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Compensatory Mitigation: Improving Success Under Changing Circumstances

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Acknowledgements

This report, produced by the Environmental Law Institute (ELI), examines whether and how In-Lieu Fee Mitigation Programs and mitigation banks have incorporated climate change considerations into their programmatic work. ELI staff contributing to this report include Rebecca Kihslinger, Elly Beckerman, Katherine Foley, and Therese Wilkerson. This report was funded through a U.S. Environmental Protection Agency Wetland Program Development Grant. The contents of this report do not represent the views of the U.S. Environmental Protection Agency, and no official endorsement of the report or its findings should be inferred. Any errors or omissions are solely ELI's responsibility.

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Cover Design: Evan Odoms
Cover Photo: Courtesy of Bryan Emerson, The Nature Conservancy (depicting a successful wetland restoration project, Clark Islands Wetlands Restoration, partially funded through Maine's In-Lieu Fee Program).

Compensatory Mitigation:
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Contents

Introduction

Extreme weather and climate events resulting from anthropogenic climate change are becoming increasingly common. Many, if not all, parts of the United States are experiencing effects in one way or another. Temperature regimes are changing; total levels and rates of precipitation vary significantly from historical norms; wildfires are more frequent and intense; sea-level rise, salt intrusion, and erosion threaten many coastal areas; 100- and 500-year floods and storms occur with regularity.[1] These new climate realities threaten wetland ecosystems, while at the same time, these critical habitats sequester significant amounts of carbon[2] and provide essential functions that can lessen the impacts of climate change[3] and make communities more resilient. To ensure long-term sustainability, these new climate realities must be considered in the preservation and restoration of wetlands, streams, and other aquatic resources undertaken as part of the compensatory mitigation process.

Compensatory mitigation is required to offset unavoidable adverse impacts to aquatic resources that remain after all practicable and appropriate impacts—permitted under the Clean Water Act (CWA) section 404, section 10 of the Rivers and Harbors Act of 1899 (RHA), and some state aquatic resource permitting programs—have been avoided and minimized.[4] Permittees are required to restore, enhance, establish, or preserve thousands of acres of wetlands or other aquatic resources annually to compensate for the permitted losses.[5] According to one recent estimate, the compensatory mitigation

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[1] Hicke, J.A., et al. (2023) "2022: North America," in *Climate Change 2022: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1929–2042, doi:10.1017/9781009325844.016, *available at:* https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-14/

[2] *See generally*, Nahlik, A.M. & Fennessy, M.S. (2016) *Carbon storage in US wetlands*. Nature Communications, *available at: https://www.nature.com/articles/ncomms13835*.

[3] *See* Rodriguez, Kristina. (2022) *Coastal Wetland Conservation: Nature-Based Solutions to Mitigate the Impacts of Climate Change*. Yale Environment Review (discussing the findings of the original research publication: Coppenolle, Rebecca Van, and Stijn Temmerman. (2017) "Identifying Global Hotspots Where Coastal Wetland Conservation Can Contribute to Nature-Based Mitigation of Coastal Flood Risks." Global and Planetary Change, Elsevier.) *available at:* https://environment-review.yale.edu/coastal-wetland-conservation-nature-based-solutions-mitigate-impacts-climate-change.

[4] 33 C.F.R. § 332.2 (2008).

[5] Bennett, Genevieve et al. (2017) *State of Biodiversity Mitigation 2017: Markets and Compensation for Global Infrastructure Development.* Forest Trends, Washington DC, a*vailable at:* https://www.forest-trends.org/wp-content/uploads/2018/01/doc_5707.pdf.

industry is worth over $3.5 billion annually.[6] In August 2024, there were more than 2,500 approved compensatory mitigation sites and another approximately 600 pending sites.[7]

In 2008, the Corps and EPA (Agencies) jointly promulgated regulations (2008 Rule) articulating the compensatory mitigation requirements for impacts authorized by permits issued under section 404 of the CWA and/or section 10 of the RHA to aquatic resources, including wetlands and streams (33 CFR Parts 325 and 332 and 40 CFR Part 230 Subpart J). The 2008 Rule was intended to improve the planning, implementation, and management of compensatory mitigation by creating higher standards for compensatory mitigation and requiring, to the extent practicable and appropriate, that all mitigation decisions be made within the context of a watershed approach. Addressing recommendations from the National Academy of Sciences[8] and others on how to improve the performance of compensatory mitigation, the 2008 Rule set forth new enforceable requirements for financial assurances, site protection instruments, long-term management planning and funding, and adaptive management. The 2008 Rule supports the inclusion of best available science, including climate science, in project development, review, and approval. However, even with these protections in place, unforeseen events occur and can lead to the failure of individual projects and ultimately jeopardize the overall success of compensatory mitigation programs.

Compensatory mitigation providers are already seeing the impacts of climate change on their projects. As we documented in the Environmental Law Institute's (ELI's) 2019 report, *In-Lieu Fee Mitigation: Review of Program Instruments and Implementation Across the Country*:

[6] BenDor, Todd K., et al. (2023) *Assessing the size and growth of the US wetland and stream compensatory mitigation industry*. PLoS One, *available at*: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0285139.
[7] RIBITS Banks and Sites Data (March 14, 2024) a*vailable at:* https://ribits.ops.usace.army.mil/ords/f?p=107:158:::::.
[8] NRC (National Research Council Committee on Wetland Mitigation). (2001) *Compensating for Wetland Loss under the Clean Water Act*. National Academy Press, Washington, D.C.

> Several programs mentioned challenges presented by extreme weather events. In the past several years, various [In Lieu Fee] [(ILF)] programs have experienced the impacts of severe storms and flooding, wildfire, or other natural disasters. These programs include the Ventura River Watershed ILF Mitigation Program, which experienced significant damage to resources during the Thomas Fire in autumn of 2017. The sponsor described the damages as amounting to approximately "6 years and $1 million worth of work." The program has now initiated a claim for Force Majeure with its IRT. The program is asking for formal concurrence from the IRT so that the project can be officially closed and the program can then find other funds to repair the project. The project site is located on land owned by the sponsor, and the sponsor is committed to restoring the site.[9]

The Ventura River Watershed ILF Mitigation Program is not the only program to have been affected by extreme weather and climate events. While conducting research in the course of this project, ELI heard from providers that have had to adapt projects or suffer losses due to major storms or wildfires, prolonged drought and floods, or extreme changes in precipitation or temperature in California, Georgia, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Montana, Oklahoma, Tennessee, Texas, West Virginia, Wisconsin, and more.

In light of these changing conditions and losses, the compensatory mitigation industry is beginning to accommodate new climate realities. The requirements in the 2008 Rule were designed to achieve successful resource replacement projects. Yet, many mitigation providers, stewards, and state and tribal regulators are now starting to think about how to design, implement, manage, and oversee projects given that changing climatic conditions may thwart a site's ability to achieve its objectives. Compensation sites must be designed to be sustainable over the long term and site protection, long-term management, and adaptive management measures are used to help ensure the long-term sustainability of compensatory mitigation projects. However, providers are only just beginning to explicitly discuss the future impacts of climate change in project plans and instruments. The Agencies have not yet provided any formal guidance to providers on how to incorporate climate change in the compensatory mitigation program.[10] As extreme weather and climate events grow increasingly common—and to

[9] Kihslinger, R., et al. (2019) *In-Lieu Fee Mitigation: Review of Program Instruments and Implementation Across the Country*. Environmental Law Institute, Washington, DC, p. 105. *available at:* https://www.eli.org/sites/default/files/eli-pubs/lieu-fee-mitigation-review-program-instruments-and-implementation-across-country.pdf.

[10] *But see*, *Compensatory Mitigation: Improving Success Under Changing Circumstances*, *infra* note 21 (citing informal guidance on how reviewers can examine consideration paid to climate change in bank and site proposals).

some extent, predictable—mitigation providers are now facing new challenges as project sites mature and move into long-term management.

This project sought to examine whether and how ILF Mitigation Programs (ILFP) and mitigation banks (collectively, "providers") have incorporated climate change considerations into their work. For this report, ELI engaged with providers and members of U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (Corps). We reviewed bank instruments, ILFP instruments, and project documents to understand these considerations from multiple perspectives. This report will briefly describe the regulatory and policy background of the CWA section 404 program and the selected research methods before detailing how providers have incorporated climate change considerations into various components of the compensatory mitigation regulatory process and will conclude with ELI's key findings.

Regulatory and Policy Background

Section 404 of the CWA generally prohibits the discharge of dredged and fill material into waters of the United States unless otherwise permitted by the Corps or authorized state agency or if the activity is otherwise exempted.[11] In making a determination on a section 404 authorized discharge application, the Corps or authorized state agency must determine that the permit applicant has taken all "appropriate and practicable steps to avoid and minimize adverse impacts to waters of the United States."[12] For those adverse impacts that are unavoidable, permittees may be required to provide compensatory mitigation through one of three mechanisms as a permit condition: performing permittee-responsible mitigation, purchasing credits from a mitigation bank, or purchasing credits from an approved ILFP.[13]

The Corps is the federal agency responsible for primary administration, including permitting, of the compensatory mitigation program.[14] EPA is responsible for establishing regulatory guidelines and has additional veto power over Corps' or authorized state's specification of a disposal site before, during, or after a 404 permit has been issued.[15] The U.S. Fish and Wildlife Service, the Natural Resources Conservation Service, and the National Marine Fisheries Service may also be involved in the permit review process.

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[11] 33 U.S.C. § 1344.
[12] 33 C.F.R. § 332.1(c)(2).
[13] United States Environmental Protection Agency. (n.d.) *Wetlands Compensatory Mitigation: Fact Sheet*. p. 2. *Available at:* https://www.epa.gov/sites/default/files/2015-08/documents/compensatory_mitigation_factsheet.pdf. (explaining that "[w]ith permittee-responsible mitigation, the permittee maintains liability for the construction and long-term success of the site. Mitigation banking and in-lieu fee mitigation are forms of 'third party' compensation, where the liability for project success is transferred to the mitigation bank or in-lieu fee sponsor").
[14] 33 U.S.C. § 1344(e).
[15] 33 U.S.C. § 1344(c).

As cited in Oliver Houck's Environmental Law Reporter® article, *More Net Loss of Wetlands: The Army-EPA Memorandum of Agreement on Mitigation under the §404 Program*, and aligned with the objectives of the CWA, the compensatory mitigation program follows the goal established via the 1989 memorandum between the Agencies of "no net loss of wetlands," which was later refined to "no overall net loss of values and function."[16] In 2008, the Agencies jointly promulgated the 2008 Rule, which requires, to the extent feasible and appropriate, compensatory mitigation decisions to be supported by a watershed approach. A watershed approach "may involve consideration of landscape scale, historic and potential aquatic resource conditions, past and projected aquatic resource impacts in the watershed, and terrestrial connections between aquatic resources."[17]

Of the enumerated regulatory considerations that together define the "watershed approach," "historic[al] and *potential* aquatic resource conditions" and "past and *projected* aquatic resource impacts in the watershed" reasonably support the position that compensatory mitigation decisions must account for climate change considerations. However, even as climate change considerations are appearing more frequently in federal policies and standards,[18] there is no regulatory mandate requiring the express incorporation of climate change considerations into the compensatory mitigation decision-making processes or specific agency guidance on how to do so.

Despite the lack of specific guidance on how to incorporate climate change in compensatory mitigation authorized under section 404 of the CWA, the Biden Administration has launched "[g]overnment-wide approach" to tackling the climate crisis via Executive Order 14008. E.O. 14008 makes clear that combating climate change is a policy priority for the Biden Administration as it looks to "deploy the full capacity of its agencies" to: reduce pollution in each economic sector; protect public health; conserve U.S. lands, waters, and biodiversity; increase resiliency to climate change impacts; deliver Environmental Justice; and promote the growth of clean energy technologies and infrastructure.[19]

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[16] Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (Nov. 14, 1989); Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (Feb. 6, 1990).

[17] 33 C.F.R. § 332.2.

[18] *See e.g.*, Exec. Order 13690, 80 Fed. Reg. 6,425 (Feb. 4, 2014) (explaining the federal policy "to improve resilience of communities and Federal assets against the impacts of flooding, [which] are anticipated to increase over time due to the effects of climate change."); *see also* 24 C.F.R. § 55.7 (2024) (implementing the FFRMS, which is a flexible standard that agencies can apply for establishing flood elevation and flood hazard areas for federally funded buildings and projects. One of the approaches of the standard used for project siting, design, and construction is the "climate informed science approach," which integrates current and projected changes in flooding based on climate science.).

[19] Exec. Order No. 14,008, 86 Fed. Reg. 7,619 (Jan. 27, 2021).

To aid in the success of its climate-focused initiative, E.O. 14008 created the National Climate Task Force to "facilitate the organization and deployment" of Federal actions aimed to further the stated climate objectives.[20] The Order directs Task Force members, including the EPA Administrator, to prioritize climate change when creating policy, making budget decisions, contracting, and engaging with State, local, Tribal, and territorial governments. Under this order, the EPA and Corps should ideally prioritize climate change when "engag[ing] with leaders across all sectors of our economy," which necessarily includes the compensatory mitigation industry.

The Agencies have begun to examine their capacity to incorporate climate change considerations in the compensatory mitigation program. In November of 2022, EPA released workbooks and checklists with guidance for mitigation banks and ILFPs' IRTs.[21] Through these workbooks, EPA "organized technical and programmatic information to facilitate the efficient review of [] draft [program instruments and site plans]."[22] These workbooks are non-binding and do not create any new legal rights, but IRT reviewers can nevertheless use the technical and programmatic information contained therein to help guide their review processes and inform decision-making. Included in the Mitigation Bank Instrument Review Workbook and Checklist, Mitigation Bank Prospectus Review Workbook, and ILFP Site Plan Review Workbook are limited examples of the ways in which IRT reviewers can evaluate whether, how, and where a provider should incorporate climate change considerations in bank or site proposals.

For example, EPA offers a guiding question in the "ecological suitability" section of its Mitigation Bank Prospectus Review Workbook for IRT reviewers, which directs reviewers to examine whether "the prospectus identifies any existing hydrologic disturbances or alterations on/adjacent to the proposed bank site (including those the Sponsor may not be able to manage or control)."[23] Under this guiding question, EPA notes briefly that "[c]onsideration should also be given to the effects of climate change, which may result in changes to the precipitation rates and storm event intensity and frequency, and to sea level rise which would affect the viability of tidal compensation

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[20] *Id.*

[21] Knauer, E., et al. (2022) *Bank Prospectus Review Workbook and Checklist*. Document No. EPA-840-B-22005, *available at*: https://www.epa.gov/system/files/documents/2022-11/Mit%20Bank%20Instrument%20Review%20Workbook%20w%20Checklist_112022.pdf; Knauer, E., et al. (2022) *Bank Instrument Review Workbook and Checklist*. Document No. EPA-840-B-22005, *available at*: https://www.epa.gov/system/files/documents/2022-11/Mit%20Bank%20Instrument%20Review%20Workbook%20w%20Checklist_112022.pdf; Knauer, E., et al. (2022) *In-Lieu Fee Program Instrument Review Workbook and Checklist*. Document No. EPA-840-B-22002, *available at*: https://www.epa.gov/system/files/documents/2022-11/ILF%20Instrument%20Review%20Workbook%20w%20Checklist%20112022.pdf; Knauer, E., et al. (2022) *In-Lieu Fee Project Site Plan Review Workbook and Checklist*. Document No. EPA-840-B-22003, *available at*: https://www.epa.gov/system/files/documents/2022-11/ILF%20Project%20Site%20Plan%20Review%20Workbook%20w%20Checklist%20112022.pdf.

