife information. Some of the analyses currently available in this application include land use summaries, ground disturbance summaries, ground cover summaries, cover summaries, woody vegetation summaries, Universal Soil Loss Equation (USLE) calculations, diversity indexes, power analysis, and plot summaries. Most of these analyses can be performed in a variety of ways, including analyzing all years together or one specific year, including or excluding special use plots, and summarizing by a user-defined grouping variable. All errors found during the analysis process are reported. These errors can be easily corrected by navigating to the relevant data management modules. The results of the analysis are displayed in a separate window, with options for printing, exporting, and transforming the data. Transforming the data presents the same results in a matrix view, allowing the user to compare multiple years of data easily. In addition, some analyses can be displayed as charts and tables.

An essential part of using the LCTA data is data management. Unlike the original version of the LCTA Program Manager, Access LCTA includes a data management module. This module assists the user in finding and correcting missing or invalid data. Tasks available in this module include VegID correction, land use value correction, ground disturbance value correction, LCTA plot metadata, check tables for missing plots, check tables for missing data, check tables for null values, open tables, update local species lists (PlntList and VertList), export the entire database, and load handheld data files (new in version 1.0 beta 2). The LCTA software can be downloaded, along with documentation, from the website for the Center for Ecological Management of Military Lands (CEMML) at Colorado State University (www.cemml.colostate.edu).

The Alabama DOT considers its biggest obstacle in wetlands mitigation to be the site location process. Successfully finding and developing suitable sites while dealing with five different agencies in the MBRT with each having different goals and expectations is extremely difficult. ALDOT did not offer any suggestions on process improvement, however. The Alabama DOT utilizes mitigation banks exclusively; therefore, the agency's staff do not consider the case study portion of the survey to be applicable to their situation.

Alaska Department of Transportation:

Level 1: Organization and Information

The Alaska Department of Transportation (Alaska DOT) has approximately sixty wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The Alaska DOT receives input from consultants, the Alaska Department of Fish and Game (DFG), the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS). Impact files containing information on delineations are maintained in printed form. Impact data include area, location, type, and extent of impact, function, and quality. While mitigation is occasionally performed for wetlands impacts, it is unknown what percentage of the Alaska DOT's permits require mitigation. The Alaska DOT recently completed a highway project without obtaining the necessary permits from the Corps, for which it was reprimanded. To date, Alaska has impacted less than one-tenth percent of its wetlands statewide, so the Corps is lenient about granting a permit, as long as the proper application for a permit is submitted.

The Alaska DOT is rarely required to mitigate impacts, except when high quality, especially emergent wetlands, are impacted. No information was provided on the mitigation types and strategies utilized. Mitigation data include area, location, and wetlands type. Printed impact and mitigation information is accessible by site visit; however, no summaries are available from the Alaska DOT. The Alaska DOT conducts follow-up monitoring, which varies widely among projects.

The Alaska DOT has had experience in off-site compensation and is looking into the possibility of developing a mitigation bank, though a site has not yet been located.

Arizona Department of Transportation:

Level 1: Organization and Information

The Arizona Department of Transportation (ADOT) has approximately 200 wetlands impacts and five mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and that one mitigation project can compensate for multiple wetlands impacts. The Arizona DOT receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Arizona Game and Fish Department (AGFD), the Arizona Historic Preservation Office (AHPO), and the U.S. Fish and Wildlife Service (FWS). The FWS simply sends a list of species found in the impacted area unless the project is unusual in some way and requires more input. Impact files are maintained in printed form. Impact data depend on the project and can include environmental assessments (EA), environmental impact statements (EISs), categorical exclusions, as well as biological and cultural information.

Less than 5 percent of the Arizona DOT's permits require mitigation, and mitigation is routinely performed for the permits involving wetlands impacts (i.e., few of the DOT's total number of construction projects involve wetlands impacts). On-site and in-kind options are the main strategies utilized. The department does not have experience with off-site mitigation. Mitigation data include vegetation composition, coverage, density, and soils data. Printed impact and mitigation information is accessible by mail or telephone request; however, no summaries are available from ADOT. Follow-up monitoring consists of reviewing mitigation areas and monitoring on larger projects.

Arkansas State Highway and Transportation Department:

Level 1: Organization and Information

The Arkansas State Highway and Transportation Department (AHTD) did not formally fill out the Level 1 Questionnaire. No summaries are available, and their biologist is too busy to put one together. Printed copies of the American Association of State Highway and Transportation Officials (AASHTO) surveys for 1993 and 1995 were provided to this study by the AHTD, as were printed AHTD internal mitigation site listings (1989–1998) that contain the same information as the AASHTO surveys.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey and summary data (1989–1998) provided by the AHTD and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the AHTD during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The AHTD summary contains data from 1989 to 1998; the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that enhancement was utilized by the AHTD only slightly more than creation. Restoration and preservation were not utilized at all from 1991 through 1994. The AHTD summary data, by stark contrast, showed that restoration was utilized almost 10 times more than enhancement and greater than 2 times more than creation. In addition, this summary showed that preservation was a viable option, which was utilized slightly more than enhancement. The 1998 survey gave results that were similar to the AHTD summary — the favored choice for mitigation was restoration, which was utilized 3 times more than creation or enhancement and 60 times more than preservation.

The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was used approximately 1.5 times more than on-site mitigation and that banking was not utilized at all between 1991 and 1994. The AHTD summary data, by contrast, showed that banking was a viable option and that on-site was the favored choice 1.5 times more often than off-site and 2 times more often than banking. The 1998 survey demonstrates yet another trend in which banking was the favored choice, having been utilized 3 times more often than on-site or off-site mitigation.

The table and two charts provided below illustrate these AHTD trends.

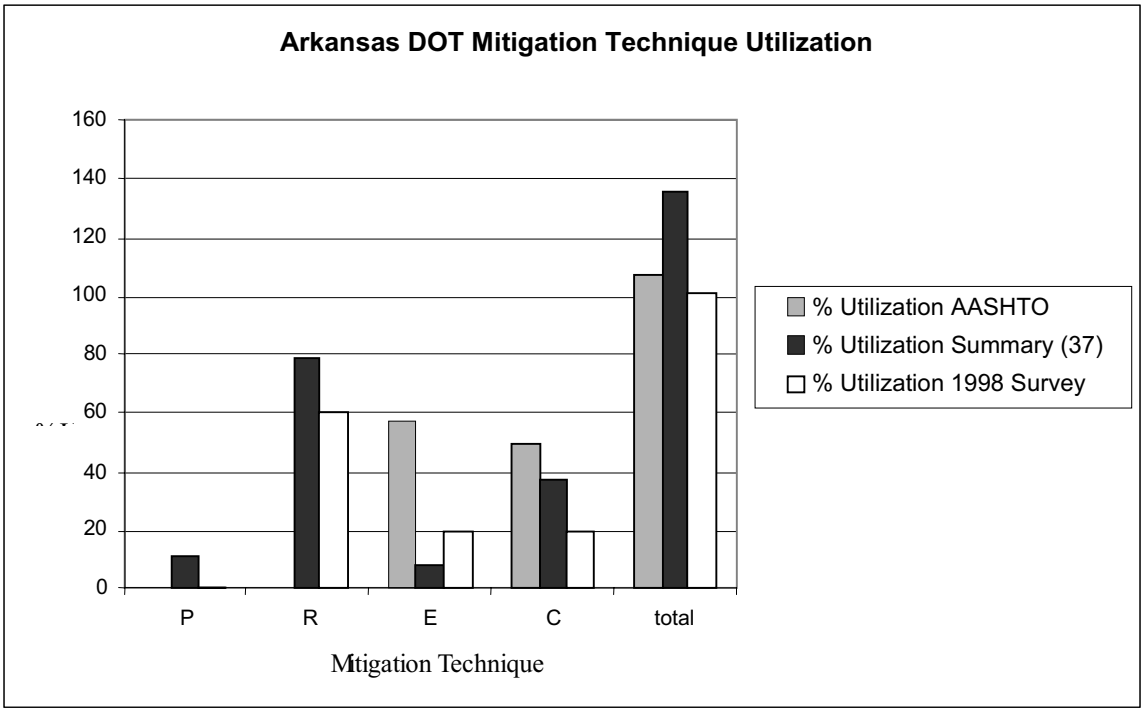
total # mitigation projects AASHTO 1993 & 1995	14
total # acres impacted 1993 & 1995	169.50
average # acres impacted per project '93 & '95	13.04
total # acres mitigated '93 & '95 (14 projects)	257.00
average replacement ratio '93 & '95 (13 projects)	1.52
total # mitigation projects Summary Arkansas Files	77
total # acres impacted Ark. Files (27 projects)	287.19
average # acres impacted per project Ark. Files	10.64
total # acres mitigated Ark files (62 projects)	871.60
average replacement ratio Ark files (34 projects)	1.80

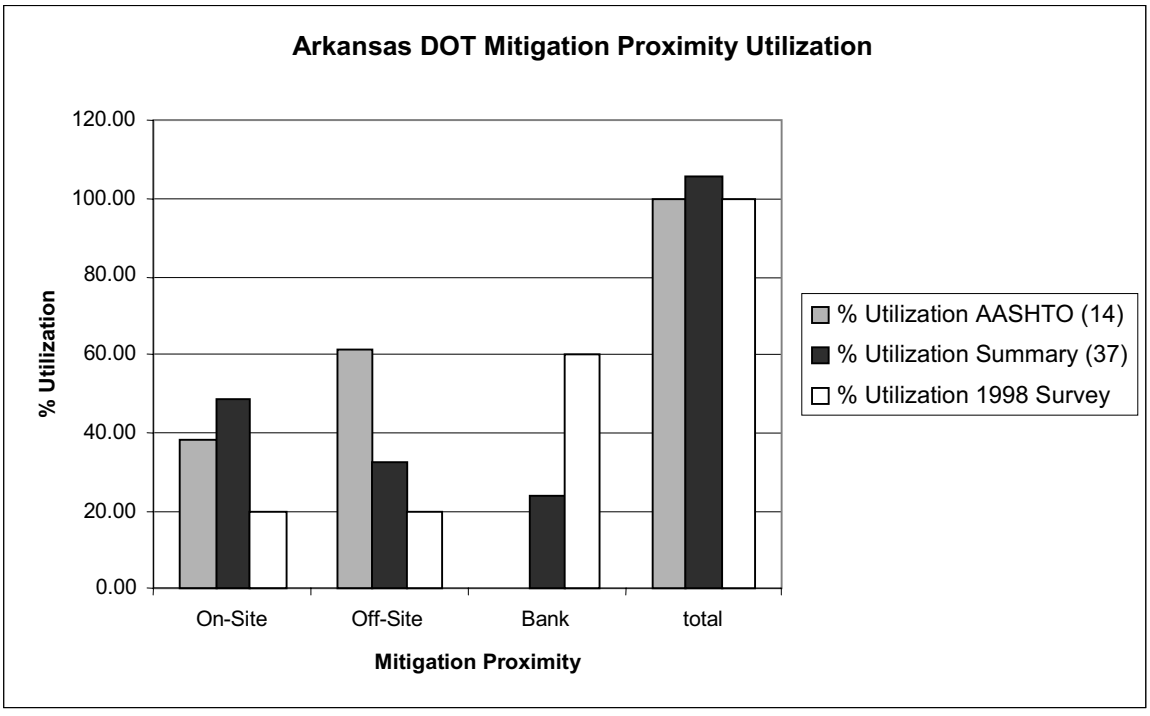
	P	R	E	C	total
% Utilization AASHTO	0	0	57.14	50.00	107.14
% Utilization Summary (37)	10.81	78.38	8.11	37.84	135.14
% Utilization 1998 Survey	1	60	20	20	101

	On-Site	Off-Site	Bank	total
% Utilization AASHTO (14)	38.46	61.54	0	100
% Utilization Summary (37)	48.65	32.43	24.32	105.41
% Utilization 1998 Survey	20	20	60	100

Level 2, Part A: Processes and Methodologies

The AHTD cannot use all four of the recognized mitigation options (PREC) for wetlands mitigation because the three U.S. Army Corps of Engineers districts within the state generally no longer accept preservation. The preference ranking is R, C, and then E. The relative percentage of time each mitigation technique is utilized by the AHTD for wetlands mitigation is as follows: restoration 60 percent, creation and enhancement 50 percent, and preservation less than 1 percent. A mixture of REC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.


Arkansas DOT Mitigation Technique Utilization
160
140
120
100
80
60
40
20
0
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization Summary (37)
% Utilization 1998 Survey


Arkansas DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO (14)
% Utilization Summary (37)
% Utilization 1998 Survey

Off-site mitigation is desired 85 percent of the time and is actually used by the AHTD 80 percent of the time. Out-of-kind replacement is desired and used approximately 45 percent of the time. The U.S. Environmental Protection Agency (EPA) has recently started limiting wetlands mitigation bank and multiproject service areas so that mitigation is not far from the site of impact. Out-of-kind replacement is not an issue with the regulators, but higher replacement ratios are required. The AHTD often impacts old borrow ditches that are palustrine emergent wetlands, but that have only palustrine forested sites to offer for mitigation. The replacement ratios are based on acreage in combination with the lost wetlands types. Perceived function and value lost are translated into mitigation ratios that determine the acreage of mitigation required. The wetlands type replacement ratios in general are 1:1 emergent, 1:1 scrub/shrub, and 2–3:1 forested. Larger multiproject mitigation areas and banks are monitored annually for success criteria consisting primarily of re-establishment of target wetlands plant communities.

The primary agency involved in the mitigation negotiation process is the Corps, and the AHTD enters into negotiations with it very early to avoid delays. It is estimated that less than 10 percent of the time the AHTD submits a mitigation plan that differs from the agency's expectations, and of these times, the AHTD's plan is accepted 50 percent of the time, requiring only minor changes. The other 50 percent of the time, the plans are basically unacceptable because of excessive preservation proposals or because of the excessive distance between location and the impact site. The AHTD could remember only one project that was preservation heavy that did not move to final approval. The Corps resolves any conflicts between the signatory agencies and the AHTD.

The AHTD's design methods rely mostly on field surveys and best professional judgment (BPJ) to construct a common sense mitigation plan that recreates and re-establishes natural conditions for the project area. The more complicated the plan, the more room for error and failure. Wetlands type does not affect the design methods utilized by the AHTD. It tries to find areas that have been degraded but that still have hydrology intact. These areas are then replanted with native wetlands vegetation. Proximity of the mitigation site to development does affect the success of the mitigation project. Public misuse of restricted high-wildlife areas close to urbanization is common because of the desire to hunt and fish.

The AHTD considers its biggest obstacle in wetlands mitigation to be the site location process. Finding suitable sites with willing sellers takes a long time, and with the new reduced service areas for banks, success in some parts of the state is particularly difficult. Early establishment of bank sites seems to be the only solution, along with acquiring large tracts of land when available to decrease the frequency of the process. Four Level 2 case studies were provided to this study: one bank, one off-site multiproject area, one on-site mitigation project, and one combination strategy. These are summarized in the section Level 2, Part B: Case Studies, below.

Level 2, Part B: Case Studies

State DOT	Arkansas	**Entry#**	1
Project Name	Northbelt Fwy (Hwy 67/I 40 East and West)		
Permit Type	individual		
Impact Location	various wetlands complexes in Arkansas River Floodplain		
Impact County	Pulaski		
Type of Impact	elimination	**Acres Impacted**	70.5
Type of Impact Notes	70.5 = 57 ac permanent, 13.5 ac temporary from clearing WL, permanently filling WL, permanent bridging and maintaining WL, and temporary filling wetlands		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal w/perennial
Impact WL Dominant Type	forested, scrub/shrub	**Impact WL Value**	high
Construction Start Date	May 88	**Construction Completion (months)**	on-going
Construction Project Cost ($)	80,000,000		
Construction Cost Notes	construction costs are estimates as construction is on going and proposed for the future		
Mitigation Location	Rixey Bayou Multi-Purpose Mitigation Area; site c rosses Hwy 67/I 40 E and is w/in 10 miles of I 40 W impacts		
Mitigation County	Pulaski		
PREC	R, E, C		
PREC Notes	mitigation area w/in same drainage as all above impacts		
Mitigation Proximity	on-site and off-site	**Type of Replacement**	in-kind
Acres Mitigated	84.5	**Replacement Ratio Calculation**	1.20
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal w/perennial
Mit WL Dominant Type	forested, some open water	**Mit WL Value**	high
Mitigation Start Date	Nov 93	**Mit Completion (months)**	on-going
Lagtime Impact/Mitigation Completion Calculation (months)			120+
Mitigation Project Cost ($)	260,000		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	not specified	**Monitoring Frequency (months)**	irregular
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	outstanding wildlife utilization values; some problems have been encountered with vegetation establishment and public trespassing; vegetation establishment is being monitored and supplemented as needed (see Ark.mit.plan report for details)		

State DOT	Arkansas	**Entry#**	2
Project Name	White River Bridge and approaches (Augusta, DeValls Bluff, and Clarendon)		
Permit Type	individual		
Impact Location	White River at Augusta, AR (US Hwy 64); at DeValls Bluff (US Hwy 70); at Clarendon, AR (US Hwy 79)		
Impact County	Woodruff, Prairie, and Monroe		
Type of Impact	elimination	**Acres Impacted**	110
Type of Impact Notes	Augusta: 11 ac perm. fill, 4 ac excavated; DeValls: 2.5 ac perm. fill, 2.5 ac cleared; Clarendon: 30 ac cleared/bridged, 60 ac perm. fill		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial and seasonal
Impact WL Dominant Type	forested, open water, farmed	**Impact WL Value**	medium to high
Construction Start Date	Mar 98	**Construction Completion (months)**	on-going
Construction Project Cost ($)	59,000,000		
Construction Cost Notes	estimated costs: Augusta = $18M; DeValls = $14M; Clarendon = $27M.		
Mitigation Location	Brushy Lake Mitigation Bank Site (off-site)		
Mitigation County	Monroe		
PREC	R, E, P		
PREC Notes	area mit (total so far=42 ac; at 2.1:1 estimate total = 231 ac).: Augusta=28 ac, DeValls=14 ac, Clarendon=to be determined; ratios (avg. so far=2.1:1): Augusta - 2:1 forested, 1.5:1 OW; DeValls - 2.8:1; Clarendon - to be determined		
Mitigation Proximity	bank	**Type of Replacement**	in-kind
Acres Mitigated	231	**Replacement Ratio Calculation**	2.10
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal and perennial
Mit WL Dominant Type	forested, open water	**Mit WL Value**	high
Mitigation Start Date	spring 96	**Mit Completion (months)**	42
Lagtime Impact/Mitigation Completion Calculation (months)	0 (advanced mitigation)		
Mit Project Cost ($)	325,000		
Mitigation Cost Notes	$435K estimated for bank (total site is 320 ac, but only 309 ac eligible for WL mit. credit)		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	yes
Mitigation Success Notes	monitor annually for 5 yrs, then every 3 yrs as necessary; will replant tree seedlings as necessary to meet density requirements of mit. plan (see Ark.mit.plan report for details)		

State DOT	Arkansas	**Entry#**	3
Project Name	Pine Bluff Bypass		
Permit Type	individual		
Impact Location	Bayou Bartholomew floodplain, Pine Bluff, AR		
Impact County	Jefferson		
Type of Impact	elimination	**Acres Impacted**	35
Type of Impact Notes	permanent clearing and conversion to roadway, bridge and ROW; 33 ac perm. clear/fill; 2 ac cleared but allowed to revert to WL		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal w/perennial
Impact WL Dominant Type	scrub/shrub, open water, forested	**Impact WL Value**	medium
Construction Start Date	Nov 88	**Construction Completion (months)**	120
Construction Project Cost ($)	105,000,000		
Construction Cost Notes	n/a		
Mitigation Location	4 sites in the Bartholomew Drainage adjacent to construction: Nevins Creek=61 ac, Bobo=37 ac, Bayou Imbeau=47 ac, Brown=66 ac		
Mitigation County	Jefferson		
PREC	C, R		
PREC Notes	mitigation on-going, estimate total 108 months to complete project		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	140	**Replacement Ratio Calculation**	4.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal w/perennial
Mit WL Dominant Type	forested, open water	**Mit WL Value**	high
Mitigation Start Date	Mar 91	**Mit Completion (months)**	108
Lagtime Impact/Mitigation Completion Calculation (months)	144		
Mit Project Cost ($)	370,000		
Mitigation Cost Notes	see attached mit. plan for details		
Mit Site Monitoring Time Period (yr)	none required	**Monitoring Frequency (months)**	n/a
Mitigation Successful	yes and no	**Further Mit Required**	yes
Mitigation Success Notes	do visual monitor of tree plantings w/augmentation as needed; Bobo site extremely successful for hydrology and percent cover; Imbeau site not as successful - planned forested, but elevations too low and will be aquatic bed w/some OW (see mit. plans for details)		

State DOT	Arkansas	**Entry#**	4
Project Name	Maumelle Boulevard Widening		
Permit Type	individual		
Impact Location	Arkansas River floodplain, White Oak Bayou		
Impact County	Pulaski		
Type of Impact	elimination	**Acres Impacted**	8
Type of Impact	wetlands cleared and converted to hwy and ROW; 12 ac cleared, 8 of these permanent fill		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forested	**Impact WL Value**	medium
Construction Start Date	Jan 90	**Construction Completion (months)**	33
Construction Project Cost ($)	3,800,000		
Construction Cost Notes	n/a		
Mitigation Location	Morgan Interchange, I-40	**Mitigation County**	Pulaski
PREC	R	**PREC Notes**	n/a
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	8	**Replacement Ratio Calculation**	1.00
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	forested	**Mit WL Value**	medium
Mitigation Start Date	Jan 90	**Mit Completion (months)**	73
Lagtime Impact/Mitigation Completion Calculation (months)	73		
Mit Project Cost ($)	12,000		
Mitigation Cost Notes	costs were for vegetation establishment only, acreage was already owned by DOT		
Mit Site Monitoring Time Period (yr)	none required	**Monitoring Frequency (months)**	n/a
Mitigation Successful	no	**Further Mit Required**	yes
Mitigation Success Notes	Corps reviewed mit. area after establishment and was not satisfied that WL hydrology was present. The DOT decided to offer mitigation at another site to appease the Corps.		

California Department of Transportation:

Level 1: Organization and Information

The California Department of Transportation (Caltrans) has approximately fourteen wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. Caltrans does maintain impact and mitigation files. It is developing a Microsoft Access database on wetlands and other habitat mitigation efforts within the agency. While there is limited access, the information can be mailed by diskette or e-mailed as a Microsoft Excel for Windows file.

Mitigation data are organized geographically by district. This is an unusual filing system because only the project number organizes most other states' mitigation files. Some printouts of summaries have been prepared and may be made available on loan. Some annual follow-up monitoring is conducted for the mitigation sites.

Caltrans does have experience with off-site mitigation. A few banks are operational, and several others are in the planning stage. Digital impact and mitigation data and mitigation summaries are available by informal written or phone request, and Microsoft Access files were provided to this study by Caltrans on diskette. In addition, 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data (1986–1997) provided by Caltrans and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the California Department of Transportation during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The Caltrans summary contains data from 1986 to 1997; and the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was utilized by Caltrans approximately 2.5 times more often than restoration and 7 times more often than enhancement. Preservation was not utilized at all between 1991 and 1994. The Caltrans summary data, by contrast, showed that restoration was the favored choice and was utilized almost 1.25 times more than creation and approximately 1.75 times more than enhancement. In addition, this summary showed that preservation was a viable option, which was utilized half as often as enhancement. The Caltrans staff did not complete this section of the 1998 survey.

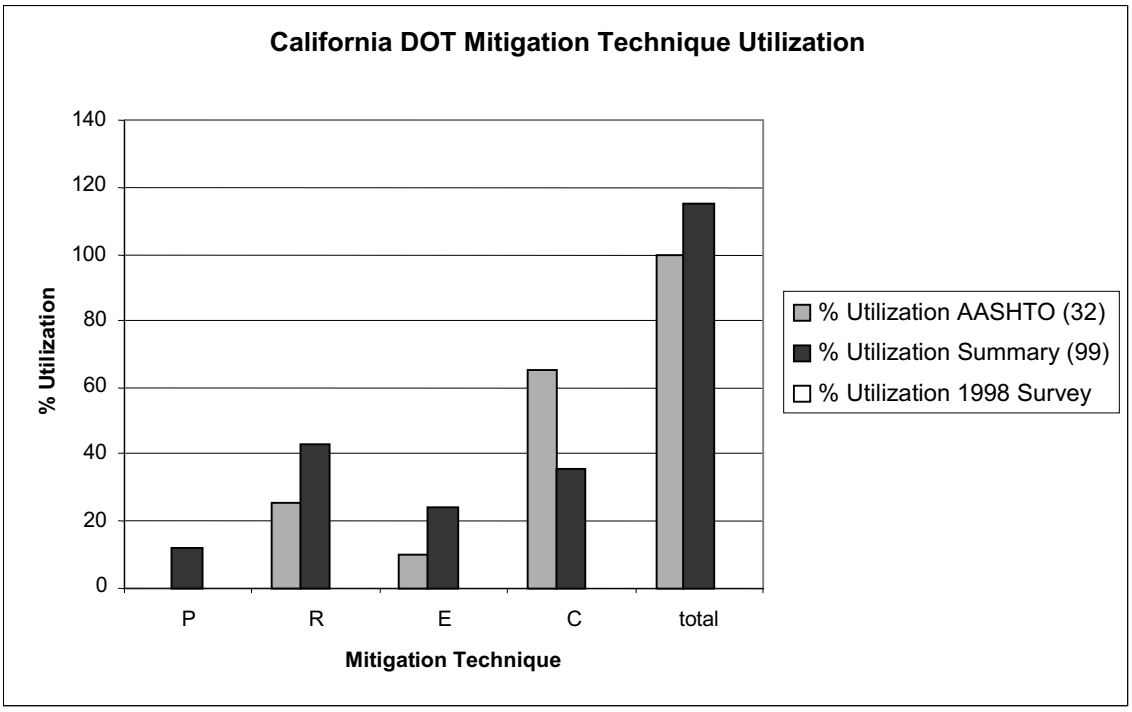
The AASHTO summary data also showed that, for mitigation proximity, on-site mitigation was used approximately 2 times more often than off-site mitigation and that banking was not utilized at all. The Caltrans summary data, by contrast, showed that on-site and off-site had similar usage rates. In addition, this summary showed that banking was a viable option but was utilized infrequently. The Caltrans staff did not complete this section of the 1998 survey.

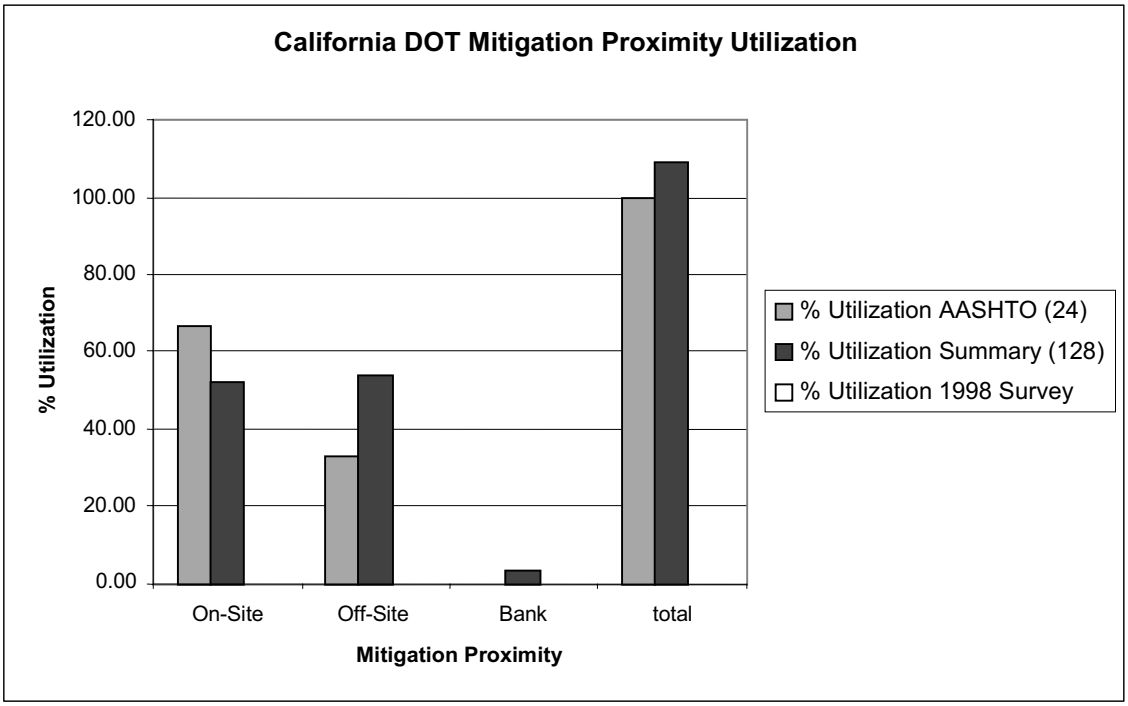
The table and two charts provided below illustrate these Caltrans trends.

total # mitigation projects AASHTO 1993 & 1995	36
total # acres impacted '93 & '95 (16 projects)	24.73
average # acres impacted/project '93 & '95	1.55
total # acres mitigated '93 & '95 (24 projects)	193.53
average replacement ratio '93 & '95 (16 projects)	2.03
total # mitigation projects Summary California Files	132
total # acres impacted CA files (107 projects)	243.00
average # acres impacted per project CA files	2.27
total # acres mitigated CA files (83 projects)	2240.00
average replacement ratio CA files (77 projects)	2.26

	P	R	E	C	total
% Utilization AASHTO (32)	0	25	9.38	65.63	100
% Utilization Summary (99)	12.12	43.43	24.24	35.35	115.15
% Utilization 1998 Survey	NA	NA	NA	NA	NA

	On-Site	Off-Site	Bank	total
% Utilization AASHTO (24)	66.67	33.33	0	100
% Utilization Summary (128)	52.34	53.91	3.13	109.38
% Utilization 1998 Survey	NA	NA	NA	NA


California DOT Mitigation Technique Utilization
140
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO (32)
% Utilization Summary (99)
% Utilization 1998 Survey


California DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO (24)
% Utilization Summary (128)
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

The primary agencies involved in the mitigation negotiation process are the Corps, FWS, EPA, the California Department of Fish and Game (CaDFG), and the San Francisco Bay Conservation and Development Commission (SFBCDC). Preservation, restoration, enhancement, and creation (PREC) are all viable options available to Caltrans for wetlands mitigation. The preference ranking is R, C, E, and then P. In certain situations, enhancement can rank higher than creation. Preservation alone is not allowed by the Corps districts. It becomes an additional option only after the other three mitigation techniques replace the lost function and value. No information was given regarding the relative percentage of time that each technique is utilized by Caltrans for wetlands mitigation.

Off-site mitigation is desired 50 percent of the time and out-of-kind replacement is desired less than 10 percent of the time; however, no information was available regarding the actual frequencies with which they are used. Caltrans notes that if off-site requires land purchase, it is not an attractive strategy. Overall, however, off-site is a more popular alternative. No information was provided concerning replacement ratios.

It is estimated that less than 50 percent of the time Caltrans submits a mitigation plan that differs from the agency expectations; when these differences occur, Caltrans' plan overrides 80 percent of the time, requiring only minor changes. The Corps resolves any conflicts between the signatory agencies and Caltrans.

Caltrans' design methods are highly variable and project-specific. These methods can consist of using science, precedence, site surveys, special-purpose field studies, functional assessment and quantification, and/or modeling. Wetlands type does not affect the design methods utilized by Caltrans. No information was available on the effects of proximity to development on the success of the mitigation project. Follow-up monitoring seems to be the responsibility of the regulatory agencies and has been limited because the regulatory agencies are understaffed. However, the FWS has done spot checking. This process is anticipated to improve soon. The Corps' requirements for mitigation vary from flexible to demanding, depending on the district in charge.

Caltrans did not respond to the biggest obstacle in the mitigation process and improvement suggestions topics. Currently, Caltrans is becoming very involved in setting up a geographic information system/Access database system, and participating in the Access-based Level 2 Questionnaire of this study has helped them make decisions on format and information issues. The one Level 2 case study provided to this study is summarized in the section Level 2, Part B: Case Studies, below.

Level 2, Part B: Case Studies

State DOT	California	**Entry#**	1
Project Name	52 East, Mission Trails Park		
Permit Type	individual		
Impact Location	Along SD-52, noise and bridge footprint		
Impact County	San Diego		
Type of Impact	modification	**Acres Impacted**	10
Type of Impact Notes	Fill and noise, least Bells vireo (endangered sp.)		

Impact WL Classification	riverine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	riparian	**Impact WL Value**	high (unique, full function)
Construction Start Date	n/a	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	nearby park		
Mitigation County	San Diego		
PREC	n/a		
PREC Notes	Fill and noise, least Bells vireo (endangered sp.)		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	60	**Replacement Ratio Calculation**	6.00
Mit WL Classification	riverine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	riparian	**Mit WL Value**	high (unique, full function)
Mitigation Start Date	Nov 89	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	8,300,000		
Mitigation Cost Notes	grading, planting		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	Won award. Dense planting for nesting habitat.		

Connecticut Department of Transportation:

Level 1: Organization and Information

The Connecticut Department of Transportation (CTDOT) has approximately one hundred wetlands impacts and ten mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. CTDOT receives input from consultants but not from other agencies. It does not summarize or reorganize information from other agencies. CTDOT maintains impact files consisting of delineation information, such as soils, hydrology, wildlife, plants, boundaries, as well as function and value. Printed impact information and summaries are available by phone request. There is a database from which they work and also a spreadsheet containing project, impact, and mitigation information for the past 1.5 years. Approximately 10 percent of CTDOT's construction permits require mitigation, and mitigation is routinely performed for the permits involving wetlands impacts. Information pertaining to a permit is maintained in files and is available by phone request. No summaries are available. The data consist of area, location, replacement ratio, and site data on soils, hydrology, plants, and wildlife.

Both on-site and off-site mitigation strategies are employed by CTDOT. If mitigation on-site is not possible, then mitigation off-site but in the same watershed is attempted. If that is not possible, then mitigation off-site and in a different watershed will be performed. CTDOT monitors mitigation sites for 5 years after construction. Monitoring generally consists of only qualitative reports with photographs; however, water monitoring, plant counts, and site inspections for viability may also be conducted. CTDOT does have experience with off-site mitigation; however, it does not have a mitigation banking program and at this time it is not interested in developing one. This is due to concerns about how the bank would be administrated and to the agency's past experiences with the Corps and FWS on these types of issues.

Summary printouts of twenty to twenty-five projects were requested and provided by CTDOT for use in this study; additional notes for on-/off-site mitigation were added separately. In addition, 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data provided by CTDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by CTDOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The CTDOT summary contains data from an unspecified time

period; the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was utilized by CTDOT approximately 5 times more often than preservation. Restoration and enhancement were not utilized at all from 1991 through 1994. The CTDOT summary data also showed that creation was the favored strategy of mitigation and was used 8 times more often than preservation; however, in this summary restoration and enhancement were both viable options. Creation was utilized almost 4.5 times and 17.5 times more than restoration and enhancement, respectively. The 1998 survey demonstrated a trend similar to that found in the CTDOT summary data.

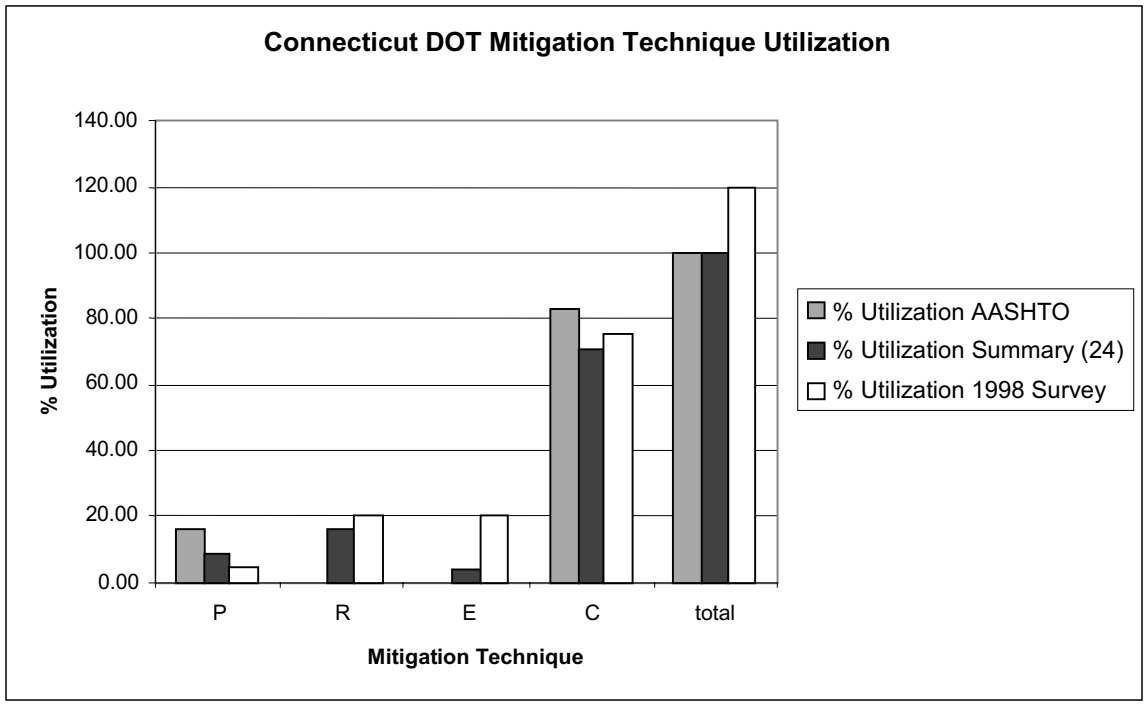
The AASHTO summary data also showed that for mitigation proximity on-site and off-site mitigation were each used half of the time and no projects involved banking between 1991 and 1994. The CTDOT summary data showed a higher rate of usage for on-site mitigation, which was 3 times greater than off-site mitigation. This summary also showed that banking was not utilized at all. The CTDOT staff did not complete this section of the 1998 survey.

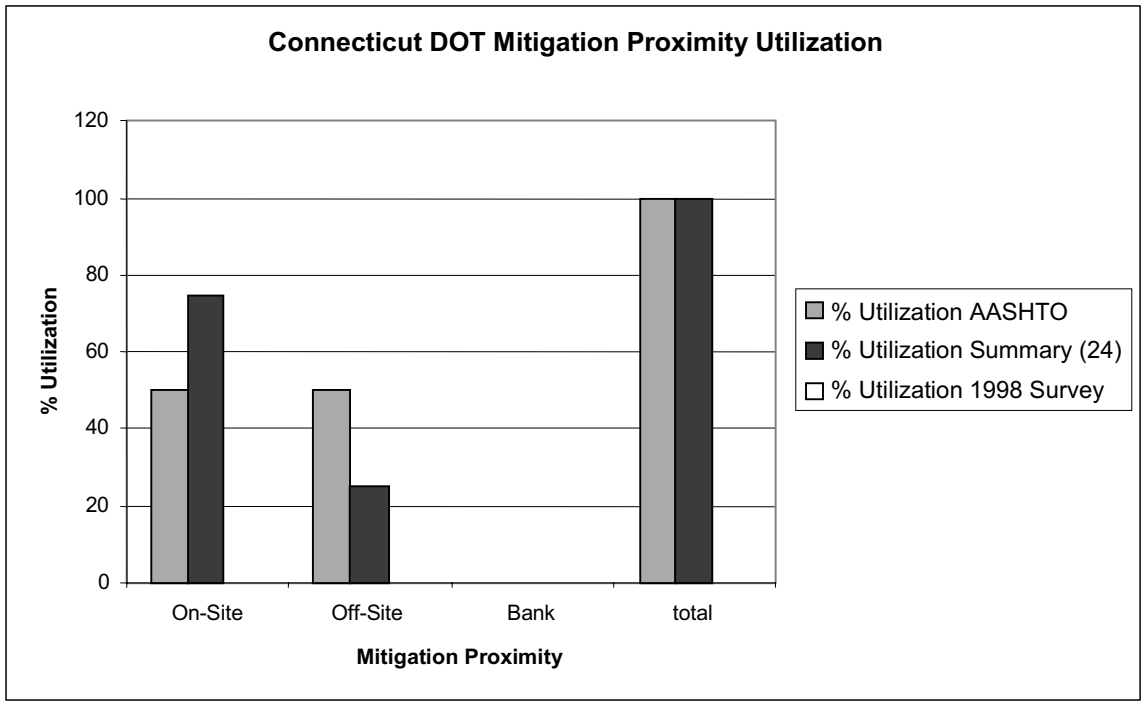
The table and two charts provided below illustrate these CTDOT trends.

total # mitigation projects AASHTO 1993 & 1995	6
total # acres impacted '93 & '95 (3 projects)	17.05
average # acres impacted per project '93 & '95	5.68
total # acres mitigated '93 & '95	24.70
average replacement ratio '93 & '95 (3 projects)	0.67
total # mitigation projects Summary Connecticut Files	25
total # acres impacted CT Files (20 projects)	149.03
average # acres impacted per project CT Files	7.45
total # acres mitigated CT Files (21 projects)	290.90
average replacement ratio CT Files (18 projects)	1.41

	P	R	E	C	total
% Utilization AASHTO	16.67	0	0	83.33	100
% Utilization Summary (24)	8.33	16.67	4.17	70.83	100
% Utilization 1998 Survey	5	20	20	75	120

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	50	50	0	100
% Utilization Summary (24)	75	25	0	100
% Utilization 1998 Survey	NA	NA	NA	NA


Connecticut DOT Mitigation Technique Utilization
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization Summary (24)
% Utilization 1998 Survey


Connecticut DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization Summary (24)
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to CTDOT for wetlands mitigation. The Corps' preference ranking is R and E, C, then P; however, the ranking preferred by the Connecticut Department of Environmental Protection (CTDEP) is R and E, P, then C. The relative percentage of time each mitigation technique is utilized by CTDOT for wetlands mitigation is as follows: 5 percent preservation, 20 percent restoration, 20 percent enhancement, and 75 percent creation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 75 percent of the time and out-of-kind replacement is desired 50 percent of the time; however, no information was given for the actual frequencies with which they are used. CTDOT would prefer to mitigate within project boundaries, but often this is not possible, especially for larger impacts greater than 0.5 acres. Half the time CTDOT impact forested areas and must replace out-of-kind with shrub. Replacement ratios are based on acreage, and most projects replace at 1:1 because they are in-kind. Out-of-kind ratios are function- and value-based. CTDOT does not have a Memorandum of Understanding (MOU) with the regulatory agencies. There are no official replacement ratios, because they are determined on a case-by-case basis. Functional assessments are performed on all impacted wetlands. The Connecticut DOT does not have a banking program and is not currently interested in starting one because of the administrative uncertainties that exist with the Corps and the FWS.

The primary agencies involved in the mitigation negotiation process are the Corps and the CTDEP. The Corps resolves any conflicts between the signatory agencies and CTDOT. If the regulatory agency objects to CTDOT's mitigation plan, the Connecticut DOT usually changes the plan to conform to the agency's expectations; however, this normally involves only minor changes.

CTDOT's design methods involve improving on precedence. Usually a consultant designs the plan. Many previous mitigation efforts were not very successful, so now factors such as percent soil organics, hydraulics, plant types, and timing of plantings are considered. This has resulted in greatly increasing the success of the past several sites. Wetlands type does not affect the design methods utilized by CTDOT. However, CTDOT has noticed that the regulatory agencies prefer "instant" wetlands. No information was available on the effects of proximity to development on mitigation success. Follow-up monitoring has been limited to some biannual and annual reports to both state and federal regulatory agencies.

CTDOT's biggest obstacle in the mitigation process is site location. The regulators do not allow CTDOT to convert uplands into wetlands; CTDOT must therefore look for degraded wetlands, disturbed uplands, or filled wetlands. Connecticut has a high population density, and most of the sites CTDOT finds are currently active or slated for development. Three Level 2 case studies were provided to this study and are summarized in the section Level 2, Part B: Case Studies, below. They are all on-site mitigations that experienced different degrees of success.

Level 2, Part B: Case Studies

The three case studies provided by CTDOT are all on-site mitigations that have experienced varying degrees of success.

I-91: This project was undertaken early in CTDOT's wetlands creation efforts, and the problems with the site include not knowing enough about the hydrology and a lack of plantings. Over time, with some manipulation of the hydrology, the site was accepted. A major downfall was that the agency did not wait at least 1 year to monitor the hydrology; therefore, the water level was too high in the beginning.

Cottage Grove Road: This site was excavated and left for a year to ensure that the hydrology was correct. The grade of the site was determined from adjacent wetlands. The site retained too much water, and ditches with check dams were constructed to reduce the water level. At the end of the year and a half, 1,300 plants were placed at the site. The plants came from a nursery that grew plants for general landscaping, not for wetlands, which resulted in a mortality rate of approximately 40 percent. The plants could be used in wetlands areas, but the company that cultivated them did not go to the trouble to acclimate them to the wetlands conditions that the plants would encounter in nature. Getting a viable, dependable supply of wetlands plants is difficult because this is a specialty market and the demand is not very high. The site was replanted, and the plants were moved to higher and drier locations. Another problem with this site was the percentage of organics in the soil (approximately 6 percent). The remaining soil was high in clay content. Three things learned or confirmed at this site: (1) dig the site and let it sit for a year to ensure the proper hydrology is achieved, (2) check existing soil to make sure the organic content and other soil properties are correct, and (3) try to get plants grown at a nursery that acclimates plants specifically for wetlands.

CCE – Rt 9: Piezometers were placed at the site to determine the groundwater elevations, and a control structure was built so the water elevation could be changed. Poor soils were removed and replaced with loam in certain areas and peat in others to determine which was better. In addition, some areas were mounded to determine if that changed the results. The site was very successful and is doing very well. The water elevation was correct to begin with; the different soils have not resulted in any differential plant growth and the mounding has not shown any significant difference.

The Corps and the state DEP have accepted all three sites, even though each site has had to be modified to improve some shortfalls. The only problems that persist at all three sites involve invasive plants (purple loosestrife and phrags) and how to control them. These plants are a big problem throughout New England, and until a regional solution is found, it is unlikely that they can be successfully eliminated from the mitigation sites. (NOTE: New Hampshire also has problems with loosestrife and is attempting a biological control of the invasive nonnative plant.)

