



What About Wetlands?

# Wetland Mitigation

A Guidebook  
For Airports

Volume 1: Executive Summary



ACRP Research Report 198



**ACRP** AIRPORT  
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# Why Develop *Wetland Mitigation: A Guidebook for Airports?*

**W**etlands are among the most productive ecosystems in the world. They protect and improve water quality, store floodwaters, and maintain surface water flow during dry periods. Wetlands are also some of the most biologically productive natural ecosystems in the world. Shallow water and abundant vegetation provide diverse habitats for fish and wildlife. Aquatic plant life flourishes in nutrient-rich wetlands and provides food for fish and other wildlife.

Despite the important ecological benefits, wetlands can also pose challenges. They function like sponges that store water and slowly release it. On-site or nearby wetlands can challenge airport operators who must keep aircraft movement areas free of water to maintain safe operations. Wetlands provide rich habitat for shorebirds, waterfowl, and wildlife species known to pose strike hazards. Data from the Federal Aviation Administration's (FAA) database indicate that nearly half of the 25 species known to pose hazards to aircraft are associated with wetland and open water habitats and include geese, cranes, and ducks.

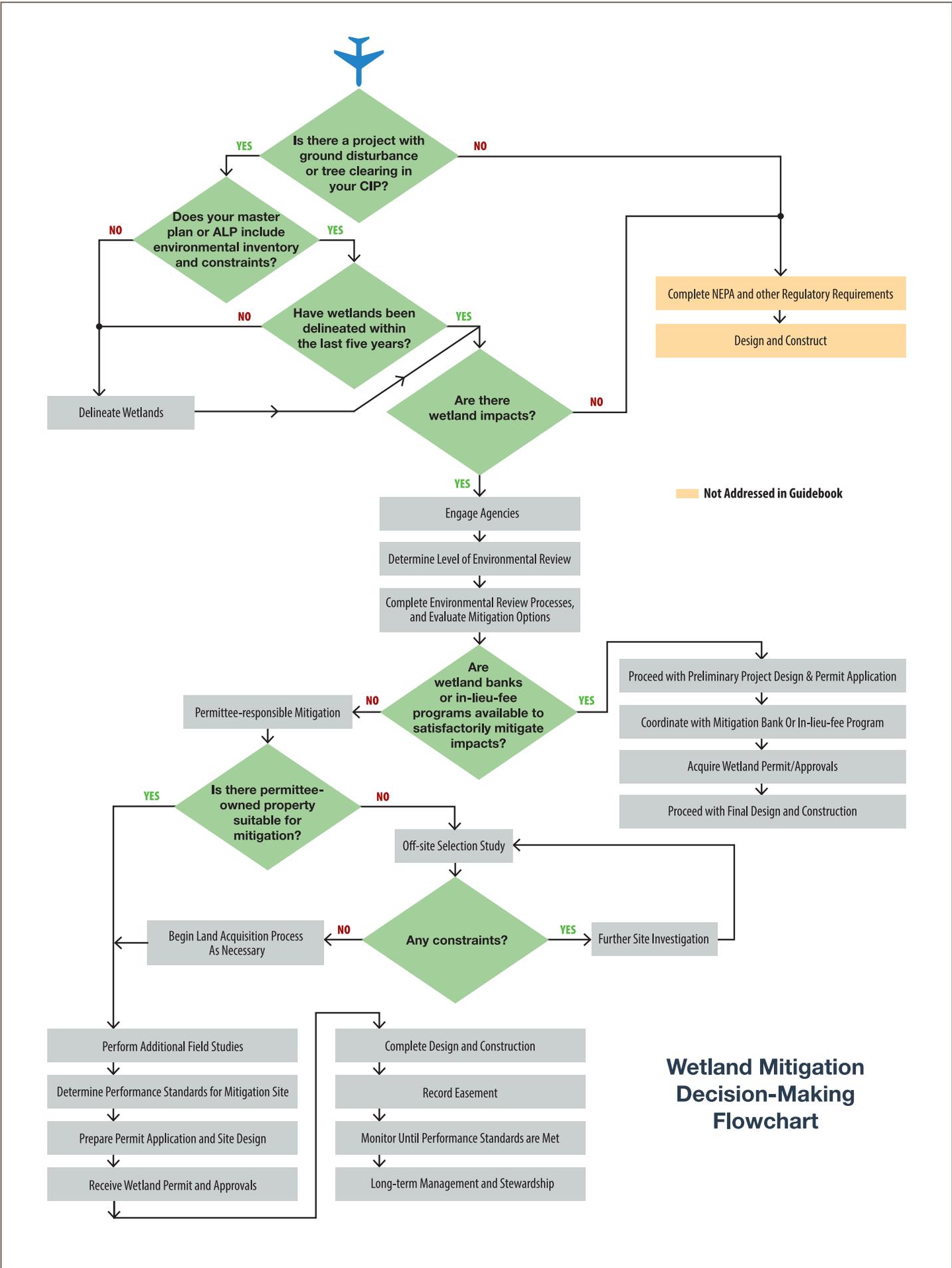
Successful wetland mitigation is often complex, time-consuming, and expensive. This Executive Summary introduces *ACRP Research Report 198: Wetland Mitigation, Volume 2: A Guidebook for Airports*. The guide was written to help airport operators identify effective wetland mitigation strategies to support expansion and development, including safety-related improvements. Although the Guidebook is focused on wetlands, many of the same principles, regulations, and mitigation strategies can also be applied to other surface waters (for example, streams, riffle pool complexes, and mudflats) if a project involves impacts to those types of water bodies.