[22] *See id*. at ii.

[23] *Bank Prospectus Review Workbook and Checklist*, pp. 29–30.

including tidal marshes, sea grass, kelp, and shellfish beds."[24] Regarding factors that may contribute to a site's long-term sustainability, the same "ecological suitability" section provides that "[a]djacent conserved lands may better ensure that a bank site is more resilient in the face of existing and future threats such as climate change."[25]

In the sections describing review elements for site selection, the Mitigation Bank Instrument Review Workbook and the ILFP Project Site Plan Review Workbook articulate that "other relevant factors [IRT reviewers can consider include] . . . likely future [site] conditions (*i.e.*, more development proposed or anticipated effects of sea level rise or climate change)."[26] These workbooks also explain that IRT reviewers "should also consider the susceptibility of the site to risk factors like climate change or sea level rise" when determining whether the proposed bank site has addressed the ecological needs of the project watershed or landscape.[27]

EPA provides additional direction to reviewers in the ILFP Project Site Plan Review Workbook by explaining that monitoring requirements "help to determine whether adaptive management activities are necessary (*e.g.*, addressing the effects of climate change and sea level rise)."[28] In a similar vein, EPA notes certain climate change considerations in its guiding question to reviewers, which asks whether a given site plan's "monitoring, management, or long-term management plans consider the potential for adaptive management as a result of climate change or sea level rise."[29] As such,

> [c]limate change, including changes in the amount or periodicity of precipitation or increase in likelihood of wildland fire, may precipitate future adaptive management actions. The reviewer should give consideration to future sea level rise for projects located in coastal, marine, or estuarine areas and in non-coastal areas, increased frequency or intensity of flooding events, wildfire, or drought. The project site plan should also acknowledge extreme events and sea level rise factors, incorporate sea level rise predictions, and consider potential alternative states for future project condition. For example, does the plan allow for estuarine vegetation migration with sea level rise?[30]

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[24] *Id.*
[25] *Id.* at p. 30.
[26] *Bank Instrument Review Workbook and Checklist*, pp. 16–17; *In-Lieu Fee Project Site Plan Review Workbook and Checklist*, pp. 17–18.
[27] *Bank Instrument Review Workbook and Checklist*, p. 21; *In-Lieu Fee Project Site Plan Review Workbook and Checklist*, p. 22.
[28] *In-Lieu Fee Project Site Plan Review Workbook and Checklist*, p. 63.
[29] *Id*. at p. 66.
[30] *Id*. at p. 66.

EPA's language discussed above offers insight into the relevant, albeit limited, ways the Agencies have provided guidance to IRT reviewers on how to evaluate a site's resiliency in the face of climate change impacts. As explained above, considering climate change at various stages of mitigation projects, and particularly in the site selection and monitoring phases, helps ensure sites are sustainable over the long term.

A noncomprehensive review of guidance from states and Corps districts revealed very little in-depth discussion of how providers can plan for, design, monitor, and maintain sites with regard to climate change impacts. For example, the New England Corps District has developed a stream compensatory mitigation module that states, under the designated "monitoring" checklist and instructions, "adaptive management measures may be needed in the event of unforeseen problems/site failures, including the effects of climate change." [31] The 2020 Standard Mitigation Standard Operating Procedures for the New England Corps District also: 1) provides a checklist item for site selection that asks whether "the source of water (for reestablishment, establishment, or rehabilitation projects) [is] sustainable and relatively predictable over the long term, considering climate change to the extent possible;" and 2) offers a template long-term management plan that articulates the following language under the "management visions and goals" section: "adaptive management includes those activities necessary to address the effects of climate change."[32] The Maryland Department of Environmental Protection has recommended that proposed "[d]esigns [of compensatory mitigation projects] should consider climate resiliency, including how sea level rise may convert aquatic communities."[33]

Though additional state or Corps district guidance may exist, the discrete examples listed above can serve as useful guideposts for IRTs and providers—especially those inclined to design and maintain a site that is adaptive to changing climatic conditions—as they progress through the regulatory review process. As will be discussed later in this report, several providers have expressed a desire for constructive guidance from authorized agencies and IRT members so that sites can be designed to achieve climate resiliency.

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[31] *See* U.S. Army Corps of Engineers New England District Regulatory Division. (September 7, 2016) *New England District Compensatory Mitigation Guidance*. a*vailable at:* https://www.nae.usace.army.mil/portals/74/docs/regulatory/Mitigation/2016_New_England_Compensatory_Mitigation_Guidance.pdf.

[32] U.S. Army Corps of Engineers New England District Regulatory Division. (December 29, 2020) *New England District Compensatory Mitigation Standard Operating Procedures. available at:* https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/Compensatory-Mitigation-SOP-2020.pdf.

[33] Maryland Department of the Environment. (April 1, 2022) *Components of a Compensatory Mitigation Plan – Guidance for Developing Wetland and Waterway Mitigation in Maryland*. *available at:* https://mde.maryland.gov/programs/Water/WetlandsandWaterways/AboutWetlands/Documents/Components-Mit-Plan-Guidance.pdf.

Methodology

Research for this project relied on questionnaires completed by providers; conversations with providers and Corps and EPA staff; and a review of a representative sample of compensatory mitigation documents, namely bank and ILFP site instruments and ILFP program instruments and compensation planning frameworks. This research examined current practices for incorporating climate change considerations into mitigation projects and was not intended to be all-inclusive.

Questionnaires

In November 2022, questionnaires were shared with the Ecological Restoration Business Association and the ILF Communications Group who sent the questionnaire to their members. Questionnaires were also shared with a broader group of ILFP administrators to gather additional responses in July 2023. Ultimately, ELI received 21 responses to the ILFP questionnaire and 29 responses to the mitigation bank questionnaire. Providers operating in at least 36 states and 31 Corps districts submitted responses discussed throughout this report. ELI spoke with two additional providers who did not submit written response to the questionnaire. A list of the states and Corps districts represented in responses can be found Tables 1 and 2 below.

Table 1. *State Responses*

State	***Number of ILFP Responses***	***Number of Bank Responses***
Alabama		2
Alaska	1	
Arizona	2	
Arkansas		1
California	1	6
Colorado	1	3
Connecticut		
Delaware		
Florida		4
Georgia		5
Hawaii		
Idaho		
Illinois		2
Indiana	1	1
Iowa		
Kansas	1	
Kentucky		3
Louisiana		3
Maine	1	
Maryland		4
Massachusetts	1	
Michigan		
Minnesota		2
Mississippi		2
Missouri		
Montana	3	1
Nebraska	1	2
Nevada		
New Hampshire		
New Jersey		
New Mexico		2
New York		
North Carolina	1	4
North Dakota	2	
Ohio	1	2
Oklahoma	1	2
Oregon	1	
Pennsylvania		2
Rhode Island		
South Carolina	1	3
South Dakota	2	
Tennessee	1	6
Texas		9
Utah		
Vermont		
Virginia	1	2
Washington	2	
West Virginia	1	4
Wisconsin	1	1
Wyoming	1	

Table 1, above, does not include one bank's response of "multiple."

Table 2. *Corps Division Responses*

Division	***District***	***Number of ILFP Responses***	***Number of Bank Responses***
Pacific Ocean Division	Alaska	1	
	Far East		
	Honolulu		
	Japan		
North-western Division	Kansas City		
	Omaha	5	2
	Portland	1	
	Seattle	2	
	Walla Walla		
South Pacific Division	Albuquerque		4
	Los Angeles	1	3
	Sacramento	1	2
	San Francisco		1
South-western Division	Fort Worth		4
	Galveston		4
	Little Rock		
	Tulsa	1	
Mississippi Valley Division	Memphis		
	New Orleans		1
	Rock Island		2
	St. Louis		
	St. Paul	1	2
	Vicksburg		1
Great Lakes and Ohio River Division	Buffalo	1	1
	Chicago	1	2
	Detroit	1	1
	Huntington	2	4
	Louisville	1	4
	Nashville	1	4
	Pittsburgh	2	3
South Atlantic Division	Charleston	1	2
	Jacksonville		3
	Mobile		2
	Savannah		4
	Wilmington	1	2
North Atlantic Division	Baltimore		4
	New England	2	
	New York		
	Norfolk	1	2
	Philadelphia		2

Table 2, above, does not include responses of "see above states" (states encompassed a number of districts at least in some small part), "several", "many", or "SFW, SWG, SWL, MVM and SWT" for banks and one response of "SPD" for ILFPs.

The questionnaires sought baseline information about: operating location and climatic changes in an operating area; which, if any, aspects of the compensatory mitigation process were climate considerations incorporated; providers' experiences in implementing adaptive management due to climate impacts or natural disasters; conversations with the Corps and IRTs about climate; considerations of community resilience benefits; and the use of climate adaptation plans, hazard mitigation plans, or other tools to evaluate anticipated climate impacts. A copy of both questionnaires can be found in Appendix 1.

Conversations with Providers

A series of conversations with providers built upon the information initially gathered via the questionnaires. Providers invited for further conversation were selected because they either had compelling questionnaire response insights and indicated a willingness to converse further or because it was recommended that ELI speak with these specific providers. These recommendations came from other conversations ELI had during project research (*e.g.*, with the Agencies), or from previous ELI work. Throughout this process, ELI spoke directly with 14 providers, including five providers working for mitigation banking companies, three subcontractors working for environmental engineering firms, and six ILFPs.[34]

Conversations with providers generally lasted 30 minutes to an hour. Discussions were structured around a set of guiding questions that aimed to discern the ways providers have integrated climate into compensatory mitigation projects. The list of guiding questions can be found in Appendix 2. The discussion structure was flexible, which permitted follow-up of pertinent lines of thought as they arose.

Document Review

We reviewed a representative number of mitigation bank and ILFP project documents for projects located across the country to identify examples of language that illustrate how climate is integrated into approved instruments. To select bank and ILFP project instruments for review, we started by filtering the database of mitigation bank and ILFP project instruments listed on the Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) for projects approved from January 1, 2018, to January 1, 2022. We then cross-checked the cyber repository housed on RIBITS to confirm whether the bank or program had uploaded an electronically searchable instrument(s) and/or other programmatic documents. We then organized projects with searchable documents approved within our sample time frame by state. Finally, we selected as many as two or more sites per state for review. In some states, ≤1 bank and/or ILFP project site met our

[34] One ILFP with whom ELI spoke administers funds to, but is not directly responsible for, projects.

selection criteria. In states with many sites in our database, we reviewed more than two documents. In total, we reviewed project documents for 67 mitigation banks and ILFPs.

ELI also reviewed a representative sample of ILFP instruments and compensation planning frameworks (where appropriate) approved between January 1, 2018, to January 1, 2022, to identify whether and to what extent ILFPs consider climate change. Like the methodology for banking and ILFP project instrument review, we started by filtering the RIBITS database for ILFP instruments approved within the 2018-2022 timeframe. We then cross-checked the RIBITS cyber repository to confirm whether the program had uploaded electronically searchable documents.

For each document reviewed, ELI used search terms—compiled from questionnaire responses and conversations with providers and Agency members—aimed to capture both explicit and implicit considerations of changing climatic conditions. The selected search terms were:

- Climate change
- Global average temperature
- Emissions
- Extreme weather events
- Changing environmental conditions
- Sea level rise (SLR)
- Drought
- Wildfire
- Precipitation (changes, decrease, or increase)
- Flooding
- Atmospheric river
- Temperature regimes
- Erosion
- Carbon (dioxide, sequestration, cycle)
- Act(s) of nature
- Unpredicted event
- Unanticipated event
- Events beyond the control of the sponsor
- Unforeseen circumstances
- Range of flow
- Variability
- Variable

When search terms returned positive results, we read the sections for broader context and determined whether climate considerations had been incorporated. We also reviewed specific sections of instruments—site selection, force majeure, long-term management, adaptive management, performance standards, and monitoring—for any language that might be relevant but that did not include our specific search terms. We also searched for language indicating the provider and IRT contemplated *future* changes/impacts that could be expected because of climate change by using other search terms in addition to “climate change.”

ELI also reviewed documents providers recommended. If providers highlighted specific sections of a document, we examined those sections regardless of whether those sections returned responsive results for the selected search terms.

Conversations with the Corps and EPA

Some providers recommended that ELI speak with specific districts or Corps employees as part of this research. ELI contacted eight staff and spoke with three Corps employees operating in different districts. As with the providers, conversations followed a general but flexible set of questions (*see* Appendix 2). Additionally, in August 2022, near the project's outset, ELI also spoke with two Corps staff, including a Corps Headquarters official who served in a limited advisory role at the outset of this research.

ELI also informally interviewed members of the EPA's Mitigation Working Group. In total, 33 people participated in the call, including representatives from EPA Headquarters and every EPA region except Region 6. Guiding questions for the call were provided to participants before the call and can be found in Appendix 2.

Analysis

Taken in the aggregate, the questionnaire responses, conversations with providers and the Agencies, and ELI's document review resulted in the finding that some compensatory mitigation providers have begun to consider climate in their operations explicitly, but these efforts are neither widespread nor systematic. In response to the questionnaires, approximately 70% of providers affirmed that they consider climate in at least one stage of their siting, management, or project and program design processes. At least two providers, the National Fish and Wildlife Foundation's Sacramento District California ILFP (NFWF ILFP) and the Virginia Aquatic Resources Trust Fund ILFP (VARTF ILFP), consider climate broadly and programmatically. The NFWF ILFP notes in its Compensation Planning Framework (CPF) that "to counterbalance climate change threats, [the] ILF Program goals and objectives will focus on aiding in the implementation of ILF [p]rojects that will minimize the impacts to aquatic resources from climate change to the maximum extent possible."[35] As described more thoroughly below, VARTF's CPF prioritization scheme accounts for the ability of a given area to maintain function in response to climate change.[36] However, ELI's conversations and document review revealed that these considerations are often not formalized in primary documentation for a given site or bank. Rather, providers often engage in general, *ad hoc* conversations about climate considerations during project review and approval. In some cases, the Corps or IRT members prompt these conversations with providers; in others, providers consider climate issues without prompting or suggestion. These

[35] National Fish and Wildlife Foundation (2014, Amended 2021) *Exhibit D: Compensation Planning Framework*. p. 27. *Available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:930989855997:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,99658.

[36] The Nature Conservancy. (March 2021) *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund*. pp. 4, 18. *Available at:* https://www.nature.org/content/dam/tnc/nature/en/documents/VARTF-CPF-March2021_Final.pdf.

informal conversations may help to direct programmatic responses to the threat of climate change, even without formal integration.

Providers often contend with several factors in the process of creating and restoring wetland and stream mitigation sites, including availability of appropriate land, financial considerations or constraints, political limitations, and changing climatic conditions, which are sometimes at odds with each other. Providers in every area of the country and in each of the Corps' divisions and EPA regions noted changing climatic conditions.

The remainder of this section addresses how providers have incorporated climate considerations into various stages of the compensatory mitigation process. As detailed below, some providers are accounting for climatic changes in new and innovative ways, including risk and variability assessments.