State DOT	Connecticut	**Entry#**	1
Project Name	I-91		
Permit Type	individual		
Impact Location	n/a		
Impact County	Hartford		
Type of Impact	elimination	**Acres Impacted**	0.5
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	forested	**Impact WL Value**	low (common, poor function)
Construction Start Date	June 88	**Construction Completion (months)**	36
Construction Project Cost ($)	n/a		
Construction Cost Notes	Mitigation costs were kept separate from construction. No idea what the construction costs were.		
Mitigation Location	Hartford		
Mitigation County	Hartford		
PREC	C		
PREC Notes	n/a		
Mitigation Proximity	on-site	**Type of Replacement**	out-of-kind
Acres Mitigated	4	**Replacement Ratio Calculation**	8.00
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	scrub-shrub	**Mit WL Value**	low (common, poor function)
Mitigation Start Date	Sept 88	**Mit Completion (months)**	11
Lagtime Impact/Mitigation Completion Calculation (months)	14		
Mit Project Cost ($)	528,633		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Success	yes	**Further Mit Required**	no
Mitigation Success Notes	Early creation effort, so not very experienced; problems included (1) not knowing enough about mit. site hydrology (too high) and (2) lack of plantings. After going back to alter hydrology, site was accepted by Corps. Should've waited ~1 yr to watch hydrology.		

State DOT	Connecticut	**Entry#**	2
Project Name	CCE-RT9		
Permit Type	individual		
Impact Location	n/a		
Impact County	Farmington		
Type of Impact	elimination	**Acres Impacted**	14
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	forested	**Impact WL Value**	high (unique, full function)
Construction Start Date	Sept 89	**Construction Completion (months)**	36
Construction Project Cost ($)	n/a		
Construction Cost Notes	Mitigation costs were kept separate from construction. No idea what the construction costs were.		
Mitigation Location	n/a		
Mitigation County	Farmington		
PREC	P, C		
PREC Notes	7 acres C = scrub/shrub; 65 acres P = forested		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind (and a little out-of-kind)
Acres Mitigated	72	**Replacement Ratio Calculation**	5.14
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	forested and scrub-shrub	**Mit WL Value**	high (unique, full function)
Mitigation Start Date	June 90	**Mit Completion (months)**	12
Lagtime Impact/Mitigation Completion Calculation (months)	21		
Mit Project Cost ($)	3,250,000		
Mitigation Cost Notes	C = $750K; P = $2.5M		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	piezometers used to determine gw elevations, and H2O level control structure installed (original level was found correct); poor soils removed and loam and peat tested as replacement soil (no plant growth diff); also tested effects of making mounds (no diff)		

State DOT	Connecticut	**Entry#**	3
Project Name	Cottage Grove Rd		
Permit Type	individual		
Impact Location	Bloomfield, CT		
Impact County	Hartford		
Type of Impact	elimination	**Acres Impacted**	3.07
Type of Impact Notes	impacts were marginal and parallel to the highway		

Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	forested	**Impact WL Value**	medium
Construction Start Date	spring 92	**Construction Completion (months)**	36
Construction Project Cost ($)	n/a		
Construction Cost Notes	Mitigation costs were kept separate from construction. No idea what the construction costs were.		
Mitigation Location	Bloomfield, CT		
Mitigation County	Hartford		
PREC	R		
PREC Notes	n/a		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	6	**Replacement Ratio Calculation**	1.95
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	scrub-shrub	**Mit WL Value**	medium
Mitigation Start Date	fall 92	**Mit Completion**	24
Lagtime Impact/Mitigation Completion Calculation (months)			29
Mit Project Cost ($)	1,012,000		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	excavated, tested, and corrected hydrology first; but had new problems: (1) nursery trees from stock grown in upland conditions (had to acclimate to wetter conditions - resulted 40 percent mortality); (2) inappropriate soil properties - too low organics, too high clay		

Delaware Department of Transportation:

Level 1: Organization and Information

The Delaware Department of Transportation (DelDOT) has approximately twenty wetlands impacts and five mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and that one mitigation project can compensate for multiple wetlands impacts. DelDOT receives input from other agencies but does not reorganize and summarize the data. Agencies include private consultants, who perform the delineations under the direction of the Delaware DOT, the Delaware Natural Resources Commission (DENRC), the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS). Impact files are maintained, though the information is kept to a minimum. Impact data include area, location, type, archaeological and historical information, and sometimes value, depending on the evaluation method utilized (Wetlands Evaluation Technique analysis, hydrogeomorphic standards, or best professional judgment).

Approximately 1 percent of DelDOT's construction permits require mitigation, and mitigation is routinely performed for those permits that involve wetlands impacts. On-site mitigation and in-kind strategies are used when possible. Mitigation files contain information on area, location, and type. Printed and digital impact and mitigation information is available by written or phone request; however, no summaries are available from DelDOT. The Delaware DOT has a mandatory 20-year monitoring program that includes vegetation cover survival and piezometer readings.

The Delaware DOT has had experience with off-site compensation and is currently looking at paying for the restoration of a river and a cypress swamp and getting banking credits in return. DelDOT has had little cooperation from federal agencies in setting up a mitigation banking program and is still in the establishment process. The representatives of the federal agencies are afraid that if a mitigation banking program is initiated, then project originators in Delaware will want to go straight to the bank to fulfill mitigation requirements, rather than attempting on-site mitigation. Impact and mitigation digital data files were requested; however, only a Microsoft Word document containing a brief summary of impact and mitigation information was provided by DelDOT for use in this study. In addition, 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data provided by DelDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are fairly limited. However, the

following table summarizes extrapolated data concerning the mitigation strategies employed by the Delaware DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The DelDOT summary contains data from 1982 to 1995; the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was utilized exclusively by DelDOT between 1991 and 1994. The DelDOT summary data, by contrast, demonstrate the utilization of all four mitigation strategies. In this summary, creation was utilized 1.2 times more than restoration, 1.5 times more than enhancement, and 2 times more than preservation. The 1998 survey also showed the use of all four strategies, with creation being the favored choice for mitigation. Creation was utilized 3.75 times more often than restoration or enhancement and 15 times more often than preservation.

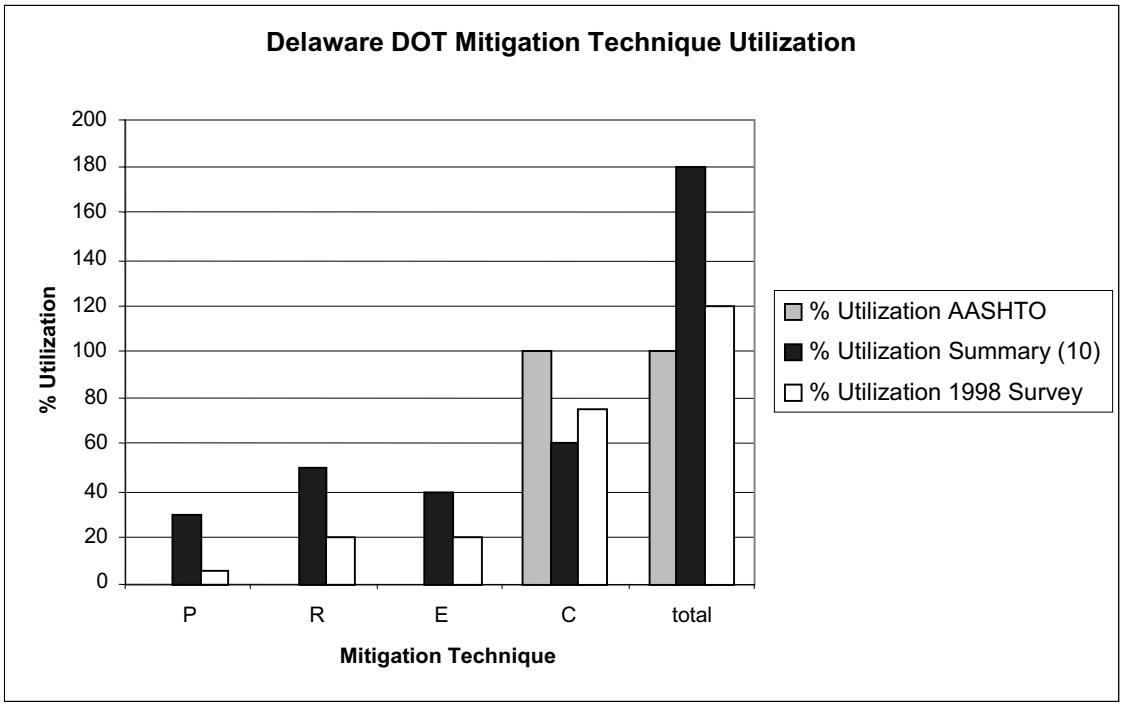
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized 3 times more often than on-site mitigation, and 6 times more often than banking between 1991 and 1994. The DelDOT summary data showed a similar trend, with off-site 1.8 times greater than on-site and 4.5 times greater than banking. The DelDOT staff did not provide clear answers to this section of the 1998 survey. In contrast to the data summaries, the 1998 survey intimated that banks were still in the development stage and were not yet an option and that off-site was utilized 30 percent of the time.

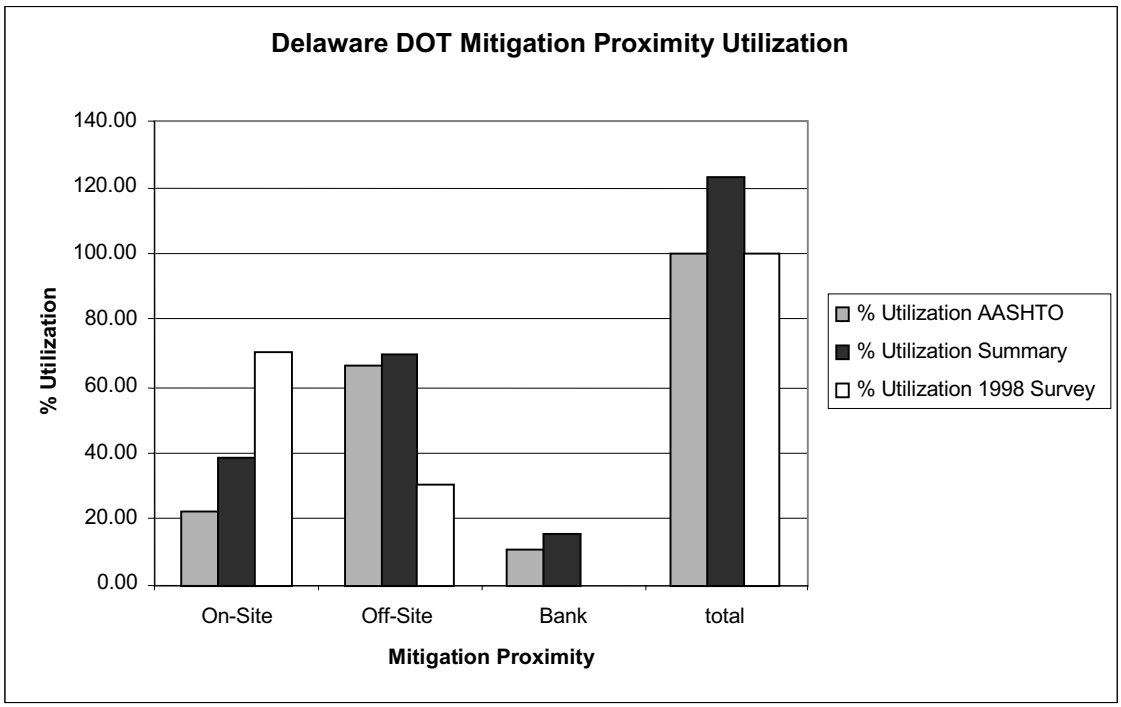
The table and two charts provided below illustrate these DelDOT trends.

total # mitigation projects AASHTO 1993 & 1995	9
total # acres impacted '93 & '95	235.84
average # acres impacted per project '93 & '95	26.20
total # acres mitigated '93 & '95	452.43
average replacement ratio '93 & '95	1.92
total # mitigation projects Summary Delaware Files	13
total # acres impacted DE Files	349.47
average # acres impacted per project DE Files	26.88
total # acres mitigated DE Files	947.91
average replacement ratio DE Files	2.71

	P	R	E	C	total
% Utilization AASHTO	0	0	0	100	100
% Utilization Summary (10)	30	50	40	60	180
% Utilization 1998 Survey	5	20	20	75	120

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	22.22	66.67	11.11	100
% Utilization Summary	38.46	69.23	15	123.08
% Utilization 1998 Survey	70	30	NA	100


Delaware DOT Mitigation Technique Utilization
200
180
160
140
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization Summary (10)
% Utilization 1998 Survey


Delaware DOT Mitigation Proximity Utilization
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization Summary
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to DelDOT for wetlands mitigation. The preference ranking is C, then P, R, and E. The Corps has a strong preference for creation. P, R, and E have only been used as additional mitigation in a creation mitigation package. The relative percentage of time each mitigation technique is utilized by DelDOT for wetlands mitigation is as follows: 20 percent preservation, <5 percent restoration, <5 percent enhancement, and 100 percent creation. Therefore, all mitigation projects have a creation component and, in addition, can have a mixture of the other strategies utilized as well.

Off-site mitigation is desired 100 percent of the time, and out-of-kind replacement is desired 50 percent of the time; however, these options are actually utilized only 30 percent and 0 percent of the time, respectively. The regulatory agencies mostly insist on on-site and in-kind and are reluctant to allow banks. For long, linear projects with many small impacts, consolidated mitigation sites are generally used in the immediate area. Replacement ratios are based on acreage in combination with the wetlands type. The ratios used are unofficially agreed on with the regulatory agencies as 1:1 for emergent tidal/nontidal and 2:1 for forested wetlands.

The primary agencies involved in the mitigation negotiation process are the Corps, the FWS, the EPA, and the NMFS. The Corps resolves any conflicts between the signatory agencies and DelDOT. It is estimated that 40 percent of the time DelDOT submits a mitigation plan that differs from the agency expectations and of these, the Delaware DOT's plan overrides 90 percent of the time, requiring only minor changes. Mitigation plans are developed anticipating agency preferences and in concert with agencies; thus, approval is generally no problem.

DelDOT's design methods start with on-site, in-kind. Location is based on biology and hydrology factors indicating potential for success. Real estate availability is the next limiting factor. Wetlands type does not affect the design methods utilized by DelDOT. The Delaware DOT believes proximity to development affects the success of the mitigation project. The smaller the site and the closer to the road, the less the habitat quality. However, this does not sway the on-site, in-kind preference of the regulatory agencies. A 20-year follow-up monitoring period is required by DelDOT for all sites. Remediation will be required if the site is not successful.

The Delaware DOT's biggest obstacle in the mitigation process is the rigid federal party line of on-site, in-kind. Many times this goal is achievable; however, the costs and benefits are questionable. DelDOT is of the opinion that it could get much more value for the investment if preservation options were explored and used. DelDOT currently spends millions of dollars creating just a few acres. Preservation options would allow hundreds, probably thousands, of acres to be preserved for what it now costs to create a few acres.

Two Level 2 case studies were provided by DelDOT for use in this study and are summarized in the section Level 2, Part B: Case Studies, below.

Level 2, Part B: Case Studies

State DOT	Delaware	**Entry#**	1
Project Name	US 113		
Permit Type	individual		
Impact Location	US 113 between Georgetown and Milford		
Impact County	Sussex		
Type of Impact	elimination	**Acres Impacted**	50
Type of Impact Notes	PFO1A - forest (sweetgum/red maple); elimination of forested wetlands adjacent to existing highway, impacts extended over 13 miles		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forest	**Impact WL Value**	medium
Construction Start Date	1995	**Construction Completion (months)**	36
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	w/in 5 miles of impacts (same watershed)		
Mitigation County	Sussex		
PREC	C		
PREC Notes	forest (sweetgum, red maple); final grade of site underway and planting next spring		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	100	**Replacement Ratio Calculation**	2.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forest	**Mit WL Value**	medium
Mitigation Start Date	1995	**Mit Completion (months)**	51
Lagtime Impact/Mitigation Completion Calculation (months)	51		
Mit Project Cost	2,000,000		
Mitigation Costs	n/a		
Mit Site Monitoring Time Period (yr)	20		
Monitoring Frequency (months)	every 6 mos. for 5 yrs, then every 5 yrs		
Mitigation Successful	unknown	**Further Mit Required**	unknown
Mitigation Success Notes	n/a		

State DOT	Delaware	**Entry#**	2
Project Name	SR1		
Permit Type	individual		
Impact Location	new highway to connect Dover and Smyrna		
Impact County	Kent, New Castle		
Type of Impact	elimination	**Acres Impacted**	162
Type of Impact Notes	new highway to connect Dover and Smyrna; PFO1A		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forest	**Impact WL Value**	medium
Construction Start Date	1990	**Construction Completion (months)**	60
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	consolidated into 5 major sites along the corridor		
Mitigation County	Kent		
PREC	C		
PREC Notes	PFO1A; mit. was concurrent w/ construction		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	324	**Replacement Ratio Calculation**	2.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forested	**Mit WL Value**	medium
Mitigation Start Date	1990	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	20		
Monitoring Frequency (months)	every 6 mos for 5 yrs, then every 5 yrs		
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	so far everything looks great		

District of Columbia Department of Public Works:

Level 1: Organization and Information

The Washington, D.C., Department of Public Works (DPW) receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Metropolitan Washington Council of Governments (COG), the Federal Highway Administration (FHWA), and the U.S. Army Corps of Engineers (Corps). A delineation was performed on the project, and the Metropolitan Washington COG helped the DPW locate a site for mitigation. In general, printed impact files contain FHWA information and environmental impact statements (EISs). Impact data include ecological information found in the delineation concerning soil, water, plants, and wildlife, as well as archaeological information. No impact or mitigation information is accessible, and no summaries are available from the DPW.

It is not known what percentage of the DPW's construction permits require mitigation, but mitigation is routinely performed for wetlands impacts. The DPW prefers utilization of off-site mitigation strategies. The DPW does not really keep any information in-house on wetlands mitigation because it so rarely encounter this situation. Historically, there have only been two DPW cases involving wetlands mitigation in D.C., and only one went through the mitigation process. For this reason, the DPW has little information on wetlands impacts or mitigation because its projects very rarely involve either one. Rivers border Washington, D.C., so there is the possibility of wetlands impacts, but there is no readily available site for mitigation.

The single project to go through the wetlands mitigation process was one on the Whitehurst Freeway near the Anocostia River. The EIS for the project was completed in 1983, but the project did not begin immediately. While walking the proposed construction site some time later, the project team noticed cattails and performed a wetlands delineation. The DPW found that they would have to go through the 404 permitting process, because there would be a significant wetlands impact. The Corps required mitigation for the 1-to-2 impacted acres. This presented a problem because there was no place within D.C. for mitigation site development. The Metropolitan Washington COG finally found a wetlands restoration project that was in progress at the Kenilworth Aquatic Gardens, near the proposed construction site. While the D.C. DPW paid for that project in order to satisfy the mitigation requirement, the project has never been completed. The DPW has not had to conduct follow-up monitoring to date because the mitigation project was never finished. The DPW has proposed to the Corps the possibility of working with Virginia or Maryland on future projects involving a similar situation; however, these discussions have not yet been resolved.

Florida Department of Transportation:

Level 1: Organization and Information

The annual number of wetlands impacts and mitigation projects for the Florida Department of Transportation (FDOT) was not known by the agency staff. FDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Florida Game and Freshwater Fish Commission, the State Water Management Districts (WMDs), the U.S Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS). Impact files containing information from the Wetlands Evaluation Report are maintained in both printed and digital forms. Impact data include function, area, location, and value. A Wetlands Evaluation Technique (WET II) evaluation is done on every wetlands, although FDOT is currently phasing that out in favor of the new hydrogeomorphic (HGM) standards.

Approximately 31 percent of the Florida DOT's construction permits require mitigation, and mitigation is routinely performed for those permits that involve wetlands impacts. On-site, off-site, and mitigation banking strategies are utilized. Mitigation files with area, location, type, replacement ratio, vegetation, and hydrology information are maintained. Printed and digital impact and mitigation information is accessible by site visit; however, no summaries are available from FDOT. The Florida DOT conducts follow-up monitoring of mitigation sites for 3 to 5 years and tracks vegetation establishment and success, as well as hydrology.

FDOT has had experience with off-site mitigation, and it has sometimes bought credits from private mitigation banks. As of 1 July 97, the Florida DOT turned responsibility for mitigation and banking over to the individual water management districts. Therefore, that information is no longer available through FDOT. For the present study, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by FDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO summary that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Florida DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The present 1998 survey was unable to obtain the most recent estimates from the agency staff because of the transfer of this task from FDOT to the individual water districts.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation between 1991 and 1994. Creation was utilized 1.8 times more than

enhancement and 2.7 times more than preservation. Restoration was not utilized at all during this time period.

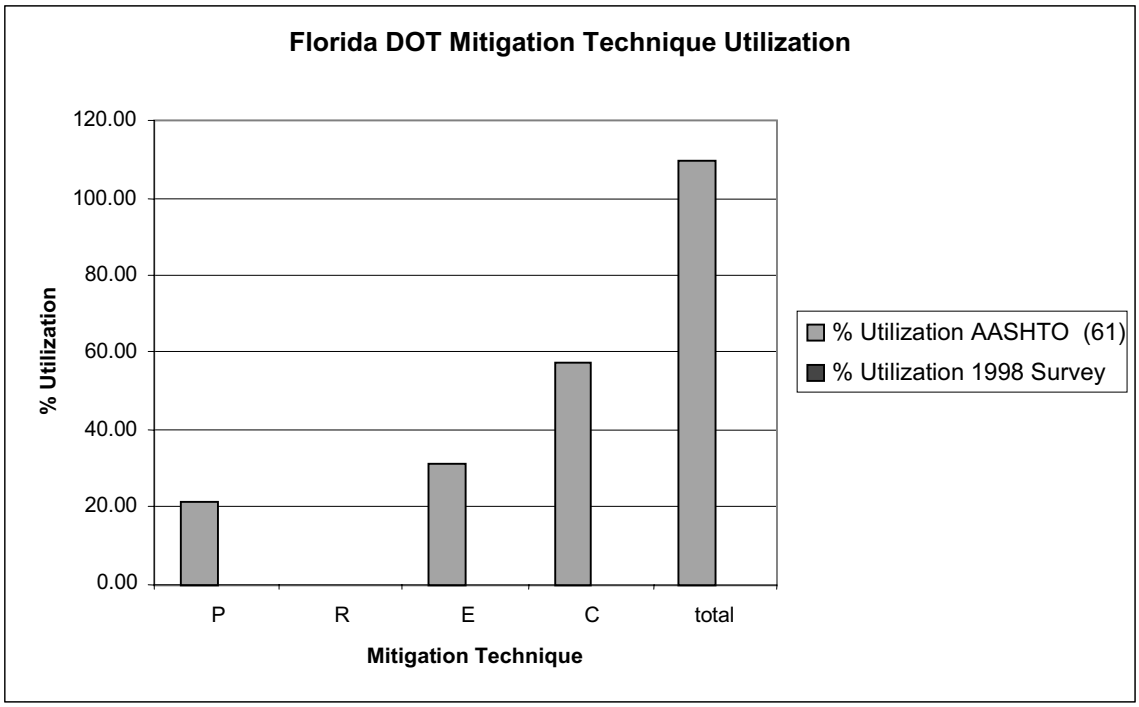
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized 1.6 times more often than on-site mitigation. Mitigation banking was not utilized between 1991 and 1994.

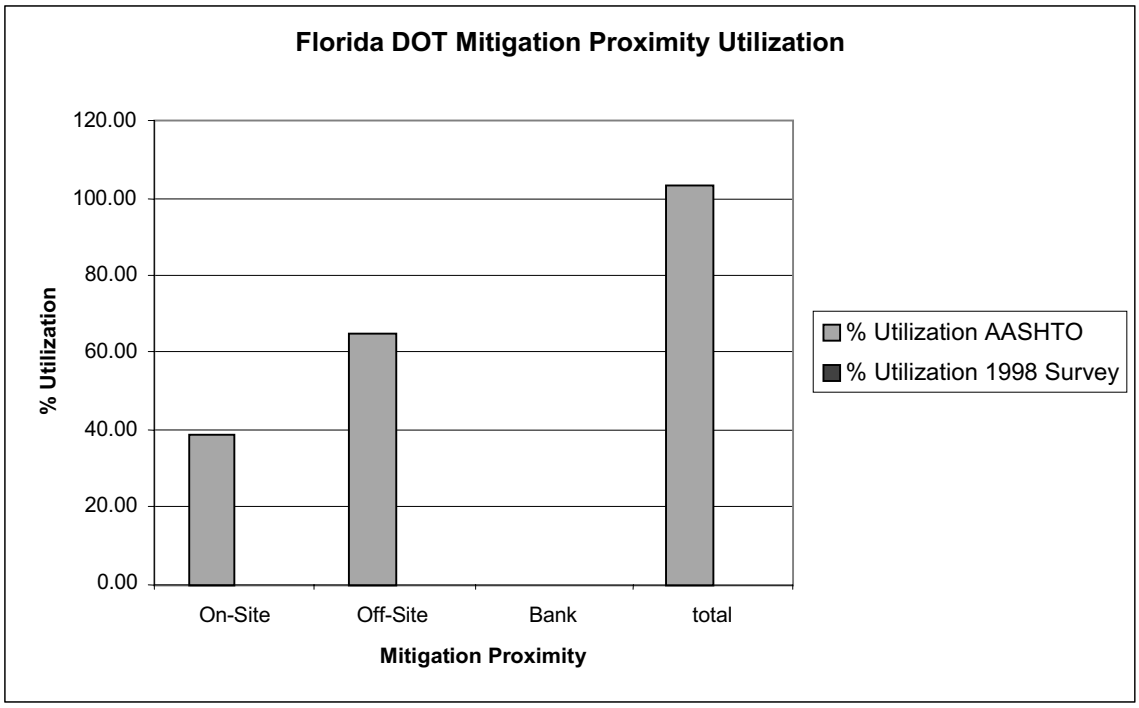
The table and two charts provided below illustrate these FDOT trends.

total # mitigation projects AASHTO 1993 & 1995	62
total # acres impacted '93 & '95 (53 projects)	287.76
average # acres impacted per project '93 & '95	5.43
total # acres mitigated '93 & '95 (56 projects)	11654.24
average replacement ratio '93 & '95 (46 projects)	18.14
or (51 projects)	38.56

	P	R	E	C	total
% Utilization AASHTO (61)	21.31	0	31.15	57.38	109.84
% Utilization 1998 Survey	NA	NA	NA	NA	NA

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	38.71	64.52	0	103.23
% Utilization 1998 Survey	NA	NA	NA	NA


Florida DOT Mitigation Technique Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO (61)
% Utilization 1998 Survey


Florida DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

A large portion of the Level 2 survey does not apply to FDOT, since the state legislature passed the Senate Resolution (SR) of 1986 that allows FDOT to send out all of their mitigation projects to the individual Water Management Districts (WMDs). In the past, mitigation has not been cost effective, so the state is trying this new approach. FDOT pays $75,000 per acre of wetlands impacted to the Florida Department of Environmental Protection (DEP), and the money is distributed to the WMDs for use in wetlands projects across the state. FDOT is currently experiencing difficulties with both the FHWA and the Corps regarding this approach because it does not conform to the typical idea of project-by-project mitigation. Discussions are taking place about the watershed-based management and in-/out-of-kind issues.

Most of the mitigation done by FDOT is restoration and preservation oriented. No information is available on preference ranking of the various mitigation strategies or the relative percentages of strategy utilization for wetlands mitigation. Off-site and out-of-kind information was also not available. FDOT has used both on-site and off-site, with the preferred method being in-kind, but the Corps and the state are becoming more flexible in their requirements. FDOT pays the WMDs for both project-by-project mitigation and multiproject banks. Currently, project-by-project mitigation is easier to get permitted because it has been difficult to get both the state and federal agencies to agree on a banking concept. Several WMDs have developed banks based on a restoration/preservation concept, only to have the federal agencies balk when time came to utilize them.

Negotiations with the various regulators are very much personality-driven. By state law, the state agencies must be satisfied before FDOT is allowed to go to the Corps. This is a big disadvantage because disagreements between these agencies frequently prevent FDOT from obtaining a permit in a timely manner. No information was provided regarding which agency resolves conflicts between the signatory agencies and FDOT. No information was provided regarding how frequently FDOT submits a mitigation plan that differs from the agency expectations. FDOT states in a 1997 memo that innovative, regional large-scale ecosystem approaches have met with unexpected difficulties from the regulators with which FDOT has a Memorandum of Understanding (MOU). Unless this situation changes, they will not continue these types of innovative programs. FDOT is concerned that the current shortsighted regulatory approaches could undermine the success of Florida's wetlands protection process.

Currently, there is no way to track individual projects to determine what was done on a project-by-project basis. FDOT does have a tracking system developed at the central office, but a lack of personnel at the district level has prevented all the data from being entered into this system. FDOT's staff is too busy trying to work out mitigations with the regulators, sometimes for small acreage of little significance. The Florida DOT's biggest obstacle in the mitigation process is getting the cooperation of the regulators and elevating the regulatory process to truly allow broader and more visionary approaches to wetlands/upland mitigation, which will achieve a meaningful and successful program. They did not provide any suggestions for improvement.

Georgia Department of Transportation:

Level 1: Organization and Information

The Georgia Department of Transportation (GDOT) has approximately fifty wetlands impacts and thirty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Georgia DOT does receive input from other agencies and also reorganizes and summarizes the data. Agencies include the National Historic Registry, the National Wetlands Inventory, the Soil Conservation Service (SCS), the U.S. Fish and Wildlife Service (FWS), and the U.S. Army Corps of Engineers (Corps). Printed impact files are maintained and contain information from delineations that are performed by the ecologists on staff using National Wetlands Inventory maps and Soil Conservation Service maps. Impact data include area, location, wetlands type, extent of impact, soil, vegetation, wildlife, water, archaeology, and the possible threat to endangered species.

GDOT conducts the national wetlands mitigation practices survey every 2 years for the American Association of State Highway and Transportation Officials (AASHTO). It usually has participation from at least thirty states; however, the information obtained from this survey is limited. During the information investigation phase of the current study, no one seemed to know of the existence of these surveys, including AASHTO. It was not until the Georgia DOT filled out the current study's questionnaires that the AASHTO surveys were discovered. The AASHTO survey results are available from GDOT by phone request; however, they provided to the current study only 1993 and 1995 data.

Approximately 75 percent of the Georgia DOT's construction permits require mitigation, and mitigation is routinely performed for those permits involving wetlands impacts. In responding to the survey of this study, GDOT staff did not specify the mitigation types and strategies utilized, but rather stated that these are found in the application package. The standard operating procedures (SOP) states that at least 50 percent of required mitigation credits must come from restoration, enhancement, creation, and/or upland buffering. Impact and mitigation information is accessible by site visit. The Georgia DOT's monitoring program for Corps compliance is conducted throughout the project. GDOT conducts 3 to 10 years of post-project monitoring.

The Georgia DOT does have experience with off-site compensation. There is an agreement in progress for one mitigation banking site and GDOT has purchased another. GDOT currently has approximately 1,300 acres in mitigation banks.

No summaries outside of the AASHTO surveys are available from the Georgia DOT. The complete 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) national summaries were requested and received for use in this study, as were the Savannah Corps District's Standard Operating Procedures (SOP) for Compensatory Mitigation.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by GDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Georgia DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation between 1991 and 1994 and was utilized 3.7 times more often than preservation or restoration and 11 times more often than enhancement. The 1998 survey, by contrast, demonstrated a different trend, with enhancement and restoration being the favored mitigation choices. Restoration was utilized 1.2 times more than enhancement, 2.8 times more than preservation, and 17 times more than creation.

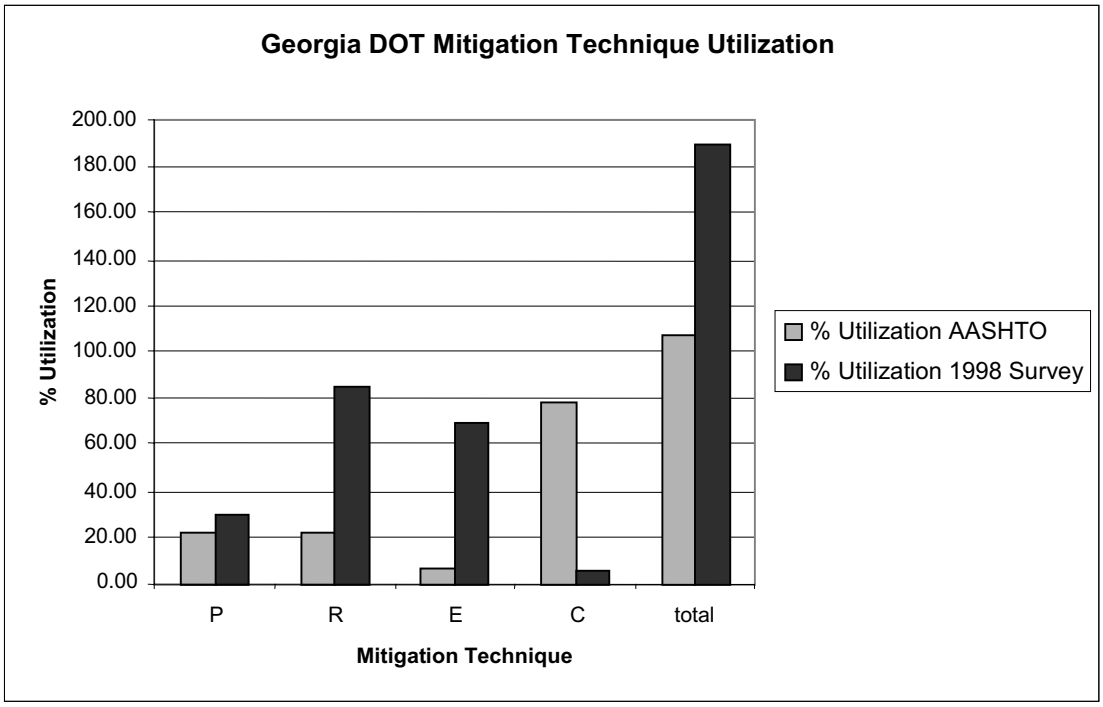
The AASHTO summary data also showed that for mitigation proximity off-site mitigation was the favored choice and was utilized 1.6 times more than on-site mitigation. Mitigation banking was not utilized at all between 1991 and 1994. The 1998 survey demonstrated a similar trend, with an off-site usage rate 9 times greater than the on-site rate.

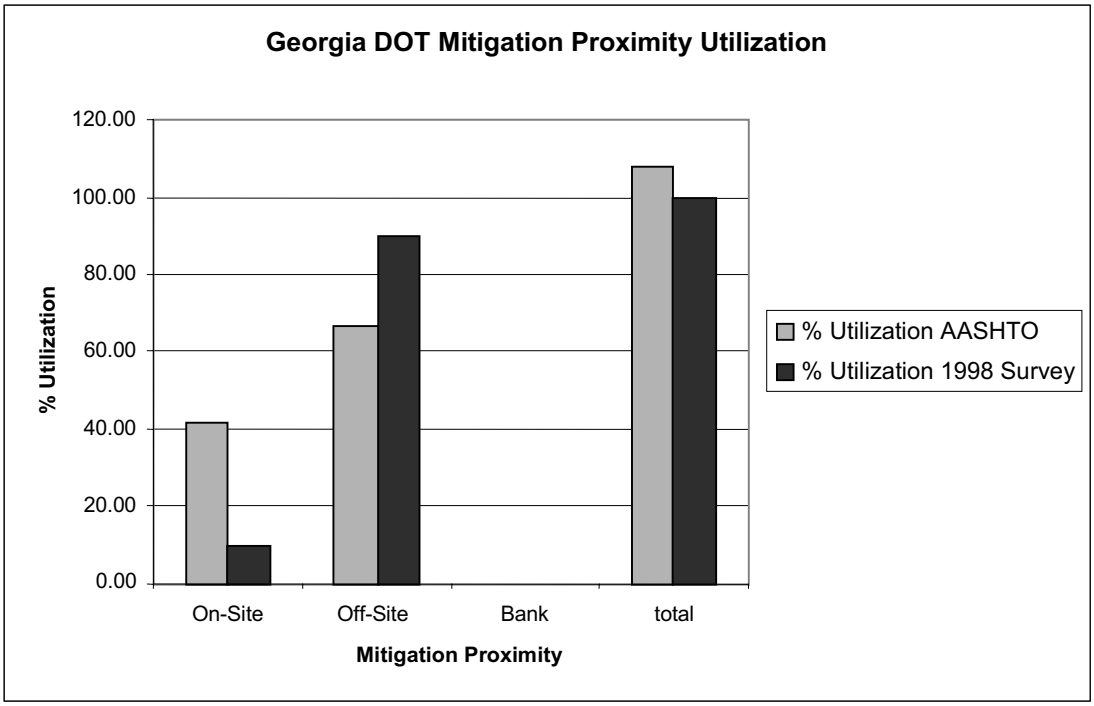
The table and two charts provided below illustrate these GDOT trends.

total # mitigation projects AASHTO 1993 & 1995	14
total # acres impacted '93 & '95	103.77
average # acres impacted per project '93 & '95	7.41
total # acres mitigated '93 & '95	154.46
average replacement ratio '93 & '95	1.49

	P	R	E	C	total
% Utilization AASHTO	21.43	21.43	7.14	78.57	107
% Utilization 1998 Survey	30	85	70	5	190

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	41.67	66.67	0	108.33
% Utilization 1998 Survey	10	90	0	100


Georgia DOT Mitigation Technique Utilization
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Georgia DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options for wetlands mitigation for the Georgia DOT. The preference ranking is R, E, P, and then C. Neither preservation nor creation is particularly preferable, but preservation is safer and more predictable than creation. There is usually a little preservation in every project. The relative percentage of time each mitigation technique is utilized by GDOT for wetlands mitigation is as follows: 30 percent preservation, 85 percent restoration, 70 percent enhancement, and 5 percent creation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent. Off-site mitigation is desired and utilized 90 percent of the time and out-of-kind replacement is desired and utilized 50 percent of the time. Off-site mitigation is never more than 50 miles away and is usually a superior mitigation.

The primary agencies involved in the mitigation negotiation process are the Corps and the FWS. The Corps is the main participant and the FWS always has objections. The FWS also receives input from the EPA, the NMFS, and the DNR. Replacement ratios are based on Florida's Corps district's function and value quantitative formulas. These formulas consist of simple, broad categories that require subjective judgments and are a function of in-/out-of-kind, on/off-site, and wetlands type, among others. Variable outputs are provided based on different proposed scenarios. Therefore, there is no standard, predetermined set of ratios used by GDOT. The Georgia DOT provided to this study a printed copy of the Savannah Corps District's SOP for calculating replacement ratios for compensatory mitigation. GDOT's opinion of this method of determining replacement ratios is mixed. While this method provides a context within which the various parties can negotiate, it also creates a laborious computational process, which may outweigh the benefit of the formulas.

The Corps resolves any conflicts between the signatory agencies and GDOT and often overrides the objections of the FWS. It is estimated that 95 percent of the time GDOT submits a mitigation plan that differs from the agency expectations; of these differing plans, GDOT's plan overrides 90 percent of the time, requiring only minor changes. GDOT design methods include precedence and common sense and do not include much research-based detail. Their method works with the location of the site within the natural systems of the state. The goal is to transform the site into what the land has a natural propensity to become. Wetlands type does not affect the design methods utilized by GDOT because type is not the heart of the matter. The approach is driven, instead, by what the site is capable of producing. In addition, time is not really an issue in determining the success of a project because it is well known that a successfully functioning system is a long-term commitment.

GDOT does not have an opinion whether proximity to development affects mitigation success because this option is rarely chosen. Usually GDOT looks for off-site degraded wetlands to restore, but has had minor problems with city utility encroachment. The Georgia DOT has an annual 5-year follow-up monitoring plan that includes general observations on whether hydrology is functioning correctly, occurrence of erosion, and vegetation establishment based on transects for tree and vegetation counts. The minimum success criteria are 70 percent. The Georgia DOT's biggest obstacle in the mitigation process is reaching agreement on the amount

of mitigation credit per acre. They did not provide any suggestions for improvement. Two Level 2 case studies were provided to this study: one past failure and one very successful mitigation bank.

Level 2, Part B: Case Studies

The mitigation bank for the Dodge/Telfair project is cited as a good example because of the high probability of success. The DOT incorporated lessons learned from past failed projects, such as the Dalton Bypass project. The bank has good soils for growing trees and the planning was well designed; the project represents habitat conservation in a biologically important area and demonstrates cooperation with the Georgia DNR in managing the site as a public wildlife management area.

State DOT	Georgia	**Entry#**	1
Project Name	Dalton Bypass		
Permit Type	individual		
Impact Location	Creek crossings along linear highway project		
Impact County	Whitfield		
Type of Impact	elimination	**Acres Impacted**	7.6
Type of Impact Notes	impacts were road fill in riparian wetlands systems		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	bottomland hardwood forest	**Impact WL Value**	high - moderate
Construction Start Date	1992	**Construction Completion (months)**	1994
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	adjacent to highway in borrow pits		
Mitigation County	Whitfield		
PREC	C		
PREC Notes	mitigation was in borrow pits adjacent to project; excavation was performed for fill material, then trees were planted		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	7.6	**Replacement Ratio Calculation**	1.00
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	forested/seepage/riparian	**Mit WL Value**	low
Mitigation Start Date	1993	**Mit Completion (months)**	24
Lagtime Impact/Mitigation Completion Calculation (months)	36		
Mit Project Cost ($)	19,000		
Mitigation Cost Notes	costs not separated - based on 7.6 ac at $2,000/acre		
Mit Site Monitoring Time Period	3	**Monitoring Frequency (months)**	12
Mitigation Successful	no	**Further Mit Required**	yes
Mitigation Success Notes	Creation is unpredictable and often fails due to exposure of inhospitable soils of borrow pits for tree plantings		

State DOT	Georgia	**Entry#**	2
Project Name	Dodge/Telfair GIP-341		
Permit Type	individual		
Impact Location	Coastal Plain/Highway		
Impact County	Dodge and Telfair		
Type of Impact	elimination	**Acres Impacted**	22
Type of Impact Notes	forested creek system		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	bottomland hardwood forest	**Impact WL Value**	high - moderate
Construction Start Date	Sept 98	**Construction Completion (months)**	24
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	Altamaha River floodplain		
Mitigation County	Montgomery		
PREC	R, E, P		
PREC Notes	mitigation is in a wetlands mitigation bank in the Altamaha River floodplain that will be used for 10 road projects; restoration/enhancement/preservation all included; restoration of farmland back to riverine bottomland		
Mitigation Proximity	bank	**Type of Replacement**	in-kind
Acres Mitigated	120	**Replacement Ratio Calculation**	5.45
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forested bottomland	**Mit WL Value**	high (unique, full)
Mitigation Start Date	fall 98	**Mit Completion (months)**	24
Lagtime Impact/Mitigation Completion Calculation (months)	25		
Mit Project Cost ($)	600,000		
Mitigation Cost Notes	costs not separated from construction project - estimated at $5,000/acre		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	Expect Yes	**Further Mit Required**	Expect No
Mitigation Success Notes	Success not yet determined, but expect to be highly successful - incorporates methods from previous successes, natural environment/location, and soils are very good. DOT is cooperating w/state DNR on management as a public wildlife management area.		

Idaho Transportation Department:

Level 1: Organization and Information

The Idaho Department of Transportation (IDT) has approximately one hundred wetlands impacts and eight mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The IDT receives input from other agencies but does not reorganize and summarize the data. Agencies include the Idaho Department of Environmental Quality (IDEQ), the Idaho Fish and Game Agency (IFGA), the Idaho Water Resources Department (IWRD), the National Marine Fisheries Service (NMFS), the National Resource Conservation Service (NRCS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS). Impact files contain information from delineations as performed per the 1987 Corps manual, National Wetlands Inventory maps, and soil classification information from the National Resource Conservation Service. Impact data include location, type, extent of impact, function and value as determined by best professional judgment, drainage area, and types of acceptable mitigation.

Nearly 100 percent of the IDT's permits require mitigation. Mitigation is routinely performed for wetlands impacts. The IDT staff prefers in-kind, on-site strategies, but will also use off-site when necessary. Mitigation data include input from the collaborative process of the resource agencies. Printed impact and mitigation information is accessible by site visit — no summaries are available from the IDT. The type of follow-up monitoring varies by project and can include anything from visual observation to actual quantification of percent vegetation cover, vegetation diversity, establishment of vegetation, Habitat Evaluation Procedure (HEP) analysis, soil, groundwater, and availability of water sources.

The IDT has had experience with off-site compensation. An agreement and procedure has been approved and is in place allowing the IDT to have a team evaluate a potential bank site. The team will then evaluate the site again after the bank is established. This banking system has yet to be utilized, however.

Illinois Department of Transportation:

Level 1: Organization and Information

The Illinois Department of Transportation (IDOT) has approximately eighty wetlands impacts and thirty-five to eighty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Illinois DOT receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Illinois Geological Survey (IGS), the Illinois Natural Historical Survey (INHS), and the Illinois Natural Resources Department (INRD). Printed impact files are maintained and contain information on acreage and the basis for replacement. The Illinois DOT is working on its files, but the files are not yet comprehensive, and IDOT is undecided as to what to do at this point. Impact data include soil information, wetlands type, and extent of the impact.

Approximately 90 percent of the Illinois DOT's construction permits require mitigation. Mitigation is routinely performed for wetlands impacts (files are maintained). Mitigation information is compiled on a per-project basis and includes wetlands type, acreage, and type of compensation. Follow-up monitoring is conducted to determine success or lack of success based on photographs, vegetation, and water level and quality. Because IDOT's filing system is currently unorganized and the amount of data compiled is scarce, impact and mitigation information is not accessible at this time; no summaries are available from IDOT.

The Illinois DOT has had experience with off-site compensation and has purchased credits from a private Chicago corporation bank. They have no paperwork for this other than the expenditure for the credit. IDOT has no mitigation banks of its own. However, the 1993 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained for use in this study.

1993 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by the Illinois DOT and from information obtained from the 1993 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO summary that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Illinois DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1991 and 1992. The IDOT staff did not provide the present 1998 survey with IDOT's most recent estimations of mitigation strategy usage rates. According to the AASHTO data, off-site creation mitigation was utilized exclusively by IDOT between 1991 and 1992.

total # mitigation projects AASHTO 1993	4
total # acres impacted '93	8
average # acres impacted per project '93	2
total # acres mitigated '93	46.9
average replacement ratio '93	5.86

	P	R	E	C	total
% Utilization AASHTO	0	0	0	100	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	0	100	0	100

Indiana Department of Transportation:

Level 1: Organization and Information

The Indiana Department of Transportation (INDOT) has approximately twenty wetlands impacts and nine mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. INDOT receives input from other agencies and sometimes reorganizes and summarizes the data. Agencies include the Indiana Department of Environmental Management (INDEM), the Indiana Department of Natural Resources (INDNR), and the U.S. Fish and Wildlife Service (FWS). Impact files contain information from delineations, National Wetlands Inventory maps, National Resource and Conservation Service (NRCS) and USGS maps, and Soil Conservation Service (SCS) maps are maintained in printed form. Impact data include area, location, wetlands type, extent of impact, soil, vegetation, function and value, and delineation information.