The wetland mitigation decision-making flow chart on the next page illustrates the decisions and steps involved to identify and mitigate wetland impacts.

**For every authorized discharge, the adverse impacts to wetlands, streams and other aquatic resources must be avoided and minimized to the extent practicable. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland and aquatic resource functions in the watershed.**

—U.S. Environmental Protection Agency





## REGULATORY CHALLENGES

The ongoing loss of wetland and water resources throughout the United States (U.S.) poses great concern. Numerous federal, state, and local laws and regulations have been enacted to avoid or minimize adverse impacts and compensate for unavoidable losses. The primary law governing wetlands is the U.S. Clean Water Act (CWA).

The U.S. Army Corps of Engineers (USACE) is the primary agency responsible for implementing wetland regulations, authorizing permits for projects that affect wetlands and waters of the U.S., and preventing the loss of wetlands. When proposed airport projects adversely affect wetland resources, the USACE may require the project sponsor to offset the effects or losses through compensatory mitigation, described in **Chapter 4** of the Guidebook, including:

- Mitigation banking,
- Wetland creation,
- Wetland enhancement or preservation, or
- In-lieu-fee payments.

## THE REGULATORS AND THE ISSUES

Compensatory wetland projects can often be complex and time-consuming. Coordination among multiple resource agencies includes federal, state, county, and local entities, and other stakeholders such as Native American Tribal councils, environmental advocacy groups, and the public. Two major federal regulations affect implementation of airport compensatory wetland mitigation projects. One is the CWA and the other is the National Environmental Policy Act (NEPA). Section 404 of the CWA established federal oversight of wetland-related projects. For greater detail about the regulators and issues, see **Chapter 2** of the Guidebook. Highlights are included here.

### What Is Covered by Section 404 of the CWA?

Section 404 established a nationwide program to regulate the discharge of dredged or fill material into “waters of the United States.” The definition of waters of the U.S. has varied greatly over the years and is currently in flux. Generally, these waters include tidal waters, wetlands, lakes, ponds, rivers, streams, and other similar water resources. Prior to initiating a project likely to require compensatory wetland mitigation, project proponents are urged to coordinate with the state and federal agencies charged with wetland protection.

Infrastructure development at airports is one of the activities regulated by Section 404. Discharges of dredged or fill materials generated by these activities into waters of the U.S. require a permit unless specifically exempted. Section 404 requires project proponents to demonstrate that steps have been taken to avoid and/or minimize wetland impacts and to provide compensation for any unavoidable impacts.