Site Selection

Under the 2008 Rule, "compensatory mitigation project site[s] must be ecologically suitable for providing the desired aquatic resource functions."[37] Project applicants must consider a variety of factors in selecting mitigation project sites and describe how these factors—such as "watershed needs, on-site alternatives where applicable, and the practicability of accomplishing a self-sustaining mitigation project"—were considered in their mitigation plans.[38] The Corps' district engineer will ultimately determine whether a proposed site is ecologically suitable by evaluating several factors, including the site's: physical and chemical characteristics, such as hydrological conditions and soil characteristics; watershed-scale features; size and location relative to hydrologic sources, including the availability of water rights, and other ecological features; and compatibility with adjacent land uses and watershed management plans.[39] The district engineer must also consider the proposed mitigation site's reasonably foreseeable effects on ecologically important aquatic or terrestrial resources, cultural sites, or federally- or state-listed threatened and endangered species' habitats.[40] Other relevant factors including, but not limited to, development trends, anticipated land use

Example of typical site selection language:

"The proposed bank site was selected because of its ability to replace targeted wetland services such as water storage, water quality and terrestrial and aquatic habitat (2) connectivity to important riverine ecosystems, (3) the ability to replace aquatic resources that have been historically lost or degraded in the watershed, (4) the need for replacement of wet prairie ecosystems in the Willamette Valley, (5) the ability of the site to be self-sustaining with minimal long term maintenance needs, and (6) the site's connectivity with priority conservation areas."

South Santiam Mitigation Bank Instrument, p.25

[37] 33 C.F.R. § 332.3(d)(1) (2008).
[38] 33 C.F.R. § 332.4(c)(3) (2008).
[39] 33 C.F.R. § 332.3(d)(1)(i)–(iv) (2008).
[40] 33 C.F.R. § 332.3(d)(1)(v) (2008).

changes, water quality goals, and floodplain management goals will inform the district engineer's determination on a proposed site's ecological suitability.[41] Consonant with these factors are anticipated climate change impacts on a given site, which the district engineer can reasonably include in their review of whether a proposed site is ecologically suitable.

In response to the questionnaire prompt about what stage(s) in which climate was considered in project planning, 60–70% of providers indicated they consider climate in their site selection process;[42] however, not all providers explained specifically how this was accomplished. Providers may be integrating climate considerations during site selection in ways that are not expressly described in program documentation. Other providers who do not currently consider climate in site selection expressed a general sentiment that they nevertheless should. Providers who do not incorporate climate into site selection cited a lack of resources or accurate data to understand predicted climate effects on landscapes. Many providers also noted that the existing difficulty in finding and acquiring sites or easements can preclude additional considerations, climate effects included among them. The Corps staff with whom ELI consulted for this project echoed the issues providers raised, such as conflicting land uses, planning processes, and competing priorities that can arise during the project review process when discussing site selection and suitability.

In these conversations, providers and Agency members highlighted specific cases where issues related to climate change are emerging based on site selection. For example, a New Jersey IRT member explained that some sites in the Meadowlands—an area of New Jersey wetlands around the Hackensack River—designed to be tidal wetlands are turning into mudflats three years into the monitoring period. This New Jersey IRT member noted that climate was not incorporated in standardized ways across all projects. Instead, climate has been considered via informal conversations and internal considerations not reflected in the primary or secondary documentation submitted to the Corps and IRT for a given project.

ELI's conversations with providers revealed certain themes in the ways providers have considered climate in site selection. For example, providers described how sites were selected in consideration of specific climate effects and how resilient and connected landscapes are prioritized. The Montana Statewide ILFP directly incorporates climate change considerations in its prioritization strategy when evaluating a potential project's "likelihood of success." As such,

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[41] 33 C.F.R. § 332.3(d)(1)(vi) (2008).

[42] Respondents to the questionnaire aimed at bankers answered the question "*In what stages of the process do you consider climate change? Please check all that apply.*" In the questionnaire aimed at ILFPs, the question read "*In what stages of the process relating to project design/approval/implementation do you consider climate change? Please check all that apply.*" Including the respondents who did not answer the question, the total positive response was between 50 and 60%. ILFP providers were slightly more likely than bank providers to say they considered climate.

> [f]unded projects must demonstrate a high likelihood of success through a sound restoration, creation or establishment and/or enhancement concept and project planning . . . Projects are more likely to be successful if they are planned and designed to be resilient in the face of anticipated land-use change and climate change.[43]

Providers may also incorporate climate change into site selection by seeking to support overlying regional goals. For example, some ILFPs prioritize "projects that assist in the attainment of local or regional goals (*e.g.*, floodplain management, habitat conservation plans, species recovery plans)."[44] ILFPs may, inferentially, incorporate climate change in site selection when the programs prioritize projects that help achieve regional or local goals addressing climate change-related impacts.

Selection of sites with consideration of specific climate effects

Understanding current and projected climatic conditions within a specific service area or watershed can allow providers, IRTs, and the Corps to plan for and better ensure sites selected for compensatory mitigation can adapt to changing environmental conditions. One national banking group reported that, depending on the general location where they are offsetting impacts, factors such as sea-level rise and floodplain inundation frequency are considered in site selection. Another national banking program explained it evaluates risks to sites by, in part, analyzing flood frequency based on current trends. In their questionnaire responses and conversations with ELI, many providers explained they use documents like hazard mitigation plans, climate adaptation plans, state climate resiliency plans, and flood control plans in the site selection process and project development more generally. While not completely predictive, these providers use available data to understand what future conditions might affect a site.

One Corps official from a district with coastlines susceptible to sea-level rise explained that their district is requiring SLR modeling for new mitigation projects.

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[43] Montana Statewide In-Lieu Fee Program. (May 2020) MARS *Compensation Planning Framework, Prioritization Strategy*. p. 64. a*vailable at:* https://ribits.ops.usace.army.mil/ords/f?p=107:0:16864642703468:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,102377.

[44] Colorado Western Slope In-Lieu Fee Program. (May 2020) *Compensation Planning Framework,* p. 55; *see also* Sunflower Land Trust (2017, Approved 2018) *Compensation Planning Framework*, p. 30 ("to the extent possible, the [Trust] will coordinate ILF site selection with federal, state, local and tribal agencies and local aquatic resource management and regulatory authorities . . . to address watershed goals and objectives specific to the area).

Some providers evaluate site suitability beyond the minimum anticipated changes to ensure the longevity of the site. For example, the Evergreen Rio Swamp Mitigation Bank has been sited higher than the modeled SLR predictions:

> The proposed ecological uplift to the site through mitigation measures proposed will serve to improve and augment existing functions and values and ensure the preservation of these wetlands. The proposed habitat improvement measures incorporated herein will contribute to the Eastern tiger salamander (Ambystoma t. tigrinum) work being done regionally by the Conserve Wildlife Foundation of New Jersey and the New Jersey Division of Fish and Wildlife. Additionally, these habitat improvements will contribute to the overall success of the Cope's gray treefrogs (Hyla chrysoscelis) utilizing the site. **CWF and DFW are mitigating for potential, regional vernal pool losses from climate change by constructing new vernal pools along the Cape May Peninsula that are greater than 3 meters above sea-level. The proposed Bank site exists landward and higher in elevation than modeled sea-level change and therefore the Rio Grande Swamp Mitigation Bank is of paramount importance to contributing to existing conservation strategies for vernal pool species along the Cape May Peninsula.**[45] [emphasis added].

Prioritization of connected and resilient landscapes

Some providers noted they consider climate in site selection through a more comprehensive approach. By prioritizing sites for connected landscapes,[46] some providers seek to develop sites (and the connected systems more broadly) that are more likely to be resilient to environmental disturbances. Connected landscapes have other benefits as well, such as providing corridors for wildlife. This prioritization is characteristic of the 2008 Rule's watershed approach because, by developing sites with an eye toward connected systems and landscapes, providers can "make decisions that support the sustainability or improvement of aquatic resources in a [given] watershed."[47]

Great Land Trust, an ILFP operating in Alaska, utilizes parcel prioritization schemes to rank sites for preservation. There are different schemes for the program's two service

[45] Evergreen Environmental, LLC. (June 2018) *Evergreen Rio Grande Swamp Mitigation Bank Mitigation Banking Instrument*. p. C-14.
[46] Connected landscapes are connected parts of wetlands and other natural landscapes, in contrast to small and isolated parcels of undeveloped land. Connected landscapes help to facilitate the movement of various flora and fauna, helping to enable natural processes of resilience and adaptation.
[47] 33 C.F.R. § 332.2.

areas—the Matanuska-Susitna Borough and the Municipality of Anchorage—which account for variation based on the locality and wetland types in the area. Great Land Trust relies on best available science to inform the schemes for both service areas and the prioritization criteria were vetted by a committee with representatives from the U.S. Fish and Wildlife Service, EPA, Great Land Trust, and members from the relevant local government.[48] In their prioritization scheme for site selection, Great Land Trust explained they also prioritize parcels that are adjacent to other protected areas or specific wetland or habitat types. This program has used this scheme to create a "hub-and-spoke" approach for many of their sites.

The Nature Conservancy (TNC) has created the Resilient Land Mapping Tool in response to declining biodiversity and negative effects of climate change to map the network of conservation sites across the United States (and parts of southern Canada) that consider resilience, connectivity, and biodiversity value. Designed to account for changing climate conditions, this tool can be used to aid in decision-making that accounts for those conditions. The tool can be set to display resilient sites, connectivity and climate flow (both continuous and categorical), recognized biodiversity value, and a simple network of resilient and connected sites.[49] (*See* VARTF case study below). The Resilient Land Mapping tool was created to help non-profits, communities, and policymakers to understand TNC's "Resilient Sites for Terrestrial Conservation in Eastern North America" report, which "identifie[s] [sites] across all geographic settings that have land characteristics (landscape diversity and local connectedness) that increase resilience to climate change."[50]

TNC has also developed a "Resilient Sites for Terrestrial Conservation in Eastern North America" project, which in part, articulates a site's "resilience score:"

[48] Great Land Trust. (2011) *Compensation Planning Framework Municipality of Anchorage Service Area*, pp. 26–28; Great Land Trust. (2011) *Compensation Planning Framework Matanuska Susitna Borough Service Area*, pp. 27–28.
[49] For more information, see PNAS article: Anderson, Mark, et al. (February 6, 2023) "A resilient and connected network of sites to sustain biodiversity under a changing climate," *PNAS,* vol. 120, No.7. *available at:* https://www.pnas.org/doi/10.1073/pnas.2204434119.
[50] The Nature Conservancy. (N.d.) Blurb for "Resilient Sites for Terrestrial Conservation in Eastern North America," *available at*: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/resilience/Pages/default.aspx.

> [an estimation of a site's] capacity to maintain species diversity and ecological function as the climate changes. It was determined by evaluating and quantifying physical characteristics that foster resilience, particularly the site's landscape diversity and local connectedness. The score is calculated within ecoregions based on all cells of the same geophysical setting and is described on a relative basis as above or below the average.[51]

Providers, like the Massachusetts Department of Fish & Game ILFP (MA DFG ILFP), can utilize these tools to integrate climate resiliency in site selection. For example, the MA DFG ILFP explains in one project mitigation plan that the given parcel was selected, in part, because it earned an "above average resiliency" score under the TNC scoring criteria.[52]

One banking group operating in the Southeastern U.S. noted they propose sites with the aim of creating corridors between populations of specific species to benefit animal and gene pool connectivity.[53]

Virginia Aquatic Resources Trust Fund Case Study

In March 2021, the Virginia Aquatic Resources Trust Fund (VARTF), operated by The Nature Conservancy (TNC), finalized an amended program instrument that included a revised CPF. The CPF supports VARTF's overall programmatic goal of "provid[ing] the best possible compensation projects in terms of both acreage and function at ecologically significant locations."[54] The CPF lays out the Mitigation Priority Area Conservation Tool (M-PACT), an approach to identify and assess potential project sites of high conservation value. Relying on a GIS-based analysis of priority lands and waters, science, and Virginia's priorities for land conservation, M-PACT uses a tiered approach to identify high-priority project sites while also identifying other project sites that can be used when flexibility is needed.[55]

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[51] The Nature Conservancy. (2016) "Resilient Sites for Terrestrial Conservation in Eastern North America," *available at*: https://easterndivision.s3.amazonaws.com/Resilient_Sites_for_Terrestrial_Conservation.pdf, pg. 5 (citing the Resilience Mapping Tool, which defines "resilience scores" at https://www.maps.tnc.org/resilientland/coreConcepts_resScore.html).
[52] MA ILFP (December 16, 2020). *Town Farm Road Preservation: MA ILFP Project #IL04*. p. 4.
[53] To note, guidance on ESA compensatory mitigation contains programmatic approaches that may seek to promote habitat connectivity.
[54] The Nature Conservancy. (March 2021) *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund*. p. 12. a*vailable at:* https://www.nature.org/content/dam/tnc/nature/en/documents/VARTF-CPF-March2021_Final.pdf.
[55] *Id*. at p. 7.

TNC utilizes a science-based, conservation framework called *Conservation by Design* to guide their conservation work by setting priorities for the landscapes that will be targeted for conservation. *Conservation by Design* helps TNC and its partners identify which lands and waters to conserve and what conservation practices to use. VARTF used the *Conservation by Design* planning process for some elements of its CPF.[56]

VARTF's CPF identifies both Tier 1 and Tier 2 priority conservation areas within each of Virginia's 14 Geographic Service Areas: Atlantic Ocean, Chesapeake Bay, Chowan River, Lower James River, Middle James River, Upper James River, York River, Potomac River, Shenandoah River, Rappahannock River, New River, Roanoke River, Tennessee River, and Big Sandy River.

Tier 1 Priority Areas are identified by TNC as "Resilient and Connected Systems, which are areas that will maintain function in the face of climate change, support biodiversity, and conserve critical habitats."[57] These areas are selected because their "geophysical variability and local connectedness" can accommodate potential shifts by species or communities as a result of climate stressors.[58] As an example, "Resilient Freshwater Systems" are waterways with "extensive longitudinal connectivity linking tributaries of many sizes, gradients, and temperatures, good lateral connectivity linking them to their floodplain, and relatively unaltered natural flows within a permeable watershed."[59] These characteristics can help to ensure a diversity of environments that are suitable for habitat migration, clean water delivery to the channel, and storage capacity for water, nutrients, and sediment on the floodplain.[60]

Tier 2 Priority Areas—used when projects cannot be identified in the Tier 1 Priority Areas—include lands and waters identified in the ConserveVirginia map.[61] ConserveVirginia is an effort of the Commonwealth of Virginia to identify and prioritize areas across multiple conservation goals. The ConserveVirginia map is a tool to develop conservation strategies that use data inputs from seven categories "that each represent an overarching conservation value"—Agriculture and Forestry, Natural Habitat

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[56] The Nature Conservancy. (March 2021) *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund: Appendix 2. Details on TNC's Conservation by Design Process, Regional Resilient and Connected Systems, and Focal Landscapes*. p. 81. *available at:* https://www.nature.org/content/dam/tnc/nature/en/documents/VARTF-CPF-March2021_Final.pdf.

[57] *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund*. p. 4.

[58] *Id*. at p. 18.

[59] TNC Conservation Gateway. (2018) "Freshwater Resilience." *available at:* https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/freshwater/fwresilience/Pages/default.aspx.

[60] *Id*., *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund: Appendix 2. Details on TNC's Conservation by Design Process, Regional Resilient and Connected Systems, and Focal Landscapes*. p. 84.