Approximately 10 percent of the Indiana DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. INDOT did not specify the mitigation types and strategies utilized, but it references the replacement ratios found in its Memorandum of Agreement (MOA) with the Corps. INDOT's follow-up monitoring for Corps compliance usually involves photographs, plant samples, and wildlife observations, among other things. Printed impact and mitigation information is accessible by FOIA request.

INDOT does not perform off-site compensation or mitigation banking. Impact and mitigation summaries were requested by this study; however, summaries were not actually available, and only the MOA replacement ratios for mitigation were sent. INDOT also sent a 1997 state map indicating that it has twenty-two wetlands mitigation projects completed or in progress across the state. INDOT did not participate in the 1993 or 1995 AASHTO surveys.

Level 2, Part A: Processes and Methodologies

The Indiana DOT cannot use all four of the recognized mitigation options (preservation, restoration, enhancement, and creation, or PREC) for wetlands mitigation. Only restoration and creation are used because the state regulatory agencies do not like preservation and enhancement and will not consider them at all. The preference ranking is R then C. Mostly restoration is done on farmed or drained wetlands. Very little creation is done because of the low occurrence of hydric soils in the state. The relative percentage of time each mitigation technique is utilized by INDOT for wetlands mitigation is as follows: 0 percent preservation, 100 percent restoration, 0 percent enhancement, and less than 10 percent creation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent. Off-site mitigation is desired 60 percent of the time and utilized 50 percent of the time.

INDOT is trying to go to a mitigation banking system, but this may be far in the future. INDOT is not allowed to do any out-of-kind replacement. Replacement ratios are based on acreage in

combination with the wetlands type. INDOT must replace with a higher quality wetlands than it impacted. The ratios used are officially agreed upon with the regulatory agencies in the MOA as 1:1 farmed, 2-3:1 emergent, 2-3:1 scrub/shrub, and 3-4:1 for forested wetlands. INDOT has contracted Indiana State University to develop a function and value replacement system.

The primary agencies involved in the mitigation negotiation process are the DEM, the DNR, the Corps, and the FWS. The DEM issues water quality (WQ) certifications and will withhold these when they do not approve of the proposed mitigation plan. The Corps cannot grant a mitigation permit without the WQ certification. The DEM dominates the resolution process for any conflicts with INDOT. It is estimated that less than 10 percent of the time INDOT submits a mitigation plan that differs from the agency expectations, and of these, INDOT's plan never overrides. For disputed projects INDOT has never been able to satisfy the DEM, so several projects have been on-hold for 3 years. INDOT is of the opinion that the other regulatory agencies need to get involved to rationalize and expedite the resolution process. The DEM is viewed as a problem agency. There have been many discussions about its "weak" management and entry-level staff that is "out of control."

INDOT's design methods include precedence and best professional judgment (BPJ) to restore the same type, if not the same function. Not much new technology is used. Wetlands type does not affect the design methods utilized by INDOT. The DOT has had a few situations where proximity to development has affected mitigation success when unauthorized adjacent landowners have altered sites for personal recreation by building piers and mowing banks. INDOT performs follow-up monitoring of sites for 3 to 5 years for Corps success criteria. INDOT's biggest obstacle in the mitigation process is that the regulatory and resource agency staff does not have an understanding of "real world" wetlands regarding hydrology, plant identification, and so forth. INDOT did not provide any suggestions for improvement. Two Level 2 case studies were provided to this study and are summarized below.

Level 2, Part B: Case Studies

The State Road 39 project was INDOT's first attempt at developing wetlands for Section 404 impacts. It also generated their current Memorandum of Understanding (MOU) with the resource agencies on mitigation ratios. It also showed INDOT that working with multiple agencies and satisfying everyone was virtually impossible. Each agency wanted different things. After receiving the Corps permit and after purchasing 16 acres for a seed base next to the site, the DNR wanted 10,000 trees planted. The Corps wanted to place root wads in the floodway, which changed the DNR's permit.

After construction, the development of the site proceeded exceptionally well with volunteer species developing faster than nonlocal planted species. Numerous species of wetlands plants invaded the area. When monitoring ended, the Corps noted how well the wetlands had developed, and permission was granted for INDOT to transfer the area to the DNR for preservation management. Within a year, a DOT employee visited the site and noted that the DNR had torn up the wetlands and built a parking lot and a boat ramp to the adjacent river. After

inquiring about these activities, the DNR produced a permit from the Corps involving the same personnel that issued the DOT's previous wetlands impact/mitigation permit allowing the development. Additionally, the DNR was not required to mitigate their impact to the DOT's restored wetlands, while the DOT was required to mitigate the site at a ratio of 4:1. Since the DOT's inquiry, the Corps required the DNR to perform mitigation at a 1:1 ratio.

INDOT learned several lessons from this project. It has no guarantee that the agencies it turns its protected mitigated site over to will follow through with their obligations. INDOT should stick to its ideas and develop the site the way it considers to be correct for the area, even if that is not necessarily the way the regulatory agency thinks it should be done. INDOT staff is of the opinion that it has a better understanding of "real world" wetlands than does the regulatory agencies.

The State Road 55 wetlands project took 10 years to develop the environmental document and 6 years to obtain the Corps permit. The area selected for the wetlands was adjacent to the impact site, and originally there was a willing land seller. After developing the concept of the wetlands and gaining the regulators' acceptance, INDOT discovered that the landowner's and the DNR's idea of land value were thousands of dollars apart. Because INDOT cannot condemn land for wetlands development, it began searching for a new location. A joint agreement was developed with the Lake County Parks Department (LCDP) to help fund another site. After long negotiations, Ducks Unlimited stepped in and offered the LCDP funding for the entire project and shut out the DOT altogether. INDOT then returned to the original landowner and offered additional funds in order to purchase the parcel of land.

The site's water source is groundwater and frequent seasonal floodwater. The problem, noted in the development of the site, was that there was too much water present to get the vegetation started. The INDOT staff decided to raise the bottom elevation 1 foot, which would still allow sufficient hydrology because the frequency of flooding of the site was constant. This project was just completed and time will determine if it is a success or failure. All indications suggest that it will be a success.

State DOT	Indiana	**Entry#**	1
Project Name	SR 39/Muscatatack River		
Permit Type	individual		
Impact Location	SR 39 at Washington/Jackson Co. Line (Muscatatack River)		
Impact County	Washington		
Type of Impact	elimination	**Acres Impacted**	13
Type of Impact Notes	roadway construction on new alignment through floodplain		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forested (pin oak, river birch)	**Impact WL Value**	high (wildlife)
Construction Start Date	Oct 90	**Construction Completion (months)**	23
Construction Project Cost ($)	3,413,194		
Construction Cost Notes	project total costs included 3 bridge structures, approximately 1 mile roadway, and wetlands mitigation		
Mitigation Location	SR 39 at Washington/Jackson Co. Line		
Mitigation County	Jackson		
PREC	R		
PREC Notes	purchased 49 acres of land to build wetlands		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	33	**Replacement Ratio Calculation**	2.54
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forested	**Mit WL Value**	medium (due to young age)
Mitigation Start Date	Oct 90	**Mit Completion (months)**	24
Lagtime Impact/Mitigation Completion Calculation (months)	24		
Mit Project Cost ($)	not separated from construction costs		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	4	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	project DOT first attempt to dev. 404 WL, generated current MOU, saw impossible to please multiple agencies; gave site to DNR for preserve; 1997 DNR wrongly received permit from Corps (who forgot it was a mit. site!) to fill 1.1 ac to build boat ramp/parking lot		

State DOT	Indiana	**Entry#**	2
Project Name	SR 55/Kankakee River		
Permit Type	individual		
Impact Location	State 55 over Kankakee River		
Impact County	Lake Newton		
Type of Impact	elimination	**Acres Impacted**	3.15
Type of Impact Notes	Roadway and bridge on new alignment		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forested (silver maple) (PFO), oxbow (POW)		
Impact WL Value	high (wood corridor, fish spawning)		
Construction Start Date	June 96	**Construction Completion (months)**	n/a
Construction Project Cost ($)	3,384,000		
Construction Cost Notes	total construction costs include wetlands construction (at the time of this survey final payment has not been made		
Mitigation Location	State 55 / Newton Co. / Kankakee River		
Mitigation County	Newton		
PREC	R		
PREC Notes	classification is palustrine, forested, open water, and emergent (PFO, POW, PEM)		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	16	**Replacement Ratio Calculation**	5.08
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal and perennial
Mit WL Dominant Type	forested and open water	**Mit WL Value**	n/a
Mitigation Start Date	June 96	**Mit Completion (months)**	24
Lagtime Impact/Mitigation Completion Calculation (months)	24		
Mit Project Cost ($)	277,294		
Mitigation Cost Notes	final acceptance and payment haven't been made		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	expect yes	**Further Mit Required**	unknown
Mitigation Success Notes	10 yrs to dev. environ. doc, 6 yrs to get Corps permit, then landowner decided price too low; after much difficulty settlement reached; site needed to raise elevation of WL 1' because was too much water to get veg. established (hydrology still expected fine)		

Iowa Department of Transportation:

Level 1: Organization and Information

The Iowa Department of Transportation (Iowa DOT) has approximately thirty wetlands impacts and fifteen mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Iowa DOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the county conservation boards, the Iowa Department of Natural Resources (IDNR), the Iowa Natural Resources Conservation Commission (INRCC), and the U.S. Army Corps of Engineers (Corps). Impact files contain delineation information, soil surveys, plans, photos, and type and function of wetlands.

Approximately 75 percent of the Iowa DOT's construction permits require mitigation. Mitigation is routinely performed for wetlands impacts. Mitigation files contain all the impact information, plus corresponding information pertaining to the mitigation site. Follow-up monitoring consists of observation, soil and water sampling, and studies of vegetation and wildlife. The Iowa DOT has not had experience with off-site compensation. Printed impact and mitigation information is accessible by informal written request. No summaries are available from the Iowa DOT. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained for use in this study.

1993 and 1995 AASHTO Summaries

The following information has been summarized from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT. The quantity and/or quality of data obtained from the AASHTO survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Iowa DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994.

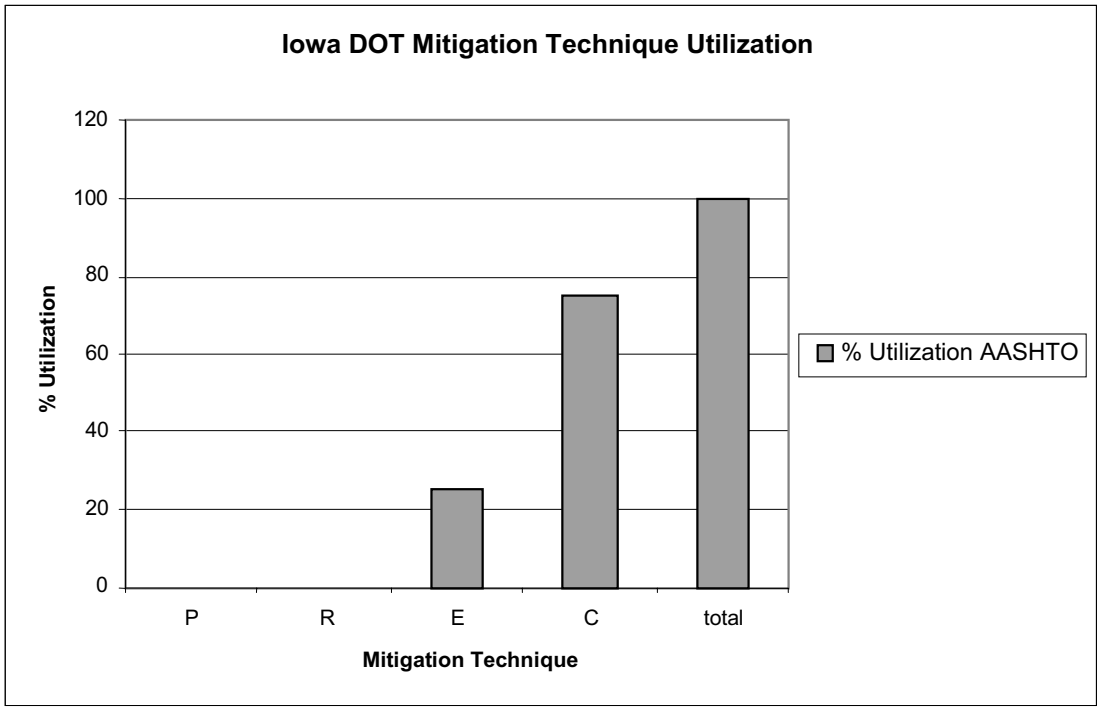
Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation from 1991 through 1994 and was utilized 3 times more often than enhancement. Preservation and restoration were not utilized at all. The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized 3 times more often than on-site mitigation. Mitigation banking was not utilized at all between 1991 and 1994. The Iowa DOT staff did not provide the present 1998 survey with its most recent estimations of mitigation strategy usage rates.

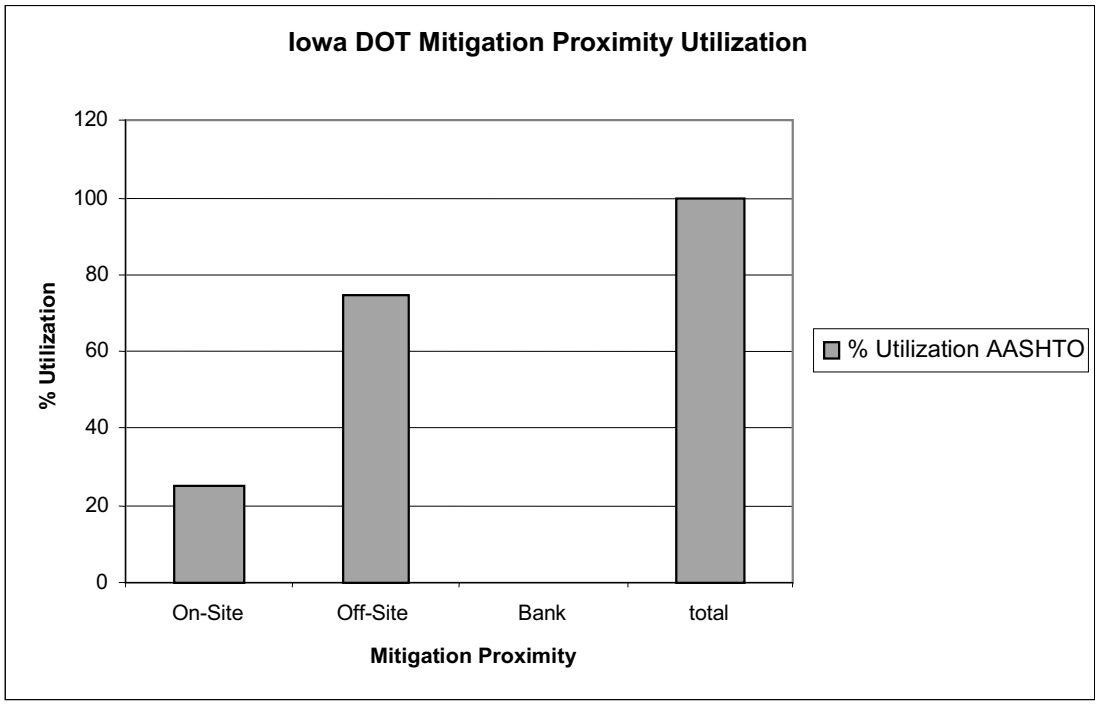
The table and two charts provided below illustrate these Iowa DOT trends.

total # mitigation projects AASHTO 1993 & 1995	12
total # acres impacted '93 & '95	115.3
average # acres impacted per project '93 & '95	9.61
total # acres mitigated '93 & '95	165.19
average replacement ratio '93 & '95	1.43

	P	R	E	C	total
% Utilization AASHTO	0	0	25	75	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	25	75	0	100.00


Iowa DOT Mitigation Technique Utilization
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO


Iowa DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO

Kansas Department of Transportation:

Level 1: Organization and Information

The Kansas Department of Transportation (KDOT) has approximately twelve wetlands impacts and one mitigation project per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. KDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Kansas Department of Parks and Wildlife (KPWD), the Kansas Natural Resource Conservation Commission (KNRCC), the Federal Highway Administration (FHWA), and the U.S. Army Corps of Engineers (Corps).

Impact files containing information from the National Wetlands Inventory maps and soil surveys are maintained. Most information is soil-based. The areas marked as wetlands on these maps have not always had certified delineations performed on them, and the Kansas DOT is working toward performing certified delineations on these areas as necessary. Impact data include area, location, and soil information. There is no organized filing system; information is accessible by site visit.

Approximately 1 percent of KDOT's construction permits requires mitigation, and mitigation is occasionally performed for wetlands impacts. There is currently less than one mitigation project per year; however, they expect to see this increase as a result of the changes in the regulations that now require all projects to be permitted. Mitigation files contain soil-based information from National Wetlands Inventory maps and soil surveys. KDOT did not specify the mitigation types and strategies utilized, though it referenced the fact that the FHWA's documented specifications are used.

KDOT does not perform off-site compensation or mitigation banking. Printed mitigation information is accessible by informal written or phone request. No summaries are available from KDOT. The Kansas DOT's follow-up monitoring includes water table fluctuation measurements, transects, and soil and vegetation surveys. None of the information is easily accessible and, consequently, could not be provided for use in this study. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by KDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Kansas DOT during the

periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was utilized exclusively by the Kansas DOT for mitigation from 1991 through 1994. The 1998 survey data also showed that creation was utilized for all mitigation cases; however, enhancement was occasionally used.

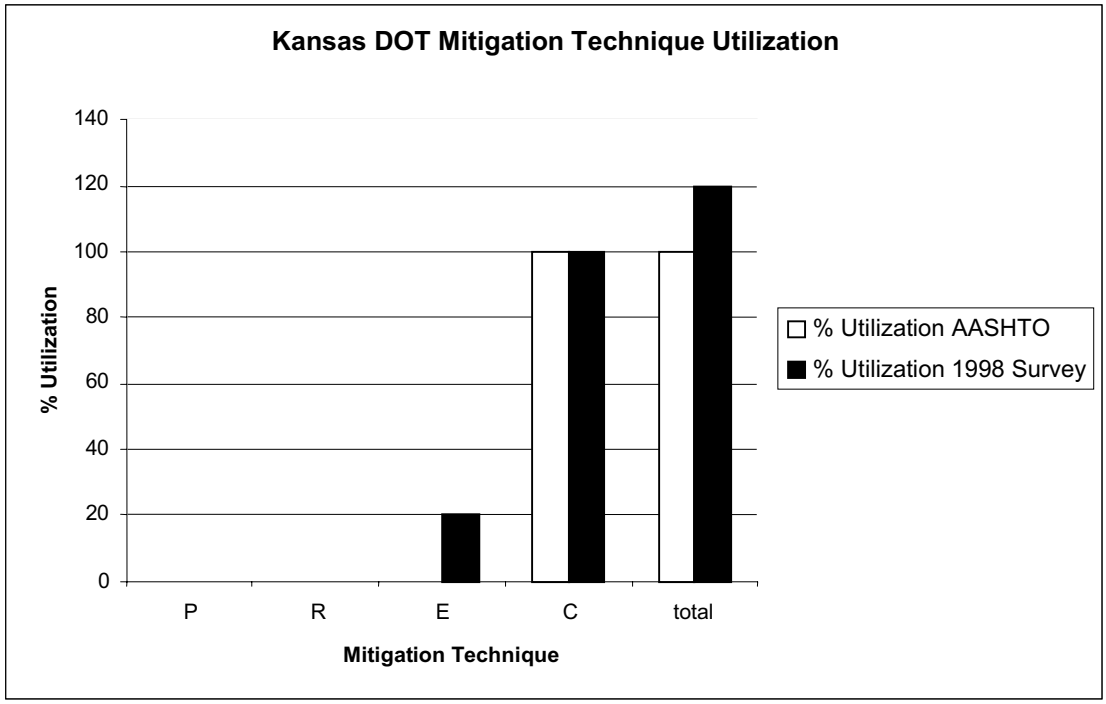
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized twice as much as on-site mitigation. Mitigation banking was not utilized at all between 1991 and 1994. The 1998 survey demonstrated the opposite trend, with an on-site usage rate 9 times greater than the off-site rate.

The table and two charts provided below illustrate these KDOT trends.

total # mitigation projects AASHTO 1993 & 1995	3
total # acres impacted '93 & '95	34.6
average # acres impacted per project '93 & '95	11.53
total # acres mitigated '93 & '95	36.6
average replacement ratio '93 & '95	1.06

	P	R	E	C	total
% Utilization AASHTO	0	0	0	100	100
% Utilization 1998 Survey	0	0	20	100	120

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	33.33	66.67	0	100
% Utilization 1998 Survey	90	10	0	100


Kansas DOT Mitigation Technique Utilization
140
120
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40
20
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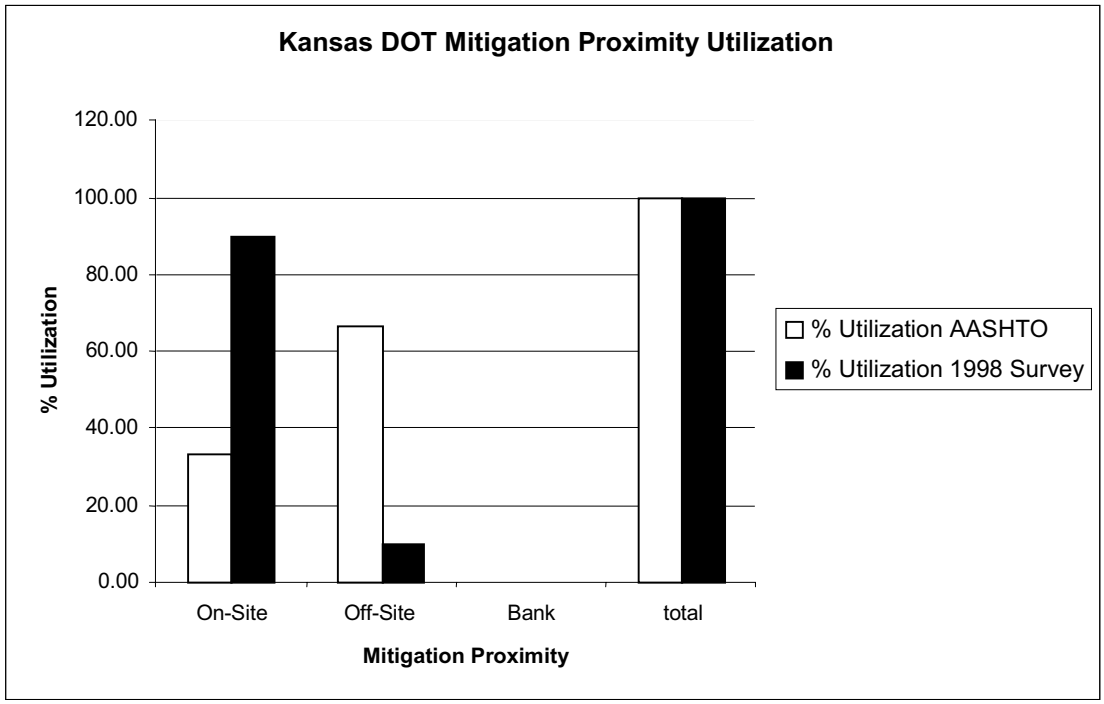
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Kansas DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options for use by the Kansas DOT in wetlands mitigation. The preference ranking is C, E, then R and P. They have not used restoration yet because most sites are small and it is easy to perform creation or enhancement. Preservation is not considered to be an economically feasible option at this time. KDOT staff gave an unofficial observation that the Corps would allow all four options to be used. However, the other regulatory agencies would have problems with utilizing restoration and preservation. The relative percentage each mitigation technique is utilized by KDOT for wetlands mitigation is as follows: 0 percent preservation, 0 percent restoration, 20 percent enhancement, and less than 100 percent creation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired and utilized approximately 10 percent of the time. KDOT considers off-site to be outside the local watershed but still within transportation project boundaries. A long linear project can span dozens of local drainage basins, and consolidated mitigation has been met with local regulatory resistance. Out-of-kind has been neither desired nor available as an option thus far. Replacement ratios are based on acreage and, unofficially, the typical ratios are 1:1 when in-kind replacement is used.

The primary agencies involved in the mitigation negotiation process are the Corps, the KPW, and the FWS. Thus far, KDOT has not submitted a mitigation plan that differs from the agency expectations, and no objections have occurred. The Corps would be the resolution agency for disputes between the DOT and the signatory agencies. The Kansas DOT design methods include site surveys, data collection, and meetings with the Corps, the KPW, and the FWS for engineering design. KDOT performs follow-up monitoring on an annual basis to assess hydrology, soils, and vegetation.

The DOT's biggest obstacle in the mitigation process is location determination. Conflicts between the desires of regulatory agencies for on-site and the desires of KDOT for within-project boundaries can conflict with optimal mitigation site location. The Kansas DOT suggests improvement to the process by developing guidelines to reasonably define "on-site." KDOT would prefer on-site to be equal to or greater than the local drainage basin because a long linear transportation project may cross thirty or more local watersheds and three to five HUC watersheds; thus, consolidation within a single project would be beneficial.

The Kansas DOT is not planning to utilize mitigation banks because of the local drainage basin issue and because KDOT has few large-scale impacts. However, newly proposed nationwide permits (NWP) may change this policy. One Level 2 case study provided for this study involves an on-site mitigation, which was KDOT's first and largest project. It is summarized below.

Level 2, Part B: Case Studies

State DOT	Kansas	**Entry#**	1
Project Name	US 50 Wetlands		
Permit Type	individual		
Impact Location	US-50 on Chase/Lyon Co. Line		
Impact County	Chase/Lyon		
Type of Impact	elimination	**Acres Impacted**	19
Type of Impact Notes	old highway and railroad borrow areas (plant species: polygonum, scirpus); borrow areas are shallow excavations used by contractors to provide fill material for highway construction		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	wet meadow	**Impact WL Value**	low (common, poor function)
Construction Start Date	spring 92	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	Chase/Lyon Co. Line, 600 feet north of highway		
Mitigation County	Lyon		
PREC	C		
PREC Notes	various obligates were used for replacement		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	19.6	**Replacement Ratio Calculation**	1.03
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	wet meadow	**Mit WL Value**	high
Mitigation Start Date	spring 92	**Mit Completion (months)**	2
Lagtime Impact/Mitigation Completion Calculation (months)	2		
Mit Project Cost ($)	173,337		
Mitigation Cost Notes	excavation used for road fill		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	Considered spectacular success; significant because it was KDOT's first designed WL mit. site and their largest site. It replaced a monoculture wetlands w/ an extremely vegetatively diverse wetlands.		

Louisiana Department of Transportation and Development:

Level 1: Organization and Information

The Louisiana Department of Transportation and Development (DOTD) receives input from other agencies, including the Vicksburg and New Orleans Districts of the U.S. Army Corps of Engineers (Corps). The Vicksburg District is extremely informal and requires little documentation from the applicant. The New Orleans District's guidelines for mitigation areas are much stricter (its guidelines are similar to banking guidelines and it has a review team). This district allows the mitigation area to collect credits and then to plant once a year for projects approved during the previous year. All the mitigation credits are assigned up front for the mitigation area and are static over time. Most mitigation areas are bottomland hardwoods and a little cypress. No areas exist yet for marshes. This mitigation is performed mostly on-site in small amounts and is not very organized.

The Louisiana DOTD has had a new wetlands mitigation policy in place for the past 1 to 1.5 years. They contract with independent providers of mitigation areas (not banks). These profit and nonprofit mitigation area sources deal individually with the Vicksburg or New Orleans Corps Districts; the Louisiana DOTD simply contracts with the provider. Usually the district accepts equal acreage replacement, which must be in-kind and located close to or in the same watershed. Brief mitigation summaries were requested and received for this study. In addition, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data provided by the Louisiana DOTD and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Louisiana DOTD during the time periods specified. The AASHTO survey cataloged information on specific cases for 1991 and 1992. The Louisiana DOTD summary contains data from an unspecified period of time, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that enhancement was utilized exclusively by the Louisiana DOTD for 1991 and 1992. No information was provided to this study by the Louisiana DOTD staff in the summary data or the 1998 survey on mitigation strategies.

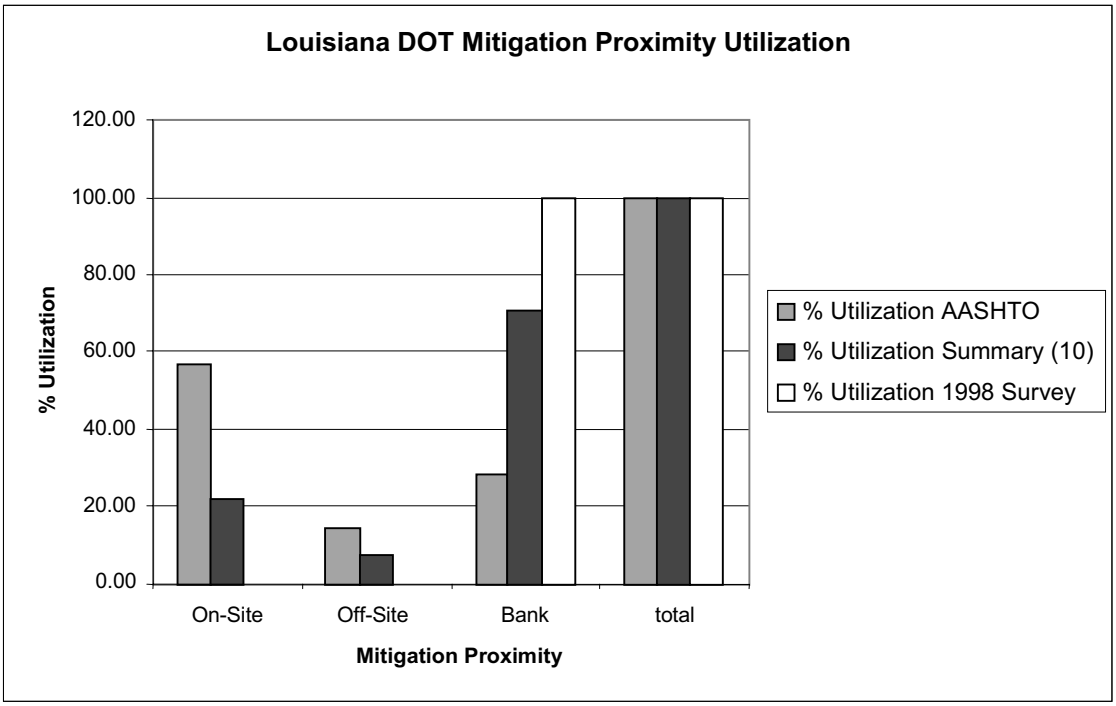
The AASHTO summary data also showed that, for mitigation proximity, on-site mitigation was the favored choice and was utilized 4 times more often than off-site mitigation, and twice as often as banking between 1991 and 1994. The Louisiana DOTD summary data indicated a different trend, with banking usage 3 times greater than on-site and 10 times greater than off-site. In contrast to the data summaries, the 1998 survey demonstrated the Louisiana DOTD's new policy of exclusively utilizing mitigation banking.

The table and chart provided below illustrate these Louisiana DOTD trends.

total # mitigation projects AASHTO 1993 only	7
total # acres impacted 1993	54.58
average # acres impacted per project 1993	7.80
total # acres mitigated 1993	51.00
average replacement ratio 1993	0.93
total # mitigation projects Summary Louisiana Files	41
total # acres impacted LA Files	494.30
average # acres impacted per project LA Files	12.06
total # acres mitigated LA Files	851.90
average replacement ratio LA Files	1.72

	P	R	E	C	total
% Utilization AASHTO	0	0	100	0	100
% Utilization Summary (10)	NA	NA	NA	NA	NA
% Utilization 1998 Survey	NA	NA	NA	NA	NA

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	57.14	14.29	28.57	100
% Utilization Summary (10)	21.95	7.32	70.73	100
% Utilization 1998 Survey	0	0	100	100



Level 2, Part A: Processes and Methodologies

The Level 2 Survey for Mitigation Processes and Methodologies no longer applies to the Louisiana DOTD's situation. This is due to the fact that all wetlands mitigation is now handled through private mitigation bank-like organizations called "Mitigation Area Contracts." These private sources deal directly with the Corps for permitting, with the Louisiana DOTD completely out of the loop.

Michigan Department of Transportation:

Level 1: Organization and Information

The Michigan Department of Transportation (MDOT) has approximately 100 wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The Michigan DOT receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Michigan Department of Environmental Quality (MDEQ), the Michigan Department of Natural Resources (MDNR), the U.S. Fish and Wildlife Service (FWS), and the U.S. Army Corps of Engineers (Corps). Impact and mitigation files are not maintained. However, larger projects do collect summary information regarding environmental impact statement (EIS), environmental assessment (EA), watershed, location, type, acreage impacted and mitigated, and function. Summaries are not available from MDOT.

Approximately 60 percent of MDOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. The Michigan DOT has not had experience with off-site compensation, and there has been no official mitigation banking. Follow-up monitoring is conducted for the DOT's mitigation projects, and reports are prepared for each site. A mitigation program summary was requested and received for this study. In addition, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

1993 and 1995 AASHTO Summaries

The following information has been summarized from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT. The quantity and/or quality of data obtained from the AASHTO survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the MDOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994.

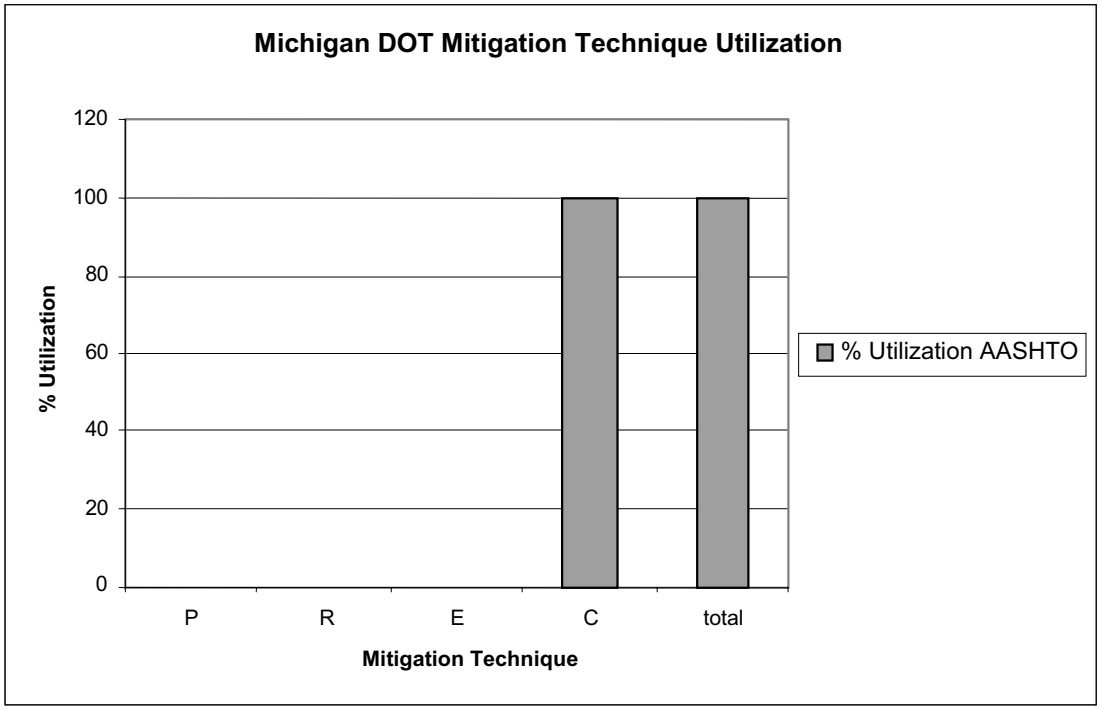
Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was utilized exclusively for mitigation from 1991 through 1994. The AASHTO summary data also showed that, for mitigation proximity, off-site and on-site mitigation utilization rates were equal. Mitigation banking was not utilized by MDOT from 1991 through 1994. The MDOT staff did not provide the present 1998 survey with its most recent estimations of mitigation strategy usage rates.

The table and two charts provided below illustrate these MDOT trends.

total # mitigation projects AASHTO 1993 & 1995	16
total # acres impacted '93 & '95	236.62
average # acres impacted per project '93 & '95	14.79
total # acres mitigated '93 & '95	258.7
average replacement ratio '93 & '95	1.09

	P	R	E	C	total
% Utilization AASHTO	0	0	0	100	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	56.25	56.25	0	112.50


Michigan DOT Mitigation Technique Utilization
120
100
80
60
40
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% Utilization
P
R
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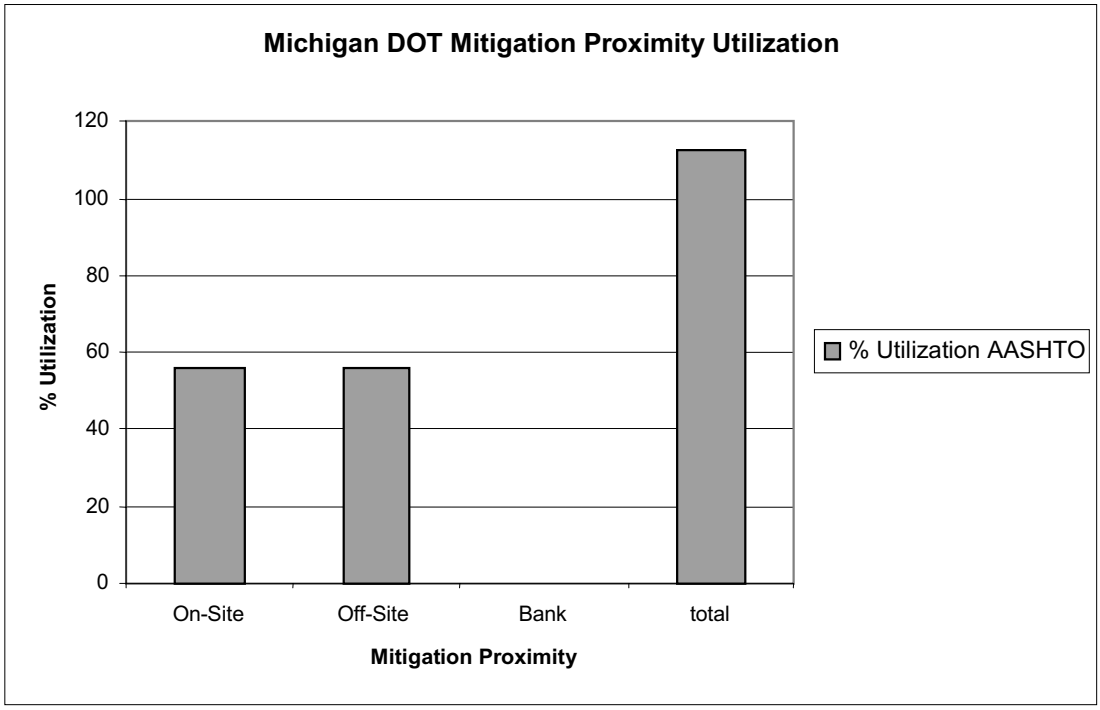
total
Mitigation Technique
% Utilization AASHTO


Michigan DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to the MDOT for wetlands mitigation. The preference ranking is R, C, E, and then P. MDOT has also shifted its mitigation efforts more toward wetlands restoration versus wetlands creation. In the past, creation has accounted for 90 percent of the wetlands mitigation; MDOT is now trying to decrease this to less than 20 percent of the mitigation efforts. Utilization of restoration is being increased from 10 to 80 percent. For many years, MDOT tended to look for areas where borrow from the mitigation site could be used on its road projects. MDOT is now trying to shift this emphasis toward finding historical wetlands areas that are not dependent on extensive excavation in an effort to both reduce cost and increase the ultimate success of the sites. To assist in locating such sites, historical wetlands maps are overlaid with current land maps via Intergraph. Preservation and enhancement are used only 1–2 percent of the time because they are not considered to be cost effective, especially in urban areas, owing to the 10:1 replacement ratio required. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired approximately 60 percent of the time, and restoration will require going off-site more in the future. The regulators are currently requiring forested wetlands to be replaced in-kind; however, MDOT is of the opinion that much of this type of replacement is still experimental and would like to have the option to reduce in-kind mitigation in areas where forests are the dominant wetlands type. The mitigation sequence advocates trying to provide on-site mitigation first, if possible, and then trying to stay within the same watershed and municipality. The emphasis on staying within the same watershed has noticeably increased in the last few years. MDOT has been successful in negotiating several cases to provide some on-site retention functions and to move the wildlife habitat portion of the mitigation off-site. The Michigan DOT has yet to convince the agencies to grant any preservation credit on its mitigation projects.

The agencies insist that the wetlands laws should adequately protect the existing wetlands. However, the DOT has found this to be untrue and has noted that many local wetlands are being lost to development in a piecemeal manner. In fact, MDOT had proposed that it purchase and preserve a rare black spruce bog as a small portion of the Haggerty Road Connector Project in Oakland County; the proposal was, however, turned down. Now, a private developer has applied for a permit application to develop a portion of this bog.

The replacement ratios are currently based on acreage in combination with the wetlands types, but are being shifted toward more of a function and value focus. Currently, typical mitigation ratios are 1.5:1 for emergent and scrub shrub habitats and 2:1 for forested wetlands. The resource agencies have indicated they would be willing to be more generous with the replacement ratios if MDOT will mitigate wetlands in advance of the transportation projects and demonstrate that the wetlands offered for mitigation are functionally successful.

For the last 4 to 5 years, MDOT has been required to replace wetlands habitats in-kind. Several forested sites are now in the ground, and MDOT is continuing to experiment with new methods and technologies. There is concern that the resource agencies' insistence on in-kind replacement is a great risk, especially for forested wetlands, because the success of the currently available replacement technology is still somewhat questionable.

The primary agencies involved in the mitigation negotiation process are the MDEQ, the EPA, the FWS, and the Corps. The MDEQ has assumed authority over administering Section 404 of the Clean Water Act for most permit applications. The Corps still retains authority over navigable rivers, the Great Lakes, and their adjacent wetlands. This allows MDOT, in most cases, to obtain one permit from the MDEQ, rather than having to deal with both agencies. This has been beneficial to MDOT's mitigation program and has reduced unnecessary duplication at the resource agencies. The FWS and the EPA still oversee and comment on all larger projects.

The MDEQ resolves any conflicts between MDOT and the signatory agencies. It is estimated that 20 percent of the time MDOT submits a mitigation plan that differs from the agency expectations. MDOT has a Memorandum of Understanding (MOU) with the MDEQ addressing transportation issues. As part of this MOU, the state transportation agency funds approximately eleven positions within the MDEQ, which form a transportation unit. This unit is devoted to processing transportation project permit applications and also allows for a better preliminary review process. Through this process, the MDOT is able to work out many potential problems before they ever get to the permit stage. The MOU also provides some flexibility in mitigation efforts, allowing the creation of "moment of opportunity wetlands." Whenever the opportunity arises, more wetlands can be created than are required for a project, and the excess can be credited toward future general permit projects, as well as toward smaller transportation projects in the vicinity. It also allows for the creation of premitigation for specific projects and allows for the aggregation of a number of smaller projects into one large mitigation site. It should be noted that this is not a wetlands banking program; it is tailored specifically to transportation agencies.

In January 1998, the State of Michigan approved wetlands banking regulations. However, MDOT has not participated in an official wetlands bank to date, and MDOT is not sure at this time if it will pursue that option because of the flexibility allowed in the current MOU. MDOT has staff biologists, soil engineers, a landscape architect, and a botanist. They utilize many plan design methods to meet the functional replacement goal, including current and historical maps, site survey and topographic map generation, soil borings, monitoring wells, and the Corps' Wetlands Evaluation Technique (WET II) analysis.

Wetlands type does have an effect on the design methods because Michigan has a large number of forested wetlands, making site selection more difficult and the planning stage longer. MDOT has observed some negative effects of proximity to development on mitigation success. However, these sites perform better for flood storage and sediment retention than for habitat. Therefore, MDOT often performs on-site mitigation for flood retention and off-site mitigation for habitat replacement. Follow-up monitoring of mitigated wetlands will last anywhere from 6 to 10 years, depending on the wetlands type. MDOT has an in-house staff that performs this work; reports that include photographs and videos of the mitigation sites are submitted to the resource agencies annually

Case studies were requested for use in this study; however, the Michigan DOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Minnesota Department of Transportation:

Level 1: Organization and Information

The Minnesota Department of Transportation (Mn/DOT) has approximately thirty wetlands impacts and fifteen mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Minnesota DOT receives input from other agencies, but does not reorganize or summarize the data. It supplements that information with delineations or other information as necessary. Agencies include the National Wetlands Inventory and the Minnesota Department of Wetlands Resources. Impact files containing information from National Wetlands Inventory maps, delineations, and soil surveys are maintained. Impact data include information on type, size, percent of basin, location, drainage area (sometimes), very general vegetation remarks (i.e., "mostly shrubs" or "mostly willows"), and proximity to other water bodies.

Prior to the Minnesota Wetlands Conservation Act of 1991, Mn/DOT used guidelines, based on reproduction and feeding in an area, to quantitatively determine the area's value. Now, if a wetlands area is assigned a value, the Minnesota Rapid Assessment Method (MINRAM) is used. Printed impact information is accessible by mail or phone for minor requests and by site visit for major requests. The state wetlands report is produced annually and is published about 6 months after the start of the current year for the previous year. The Minnesota DOT also has a project managers' handbook that includes a section on wetlands.

Mitigation data include size, type, and vegetation information, as well as field notes. Basically all of Minnesota DOT's permits require mitigation. Mitigation is routinely performed for wetlands impacts, and the types and strategies used are found in the wetlands section of the environmental impact statement (EIS) or in a project memo.

Minnesota has had mitigation banking since the early 1980s. There are 2,000 acres banked for Mn/DOT, and their account balance is more than 200 acres. Areas, credits, and debits are utilized in the program. The state is divided into three categories: areas that still retain more than 80 percent of their presettlement wetlands, areas that retain 50 to 80 percent of their presettlement wetlands, and areas that have lost at least 50 percent of their presettlement wetlands. Locations throughout the entire state can be used in mitigation banking with two exceptions: all projects for which an area within the seven-county Twin Cities metro area was impacted must be mitigated, within that same area and projects for which a site in an area that has lost at least 50 percent of its presettlement wetlands cannot be mitigated in a 50–80 percent or an 80+ percent remaining area. Minnesota is currently debating this with the U.S. Environmental Protection Agency (EPA), whose position is that all impacts should be mitigated as close to the impact as possible. Mn/DOT's position is that it is better to mitigate a wetlands impacted in a wetlands-rich area with one placed in a wetlands-poor area. In particular, it is trying to mitigate impacts that occur in the northeast corner of the state, where there are many naturally occurring wetlands, with mitigation sites in the southwest corner of the state, where many presettlement wetlands have been destroyed by farming.