Types of USACE wetland permits include:

- General permits that can be issued on a nationwide, regional, or state basis for projects involving minimal impacts. General permits provide a more expedited approval process.
- Individual permits required for projects with significant impacts or those that do not meet the definition of General permits.

For permittee-responsible mitigation, the mitigation plan should be developed with the assistance of environmental professionals to maximize the chances of hydrologic and ecological success.

### Section 404 Permits

Individual permits are generally required for “potentially significant impacts.”

Nationwide Permits (NWP) are general permits issued on a national level. NWPs are updated and reissued by the USACE every five years. NWPs most likely to pertain to airport projects include:

- NWP 3 Maintenance;
- NWP 14 Linear Transportation Projects;
- NWP 20 Response Operations for Oil and Hazardous Substances;
- NWP 33 Temporary Construction, Access, and Dewatering;
- NWP 39 Commercial and Institutional Developments;
- NWP 41 Reshaping Existing Drainage Ditches;
- NWP 43 Stormwater Management Facilities; and
- NWP 46 Discharges in Ditches.

### Regional General Permits

The USACE issues these general permits that authorize activities:

- On a regional basis,
- That are similar in nature, and
- That cause only minimal adverse environmental impacts to aquatic resources.

### State Programmatic General Permits

These permits are administered by a state agency and designed to eliminate duplication of effort between USACE districts and states to make the permitting process more efficient.

## ROLES OF FEDERAL AGENCIES IN PROJECTS THAT MAY IMPACT WETLANDS

### USACE

- Administers day-to-day program, including individual and general permit decisions;
- Conducts or verifies jurisdictional determination;
- Develops policy and guidance; and
- Enforces Section 404 permit provisions.

### USEPA

- Develops and interprets policy, guidance, and environmental criteria used in evaluating permit applications;
- Determines scope of geographic jurisdiction and applicability of exemptions;
- Approves and oversees State and Tribal assumption;
- Reviews and comments on individual permit applications;
- Has authority to prohibit, deny, or restrict the use of any defined area as a disposal site [Section 404(c)];
- Can elevate specific cases [Section 404(q)];
- Enforces Section 404 provisions.

### USFWS

- Evaluates impacts on fish and wildlife of all new Federal projects and Federally permitted projects, including projects subject to the requirements of Section 404 (pursuant to the Fish and Wildlife Coordination Act); and
- Elevates specific cases or policy issues pursuant to Section 404(q).

<https://www.epa.gov/cwa-404/section-404-permit-program>

## What Is Section 401?

Under the CWA, an applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. must provide the federal agency with a Section 401 certification. The certification, made by the state in which the discharge originates, declares the discharge will comply with applicable provisions of the CWA, including water quality standards.

Section 401 provides states with two distinct powers: the power indirectly to deny federal permits or licenses by withholding certification, and the power to impose conditions upon federal permits by placing limitations on certification.

➤ For more information on CWA Section 401, visit <https://fas.org/sgp/crs/misc/97-488.pdf>.

## Who Administers Section 404?

A 1989 Memorandum of Agreement (MOA) established the allocation of enforcement responsibilities between the U.S. Environmental Protection Agency (USEPA) and the USACE for Section 404 of the CWA. In general, as stated in the MOA, the USACE will “perform the majority of the geographic jurisdictional determinations and determinations of the applicability of the exemptions under section 404(f)” as part of its role in administering the Section 404 regulatory program. It shall also be the policy of the Army and USEPA that the USACE shall fully implement USEPA guidance on determining the geographic extent of section 404 jurisdiction and applicability of the 404(f) exemptions.

➤ For more information on CWA Section 404, visit <https://www.epa.gov/cwa-404/1989-memorandum-agreement-between-epa-and-department-army-determination-geographic>.

The U.S. Fish and Wildlife Service, individual states, and Native American Tribal entities also coordinate with the USACE in enforcing the policies of Section 404.