[61] *The Nature Conservancy's Watershed Approach to Compensation Planning for the Virginia Aquatic Resources Trust Fund*. p. 17.

and Ecosystem Diversity, Floodplains and Flooding Resilience, Cultural and Historic Preservation, Scenic Preservation, Protected Landscape Resilience, and Water Quality Improvement—to identify "high value lands and conservation sites across [Virginia]."[62]

Compensation Planning Frameworks

Under the 2008 Rule, ILFPs with an approved instrument must include a CPF that "must support a watershed approach to compensatory mitigation."[63] CPFs provide a structured process that directs the selection, securement, and implementation of "aquatic resource restoration, establishment, enhancement, and/or preservation activities."[64] There are eleven required elements of a CPF, which include: 1) the geographic service area(s); 2) a description of the threats to aquatic resources in the service area(s); 3) an analysis of historic aquatic resource loss in the service area(s); 4) an analysis of current aquatic resource conditions in the service area; 5) a statement of aquatic resource goals and objectives for each service area; 6) a prioritization strategy for selecting and implementing compensatory mitigation activities; 7) an explanation of how preservation objectives satisfy the criteria for use of preservation, as applicable; 8) a description of any public and private stakeholder involvement in plan development; 9) a description of the long-term protection and management activities conducted by the program sponsor; 10) a strategy for periodic evaluation and reporting on program success and CPF revision, as necessary; and 11) any other information the district engineer deems necessary."[65]

Aquatic Resource Threats, Current Conditions, and Aquatic Resource Goals and Objectives

The 2008 Rule's requirement that CPFs must describe aquatic resource goals and objectives for each program service area may serve as one viable avenue through which ILFPs may plan for changing climatic conditions, even if the precise changes or effects are uncertain. Committing to broader goals that account for changing climatic conditions may help programs implement specific projects that protect aquatic resources against the effects of climate change.

For example, in describing the ongoing threats to its Program Area, the NFWF ILFP has specifically identified climate change as one of the Program Area's current conditions. To counterbalance this condition, NFWF ILFP has developed aquatic resource goals and objectives. NWFW ILFP describes in its CPF that, while the precise effects of climate change are uncertain, certain variables are expected to impact the aquatic

[62] *Id*. at p. 7, 21.
[63] 33 C.F.R. § 332.8(c)(1).
[64] *Id*.
[65] 33 C.F.R. § 332.8(c)(2).

resources in its Program Area and Northern California habitats more generally—namely, increased temperature, changing precipitation levels, and sea-level rise. Warmer conditions and changes in precipitation levels may result in "less water availability for wetlands and the species that depend on them" and "a need for increased flood protection and significant groundwater demands."[66]

To address these current conditions and threats, the NFWF ILFP's

> goals and objectives will focus on aiding in the implementation of ILF Projects that will minimize the impacts to aquatic resources from climate change to the maximum extent practicable. These may include developing projects that address goals defined in the Interior Department's High Priority Goals for Climate and the National Marine Fisheries Central Valley Salmonid Recovery Plan or other similar documents.[67]

Prioritization Strategy

The 2008 Rule does not prescribe certain requirements for prioritization strategies but does list several factors the Corps must consider generally for site selection.[68] As a result, the level of detail seen in prioritization strategies across programs can vary significantly. An approach that several ILFPs employ to satisfy this requirement, however, involves creating scoring criteria aligned with the 2008 Rule's site selection requirements using both qualitative and quantitative variables. This can help sponsors identify and prioritize sites that are suitable to the program's objectives and needs.

The Maine Natural Resources Conservation Program ILFP, for example, has included climate considerations in its scoring criteria to determine which projects are funded. Out of a total of 100 possible points, potential sites can earn up to 10 possible points under the heading of "climate change and habitat resiliency." This section of the scoring criteria reads:

> **6. Climate Change and Habitat Resiliency: 0 – 10**
> Assesses the extent to which the project will be resilient to the effects of climate change and/or help to mitigate the potential impacts of climate change in the future. Considerations include:

[66] National Fish and Wildlife Foundation (2014, Amended 2021) *Exhibit D: Compensation Planning Framework*. p. 25. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:930989855997:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,99658.
[67] *Id*. at p. 26.
[68] 33 C.F.R. § 332.3(d)(1).

- The project site demonstrates resiliency to the expected impacts of climate change, particularly the ability to maintain species diversity and ecological function. Consider the site's landscape diversity, microclimates, local connectedness, and presence of under represented habitats that support biodiversity.
- The site provides opportunity for salt marsh migration resulting from sea level rise.
- The project area provides habitat, or improves habitat conditions, for species that are particularly vulnerable to climate change.
- For restoration/enhancement projects, proposed activities will increase carbon sequestration and/or storage, increase the ability of the site to capture and filter stormwater, or provide other solutions to reduce the effects of climate change.[69]

Climate change considerations are also included in the environmental justice and equity section of this program's scoring criteria. Sites can earn up to five points in this category:

7. Environmental Justice and Equity: 0 – 5
Assesses the extent to which the project addresses environmental justice and equity concerns. Considerations include:

- The applicant is a member of a socially or economically disadvantaged community or represents an under-resourced community.
- The project site is within or adjacent to land managed by Indigenous tribes in Maine and/or the project will provide access for Indigenous tribes for cultural uses.
- The project site is in close proximity to socially vulnerable or underserved communities, including those that have historically borne disproportionate impacts of commercial and industrial development.
- The project site is identified in screening tools (*e.g.*, Climate and Economic Justice Screening Tool, Neighborhoods at Risk, Social Vulnerability Index, EPA EJScreen) as being located within a disadvantaged community that is subject to environmental, climate, health, or other socioeconomic burdens.
- The project will ***benefit*** any of the disadvantaged, underserved, or vulnerable communities identified above,

[69] Maine Natural Resources Conservation Program. (May 15, 2024) MNRCP *Scoring Criteria*. p. 3. *available at: https://www.mnrcp.org/sites/default/files/MNRCP%20Revised%20Scoring_051524_final.pdf*.

regardless of the project's location within these communities (*e.g.*, land protection in the Sebago Lake watershed may not be located in a disadvantaged community but may benefit disadvantaged communities in Portland that utilize drinking water from the lake).

- **The project improves the climate change resiliency of the surrounding community (*e.g.*, reduced flooding, improved emergency vehicle access)**.[70] [emphasis added].

Project Design

The 2008 Rule requires project sponsors or responsible parties to design mitigation projects that are self-sustaining, to the maximum extent practicable, once the project achieves its performance standards.[71] Project developers can achieve a self-sustaining project through appropriate siting and minimal use of active engineering features, such as pumps.[72] At the same time, a project's long-term sustainability might require active management and maintenance mechanisms, like prescribed burning or invasive species control, which are permissible under the 2008 Rule.[73]

The project design includes all the elements of the work to be completed on-site to achieve the stated objectives and proposed outcomes of the mitigation project. The 2008 Rule requires each mitigation plan to describe "the resource type(s) and amount(s) that will be provided, the method of compensation . . . , and the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed, ecoregion, physiographic province, or other geographic area of interest."[74] Some providers may identify needs related to climate change resiliency as a resource function of a given project, such as the need(s) to improve flood resiliency of local communities.[75] The 2008 Rule also requires that the mitigation plan include, among other components, a description of baseline conditions and the mitigation work plan.

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[70] *Id.*
[71] 33 C.F.R. § 332.7(b) (2008).
[72] 33 C.F.R. § 332.7(b) (2008).
[73] 33 C.F.R. § 332.8(a)(2) (2008).
[74] 33 C.F.R. § 332.4(c)(2) (2008).
[75] *See e.g.,* Big Thompson Confluence Mitigation Bank, Weld County, Colorado. (2020) *Mitigation Banking Instrument Amendment 1, available at:* https://ribits.ops.usace.army.mil/ords/f?p=107:0:14397862891065:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,86124 (stating that an objective of this bank is to improve flood resiliency of local communities).

> Baseline information: "A description of the ecological characteristics of the proposed compensatory mitigation project site and, in the case of an application for a DA permit, the impact site. This may include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a map showing the locations of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other site characteristics appropriate to the type of resource proposed as compensation. The baseline information should also include a delineation of waters of the United States on the proposed compensatory mitigation project site. A prospective permittee planning to secure credits from an approved mitigation bank or in-lieu fee program only needs to provide baseline information about the impact site, not the mitigation bank or in-lieu fee project site."[76]
>
> Mitigation work plans include written specification of, among others, "construction methods, timing, and sequence; source(s) of water, including connections to existing waters and uplands; methods for establishing the desired plant community; plans to control invasive plant species; the proposed grading plan, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream compensatory mitigation projects, the mitigation work plan may also include other relevant information, such as planform geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian area plantings."[77]

For the site to be sustainable over time, both baseline information and project design should consider anticipated future conditions and the probable effects of climate change. For example, though many programs examine historic temperature and precipitation records as part of their examination of baseline conditions or site suitability, baseline monitoring conducted under today's "normal" conditions may not be as instructive in a future climate that is significantly wetter or dryer than today's baseline. Looking to the future as well as the past could best inform the design of resilient sites.

Providers reported they incorporate climate in project design in ways that generally parallel how providers incorporate climate considerations in site selection. In response to the questionnaire prompt about what stages climate considerations were

[76] 33 C.F.R. § 332.4(c)(5) (2008).
[77] 33 C.F.R. § 332.4(c)(7) (2008).

incorporated, 70% of providers indicated they consider climate in project design.[78] Some providers gave examples, discussed in the analysis below, but few were specific about how climate was incorporated at this stage. Members of the Agencies also explained to ELI that they frequently ask providers about how climate is being incorporated into various project design aspects. As with site selection, providers noted that climate was discussed and incorporated in more implicit ways.

Explicit examples of the incorporation of climate into site design were less common in this research, which may be attributable in part to reliance on standard site design protocols, difficulty in finding good climate data to inform site design, and lack of guidance.

For project design, research and conversations with providers revealed themes for integrating climate, including designing for future conditions and resiliency and reframing conversations on invasive/non-native species management.

Designing for anticipated future conditions and resiliency

Many providers shared that they consult hazard mitigation plans, climate adaptation plans, state climate resiliency plans, flood control plans, and similar documents that identify current risks and vulnerabilities and identify possible future conditions at a site. Providers also explained they use a mix of observed and predicted changes to design compensation sites with climate change in mind. By incorporating climate considerations in this way, providers may be accounting for the effects of climate change in a comparable manner (*i.e.*, not explicitly discussing climate change or climate data in the instrument or CPF but rather through design or analysis that itself anticipates and controls for the effects of potential climate scenarios).

For example, one representative from a national environmental engineering firm explained the firm designs sites for increased flow in areas with increasing precipitation, or where increased precipitation is predicted. The firm uses nested channels and widened streams to ensure its sites are more resilient and capable of controlling additional flow.

Some bank instruments generally acknowledge expected change or variability (even if climate change is not explicitly mentioned). This can allow providers to anticipate different conditions even if the exact changes are still unclear. The Canton Creek Stream and Wetland Mitigation Bank notes in its “baseline conditions” section that the original data collected may not be appropriate for application to long-term trends:

[78] In this case, including the respondents who did not answer the question, the total positive response was between 55 and 60%.

> [i]t should be noted that data collected from the flow meters was obtained over a two year timeframe. This data, although applicable to the timeframe in which it was collected, may not be appropriate for application to long term trends (such as recurrence intervals of bankfull discharge). Additionally, three storm events that equate to greater than 5, 10 to 50 and 500 year recurrence events were documented within this two year timeframe. These extreme storm events in addition to the varied total monthly rainfall extremes (both excessive rain as well as drought conditions) appears to lend credence to the theory that climate change may affect the amount, duration and intensity of precipitation events.[79]

Providers and IRT members both noted in their feedback that selecting proper plant species can be an important part of ensuring a given site's resiliency. One mitigation banking group considers the observed and predicted migration of plants and then designs sites using the plants that are moving into the area from other parts of the state. One ILFP in the Northeast reported it selects plant species that can withstand greater changes in temperature and precipitation. An IRT member from the Midwest indicated they account for climate in terms of diversity of species and plantings.

Reconsidering conventions around non-native or invasive species

Many providers discussed the need to rethink conventional attitudes about the encroachment of non-native species onto a site. These providers noted that plant populations are shifting and migrating, and the species that have historically occupied a site may no longer be well suited to that environment or may have to compete with other species. Often, these factors affect the entire landscape in an area, not just individual mitigation sites.

Providers are considering how to address this issue. Multiple providers, as well as IRT members, advocated shifting focus from limiting non-natives to limiting undesirable species. One ILFP noted that shifting focus to undesirable species would help mitigate disagreements that sometimes arise regarding the percentage of native species cover.

A regional EPA member helped to illustrate this issue within the context of phragmites. The IRT received a prospectus for a coastal marsh restoration project, which was 50% degraded coastal marsh and 50% healthy salt marsh. The site supported an abundant phragmites population, including in the healthy salt marsh. The individual with whom ELI spoke raised questions about whether the provider's proposal to remove phragmites, an

[79] Meadwestvaco Caton Creek, LLC. (December 21, 2017) *Caton Creek Stream and Wetland Mitigation Bank Instrument.* p. 21.

invasive species, was the best restoration approach given the species' current and potential function in the ecosystem.

Monitoring and Performance Standards

The 2008 Rule requires that approved mitigation plans include measures, or "performance standards," against which the success of a compensatory mitigation project will be objectively evaluated.[80] Performance standards are "observable or measurable physical (including hydrological), chemical and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives."[81] These standards must be described in approved mitigation plans and are used by the Corps, in consultation with the IRT, to determine a variety of compensatory mitigation project components, such as the length of the project's monitoring period,[82] the required amount and duration of financial assurances,[83] and release of credits for ILFP and mitigation bank sites.[84]

Though ecological performance standards must be based on the "best available science that can be measured or assessed in a practicable manner," the Corps and IRT maintain flexibility to determine standards that are appropriate to the given project site depending on "aquatic resource type, geographic location, and compensation method."[85] In general, performance standards are considered on a project-by-project basis. However, various science-based and measurable performance standards are beginning to be developed for various project characteristics or types of aquatic resources across the country. These new methodologies aim "to clarify expectations and provide mitigation providers with clear guidance on what is expected of a mitigation project."[86]

To determine whether projects are achieving performance standards, the project sites must be monitored. Project sponsors must detail in mitigation plans the "parameters to be monitored, the length of the monitoring period, the party responsible for conducting the monitoring, the frequency of submitting monitoring reports to the district engineer, and the party responsible for submitting those reports to the district engineer."[87] The length of the monitoring period cannot be less than five years, but otherwise depends on factors such as aquatic resource development rates and the pace at which the

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[80] 33 C.F.R. § 332.4(c)(9) (2008).
[81] 33 C.F.R. § 332.2 (2008).
[82] 33 C.F.R. § 332.6(b) (2008).
[83] 33 C.F.R. §§ 332.3(n)(1), (n)(4) (2008).
[84] 33 C.F.R. § 332.8(o)(8)(iii) (2008).
[85] 73 Fed. Reg. 19,594, 19,616 (Apr. 10, 2008).
[86] *See generally* The Nature Conservancy (2016). *Aligning Stream Mitigation Policy with Science and Practices, available at:* https://www.eli.org/sites/default/files/docs/wetlands/tnc_aligningstreamsmitigationpolicy.pdf.
[87] 33 C.F.R. § 332.6(a) (2008).

project is meeting its performance standards.[88] The governing instrument must prescribe the manner in which the project sponsor must submit monitoring reports to the district engineer.[89] The specific contents of the monitoring report will be determined by the district engineer but, in any event, must include information "sufficient for the district engineer to determine how the compensatory mitigation project is progressing toward meeting its performance standards."[90] Failure to meet performance standards and/or conduct monitoring as required under the instrument may result in compliance action up to and including site closure. Often, when sites do not meet performance standards, the provider must, in consultation with the IRT, implement corrective actions (or adaptive management).