Follow-up monitoring is conducted via site visits with photography every year for 5 years. For mitigation banking projects, the monitoring is a little different. A site inspection team must visit the site a minimum of 6 months after completion of the project. The mitigation cannot be credited until this team has approved it. Impact, mitigation, and banking summaries, as well as the past 3 to 4 years of the state wetlands report and the project manager's handbook were requested. The 1993–1995 state wetlands reports were received for use in this study. In addition, the 1993 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by Mn/DOT and from information obtained from the 1993 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Minnesota DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1991 and 1992, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was utilized exclusively for mitigation for 1991 and 1992 projects. The 1998 survey, by contrast, demonstrated a different trend, with restoration being the favored mitigation choice, which was utilized 9 times more often than creation and 18 and 90 times more often than enhancement and preservation, respectively.

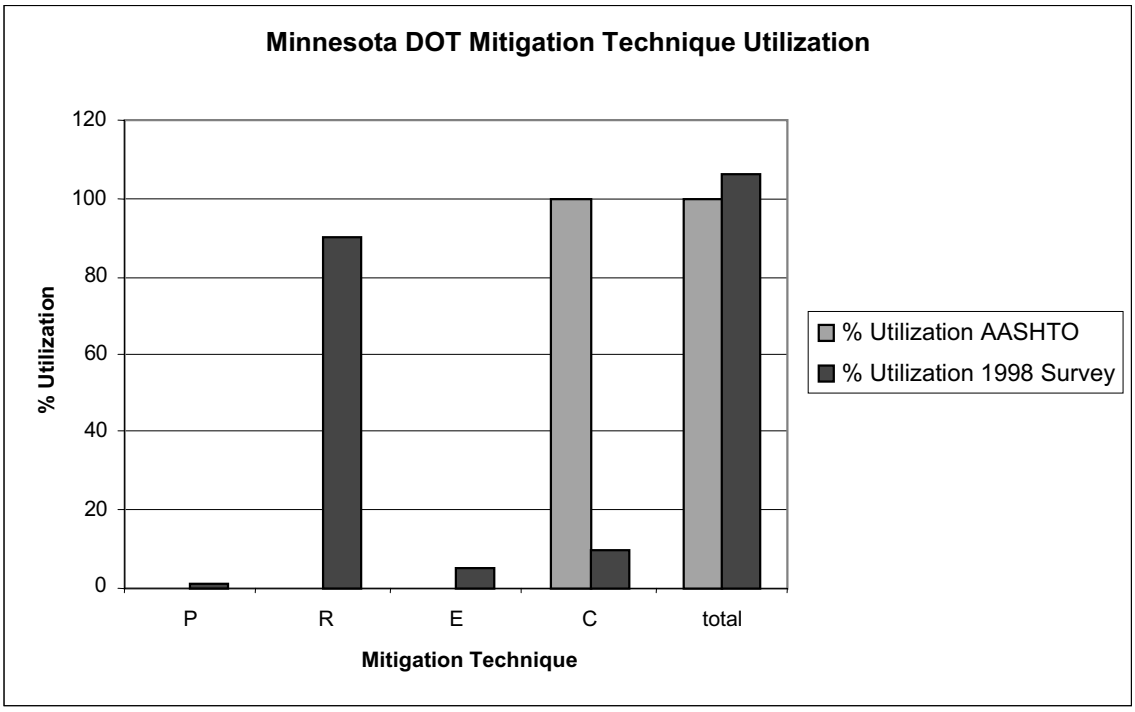
The AASHTO summary data also showed that for mitigation proximity banking was utilized exclusively by Mn/DOT for mitigation projects in 1991 and 1992. The 1998 survey demonstrated a different trend, with an off-site usage rate 2.3 times greater than the on-site rate. Mn/DOT utilizes a statewide bank; however, the staff did not supply information distinguishing between case-specific off-site mitigation and mitigation banking usage rates to the present study. Mn/DOT combines these two options under the "off-site" category.

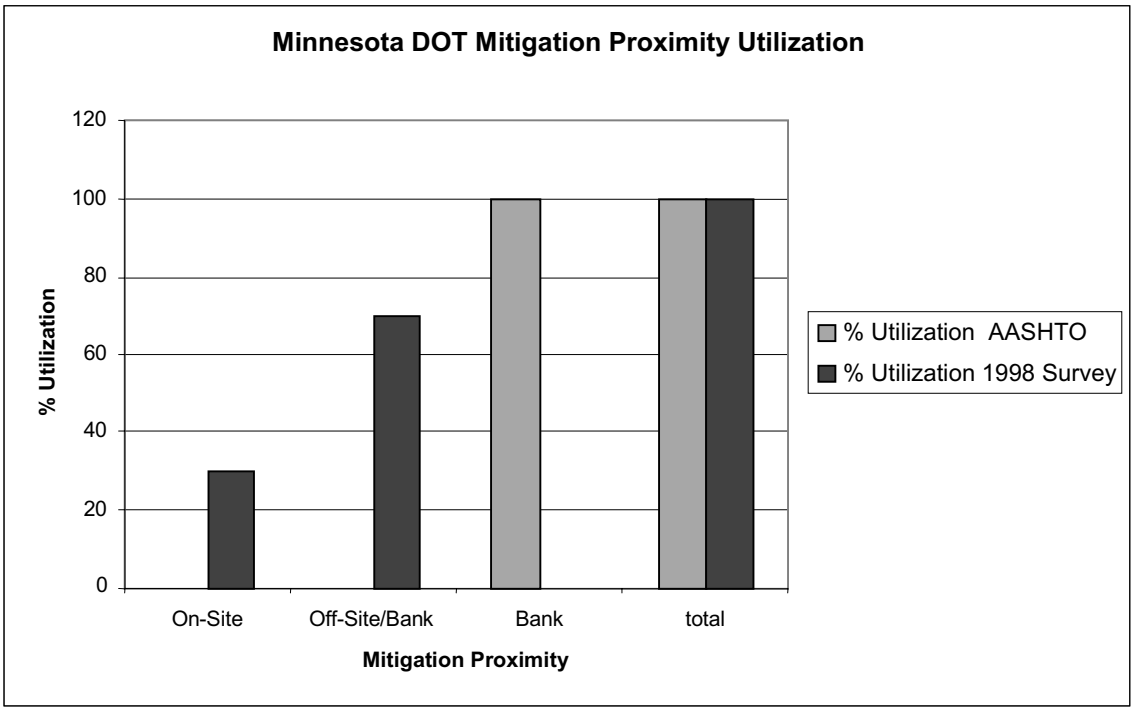
The table and two charts provided below illustrate these Mn/DOT trends.

total # mitigation projects AASHTO 1993	6
total # acres impacted '93	591.11
average # acres impacted per project '93	98.52
total # acres mitigated '93	1360.01
average replacement ratio '93	2.30

	P	R	E	C	total
% Utilization AASHTO	0	0	0	100	100
% Utilization 1998 Survey	1	90	5	10	106

	On-Site	Off-Site/Bank	Bank	total
% Utilization AASHTO	0	0	100	100
% Utilization 1998 Survey	30	70	NA	100


Minnesota DOT Mitigation Technique Utilization
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Minnesota DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site/Bank
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to Mn/DOT for wetlands mitigation. The preference ranking is R, C, E, then P. Restoration is used for projects larger than 20 acres, and creation is used for less than 1 acre. Most are small acreage projects, so creation is used on approximately 80 percent of the projects. Preservation has only occurred once in the past 20 years. Enhancement has had a checkered past. The first 10 years it was used a great deal as a conversion from one type to another, then was discouraged for a period of time. Now, enhancement is being encouraged again. The relative percentage of time each mitigation technique is utilized by Mn/DOT for wetlands mitigation is as follows: <1 percent preservation, 90 percent restoration, 5 percent enhancement, and 10 percent creation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site is desired 100 percent of the time and is utilized 70 percent of the time. Out-of-kind replacement is desired 67 percent of the time and is utilized 80 percent of the time. Out-of-kind occurs mostly for damp impacts (shrub/bottomland swamps, shallow basin palustrine emergent marsh), which receive deep mitigation (lots of opportunities on farmland to restore duck marshes). Replacement ratios are based on the percent remaining of presettlement wetlands (PSWLs). This divides the state into three basic geographic regions: the >80 percent and >50 percent PSWLs each has a 1:1 ratio, and the <50 percent PSWL ratio is 2:1. Then ratio penalties are added for out-of-kind and/or for flow regime (topographic setting). These are determined by functional assessments. Public value credits (PVCs) can be used above a 1:1 ratio after the basic PSWL replacement has been satisfied. Replacement value for a particular wetlands impact can range from 1:1 to 3:1. The 1:1 ratio must be satisfied using new wetlands credits (NWCs), then the remaining portion can be replaced with NWCs or PVCs. Below is a listing of what qualifies as an NWC and a PVC.

New Wetlands Credit (NWC)	Public Value Credit (PVC)
Creation of a wetlands from upland	Restoration of hydrology on a partially drained wetlands (limited to 50 percent of replacement basin size)
Restoration of hydrology and vegetation of a completely drained wetlands	Construction of water quality treatment ponds associated with projects that impact wetlands (amount limited to 75 percent of replacement basin size)
Restoration of vegetation only on a farmed wetlands (amount limited to 50 percent of replacement basin size)	Establishment of upland buffer areas around replacement wetlands (limited to 75 percent of replacement basin size)
Construction of 2-cell stormwater detention basin (amount limited to acreage of downstream cell)	

As shown in the table above, the regulators acknowledge the importance of including upland buffers around the wetlands area and give 75 percent credit for uplands in the mitigation. Therefore, a mitigation project with 10 acres of creation/restoration and a 10 acre upland buffer would yield 10 acres of NWCs and 7.5 acres of PVCs.

The primary agency involved in the mitigation negotiation process is the Department of Natural Resources for wetlands Types 3, 4, and 5, and the Corps for all other types of wetlands. The state of Minnesota uses the Circular 39 system in this case to classify wetlands types. Type 3 is a shallow freshwater marsh: Type 4 is a deep freshwater marsh; and Type 5 wetlands are shallow open-water lakes. These two agencies are also the resolution agencies. It is estimated that 1 percent of the time Mn/DOT submits a mitigation plan that differs from the agency expectations, and of these, Mn/DOT's plan overrides 99 percent of the time, requiring only minor changes. Two subdivisions within the Corps district deal with 404 permitting: the ecology section, which often has philosophical problems with the mitigation plans, and the permit section, which is primarily concerned with completing permits. Mn/DOT considers the permitting section easy to deal with, and, fortunately for Mn/DOT, this section often overrides the ecology section in the final decision.

There is no standard Mn/DOT design approach. The amount of effort is personality driven by the various project directors. Wetlands type does not affect the design methods utilized by the DOT. The only effect would be concerning the state rule for how fast bank credits are available for withdrawal, which is based on hydrology success. Restoration requires 6 months and creation requires more than a year to allow the bank credits to become available for withdrawal. There is no presale of credits; however, it is not required to have all the vegetation cover complete. Mn/DOT requires 5 years of follow-up monitoring (several times per season for all sites). The procedure is simple and includes a site visit to measure water elevation and to estimate the percent vegetative cover (no transects).

The Minnesota DOT's biggest obstacle in the mitigation process is trying to convince the regulatory agencies that a good faith effort has been made to do replacement on-site or in the local watershed (i.e., showing that mitigation sequencing has been followed, so that the statewide bank can be used). They did not provide any suggestions for improvement. Three case studies were provided to this study and are summarized in the following section Level 2, Part B: Case Studies.

The summer 1998 issue of the *Wetland Journal* (Vol. 10, No. 3, p. 12) contains "The Minnesota Wetlands Conservation Act — Political Success, Ecological Failure," a critical evaluation of Minnesota's Wetlands Conservation Act (WCA) by Franklin J. Svodboda. Svodboda (#412) states that the WCA is a clearly thought out and carefully crafted piece of legislation that was creative in its approach to addressing the issue of wetlands losses in the state. However, its implementation at the local level is severely limiting opportunities for restoration and enhancement of degraded wetlands systems. It is perpetuating the degraded condition of wetlands in both urban and rural areas and is hindering mitigation opportunities for the re-establishment of upland-wetlands complexes on previously drained agricultural lands in rural areas using financial resources available from urban projects. The WCA, along with the new NWP26, has successfully reduced the quantitative losses of wetlands, but the quality and biological diversity of existing wetlands in most parts of the state are continuing to decline. The quality of replacement wetlands is only marginally being improved, if at all. Major problems relating to the implementation of the WCA, according to Svodboda (#412), include:

- Failure of local elected and appointed officials to recognize that wetlands have been altered by past land uses and that restoration goals should achieve presettlement conditions, not status quo.
- Many regulators and consultants are unprepared and unqualified for the job of regulatory implementation because of inexperience and a lack of academic training.
- Decentralized implementation has caused inconsistencies in delineation and interpretation of the rules.
- Insistence by local elected and appointed officials that mitigation be on-site even though the WCA allows off-site replacement. On-site replacement almost always results in making significant compromises with regard to the integration of upland and wetlands functions. The landscape feature will retain water; however, it is not a fully functional wetlands that produces enhanced functions and related values.
- The wrongful use of the WCA, as well as the national Clean Water Act, by political groups to curtail urban growth. These efforts fail to recognize the deteriorated state of existing wetlands and prevent the opportunity for reversal of the ecological damage of the past. It would be a much better service to work cooperatively with the development community to enhance selected existing urban wetlands in exchange for measured impacts to degraded wetlands, restore rural wetlands, and significantly benefit wildlife in both cases.

Svodboda (#412) concludes that if these issues can be addressed and corrected, the WCA could be one of the most well-crafted pieces of wetlands legislation crafted from an ecological restoration perspective.

Level 2, Part B: Case Studies

Three case studies were provided to this study by Mn/DOT: one bank, one on-site, and one combination bank plus on-site mitigation project. These mitigation projects were considered adequate by Mn/DOT, and there were no problems with the regulators.

State DOT	Minnesota	**Entry#**	1
Project Name	T.H. 113901-34		
Permit Type	individual		
Impact Location	T.H. 11 (Trunk Highway)		
Impact County	Lake of the Woods		
Type of Impact	elimination	**Acres Impacted**	3.61
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	Sub plain forest - sedge meadow	**Impact WL Value**	not assessed
Construction Start Date	May 95	**Construction Completion (months)**	25
Construction Project Cost ($)	4,500,000		
Construction Cost Notes	mitigation costs not separated from construction costs except for Private Bank = $3,000/acre/credit		
Mitigation Location	3 sites: T.H. 6 - Talmoon (off-site) / T.H 2 - Sheltie Pond (on-site) / Waseca Private Bank (bank)		
Mitigation County	Itasca / Hubbard / Waseca		
PREC	R / C / R		
PREC Notes	4.2ac=3.2+1.08+0.41		
Mitigation Proximity	off-site / on-site / bank	**Type of Replacement**	out-of-kind/in-kind/in-kind
Acres Mitigated	4.2	**Replacement Ratio Calculation**	1.16
Mit WL Classification	palustrine		
Mit WL Dominant Type	sedge meadow - cattail marsh (grasses and sedges/grasses and sedges/shrubs and sedges)		
Mit WL Inundation	perennial	**Mit WL Value**	not assessed
Mitigation Start Date	June 95/June 96/June 95	**Mit Completion (months)**	1/ 3/1
Lagtime Impact/Mitigation Completion Calculation (months)	1/16/1		
Mit Project Cost	bank credits: $3,000/acre		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	3 times/summer
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	mitigation was adequate; encountered no problems w/ regulators		

State DOT	Minnesota	**Entry#**	2
Project Name	T.H. 26 2802-54		
Permit Type	individual		
Impact Location	T.H. 26		
Impact County	Houston		
Type of Impact	elimination	**Acres Impacted**	8
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	seasonally flooded / deep water marsh	**Impact WL Value**	not assessed
Construction Start Date	June 97	**Construction Completion (months)**	14
Construction Project Cost ($)	3,800,000		
Construction Cost Notes	n/a		
Mitigation Location	T.H. 26 (on-site) / Olmstead State Bank (Rock Dell TWP)		
Mitigation County	Houston / Olmstead		
PREC	C		
PREC Notes	16 acres total: 4 acres on-site, 12 acres bank		
Mitigation Proximity	on-site / bank	**Type of Replacement**	out-of-kind
Acres Mitigated	16	**Replacement Ratio Calculation**	2.00
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	Type 3 cattails / Type 6 shrubs	**Mit WL Value**	not assessed
Mitigation Start Date	June 98 (on-site) / 96 (bank)	**Mit Completion (months)**	2 / 0
Lagtime Impact/Mitigation Completion Calculation (months)	14 / 0		
Mit Project Cost ($)	not separate from construction		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	3 times/summer
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	pending - mitigation was adequate; encountered no problems w/ regulators		

State DOT	Minnesota	**Entry#**	3
Project Name	T.H. 23 0503-62		
Permit Type	NWP		
Impact Location	T.H. 23		
Impact County	Benton		
Type of Impact	modification	**Acres Impacted**	1.35
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	shallow - deep marsh - rushes	**Impact WL Value**	not assessed
Construction Start Date	April 95	**Construction Completion (months)**	2.5
Construction Project Cost ($)	7,400,000		
Construction Cost Notes	n/a		
Mitigation Location	T.H. 23		
Mitigation County	Benton		
PREC	C		
PREC Notes	n/a		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	2.08	**Replacement Ratio Calculation**	1.54
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	rushes	**Mit WL Value**	not assessed
Mitigation Start Date	Mar 95	**Mit Completion (months)**	8
Lagtime Impact/Mitigation Completion Calculation (months)	7		
Mit Project Cost ($)	not separated from construction costs		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	3 times/summer
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	mitigation was adequate; encountered no problems w/ regulators		

Mississippi Department of Transportation:

Level 1: Organization and Information

The Mississippi Department of Transportation (MissDOT) has approximately fifty wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The Mississippi DOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Mississippi Natural Heritage Program (the state environmental agency), the Federal Highway Administration (FHWA), the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS).

Printed impact files contain information from soil maps; reports based on site observations are maintained along with the 404 permit. Impact data include soil information, wetlands type, and extent of the impact. A site plan accompanies the documentation. Basically all of Mississippi DOT's permits require mitigation, and mitigation is routinely performed for wetlands impacts. The exception to the rule of routine mitigation on wetlands impact projects is that mitigation is almost never required on Nationwide 23 permits. MissDOT did not specify the mitigation types and strategies utilized. Mitigation data include acres, type, and area below the high water level. Printed impact and mitigation information is accessible by site visit or by mail request; however, no summaries were available from MissDOT. The Mississippi DOT does very little follow-up monitoring, performing only what is required by law.

MissDOT, which has had experience with off-site mitigation, has just purchased 1,600 acres of land to use as a mitigation bank. The land title was transferred to the FWS because state law dictates that another state or federal agency must manage the DOT's mitigation banks. MissDOT is paying the FWS $155,000 to undertake not only wet soil and plant management, but also bottomland hardwood reforestation. These projects should take 3 years to complete. MissDOT has three other mitigation banks (totaling 800 acres), though all of those credits have been depleted. Their banking program began in 1990 and has been very successful. The agency may buy an additional 800 acres in the future for banking purposes. All of their mitigation banks are located in the Vicksburg area; presently, state law allows these to be used for mitigation of impacted sites across the state. This is changing, however, and MissDOT is attempting, with little success, to find an acceptable site for a mitigation bank in the southeast corner of the state.

Banking summaries requested from MissDOT for this study were never received. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1993/1995 AASHTO Summaries:

The following information has been summarized from the 1998 survey data provided by MissDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Mississippi DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was the favored choice for mitigation and was utilized 15.5 times more than enhancement for projects from 1991 through 1994. The 1998 survey, by contrast, demonstrated a different trend, with restoration and enhancement being equally favored for mitigation and utilized 50 times more than creation or preservation.

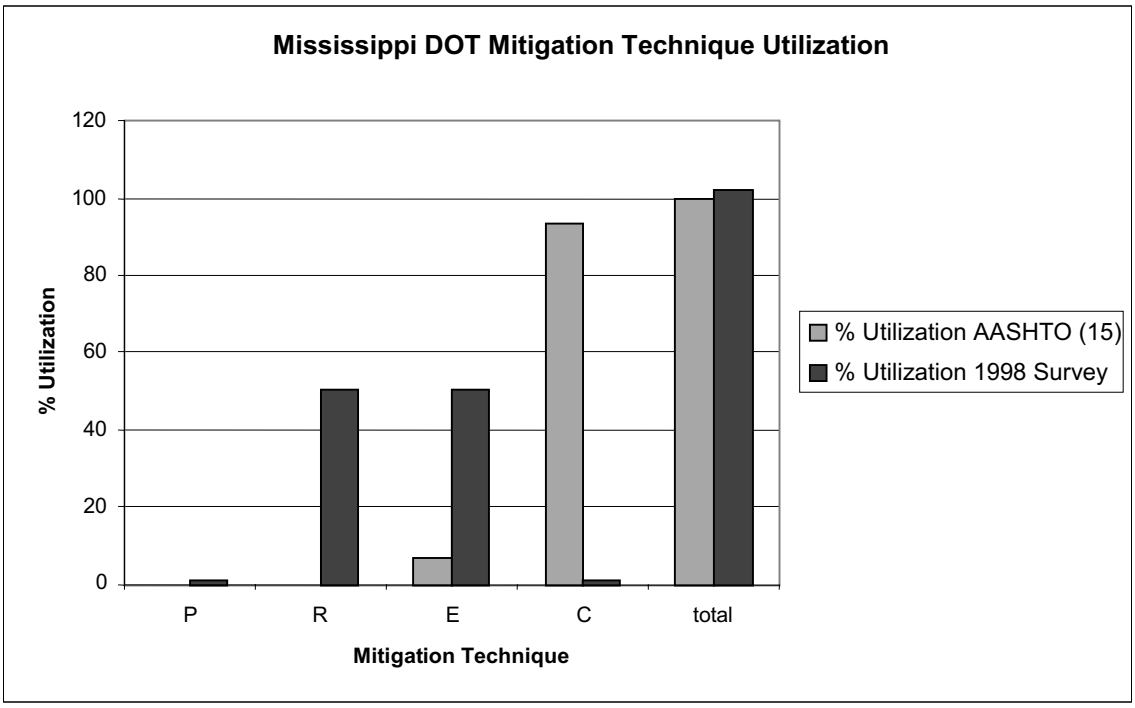
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized 1.2 times more often than banking and almost 4 times more often than on-site between 1991 and 1994. The 1998 survey demonstrated a different trend, with a banking usage rate 8.5 times greater than the off-site rate and 17 times greater than the on-site rate.

The table and two charts provided below illustrate these MissDOT trends.

total # mitigation projects AASHTO 1993 & 1995	48
total # acres impacted 1993 & 1995	448.75
average # acres impacted per project '93 & '95	9.35
total # acres mitigated '93 & '95	450.45
average replacement ratio '93 & '95	1.004

	P	R	E	C	total
% Utilization AASHTO (15)	0	0	6.67	93.33	100
% Utilization 1998 Survey	1	50	50	1	102

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	12.50	47.92	39.58	100
% Utilization 1998 Survey	5	10	85	100


Mississippi DOT Mitigation Technique Utilization
120
100
80
60
40
20
0
% Utilization
P
R
E
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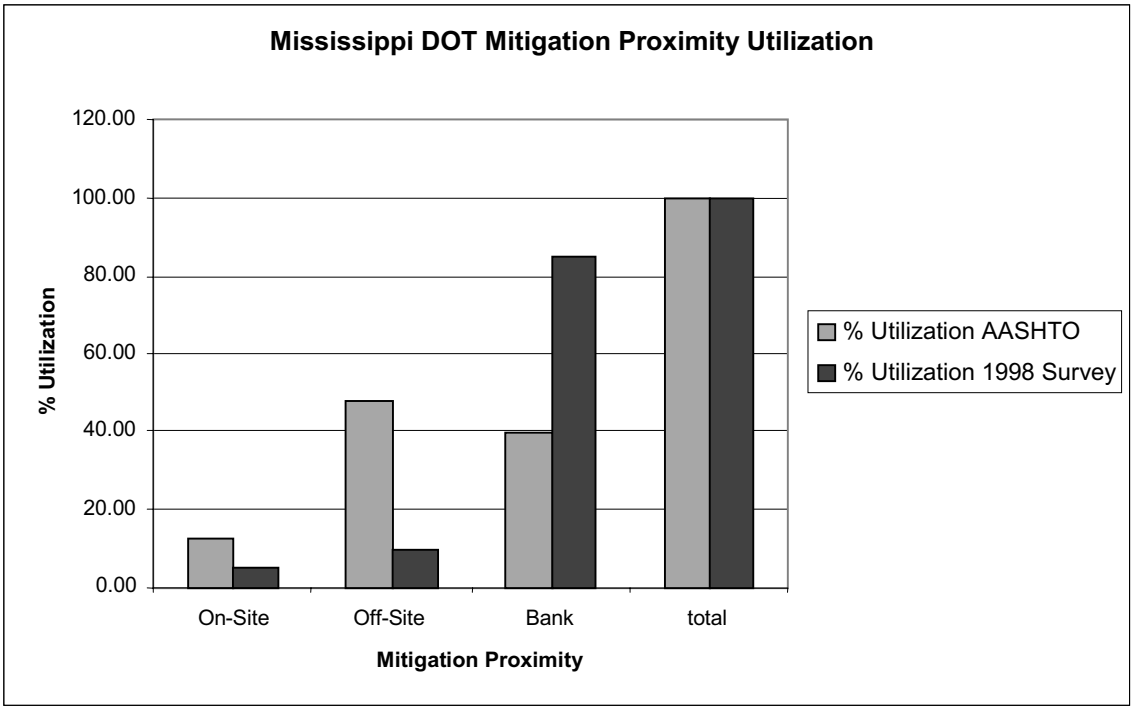
total
Mitigation Technique
% Utilization AASHTO (15)
% Utilization 1998 Survey


Mississippi DOT Mitigation Proximity Utilization
120.00
100.00
80.00
60.00
40.00
20.00
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% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to MissDOT for wetlands mitigation. The preference ranking is R and E, then P and C. Approximately 99 percent of the banks use 1:1 replacement ratios for restoration and enhancement. MissDOT avoids preservation and creation because of the higher ratio of 2-3:1 (the agency is currently in negotiations with the Corps concerning this issue). From MissDOT's perspective, a replacement ratio greater than 1:1 is too large for any one of the four mitigation options. It is estimated that restoration and enhancement are each utilized 50 percent of the time and creation and preservation are utilized 1 percent of the time in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 100 percent of the time and is actually used by MissDOT 95 percent of the time. MissDOT views on-site mitigation as a waste of money; off-site mitigation requires a lesser effort to maintain. The Mississippi DOT has had experience with off-site mitigation. In fact, the state of Mississippi had this country's first banks, but, because these are state-funded banks, they are not well known. In general, all of MissDOT's mitigation is handled through the banking program. Out-of-kind replacement is desired 90 percent of the time and is actually used 40 percent of the time. There are state laws prohibiting the use of out-of-kind along the coastal areas in Mississippi; however, out-of-kind is utilized more than 90 percent of the time inland. The replacement ratios are based on acreage only, but the DOT may be forced in the future to go to a function and value assessment. General permits (impacts of 7 acres or less) usually have ratios of 1:1 and the ratios for individual permits (impacts greater than 7 acres) are usually greater than this. MissDOT estimates it has approximately 127 acres impacted per year, mostly bottomland hardwoods and delta sloughs and farmland.

The primary agencies involved in the mitigation negotiation process are the Corps and the FWS. The Corps oversees general permits and banks, and it never has a conflict with MissDOT. (Note that this is the same Corps district, the Vicksburg District, that the Louisiana DOTD also finds easy to work with.) They usually accept 1:1 replacement ratios for MissDOT's wetlands mitigation. The FWS has authority over individual permits and has traditionally been a problem agency. The FWS wants MissDOT to use the Charleston, South Carolina, mitigation plan that has replacement ratios beginning at 3:1. It is estimated that less than 30 percent of the time the DOT submits a mitigation plan that differs from the agency expectations, and of these, MissDOT's plan overrides 5 percent of the time, requiring only minor changes. MissDOT overcompensates during the delineation process in order to conduct less stringent surveys, which is why the Corps allows the use of a 1:1 ratio. If the replacement ratios increase, MissDOT will have to perform more stringent technical delineations. The FWS often wins higher ratios owing to time constraints and, until recently, the availability of relatively cheap bank acres. MissDOT wants to keep the design methods simple with precedence. MissDOT often mitigates with land adjacent to park and wildlife refuges, so they use whatever methods the FWS wants.

Usually, it takes 3 years to complete a mitigation project, and then the project is monitored for a 5-year term by MissDOT. There is an initial first-year report, then the monitoring frequency

increases to every 2–3 years until the Corps is satisfied. The Mississippi DOT considers its biggest obstacle in wetlands mitigation to be time. It is always pressed for time during the mitigation process. In addition, it has a good relationship with the Corps; however, other regulatory agencies seem to demonstrate resentment toward the state transportation agency. MissDOT staff members were of the opinion that the agency did not have time to participate in the case study section of the Level 2 survey. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Missouri Department of Transportation:

Level 1: Organization and Information

The Missouri Department of Transportation (MoDOT) has approximately fifty wetlands impacts and fifteen mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Missouri DOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Missouri Department of Conservation (MoDOC), the Missouri Department of Natural Resources and Parks (MoDNR), the Federal Highway Administration (FHWA), and the U.S. Army Corps of Engineers (Corps). Separate impact and mitigation files are not maintained. There is a database with delineation information on the area, location, and type, and on the function and value as determined by best professional judgment or by hydrogeomorphic (HGM) standards. The database is in a rough format that would not be user friendly to an outside party. Summaries are also not available from MoDOT.

Before 1996, approximately 5–10 percent of permits involved mitigation, but this proportion has increased to 50–60 percent since then because of the "no net loss" rule. Mitigation is routinely performed for wetlands impacts. The Missouri DOT has had experience with off-site compensation and a mitigation banking program is currently being developed. Follow-up monitoring is conducted qualitatively the first year and quantitatively for the remainder of the 5-year term; monitoring includes information on hydrology and plants.

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to MoDOT for wetlands mitigation. The preference ranking is R, C, E, and then P. In reality MoDOT's preference is based on the nature of typical impacts and the likelihood of mitigation success. The opportunity to actually use each method is R, E, C, and P. Creation has been most used in the past and enhancement was never used until 3 years ago. Preservation will no longer be allowed except in combination with other mitigation techniques. It is estimated that preservation and enhancement have each been used approximately 5 percent of the time, restoration 70 percent of the time; creation accounts for 20 percent of the wetlands mitigation.

Off-site mitigation is desired and utilized approximately 80 percent of the time, and out-of-kind is desired and utilized 10 percent of the time. Off-site is typically utilized within the same watershed for a single mitigation project. Officially, there are no set replacement ratios for wetlands mitigation. The EPA and the DNR favor ratios based on the acreage lost in combination with the wetlands type. This basis is viewed as overly simplistic by the lead Corps district, so by default there is not an official policy. The DOT also views ratios based on wetlands type to be invalid and does not support making it a policy. Mitigation is project specific, and four different approaches are used between the five Corps districts. The DOT notes that several terms, such as *off-site* and *bank*, have different meanings to different entities. In addition, the DOT stated that *rapid replacement system* is a term not used by most in the mitigation or regulatory business.

The Corps is the primary agency involved in the mitigation negotiation process. Occasionally other regulatory agencies are involved, although they typically lack expertise in that area. However, they do not lack opinions. The other agencies could also fill a role in the resolution process, but they have neither the skill nor the inclination to arbitrate. It is estimated that 20 percent of the time the DOT submits a mitigation plan that differs from the agency expectations. Of these, the DOT's plan overrides 95 percent of the time with only minor adjustments. Mitigation plans are rarely far from what the Corps wants because they are involved from the very beginning.

The MoDOT's plan design methods lean heavily on current applied science, as well as on anecdotal advice from others across the country. Wetlands type does have an effect on design methods. Creation and enhancement are easily accepted for mitigation of low quality, fast replacement systems; however, there is a preference for finding a good restoration site when mitigating higher quality wetlands. The composition of mitigation site plant species will be dictated by the mitigation site conditions. The MoDOT does not have experience with the effects of proximity to development on mitigation success because high quality habitat sites are not located near traffic or development. Follow-up monitoring typically consists of annual surveys for 5 years. Banks can be required to monitor for 10–20 years. Reports include photographs, species lists, delineation data forms, soil profiles, hydrology, percentage of cover (some transects used), and stem densities for forested restoration.

MoDOT considers its biggest obstacle to be the lack of technical expertise on the part of resource agencies that are consulted by the Corps in the permit review process. The Corps and MoDOT wetlands specialists have similar training and skills, which do not always exist at the other agencies. MoDOT commented that working with nonwetlands specialists can be frustrating. The MoDOT staff declined to participate in the Level 2 survey. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Montana Department of Transportation:

Level 1: Organization and Information

The Montana Department of Transportation (MDT) has approximately fifty wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The MDT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Inter-Agency Wetlands Group (IAWG), the Montana Environmental Quality Fisheries Taskforce, the Montana Fish and Wildlife and Parks (MFWP), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service (FWS). Impact files containing information from delineations, data forms for the Corps, functional assessments (values and functions), and wildlife information are maintained in printed form. Impact data include planned or constructed function, overall rating of the impacted wetlands based on various criteria (ranking is highest to lowest, corresponding to Categories I through IV) such as actual impact, mitigation credits, reserve balance, and acres left in reserve.

Approximately 90 percent of the Montana DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. The MDT collects a variety of information, including books on mitigation, plans, agreements, monitoring reports, and progress reports. Mitigation files are maintained, and the data include acreage and size, water temperature and quality evaluations, vegetation, wildlife usage, endangered wildlife, and follow-up on vegetation. The MDT has had experience with off-site mitigation and is in the process of developing procedures for mitigation banking. The MDT is working on the agreement with the Bureau of Land Management, the Corps, and the FWS. The Montana Department of Transportation has not yet needed to purchase mitigation credits.

Printed impact and mitigation information is accessible by request or on-site visit. Summaries have not yet been prepared, but will be available in the future from the MDT. No information is currently available on the banking program. The MDT provided to this study the 1996 interagency standard operation procedure, the 1997 USACE Mitigation Banks in Montana, and a 1996 wetlands field evaluation form. In addition, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

Survey and 1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by the MDT and from information obtained from the 1995 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Montana DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1993 and

1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies and mitigation proximity, neither the AASHTO summary nor the MDT staff provided data for this section of the present study.

total # mitigation projects AASHTO 1995	2
total # acres impacted 1995	19.70
average # acres impacted per project '95	9.85
total # acres mitigated '95	31.41
average replacement ratio '95	1.594

	P	R	E	C	total
% Utilization AASHTO	NA	NA	NA	NA	NA
% Utilization 1998 Survey	0	NA	NA	NA	NA

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	NA	NA	NA	NA
% Utilization 1998 Survey	NA	NA	NA	NA

Level 2, Part A: Processes and Methodologies

The Montana Department of Transportation cannot use all four of the recognized mitigation options (preservation, restoration, enhancement, and creation, or PREC) for wetlands mitigation. The preference ranking is R, C, then E. Preservation is currently not an option; however, the recent changes in the federal regulations and policies may force the agencies to allow it as a viable mitigation strategy. Restoration is used the most because it provides the greatest number of credits and the greatest cost effectiveness. Enhancement is usually used in conjunction with other options.

Off-site mitigation is desired 100 percent of the time by the Montana Department of Transportation. The MDT is in the process of establishing mitigation banks in each of the sixteen major watersheds for off-site mitigation. The EPA prefers most mitigation to be on-site; however the MDT is of the opinion that this is not practical owing to the attraction of the state's large wildlife species (e.g., elk, moose, and bear) to roadside wetlands — an attraction that increases the likelihood of animal/vehicle collisions. In addition, the MDT advocates off-site mitigation to avoid having to perform subsequent mitigations at the same location for inevitable future road expansions. There is no desire for out-of-kind mitigation by the MDT. The replacement ratios are based on acreage in combination with the PREC ratios. Function and value are not used to determine ratios. However, functional assessments are conducted for every impacted wetlands, and mitigation plan development tries to match or replicate the lost function. The general wetlands replacement ratios are 1:1 for restoration, 2–5:1 for enhancement, and 8+:1 for creation.

The primary agencies involved in the mitigation negotiation process are the Corps and the Interagency Wetlands Group (IAWG). The IAWG is a cooperative that includes the FWS, the EPA, the MFWP, the DEQ, the NRCS, the Corps, the FHWA, and the MDT. The IAWG cooperative group reviews all proposals early, before the permit application is submitted, to obtain early support. The IAWG's input is considered to generally improve the overall design of the wetlands site. The Corps resolves any disputes between the signatory agencies and the Montana Department of Transportation. The MDT has been fortunate to find cooperative projects with such conservation groups as the FWS, the MFWP, and/or Ducks Unlimited, with such projects having a definite advantage over solo MDT projects. In these joint ventures, MDT generally participates solely as a funding source because the partner organization already has a project designed but has lacked the money for construction.

The MDT does not consider that wetlands type affects mitigation design plan methods. The MDT tries to develop the best wetlands system possible for the site selected. Hydrology is the most important aspect, and extensive research on water rights, availability of water sources, and water budgets are performed. Most mitigations consist of the development of emergent marsh/wet meadow/open-water ecosystems. In most cases, woody vegetation will establish itself. The MDT is required to perform follow-up monitoring on all sites it develops for 1–5 years, depending on size, and includes wildlife counts and water quality parameters.

Case studies were requested for use in this study; however, the Montana Department of Transportation staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Nebraska Department of Roads:

Level 1: Organization and Information

The Nebraska Department of Roads (NDR) has approximately ninety wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The NDR receives input from other agencies, but does not reorganize or summarize the data. Agencies include the Nebraska Department of Game and Parks, the Natural Resource Conservation Service (NRCS), the U.S. Fish and Wildlife Service (FWS), the U.S. Army Corps of Engineers (Corps), and the U.S. Geological Survey (USGS).

Impact files containing information on soils, NRCS wetlands classifications (delineation), wildlife habitat, endangered species, and hydrology are maintained in digital form (Microsoft Access software). Impact data include delineations, impacts, erosion control, seeding, location, and mitigation site. Printed and digital impact and mitigation information is accessible by request or site visit, while summaries are available from the NDR.

The NDR has had experience with off-site mitigation and has a banking program. Banking information includes bank name, location, size, service area, wetlands type, and compensation ratios. The NDR conducts both mini-monitoring that consists of visuals and pictures and full monitoring that includes vegetative transects, hydrological notes, and observations of wildlife species present at the site. Digital data (Access database) and impact, mitigation, and banking summaries were requested, and the Microsoft Access database was received for use in this study. In addition, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained.

There was a personnel change at the Nebraska Department of Roads during the interim between the Level 1 and Level 2 surveys, with the new contact declining to participate in the Level 2 survey. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the Level 1 summary data provided by the NDR and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summaries that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Nebraska Department of Roads during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the Level 1 summary obtained contains projects permitted from 1990 through 1997 for the NDR. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was utilized exclusively for mitigation from 1991 through 1994. The NDR staff did not include these data in the Level 1 summary.

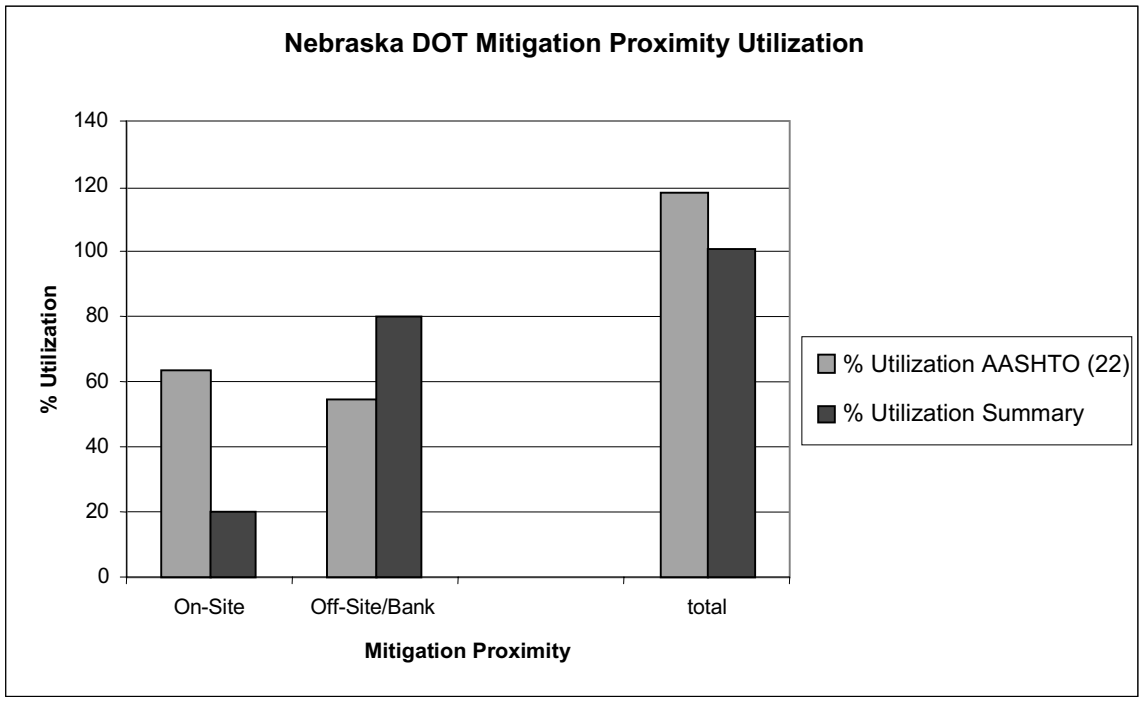
The AASHTO summary data also showed that, for mitigation proximity, on-site mitigation was the favored choice and was utilized approximately 1.2 times more often than off-site and mitigation banking combined. The Level 1 summary demonstrated a different trend, with an off-site/banking usage rate 4 times greater than the on-site rate.

The table and chart provided below illustrate these NDR trends.

total # mitigation projects AASHTO 1993 & 1995	43
total # acres impacted 1993 & 1995	155.62
average # acres impacted per project '93 & '95	3.71
total # acres mitigated '93 & '95	172.49
average replacement ratio '93 & '95	1.11
total # mitigation projects Summary Nebraska Access Files	128
total # acres impacted NE files (102 files)	218.15
average # acres impacted per project NE files (102 files)	2.14
total # acres mitigated NE files (104 files)	307.70
average replacement ratio NE files (87 files)	1.26

	P	R	E	C	total
% Utilization AASHTO (41)	0	0	0	100	100
% Utilization Summary	NA	NA	NA	NA	NA

	On-Site	Off-Site/Bank	total
% Utilization AASHTO (22)	63.64	54.55	118.18
% Utilization Summary	20.31	80.47	100.78


Nebraska DOT Mitigation Proximity Utilization
140
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site/Bank
total
Mitigation Proximity
% Utilization AASHTO (22)
% Utilization Summary

New Hampshire Department of Transportation:

Level 1: Organization and Information

The New Hampshire Department of Transportation (NHDOT) has approximately seventy-five wetlands impacts and twenty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. NHDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include local conservation groups and regional planning commissions, the New Hampshire Department of Environmental Services (NHDES), the Office of State Planning, the U.S. Army Corps of Engineers (Corps), and the Federal Highway Administration (FHWA).

Impact files contain delineation information, which is usually gathered after the project has been determined. This implies that an informal fact-finding procedure occurs first, and the best potential site is chosen. Then the formal delineation is performed to determine the actual extent of the wetlands impacts for the final decision process of site suitability. Approximately 35 percent of the New Hampshire DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. A plan is developed for each site for which mitigation will occur, and the types and strategies are included in the plan document. Mitigation files are maintained; printed data include area, location, and hydrology. There is a mitigation summary in progress, although not yet available, and there are also fact sheets available on the individual projects.

NHDOT has had experience with off-site compensation and has had a failed attempt to set up a banking program. The point of contention was the time factor regarding when credit from the bank(s) would be available for mitigation. Follow-up monitoring includes data plots, photographs, water quality, and wildlife information. Printed impact and mitigation information is accessible by mail request, with a charge sometimes imposed for providing large documents. No summaries are available from NHDOT; however, the agency staff provided several project fact sheets for use in this study.

Survey Summaries

The following information has been summarized from the 1998 survey data provided by the NHDOT staff, which consisted of the most recent mitigation strategies usage estimations. The quantity and/or quality of data obtained from the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the New Hampshire DOT. Regarding PREC mitigation strategies, the 1998 survey data provided showed that creation was the favored choice for mitigation. Creation was utilized 1.4 times more often than preservation, 2.8 times more often than restoration, and 14 times as often as enhancement.

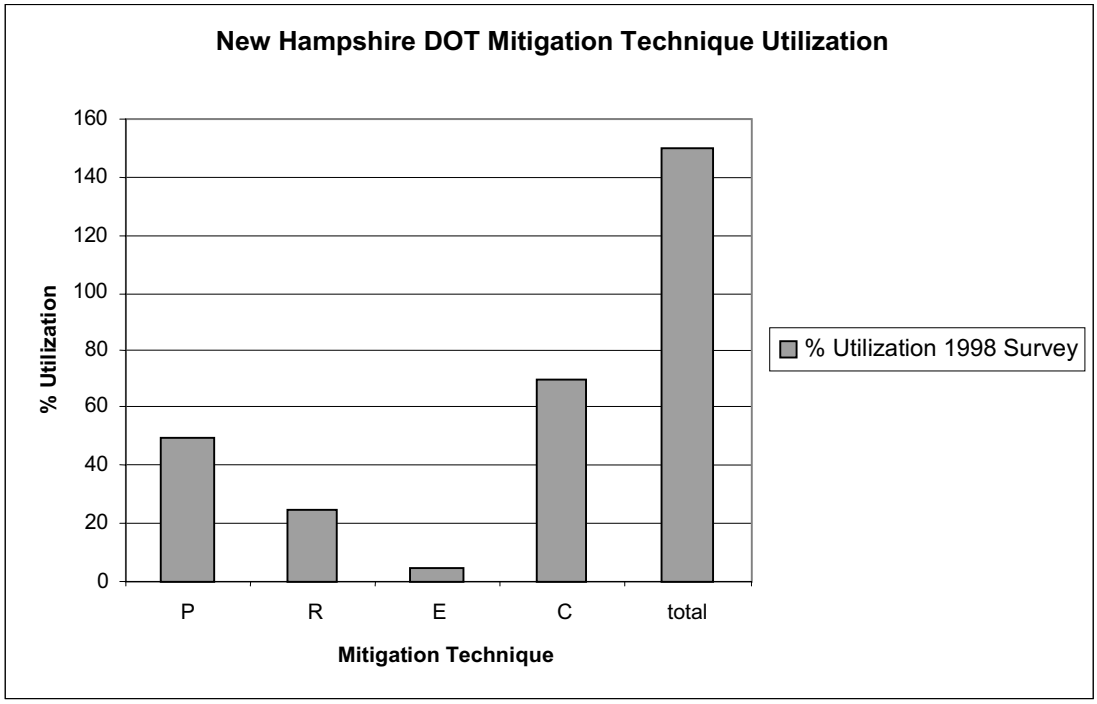
The 1998 survey data also showed that, for mitigation proximity, on-site mitigation was the

favored choice and was utilized 9 times more often than off-site mitigation.