## What Is NEPA?

NEPA establishes a broad national framework for protecting the nation’s environmental resources, including wetlands. Airports need to know about NEPA because projects that will use federal funding or require permits or approvals from federal agencies generally require a NEPA review. The nature, size, and significance of the potential environmental impacts of the proposed projects determine what level of NEPA review proponents will have to complete from one or more of these environmental review documents:

- Categorical exclusion (CE or CATEX),
- Environmental assessment (EA), and/or
- Environmental impact statement (EIS).

## EVOLUTION OF FEDERAL WETLAND REGULATORY ACTIONS

1948 Federal Water Pollution Control Act

1972 Clean Water Act (CWA)

1977 Executive Order 11990-  
Protection of Wetlands

1989 USACE Memorandum of Agreement

2008 U.S. Environmental Protection Agency (USEPA) & USACE-Compensatory Mitigation for Losses of Aquatic Resources; Final Rule

## Who Leads NEPA for Airport Actions?

Typically, the FAA is the lead agency for airport projects. The FAA has issued two orders to help airports achieve and maintain NEPA compliance:

- *FAA Order 1050.1F: Environmental Impacts: Policies and Procedures, and*
- *FAA Order 5050.4B: National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions.*

## Who Else Might Be Involved?

- U.S. Fish and Wildlife Service (USFWS),
- National Marine Fisheries Service (NMFS),
- State agency stakeholders (including states with NEPA-like requirements),
- Native American and Alaska Native tribes and councils,
- Regional, metropolitan, and local planning offices, transportation and land use planning agencies, and
- Municipal conservation commission and zoning boards.

Each state is responsible for implementing the CWA. **Appendix B** of the Guidebook provides state-specific information. Early and frequent coordination with state agencies is a key to developing and maintaining successful wetland mitigation programs. But, how do airports find out if a wetland is present?

## What Is a Wetland?

The USACE provides a specific protocol for identifying jurisdictional wetlands. If a habitat feature shows evidence of hydrology, hydrophytes, and hydric soils, then it is defined as a wetland by USACE. See **Chapter 3** of the Guidebook for more detail about wetland types and impacts.

## Why Perform a Wetland Delineation?

A wetland delineation is performed to identify and quantify the presence and extent of wetlands and waters of the U.S. and must account for direct and/or indirect impacts.

### FAA WETLAND SIGNIFICANCE THRESHOLDS THAT MAY GENERATE NEED FOR EIS

The action would:

1. Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;
2. Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;
3. Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);
4. Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands;
5. Promote development of secondary activities or services that would cause the circumstances listed above to occur; or
6. Be inconsistent with applicable state wetland strategies.

—FAA Order 1050.1F



### HYDROLOGY

Water saturation and movement through the wetland



### HYDROPHYTES

Plants specially adapted to grow in wetlands due to the prolonged presence of water



### HYDRIC SOILS

Characteristic soils that develop in wetlands due to the prolonged presence of water

*If a proposed project is going to cause temporary or permanent losses to wetlands or impair wetland functions, the mitigation should replace the same lost functions and values as provided by the impacted wetland. See Chapter 4 for more information about function and mitigation options.*

Options for Wetland Mitigation		
Permittee-responsible	Bank Credits	In-Lieu-Fee
Mitigation design, construction, monitoring and management are responsibility of permittee	Off-site source of mitigation generated by a third party	Permittee provides funds to public agency or non-profit organization

## SITE-RELATED CONSTRAINTS

### Site-Related Wetland and Wetland Mitigation Constraints

On-site wetlands are not desirable on airports, and the challenges associated with wetland avoidance and mitigation can be compounded by the presence of wildlife hazards, listed (protected) species, or other environmental resources that may be on or near an affected wetland or a proposed mitigation site.

### Hazardous Wildlife Attractants

Wildlife can pose hazards to aircraft operations, and hazardous wildlife poses one of the greatest challenges to wetland mitigation. On-site or nearby wetlands and stormwater management ponds are known to provide habitat that attract wildlife, such as waterfowl, wading birds, and coyotes. In 2015 (the most recent year of available data), wildlife strikes with aircraft resulted in approximately \$229 million dollars of damage.