ELI did not ask specifically about the incorporation of climate in performance standards or monitoring in the questionnaires or as part of initial engagement with providers. However, this topic later arose in conversations with providers. General recommendations were offered about how to: 1) increase flexibility (or adaptability) in performance standards; 2) best incorporate data into performance standards; and 3) monitor the status of sites with consideration to broader conditions. One banking group explained that incorporating climate change into performance standards would require that the standards go above and beyond current standards, as they will need to account for greater variability and harsher extremes.

Flexibility in performance standards

Providers frequently noted that more traditional performance metrics emphasize stability over time and do not necessarily capture dynamic natural processes that may be better able to address site resiliency over time. One provider specifically submitted that performance objectives drafted with a focus on optimal, historical hydrologic and floristic conditions may not favor the full range of potential future conditions required for sustainability. Providers suggested performance standards and monitoring requirements that incorporate flexibility or contemplate changing conditions may better account for climate change.

For example, the C & W Hunter Mitigation Bank has developed performance standards that include measures for evaluating groundwater hydrology

[88] 33 C.F.R. § 332.6(b) (2008).
[89] 33 C.F.R. § 332.6(c)(2) (2008).
[90] 33 C.F.R. § 332.6(c)(1) (2008).

> that will be determined by the monitoring of groundwater monitoring wells and saturation. Wetland credits available for sale will be limited to areas at or below the elevation of the highest area with confirmed wetland hydrology in normal rainfall years. When drought conditions exist (D2 through D4 according to the USDA's drought monitor map located at https://droughtmonitor.unl.edu/) during the majority of a growing season, the IRT may consider releasing credits when hydrology has not been met (D0 and D1 will not be considered drought conditions). Drought exception will not be considered during the first full growing season and will only be considered after hydrology has been documented.[91]

An ILFP in New England uses qualitative rather than quantitative targets (or a range of quantitative targets) when a project's characteristics make it susceptible to climate change (*e.g.,* salt marshes facing sea-level rise). Drafting performance standards that establish a range of qualitative and quantitative targets may allow providers to develop better expectations of reaching success under a range of climate scenarios.

Performance standards may also contemplate specific types of changing climate conditions, even if not expressly stated. For example, the Great Pee Dee Mitigation Bank's performance standards allow for changes to the vegetation community due to increased hydrology. The performance standards section of the Bank's instrument reads:

> The wetland performance standards . . . have been created for each wetland mitigation unit using the degree of existing impairment documented during baseline data collection. When measuring performance of vegetation, desirable volunteer species will be factored into target density. Changes in the vegetation community, such as a transition to more water tolerant species due to increased hydrology, will not be considered an indication of vegetative failure.[92]

[91] C&W Hunter Mitigation Bank. (2020) *Mitigation Bank Instrument*, pg. 8. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:16444487632499:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,78619.

[92] Pee Dee Wetland and Stream Mitigation, LLC. (January 13, 2021) *Great Pee Dee Mitigation Bank Final Mitigation Banking Instrument.* p. 63.

Alternative Endpoints

Alternative Endpoint:

"If the goals of the mitigation are fulfilled, there is the potential for regulators to use alternative endpoints and other indicators of function to allow for shifts in the restored stream when those shifts result in similar or greater functional benefit."

Expanding Monitoring and Performance to Dynamic Alluvial Valleys

One possible approach to flexible evaluation of site performance is detailed in the proceedings from a 2023 workshop on expanding monitoring and performance to dynamic stream systems.[93] The approach focuses on creating at the outset a set of performance standards based on the processes and functions that the site is expected to provide and subsequently identifying a set of acceptable (*i.e.*, functions are indicated with the same or different metrics) and unacceptable (*i.e.*, functions are not provided) alternative endpoints and corresponding monitoring strategies and corrective actions. Although developed in the context of creating tools for monitoring and evaluating the performance of dynamic alluvial valleys, this approach could be applicable in other situations where flexibility may be required to address changing conditions on site (*e.g.*, beaver dam activity or climate change). This kind of language can help set clear expectations for the IRT and the provider and alleviate strain on decision-making under changing conditions later in the monitoring period. Table 3, below, is an example framework of alternative endpoints.

[93] Leberg, Samuel. (August 2023) *Expanding Monitoring and Performance to Dynamic Alluvial Valleys [draft report]*, *found in: Pre-Conference Workshop at the National Stream Restoration Conference,* p. 120. *available at:* https://static1.squarespace.com/static/5d2a47a81204020001911ef1/t/653183513bad63385a646e26/1697743891563/new_NSRC_epa_monitoring_workshop_report.pdf.

Table 3. *An example framework for a theoretical stream mitigation project with both expected and alternative endpoints.*

<table>
<tr><th rowspan="2">Expected Process or Function and Indicator</th><th rowspan="2">Expected/designed Endpoint</th><th colspan="2">Alternative Endpoints</th></tr>
<tr><th>Acceptable Endpoints</th><th>Unacceptable endpoints</th></tr>
<tr><td rowspan="3">Extensive Lateral and Vertical Connectivity Vegetative Community</td><td rowspan="3">Wet meadow: Performance standards include aerial dominance by herbaceous species and presence of hydrophytic vegetation, with limits on invasive species coverage. If floodplain is inundated (i.e., regular overtopping flows) for extended periods during monitoring, percent coverage by herbaceous species may be reduced.</td><td>Riparian forested wetlands: Performance standards include hydrophytic vegetation and typical tree metrics (e.g., minimum woody stems per acre, species diversity and composition, growth or size and nonnative species limits). Wetland species are represented.</td><td rowspan="2">Upland community: Community is dominated by upland species. Hydrophytic and wetland species are not present or are minimally represented, indicating that the site is not connected vertically.</td></tr>
<tr><td>Scrub-shrub: Performance standards include presence of hydrophytic vegetation and typical shrub metrics (e.g., minimum stems per acre, species diversity and composition and nonnative species limits). Wetland species are represented.</td></tr>
<tr><td>Vegetation managed by beaver: Performance standards include the presence or dominance of hydrophytic vegetation. Floodplain is likely to be inundated for extensive periods, reducing shrub and woody vegetation coverage. Wetland species are represented.</td><td>Minimal or bare community: Soil bare in many areas with fresh deposition or erosion across the site. Suggests that design failures (e.g., boundary stresses, bank heights, soil compaction, etc.) are limiting vegetation establishment and the site is not appropriately connected laterally or vertically.</td></tr>
</table>

In a similar example, one provider details in its banking instrument that

> alternative criteria may be [proposed] after several monitoring events if actual onsite data indicate that such criteria provide a better assessment of the ecological goals and outcomes upon which credit was assessed. In particular, data from the relatively intact wet prairie assessment areas can serve as a reference to help determine appropriate species richness, density, structure or composition of other wet prairie areas.[94]

[94] Mitigation Resources, L.L.C. (2018) *Mitigation Banking Instrument, Bear Creek Mitigation Bank*, *Appendix F* p. 3. a*vailable at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:11684312464921:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,54873.

Agreeing on alternative endpoints at the beginning of the project can ensure that the necessary monitoring data is collected that can inform performance evaluation and the development of adaptive management strategies when the site does not achieve expected endpoints. As discussed in the 2023 workshop proceedings, this kind of "regulatory flexibility" does not "preclude important jurisdictional, crediting, and procedural concerns."[95] Alternative metrics and endpoints may be used when a site does not reach the expected outcome but is the result of natural processes, is fulfilling project goals, is not at risk of failure, and demonstrates similar or greater functional benefit for the watershed. Establishing acceptable and agreed-upon alternative endpoints at the outset of a given project may pay dividends if and when those indicators might need to be used in the future.

Best data in performance standards

The requirement that ecological performance standards be supported by the best available science does not foreclose providers' ability to incorporate flexible standards to account for expected landscape and climatic variability. On the contrary, "best available science" is not fixed in time: it evolves, incorporating the most up-to-date scientific consensus as it develops. To employ the best available science is to acknowledge that flexibility and adaptability are likely required. For example, the 2008 Rule provides that using "reference aquatic resources to establish performance standards will help ensure that those performance standards are reasonably achievable, by reflecting the range of variability exhibited by the regional class of aquatic resources *as a result of natural processes and anthropogenic disturbances*."[96] Especially for wetlands, performance standards based on hydrology measurements "should take into consideration the hydrologic variability exhibited by reference aquatic resources."[97]

As with the integration of climate considerations into other aspects of the mitigation process, providers also noted the importance and challenge of finding and incorporating the best available data and using multiple sources of data. The Caton Creek Stream and Wetland Mitigation Bank Instrument includes provisions that require data incorporation into site baseline information, performance standards, monitoring, and credit determination. This bank instrument expressed skepticism over some of the initial data used; however, the instrument includes language that allows the IRT, Corps, and

[95] Leberg, Samuel. (August 2023) Expanding Monitoring and Performance to Dynamic Alluvial Valleys *[presentation]*, *found in: Pre-Confrence Workshop at the National Stream Restoration Conference,* p.5. *available at:* https://static1.squarespace.com/static/5d2a47a81204020001911ef1/t/653183513bad63385a646e26/1697743891563/new_NSRC_epa_monitoring_workshop_report.pdf.
[96] 33 C.F.R. § 332.5(b) (2008) (emphasis added).
[97] *Id*.

bank to gauge the appropriateness of the performance standards established with that data.

> Although the two years of data collection provides useful information, it is a small sample size and could potentially lead to a determination of performance standards that do [not] match realities associated with historic norms or changing climate trends. Data will continue to be collected on Caton Creek to assist in determining if restored and enhanced wetlands are meeting performance standards, however data will also be collected for flows and floodplain interactions of flows with wetlands on UT 11 in an effort to bolster useful information that could potentially assist the Sponsor and IRT in the case that performance standards are not me[t]. It would be anticipated that data collected along Caton Creek and UT 11 could be used to determine potential modifications in performance standards, credit potential and/or adaptive management strategies for monitoring or site modifications.[98]

Drafting instrument language that provides for the opportunity to modify performance standards where applicable and appropriate to achieve the purposes of the bank is reflective of the flexibility in the 2008 Rule's provisions governing performance standards. Using this type of language can also conceivably allow providers to set a range of performance standards that are both science-based and sufficiently pliable to address changing climatic conditions.

Monitoring sites within a broader landscape context

Monitoring determines if the site is progressing toward meeting performance standards; metrics and protocols help determine what is happening on site. When a site falls short, the provider needs to determine the cause and whether adaptive management will be needed. With a changing climate, some providers are evaluating how the site is performing in relation to other nearby wetlands to better understand if a site is performing poorly as a result of climatic conditions (*e.g.*, similar sites should be performing poorly as well) or if a site is performing poorly due to an issue with the specific site (*e.g.*, other sites of the same type in the area are doing well). At the discretion of the IRT and when normal precipitation does not occur on the site during the majority of the monitoring years, the Big Sandy Creek Mitigation Bank in Georgia will also compare monitoring data taken from the site with monitoring data taken from the

[98] *Caton Creek Stream and Wetland Mitigation Bank* Instrument. p. 69.

established reference site to determine whether the site is meeting hydrological success criteria.[99]

Credit Determination

Example of typical credit determination language:

"Mitigation credits presented in Table 14 are projections based upon site design (Figure 8). If upon Project completion, there is a large discrepancy between design and as-built conditions an updated plan will be submitted to the District for approval as a project modification. The plan will include revised credit totals and justification for the large discrepancies."

Carolina Bison Stream Mitigation Bank Instrument, p. 30

Under the 2008 Rule, "the amount of compensatory mitigation must be, to the extent practicable, sufficient to replace lost aquatic resource functions."[100] Where practicable and available, functional or condition assessment methods (or other suitable metrics) should be used to determine how much compensatory mitigation is required.[101] Where credit determination is not calculated by either a functional or condition assessment methodology (or a suitable alternative), the district engineer will minimally require a one-to-one acreage or linear foot compensation ratio.[102] The district engineer must require a ratio greater than one-to-one when necessary, which is determinant upon a variety of factors including, but not limited to, the method of compensatory mitigation, likelihood of success, and temporal losses of aquatic resource functions.[103] The number of credits produced by the compensation project—as determined by one of these suitable metrics—must capture the "difference between pre- and post-compensatory mitigation project site conditions."[104] Project instruments often include language specifying that the final determination of the number of credits generated by a site will necessarily depend on the conditions of the site. Instruments may also set forth a process through which the provider will work with the IRT if the final number of credits determined by the IRT is significantly less than the expected number of credits.[105]

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[99] Big Sandy Creek Mitigation Bank. (2019) *Final Banking Instrument*. pg.6-6 (this bank uses WETS tables for the site's encompassing county to determine normal precipitation).
[100] 33 C.F.R. § 332.3(f)(1) (2008).
[101] *Id*.
[102] *Id*.
[103] 33 C.F.R. § 332.3(f)(2) (2008).
[104] 33 C.F.R. § 332.8(o)(3) (2008).
[105] For example, the provision detailing the "Timing of Determination of Potential Credits" in the Wancopin Creek Mitigation Bank Instrument's states that "[i]f the IRT finds that application of the IRT-Approved Assessment Methodology to the [Final Mitigation Work Plan] yields fewer Credits than determined based on the [Conceptual Mitigation Work Plan], the IRT may decrease the Bank's number of Potential Credits. The Sponsor may request that the IRT reevaluate the number of Potential Credits based on the Sponsor's FMWP. If the IRT concludes that application of the assessment methodology or methodologies described in Section I above demonstrate a greater difference between pre- and post-compensatory mitigation project site conditions than was indicated at the time of MBI approval, the IRT may increase the number of Potential Credits in accordance with the findings of the updated assessment).

Providers offered very few concrete examples of how climate considerations were incorporated into credit determination. Just over 10% of respondents indicated in the questionnaires that they consider climate as part of the credit determination process.[106] However, there was extensive discussion in ELI's interviews regarding how changes to the climate could create significant uncertainty for the crediting process. This uncertainty can pose a financial risk to providers should a site fail or fail to generate the credits needed to make the site financially viable.

Providers offered several examples of how rapidly changing conditions create challenges for crediting, many of which centered on coastal areas affected by sea-level rise. This is a pressing concern, as certain landscapes are changing rapidly—especially between the time of instrument approval and submission of the final monitoring report. Examples of these changes were reported to have occurred in, among other locations, the Gulf of Mexico, New England, the Mid-Atlantic, and involved occurrences of sites turning to tidal areas that were designed to restore freshwater wetlands, tidal wetlands becoming mudflats, and upland buffer areas transitioning to salt marshes. Both providers and members of the Corps highlighted the need for science-based methods to anticipate and incorporate future conditions into crediting.

ELI's interviews offered insight into ways that providers and the Corps are addressing this uncertainty, such as incentivizing resilient design, using best available data in credit determination, and taking steps to incorporate risk.