The table and chart provided below illustrate these NDR trends.

in-kind replacement ratio is 1:1 R and C, plus a P component					
	P	R	E	C	total
% Utilization 1998 Survey	50	25	5	70	150

	On-Site	Off-Site/Bank	total
% Utilization 1998 Survey	90	10	100



Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to NHDOT for wetlands mitigation. The preference ranking is R, C, E, then P. Preservation is not a stand-alone mitigation choice, but is often added as a hedge factor to ensure the degree of success of restoration and creation mitigation. For large projects, this often results in substantial amounts of habitat preservation. It is estimated that preservation frequency is 50 percent of the time, restoration 25 percent, enhancement 5 percent, and creation 70 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 10 percent of the time, and out-of-kind is desired 50 percent of the time. Most mitigation is currently on-site and NHDOT has not yet established any mitigation banks to facilitate off-site compensation. When off-site is necessary, it receives support from the regulatory agencies. It is more difficult to get approval for out-of-kind replacement. Most impacts are in forested wetlands; mitigation replication is difficult. NHDOT is trying some function and value replacement through development of the best system for the site. The replacement ratios are based on acreage in combination with the function and values (on-/off-site, in-kind/out-of-kind). The NHDOT does not have a standard set of replacement ratios; however, a 1:1 ratio for restoration and creation is usually accepted. Preservation is often added to ensure the desired success. If the mitigation is off-site or out-of-kind, then the ratios and the amount of preservation both rise.

The primary agencies involved in the mitigation negotiation process are the Corps and the New Hampshire Wetlands Bureau. It is estimated that 25 percent of the time NHDOT submits a mitigation plan that differs from agency expectations, and of these, NHDOT's plan overrides 75 percent of the time, requiring only minor changes. The Corps resolves any conflicts between the signatory agencies and NHDOT. NHDOT design methods are based on several factors, including, but not limited to, area impacted, function and value, site characteristics, water budget, availability and source of hydrology, and location. NHDOT does not believe wetlands type affects the design methods utilized because mitigation must strive to replace specifically what was lost. There is follow-up monitoring for 100 percent of the substantial mitigation efforts, which normally require an individual permit from the Corps.

The New Hampshire DOT considers its biggest obstacle in wetlands mitigation to be the location process. Finding mitigation sites in the southern part of the state is difficult because of the high population density and the associated development. Another problem is overcoming the attitude that creation must always be doomed. The NHDOT staff stated they did not have sufficient time to fully participate in the Level 2 survey. However, they provided several fact sheets that were mentioned in the Level 1 survey section above, with four of these containing enough information to be of use to the Level 2, Part B: Case Studies section; these fact sheets are summarized below.

Level 2, Part B: Case Studies

Four Level 2 case studies were provided by NHDOT for this study. The Bedford and Exeter-Stratham sites are recent examples that have had great success in achieving the designed mitigation. The new Nashua project, an example of an off-site mitigation plan that was successfully negotiated with the regulators, is scheduled to begin soon.

NHDOT has had problems with purple loosestrife (lythrum salicara) invasion at several sites. Control of this nonnative plant is being attempted with the introduction of the leaf-eating beetles, garucella spp., at these sites for the past 2 years. The results are encouraging, but the beetles will need a few more years to attain to a population density large enough to control the loosestrife.

State DOT	New Hampshire	**Entry#**	1
Project Name	96-00472 - Contoocook River - Hillsborough		
Permit Type	individual		
Impact Location	Contoocook River at NorthBranch and Beard's Brook, Hillsborough, NH		
Impact County	n/a		
Type of Impact	elimination	**Acres Impacted**	17
Type of Impact Notes	C1/C alignment to improve safety, efficiency, and continuity of 4.5 mile section of NH RT 9/US RT 202		
Impact WL Classification	n/a	**Impact WL Inundation**	n/a
Impact WL Dominant Type	n/a	**Impact WL Value**	n/a
Construction Start Date	n/a	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	n/a	**Mitigation County**	n/a
PREC	C, E, P		
PREC Notes	total 60.89 acres at six selected sites: 17 ac = C, 1.95 ac E, 15.72 ac = P, and 26.22 ac upland P, E		
Mitigation Proximity	on/off-site	**Type of Replacement**	in/out-of-kind
Acres Mitigated	60.89	**Replacement Ratio Calculation**	3.58
Mit WL Classification	n/a	**Mit WL Inundation**	n/a
Mit WL Dominant Type	n/a	**Mit WL Value**	n/a
Mitigation Start Date	n/a	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	n/a	**Further Mit Required**	n/a
Mitigation Success Notes	n/a		

State DOT	New Hampshire	**Entry#**	2
Project Name	Bedford 11005 (NHS-F-018-5(4), P-3783)		
Permit Type	SPGP		
Impact Location	NH RT 101/114 interchange - widening intersection		
Impact County	n/a		
Type of Impact	elimination	**Acres Impacted**	1.7
Type of Impact Notes	total wetlands impacts = 1.7 ac = 1.3 ac forested/scrub-shrub + 0.2 emergent + 0.2 ac open water		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	forested, emergent, open water	**Impact WL Value**	n/a
Construction Start Date	n/a	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a		
Construction Cost Notes	excavated material for WL creation was used as road fill		
Mitigation Location	n/a	**Mitigation County**	n/a
PREC	P, R, E, C		
PREC Notes	R, C = 2.4 ac WL; E = 0.8 ac WL; C = 0.4 ac transitional WL/uplands; P = 4.5 ac existing WL/uplands; 2.8 ac of mit. site was previously disturbed/degraded; F/V provided = flood storage, sediment trap, nutrient retention, wildlife habitat		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind/out-of-kind?
Acres Mitigated	8.1	**Replacement Ratio Calculation**	4.76
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial and seasonal
Mit WL Dominant Type	emergent	**Mit WL Value**	high
Mitigation Start Date	n/a	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	2.25 ac of P = $65,900; $1.4 ac of C = 111,700		
Mit Site Monitoring Time Period (yr)	n/a	**Monitoring Frequency (months)**	n/a
Mitigation Successful	n/a	**Further Mit Required**	n/a
Mitigation Success Notes	created sev. tiers of WL hydrological zones: temp. flooded, saturated slope, seasonally/semi-perm/perm. flooded, and seasonally saturated; hydrology: gw discharge and runoff from 65 ac watershed; excavated areas lined w/min. 12” humus		

State DOT	New Hampshire	**Entry#**	3
Project Name	F.E. Everett Turnpike exits 1-7		
Permit Type	n/a		
Impact Location	widening/construction of FE Everett Turnpike, exits 1-7		
Impact County	n/a		
Type of Impact	elimination	**Acres Impacted**	23.9
Type of Impact Notes	widening/construction impacts total 23.9 ac = 15.6 ac forested + 8.8 ac scrub/shrub + 2.9 ac emergent + 1.6 ac mixed classes/open water		
Impact WL Classification	palustrine	**Impact WL Inundation**	n/a
Impact WL Dominant Type	forested, scrub/shrub, emergent, open water		
Impact WL Value	n/a		
Construction Start Date	n/a	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	7 diff. sites: (1) Exit 3 median; (2) south of Main Dunstable Rd, 3,000' west of turnpike		
Mitigation County	n/a		
PREC	P, R, E, C		
PREC Notes	7 diff. sites: (1)C=2.2 ac; (2)E=1.1 ac, R=4.2 ac, C=3.4 ac WL + 3.3 ac upland buffer, P=13 ac WL and uplands; F/V provided=bird habitat, sediment trap, nutrient retention, flood storage, toxicant removal, passive recreation		
Mitigation Proximity	2 on-site/other 5	**Type of Replacement**	in-kind/out-of-kind
Acres Mitigated	n/a	**Replacement Ratio Calculation**	n/a
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial and seasonal
Mit WL Dominant Type	forested, scrub/shrub, emergent, open water		
Mit WL Value	n/a		
Mitigation Start Date	n/a	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	1	**Mitigation Cost Notes**	n/a
Mit Site Monitoring Time Period (yr)	n/a	**Monitoring Frequency (months)**	n/a
Mitigation Successful	n/a	**Further Mit Required**	n/a
Mitigation Success Notes	created sev. tiers of WL hydrological zones: temp. flooded, saturated slope, seasonally/semi-perm/perm. flooded, and seasonally saturated; hydrology: gw discharge, overland flows, and roadway drainage; over-excavated areas to line w/1' impact area humus		

State DOT	New Hampshire	**Entry#**	4
Project Name	Exeter-Stratham, FF-018-2(60), 10422		
Permit Type	n/a		
Impact Location	NH RT101 bridge over floodplain of Squamscott River and NH RT 101 widening		
Impact County	n/a		
Type of Impact	elimination	**Acres Impacted**	3.8
Type of Impact Notes	Palustrine=3.7 ac, Estuarine=0.1 ac		
Impact WL Classification	palustrine, estuarine	**Impact WL Inundation**	perennial, seasonal
Impact WL Dominant Type	n/a	**Impact WL Value**	n/a
Construction Start Date	n/a	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a		
Construction Cost Notes	Bill, the fact sheet says your removing existing bridge and this is where mit. will be. Where are you building the new bridge?		
Mitigation Location	3.7 ac filled/disturbed land located at the site of the existing NH RT 101 bridge over Squamscott River		
Mitigation County	n/a		
PREC	R		
PREC Notes	F/V provided = wildlife habitat, WQ renovation, exporting nutrients to marine ecosystems, flood storage		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	3.7	**Replacement Ratio Calculation**	0.97
Mit WL Classification	all estuarine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	tidal marsh wetlands	**Mit WL Value**	n/a
Mitigation Start Date	n/a	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	n/a		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	n/a	**Monitoring Frequency (months)**	n/a
Mitigation Successful	n/a	**Further Mit Required**	n/a
Mitigation Success Notes	R of floodplain 0.5' below surrounding tidal marsh, placing 0.5' fine silt-clay/peat mix to finish grade of surround marsh, removal of existing bridge enhances river's wildlife travel corridor; est. salt-tolerant emergent species to replicate marsh.		

New Mexico State Highway and Transportation Department:

Level 1: Organization and Information

The New Mexico State Highway and Transportation Department (NMSHTD) has approximately six wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. The NMSHTD receives input from other agencies and also reorganizes and summarizes the data. Agencies include the New Mexico Environmental Department (NMED), the New Mexico Department of Game and Fish (NMDGF), the state land management agency, the Federal Highway Administration (FHWA), the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS).

The NMSHTD does not maintain separate impact or mitigation files, but does want to develop a system. Currently, it has no computer capability, no staff time, and no equipment. Consultants prepare some summaries. There is no funding available for post-project monitoring; however, the NMSHTD is looking for a way to adopt private monitoring. The NMSHTD does not have any summaries currently available. It is supposed to be building a mitigation information database through a contract with a consulting firm; however, the current workload and lack of personnel at the NMSHTD has impeded program initiation. The NMSHTD did not participate in the AASHTO survey for 1993 or 1995.

Survey Summaries

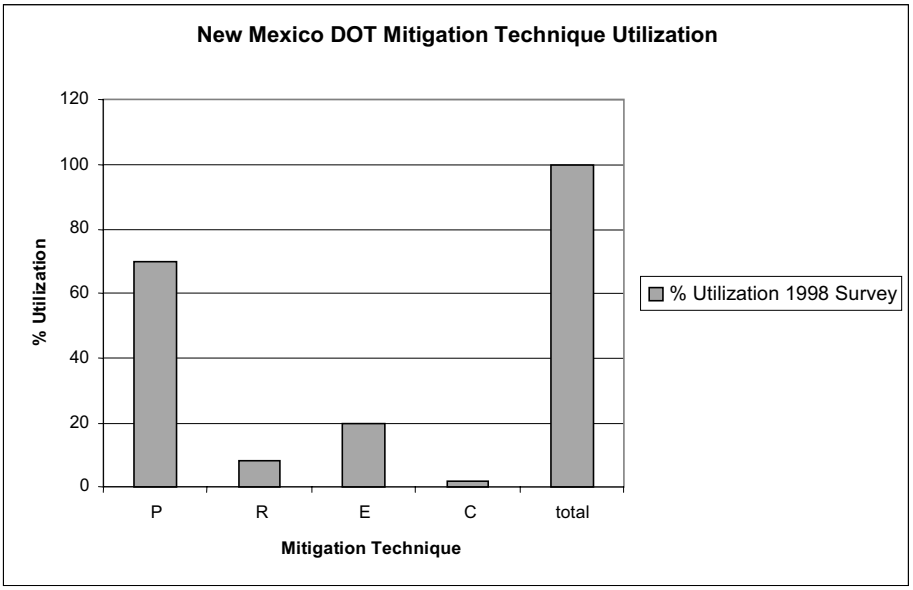
The following information provided by the NMSHTD staff has been summarized from the 1998 survey data, which consisted of the most recent mitigation strategy usage estimations. The quantity and/or quality of data obtained from the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the New Mexico State Highway and Transportation Department.

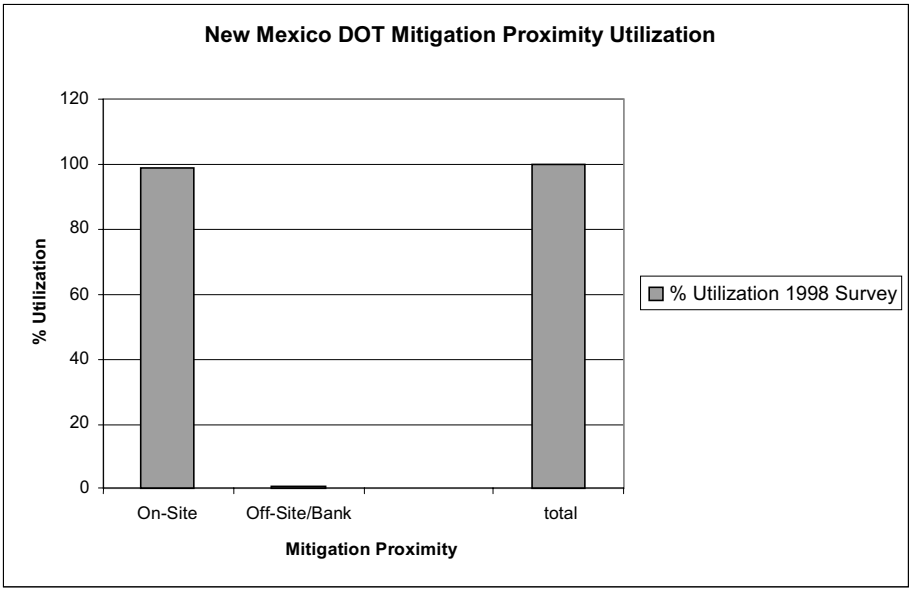
Regarding PREC mitigation strategies, the 1998 survey data showed that preservation was the favored choice for mitigation. Preservation was utilized 3.5 times more than enhancement, 8.75 times more than restoration, and 35 times as often as creation.

The 1998 survey data also showed that, for mitigation proximity, on-site mitigation was the favored choice and was utilized 99 times more often than off-site and banking combined. The table and two charts provided below illustrate these NMSHTD trends.

function/value replacement ratio range is 1:1 to 4:1					
	P	R	E	C	total
% Utilization 1998 Survey	70	8	20	2	100

	On-Site	Off-Site/Bank	total
% Utilization 1998 Survey	99	1	100





Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available for use by the NMSHTD for wetlands mitigation. The preference ranking is P, E, R, and then C. It is estimated that preservation is utilized 70 percent of the time, restoration 8 percent, enhancement 20 percent, and creation 2 percent in wetlands mitigation. The NMSHTD does not have much desire to use either off-site or out-of-kind mitigation strategies; however, it uses off-site approximately 1 percent of the time. The replacement ratios are based on acreage in combination with the function and value, and actual replacement ratios utilized a range from 1:1 to 4:1, depending on the individual mitigation situation. Ratios are determined by the combination of the new hydrogeomorphic (HGM) classification system, as well as by a less scientific analysis based on the determination of the regulatory and land management agencies involved. Different areas of a mitigation site can utilize different functional assessments.

The primary agencies involved in the mitigation negotiation process are the Corps and the NMED. The Surface Water Quality Bureau, the FWS, and the NMDGF also participate, but the Corps and the NMED are the major objectors to design and structural issues and to water quality certification, respectively. The NMED is also the agency most concerned with replacement ratios. It is estimated that 5 percent of the time the NMSHTD submits a mitigation plan that differs from agency expectations. Of these, the NMSHTD's plan overrides 50 percent of the time, requiring only minor changes. The Corps resolves any conflicts between the signatory agencies and the NMSHTD.

The NMSHTD design methods include functional assessment and quantification. Wetlands type does not affect the design methods utilized by the NMSHTD. The NMSHTD monitors projects for 3 years after completion. The data collected include a large number of transects, success rate estimates, and so forth. The major portion of the monitoring report consists of recommendations for additional measures to ensure mitigation success.

The NMSHTD considers their biggest obstacle in wetlands mitigation to be right-of-way (ROW) acquisition. State law does not allow the NMSHTD to condemn land for mitigation. Because land appropriate for mitigation frequently is highly valuable, owners are reluctant to sell. Water is precious in this desert state, and people do not part with it easily. The water rights, as well as the property, must be purchased. Three mitigation case studies provided by the NMSHTD for use in this study are summarized in the section below.

Level 2, Part B: Case Studies

State DOT	New Mexico	**Entry#**	1
Project Name	Rio Grande Bridge at San Juan Pueblo		
Permit Type	individual		
Impact Location	San Juan Pueblo - Rio Grande Wetlands (new alignment for bridge)		
Impact County	Rio Arriba		
Type of Impact	elimination	**Acres Impacted**	1.94
Type of Impact Notes	Different concerns: (1) Pueblo concerned about loss of open water and Gooding's Willow; (2) FWS determined loss impacted the SW flycatcher habitat so mit. must be in-kind; (3) Corps wanted 4:1 ratio regardless of F/V.		
Impact WL Classification	riverine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	bottomland hardwood forest	**Impact WL Value**	high (SW willow flycatcher habitat)
Construction Start Date	Apr 96	**Construction Completion (months)**	12
Construction Project Cost ($)	7,000,000	**Construction Cost Notes**	n/a
Mitigation Location	San Juan Pueblo - Rio Grande		
Mitigation County	Rio Arriba		
PREC	C		
PREC Notes	Because of the different impact concerns listed above, different areas had different mit. efforts based upon different functional assessments of the different agencies.		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	3	**Replacement Ratio Calculation**	1.55
Mit WL Classification	riverine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	bottomland hardwood forest	**Mit WL Value**	high
Mitigation Start Date	Mar 96	**Mit Completion (months)**	36
Lagtime Impact/Mitigation Completion Calculation (months)	35		
Mit Project Cost ($)	200,000	**Mitigation Cost Notes**	n/a
Mit Site Monitoring Time Period (yr)	3 (voluntary)	**Monitoring Frequency (months)**	3
Mitigation Successful	yes	**Further Mit Required**	possible additional
Mitigation Success Notes	high success - new habitat established for the endangered southwestern willow flycatcher (habitat was replaced at least 3:1)		

State DOT	New Mexico	**Entry#**	2
Project Name	US 64 reconstruction — Eagle Nest		
Permit Type	NWP		
Impact Location	US 64 ROW (widening of road between Eagle Nest and Angel Fire)		
Impact County	Colfax	**Acres Impacted**	0.5
Type of Impact	elimination and modification (change alignment in minor stream)		
Type of Impact Notes	n/a		
Impact WL Classification	riverine and lacustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	emergent, scrub/shrub	**Impact WL Value**	medium
Construction Start Date	June 98	**Construction Completion (months)**	3
Construction Project Cost ($)	6,000,000	**Construction Cost Notes**	n/a
Mitigation Location	US 64 ROW		
Mitigation County	Colfax		
PREC	R, E		
PREC Notes	realignment of stream flow to one wetlands site; planting of willows at degraded site.		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	0.5	**Replacement Ratio Calculation**	1.00
Mit WL Classification	riverine and lacustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	emergent, scrub/shrub	**Mit WL Value**	medium
Mitigation Start Date	June 98	**Mit Completion (months)**	3
Lagtime Impact/Mitigation Completion Calculation (months)	3		
Mit Project Cost ($)	50,000	**Mitigation Cost Notes**	n/a
Mit Site Monitoring Time Period (yr)	3	**Monitoring Frequency (months)**	3
Mitigation Successful	unknown	**Further Mit Required**	no
Mitigation Success Notes	Successful re-creation of emergent wetlands w/in same watershed and ROW; good coordination w/regulatory agencies, esp. Corps and NMED.		

State DOT	New Mexico	**Entry#**	3
Project Name	Mills Ave. reconstruction; Las Vegas, NM		
Permit Type	individual		
Impact Location	Urban - Las Vegas, NM		
Impact County	San Miguel		
Type of Impact	elimination	**Acres Impacted**	1
Type of Impact Notes	n/a		
Impact WL Classification	riverine, isolated	**Impact WL Inundation**	perennial
Impact WL Dominant Type	emergent marsh	**Impact WL Value**	medium-low
Construction Start Date	June 96	**Construction Completion (months)**	24
Construction Project Cost ($)	10,000,000	**Construction Cost Notes**	n/a
Mitigation Location	USFWS wildlife / wetlands preserve		
Mitigation County	San Miguel		
PREC	C, E		
PREC Notes	constructing new wetlands area on preserve and enhancing another area w/cottonwood plantings		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind and out-of-kind
Acres Mitigated	4	**Replacement Ratio Calculation**	4.00
Mit WL Classification	lacustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	emergent marsh	**Mit WL Value**	high
Mitigation Start Date	June 96	**Mit Completion (months)**	3
Lagtime Impact/Mitigation Completion Calculation (months)	3		
Mit Project Cost ($)	50,000		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	unknown — USFWS responsibility		
Monitoring Frequency (months)	unknown — USFWS responsibility		
Mitigation Successful	unknown	**Further Mit Required**	no
Mitigation Success Notes	Resistance from Corps to create wetlands off-site and in different drainage; however, superior quality of created wetlands was deciding factor.		

New York Department of Transportation:

Level 1: Organization and Information

The New York Department of Transportation (NYDOT) has approximately 150 wetlands impacts and 125 mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The NYDOT receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Adirondack State Department of Conservation, the Department of State, the National Marine Fisheries Service (NMFS), the National Wetlands Inventory, the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS). Separate impact and mitigation files are not maintained. Data collected on impacts include acreage, cover types, and functions and values as determined by the Wetlands Evaluation Technique (WET II) method.

Less than 50 percent of the NYDOT's construction permits require mitigation, and mitigation is routinely performed for those permits involving wetlands impacts. The NYDOT staff did not specify the mitigation types and strategies utilized. Mitigation data are summarized in annual written reports and include permit type, enhancement or creation, cover type, acreage, overall cost, avoidance, and minimization. Printed impact and mitigation information is accessible by mail or phone request. There are individual reports, but no summaries. Formal reports are not prepared for small impacts.

NYDOT has a 3–5 year monitoring program, which involves functions and values, cover type, hydrology, types of animals, and, occasionally, chemical analysis. The agency does not have experience with off-site compensation; however, it has recently negotiated an off-site agreement that has yet to be signed. Summary reports were requested for use in this study, but were never received.

North Carolina Department of Transportation:

Level 1: Organization and Information

The North Carolina Department of Transportation (NCDOT) has approximately 1,000 wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. NCDOT receives input from other agencies, but does not reorganize or summarize the data. Agencies include the U.S. Army Corps of Engineers (Corps), the U.S. Fish and Wildlife Service (FWS), the North Carolina Division of Marine Fisheries, the North Carolina Division of Water Quality (NCDWQ), the North Carolina Fish and Wildlife Service, and the National Marine Fisheries Service (NMFS).

Separate impact and mitigation files are not maintained, and information is accessible only by site visit. Mitigation is routinely performed for wetlands impacts, but it is not known what percentage of NCDOT's total construction permits require mitigation. NCDOT has had experience in off-site compensation. There is one formalized bank, approximately 1,000 acres in size, located in northeastern North Carolina, near the Raleigh River. No banking files are maintained and no information is available from NCDOT. Follow-up monitoring is conducted by NCDOT and includes information on water and vegetation.

Survey Summaries

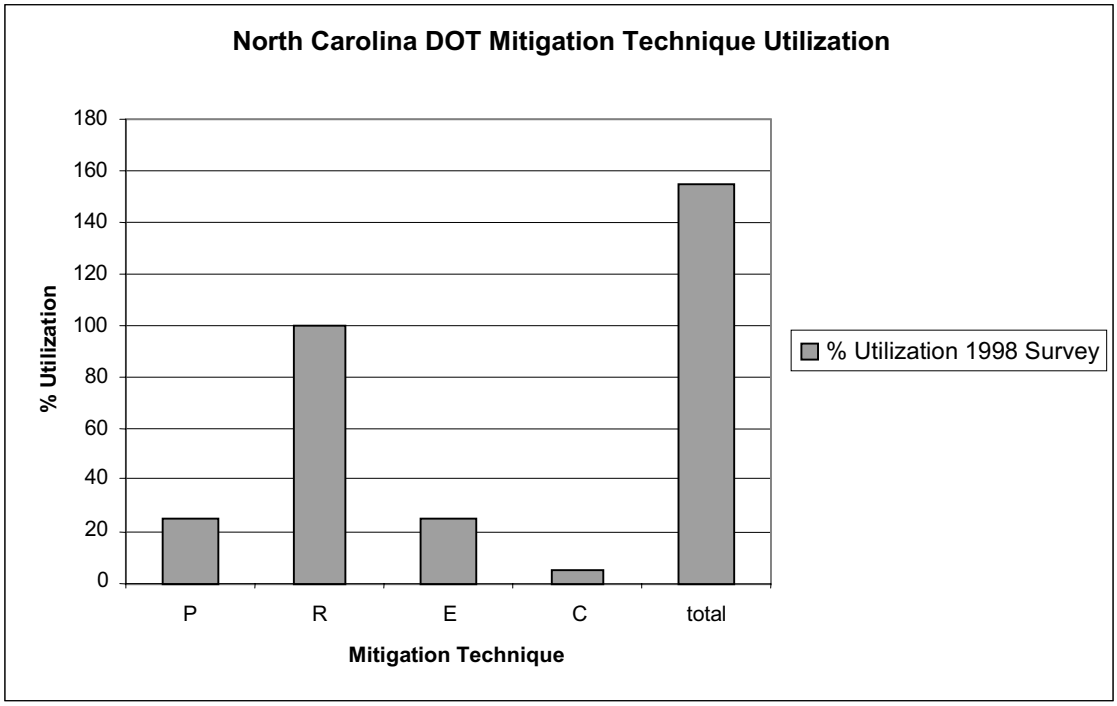
The following information provided by the NCDOT staff has been summarized from the 1998 survey data, which consisted of the most recent mitigation strategy usage estimations. The quantity and/or quality of data obtained from the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the North Carolina Department of Transportation.

Regarding PREC mitigation strategies, the 1998 survey data showed that restoration was utilized in all mitigation projects. Restoration was utilized 4 times more often than preservation or enhancement and 20 times more often than creation. The NCDOT staff did not provide the 1998 survey with data for mitigation proximity. The table and chart provided below illustrate these NCDOT trends.

in-kind replacement ratio generally 1:1 or 2:1

	P	R	E	C	total
% Utilization 1998 Survey	25	100	25	5	155

	On-Site	Off-Site	Bank	total
% Utilization 1998 Survey	NA	NA	NA	NA



Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are not all viable individual options available to NCDOT for wetlands mitigation. The preference ranking is R, E, C, and then P. They can all be utilized, but only in a package that includes at least a 1:1 ratio for restoration. It is estimated that restoration has been utilized 100 percent of the time, preservation and enhancement 25 percent each, and creation 5 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent. Off-site mitigation is desired 100 percent of the time and out-of-kind replacement is desired approximately 10 percent of the time. The replacement ratios are generally based on in-kind acreage. When mitigation is for stream lengths, a ratio of 1:1 or 2:1 is used, depending on the quality of the stream.

The primary agencies involved in the mitigation negotiation process are the Corps for 404 permits and the NCDWQ for 401 permits. It is estimated that less than 5 percent of the time NCDOT submits a mitigation plan that differs from the agency expectations; of these exceptions, NCDOT's plan overrides 50 percent of the time, requiring only minor changes. The Corps resolves any conflicts between the signatory agencies and NCDOT.

NCDOT's design methods include field studies and water budget modeling. Regulatory agencies are brought in at the beginning of the process to review potential sites, feasibility studies, and mitigation plans. Wetlands type does affect the design methods utilized by NCDOT. North Carolina has three distinct regions in the state (mountain, piedmont, and coastal), each with unique types of wetlands, and appropriate methods are used in each area. Annual monitoring reports include hydrology criteria (water within 12 inches of the surface for 12.5 percent of the growing season), hardwood plantings survival (320 stems/acre), photos, charts, and tables. Lately, NCDOT has tried to prepare a cumulative status report every 4 years.

Although case studies were requested for use in this study, the NCDOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

North Dakota Department of Transportation:

Level 1: Organization and Information

The North Dakota Department of Transportation (NDDOT) has approximately ten to twenty wetland impacts and three mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. NDDOT receives input from other agencies, but does not reorganize or summarize the data. Agencies include the North Dakota Game and Fish Department (NDGFD), the State Water Commission, the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS).

Impact files containing delineation information, including wetlands boundaries, size, acres impacted, and location of mitigation, as well as road design plans, are maintained in printed form. Mitigation files are maintained, and printed data include location, resources of surrounding areas, and public or private ownership of surrounding areas. Printed impact and mitigation information is accessible by site visit, and no summaries are available. A mitigation summary database in progress is not yet available from NDDOT.

Approximately 85–90 percent of the North Dakota DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation is currently designed on a case-by-case basis, with the plan subject to final approval by the Corps. Off-site compensation is the primary strategy used by NDDOT. NDDOT has 5–6 years of experience with off-site compensation and is in the process of developing a mitigation bank that will be available to only a certain area of the state. The bank will eventually be transferred to the NDGFD for management. No banking information is currently available from NDDOT. Follow-up monitoring is currently not required; however, the mitigation specialists will informally check on a site if they happen to be in the vicinity. The 1995 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained for use in this study.

Survey and 1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by NDDOT, as well as from information in the 1995 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the North Dakota DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1993 and 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that enhancement was the favored choice for mitigation and was utilized 6 times more often than creation for projects from 1993 through 1994. The 1998 survey, by contrast, demonstrated a different trend: Restoration was the favored choice for mitigation, having been utilized 18 times more often than creation or enhancement.

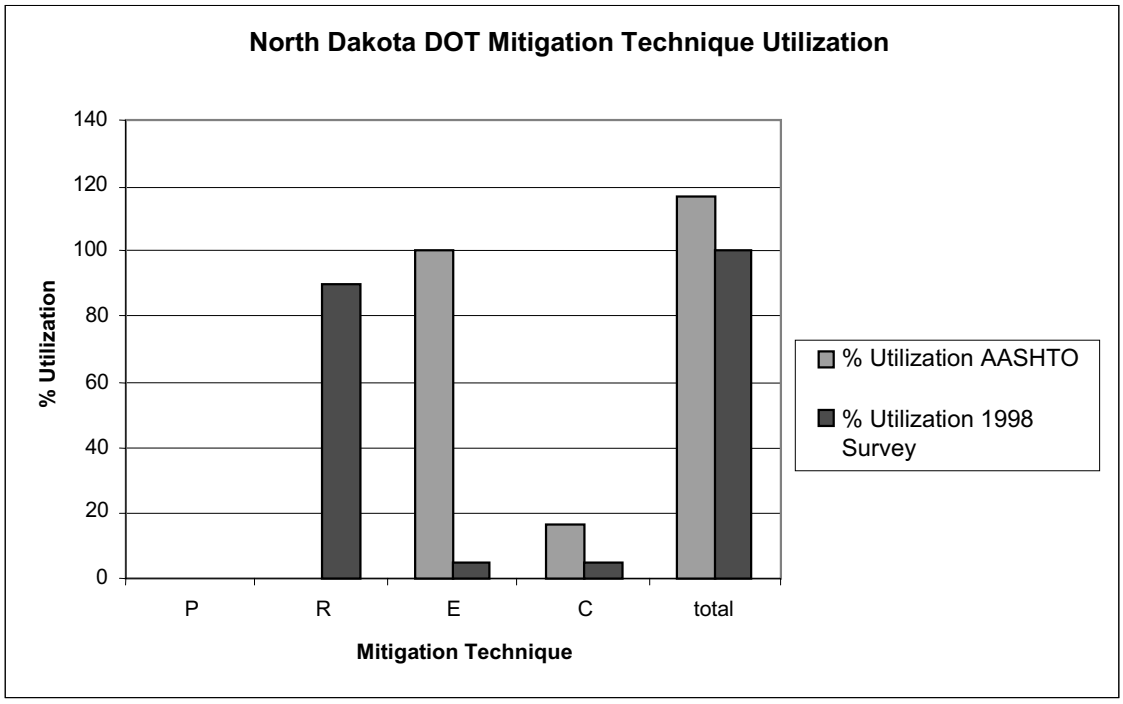
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice and was utilized 5 times more often than on-site mitigation between 1993 and 1994. Banking was not utilized at all during this period. The NDDOT staff did not provide the 1998 survey with data for this section.

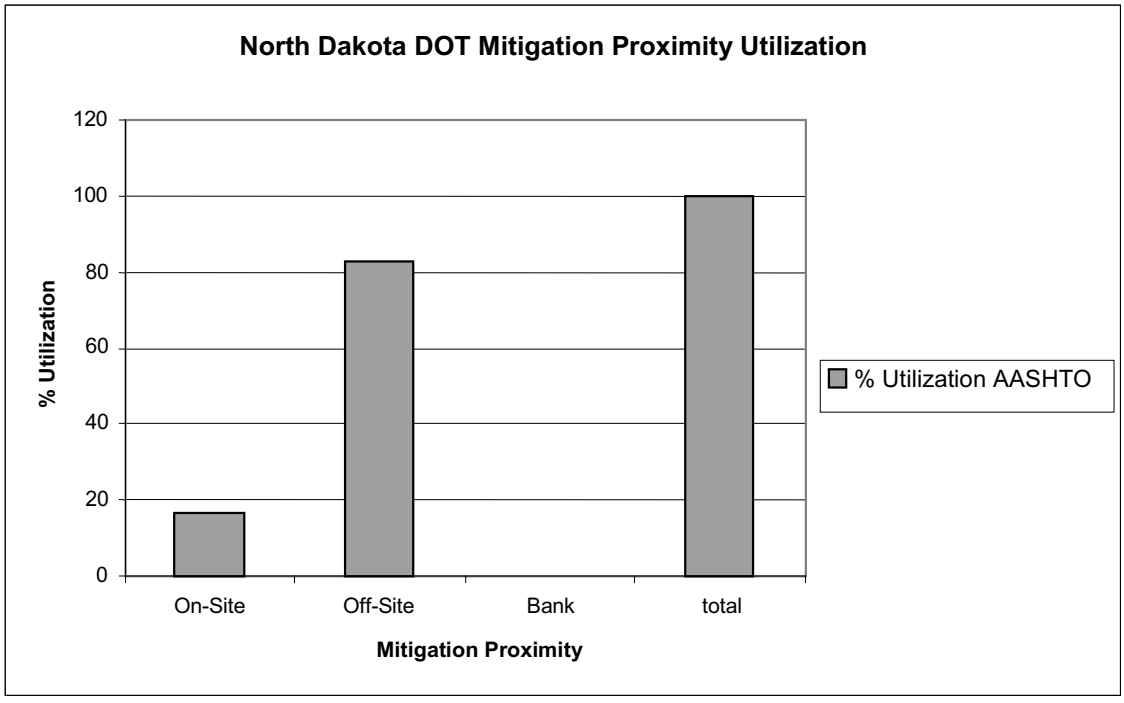
The table and two charts provided below illustrate these NDDOT trends.

total # mitigation projects AASHTO 1995	6
total # acres impacted 1995	38.26
average # acres impacted per project '95	6.38
total # acres mitigated '95	55.24
average replacement ratio '95	1.44

	P	R	E	C	total
% Utilization AASHTO	0	0	100	16.67	116.67
% Utilization 1998 Survey	0	90	5	5	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	16.67	83.33	0	100
% Utilization 1998 Survey	NA	NA	NA	NA


North Dakota DOT Mitigation Technique Utilization
140
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


North Dakota DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to NDDOT for wetlands mitigation. The preference ranking is R, C, E, and then P. It is estimated that restoration has been utilized 90 percent of the time, enhancement and creation 5 percent each, and preservation 0 percent in wetlands mitigation. Off-site mitigation is desired 100 percent of the time and out-of-kind replacement is desired approximately 95 percent of the time. The replacement ratios are generally based on acreage.

The primary agencies involved in the mitigation negotiation process are the Corps and the FHWA, which relies on the FWS. There is a power struggle between these two entities (essentially, the Corps versus the FWS) over which will have the final decision on a project. NDDOT has problems with the FWS on plan choices for off-site projects. It is estimated that less than 1 percent of the time NDDOT submits a mitigation plan that differs from the agency expectations, and of these, NDDOT's plan overrides 100 percent of the time, requiring only minor changes. The Corps and the FWS are in dispute over which agency resolves conflicts between the signatory agencies and NDDOT. Approximately 10 percent of the time the mitigation plan is not the responsibility of NDDOT because the project property belongs to one of the regulatory agencies, which, therefore, designs the plan. NDDOT simply provides the funding for the project.

NDDOT's design methods include precedence and hydrology. No functional assessment has been incorporated into the design process yet. Wetlands type does not affect the design methods utilized by NDDOT. NDDOT has not seen any effects of proximity to development on the success of the mitigation, mainly because of the rural locations of most of the projects. There are no yet strict guidelines for monitoring; however, the FWS and NDDOT are attempting to perform informal annual monitoring consisting mostly of aerial surveying.

Case studies were requested for use in this study; however, the NDDOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Ohio Department of Transportation:

Level 1: Organization and Information

The Ohio Department of Transportation (ODOT) has approximately thirty wetlands impacts and two mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and that one mitigation project can compensate for multiple wetlands impacts. ODOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Ohio Department of Fish and Wildlife, the Ohio Department of Natural Resources (ODNR), the Ohio Environmental Protection Agency (OEPA), the Federal Highway Administration (FHWA), the U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (Corps).

Impact files containing literature, National Wetlands Inventory maps, Natural Resource Conservation Service (NRCS) maps, U.S. Geological Survey (USGS) maps, Soil Conservation Service (SCS) maps, field surveys, delineations, and OEPA data are maintained in printed form. Impact data include area, location, plants and plant communities, wildlife, soil, and value. The Ohio DOT formerly employed the Wetlands Evaluation Technique (WET II) method to determine function and value. ODOT has since changed to using more narrative descriptions of the sites, and it is in the process of implementing a rapid assessment process being developed by the Ohio EPA (similar to that used by Washington state). ODOT is also evaluating the hydrogeomorphic (HGM) method for function and value, because it expects HGM will become a regulatory requirement in the future.

All Ohio DOT permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation files containing information on the conceptual report and plan, full plan, ecological manual, and FHWA guidelines are maintained in printed form. Mitigation data include area, location, plants and plant communities, wildlife, and soil. Printed impact and mitigation information is accessible by site visit; no summaries are available from ODOT. The Ohio DOT conducts follow-up monitoring based on permit requirements. The 5-year program performs delineations once or twice a year and monitors wildlife, vegetation, soils, and hydrology using transects and photographs.

The Ohio DOT has had experience with off-site compensation and purchase credits from private mitigation banks. There is also a not-for-profit group, the Ohio Wetlands Foundation, that operates mitigation banks in the state, and ODOT has bought credits from them as well. Currently there are at least 488 acres debited from mitigation banks in Ohio. No banking information is currently available from ODOT.

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to ODOT for wetlands mitigation. The preference ranking is R, C, E, and then P. Enhancement and preservation are used only under very specific conditions that rarely occur; however, combinations of enhancement with creation or restoration are common. Restoration is preferred, but on-site strategies predominate, so more creation actually occurs. It is estimated that restoration has been utilized 25 percent of the time, enhancement 5 percent, creation 80 percent, and preservation less than 5 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 100 percent of the time and out-of-kind replacement is desired less than 10 percent of the time. These options are actually utilized 50 percent and less than 10 percent, respectively. The constraints imposed by OEPA's new Wetlands Water Quality Standards (WQS) allow off-site proposals only for low quality wetlands. These standards base out-of-kind on quality ranking, and the new OEPA regulations require replacing low quality with higher quality wetlands.

The replacement ratios are based on acreage in combination with the wetlands type and the proximity. When off-site is used, ratios are acreage based, but some functions, such as flood retention and water quality, must be mitigated on-site. The OEPA's WQS has a table of ratios in which wetlands type ratios for on-/off-site are listed for each quality category; the mitigated wetlands must be of higher quality than the impact. Low quality replacement is 1.5:1, regardless of wetlands type or proximity.

Medium Quality Replacement Ratios

Proximity	Emergent	Scrub/Shrub	Forested
On-Site	1.5	1.5	2
Off-Site	2	2	2.5

High Quality Replacement Ratios

Proximity	Emergent	Scrub/Shrub	Forested
On-Site	2	2	2.5
Off-Site	2.5	2.5	3

The primary agencies involved in the mitigation negotiation process are the OEPA, the Corps, the ODNR, and the FWS. It is estimated that approximately 85 percent of the time ODOT submits a mitigation plan that differs from the agency expectations; of these exceptions, ODOT's plan overrides 60 percent of the time, requiring only minor changes.

Off-site plans are controversial within the OEPA, with the OPEA proving difficult to persuade. Off-site plans are rejected by the OEPA, and ODOT has to change them to on-site. Nationwide permits (NWPs) need only Corps approval. Off-site mitigation requests for these projects are usually successful because the mitigation process bypasses the OEPA. This policy is going to

change in the future, and all mitigation will be controlled by the OEPA. The OEPA and the Corps resolve any conflicts between the signatory agencies and ODOT.

ODOT's plan designs incorporate several methods. At the very minimum, the basic FHWA guidelines are addressed. The site selection is the most critical element. ODOT coordinates with the agencies to produce the conceptual plan; ODOT then collects field validation data and performs watershed modeling. The final design is produced and submitted for site approval.

The Ohio DOT has observed detrimental effects of proximity to development on the success of the mitigation project. Access-stimulated development severely compromised one project during the final construction stage (the site may have to be abandoned). After completion, another project had its upstream water supply threatened. ODOT uses the standard 5-year follow-up monitoring period with extensions if expectations have not been met by then. ODOT is now required to monitor other types of mitigations as well, such as stream water quality, and this is the reason why it prefers to utilize private banks.

ODOT's biggest obstacle is considered to be the on-site requirement, where less-than-adequate sites have to be selected in order to meet this requirement; this results in poor quality mitigation. In addition, the potential for conflicting adjacent development is exacerbated by this approach.

Case studies were requested for use in this study; however, the Ohio DOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Oklahoma Department of Transportation:

Level 1: Organization and Information

The Oklahoma Department of Transportation (ODOT) has approximately ten wetlands impacts per year; however, the agency staff did not know the corresponding number of mitigation projects. ODOT receives input from other agencies but does not reorganize or summarize the data. Agencies include the Oklahoma Department of Environmental Quality (ODEQ), the Natural Resource Conservation Service (NRCS), the State Wildlife Agency, the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS).

Impact files contain such wetlands information as species present, soil types, and location. Approximately 3 percent of the Oklahoma DOT's construction permits require mitigation, and mitigation is occasionally performed for wetlands impacts. Mitigation files are maintained, and printed data include area, location, type, and replacement ratio. Printed impact and mitigation information is accessible by site visit. There are no impact or mitigation summaries available from ODOT.

Preservation, restoration, and creation are the strategies utilized by ODOT. Follow-up monitoring consists of site photographs. The Oklahoma DOT has had experience with off-site mitigation. Mitigation banking is in place, and it anticipates that the process will commence in the near future. No banking information is currently available from ODOT. Follow-up monitoring is conducted mainly by photographic methods. To assist the present study, the mitigation specialist at ODOT had planned to have the staff biologist compile a summary of information from the past few years. This summary was never completed, however, because the biologist's workload was too great. Therefore, no project summary data were available from ODOT. The 1993 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained for use in this study.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by ODOT and from the 1993 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Oklahoma DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1991 and 1992, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that preservation and creation were equally favored for mitigation projects from 1991 through 1992. Restoration and enhancement were not utilized at all during this time. The 1998 survey, by contrast, demonstrated a different trend, with preservation being the favored choice for mitigation; it was utilized 9 times more often than restoration or enhancement and 90 times more than creation.