Inadvertent creation of a new hazardous wildlife attractant is a common concern for airports identifying wetland mitigation strategies or planning stormwater management. The FAA warns against the creation of new wetlands or open water resources on airports in FAA Advisory Circular (AC) 150/5200-33(B) or current

**Proposed aviation improvements have the potential to affect on-site or nearby jurisdictional wetlands and waters of the U.S. In some cases, proposed airport facilities are fixed by function or their relationship to other facilities, such as runways and taxiways. If wetlands are present in these areas, impacts may be unavoidable and compensatory mitigation will be required elsewhere.**



Herbaceous wetland located within the infields at an airport could attract hazardous wildlife toward the movement areas.



version), *Hazardous Wildlife Attractants On or Near Airports*. This AC specifies the distances necessary to separate potential wildlife attractants, including wetlands, from aircraft movement areas.

## Threatened or Endangered Species

If a potentially affected wetland provides habitat for listed species, the wetland mitigation strategy and subsequent permitting efforts will require coordination with the USFWS, the NMFS and/or state wildlife management agencies. An incidental take permit (ITP) is required in cases where impacts to wetlands result in the loss of listed species or their critical habitat. Either the USFWS or the NMFS issues the ITP depending on the species listed.

Airports must consider agency coordination as part of mitigation timelines and costs.

## Other Resources and Mitigation Constraints

Other environmental resources and issues can affect mitigation strategies, timelines, and costs, including:

- **Cultural Resources.** Historic or archaeological resources may be present in wetland areas. Potentially affected wetland resources and mitigation sites may require cultural resource surveys and mitigation.
- **Invasive Species.** Invasive species may be present in potentially affected wetlands or proposed mitigation sites. If so, the costs of eradication and ongoing monitoring/control must be considered.
- **Hazardous Materials.** Hazardous materials may be present in a potentially affected wetland impact or mitigation site. If so, the cost and time associated with a hazardous material investigation and remediation must be considered.
- **Property Acquisition.** Property acquisition may be required for permittee-responsible mitigation. If so, the cost and time associated with the property purchase and legal fees must be considered.

See **Chapter 5** for more information about constraints.

## ENGINEERING AND DESIGN ISSUES

### A Project Has Unavoidable Impacts—Now What?

Unavoidable impacts require mitigation based on the resource affected, the extent of the impact and the type of permit or authorization necessary. If there are suitable existing wetland banks or an in-lieu-fee program, regulators will likely prefer this type of mitigation to permittee-responsible mitigation, unless there are extenuating circumstances such as a unique resource that requires a special type of mitigation. See **Chapter 6** for more detail about these engineering and design issues.

### Does the Project Sponsor Own Property Suitable for Mitigation?

If not, the sponsor must seek real estate services to acquire property, which may become a critical-path item for completing mitigation within the required timeline. Consider these criteria when selecting a site:

- Its ability to enhance, restore, create or preserve wetland functions;
- The preference to provide in-kind mitigation to assure that lost wetland functions are replaced and to minimize the mitigation ratios required;
- Water rights, especially in western and southwestern parts of the U.S.;

**An Incidental Take Permit (ITP) is issued by USFWS and authorizes the permittee to unintentionally take (harass or kill) a species protected by the Endangered Species Act. Obtaining an ITP can be difficult and impacts to listed species should be avoided if possible.**

- Accessibility during construction;
- Monitoring and maintenance; and
- Long-term stewardship.

Once a mitigation site is identified, additional field studies may be needed, such as:

- Wetland delineations,
- Archaeological and special species surveys,
- Topographic survey and soil testing, and
- Hydrologic studies prior to start of design.

Work with consultants to advance preliminary designs and to identify wetland and upland habitat objectives and measurable performance standards for wetland hydrology. Develop a preliminary plan set that shows grading, planting and other mitigation features plus preliminary cost estimates. This preliminary plan set goes into the wetland permit application package.