Multiple providers and members of the Agencies noted there has been movement in the industry toward crediting based on function, which was discussed in the 2008 Rule's preamble.[107] The 2008 Rule requires that "hydrogeomorphic approach[es] to wetlands functional assessment[s] . . . or other suitable metric must be used to assess and describe the aquatic resource types that will be restored, established, enhanced, and/or preserved by the [provider]" where practicable.[108] Stream and wetland assessment methodologies used in the CWA section 404 program to assign debits and credits are being developed across the country.[109] These methodologies translate collected data from the assessed site into an ecologically meaningful value or score that in turn reflects the function (or predicted function) at the site and thus the number of debits/credits. Many methodologies combine the assessment and the accounting protocol (debit/credit calculation) into a single methodology, so it may sometimes be difficult to parse out what has been "functionally assessed" and based in science and what has resulted from

[106] In this case, including the respondents who did not answer the question, the total positive response was also around 10%.
[107] *See* 73 Fed. Reg. 19,594, 19,594 (2008) (explaining "compensatory mitigation is a critical tool in helping the federal government to meet the longstanding national goal of ''no net loss'' of wetland acreage and function" and "[w]ith this rule, we are moving towards greater reliance on functional and condition assessments to quantify credits and debits, instead of surrogates such as acres and linear feet").
[108] 33 C.F.R. § 332.8(o)(2).
[109] *See* Kihslinger, R., et al. (2019) at pp. 52–57.

an embedded policy decision (*e.g.*, as an adjustment or a ratio or assumption of function) to get at the resulting debit/credit.[110] Both the underlying science (*e.g.*, the underlying standard performance indices establishing the expected range of function for the metrics assessed) and the policy adjustments may reflect/integrate climate data.

Some methodologies, like the Stream Function Assessment Method for Oregon, are trending toward the integration of climate change in performance indices, but the availability of science/data/research at the scale/scope of assessment and decision implementation can be a barrier. Another example is the Wetland Ecosystem Services Protocol for Alaska - Southeast (WESPAK-SE) tool used by the Southeast Alaska Land Trust ILFP for assessing a wetland's functions and values in order to calculate debits and credits.[111] The WESPAK-SE

> uses assessments of weighted ecological characteristics (indicators) to generate scores for a wetland's functions and values. The number of indicators that are applied to estimate a particular wetland function or value depends on what the function or value is. The indicators are combined using mathematical formulas (models) to generate the score for each wetland function or value. The models are logic based rather than deterministic. Together they provide a profile of "what a wetland does."[112]

Notably, one of the functions/attributes that the WESPAK-SE scores is carbon sequestration, which is defined as "the effectiveness for retaining both incoming particulate and dissolved carbon and converting carbon dioxide gas to organic matter (particulate or dissolved), and then retaining that organic matter on a net annual basis for long periods while emitting little or no methane (a potent 'greenhouse gas.')."[113] The identified value of the carbon sequestration function of a wetland is to "reduce the risk of global climate warming."[114] WESPAK-SE will generate a "score" for each wetland that is then used as the input for the Corps Alaska District Credit Debit Methodology to calculate credits and debits.[115] While WESPAK-SE serves as an example of a

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[110] Personal communication with Tracie Nadeau, U.S. Environmental Protection Agency (April 1, 2024).
[111] Southeast Alaska Land Trust. (October 2022) *Southeast Alaska Land Trust In-Lieu Fee Compensatory Mitigation Program Instrument*, pp. 17–18, *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:7020016669725:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,114354 (WESPAK-SE is a functional assessment tool that has been accepted by the Corps Alaska District for use by mitigation sponsors operating in Southeast Alaska).
[112] Southeast Alaska Land Trust. (Oct. 2020) *Grummett Wetlands Property 2020 Wetland Functional Assessment and Mapping*, p. 5, *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:7020016669725:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,109619 (WESPAK-SE is "specifically customized for Southeast Alaska wetlands and has previously been tested and reviewed in Juneau and throughout the region").
[113] *Id*. at p. 8.
[114] *Id*.
[115] *Southeast Alaska Land Trust In-Lieu Fee Compensatory Mitigation Program Instrument*, at p. 18.

functional assessment methodology that accounts, in part, for wetland functions that can mediate the risks of climate change, most functional assessment methodologies do not yet give credits or assess debits specifically for integrating climate data.

Integrating climate in credit determination

Wilmington District has incentivized resilient project design by increasing credits for projects that exceed the set standards for resilient design measures (*e.g.,* including wider buffers than required). The Wilmington District's Stream and Wetland Compensatory Mitigation 2016 Guidance, prepared with the North Carolina IRT, explains that:

> The objective of the monitoring protocols included in [the stream water quality, macroinvertebrate, and fish monitoring] section is to directly measure physical, chemical and biological metrics within restored and enhanced reaches of stream channels with the intent of linking stream mitigation and functional uplift. Water quality, macroinvertebrate, and fish community monitoring included in this section is not required, but is encouraged. For those projects where this monitoring is conducted, additional credit of up to 2% may be generated for each tributary to be monitored in accordance with the protocols specified below. (The additional credit will be calculated based on the credit generated by the tributary before applying any additional credit resulting from wider buffers, BMPs or other measures.) . . . These water quality and macroinvertebrate indicators are inherently sensitive to changes that occur anywhere within the watershed draining to the mitigation project, such as land use changes, meteorological changes (droughts, storms, etc.), or pollution entering the watershed (e.g., herbicide use, fertilizer application, road runoff, etc.).[116]

This method of crediting may incentivize climate considerations in project design.

The type of credits at the site may also offer more flexibility in changing conditions. For example, a member of the Corps in Virginia noted that blended credits (*e.g.*, wetlands, uplands, etc.) are used to avoid issues of not having a single wetland type in an area for a simple one-to-one replacement.

[116] U.S. Army Corps of Engineers, Wilmington District and North Carolina Interagency Review Team. (October 24, 2016) *Wilmington District Stream and Wetland Compensatory Mitigation Update*. p. 10. *available at:* https://www.ncwetlands.org/wp-content/uploads/IRT-Stream-Wetland-Mitigation-Guidance-Document-2016.pdf.

Utilizing the best available data to build climate into final credit determination

As with other aspects of the compensatory mitigation process, providers noted the importance of using the best available data to understand how the site is responding to changing conditions. For example, the Montana Statewide ILFP used multiple sources of data to inform the final credit determination process for a wetland site that experienced extended drought during monitoring. In this case, the baseline analysis for the prairie pothole wetland site was conducted in a historically wet period and the expected number of credits was based on what turned out to be abnormally wet conditions. The site subsequently experienced drought for 4 out of 5 monitoring years. Final credit determination was expected in year 5; however, year 5 was an extreme drought year resulting in the extent of the site being much smaller than expected. The program used imagery, LiDAR, drought indices, and EPA's Antecedent Precipitation Tool[117] to determine a site boundary that could be expected in a "normal" precipitation year (see Figure 1). The drought indices confirmed levels of drought for each monitoring year. The antecedent precipitation data correlated drought index with onsite observations. This helped the Montana Statewide ILFP show the projected extent of the site in normal conditions as compared to the observed extent of the site, informing final credit determination.

[117] U.S. Environmental Protection Agency. (November 7. 2023) "The Antecedent Precipitation Tool (APT)," *available at*: https://www.epa.gov/wotus/antecedent-precipitation-tool-apt.

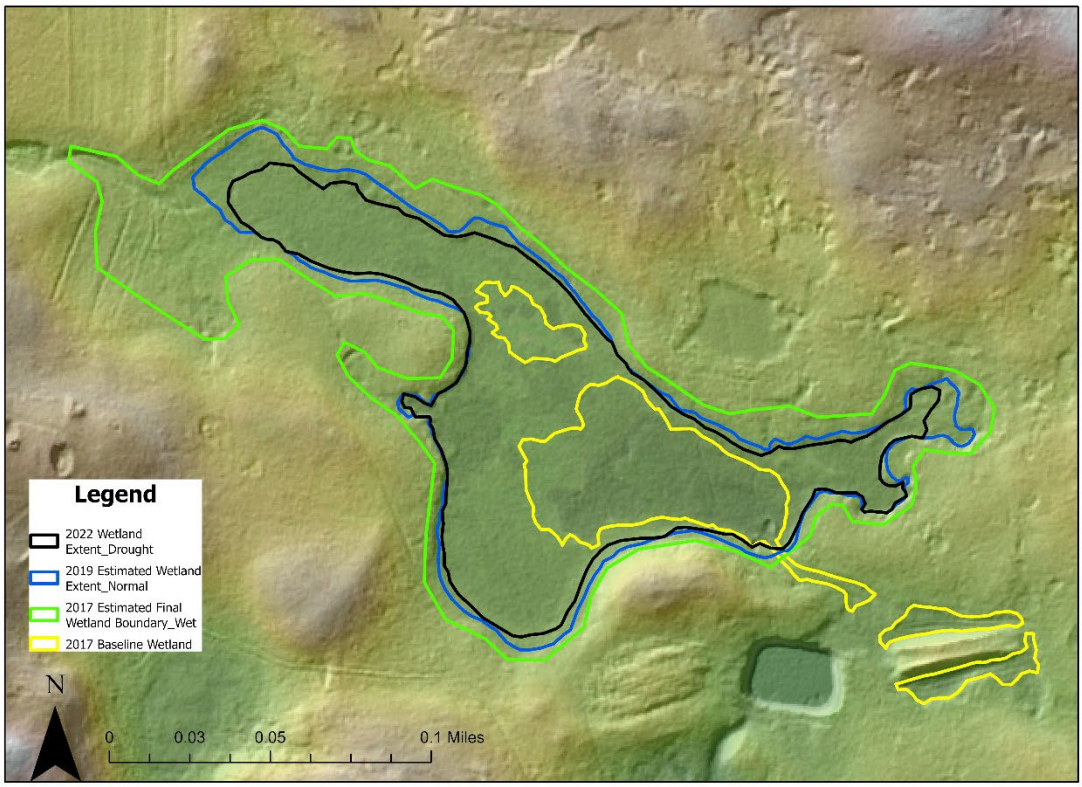

Figure 1: Image showing the extent of a prairie pothole wetland site showing baseline assessment, expected final boundary, and during drought conditions. Montana ILFP

Financial Assurances

Under the 2008 Rule, district engineers "shall require sufficient financial assurances to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with applicable performance standards."[118] The amount of financial assurance required for each project will be determined by the district engineer and provider on a fact-specific basis depending on "the size and complexity of the [] project, the degree of completion of the project at the time of project approval, the likelihood of success, the past performance of the project sponsor, and any other factors the district engineer deems appropriate."[119] In making this determination, the district engineer must also "consider the cost of providing replacement mitigation, including costs for land acquisition, planning and engineering, legal fees, mobilization,

[118] 33 C.F.R. § 332.3(n)(1) (2008).
[119] 33 C.F.R. § 332.3(n)(2) (2008).

construction, and monitoring."[120] The type of required financial assurances can take different forms—subject to the district engineer's approval—and may include "performance bonds, escrow accounts, casualty insurance, letters of credit, legislative appropriations for government sponsored projects."[121]

ELI did not ask specifically about the incorporation of climate in financial assurances in the questionnaires or as part of initial engagement with providers. However, this topic later arose in conversations with providers and document review.

Insurance Policies

While there are many options for financial assurances, as described above, some districts are increasingly seeing providers secure insurance policies as a form of financial assurance for their mitigation projects. Some providers identified insurance as a possible vehicle for long-term management. During interviews conducted throughout this research, a member of the Corps expressed a concern related to some types of insurance policies as financial assurances. This Corps member explained that many of the insurance policies they see include language limiting what types of claims can become payable. For example, many policies do not allow payouts for storms, or for Acts of God. In these instances, the insurance policies may not deliver the intended results as contemplated by the 2008 Rule to assure mitigation projects will be successfully completed because funds will not be available to remediate the damage caused by events not covered by the policies.

[120] *Id*.
[121] *Id*.

Adaptive Management

To address both foreseeable and unforeseeable changes to a site's conditions or other project components that adversely affect the project's success, providers must develop adaptative management plans that contain strategies to aid in decision-making for necessary mitigation plan revision.[122] When a given project is not progressing toward successful implementation, the district engineer, responsible party, and other appropriate agencies will refer to the adaptive management plan to determine appropriate measures. These potential measures—such as site modifications, design changes, revisions to maintenance and/or monitoring requirements—must be "designed to ensure that the modified compensatory mitigation project provides aquatic resource functions comparable to those described in the mitigation plan objectives."[123]

Example of typical adaptive management language:

"Upon completion of Project construction, RES will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring, it is determined that the Project's ability to achieve performance standards are jeopardized, RES will notify the USACE of the need to develop a Plan of Corrective Action. Once the Corrective Action Plan is prepared and finalized RES will:
1. Notify the USACE as required by the Nationwide 27 permit general conditions.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
3. Obtain other permits as necessary.
4. Prepare Corrective Action Plan for review and approval by IRT.
5. Implement the Corrective Action Plan.
6. Provide the IRT a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed."

Carolina Bison Stream Mitigation Bank Instrument, p.38

When asked if climate change was considered in developing their adaptive management plans, approximately 70% of bankers and 50% of the ILFPs responded in the affirmative.[124] Approximately 40% of bankers and just under 25% of ILFPs indicated they have already needed to implement adaptive management practices because of climate change impacts and/or natural disasters.[125] Some mitigation bank respondents discussed the use of adaptative management in response to natural disasters, such as

[122] 33 C.F.R. § 332.4(c)(12); *Appendix A: Sugar River Wetland Mitigation Bank Compensation Site Plan for Southern Wisconsin Land Conservancy*. p. 35 (defining adaptive management as "the day to day, season to season refinements in restoration programming needed to achieve success against the performance criteria").
[123] 33 C.F.R. § 332.7(c)(3).
[124] Including the respondents who did not answer the question, the total positive response was also around 40% for ILFPs and 55% for bank providers.
[125] This set of answers came in response to the question: *Have you had to implement adaptive management as a result of the impacts of climate change or extreme natural disaster? With what obstacles and outcomes? What resources aided your response?* Including the respondents who did not answer the question, the total positive response was approximately 40% for mitigation bankers and 20% for ILFPs.

flooding events and hurricanes. Others mentioned that extreme drought and heat have contributed to an increase in drought- and heat-tolerant invasive species, which, in turn, has required some banks to replant vegetation, change the species being planted, and irrigate trees to promote drought and heat resilience. ILFP respondents mentioned site impacts caused by severe drought and wildfire required adaptive management practices such as increased frequency of weed treatments and reseedings.

Based on ELI's review, providers have generally applied three approaches to adaptive management plans. First, a few providers have taken the approach that adaptive management includes responding to climate change and catastrophic events. Second, some providers may anticipate specific problems—that may or may not stem from climate change—and develop strategies to address those anticipated issues. Third, some providers take an even broader approach and instead build more flexibility into their adaptive management strategies. Other providers do not mention climate change at all within their management plans.

Express consideration of climate change

As catastrophic events are increasing in both frequency and intensity within the United States due to the changing climate,[126] some providers have incorporated responses to these events in their adaptive management plans. For example, the mitigation plan for the Western Placer County ILFP details in its adaptive management that

> [w]hile it is not anticipated that major management actions will be needed at [the specific site], unforeseen or unlikely conditions may arise that are not addressed in this plan or the Reserve Management Plan. Adaptive management would be necessary [parenthetical omitted] to address large problems such as *impacts of climate change*; fire; catastrophic flood; substantial infestation by invasive, non-native plants and animals; or other extraordinary circumstances."[127] [emphasis added].

[126] Smith, Adam. (January 10, 2023) "2022 U.S. billion-dollar weather and climate disasters in historical context." NOAA: *Beyond the Data*. *Available at:* https://www.climate.gov/news-features/blogs/beyond-data/2022-us-billion-dollar-weather-and-climate-disasters-historical#:~:text=However%2C%20climate%20change%20is%20also,for%20extremely%20heavy%20rainfall%20becoming.