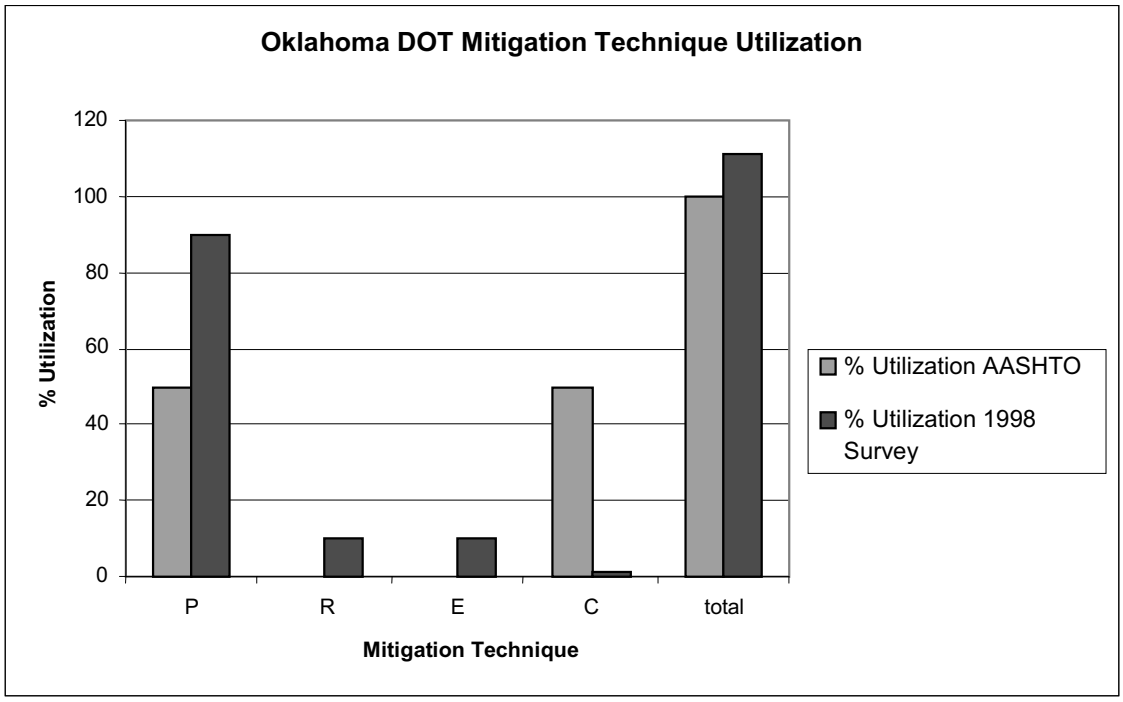
The AASHTO summary data also showed that, for mitigation proximity, off-site and on-site mitigation were equally favored between 1991 and 1992. Banking was not utilized at all during this period. The ODOT staff did not provide the 1998 survey with data for this section.

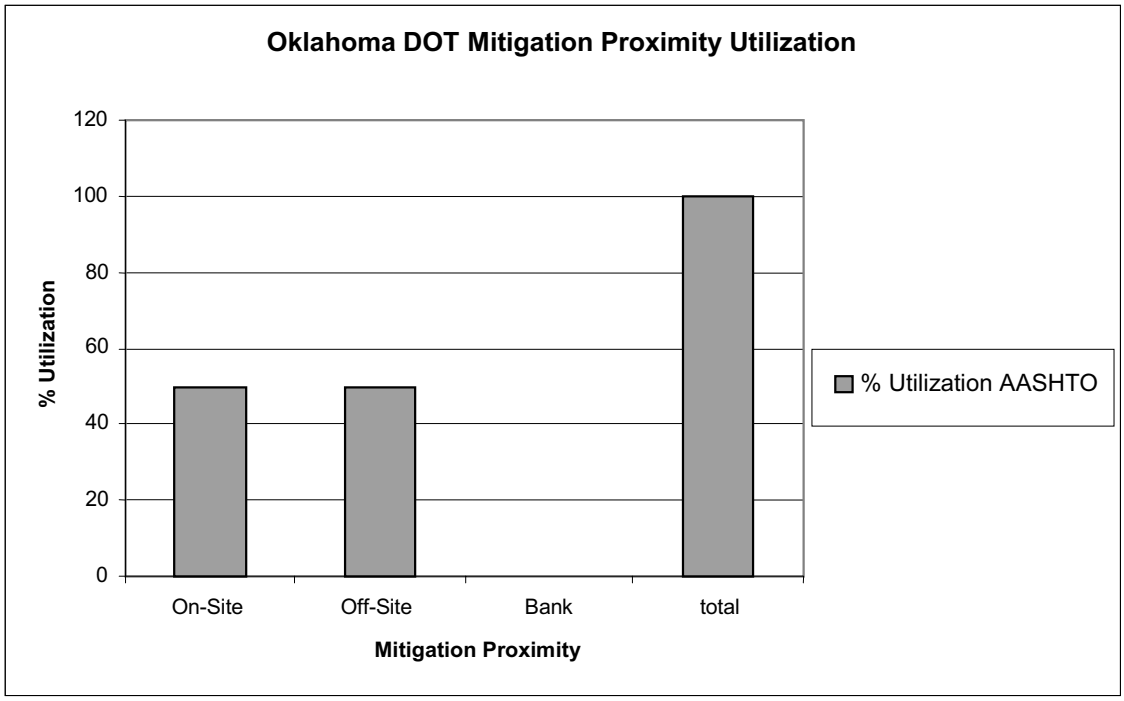
The table and two charts provided below illustrate these ODOT trends.

total # mitigation projects AASHTO 1993	2
total # acres impacted 1993	5.4
average # acres impacted per project 1993	2.70
total # acres mitigated 1993	23
average replacement ratio 1993	4.26

	P	R	E	C	total
% Utilization AASHTO	50	0	0	50	100
% Utilization 1998 Survey	90	10	10	1	111

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	50	50	0	100
% Utilization 1998 Survey	NA	NA	NA	NA


Oklahoma DOT Mitigation Technique Utilization
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Oklahoma DOT Mitigation Proximity Utilization
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80
60
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20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to ODOT for wetlands mitigation. The preference ranking is P, R, E, and then C. There is not a Memorandum of Agreement (MOA) or Memorandum of Understanding (MOU) with the Corps regarding preferences. However, in the proposal consensus meetings, there is a verbal preference for preservation from both the FWS and the Corps. It is seen as the most cost-effective and time-efficient choice for mitigation. It is estimated that preservation has been utilized 90 percent of the time, enhancement and restoration 10 percent each, and creation <1 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site and out-of-kind are both desired about 80 percent of the time. In actual practice, most mitigation is in-kind on-site preservation because ODOT buys adjacent wetlands for expansion. The Oklahoma DOT has a banking agreement in place, but has not had the time to set up a program. ODOT has bought extra acreage on individual projects to bank in the future. The replacement ratios are generally based on acreage in combination with the wetlands type. Ratios are determined by the Habitat Evaluation Procedure (HEP) value system. Typical preservation ratios are 4–5:1.

The primary agency involved in the mitigation negotiation process is the Corps. There is an atmosphere of consensus among the FWS, the DNR, and the DEQ (401 certification). ODOT never submits a mitigation plan that differs from the agency expectations because it develops the original plan with the proposal consensus panel. The Corps resolves conflicts between the signatory agencies and ODOT. When restoration and creation were used in the past, ODOT did not put much effort into the design methods, but now preservation is the main strategy, so design is not an issue. The Oklahoma DOT has not done any studies to assess the effects of proximity to development on the success of the mitigation. Monitoring has not been conducted because ODOT mostly utilizes preservation of existing wetlands as a mitigation strategy.

The Oklahoma DOT staff was of the opinion that the case studies' portion of this study was not applicable because they rely almost exclusively on preservation as their mitigation strategy.

Oregon Department of Transportation:

Level 1: Organization and Information

The Oregon Department of Transportation (ODOT) has approximately ninety wetlands impacts and twenty-four mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. ODOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Natural Resource Conservation Service (NRCS), the Oregon Department of Environmental Quality (ODEQ), the Oregon Department of Fish and Wildlife, the Oregon Department of Water Resources, the Oregon Land Bureau, the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS).

Impact files are maintained and contain such wetlands information as type, area, and function. Function is often determined for already-delineated wetlands simply for the sake of knowing, utilizing the Wetlands Evaluation Procedure (WET II) methodology. For new projects, the information is not very refined. As a project progresses, the actual delineation, the environmental impact statement (EIS), the environmental assessment (EA), and so forth are accumulated, culminating in a jurisdictional analysis. The process can take from 12 months to 3-to-5 years, or, in the case of emergencies (catastrophic events like floods or landslides), as little as 1 month.

All the Oregon DOT's permits require mitigation, and mitigation is routinely performed for wetlands impacts. A technical report is always prepared for impact projects. Detailed files are kept on full National Environmental Policy Act (NEPA) impact projects. All permits related to easement removal or fill requires mitigation. Oregon is also moving toward requiring mitigation for any project involving wastewater. Mitigation files are maintained, and printed data include area, location, type, and replacement ratio, depending on the size of the project, the potential for learning, and staff time available. Printed impact and mitigation information is accessible by informal written or phone request. No summaries were available from ODOT.

The Oregon DOT has had experience with off-site compensation. Banking files are maintained; however, no banking information is currently available. Follow-up monitoring is conducted; however, the extent depends on the size of the project, the potential for learning, and the staff time available. Methods include the use of transects and estimates. There is no information available for request from ODOT. The 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained for use in this study.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by the Oregon DOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Oregon DOT during the time periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was favored for mitigation projects from 1991 through 1994 and was utilized 1.6 times more often than enhancement and 13 times more than preservation. Restoration was not utilized at all during this time. The 1998 survey, by contrast, demonstrated a different trend, with creation and enhancement being equally favored and utilized 1.25 times more than restoration and 17.5 times more than preservation.

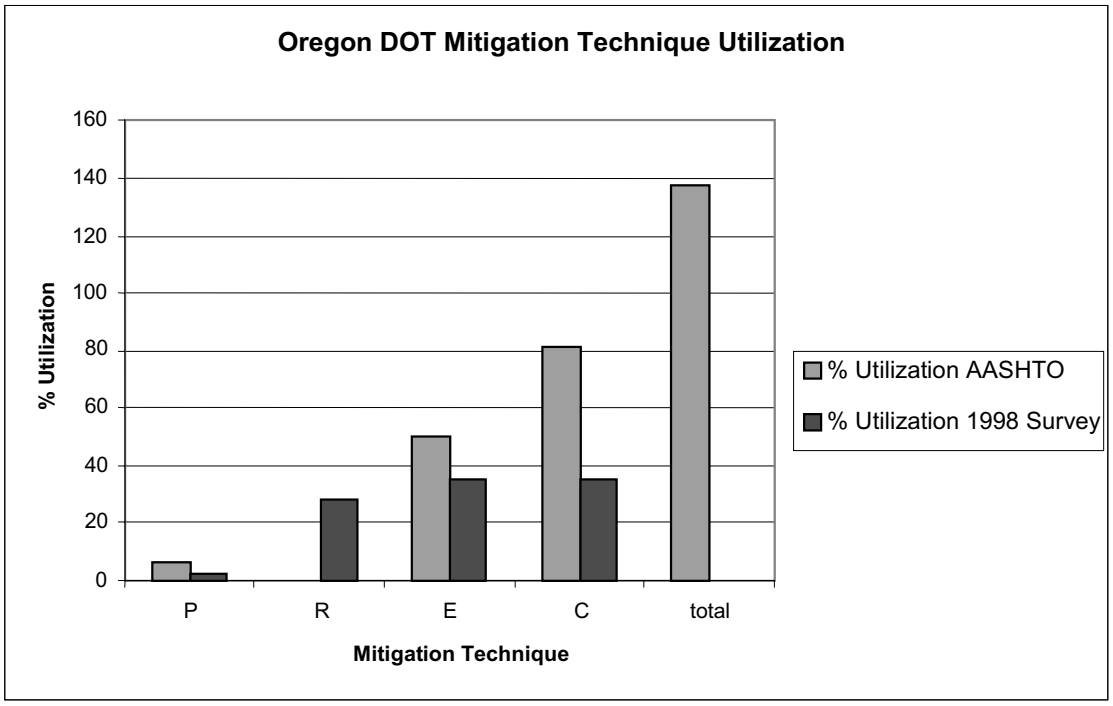
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice between 1991 and 1994 and was utilized 3 times more often than on-site mitigation. Banking was not utilized at all during this period. The 1998 survey demonstrated the same trend.

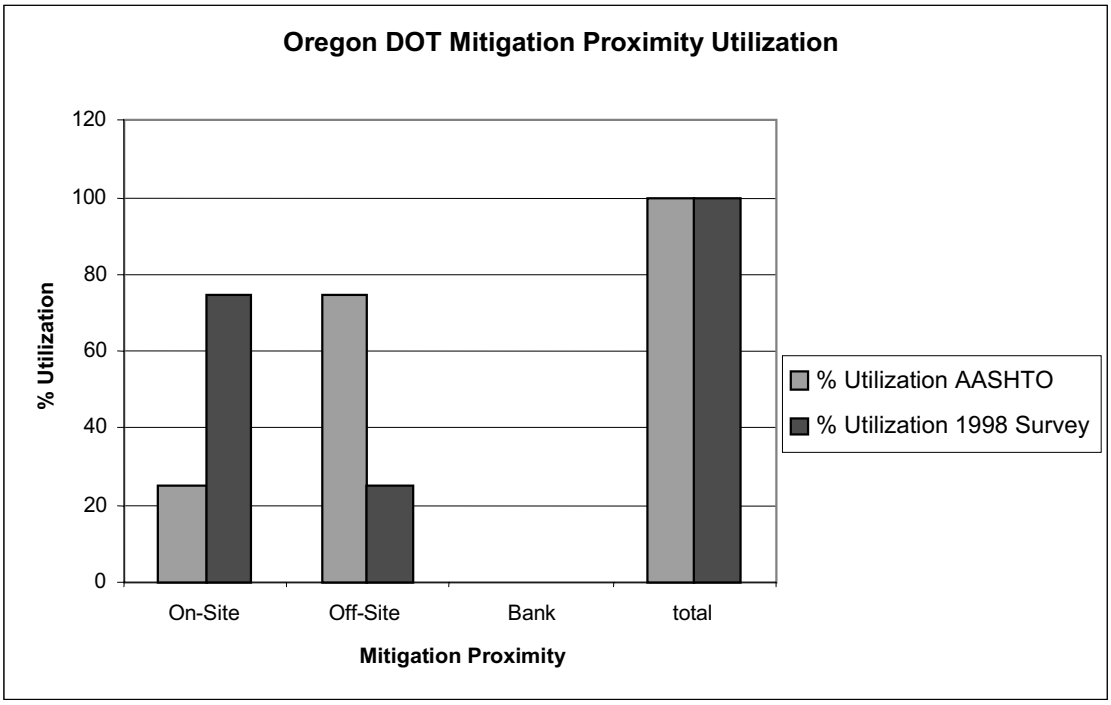
The table and two charts provided below illustrate these Oregon DOT trends.

total # mitigation projects AASHTO 1993 & 1995	16
total # acres impacted 1993 & 1995	11.83
average # acres impacted per project '93 & '95	0.85
total # acres mitigated '93 & '95	29.52
average replacement ratio '93 & '95 (14 files)	2.41

	P	R	E	C	total
% Utilization AASHTO	6.25	0	50	81.25	137.50
% Utilization 1998 Survey	2	28	35	35	

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	25	75	0	100
% Utilization 1998 Survey	75	25	0	100


Oregon DOT Mitigation Technique Utilization
160
140
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Oregon DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to the Oregon DOT for wetlands mitigation. The preference ranking is R, C, E, and then P. The Oregon Division of State Lands (DSL) sets the preference ranking. Preservation is strongly discouraged. The rationale is that state and federal regulations already protect wetlands that need to be preserved. Protection by preservation can be used in special situations when the area is subject to imminent destruction and other mitigation options cannot be utilized. Often two or more mitigation options are used for a single project. It is estimated that preservation has been utilized 2 percent of the time, enhancement and creation 35 percent each, and restoration 28 percent in wetlands mitigation.

Off-site mitigation is desired 25 percent of the time and out-of-kind replacement is desired approximately 75 percent of the time. There is no difficulty in obtaining approval for off-site mitigation by the Corps and the DSL. These agencies would like to move toward more banking, as well as other off-site strategies, in the future. In actual practice, off-site and out-of-kind occur approximately 25 percent and 20 percent of the time, respectively. The replacement ratios are generally based on acreage in combination with the wetlands type and/or PREC ratios. The Oregon DSL sets the replacement ratios, and acreage is the most important factor. For most wetlands types, the PREC ratios are used as well: preservation ratios are quite high, restoration is 1:1, enhancement is 3:1, and creation is replaced at 1.5:1. The PREC and wetlands type ratios are determined by weighted formulas for large projects (several acres) or extremely sensitive (estuarine or fen) areas, as well as for banks.

The primary agencies involved in the mitigation negotiation process are the DSL and the Corps. Their jurisdictions and permitting overlap, so they have set up a joint permitting process. In this system, the Corps generally defers to the DSL during negotiations. It is estimated that less than 1 percent of the time ODOT submits a mitigation plan that differs from the agency expectations. Of these, ODOT's plan overrides 90 percent of the time with only minor adjustments because they use the DSL's replacement ratios. The DSL and the Corps resolve any conflicts between the signatory agencies and ODOT.

According to the Oregon DOT, there is no time to perform scientific analysis, such as monitoring ground and surface water hydrology of the mitigation site for mitigation plan design; therefore, ODOT consults others who have performed mitigation in the same area; it also utilizes best professional judgment (BPJ). The agency often tries to expand existing wetlands to increase mitigation success. Because out-of-kind mitigation is a major mitigation strategy, wetlands type does affect the design methods utilized by the Oregon DOT. Proximity to traffic and people probably does affect wildlife usage, but ODOT does not have any data to investigate this. Follow-up monitoring is conducted and includes annual reports for 3–5 years after the project has been completed. The general health of the site is assessed through photographs and through qualitative or quantitative data on the percent plant cover and species diversity and density; field monitors describe any remedial actions needed.

The Oregon DOT's biggest obstacle is considered to be the process of finding and acquiring

suitable mitigation sites. With respect to the regulations, the biggest obstacle is the long permit review and approval process. ODOT does not consider itself to have enough insight into the inner workings of the Corps and the DSL to make suggestions for improvement. Case studies were requested for use in this study; however, the ODOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Pennsylvania Department of Transportation:

Level 1: Organization and Information

The Pennsylvania Department of Transportation (PennDOT) has approximately sixty wetlands impacts and four mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. PennDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Pennsylvania Department of Environmental Protection (DEP), the Pennsylvania Fish and Boat Commission, the Pennsylvania Game Commission, the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS).

Impact files are maintained and contain project scooping, delineations, functional assessments, comments, environmental assessments (EA), and environmental impact statements (EISs). Functional assessments are performed using the Wetlands Evaluation Technique (WET) and/or best professional judgment (BPJ). PennDOT has recently started using an HGM-like system (hydrogeomorphic method).

Approximately 100 percent of the Pennsylvania DOT's construction permits require mitigation. Mitigation is routinely performed for wetlands impacts. Mitigation files are maintained, and printed data include area, location, type, replacement ratio, Pennsylvania Modified Habitat Evaluation Procedure (PAMHEP) assessment, piezometer readings, vegetation samples, as well as the percent organic component in the soil. There are no mitigation summaries available. Printed impact and mitigation information is accessible by informal written or phone request. PennDOT was planning to have an extensive database (PENNWET) available on the Internet by March 1998, but this program never materialized. The agency wanted to substitute the in-depth access to this database for quarterly and annual reports to the Corps; however, PennDOT could not convince the Corps to accept this plan. Thus, PennDOT does not consider it economically feasible to make this type of information available to the general public. No summaries are available from PennDOT.

The Pennsylvania DOT has had experience with off-site compensation. The first two PennDOT-owned mitigation banks were completed this summer. They are both 20-acre restoration sites. There are at least two other sites in development. The PennDOT procedure is to go through the Soil Conservation Service (SCS) photos to find converted cropland that will make suitable mitigation sites. The current banks are regionally operated; however, a statewide banking agreement is being drafted.

Until February 1997, wetlands mitigation sites were created at a minimum 1:1 ratio for all impacts, with the ratios going as high as 7:1. The guidelines were 1:1 for emergent wetlands, 1.5:1 for scrub/shrub areas, and 2:1 for forested areas, although these ratios could be negotiated with the resource agencies. PennDOT had to create the mitigation site. Since February 1997, at least one of the Corps districts with which PennDOT works has actively accepted the idea of

wetlands banking, and Pennsylvania no longer regarded converted cropland as jurisdictional wetlands. This has given PennDOT many more options for mitigation.

One district in Pennsylvania is pursuing a turnkey entrepreneurial bank after obtaining approval from the FHWA to contract with an outside firm to purchase, restore, and monitor a banking site for a flat fee. There is also a private firm trying to establish an entrepreneurial bank, but it is running into problems owing to the unusually large size of the project.

All mitigation sites are monitored in some way, even if the permit doesn't require it. Tier I monitoring includes plan and project information that is sent to the central office. Only Tier I is performed for projects where permits do not require monitoring, which accounts for about 5 percent of all permits. Tier II monitoring requires approximately the same level of effort as a delineation, which usually includes an annual report for the first 2 years and then biennial reports for the next 4 years. Spring and fall site visits are conducted. Tier III monitoring is exhaustive and includes PAMHEP assessments, piezometer installation, 1 percent vegetation sampling using transects, and the percent organic component in the soil. There is no summary information available for request from PennDOT. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained for use in this study.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by PennDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Pennsylvania DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was favored for mitigation projects from 1991 through 1994 and was utilized 48 times more often than enhancement. Restoration and preservation were not utilized at all during this time. The 1998 survey demonstrated a slightly different trend, with creation still favored, but having been utilized approximately 6.5 times more than restoration and 10 times more than enhancement.

The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was the favored choice between 1991 and 1994 and was utilized approximately 1.6 times more than on-site mitigation. Banking was not utilized at all during this time period. The 1998 survey demonstrated a similar trend.

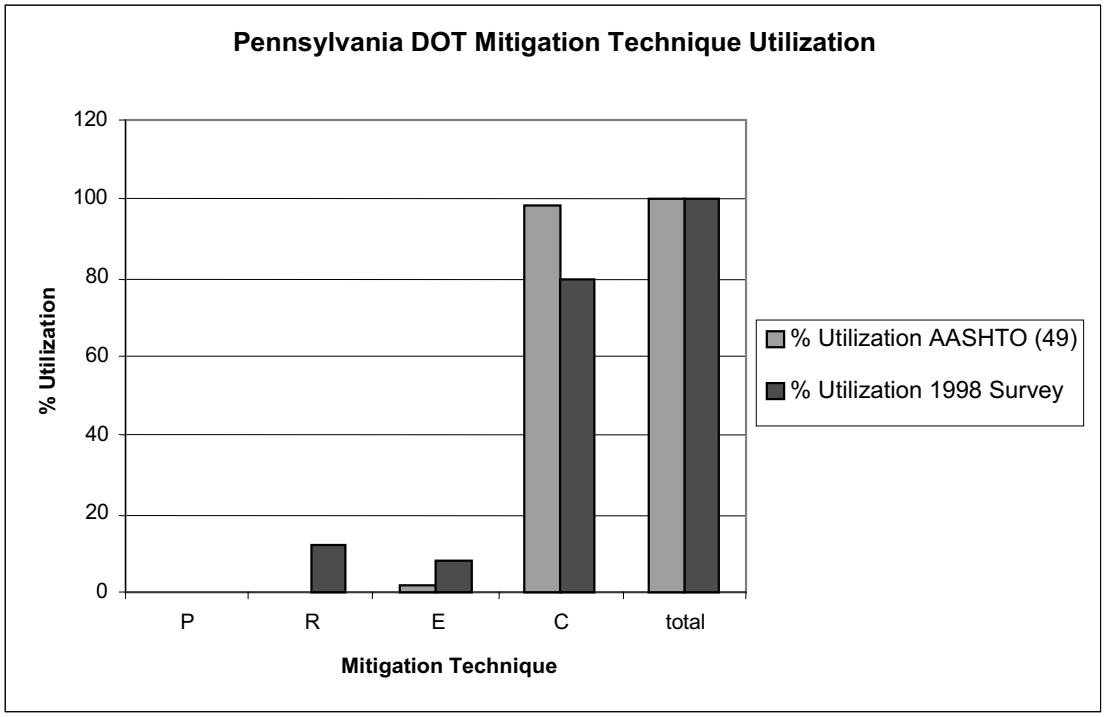
The table and two charts provided below illustrate these PennDOT trends.

total # mitigation projects AASHTO 1993 & 1995	51
total # acres impacted 1993 & 1995	136.99
average # acres impacted per project '93 & '95	9.79
total # acres mitigated '93 & '95	243.69
average replacement ratio '93 & '95	2.42

1998 Survey: 1st 2 banks just completed

	P	R	E	C	total
% Utilization AASHTO (49)	0	0	2.04	97.96	100
% Utilization 1998 Survey	0	12	8.00	80.00	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO (50)	38	62	0	100
% Utilization 1998 Survey	30	70	0	100


Pennsylvania DOT Mitigation Technique Utilization
120
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% Utilization
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R
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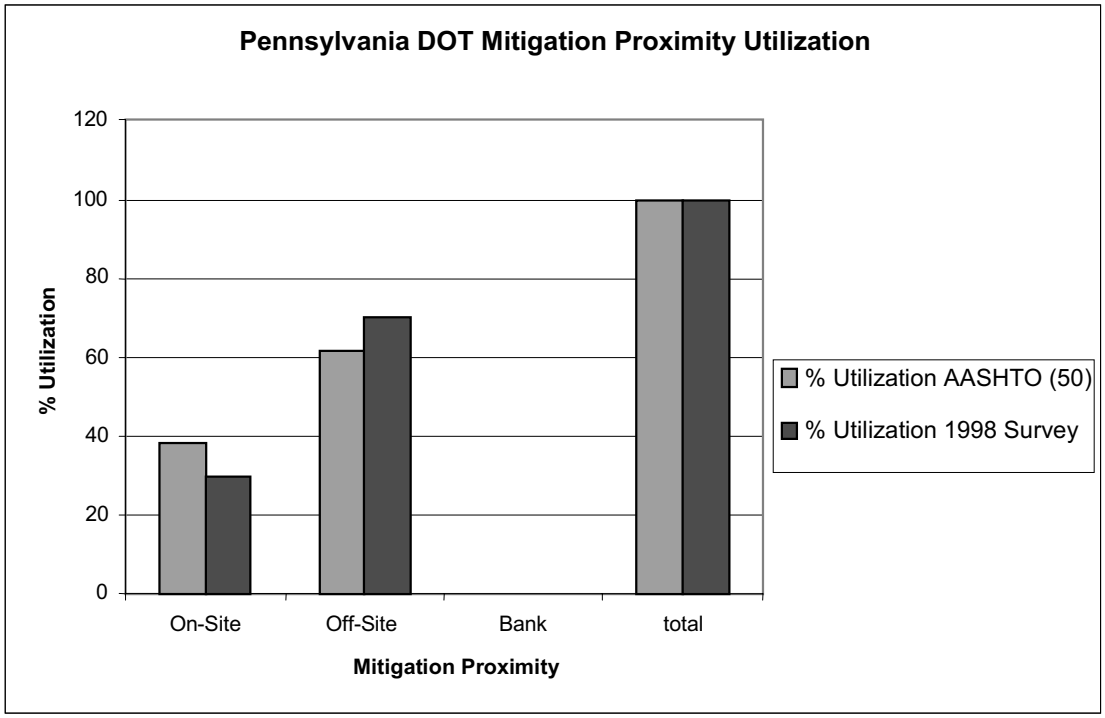
Mitigation Technique
% Utilization AASHTO (49)
% Utilization 1998 Survey


Pennsylvania DOT Mitigation Proximity Utilization
120
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% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO (50)
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to PennDOT for wetlands mitigation. The preference ranking is R, C, E, and then P. In reality, preservation has never been accepted on a PennDOT project. Before 1996, hardly any restoration was performed owing to the lack of opportunity. After the PennDEP reversed its philosophy (such that it no longer regarded converted cropland as jurisdictional wetlands), the use of restoration as a mitigation strategy dramatically increased. It is estimated that preservation has been utilized 0 percent of the time, enhancement 8 percent, creation 80 percent, and restoration 12 percent in wetlands mitigation.

Off-site mitigation occurs approximately 70 percent of the time; however, PennDOT mitigates at the best sites for restoration and as close as possible to the impact and does not really consider the on-/off-site concept. The regulators involved in the mitigation process support this idea. PennDOT designs the mitigation to replace the Cowardin classification of impacted wetlands and it is beginning to explore nonwetlands replacement of wetlands function, such as streambank fencing, riparian and upland buffers, as well as floodplain easements when ratios are greater than 1:1. The replacement ratios are generally based on acreage in combination with the wetlands type and/or PREC strategies utilized. Creation and restoration both have a 1:1 replacement ratio, and preservation is set at 10:1. Wetlands type replacement ratios are 1:1 for emergent, 1.5:1 for scrub/shrub, and 2:1 for forested wetlands. Ratios for high quality wetlands can range between 2–5:1. The regulatory agencies consider the wetlands's function and value, as well as their estimation of the rate of mitigation failure.

The primary agencies involved in the mitigation negotiation process are the Corps and the DEP. The Corps has a programmatic general permit that automatically issues a 404 permit for any impact less than or equal to 1 acre that is permitted by DEP. It is estimated that 95 percent of the time PennDOT submits a mitigation plan that differs from the agency expectations. Of these, PennDOT's plan overrides 60 percent of the time with only minor adjustments. However, PennDOT must collect significant amounts of auxiliary data to support its position. The Corps resolves any conflicts between the signatory agencies and PennDOT. Secondary data would indicate that there is some adverse effect of proximity to development on mitigation success; however, PennDOT has no scientific basis for this. Follow-up monitoring is conducted on all sites to some degree. The data are entered into a geographical information system (GIS) database for tracking, maintenance, and design feedback.

PennDOT's biggest obstacle is resolving conflicts between the two competing resource interests for site selection (either party can shut down a project). The Corps expressly prefers restoration of converted cropland; however, special protection is afforded the condemnation of farmland. The PennDOT staff felt that they did not have time to participate in the case study portion of this study. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Rhode Island Department of Transportation:

Level 1: Organization and Information

The Rhode Island Department of Transportation (RIDOT) has approximately fifty wetlands impacts and three mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Rhode Island DOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Rhode Island Department of Environmental Management (RIDEM), the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS). The Rhode Island DEM has departments for wetlands, water quality, fish and wildlife, air quality, and wastewater. Printed impact files contain information on costs of design, construction, right-of-way acquisition, and monitoring, as well as on monitoring reports prepared by consultants. Specific data include highway station number, area impacted, volume of fill, pollutant loading in water, before-and-after monitoring results.

Approximately 5 percent of the Rhode Island DOT's construction permits require mitigation, and mitigation is occasionally performed for wetlands impacts. Mitigation files are also maintained and contain information on groundwater tests, monitoring wells, habitat, delineation, alternative strategies, and options that require the least impact on the site. Specific data include location, area, size, and water quality data, as well as before-and-after monitoring results. The Rhode Island DOT has a 3–5 year follow-up monitoring program, which includes monitoring of vegetation, soil, and water.

RIDOT has had experience with off-site compensation. For example, there was no way to successfully mitigate an impact resulting from construction of the Narragansett Bridge on-site, so RIDOT restored a saltwater marsh in Galilee, Rhode Island.

Printed impact and mitigation information is accessible by formal written request and summaries are available. Impact and mitigation summaries were requested for use in this study, but were never received. However, the 1995 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained.

1995 AASHTO Summaries

The following information has been summarized from the 1995 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT. The quantity and/or quality of data obtained from the AASHTO survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by RIDOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1993 through 1994.

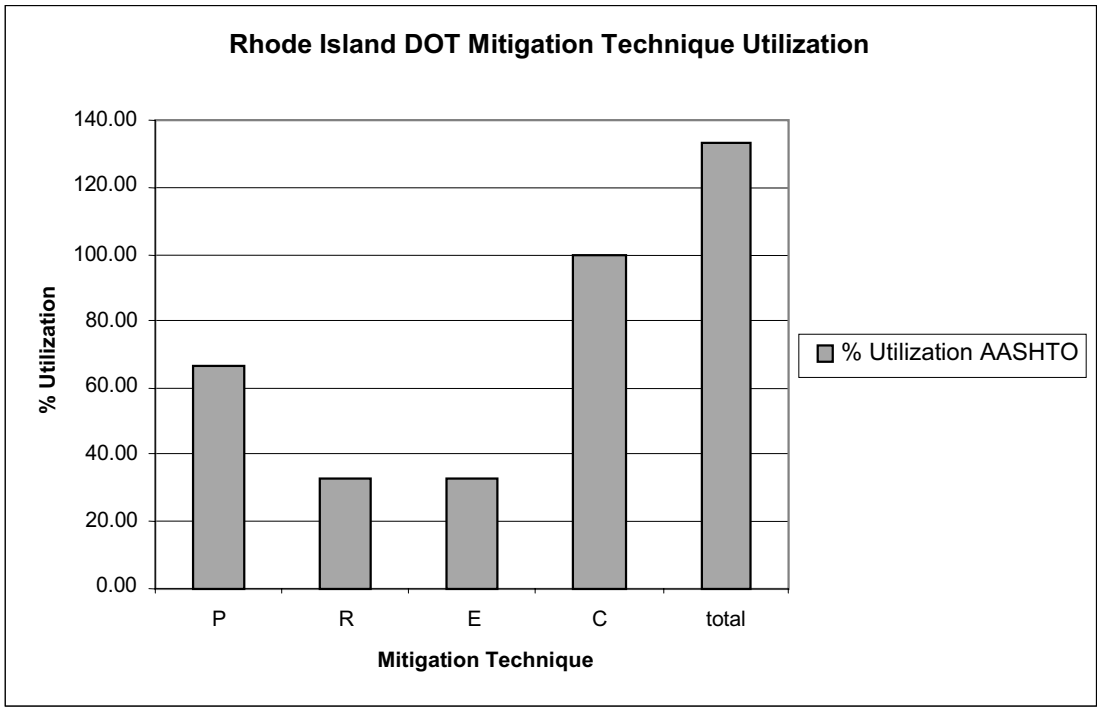
Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation projects from 1993 through 1994. Creation was utilized 1.5 times more often than preservation and 3 times more often than restoration or enhancement. The AASHTO summary data also showed that, for mitigation proximity, off-site was favored, being utilized 2 times as much as on-site mitigation. Mitigation banking was not utilized by RIDOT from 1993 through 1994.

The RIDOT staff did not provide the present 1998 survey with its most recent estimations of mitigation strategy usage rates. The table and two charts provided below illustrate these RIDOT trends.

total # mitigation projects AASHTO 1995	3
total # acres impacted '95	14.7
average # acres impacted per project '95	4.90
total # acres mitigated '95	74.4
average replacement ratio '95	5.06

	P	R	E	C	total
% Utilization AASHTO	66.67	33.33	33.33	100.00	133

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	33.33	66.67	0	100.00


Rhode Island DOT Mitigation Technique Utilization
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
% Utilization
P
R
E
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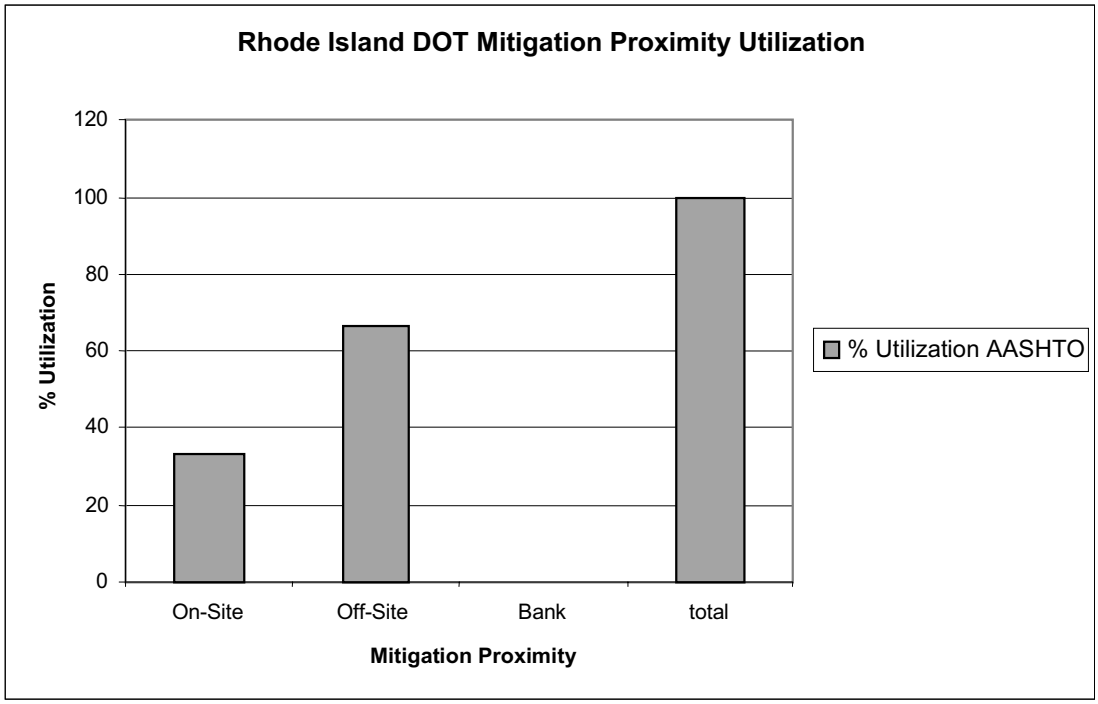
total
Mitigation Technique
% Utilization AASHTO


Rhode Island DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO

South Carolina Department of Transportation:

Level 1: Organization and Information

The South Carolina Department of Transportation (SCDOT) has approximately fifty wetlands impacts per year; however, the SCDOT staff did not know the corresponding number of mitigation projects. SCDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the South Carolina Department of Health and Environmental Control, the South Carolina Department of Natural Resources (SCDNR), the South Carolina Office of Coastal Resources Management, the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS). SCDOT sends the permit application to the EPA and receives comments from the agencies listed above; comments are organized for the most effective use.

Impact files are maintained, but contain little quantitative information. The impact data are mainly comments received from the regulatory agencies in response to the permit application. SCDOT does prepare an annual summary, but it contains only the number of projects for that year.

Approximately 99 percent of the South Carolina DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation files are maintained, but contain little quantitative information. There are no mitigation summaries available. Printed impact and mitigation information is accessible by site visit; no summaries are available. Follow-up monitoring is conducted and quarterly reports are submitted for 1 to 4 years.

The South Carolina DOT has had experience with off-site compensation and it maintains two mitigation banks (1,700 acres freshwater, 251 acres saltwater). There is no information available for request from SCDOT. However, the 1995 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained for use in this study.

Survey and 1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by SCDOT and from information obtained from the 1995 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the South Carolina DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1993 and 1994, while the present 1998 survey obtained the most recent estimations from the agency staff.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation projects from 1993 through 1994. Creation was utilized 3 times more often than preservation and enhancement. Restoration was not utilized at all during this period. Unfortunately, the only information provided to the 1998 survey by the SCDOT staff was the statistic that restoration was utilized 85 percent of the time and is assumed to be the favored choice, in contrast to the AASHTO data.

The AASHTO summary data also showed that, for mitigation proximity, off-site and banking data were combined and were the favored choice for mitigation. They were utilized 1.5 times more often than on-site mitigation during this period.

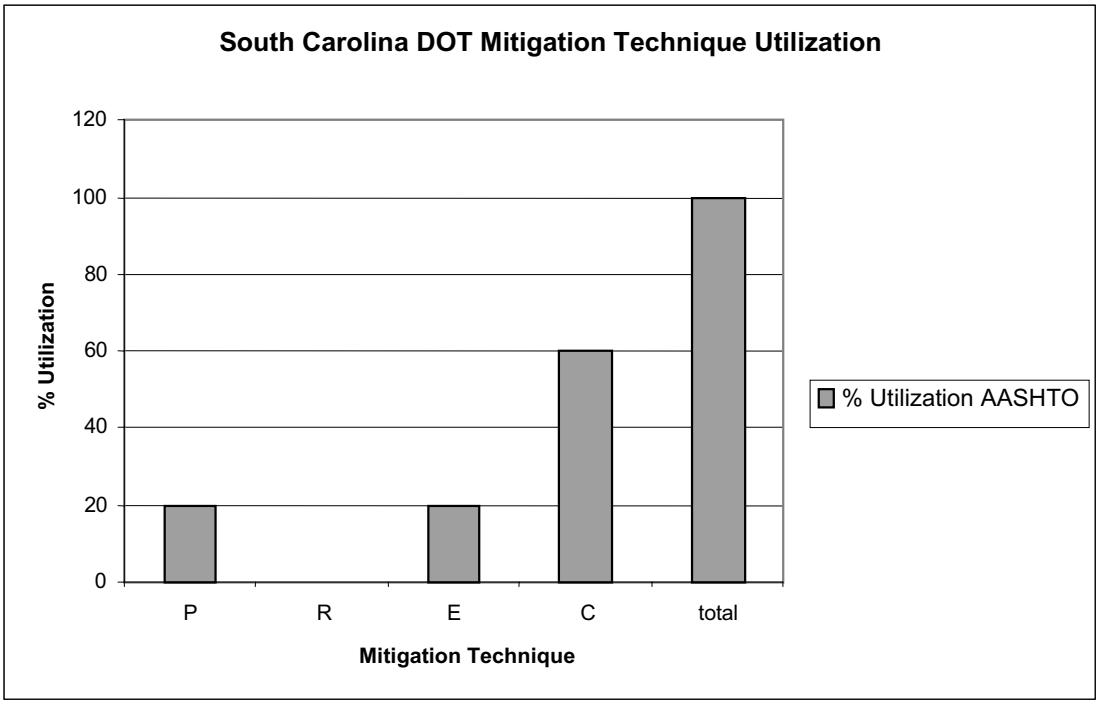
The SCDOT staff did not provide the present 1998 survey with its most recent estimations of mitigation strategy usage rates. The table and two charts provided below illustrate these SCDOT trends.

total # mitigation projects AASHTO 1995	5
total # acres impacted 1995 (4 files)	36.83
average # acres impacted per project 1995	9.21
total # acres mitigated 1995	98.75
average replacement ratio 1995	2.49

1998 Survey: Restoration utilized 85%

	P	R	E	C	total
% Utilization AASHTO	20	0	20	60	100

	On-Site	Off-Site/Bank	total
% Utilization AASHTO	40	60	100


South Carolina DOT Mitigation Technique Utilization
120
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% Utilization
P
R
E
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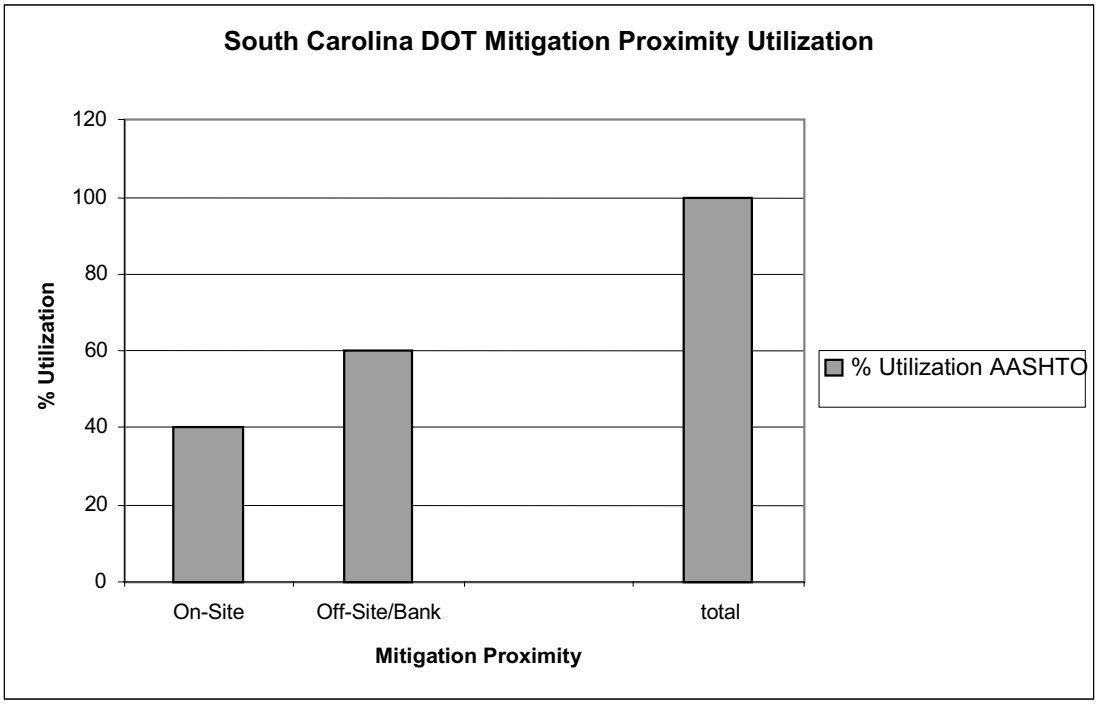
Mitigation Technique
% Utilization AASHTO


South Carolina DOT Mitigation Proximity Utilization
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% Utilization
On-Site
Off-Site/Bank
total
Mitigation Proximity
% Utilization AASHTO

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to SCDOT for wetlands mitigation. The preference ranking is R, P, E, and then C. Creation works well in the coastal zone, but it is still problematic in other areas. The Charleston Corps District presently allows no more than 49 percent of mitigation credits to come from preservation; however, it has the discretionary authority to waive this requirement if the preservation habitat is truly unique. It is estimated that restoration has been utilized approximately 85 percent in wetlands mitigation.

Off-site mitigation is desired approximately 80 percent of the time, and out-of-kind less than 5 percent of the time. If on-site mitigation is not practicable, SCDOT usually proposes debiting its mitigation bank, which occurs in most cases. Out-of-kind is seldom used because of resource and regulatory constraints. The basis for replacement ratios varies depending on the type of mitigation. SCDOT's freshwater bank uses acreage to set its replacement ratios, while the tidal bank and on-site mitigation ratios are based on function and value. Compensatory mitigation is calculated using the Corps' standard operating procedures (SOP).

All state and federal resource and regulatory agencies are involved with decisions in the negotiation process. It is estimated that 90 percent of the time SCDOT submits a mitigation plan that differs from the agency expectations. Of these, SCDOT's plan overrides 80 percent of the time with only minor adjustments. The Corps resolves any conflicts between the signatory agencies and SCDOT. Wetlands type occasionally affects SCDOT's mitigation design methods with respect to the length of time required for the post-construction monitoring.

SCDOT has not experienced any major mitigation success problems with respect to proximity to development. These types of problems are avoided partly by including a buffer area around the mitigation site (the Corps' SOP allows reduced mitigation credits for buffers). Follow-up monitoring is required for a 3–5 year period and consists of groundwater well monitoring to ensure proper hydrology, as well as photo documentation of revegetation and tree planting survivability. This information is presented in quarterly or semi-annual reports. Case studies were requested for use in this study; however, the SCDOT staff never provided the information. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

South Dakota Department of Transportation:

Level 1: Organization and Information

The South Dakota Department of Transportation (SDDOT) has approximately thirty wetlands impacts and mitigation projects per year. SDDOT receives input from other agencies and also reorganizes and summarizes the data for use in the project. Agencies include the South Dakota Department of Environment and Natural Resources; the South Dakota Department of Game, Fish, and Parks (SDDGFP); the U.S. Army Corps of Engineers (Corps); and the U.S. Fish and Wildlife Service (FWS). Mitigation is especially routine for federally funded wetlands impact projects.