## Permitting

How long it takes to receive a wetland permit depends on the type of permit and agency staff resources. An airport can complete design but cannot begin construction without an issued wetland permit. Payment for banks and in-lieu-fee mitigation varies by state and can be required during any part of the permitting process. The mitigation fee is a project cost that should be identified and included as part of the Airport Improvement Program grant application. For permittee-responsible mitigation, monitoring begins immediately after construction to remain in compliance with the permit and extends until performance objectives are met. Ideally, a mitigation site provides a natural system that can sustain itself once established. Regardless, either the site owner is responsible for its continued function to meet the identified objectives, or the Airport operator or sponsor finds a long-term steward to transfer the site to, or the Airport is responsible for the ongoing maintenance and management, including possible adaptive management. Finding a site and an appropriate long-term steward for it can reduce or eliminate the post-construction costs. The permit requires an easement in perpetuity for the mitigation site, and typically this is obtained after the objectives are met.

### Permitting

Typically, the type of mitigation is considered during the environmental planning process and presented as a mitigation measure during the NEPA evaluation and as a condition of NEPA approval. During the project, the proponent must prepare a permit application for a USACE 404 permit, submit it to the USACE, and receive the 404 permit along with 401 Water Quality Certification prior to the start of construction. In addition, in some regions of the country, a state and local wetland permit may also be required.

### In-Lieu-Fee Mitigation

For an in-lieu-fee mitigation cost example, USACE Sacramento District showed 2014 fee categories ranging from \$5,752 to \$23,528 for non-riparian wetland credits to \$155,998 for coastal wetland credits (per acre).

## COSTS AND FUNDING

The effort and associated cost with preparing a permit application depends on the type of permit necessary and the extent of the impact.

Factoring in all the project elements is essential to develop the actual cost of a wetland mitigation project. Airport sponsors need to understand the process to aid in choosing appropriate mitigation. The selected mitigation and scope depend on the type, function, and scale of a wetland impact. See **Chapter 7** for more detail on components of mitigation total cost, including after completion of the NEPA process.

## Life-Cycle Cost Analysis (LCCA)

There are times project alternatives fulfill the same performance requirements but differ in initial and management costs. In these cases, an LCCA aids in comparison of the alternatives and selection of the one that maximizes net savings. In permittee-responsible mitigation, the function and likelihood of success given the site constraints carry more weight in the decision than costs. LCCA results typically would rank wetland creation lower than restoration or enhancement because creation is also typically more expensive, time-consuming, and risky than other mitigation methods.

## Funding Sources

Mitigation costs are eligible for Airport Improvement Program (AIP) funds if the mitigation is associated with a specific AIP project identified in Table S-1 of Order 5100.38D *Airport Improvement Program Handbook*. The cost of wetland monitoring for the required period, up to a maximum of 5 years, included in the record of decision, is an AIP-allowable cost.

If the project is not federally funded, then the cost will be borne by the sponsor and possibly the state. Sponsors may be able to find opportunities to secure a portion of the funding through other sources, such as local partners through regional collaboration.

***Because of the requirements for management and maintenance in permittee-responsible mitigation, there is a preference to select banking and in-lieu-fee mitigation where these programs exist unless the needs of the project require permittee-responsible (project-specific) mitigation.***

### Wetland Mitigation Summary

#### Permittee-responsible

Definition	Airport must generate their own credits by creating a wetland or enhancing or preserving an existing wetland or combination. Can occur on airport if no potential for wildlife attractants or on an off-airport site owned or acquired by the airport.
Pros	Can be cost effective if airport already owns property that lends itself to mitigation and has staff or can identify long term stewardship for management. May be only option if bank credits or in-lieu-fee programs do not exist or if a unique resource is impacted.
Cons	Airport responsible for monitoring until performance objectives are met before credits can be applied and may include adaptive and long-term management. Can be risky and time consuming; not the preferred method by agencies if other options are available. Conservation easements required.