[127] Western Placer County In-Lieu Fee Program. (November 2019) *ILF Project Mitigation Plan, Markham Ravine Mitigation Site*. p. 71.

Anticipating potential problems & providing solutions

Alternatively, some providers explained that they use an anticipatory strategy that helps inform strategies to address potential issues before they arise.[128] For example, the Douglas County Mitigation Bank's Instrument includes three specific problems that the sponsor anticipates occurring at their site and provides solutions to each:

> - If vegetative cover by desirable species is less than 50 percent by Year 3, the site will be reseeded or with a mix of species similar or comparable to the original seeding.
> - If hydrology does not develop as anticipated, the Corps will be consulted to determine what actions would correct the situation.
> - If channels and wetlands develop, but not at the specific locations, types, or amounts anticipated, and other performance measures are met, the mitigation will be considered successful for the types and amounts that actually develop.[129]

Another provider specifically identified several variables that may trigger the submission of an adaptive management plan to its IRT if monitoring indicates that additional, corrective action is necessary to secure successful restoration of the site. For example, the provider anticipates that the presence of beaver dams on the site may "cause upstream pools to fill in with sediment [because] the dam precludes proper sediment transportation downstream."[130] If this variable impairs the site's ability to meet performance standards, then the provider—with the approval of the IRT—will take steps to remove the barrier (*i.e.,* the dam) to meeting performance standards. If the IRT disapproves of this remedial step, then the inability of the site to meet performance standards due to the dam impacts "will not be considered a failure."[131] Other variables that may pose potentially undesired impacts to the site include: lowered sapling count from herbivorous wildlife's consumption; increased establishment of invasive and noxious plant species; elevation changes that may alter the site's hydrology; and vertical and horizontal in-stream or wetland structure failure. For all these variables, the provider identified a process through which it will attempt to remediate the undesired impacts and,

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[128] Other providers simply listed potential problems that could negatively affect the mitigation bank, such as vegetation established, invasive species, in-channel erosion, instability of in-channel structures, or lack of regular stream flow, but did not provide potential solutions to these problems. *e.g.,* KCI Technologies. (May 9, 2018) *Neely's Bend Mitigation Bank: Mitigation Banking Instrument - Final*

[129] Felsburg Holt & Ullevig. (July 2019) *Douglas County Mitigation Bank: Banking Instrument and Bank Plan.* p. 23.

[130] Blueway. (Feb. 2021) *Old Creek lace Mitigation Bank: Mitigation Plan*. pp. 41–43. *available at:* https://ribits.ops.usace.army.mil/ords/f?p=107:0:14227545560596:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,90220.

[131] *Id*.

in most instances, articulated when, despite remedial efforts, the undesired impacts to the site will not be considered a failure to meet performance standards.[132]

Building broad flexibility into adaptive management plans

Multiple providers explained their plans are not "fixed in stone"[133] and represent the starting point of an ongoing process to restore a wetland's biodiversity and natural processes. One provider explains in its banking instrument that its "adaptive management process identifies protection and management practices that are often implemented, by necessity, with imperfect knowledge. Identification of [such] uncertainty allows for the development of approaches that increasingly improve knowledge and therefore management of the bank."[134] Flexibility is required to ensure that potential problems are efficiently addressed using the latest scientific information.

As there is a wide range of potential problems that may occur with a site, the adaptive management plan can set up a process or approach to select appropriate responses to specific problems when they arise. Examples of potential responses include additional monitoring, literature research, experiments, consultations with discipline experts, re-evaluation, restatement of goals and Performance Criteria, design changes to incorporate innovative techniques and materials or new knowledge, and/or active intervention (*e.g.*, planting desired species or removing invasive species), among others.[135] For example, the Gretna Bottom Mitigation Bank Instrument's adaptive management section provides that

[132] *Id*.
[133] Applied Ecological Services, Inc. (June 2020) *Sugar River Wetland Mitigation Bank Compensation Site Plan for Southern Wisconsin Land Conservancy.* p. 35.
[134] Wildwood Environmental Credit Company, LLC. (December 2019) *Mitigation Banking Instrument: Sea Breeze Mitigation Bank*. p. 34. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:9166510894448:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,100892.
[135] Evergreen Environmental LLC. (October 21, 2019) *Exhibit G: Performance Standards and Adaptive Management Plan Evergreen Hop Bottom Creek Mitigation Bank Site.* p. G-6–G-9; Northern Kentucky University Center for Environmental Restoration and Northern Kentucky University Research Foundation. (2019) *Agreement Concerning In-Lieu Mitigation Fees*, p.10. *available at:* https://ribits.ops.usace.army.mil/ords/f?p=107:0:3347626354203:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,73380; Meadwestvaco Caton Creek, LLC. (2018) *Mitigation Banking Instrument: Caton Creek Stream and Wetland Mitigation Bank*. p.68. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:439890211086:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,55013.

> [i]f circumstances beyond LRC's control (for example, significant changes in annual precipitation compared to baseline analysis) occurred during a year of monitoring affecting the development of the site, discussions with the [Corps] would occur to determine if the situation is now normal for the site. In this event, remedial actions would be proposed. Remedial actions may include additional excavation, reseeding, additional review of local or regional hydrology, re-evaluation of management techniques, and/or development of a new mitigation site.[136]

As climate change can be unpredictable, these flexible approaches can allow providers to choose restoration approaches that best respond to these changing conditions and events.

Force Majeure

While the 2008 Rule does not specifically require providers to contemplate force majeure events, many programs will include force majeure clauses within the required default and closure provisions of their instruments. Default and closure provisions are a requisite component of mitigation banking and ILFP draft instruments.[137]

In response to the question about which stages of the process providers incorporated climate change, about half of bank and ILFP respondents indicated they consider climate change in force majeure provisions.[138] Through our interviews, however, we learned that providers might encounter a tension between designing, managing, and maintaining a site against anticipated impacts versus anticipated *and* controllable impacts.

Of a representative sample of only mitigation bank instruments, ELI reviewed provisions governing force majeure to determine whether and how bank sponsors, the Corps, and IRTs have incorporated language regarding site remediation liability for damage from events caused by or attributable to climate change.

Defining "Force Majeure"

As a threshold matter, force majeure—sometimes referred to as an "Act(s) of God"[139]—is generally described as an event or occurrence beyond the sponsor's control,

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[136] Lyman-Richy Corporation. (March 1, 2019) *Final Site Development Plan: Gretna Bottom Wetland Mitigation Bank Site*. p. 21.
[137] 33 C.F.R. § 332.8(d)(6)(ii)(D) (2008).
[138] Including the respondents who did not answer the question, the total positive response was approximately 40%.
[139] *Caton Creek Stream and Wetland Mitigation Bank Instrument,* p. 71.

"reasonable" control,[140] or "reasonable anticipation and control,"[141] that causes substantial damage[142] to or adversely affects[143] a mitigation project. Rather than targeting the effects on the project or site, at least one instrument centers force majeure on the sponsor's ability to "perform its obligations under the [instrument]" following the triggering event that is beyond the sponsor's control.[144] Instruments may reference force majeure without an attendant definition,[145] and others have specifically defined events that do not qualify as force majeure—expressing excluding separately-defined "catastrophic events"[146] (*e.g.*, floods greater than a presently projected 100-year flood, where "flood" refers to a runoff event, tornado of F2 or greater magnitude on the Fujitsu scale, or extreme drought that has broad regional impact and is not endemic to the specific site and its immediate locale);[147] economic hardship; failure to attain performance standards; and "normal inclement weather" as force majeure-constituting events.[148]

Some instruments define force majeure occurrences broadly without express distinction as to cause. For example, some instruments define force majeure as including "natural catastrophes, such as fires, floods, droughts, diseases, earthquakes, tornadoes, hurricanes, regional pest infestations,"[149] in addition to "war, civil disturbance, strike or similar causes,"[150] and "unforeseen strikes or work stoppages, explosion, riot, and sabotage."[151]

Comparatively, one instrument has defined force majeure as an umbrella term, encompassing and defining both natural and anthropogenic catastrophic events, in addition to deliberate and unlawful acts committed by third parties.[152] The Keller Farm Mitigation Bank Instrument, for example, describes natural catastrophic events in detail:

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[140] *Evergreen Rio Grande Swamp Mitigation Bank Mitigation Banking Instrument*. p. 20; Habitat Bank, LLC. (December 2019) *Keller Farm Mitigation Bank Mitigation Banking Instrument.* p. 16.
[141] *Neely's Bend Mitigation Bank: Mitigation Banking Instrument - Final.* p. 5.
[142] *Keller Farm Mitigation Bank Mitigation Banking Instrument.* pp. 15–16.
[143] Decota Consulting Company, Inc. (May 2019) *Umbrella Mitigation Banking Instrument: Harmony Umbrella Mitigation Bank.* p. 4.
[144] *Neely's Bend Mitigation Bank: Mitigation Banking Instrument - Final.* p. 6.
[145] Applied Ecological Services, Inc. (June 4, 2020) *Appendix A: Sugar River Wetland Mitigation Bank Compensation Site Plan for Southern Wisconsin Land Conservancy*. p. 3.
[146] GreenVest. (June 2018) *Joint Base Andrews – Department of Defense Umbrella Mitigation Banking Instrument*. p. 36. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:12457657023020:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,73008.
[147] *New Mill Mitigation Banking Instrument*. p. 25.
[148] *Id.* at. p. 6; Oregon Wetlands LLC. (January 9, 2020, revised May 13, 2020) *Mitigation Bank Instrument for Marys River Mitigation Bank*.
[149] *Evergreen Rio Grande Swamp Mitigation Bank Mitigation Banking Instrument*. p. 19.
[150] *Caton Creek Stream and Wetland Mitigation Bank Instrument.* p. 71.
[151] *Mitigation Bank Instrument for Marys River Mitigation Bank*. p. 10.
[152] *Keller Farm Mitigation Bank Mitigation Banking Instrument.* pp. 15–16.

> examples of a "natural catastrophic event" [that may constitute force majeure] include, but are not limited to: a flood equal to or greater in magnitude than the 100-year flood event; an earthquake of force projected from an earthquake with a return period of 475 years; drought that is significantly longer than the periodic multi-year drought cycles that are typical of weather patterns in [the site's encompassing region]; as well as events of the following type when they reach a substantially damaging nature; disease, wildfire, depredation, regional pest infestation, or significant fluviogeomorphic change.[153]

Another instrument expressly provides that "drastic changes in climate from the current hydrologic condition averaged over the past 50 years" constitutes force majeure.[154] This instrument also defines force majeure as "irreparable impacts," which are "the type of damage that cannot be corrected because [the site] can no longer be practicably restored or maintained as a stream and wetland community."[155] In that instance, irreparable impacts "could include climate change that alters the function of the stream or wetland over the long term."[156]

Because force majeure provisions can occur in the default and closure provisions of instruments, the procedure for force majeure occurrences will be discussed next.

Procedure

Though not expressly required, force majeure provisions can be seen in the default and closure provisions of banking instruments. Other instruments have incorporated provisions related to force majeure in adaptive management approaches in long-term management plans. In general, force majeure provisions will require the sponsor to provide written notice to the Corps upon occurrence of force majeure within a specified time frame, such as "within two weeks,"[157] "as soon as reasonably practicable,"[158] or "within 24 hours of [the provider's] knowledge of the occurrence of an event of force majeure."[159] The sponsor may also be required to "state the reason for bank failure and provide argument explaining why it should not be held responsible for corrective action."[160] The Corps, in consultation with the IRT, will determine whether the event or occurrence constitutes force majeure and, if so, whether force majeure has significantly

[153] *Id*. at p. 16.
[154] *Umbrella Mitigation Banking Instrument: Harmony Umbrella Mitigation Bank.* p. 4.
[155] *Id*. at p. 17.
[156] *Id*.
[157] *Id*.
[158] *Keller Farm Mitigation Bank Mitigation Banking Instrument.* p. 16.
[159] *Appendix A: Sugar River Wetland Mitigation Bank Compensation Site Plan for Southern Wisconsin Land Conservancy*. p. 3.
[160] *Evergreen Rio Grande Swamp Mitigation Bank Mitigation Banking Instrument*. p. 20.

and adversely affected the site.[161] The Corps and IRT may then evaluate and establish an appropriate course of action at their discretion. Examples of appropriate courses of action include whether any changes to the site or its management are permissible and feasible such that the sponsor can remediate the damage.[162]

Liability

If the Corps and IRT determine that the sponsor cannot remedy the damage precipitated by force majeure, the sponsor may be relieved of its obligation to take corrective actions to manage the site and/or maintain the site in instances where the sponsor has not assigned its long-term management responsibilities to a third party. The standard by which the Corps and IRT will make this determination may vary. An example standard includes whether the sponsor can repair the damage by "any practicable and reasonable means."[163]

Climate Change Impacts

The extent to which liability is disclaimed under force majeure provisions that encompass events caused or exacerbated by climate change may be determined by several factors. Included among them is how expansive or restrictive the definition is of "force majeure." For example, occurrences of force majeure-qualifying events that are not tethered to additional descriptors (*e.g.*, "flood," or "drought") may be prohibitively broad and include any event attributable to climate change. Additionally, the ultimate determination (and standard by which this determination is made) about whether a given force majeure event was indeed beyond the provider's reasonable anticipation and control may unnecessarily limit a project's capability to adapt to events attributable to or exacerbated by climate change. Take for example a site that is designed and planned for an area that is subject to intense precipitative events. Is an increase in the frequency of 100-year storm events truly outside of the provider's reasonable anticipation and control? Should the provider minimally have to plan for (*i.e.*, anticipate) these types of events?

These types of questions may help illuminate whether a project is sited in a suitable area (*i.e.*, if the provider can reasonably anticipate common force majeure events, how is this knowledge accounted for in site selection and design?). The exact procedure following a force majeure event may be determined on a case-by-case basis; however, expectations can be effectively managed by identifying in a force majeure clause (or otherwise within a default and closure instrument provision) the process and standard by which the Corps and IRT will determine whether the provider can remedy the impacts

[161] *Keller Farm Mitigation Bank Mitigation Banking Instrument.* p. 16; *Umbrella Mitigation Banking Instrument: Harmony Umbrella Mitigation Bank.* p. 4.
[162] *See e.g.*, *Keller Farm Mitigation Bank Mitigation Banking Instrument.* p. 16.
[163] Evergreen Environmental LLC. (November 26, 2019) *Evergreen Hop Bottom Creek Mitigation Bank.* p.24.

from the catastrophic event. Doing so may help drive transparency, clarify expectations, and prompt thoughtful consideration of site selection, design, and management. This can also be an aim of a project's adaptive management. For example, providers may specifically identify that depending on the act of nature, "it may be appropriate to let nature take its course, particularly when acceptable environmental conditions would be expected to eventually reestablish."[164] As seen in this specific instance, it can be useful to articulate that a process will commence through which the provider and IRT will determine whether such changes are in the best interest of the project.[165]

Long-Term Management

Example of typical long-term management language:

"The primary goal of the Bank is to create a self-sustaining natural aquatic system that achieves the intended level of aquatic ecosystem functionality with minimal human intervention, including long-term maintenance. Natural changes to the vegetative community that occur after all Bank performance standards have been met, other than changes caused by non-native/invasive weeds, are not expected to require remediation. Therefore, the purpose of this Long-Term Management Plan (Plan) is to (1) monitor the Bank in order to identify potential problem areas that may jeopardize the capacity of the natural aquatic system within the Bank to remain self-sustaining; (2) implement reasonable measures with the appropriated funding available to maintain the self-sustaining capacity of the natural aquatic system; (3) monitor and minimize human intervention (i.e., trespassing and trash disposal); and (4) maintain access to and within the Bank for purposes of long-term management and monitoring"
Great Pee Dee Mitigation Bank Instrument, p. 72.