Impact files are maintained containing National Wetlands Inventory maps, Natural Resource Conservation Service (NRCS) maps, preliminary cross sections, area, location, and the extent of impact. Printed impact and mitigation information is accessible by site visit; no summaries are available.

Approximately 50 percent of the South Dakota DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation files are maintained, and printed information is collected by staff-member observations during field trips to the site. The South Dakota DOT has had experience with off-site compensation. SDDOT has a mitigation banking agreement with the FWS, the Federal Highway Administration (FHWA), and the SDDGFP. Currently, its mitigation bank consists of approximately 30 acres. Banking files contain debit and credit information; no summaries are available. Follow-up monitoring is conducted by visual observation of the mitigation sites. There is no information available for request from SDDOT. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained for use in this study.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by SDDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the South Dakota DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was favored for mitigation projects from 1991 through 1994 and was utilized 1.5 times more often

than enhancement. Restoration and preservation were not utilized at all during this time. The 1998 survey demonstrated a different trend, with creation still favored but having been utilized approximately 2.2 times more than restoration or enhancement and 13 times more than preservation.

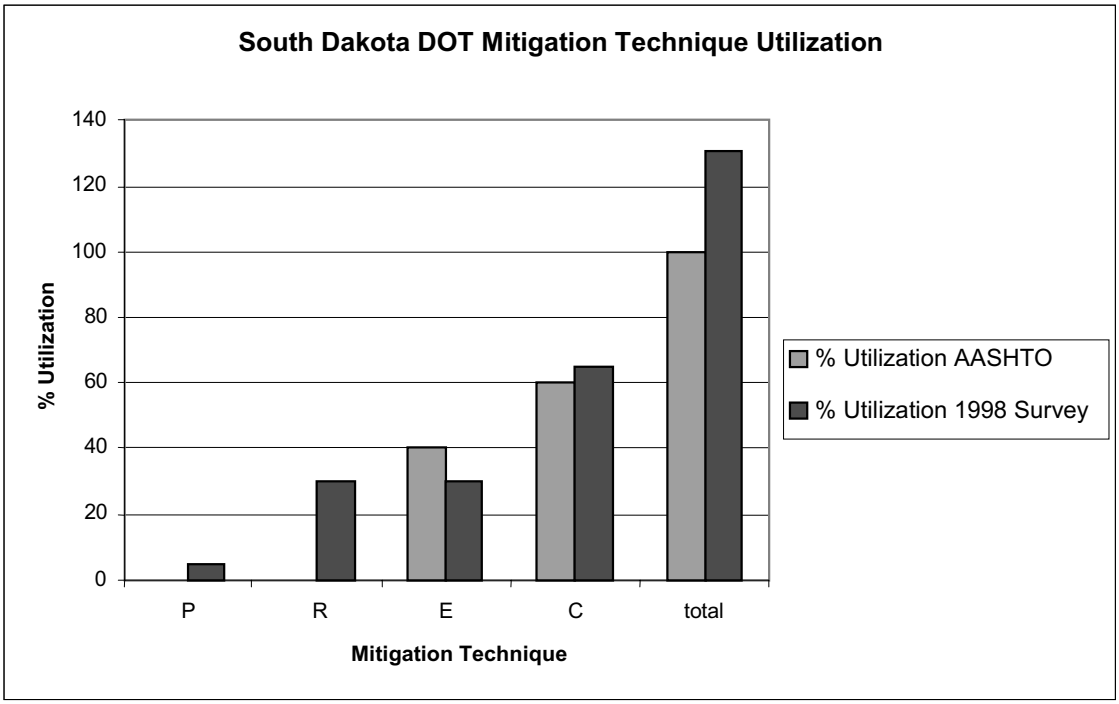
The AASHTO summary data also showed that, for mitigation proximity, on-site mitigation was the favored choice between 1991 and 1994 and was utilized 3 times more often than off-site or banking. The 1998 survey demonstrated a different trend, with on-site and off-site mitigation being equally favored. The SDDOT staff provided no clear information on mitigation banking usage rates.

The table and two charts provided below illustrate these SDDOT trends.

total # mitigation projects AASHTO 1993 & 1995	5
total # acres impacted 1993 & 1995	36.83
average # acres impacted per project 1993 & 1995	9.21
total # acres mitigated 1993 & 1995	98.75
average replacement ratio 1993 & 1995	2.49
1998 Survey: average acreage replacement ratio 2:1	

	P	R	E	C	total
% Utilization AASHTO	0	0	40	60	100
% Utilization 1998 Survey	5	30	30	65	130

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	60	20	20	100
% Utilization 1998 Survey	50	50	NA	100


South Dakota DOT Mitigation Technique Utilization
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% Utilization
P
R
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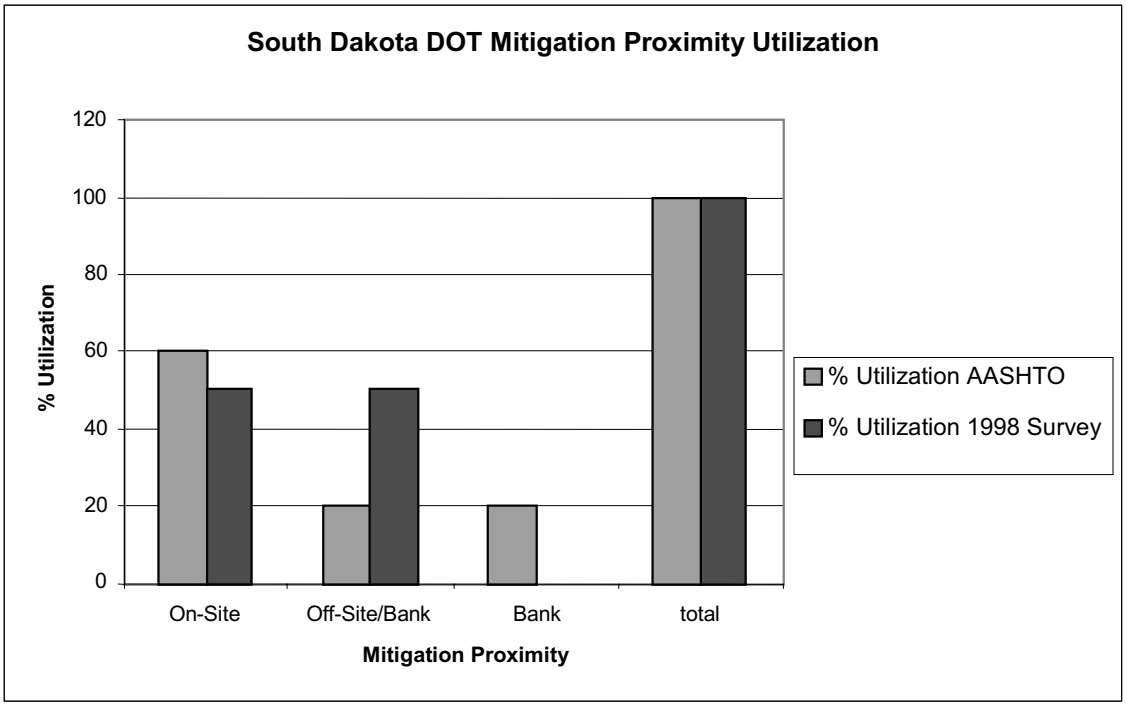
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


South Dakota DOT Mitigation Proximity Utilization
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% Utilization
On-Site
Off-Site/Bank
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to SDDOT for wetlands mitigation. The preference ranking is R, E, C, and then P. SDDOT would like to do restoration and enhancement most of the time. It is estimated that preservation has been utilized 5 percent, enhancement and restoration 30 percent each, and creation 65 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 100 percent of the time and actually utilized approximately 50 percent of the time. Out-of-kind is never desired by SDDOT because prairie potholes are a concern; therefore, all mitigation is in-kind. The replacement ratios are based on acreage alone, and SDDOT wants to maintain this system. The most common acreage ratio used is 2:1.

The primary agencies involved in the mitigation negotiation process are the FWS and the SDDGFP. The Corps will go along with these agencies' recommendations. It is estimated that 10 percent of the time SDDOT submits a mitigation plan that differs from the agency expectations, and the SDDOT's plan never overrides the desires of the regulatory agencies. It is conceded that SDDOT's plans are often not good ones, so it must sometimes alter the original plan to compromise between its desires and the objections of the regulatory agencies.

The SDDOT's plan design methods rely mostly on precedence. The South Dakota DOT has also had a research project that evaluated past projects and made suggestions for change in the future. SDDOT considers it difficult to say if proximity to development affects the success of mitigation. SDDOT does some mitigation projects close to the highway, but these are difficult to assess because they are expansions of existing roadways. There is no formal follow-up monitoring program, but the agency staff goes out annually for 4–5 years with the regulatory agency to determine what is working.

SDDOT's biggest obstacle is the resource agencies' unrealistic desires to obtain the ideal wetlands. In SDDOT's opinion, the regulators seem to acknowledge neither the realities of the difficulties in obtaining land or easements from landowners, nor the high construction costs involved in attaining perfection. SDDOT suggests this could be improved if the resource agencies could become more flexible at times. One Level 2 case study was provided to this study by SDDOT.

Level 2, Part B: Case Studies

State DOT	South Dakota	**Entry#**	1
Project Name	Wall Lake		
Permit Type	NWP		
Impact Location	SD42 west of Sioux Falls, I-29 at Sioux Falls		
Impact County	Minnehaha		
Type of Impact	elimination	**Acres Impacted**	18
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	emergent marsh	**Impact WL Value**	medium
Construction Start Date	July 95	**Construction Completion (months)**	12
Construction Project Cost ($)	4,500,000		
Construction Cost Notes	n/a		
Mitigation Location	2 locations, both within Wall Lake watershed		
Mitigation County	Minnehaha		
PREC	R, E		
PREC Notes	3 acres required for mitigation on project and the remainder entered in bank (both off-site)		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	18	**Replacement Ratio Calculation**	1.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	farmed wetlands	**Mit WL Value**	high
Mitigation Start Date	spring 95	**Mit Completion (months)**	0.1
Lagtime Impact/Mitigation Completion Calculation	0		
Mit Project Cost ($)	40,000	**Mitigation Cost Notes**	n/a
Mit Site Monitoring Time Period (yr)	no formal requirements		
Monitoring Frequency (months)	occasional		
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	considered excellent success - attributed to ample water supply, resource agency satisfaction w/ results, and public acceptance		

Tennessee Department of Transportation:

Level 1: Organization and Information

The Tennessee Department of Transportation (TDOT) has approximately fifteen wetlands impacts and twelve mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. TDOT receives input from other agencies but does not reorganize or summarize the data. Agencies include the Tennessee Department of Environment (TDE), the Federal Highway Administration (FHWA), the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS).

Impact files are maintained containing delineations and jurisdictional evaluations with such information as area, location, size, function, and value. Function and value are currently determined by best professional judgment (BPJ), though TDOT is moving toward the use of hydrogeomorphic (HGM) standards.

Approximately 15 percent of the Tennessee DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Tennessee has seen most of its wetlands impact and mitigation activity in the western part of the state up to this point, which is where most of the naturally occurring wetlands are found. Activity is shifting to the east, and as that happens a decrease in impact and mitigation activity is expected. The state of Tennessee plans to restore 70,000 acres of wetlands by the year 2000 (a program begun in 1993). TDOT conducts whatever follow-up monitoring is required (usually a 5-year plan involving soil and water monitoring).

The Tennessee DOT has had experience with off-site compensation and has a Memorandum of Agreement (MOA) to operate mitigation banks with the Environmental Protection Agency (EPA), the Corps, the FWS, the FHWA, and its state natural resources agency. The banks can be used for projects statewide. After the site plan for the bank is approved, up to 50 percent of its credits may be used immediately. Banking files contain debits, credits, and acreage information, but no summaries are available. Mitigation files are maintained, and printed information includes area, location, replacement ratio, and soil and water data. Printed impact and mitigation information is accessible by site visit; no summaries are available.

There is no information available by request from TDOT. However, the 1993 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained for use in this study.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by TDOT and from information obtained from the 1993 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Tennessee DOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1991 and 1992, while the present 1998 survey obtained the most recent estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that preservation was utilized exclusively for mitigation projects from 1991 through 1992. The 1998 survey demonstrated a different trend, with restoration the favored choice, which was utilized 8 times more than enhancement and 16 times more than preservation or creation.

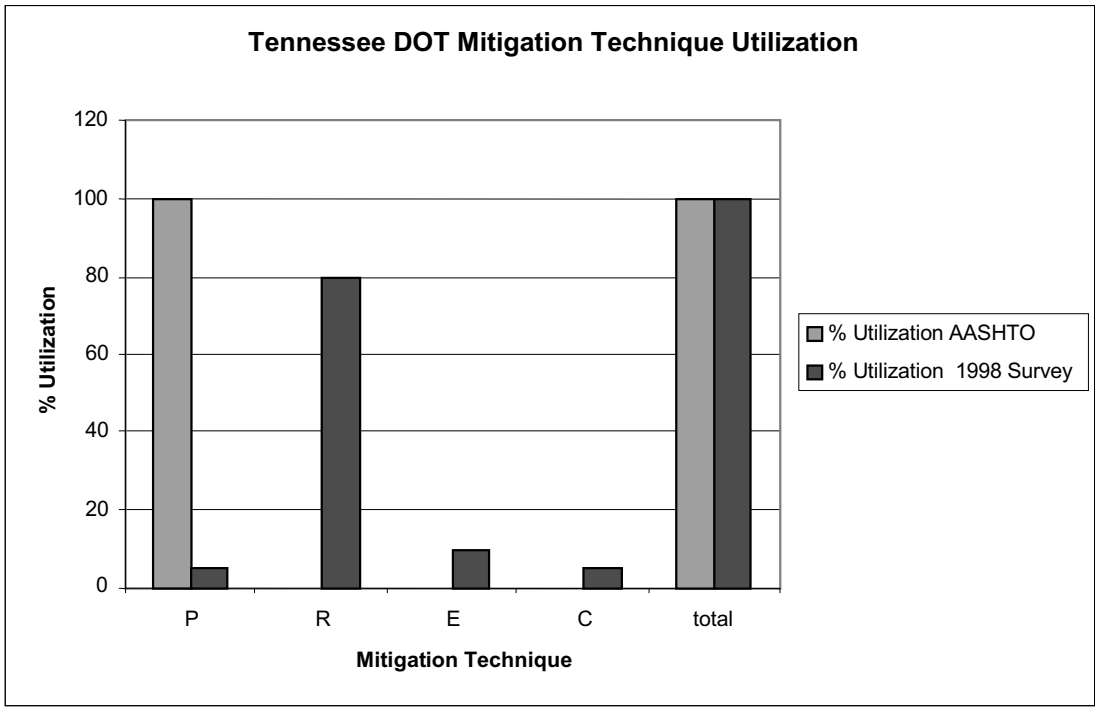
The AASHTO summary data also showed that, for mitigation proximity, banking was utilized exclusively between 1991 and 1992. The 1998 survey demonstrated a different trend, with on-site mitigation being favored and having been utilized 1.5 times more often than banking.

The table and two charts provided below illustrate these TDOT trends.

total # mitigation projects AASHTO 1993	19
total # acres impacted 1993	105
average # acres impacted per project 1993	5.53
total # acres mitigated 1993	146
average replacement ratio 1993	1.39

	P	R	E	C	total
% Utilization AASHTO	100	0	0	0	100
% Utilization 1998 Survey	5	80	10	5	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	0	0	100	100
% Utilization 1998 Survey	60	0	40	100


Tennessee DOT Mitigation Technique Utilization
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% Utilization
P
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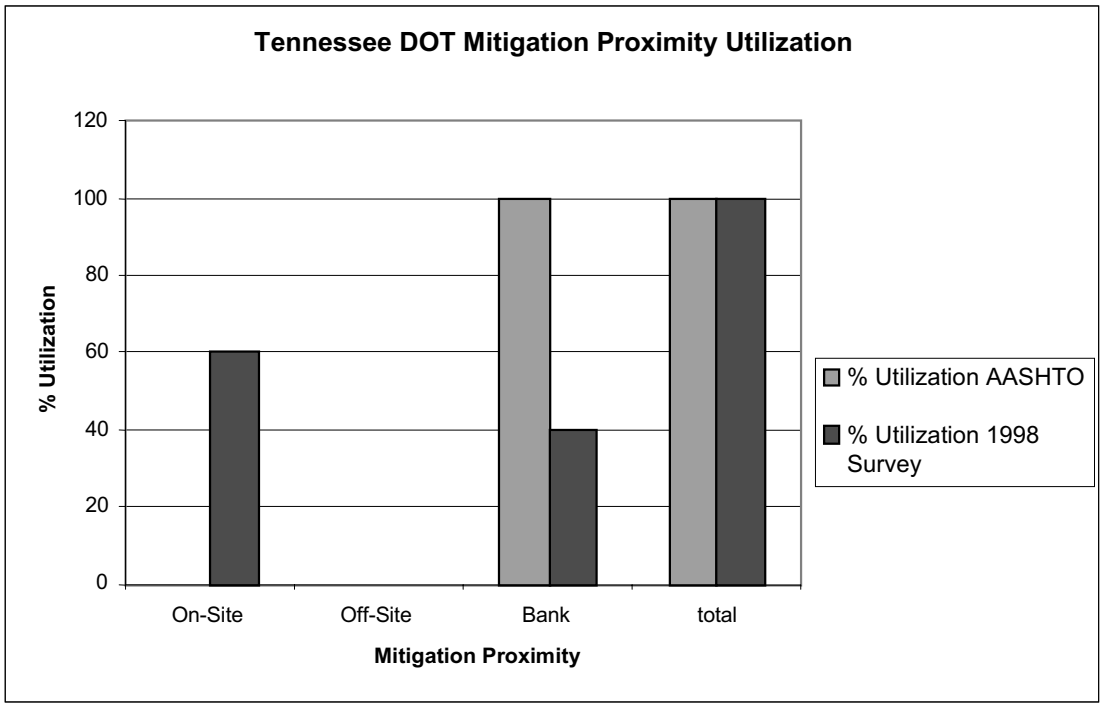
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Tennessee DOT Mitigation Proximity Utilization
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% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to TDOT for wetlands mitigation. The preference ranking is R, C, E, and then P. Enhancement and preservation are difficult to get credit for unless no other viable option exists. It is estimated that preservation has been utilized 5 percent of the time, enhancement 10 percent, restoration 80 percent, and creation 5 percent in wetlands mitigation.

Off-site mitigation is desired only 5 percent of the time and actually used 40 percent of the time. Out-of-kind is never desired by TDOT, but is utilized approximately 5 percent of the time. Off-site mitigation is more practical with many small impacts less than 0.5 acres that can be consolidated in a larger single mitigation area. Out-of–kind replacement happens many times for difficult replacement types. The replacement ratios are based on acreage in combination with the PREC strategies utilized; they take into account the fact that some portion of the mitigation will be unsuccessful. Typical ratios are 10:1 for preservation, 2:1 for restoration, 4:1 for enhancement, and 3:1 for creation.

The primary agencies involved in the mitigation negotiation process are the TDE above headwaters and the Corps below headwaters. It was not clear what was meant by "headwaters" in this context. These two agencies also resolve any conflicts between the signatory agencies and TDOT. It is estimated that 20 percent of the time TDOT submits a mitigation plan that differs from the agency expectations. Of these, TDOT's plan overrides 60 percent of the time with only minor adjustments.

TDOT's plan design methods utilize site surveys and special purpose field studies, along with limited functional assessments. Location of a suitable site with a good chance of success has more effect on the design methods than on the wetlands type. Few problems have been observed with proximity to development because TDOT fences its sites, which are usually located in rural areas with little threat of development. In fact, the development rate of an area is a site selection factor. Follow-up monitoring consists of a 5-year plan to conduct annual post-project surveys during the growing season. The Tennessee DOT's biggest obstacle is seen as the inconsistency that exists among agencies outside TDOT with regard to such issues as site selection and mitigation ratios. The Tennessee Department of Transportation staff declined to participate in the Level 2 survey. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Texas Department of Transportation:

The Texas Department of Transportation (TxDOT) did not participate in either of the surveys. However, some site-specific and/or project history information was provided by members of the TxDOT staff during the course of this project. Level 1 summaries, as well as the 1995 American Association of State Highway and Transportation Officials (AASHTO) summary, were obtained for use in this study.

Survey and 1995 AASHTO Summaries

The following information has been summarized from the Level 1 summary data provided by TxDOT and from the 1995 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summaries that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by TxDOT during the periods specified. The AASHTO survey cataloged information on specific cases for 1993 and 1994, while the Level 1 summary contains projects permitted during an unspecified period of time for TxDOT. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that preservation was the favored choice for mitigation between 1993 and 1994. Preservation was utilized approximately 1.2 times more often than creation and 2.3 times more than enhancement. Restoration was not utilized at all during this period. The Level 1 summary demonstrated a different trend, with creation favored and utilized 2.5 times more than restoration, 4.5 times more than preservation, and 6 times as much as enhancement.

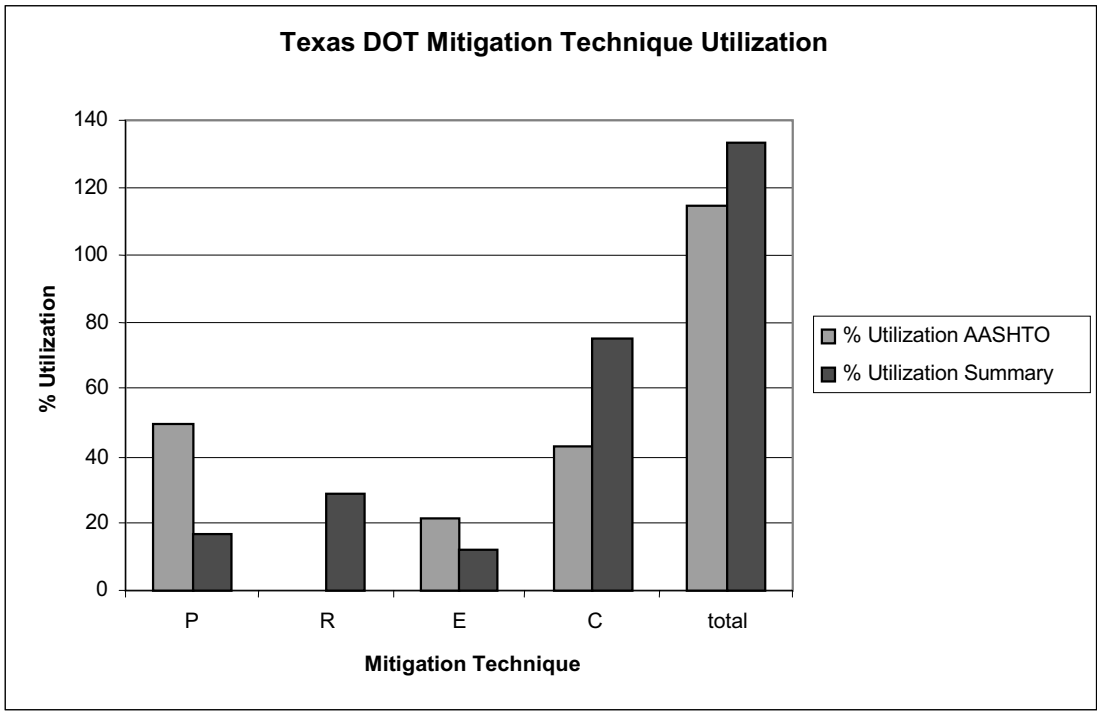
The AASHTO summary data for mitigation proximity were incomplete, as the summary lacked information for on-site mitigation. The data did indicate that off-site mitigation was utilized 5 times more often than banking. The Level 1 summary data gave unclear information on the utilization rates of mitigation banking for the time periods considered; however, the data showed that on-site mitigation was utilized twice as much as off-site mitigation.

The table and chart provided below illustrate these TxDOT trends.

total # mitigation projects AASHTO 1995	14
total # acres impacted 1995	NA
average # acres impacted per project 1995	NA
total # acres mitigated 1995	NA
average replacement ratio 1995	NA
total # mitigation projects Summary Texas Files	24
total # acres impacted Texas files	NA
average # acres impacted per project Texas files	NA
total # acres mitigated Texas files	424.30
average replacement ratio Texas files (5 projects)	1.71

	P	R	E	C	total
% Utilization AASHTO	50	0	21.43	42.86	114.29
% Utilization Summary	16.67	29.17	12.50	75.00	133.33

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	NA	35.71	7.14	42.86
% Utilization Summary	66.67	33.33	NA	100


Texas DOT Mitigation Technique Utilization
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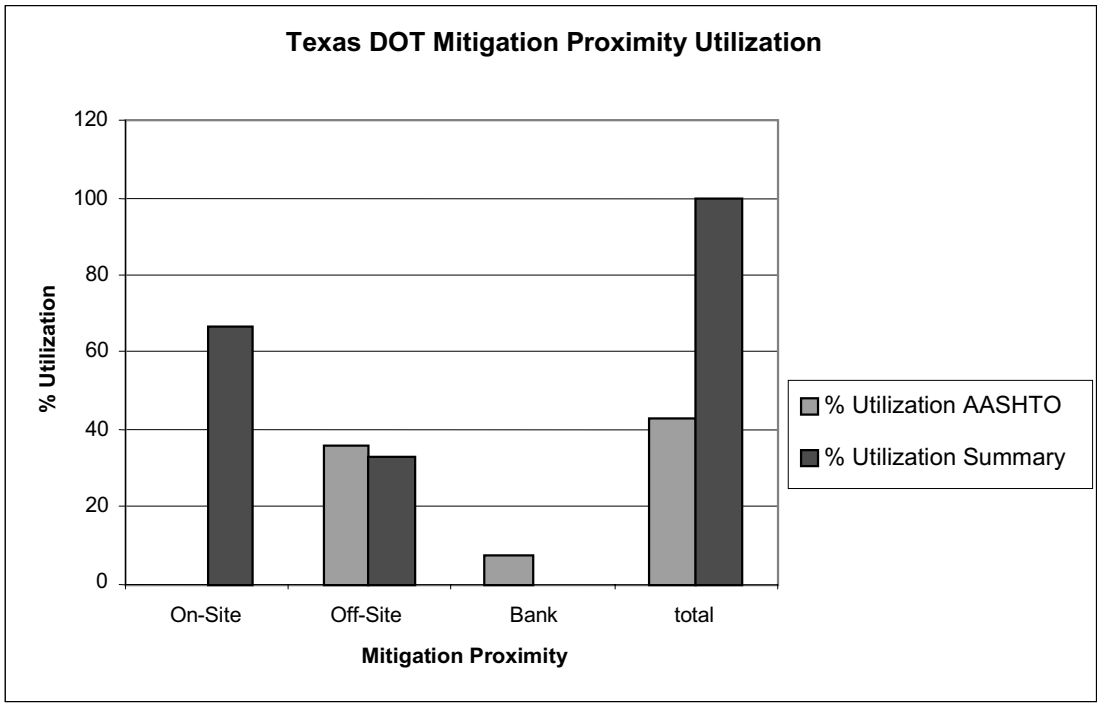
% Utilization AASHTO
% Utilization Summary


Texas DOT Mitigation Proximity Utilization
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% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization Summary

Utah Department of Transportation:

Level 1: Organization and Information

The Utah Department of Transportation (UDOT) has approximately fifteen wetlands impacts and twelve mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The Utah DOT receives input from other agencies, but does not reorganize and summarize the data. Agencies include the Utah Fish and Wildlife Service (UFWS), the Utah Department of Wildlife, the Utah Water Resources Department (UWRD), the Utah Water Quality Service (UWQS), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (Corps), and the U.S. Fish and Wildlife Service (FWS). Impact files are maintained with information on delineations, environmental assessments (EA), and environmental impact statements (EIS); these files also contain data on area, extent of impact, and quality.

Approximately 10 percent of the Utah DOT's construction permits require mitigation. Mitigation is occasionally performed for wetlands impacts. UDOT prefers to utilize in-kind, on-site strategies. Mitigation data include delineations, other states' information on similar successful situations, and information from the resource agencies. Printed impact and mitigation information is accessible by site visit, mail request, or phone request; however, no summaries are available. The Utah DOT has a 3- to 5-year post-project monitoring program, as prescribed by the Corps, which monitors vegetation and soils.

UDOT has had experience with off-site mitigation and is trying to obtain funding for mitigation banking. UDOT has just completed a feasibility study that indicates that the location of the bank should be in the northern part of the state.

Vermont Agency of Transportation:

Level 1: Organization and Information

The Vermont Agency of Transportation (VAOT) has approximately thirty wetlands impacts and three mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The VAOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include all the Vermont state agencies, the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS). Impact files containing project-specific information on area, location, type, extent of impact, routine delineation information (soils, hydrology, vegetation), and topography, as well as function and value based on best professional judgment. The total annual impacts are usually less than 10 acres.

Less than 10 percent of the VAOT's permits require mitigation, and mitigation is occasionally performed for wetlands impacts. The mitigation types and strategies are a combination of marsh and open water with islands. The mitigation data collected depend on the site and the goals of the project. Groundwater monitoring wells are sometimes used, as well as 1–2 foot contour topographic surveys. Printed impact and mitigation information is accessible by site visit or mail request; no summaries are available. The VAOT has a 5-year follow-up monitoring program based on professional judgment observations. The annual site visits primarily focus on nuisance plants, developing species, planting success and colonizing plant communities, wildlife, erosion, and instability.

The VAOT has no experience with off-site compensation. The agency explored the possibility of mitigation banking when the Federal Highway Administration was encouraging it, but found that the state's terrain and the broad distribution of project sites across the state would make banking impractical.

Virginia Department of Transportation:

Level 1: Organization and Information

The Virginia Department of Transportation (VDOT) has approximately 350 wetlands impacts and twenty-five mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. The VDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Virginia Department of Environmental Quality (VDEQ), the Virginia Department of Game and Inland Fisheries (VDGIF), the Virginia Department of Historical Resources, the Virginia Department of Conservation and Recreation, the Marine Resources Commission, the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS).

Impact files are maintained containing plant and soils information and permit applications. Approximately 50 percent of the Virginia DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation files are maintained and contain information on the type of mitigation and acreage. Digital impact and mitigation information (Microsoft Access software) is accessible by informal written or phone request; no summaries are available.

The Virginia DOT has had experience with off-site compensation. The commonwealth of Virginia had the first mitigation bank in the United States; however, banking files are not maintained, and no summaries are available.

Follow-up monitoring is required by permit. VDOT monitors the water level for 1 year, the vegetation for 5 years; it also maintains global positioning system coordinates. The impact and mitigation Microsoft Access database for VDOT was requested and received for use in this study. In addition, the 1993 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data provided by the Virginia DOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Virginia DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994. The VDOT summary contains data from an unspecified period of time, while the present 1998 survey obtained the most recent estimations from the

agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that creation was the favored choice for mitigation projects between 1991 and 1994. Creation was utilized 8 times more often than enhancement; neither restoration nor preservation was utilized during this time period. No information on PREC utilization rates was provided to this study by the VDOT staff in the summary data. The 1998 survey demonstrated a different trend, with creation having been utilized approximately 2.2 times more often than restoration and 13 times more than enhancement.

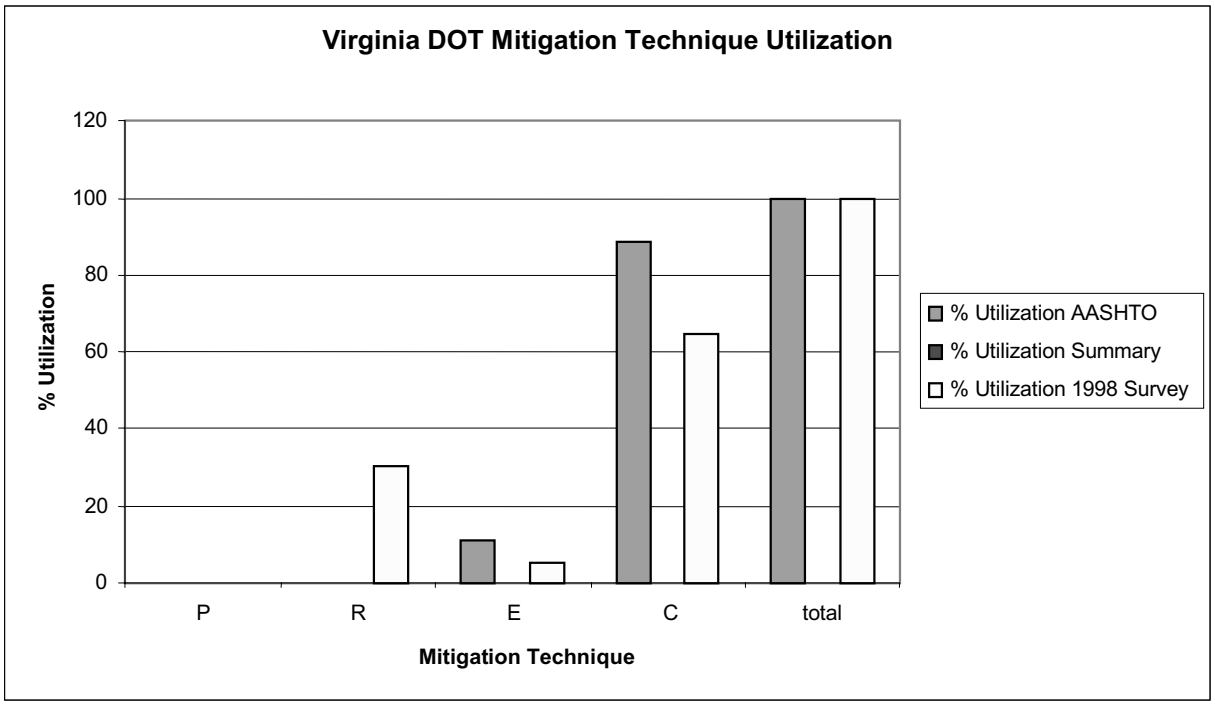
The AASHTO summary data also showed that, for mitigation proximity, on-site mitigation was slightly favored over off-site and was utilized 4.8 times more than banking between 1991 and 1994. The VDOT summary data indicated a different trend, with on-site being the favored choice, having been utilized twice as much as banking and 3.6 times more than off-site. In contrast to the data summaries, the 1998 survey combined off-site and banking data and showed this to be utilized almost as much as on-site mitigation.

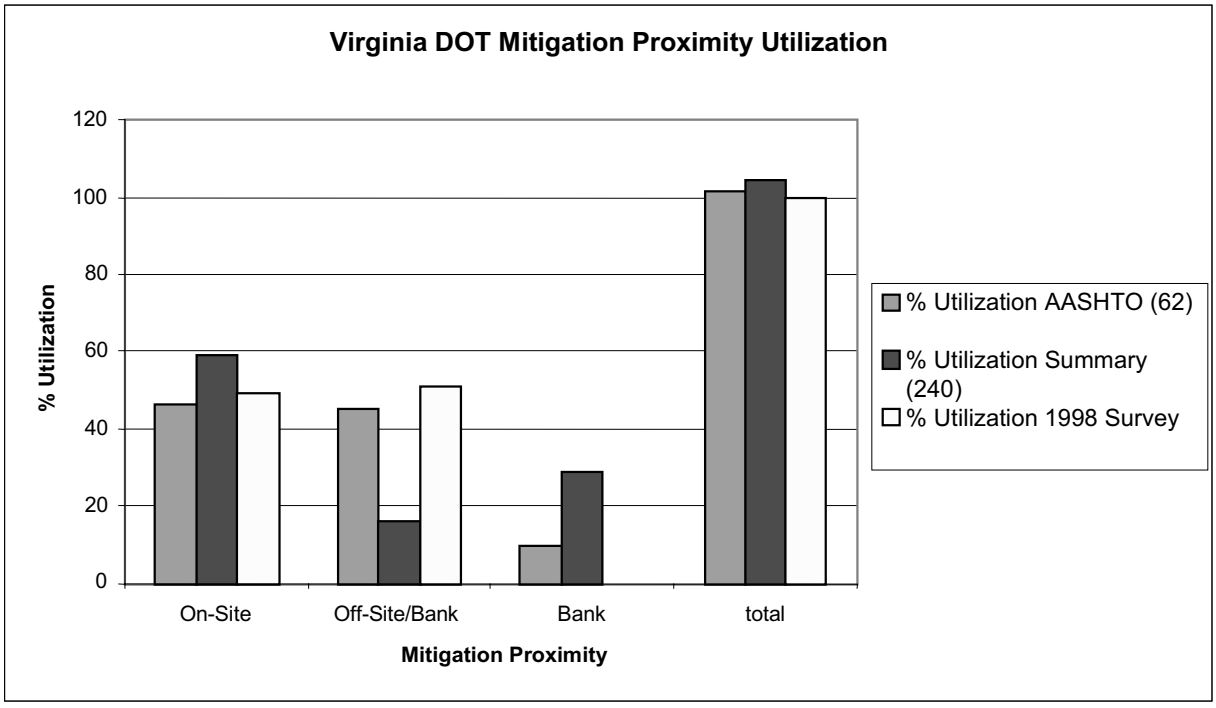
The table and two charts provided below illustrate these VDOT trends.

total # mitigation projects AASHTO 1993 & 1995	63
total # acres impacted 1993 & 1995 (61 files)	56.40
average # acres impacted per project '93 & '95 (61 files)	0.92
total # acres mitigated '93 & '95 (59 files)	91.05
average replacement ratio '93 & '95 (59 files)	1.78
total # mitigation projects Summary Virginia Access Files	260
total # acres impacted VA files (242 files)	1021744
average # acres impacted per project VA files	4222.08
total # acres mitigated VA files (230 files)	1575493
average replacement ratio VA files (224 files)	1.37

	P	R	E	C	total
% Utilization AASHTO	0	0	11.11	88.89	100
% Utilization Summary	NA	NA	NA	NA	NA
% Utilization 1998 Survey	0	30	5	65	100

	On-Site	Off-Site/Bank	Bank	total
% Utilization AASHTO (62)	46.77	45.16	9.68	101.61
% Utilization Summary (240)	59.17	16.25	29.17	104.58
% Utilization 1998 Survey	49	51	NA	100


Virginia DOT Mitigation Technique Utilization
120
100
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization Summary
% Utilization 1998 Survey


Virginia DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site/Bank
Bank
total
Mitigation Proximity
% Utilization AASHTO (62)
% Utilization Summary (240)
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to VDOT for wetlands mitigation. The preference ranking is C, R, E, and then P. The mitigation specialist at VDOT does not recall ever using preservation and believes it would be extremely difficult to convince the regulatory agencies that preservation is the best option. VDOT would prefer to use restoration over creation, but it is difficult to find landowners willing to sell land for this purpose. Enhancement is presently receiving more attention than it has had in the past because it is a cheaper option than restoration or creation. It is estimated that preservation has been utilized 0 percent of the time, enhancement 50 percent, restoration 30 percent, and creation 65 percent in wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 50 percent of the time and actually used 51 percent of the time. Off-site mitigation is desired for small impacts, and bank withdrawal is preferred. It is more costly to create small wetlands, and the Corps is increasing its acceptance of banking. Otherwise, VDOT desires on-site because the mobilization costs are already paid. Out-of-kind is desired and utilized less than 5 percent of the time. The regulatory agencies rarely allow out-of-kind mitigation.

The replacement ratios are based on acreage in combination with the wetlands type. Nationwide permits require only the Corps' input to set ratios. Letter of permission (LOP-1) permits use higher ratios because the FWS input is also required.

Replacement Ratios

Permit	Emergent	Scrub/Shrub	Forested
NWP	2	1.5	2
LOP-1	1.5	2	2

The primary agency involved in the mitigation negotiation process is the Corps. The regulatory agencies are considered difficult to deal with because of the great variability of competency among the staffs. This situation makes the results of mitigation negotiations variable from project to project. The Corps also resolves any conflicts between the signatory agencies and VDOT. It is estimated that 25 percent of the time VDOT submits a mitigation plan that differs from the agency expectations. Of these, the DOT's plan overrides 30 percent of the time with only minor adjustments. VDOT did not consider this to be a straightforward question because the plan is an evolving process that becomes more detailed with time. The more important question would be the amount of time that is spent gathering data and answering questions for all the regulators. The VDOT estimate that 50 percent of its time is spent developing an acceptable plan.

VDOT coordinates with the agencies throughout the mitigation process, with the methods varying between projects. Methods can be simple field investigations or detailed site surveys and

water budgets. Wetlands type does not have an effect on the design mitigation methods. Wetlands type mainly determines the hydrology that will be sought after for the mitigation site, and the methods will determine where the hydrology will come from. Problems primarily with vandalism (pulling plants, all terrain vehicles, and 4x4 paths) have been observed when the mitigation site is in proximity to development. The Corps is also concerned about this. However, remote sites get less recognition than those developed in populated areas.

Follow-up monitoring consists of a 5-year plan that includes annual photos, transects, soil descriptions, plant densities and coverages, and calculations. Minimum success criteria include plant survival rates, hydrology, and hydrophytic vegetation dominance.

VDOT perceives obstacles to be on an individual project basis, not for the overall mitigation process. Three Level 2 case studies were provided by VDOT for use in this study.

Level 2, Part B: Case Studies

Case 2. This mitigation was not successful; however, VDOT is not planning to perform any further remediation. The VDOT staff member stated that "the follow-up assessments are the Corps' responsibility, but the Corps does not have time to monitor all of the wetlands mitigation sites." This seems to be a classic case of avoiding responsibility for fulfillment of permit requirements simply because the permitting agency is not or can not monitor every aspect of every project.

State DOT	Virginia	**Entry#**	1
Project Name	90-4021		
Permit Type	individual		
Impact Location	RT 17 over Portobago and Mill Creeks, and Roy's Run		
Impact County	Caroline		
Type of Impact	elimination	**Acres Impacted**	3.14
Type of Impact Notes	impact types: PFO1, PSS1, and PEM1 (Cowardin classification system: P=palustrine, FO=forested, EM=emergent, SS=scrub/shrub, and 1=deciduous/persistent)		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forested, emergent, and scrub/shrub	**Impact WL Value**	medium
Construction Start Date	Nov 91	**Construction Completion (months)**	19
Construction Project Cost ($)	n/a		
Construction Cost Notes	n/a		
Mitigation Location	RT 17 over Portobago Creek		
Mitigation County	Essex		
PREC	C		
PREC Notes	total mitigation site size = 4.83 acres, therefore there is a surplus of 1.69 acres to be saved for later use on other appropriate projects; mit. types: PFO1, PSS1, and PEM1		

Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	3.14	**Replacement Ratio Calculation**	1.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forested, emergent, and scrub/shrub	**Mit WL Value**	medium
Mitigation Start Date	Jan 91	**Mit Completion (months)**	11
Lagtime Impact/Mitigation Completion Calculation (months)	0		
Mit Project Cost ($)	222,665		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	24
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	bad soil on 25 percent of site		

State DOT	Virginia	**Entry#**	2
Project Name	WLB0-040-101-L801		
Permit Type	NWP		
Impact Location	RT 58, near Emporia		
Impact County	Southampton		
Type of Impact	elimination	**Acres Impacted**	3.93
Type of Impact Notes	impact type PFO1A		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	forested	**Impact WL Value**	medium
Construction Start Date	June 89	**Construction Completion (months)**	14
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	I-95 over Otterdam Swamp		
Mitigation County	Greensville		
PREC	C		
PREC Notes	total mitigation site size = 10.22 acres, therefore 2.36 acres leftover to use later (these acres must be remediated to be able to use for future projects); mit. type = PFO, PSS, and PEM		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	7.86	**Replacement Ratio Calculation**	2.00
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	forested, emergent, and scrub/shrub	**Mit WL Value**	low
Mitigation Start Date	Aug 89	**Mit Completion (months)**	17
Lagtime Impact/Mitigation Completion Calculation (months)	19		
Mit Project Cost ($)	733,914		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	24
Mitigation Successful	no	**Further Mit Required**	no-Corps doesn't have time to watch
Mitigation Success Notes	3.67 acres of the total site is not a wetlands. A large percentage of the WL site is sparsely vegetated due to extremely acidic soils and very low available phosphorous. This is because the final grade is subsoil, not topsoil.		

State DOT	Virginia	**Entry#**	3
Project Name	91-4036		
Permit Type	individual		
Impact Location	I-95 over Accotink Creek and Pohick Creek		
Impact County	Fairfax		
Type of Impact	elimination	**Acres Impacted**	1.76
Type of Impact Notes	impact types = PEM1Gb and PFO1A		
Impact WL Classification	palustrine	**Impact WL Inundation**	seasonal
Impact WL Dominant Type	emergent, forested	**Impact WL Value**	medium
Construction Start Date	Mar 92	**Construction Completion (months)**	12
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	RT 649 over Broad Run		
Mitigation County	Prince William		
PREC	C		
PREC Notes	mit. types = PEM1B and PFO1A		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	2.46	**Replacement Ratio Calculation**	1.40
Mit WL Classification	palustrine	**Mit WL Inundation**	seasonal
Mit WL Dominant Type	emergent, forested	**Mit WL Value**	medium
Mitigation Start Date	Apr 92	**Mit Completion (months)**	12
Lagtime Impact/Mitigation Completion Calculation	13		
Mit Project Cost ($)	27,772		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	24
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	initial survival of plantings was poor - we had to replant		

Washington Department of Transportation:

Level 1: Organization and Information

The Washington Department of Transportation (WSDOT) has approximately sixty wetlands impacts and thirty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. WSDOT receives input from other agencies but does not reorganize or summarize the data. Agencies include the city and county regulators, the Washington Department of Ecology (WSDE), the Washington Fish and Wildlife Service (WSFWS), the U.S. Army Corps of Engineers (Corps), and the U.S. Environmental Protection Agency (EPA).

Separate impact files are not maintained, and summaries are not available. Impact information includes the delineation, determination of the impact from design classification, the WSDE rating system, state and national endangered species, and stream impacts. Approximately 75 percent of the Washington DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Mitigation files are maintained, and digital information includes impacts, compensation package, types replaced, permits issued for project, monitoring required per project, location, date, cost, and other miscellaneous information. Files have been developed but are not yet complete; no summaries are available. The Washington DOT has had experience with off-site compensation.

Follow-up monitoring is conducted and submitted with annual reports. An Internet search turned up the following WSDOT website that briefly describes their research projects for the current biennium; however, no in-depth information is available (www.wsdot.wa.gov/ppsc/research/envir.htm). Of specific interest are two environmental projects: "Defining Wetlands Monitoring Success" and "Wetlands Banking: Survey of Legal and Organizational Structure." These reports will be available for purchase from NTIS when they have been completed and published. There was no information available by request from WSDOT. However, the 1993 and 1995 American Association of State Highway and Transportation Officials (AASHTO) summaries were obtained for use in this study.