#### Bank Credits

Definition	An off-site source of wetland mitigation generated by a third party; airports purchase credits in the bank to offset wetland impacts and the banker is responsible for generating the credits.
Pros	Low risk. Off airport property. Airport free of continued responsibility or maintenance; no risk of wildlife attractant on airport; no conservation easements needed; preferred by agencies.
Cons	Prices variable and market driven; banks or wetland types are not always available in service areas

#### In-lieu-fee

Definition	Airport provides funds to an in-lieu sponsor, such as a public agency or non-profit organization.
Pros	Low risk. In-lieu-fee sponsor is responsible for the success of the mitigation; occurs off-site.
Cons	Prices variable. Programs not available everywhere.

## PUBLIC OUTREACH AND STAKEHOLDER INVOLVEMENT

### Who Are Stakeholders?

A stakeholder is any person or group who could be affected by a project or that has an interest in a proposed project. (See **Chapter 8**.) Stakeholders associated with projects affecting jurisdictional wetlands are likely to include public officials or representatives from agencies responsible for providing permits or authorization, environmental interest groups, and neighbors living or working near a proposed project or mitigation site.

*Public outreach is the process of informing, engaging, and collaborating with individuals, groups or communities about a proposed project and its potential effects.*

**Likely stakeholders associated with wetlands include regulatory agencies (USACE, state and regional resource management agencies), environmental interest groups, and neighbors associated with a potentially affected wetland or proposed mitigation site.**

## Who Conducts Stakeholder Outreach?

When airport projects have the potential to affect jurisdictional wetlands and waters of the U.S., either the FAA or USACE will be responsible for public involvement. Which agency undertakes public involvement will depend on the type of project proposed, the extent of potential environmental impacts, and the level of NEPA compliance required.

## When Is Stakeholder Outreach Performed?

When it comes to outreach—the earlier the better! Airport operators must reach out to the USACE and other regulatory agencies as soon as a project is proposed that could affect jurisdictional wetlands. Regulatory agencies can provide data about known resources prior to field surveys or assist with mitigation planning.

NEPA requires federal agencies to disclose the potential effects of a proposed project and to reach out to those who could be affected. A proposed airport project that requires a federal action from FAA, such as federal funding or Airport Layout Plan (ALP) approval or requires a permit from the USACE or other federal agencies to address potential wetland impacts must comply with NEPA.

When a NEPA document (EA or EIS) is necessary, representatives from the USACE and state resource management agencies should be invited to agency scoping meetings, when held. Agency scoping meetings and discussions with identified stakeholders can help to define the project planning area, other potentially affected resources, and other stakeholders, and provide information or advice about project planning and mitigation strategies. Scoping meetings and one-on-one discussions with agency representatives also provide airport managers with an opportunity to discuss the challenges associated with the presence of wetlands and wetland mitigation sites on and near airports.

## What Are the Benefits of Stakeholder Involvement?

Projects often involve numerous stakeholders, and they may have competing goals or interests. Long-lasting benefits to both the airport operators and stakeholders include:

- Enhanced safety by identifying and preventing potential conflicts between wetlands, wildlife, and aviation safety.
- Regional enhancements such as opportunities to develop programmatic and streamlined mitigation plans that provide regional resource benefits, such as corridor management plans, passive recreational opportunities, etc.
- Economic benefits by identifying resource management solutions that promote the goals of multiple agencies or provide cost-saving opportunities through resource sharing.

Stakeholder involvement is especially important for projects that affect jurisdictional wetlands because standard approaches for avoidance, minimization, and compensatory mitigation might not be appropriate on or near an airport. In addition, an airport manager may be required to coordinate with the USACE and other state and local resource agencies to fulfill multiple agency requirements.

Early communication with regulatory agencies and other stakeholders can provide airport managers with an opportunity to identify and disclose potential impacts to jurisdictional wetlands, avoid and minimize those impacts, and develop collaborative mitigation strategies that are both acceptable to regulatory agencies and appropriate for an aviation environment. Moreover, the relationship established during stakeholder involvement activities can help to improve transparency between airports and their communities.