Survey and 1993/1995 AASHTO Summaries

The following information has been summarized from the 1998 survey data provided by WSDOT and from information obtained from the 1993 and 1995 AASHTO Biennial Surveys, which are conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Washington DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1994, while the present 1998 survey obtained the most recent estimations from the

agency staff. This difference in information sources is the most likely factor contributing to the variability between the two sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data showed that creation was the favored choice for mitigation projects between 1991 and 1994. Creation was utilized 1.6 times more often than preservation or enhancement, and restoration was not utilized at all during this time period. The 1998 survey demonstrated a different trend, with creation and enhancement being equally favored, having been utilized 1.75 times more than restoration and 3.5 times more than preservation.

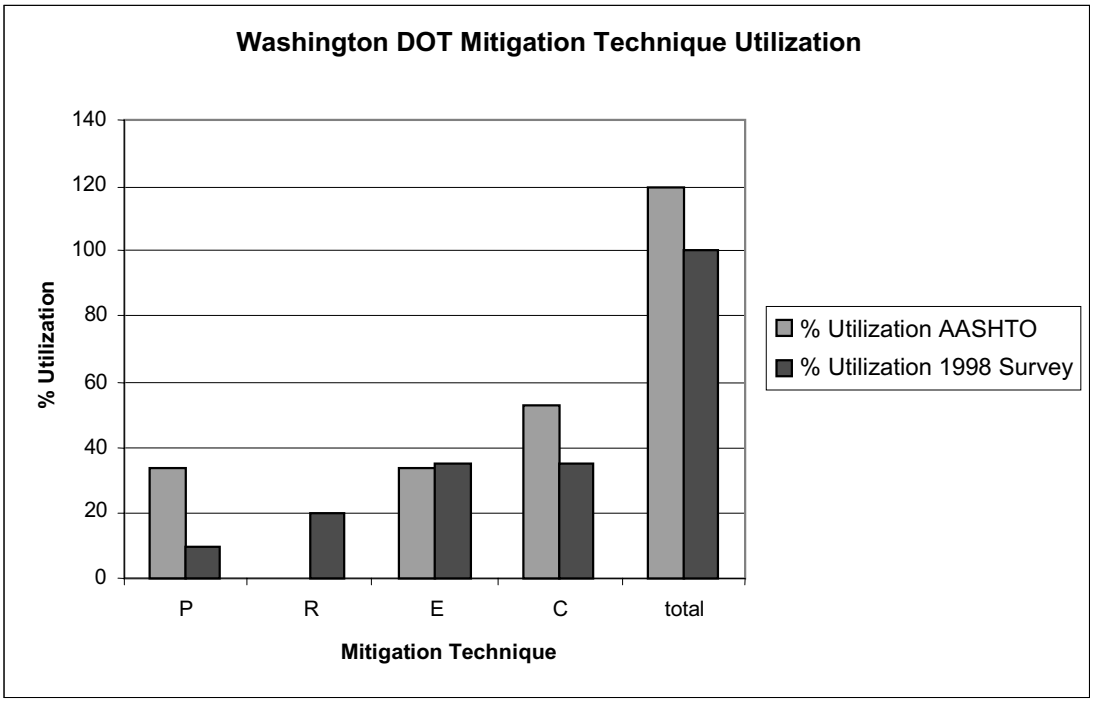
The AASHTO summary data also showed that, for mitigation proximity, off-site mitigation was utilized 2.75 times more than on-site mitigation between 1991 and 1994. Mitigation banking was not utilized at all during this time period. The 1998 survey demonstrated the opposite trend, with on-site mitigation being favored and having been utilized 9 times more than off-site.

The table and two charts provided below illustrate these WSDOT trends.

total # mitigation projects AASHTO 1993 & 1995	15
total # acres impacted 1993 & 1995 (10 projects)	16.2
average # acres impacted per project 1993 & 1995	1.62
total # acres mitigated 1993 & 1995	70.6
average replacement ratio 1993 & 1995 (10 projects)	3.66

	P	R	E	C	total
% Utilization AASHTO	33.33	0.00	33.33	53.33	120
% Utilization 1998 Survey	10	20	35	35	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	26.67	73.33	0	100
% Utilization 1998 Survey	90	10	0	100


Washington DOT Mitigation Technique Utilization
140
120
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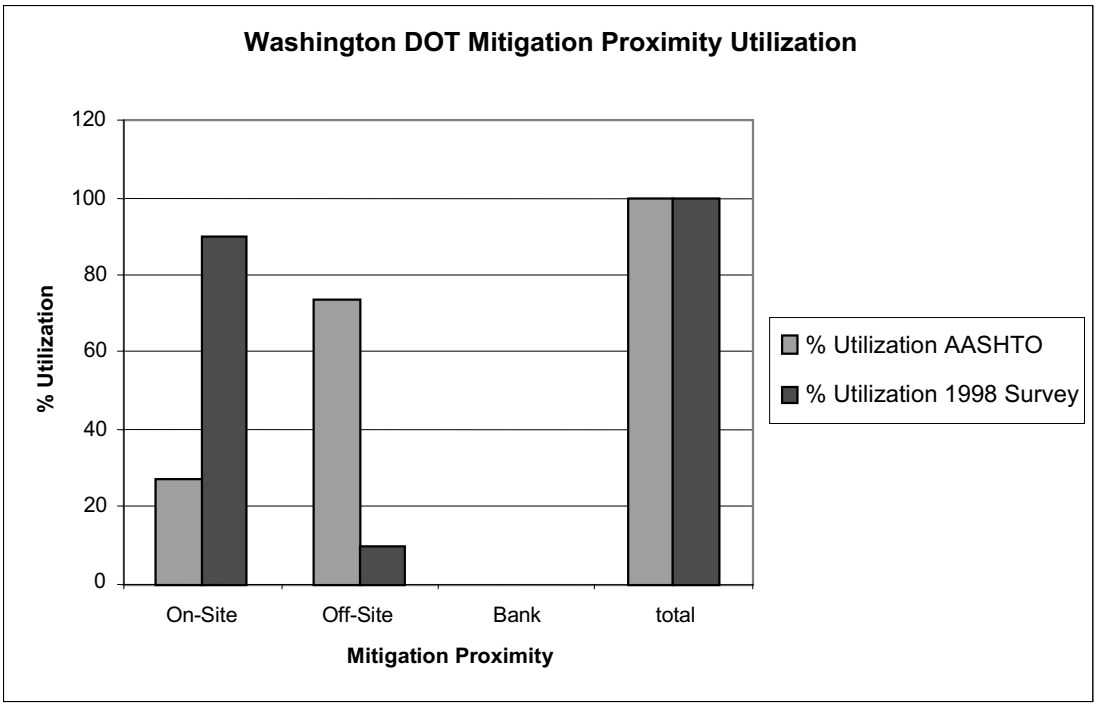
80
60
40
20
0
% Utilization
P
R
E
C
total
Mitigation Technique
% Utilization AASHTO
% Utilization 1998 Survey


Washington DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to WSDOT for wetlands mitigation. The preference ranking is R, C and E, and then P. Restoration is the unwritten preference. Preservation can be utilized only in conjunction with restoration or creation. WSDOT is trying to increase the amount of preservation utilized in wetlands mitigation. It is estimated that preservation has been utilized less than 10 percent of the time, restoration 20 percent, and creation plus enhancement account for 75 percent of the wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired 90 percent of the time and out-of-kind is desired 80 percent of the time. They are both actually utilized only approximately 10 percent of the time. Because WSDOT typically has many small impacts along the roadway, it considers on-site to be mitigation within 5 miles of the impact. Impacts occur mostly to low quality marsh wetlands and are replaced with forested shrubs/trees owing to the unavailability of sites and/or expensive land prices. The replacement ratios are based on acreage in combination with the PREC strategies and wetlands quality.

Replacement Ratios

PREC	Low Quality	Medium Quality	High Quality
Creation	2	4	8
Enhancement	1	2	4

The primary agencies involved in the mitigation negotiation process are the Corps, the WSDE, and the local regulators. The Corps is the easiest agency to deal with, according to WSDOT, and the local agencies can be problematic because they are very inflexible with respect to the strict urban regulations. It is estimated that 10 percent of the time WSDOT submits a mitigation plan that differs from the agency expectations. Of these, the WSDOT's plan overrides 80 percent of the time with only minor adjustments. Usually the mitigation proposal is straightforward and is easily accepted by the regulatory agencies. The regional WSDOT offices handle problems that arise with mitigation plans. They will often submit to the regulators' objections because this is less trouble. However, the WSDOT headquarters is of the opinion that the regulatory agencies often have unreasonable expectations and want the regional offices to engage in more negotiations.

The WSDOT's plan design methods utilize mainly precedence. Time limitations prevent it from pursuing more innovative planning strategies. Wetlands type does not have an effect on design methods. Proximity to development definitely affects mitigation success. These types of projects are discouraged because they represent hazards to animals and motorists and because their associated increases in waste loads from impervious cover can jeopardize water quality.

There is a large, formal monitoring program established within the Washington State Department of Transportation, where every mitigation site with a permit is monitored for at least 5 years for vegetative cover, wildlife, and water quality. Currently, WSDOT is trying to increase this period to a 10-year term while keeping the number of surveys per term the same as the 5-year plan.

WSDOT's biggest obstacle is considered to be time. Its internal process pushes mitigation to very late in the overall project development, and in order to meet required timelines, the agency often ends up doing rushed mitigation design, at poor locations, with unreasonable permit conditions. In WSDOT's opinion, the best solution would be to change the whole process to allow for a mitigation development phase between the highway design and the construction. However, it is highly unlikely that this change in WSDOT procedure will ever occur. Therefore, the realistic solution would be to use wetlands banks, as well as advanced mitigation, funded through a nonproject-dependent account. One Level 2 case study was provided for use in this study and is summarized in the section Level 2, Part B: Case Studies.

Level 2, Part B: Case Studies

One Level 2 case study was provided for use in this study and is an example of a successful off-site partnership with the state park.

State DOT	Washington	**Entry#**	1
Project Name	SR 14 Dock Grade to Willow		
Permit Type	NWP		
Impact Location	SR 14		
Impact County	Skamania		
Type of Impact	elimination	**Acres Impacted**	0.42
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	emergent, scrub/shrub, and forested	**Impact WL Value**	medium
Construction Start Date	1996	**Construction Completion (months)**	n/a
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	1 mile from SR14, and 50 miles east of impact area in a state park; land at impact site scarce and exorbitant values		
Mitigation County	Klickitat		
PREC	E, C		
PREC Notes	mitigation also includes buffer enhancement		
Mitigation Proximity	off-site	**Type of Replacement**	in-kind
Acres Mitigated	3.5	**Replacement Ratio Calculation**	8.33
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	emergent, scrub/shrub, and forested	**Mit WL Value**	high
Mitigation Start Date	1997	**Mit Completion (months)**	n/a
Lagtime Impact/Mitigation Completion Calculation (months)	estimate 12		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	12
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	couldn't find suitable on-site locations; inquiries found state park desiring enhancement project for an old borrow pit but had no money; DOT did design, planting, monitoring and park has long-term ownership/management of site		

West Virginia Department of Transportation:

Level 1: Organization and Information

The West Virginia Department of Transportation (WVDOT) has approximately twelve wetlands impacts per year; however, the WVDOT staff did not know the corresponding number of mitigation projects. WVDOT receives input from other agencies, but does not reorganize or summarize the data. Agencies include the West Virginia Department of Natural Resources (WVDNR), the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service (FWS). WVDOT obtains National Wetlands Inventory maps from the FWS.

Impact files are maintained and include information on the area, the location, and the extent of the impact, which is shown on the contract plans. WVDOT also determines the wetlands type according to the Cowardin classification system. Approximately 1 percent of the West Virginia DOT's construction permits require mitigation, and mitigation is routinely performed for wetlands impacts. Creation and enhancement are common mitigation strategies utilized by WVDOT. Mitigation files are maintained, and printed information includes area, location, type, and replacement ratios. Printed impact and mitigation summaries are available by informal written or phone request.

The West Virginia DOT has had experience with off-site compensation and is currently in the process of trying to bank some wetlands acreage, but the agency does not yet have the formal agreements completed.

Follow-up monitoring is conducted and includes photography, studies of edaphic conditions, plant community evaluations, vegetative cover surveys, vegetation plot analyses, and wildlife identification.

Impact and mitigation summaries were requested and provided by WVDOT for use in this study. In addition, the 1993 American Association of State Highway and Transportation Officials (AASHTO) summary was obtained.

Survey and 1993 AASHTO Summaries

The following information has been summarized from the 1998 survey and Level 1 summary data provided by the West Virginia DOT and from information obtained from the 1993 AASHTO Biennial Survey, which is conducted for AASHTO by the Georgia DOT.

The quantity and/or quality of data obtained from the AASHTO and Level 1 summary data and the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the West Virginia DOT during the periods specified. The AASHTO survey cataloged information on specific cases from 1991 through 1992. The WVDOT summary contains data from an unspecified period of time, while the present 1998 survey obtained the most recent

estimations from the agency staff. This difference in information sources is the most likely factor contributing to the variability among the three sets of statistics.

Regarding PREC mitigation strategies, the AASHTO summary data provided showed that preservation, enhancement, and creation are all equally favored between 1991 and 1992, and all three were utilized on every mitigation project. Restoration was not utilized at all during this time period. The WVDOT Level 1 summary data demonstrate a different trend, with creation being the favored choice, having been utilized 2.25 times more than preservation or enhancement. The 1998 survey provided a third trend, with creation having been utilized approximately 18 times more than preservation and 36 times more than restoration or enhancement.

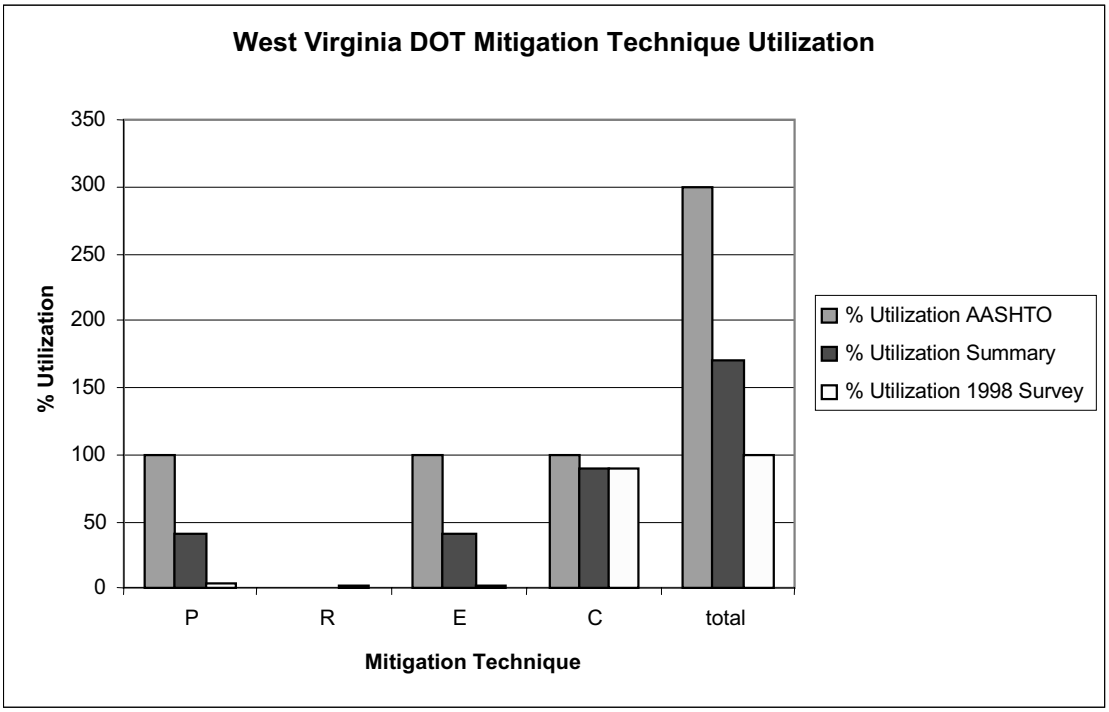
The AASHTO summary data also showed that, for mitigation proximity, on-site and off-site mitigation were used on every mitigation project between 1991 and 1992. Mitigation banking was not utilized at all during this time period. The WVDOT summary data indicate a different trend, with on-site mitigation being the favored choice, having been utilized 3.5 times more than off-site mitigation. The 1998 survey indicated a similar trend to the WVDOT Level 1 summary data.

The table and two charts provided below illustrate these WVDOT trends.

total # mitigation projects AASHTO 1993	2
total # acres impacted 1993	20
average # acres impacted per project 1993	1.54
total # acres mitigated 1993	52
average replacement ratio 1993	1.52
total # mitigation projects Summary W.Virginia Files	10
total # acres impacted WV Files	215
average # acres impacted per project WV Files	7.96
total # acres mitigated WV files	886
average replacement ratio WV files	4.12

	P	R	E	C	total
% Utilization AASHTO	100	0	100	100	300
% Utilization Summary	40	0	40	90	170
% Utilization 1998 Survey	5	2.5	2.5	90	100

	On-Site	Off-Site	Bank	total
% Utilization AASHTO	100	100	0	100
% Utilization Summary (8)	87.5	25	0	112.5
% Utilization 1998 Survey	80	20	0	100


West Virginia DOT Mitigation Technique Utilization
350
300
250
200
150
100
50
0
% Utilization
P
R
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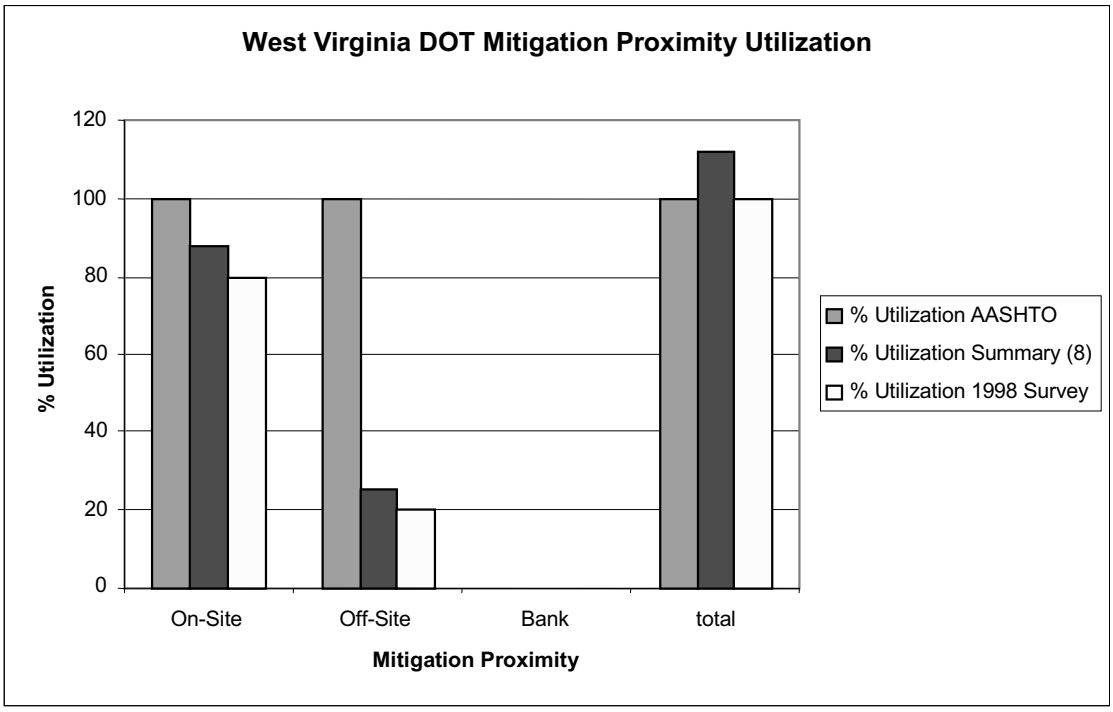
total
Mitigation Technique
% Utilization AASHTO
% Utilization Summary
% Utilization 1998 Survey


West Virginia DOT Mitigation Proximity Utilization
120
100
80
60
40
20
0
% Utilization
On-Site
Off-Site
Bank
total
Mitigation Proximity
% Utilization AASHTO
% Utilization Summary (8)
% Utilization 1998 Survey

Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to WVDOT for wetlands mitigation. The preference ranking is R, C and E, and then P. It is estimated that preservation has been used approximately 5 percent of the time, restoration and enhancement 2.5 percent each, and creation accounts for 90 percent of the wetlands mitigation.

Off-site mitigation is desired 25 percent of the time and out-of-kind is desired 100 percent of the time. They are both actually utilized approximately 20 percent of the time. Out-of-kind is really not an issue. WVDOT finds that the alternate systems developed are functionally superior to what was taken, which is a net benefit. The replacement ratios are based on acreage in combination with the wetlands type. Standard ratios are 1:1 for emergent and 3:1 for forested and scrub/shrub. These ratios take into consideration the time lag required to replace the lost function, as well as the past history of success and general experience in the wetlands areas. The ratio system was established by mutual agreement between WVDOT and the regulatory agencies. Banks are rarely used, but the same ratios apply.

The primary agencies involved in the mitigation negotiation process are the WVDNR and the FWS. The Corps resolves any conflicts between WVDOT and the signatory agencies. It is estimated that 5 percent of the time WVDOT submits a mitigation plan that differs from the agency expectations. Of these, WVDOT's plan overrides 95 percent of the time with only minor adjustments.

The WVDOT's plan design methods utilize site surveys and hydrology models. Wetlands type does not have an effect on design methods. WVDOT always replaces impacted wetlands with 10 percent open water, 70 percent emergent marsh, and 20 percent transition to an upland island. WVDOT does not have the experience to determine whether proximity to development affects mitigation success.

Formal monitoring consists of a 5-year generic monitoring period and occasionally includes college research grants to enhance the monitoring program. Monitoring is based on simple site visits and estimations, as well as on transects for vegetation counts and succession photographs.

The West Virginia DOT staff declined to participate in the case study portion of this study. This is particularly unfortunate because the project-specific information would have been of great value to the present study.

Wisconsin Department of Transportation:

Level 1: Organization and Information

The Wisconsin Department of Transportation (WisDOT) has approximately 200 wetlands impacts and fifty mitigation projects per year. These numbers imply that one construction project can include more than one wetlands impact and one mitigation project can compensate for multiple wetlands impacts. WisDOT receives input from other agencies and also reorganizes and summarizes the data. Agencies include the Wisconsin Department of Natural Resources (WisDNR), the U.S. Army Corps of Engineers (Corps), and the U.S. Environmental Protection Agency (EPA).

Impact files are maintained and include digital information on acres, wetlands type, National Environmental Policy Act (NEPA) data, and, on rare occasions, functional assessments. Summaries in the form of annual reports and tables are available by informal written or phone request.

Approximately 100 percent of the Wisconsin DOT's individual permits and 15 percent of the state and local permits require mitigation, and mitigation is always performed for wetlands impacts. Mitigation files are maintained, and printed information includes the cooperative agreement, the real estate information, and the environmental design. Summaries in the form of tabulated reports are available by informal written or phone request. The Wisconsin DOT has had experience with off-site compensation and has a mitigation banking program in place. Follow-up monitoring is conducted according to the Corps' 404(1)(b) process and includes geomorphology, landscape, and soil borings information. Impact and mitigation summaries were requested and provided by WisDOT for use in this study.

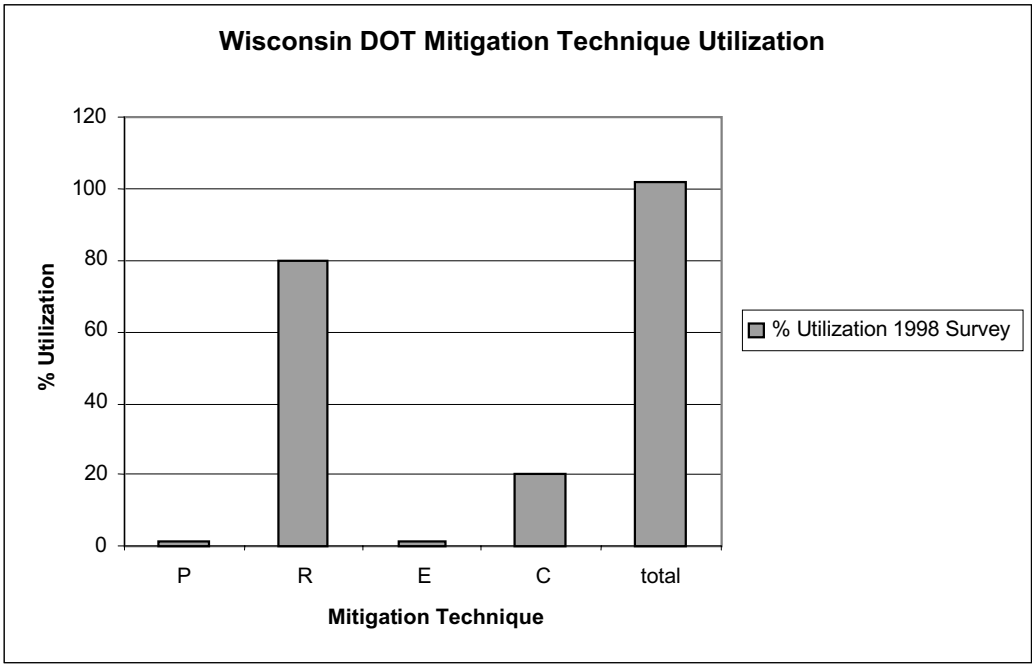
Survey Summaries

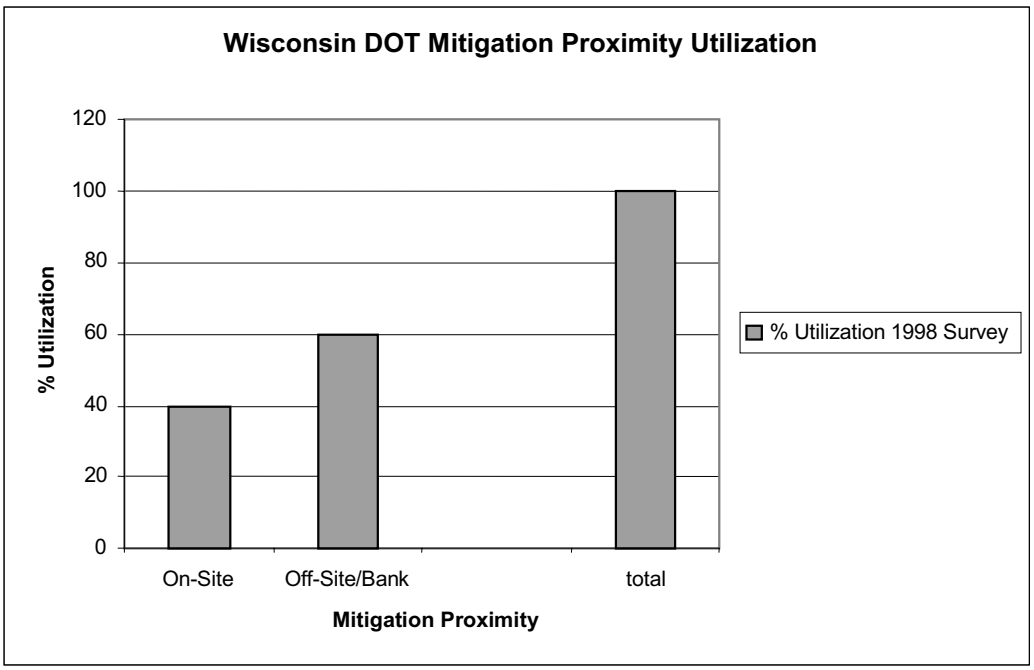
The following information has been summarized from the 1998 survey data provided by the WisDOT staff, which consisted of the most recent mitigation strategy usage estimations. The quantity and/or quality of data obtained from the 1998 survey results that can be utilized by the present study are limited. However, the following table summarizes extrapolated data concerning the mitigation strategies employed by the Wisconsin Department of Transportation.

Regarding PREC mitigation strategies, the 1998 survey data showed that restoration was the favored choice for mitigation and was utilized 4 times more than creation and 80 times more than preservation or enhancement. The WisDOT staff combined off-site mitigation and banking information; together, they were utilized 1.5 times more than on-site mitigation. The table and two charts provided below illustrate these WisDOT trends.

	P	R	E	C	total
% Utilization 1998 Survey	1	80	1	20	102

	On-Site	Off-Site/Bank	total
% Utilization 1998 Survey	40	60	100





Level 2, Part A: Processes and Methodologies

Preservation, restoration, enhancement, and creation (PREC) are all viable options available to WisDOT for wetlands mitigation. The preference ranking is R, C, P, and then E. The rare use of preservation as a mitigation strategy is on a case-by-case basis for endangered or unique types of wetlands. Wisconsin is currently in the process of formally writing this policy. Enhancement occurs even less often than preservation because of the 1988 National No Net Loss Policy. Restoration is utilized for large sites. It is estimated that preservation and enhancement have each been used less than 1 percent of the time; restoration has been used 80 percent of the time, and creation accounts for 20 percent of the wetlands mitigation. A mixture of PREC can be utilized in a single project; thus, the sum of these percentages is greater than 100 percent.

Off-site mitigation is desired and utilized approximately 60 percent of the time, and out-of-kind is desired 30 percent of the time. WisDOT argues that there is no such thing as a "totally in-kind replacement." The goal is to aim for the replacement that provides the best fit for the landscape. The replacement ratios are based on acreage in combination with the wetlands type. It is acceptable to the state and the DNR to use acreage only; however, the federal regulatory agencies require including type and location to approximate the function.

The primary agencies involved in the mitigation negotiation process are the Corps and the WisDNR. The Corps presides over banks and also acts as the representative for the FWS. The DNR is in charge of individual projects. If there is a conflict between WisDOT and the DNR, there are negotiation levels within this regulatory agency. It is estimated that 10 percent of the time WisDOT submits a mitigation plan that differs from the agency expectations. This does not occur often because the project development is coordinated from the beginning of the process. Of these, WisDOT's plan overrides 90 percent of the time with only minor adjustments.

The Wisconsin DOT's plan design methods utilize precedence with modifications to take out failed concepts and keep successful parts of projects. Moreover, a scientific procedure is used to initially pick a successful site. Wetlands type does not have an effect on design methods because the possibilities are dictated by the geophysical attributes of the site. WisDOT has observed several changes or problems concerning water chemistry, vandalism, construction, and utilities on the right-of-way (ROW).

The Wisconsin DOT does not have a major monitoring program. Follow-up monitoring is conducted for large sites and banks, which accounts for approximately 80 percent of WisDOT's projects, as well as for urban on-site projects. In WisDOT's opinion, it has too many mitigation sites to keep track of and cannot monitor all of them. Since 1991, WisDOT has had eighty on-site projects and eighteen banking projects. Reports are prepared for the first year, then every 2 years for the 5-year term. A tiered approach involving either a brief or in-depth research project is utilized as needed. Six Level 2 case studies were provided by WisDOT for use in this study and are summarized in the Level 2, Part B: Case Studies section.

Level 2, Part B: Case Studies

State DOT	Wisconsin	**Entry#**	1
Permit Type	individual		
Impact Location	State Hwy 80		
Impact County	Richland		
Type of Impact	elimination	**Acres Impacted**	6
Type of Impact Notes	on-site saturated wet meadow dominated by reed Canary grass, some shallow marsh		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	wet meadow	**Impact WL Value**	low (common)
Construction Start Date	Apr 94	**Construction Completion (months)**	6
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	1/2 mile south of city		
Mitigation County	Richland		
PREC	R		
PREC Notes	advanced mitigation: remove - restore farmed prior converted (PC) to wetlands		
Mitigation Proximity	n/a	**Type of Replacement**	in-kind
Acres Mitigated	6.8	**Replacement Ratio Calculation**	1.13
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	wet meadow (saturated)	**Mit WL Value**	medium
Mitigation Start Date	Aug 92	**Mit Completion (months)**	1
Lagtime Impact/Mitigation Completion Calculation (months)	0		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	1 yr. preconstruction + 6 yrs		
Monitoring Frequency (months)	0.5 during growing season		
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	matched expectations - what was anticipated occurred; monitoring is greater than the required 5 yrs		

State DOT	Wisconsin	**Entry#**	2
Project Name	Dairyland to Patterson		
Permit Type	individual		
Impact Location	State Hwy 35 and US 53 (Solon Springs to Hawthorn)		
Impact County	Douglas		
Type of Impact	elimination	**Acres Impacted**	60
Type of Impact Notes	loss to shrub (Alder) wetlands and kettle wetlands adjacent to highways		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	shrub (primarily Alder thickets)	**Impact WL Value**	medium and high (full function)
Construction Start Date	Apr 91	**Construction Completion (months)**	18
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	5 miles south of the city of Superior		
Mitigation County	Douglas		
PREC	C		
PREC Notes	established site over perched glacial lake plain - retard drainage into constructed impoundments; site actually 130 acres - extra 10 ac became Kimmes Tobin Bank Site		
Mitigation Proximity	off-site	**Type of Replacement**	out-of-kind
Acres Mitigated	120	**Replacement Ratio Calculation**	2.00
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	shallow marsh	**Mit WL Value**	high (full function)
Mitigation Start Date	Nov 90	**Mit Completion (months)**	9
Lagtime Impact/Mitigation Completion Calculation (months)	4		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	0.5 during growing season
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	exceeded expectations - more wetlands acres established than originally anticipated; wetlands types anticipated occurred		

State DOT	Wisconsin	**Entry#**	3
Project Name	Hope Marsh Bank Site		
Permit Type	NWP and Ind.		
Impact Location	various projects w/in 10 county radius		
Impact County	10 south central counties		
Type of Impact	elimination	**Acres Impacted**	small
Type of Impact Notes	primarily bank debited for bridge projects w/ 0.1-0.5 acre wetlands losses and road improvement projects w/ 1-20 acre losses		
Impact WL Classification	palustrine (primarily)	**Impact WL Inundation**	perennial and seasonal
Impact WL Dominant Type	wet meadow and shallow marsh (primarily)		
Impact WL Value	medium to low		
Construction Start Date	variable	**Construction Completion (months)**	variable
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	glacial lake plain w/in the Grand River System		
Mitigation County	Marquette		
PREC	R		
PREC Notes	advanced mitigation: restoration of a glacial lake plain that was drained and pumped for corn and crops; site returned to shallow marsh and wet meadow.		
Mitigation Proximity	bank	**Type of Replacement**	out-of-kind
Acres Mitigated	190	**Replacement Ratio Calculation**	
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	shallow marsh	**Mit WL Value**	high (full function)
Mitigation Start Date	Oct 96	**Mit Completion (months)**	3
Lagtime Impact/Mitigation Completion Calculation (months)	0		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5	**Monitoring Frequency (months)**	to be determined
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	best example to date of a glacial lake basin restoration in the state - 100 percent conversion of site to wetlands		

State DOT	Wisconsin	**Entry#**	4
Project Name	Sun Prairie to Columbus - 151		
Permit Type	individual		
Impact Location	Sun Prairie to Columbus		
Impact County	Dane		
Type of Impact	elimination	**Acres Impacted**	23
Type of Impact Notes	n/a		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	sedge and wet meadows (saturated)	**Impact WL Value**	medium and high (full function)
Construction Start Date	Apr 90	**Construction Completion (months)**	Oct 90
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	State Hwy 151		
Mitigation County	Dane		
PREC	R		
PREC Notes	compensation for several on-site wetlands losses; surplus acreage (122.5) became wetlands bank and bank site compensating mainly for local bridge replacements		
Mitigation Proximity	n/a	**Type of Replacement**	out-of-kind
Acres Mitigated	34.5	**Replacement Ratio Calculation**	1.50
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	deep marsh (>12” water)	**Mit WL Value**	high (full function)
Mitigation Start Date	Nov 89	**Mit Completion (months)**	24
Lagtime Impact/Mitigation Completion Calculation (months)	19		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	5 (not required)	**Monitoring Frequency (months)**	4
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	partial failure - spillway (culvert) structure elevation estimated too high; site allowed to go to full pool during 1993 wet year, producing deep marsh and aquatic bed instead of mix of meadow, shallow marsh, and deep marsh.		

State DOT	Wisconsin	**Entry#**	5
Permit Type	individual		
Impact Location	Madison - Monona, WI		
Impact County	Dane		
Type of Impact	elimination	**Acres Impacted**	22
Type of Impact Notes	loss of deep/shallow marshes and sedge meadow of Yahara River System - controversial to the public		
Impact WL Classification	riverine and palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	shallow marsh and sedge meadow (saturated)		
Impact WL Value	high (full function)		
Construction Start Date	Sept 85	**Construction Completion (months)**	36
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	US Hwy 12 and 18		
Mitigation County	Dane		
PREC	R		
PREC Notes	compensation sites are at 7 locations along the project length - all sites required removal of fill from pre-existing wetlands (fill discharged by others in the past)		
Mitigation Proximity	on-site	**Type of Replacement**	in-kind
Acres Mitigated	25	**Replacement Ratio Calculation**	1.14
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	shallow marsh and wet meadow	**Mit WL Value**	medium to high (full
Mitigation Start Date	Sept 85	**Mit Completion (months)**	July 88
Lagtime Impact/Mit Completion Calculation (months)	34		
Mit Project Cost ($)	n/a	**Mitigation Cost Notes**	n/a
Mit Site Monitoring Time Period (yr)	1-5, final at 10 yrs (not required)		
Monitoring Frequency (months)	12		
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	some minor local failure due to poor hydrologic characteristics of substrate; community diversity anticipated from planting plan did NOT succeed		

State DOT	Wisconsin	**Entry#**	6
Project Name	Wilton 131 to Ontario		
Permit Type	individual		
Impact Location	State Hwy 131, 1/2 mile south of Wilton		
Impact County	Monroe		
Type of Impact	elimination	**Acres Impacted**	2.3
Type of Impact Notes	on-site sedge meadow and smaller amount of shallow marsh, cattle-grazing disturbances		
Impact WL Classification	palustrine	**Impact WL Inundation**	perennial
Impact WL Dominant Type	sedge meadow	**Impact WL Value**	medium
Construction Start Date	June 91	**Construction Completion (months)**	4
Construction Project Cost ($)	n/a	**Construction Cost Notes**	n/a
Mitigation Location	1/2 mile south on State Hwy 131 from Wilton, WI		
Mitigation County	Monroe		
PREC	C		
PREC Notes	remove alluvial post settlement silt cap to predetermined elevation; based gw monitoring to intercept gw flux to nearby river		
Mitigation Proximity	n/a	**Type of Replacement**	in-kind
Acres Mitigated	10.5	**Replacement Ratio Calculation**	4.57
Mit WL Classification	palustrine	**Mit WL Inundation**	perennial
Mit WL Dominant Type	wet meadow	**Mit WL Value**	medium
Mitigation Start Date	June 91	**Mit Completion (months)**	4
Lagtime Impact/Mitigation Completion Calculation (months)	4		
Mit Project Cost ($)	n/a		
Mitigation Cost Notes	n/a		
Mit Site Monitoring Time Period (yr)	7 (only 5 required)	**Monitoring Frequency (months)**	1
Mitigation Successful	yes	**Further Mit Required**	no
Mitigation Success Notes	originally had 1.5:1 replacement ratio and would have had surplus mit. acreage to bank, however part of site failed and all surplus used to compensate for failure; failure related to variability of gw flux over site and incomplete removal of alluvial silt cap		

APPENDIX

Survey formats and structure

Level 1 Questionnaire: Wetlands Information Base

1. If this is a cold call or a person referred by someone else, determine the role of that person in the 404 process. (There may be a more appropriate person to whom to address questions.)

2. Give an introductory statement of two-to-three sentences to introduce yourself and the nature of the project we are working on.

3. What is the role of the agency in permitting or monitoring wetlands permits involving construction of highways, roadways, or similar structures (e.g., pavement)? For a regulatory entity, like the Corps district offices or EPA regional offices, this question is unnecessary. For state resource agencies, DOTs, universities, or private organizations, this will have to be explored. (Many such agencies work with derivative information acquired from other agencies. If they have reorganized and summarized these holdings, then this could be useful to us. If they merely mirror some information from a more comprehensive agency, then we would probably be better advised to go directly to the source agency.)

4. Find out the general nature of information available at that agency about wetlands impact projects. Is a file of descriptive information maintained? What is the medium (hard copy, computer files)? What kind of data is compiled on each project: area, location, physical dimensions, etc.? Nature of wetlands impacted? Extent of wetlands impacted? How is the file organized, e.g., by name of permittee, by geographical area of project, by date, by type of wetlands? How many separate projects/records per year (say)? Is the information file accessible by the public, especially by our project? If so, what is the mechanism (site visit, mail request, diskette transmittal, website download)? Have any summary reports been prepared? Is it possible for us to obtain/borrow copies?

5. Is mitigation is ever, routinely, or never required? What information is available, e.g., types of mitigation, strategies? Any follow-up or post-project monitoring? How is the information on mitigation procedures stored? (Same questions as above.) Is there a specific person or personnel at the agency who is most familiar with mitigation practices? If so, obtain that person's name for later contact.

6. Generally how many permits or what proportion of the permits (few, some, many) have involved mitigation? Is it possible for us to get access to this information (easy or difficult, digital or hardcopy files)?

7. Has there been any experience with the agency in mitigation banking, or off-site compensation? How many and how recent? Same questions as number 6.

8. At this point you will have either determined some leads to agencies/personnel or the person you have been communicating with is in fact the end-point contact, i.e., most knowledgeable about the target agency's information holdings. At this point, thank the individual for the trouble and information and indicate that we would like to recontact him/her in the near future after we have sorted out our information and determined how best to proceed.

Level 2 Part A Questionnaire: Mitigation Processes/Methodologies

Part A of this survey will deal with the processes and methodologies used by various DOTs to successfully mitigate their wetlands impacts with the regulatory agency in charge of deciding on the appropriate type of wetlands replacement for the projects. Of particular interest to TxDOT are projects in which the DOT desires a specific off-site plan and successfully negotiates this result with the regulatory agency that preferred an on-site, in-kind replacement.

1. Are all four of the mitigation strategies, PREC, viable options to use for mitigation and is there a ranking of choices?
2. With what frequency are the different mitigation options used?
3. With what frequency is off-site desired by the DOT?
4. With what frequency is this option actually used?
5. With what frequency is out-of-kind desired by the DOT?
6. With what frequency is this option actually used?
7. Which regulatory agency does the DOT negotiate with to determine the type of replacement that will be used?
8. What is the actual replacement ratios you use for determining mitigation acreage required (such as 1:1 emergent marsh, 2:1 bottomland hardwoods, 1:1 restoration, 3:1 creation, 10:1 preservation, and so forth)? Are these officially stated in the MOU or MOA you have with the Corps, or are they unofficially the typical standards all parties agree to use?
9. How often does the DOT offer a plan that is different from the regulatory agency's plan?
10. What agency dictates the resolution when differing plans need to be compared?
11. What is the DOT's success rate in persuading the regulatory agency to approve its plan?
12. What methods does the DOT use to design a mitigation plan (ad hoc expansion: use of science, precedence; details of procedure, such as formulation of plan, stage at which regulatory agency is involved, use of site surveys and special-purpose field studies, functional assessment and quantification, use of models)?
13. Does the type of wetlands system impacted (e.g., slow versus fast replacement systems) affect the DOT's processes or methodologies used to determine the mitigation plan?
14. What has been the DOT's experience with how proximity to traffic or access-stimulated development affects the habitat after mitigation?
15. To what extent does the DOT or the cognizant regulatory agency conduct follow-up surveys of the mitigation project for post facto evaluations?
16. In your opinion, what is the biggest obstacle the DOT encounters during the mitigation process (please explain)? Do you have any suggestions for improvements?

Level 2 Part B Questionnaire: Specific Project Information

Part B is the specific project information survey. We would like to obtain details from several mitigation projects for each DOT surveyed. A form and table have been created in the Microsoft Access database software to compile the survey results. There are three types of mitigation projects we want to represent in this survey:

- Spectacular successes
- Spectacular failures
- Off-site mitigation projects successfully presented/argued to the regulatory agency

Survey2B: Specific Project Information

Field Name	Description
Auto DOT ID	unique to this table
State DOT	Name of contact organization or agency
Date	date of interview
Project Name	
Permit Type	multiple choice: NWP, individual
Impact Location	exact hwy location
Impact County	
Type of Impact	multiple choice: elimination, modification (such as change in hydrology), other
Type of Impact Notes	COMMENT if need further explanations on type of impact, such as critical habitat, etc…
Area Impacted (acres)	
Impact Wetlands Classification	multiple choice: marine, estuarine, palustrine, lacustrine, riverine
Impact Wetlands Inundation	multiple choice: perennial, seasonal
Impact Wetlands Dominant Type	too many possibilities for mc, use fill in the blank
Impact Wetlands Value	multiple choice: high (unique, full function), medium, low (common, poor function)
Construction Start Date	date of impact
Construction Completion Time Period (months)	approximate time required to complete construction project
Construction Project Cost (dollars)	total costs of construction
Construction Cost Notes	COMMENT if construction costs not separated from mitigation costs, etc
Mitigation Location	exact hwy location
Mitigation County	
Type of Mitigation	multiple choice: preservation, restoration, enhancement, creation
Type of mitigation notes	COMMENT if need further explanations on type of mitigation
Mitigation Proximity	multiple choice: on-site, off-site, bank
Type of Replacement	multiple choice: in-kind, out-of-kind
Area Mitigated (acres)	
Replacement Ratio Calc	**calculate in the form and query = (mitigated acreage)/(impact acreage)
Mitigation Wetlands Classification	multiple choice: marine, estuarine, palustrine, lacustrine, riverine
Mitigation Wetlands Inundation	multiple choice: perennial, seasonal
Mitigation Wetlands Dominant Type	too many possibilities for mc, use fill in the blank
Mitigation Wetlands Value	multiple choice: high (unique, full function), medium, low (common, poor function)
Mitigation Start Date	date mitigation project began
Mitigation Completion Time Period (months)	approximate time required to complete mitigation project
Lagtime Impact/Mit Calc	**calculate in the form and query = (mitigation start date + mit.Time Period)-(impact start date)
Mitigation Project Cost (dollars)	total costs of mitigation project
Mitigation Cost Notes	COMMENT if construction costs not separated from mitigation costs, etc
Mitigation Site Monitoring Time Period (yrs)	total # years monitoring is required after mitigation completed
Monitoring Frequency (months)	interval between monitoring events
Mitigation Success	multiple choice: yes, no, unknown
Further Mitigation Required	multiple choice: yes, no, unknown
Mitigation Success Notes	why was this project significant? What made it a spectacular success, failure, or controversial w/regulators? Comment on problems encountered, uncertainties, etc.