# Case Studies

Case studies were prepared for six airports that have designed and implemented compensatory wetland mitigation projects. The selected airports are in different FAA regions and vary in size, geographic settings, local weather conditions, types of wetland mitigation projects, and levels of airline service. Data collected from the airports included the type and quantity of wetland impacts that necessitated the mitigation, permits required, the detailed mitigation plan implemented, and the challenges associated with the mitigation project. More detail regarding the goals of the case studies and the specific data collected can be found in **Chapter 9** of the Guidebook.

## CASE STUDY #1:

### Cecil Airport (VQQ),

Jacksonville, Florida

In support of planned development for the new Cecil Airport and Cecil Commerce Center, the City prepared a Master Plan for the former military property. Field studies identified impacts to more than 500 acres of jurisdictional wetlands, one-third of which occurred within airport boundaries. The City worked with several federal, state, and local agencies to develop aviation-compatible mitigation through a combination of on-site wetland preservation and creation projects that also contributed to regional conservation efforts.



## CASE STUDY #2:

### La Crosse Regional Airport (LSE),

La Crosse, Wisconsin

Taxiway relocation caused impacts to wetlands and a fishery, both located within a National Wildlife Refuge. The unique challenges for mitigation included an extensive search to identify and select two sites (one for each impact) rather than one, and working around the region's natural, surrounding terrain. This successful mitigation also identified long-term stewardship: the City of La Crosse took over the fishery mitigation located in a city park, and a conservancy undertook stewardship of the wetland mitigation bank site, which was adjacent to their property.



## CASE STUDY #3:

### Manchester-Boston Regional Airport (MHT),

Manchester, New Hampshire

The Runway 24 improvement project resulted in impacts to jurisdictional wetlands. The impacts were minimized by the construction of an Engineered Material Arresting System (EMAS) that provided for a 400-foot reduction of the runway safety area. The final mitigation package included the restoration/creation of 4.3 acres of compensatory wetlands, the preservation of 20 acres of wetlands and adjacent upland, and payment of \$200,000 to the state in-lieu-fee fund.



## **CASE STUDY #4:** **Nut Tree Airport (VCB),** Vacaville, California

The State of California required Solano County to remove approximately 23 acres of primarily eucalyptus groves adjacent to jurisdictional waters or face operational restrictions up to and including temporary closure. Although the County was able to avoid impacts to jurisdictional waters, it was still required to plant 3,000 trees of native species in a riparian area as compensatory mitigation. Challenged by the prohibitive costs associated with either land acquisition or mitigation banking credits that exceeded \$1 million, the County forged a collaborative relationship with a private water agency and a local watershed restoration project that provided designated land and easements for riparian planting. The collaborative effort provided the County with an opportunity to further regional watershed restoration efforts and fulfill its mitigation requirements at an affordable cost.



## **CASE STUDY #5:** **Pullman-Moscow Regional Airport (PUW),** Pullman, Washington

The airport was operating under an FAA temporary "Modification to Design Standards." The planned runway realignment resulted in impacts to over 17 acres of riverine wetlands and sloped wetlands/ephemeral stream channels, 0.9 acre of depressional wetlands, and 8,460 feet of Airport Creek. After coordination with stakeholders, the selected mitigation was a conservation easement far enough from the airport to meet FAA siting requirements for preventing wildlife hazards, but within the same watershed as the impacts. A unique feature was the collaboration with local partners who have contributed to the local match of this project.



## **CASE STUDY #6:** **Denver International Airport (DIA),** Denver, Colorado

As part of the initial phase of airport construction, Denver International Airport obtained a USACE permit to impact 15 acres of wetlands in 1989. The permit required the airport to create 22.5 acres of wetlands to offset these impacts. In 1998, the airport found that 13.1 of the 22.5 acres of wetland creation were unsuccessful and that additional annual losses could be expected. The airport worked with the USACE and local agencies to develop an alternative mitigation plan that would guarantee success and meet the requirements of the permit while still taking airport priorities (e.g., cost, long-term viability, wildlife hazards) into consideration. The alternative sites were better suited for constructed wetlands, had more reliable water supplies, and successfully provided mitigation for wetlands impacted during original airport construction.



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