The 2008 Rule requires project sponsors or responsible parties to develop "long-term management plans" that explain how the projects will be managed after the projects meet performance standards to ensure the long-term sustainability of the aquatic resource(s).[166] A long-term management plan generally includes a description of the project's "long-term management needs, annual cost estimates for these needs, long-term funding mechanism[s]," and identification of the party responsible for long-term management.[167] Generally, until and unless a sponsor assigns their long-term management obligations and rights to a third-party, the sponsor will retain responsibility for the long-term management of a project.

In response to the questionnaire, approximately 55% of bank respondents and just under 80% of ILFP respondents indicated that they consider climate in their long-term management plans.[168] Providers have also experienced issues with existing

[164] Corblu Ecology Group. (2019) *Big Sandy Creek Mitigation Bank Final Banking Instrument*. pp. 7–10. *available at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:1728363929398:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,87248.
[165] *Id.*
[166] 33 C.F.R. § 332.4(c)(11) (2008).
[167] 33 C.F.R. §§ 332.7(d)(2), 332.4(c)(11) (2008).
[168] Including the respondents who did not answer the question, the total positive response was around 45% from bank respondents and 65% for ILFP respondents.

sites already in the long-term monitoring phase that are affected by changing climatic conditions, but ELI did not hear specifically how providers are managing these scenarios.

Climatic Variability and Long-Term Management Plans

ILFPs and mitigation banks may appraise climate-related impacts in describing the long-term management needs of their sites.[169] For example, the Montana Statewide ILFP Instrument offers a narrative description of climate change and affirmatively states that program sites should be designed to be a self-sustaining natural habitat throughout the long-term management phase to recognize that the condition and function of the mitigation site may change in response to natural processes over time, providing that

> [l]ong-term management and maintenance should allow for a given mitigation site to mature and to adapt to natural dynamic processes such as seasonal and *long-term climatic variability*. These changes may include shifts in species composition and/or ecological functions as the site matures**.** Long-term adaptation to natural processes does not preclude the site from being able to continue to deliver ecological benefits over time.[170] [emphasis added].

A similar treatment of climatic variability can be seen in the New Mill Creek Tidal Mitigation Bank Instrument. This bank describes in its long-term management plan that the long-term steward, in coordination with the IRT, may need to pursue adaptive management changes when "necessary to address the effects of climate change, fire, flood, or other natural events."[171] Before adaptive management changes to the long-term management plan occur, however, the IRT "will consider whether such [proposed adaptive management] actions will help ensure continued viability of [the] bank's biological resources."[172] The Wancopin Creek Mitigation Bank describes a nearly identical concept in addressing adaptive management in its long-term management plan,[173] which may be partially attributable to the fact that these banks share the same regulatory bank managers and are otherwise located in the same Corps district. These

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[169] *See e.g., Bank Prospectus Review Workbook and Checklist*, p. 59 (posing the question to IRT reviewers of mitigation banks whether "the monitoring, management, or long-term management plans consider the potential for adaptive management as a result of climate change or sea level rise").
[170] Montana Aquatic Resources Services, Inc. (May 2020, with approved updates through December 15, 2021) *Montana Statewide In-Lieu Fee Mitigation Program Instrument Final Version 2.0*. p. 23.
[171] *New Mill Creek Tidal Mitigation Bank: Mitigation Banking Instrument.* p. 73 (Exhibit Q: Long-Term Management Plan).
[172] *Id*.
[173] Wancopin Creek Mitigation Bank. (Jan. 2021) Long-Term Management Plan, Exhibit L, Section IV (A). a*vailable at*: https://ribits.ops.usace.army.mil/ords/f?p=107:0:12337102849167:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,90804.

long-term management plans are examples of express, yet measured approaches toward incorporating climate change considerations in the long-term management phase of a given project/site.

Consideration of Climate Change as a Conservation Threat

At least one mitigation bank, Marys River Wetland Mitigation Bank, cites climate change in its long-term management plan as a threat to the bank's conservation goals and the long-term functioning of the wetland (*e.g.*, changes in hydrologic patterns and storm or drought occurrences or duration as a result of climate change).[174] However, the same instrument expressly disclaims liability for both the landowner and long-term manager for "any unforeseen natural catastrophic events, such as flood, drought, disease, regional pest infestation, etc., determined to be beyond their reasonable control by the [IRT] and [Corps]."[175] Thus, to the extent that any unforeseen natural catastrophic events threaten the long-term sustainability of the site and the IRT and Corps determine the events were beyond the reasonable control of the long-term manager or landowner, liability to remediate the damage caused by the catastrophic events will not be triggered. This specific instrument does not provide further detail about how the IRT and Corps will make the determination of what is beyond the sponsor's or banker's reasonable control; however, this type of language is common across a representative sample of instruments. Within the context of climate change, a relevant question for project sponsors, IRTs, and the Corps to meaningfully consider then is "for how long can climate change-related or -exacerbated impacts be reasonably *un*foreseen?"

Conditional Approaches to Climate Change Adaptation

Other banks discuss climate change-related impacts less explicitly in their long-term management plans. For example, the Honey Springs Mitigation Bank acknowledges that its site is vulnerable to climatic instability. In instances where acts attributable to climatic instability occur after performance standards have been met, the Honey Springs Mitigation Bank may need to revise its instrument to counteract negative impacts. In other circumstance-dependent instances, the Honey Springs Bank may "let nature take its course, particularly when wetland vegetation is expected to reestablish due to continued existence of seed sources, wetland hydrology, hydric soils, and restrictions on incompatible land uses."[176] This is an example of a more conditional approach to the consideration of and adaptation to climate change in a site's long-term management plan where the wetland may be evolving in a natural way that is good for the watershed and the site is not at risk of failure.

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[174] Oregon Wetlands LLC. (March 2019, Revised May 2020) *Marys River Wetland Mitigation Bank: Long Term Management Plan*. p. 5.
[175] *Id*.
[176] Hoffman Environmental, Inc. (May 2020) *Mitigation Banking Instrument: Honey Springs Mitigation Bank, McIntosh County, Oklahoma; USACE Project Number: SWT-2019-218*. p. 46.

Implicit Considerations of Climate Change

Other instruments that do not expressly mention climate change or climate change-related impacts may potentially leave the door open to implicit climate change considerations in their long-term management plans. For example, the Great Pee Dee Mitigation Banking Instrument explains that the purpose of the bank's long-term management plan is to, among other objectives, "1) monitor the bank in order to identify potential problem areas that may jeopardize the capacity of the natural aquatic system with the bank to remain self-sustaining; and 2) implement reasonable measures with the appropriated funding available to maintain the self-sustaining capacity."[177] Increased temperatures, frequent and more severe precipitation events caused or exacerbated by climate change may cause or exacerbate "potential problem areas," as described above. The long-term steward for this bank is "responsible, at its sole cost and expense, for all long-term management tasks and funding required to maintain the aquatic resources on the Bank in perpetuity."[178] To the extent that a provider's IRT and Corps district are required to make determinations of what circumstances are beyond the reasonable control of the sponsor or long-term steward, it may be beneficial for these parties to thoroughly discuss what climatic predictions are and are not within the reasonable control of the provider to account for in long-term management and potential adaptive management approaches articulated therein.

Inclusion of Climate as a Release from Future Liability

At least one bank, in its long-term management plan, has expressly disclaimed liability for remediating damage caused by force majeure events, specifically referencing climate change as a force majeure-constituting event or one that causes "irreparable impact" to the site.[179] The Glade Farms Umbrella Mitigation Banking Instrument offers that "climate change" is a form of "irreparable impact" that could "alter[] the function of the stream or wetland over the long term," the resulting damage from which "can no longer be practicably restored or [the stream or wetland cannot be] maintained."[180] In this instance, the long-term steward is required to submit a written request to the Corps for a "Force Majeure evaluation."[181] The Corps will then make a determination on whether the damage to the site was caused by a force majeure event.[182]

[177] *Great Pee Dee Mitigation Bank Final Mitigation Banking Instrument.* p. 72.
[178] *Id*. at 73.
[179] *Umbrella Mitigation Banking Instrument: Harmony Umbrella Mitigation Bank.* p. 17.
[180] *Id*.
[181] *Id*.
[182] *Id*.

Catastrophic Event Funds

Providers may be required to secure funds for long-term management that specifically account for catastrophic events.[183] A March 2023 Memorandum of Understanding between the Corps' Norfolk District and the Virginia Department of Environmental Quality (VDEQ) regarding the implementation of third-party compensatory mitigation impliedly states that escrow accounts for "catastrophic event funds" can be a form of both short- and long-term financial assurances. Should this mechanism be required for a given program, VDEQ will "confirm proper funding of and coordinate reduction or release requests" for catastrophic event funds."[184] In context, this type of financial mechanism can be seen in the following example from a bank operating within the Corps' Norfolk District. However, one Corps member and one partner organization indicated providers are moving away from this type of funding for different reasons, including because the catastrophic event funds may be insufficient to cover the costs of, for example, a total site loss.

Still, at least one mitigation bank from this Corps district, the New Mill Creek Tidal Mitigation Bank, anticipates in its instrument how to manage its sites following a catastrophic event, which includes but is not limited to "floods greater than a presently projected 100-year flood, where 'flood' refers to a runoff event; [a] tornado of F2 or greater magnitude on the Fujitsu scale; [or a] Hurricane of Category 2 or greater magnitude on the Saffir-Simpson scale."[185] Upon occurrence of these types of events, the bank's instrument directs the sponsor or long-term steward to engage in recovery efforts through the use of monies from the bank's Catastrophic Event Fund: an interest-bearing escrow account, insured by a federal financial institution, separate from any other accounts.[186] For New Mill Creek, the escrow account is comprised of "[one percent] of all proceeds from [c]redits to address potential catastrophic events."[187] Most of the enumerated events listed in this instrument may become more common and more intense as a result of changing climatic conditions.

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[183] *See* Ecotone, Inc. (2020) *Peige Mitigation Bank: Mitigation Banking Instrument*, p. 13, 15 (establishing a catastrophic event fund for events including, but not limited to, "floods greater than a presently projected 100-year flood, where "flood" refers to a runoff event; tornado[es] of F2 or greater on the Fujitsu scale; and hurricane[s] of Category 2 or greater magnitude on the Saffir-Simpson scale).

[184] Army Corps of Engineers Norfolk District and Virginia Department of Environmental Quality. (March 29, 2023). "Memorandum of Agreement Between the U.S. Army Corps of Engineers, Norfolk District and the Virginia Department of Environmental Quality Regarding the Implementation of the Third-Party Compensatory Mitigation Program," *available at*: https://www.deq.virginia.gov/home/showpublisheddocument/17819/638164635980130000.

[185] *New Mill Creek Tidal Mitigation Banking Instrument*. pp. 14–15.

[186] *New Mill Creek Tidal Mitigation Bank: Mitigation Banking Instrument.* pp. 13–14. *available at: https://ribits.ops.usace.army.mil/ords/f?p=107:0:8388488555381:APPLICATION_PROCESS=AP_DB_DOC:::AI_STRING,AI_ID:inline,53528.* ..

[187] *New Mill Creek Tidal Mitigation Bank: Mitigation Banking Instrument.* pp. 13–14.

Despite the above-described example, this type of mechanism may be falling out of favor because of the possibility that all habitats of a similar type in the given region may be equally damaged by a catastrophic event.

Other Incorporations of Climate Change

Consideration of climate in site easements

Under the 2008 Rule, the components of a mitigation site (*i.e.*, aquatic habitats, riparian areas, buffers, and uplands) must be afforded "long-term protection through real estate instruments or other available mechanisms, as appropriate."[188] The district engineer should, when approving a long-term protection method, "consider relevant legal constraints on the use of conservation easements and/or restrictive covenants in determining whether such mechanisms provide sufficient site protection."[189] In conversations with ELI, members of the Corps and providers who use conservation easements as a method of long-term protection both highlighted the importance of drafting clear and legally sound easement language because of the effects changing landscapes may have on the subject property and the easement. For example, the purpose of a conservation easement may conflict with the on-the-ground conditions of the site's changing landscape (*e.g.*, the purpose of a conservation easement to protect specific landscape attributes or specific species that existed on the site at the time the easement was drafted, but changing conditions made the site unviable for those specific attributes).[190] Conversely, changing conditions may conflict with a given easement's requirements (*e.g.*, certain vegetation management restrictions that become impossible to meet given changes in the amount and frequency of precipitation that falls on the property).[191]

Some providers may draft conservation easements with several broad purposes to protect the subject property against changing landscapes and to ideally avoid conflicts that would result in termination or substantial amendment of the easement. Great Land Trust explained that to guard against the possibility of needing to amend or terminate a conservation easement on the basis of climate change-induced landscape changes, the program includes broad language that covers as many climate-related effects and factors as possible into the site easement. This way, small changes in site conditions do not conflict with the easement's purposes.

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[188] 33 C.F.R. § 332.7(a)(1) (this applies to non-government property other than transfer of title).
[189] *Id*.
[190] Owley, Jessica. (Fall 2011) "Conservation Easements at the Climate Change Crossroads," 74 *Law & Contemporary Problems,* pp. 199, 205. *available at:* https://scholarship.law.duke.edu/lcp/vol74/iss4/9/.
[191] *Id*. at pp. 206–07.

Response to financial risk and liability

Some providers are also taking steps to insulate themselves from the financial risk of changing climate conditions negatively impacting their sites. One ILFP noted utility in reserving a set of credits. This way, the program has credits it can shift to the damaged project in the event of an unanticipated issue. Critically, the provider in this case noted that any transfer of credits would not replace attempts to repair damage at the site in question but would raise questions about the cost of each credit with this contingency.

Key Findings

The explicit integration of climate change in compensatory mitigation projects is still relatively limited and not consistently executed. Despite limited regulatory guidance, there is interest among agencies and providers in designing and maintaining sites that meaningfully account for climate change, and best practices may be emerging. The feedback ELI received and the conversations ELI held with providers and Corps and EPA staff revealed two best practices to incorporate climate considerations into compensatory mitigation.

First, providers, members of the Corps, and other members of IRTs all emphasized the importance of incorporating considerations of climate at the earliest stages of the process. By selecting sites and designing projects with consideration of anticipated climate effects, projects can be more resilient and adaptive to changing conditions. Selecting and designing sites with an eye toward changing climate scenarios may also help providers avoid costly interventions later in the process and mitigate the overall risk of site failure.

Second, using the best available data and science helps ensure sites are designed to withstand coming changes. Providers offered several examples of where they source relevant data on changing conditions, including, but not limited to, data from federal agencies (*e.g.,* NOAA's sea-level rise data or FEMA's flood maps); aggregated data from local weather or climate monitoring stations; the National Wetland Condition Assessment, and vegetation migration maps. Other data sources used by providers include drought indices and EPA's Antecedent Precipitation Model. Some providers also use local or state hazard plans or climate adaptation plans to better understand an area's risk and vulnerability to natural hazards and opportunities for compensatory mitigation projects to provide hazard mitigation benefits. Spatial data and tools such as GIS prioritization schemes and TNC's Resilient and Connected Landscapes Mapping Tools can be useful when identifying priority areas or specific site locations.

Providers, however, identified several barriers that impede their ability to incorporate climate considerations in project planning, design, maintenance, and monitoring. In some cases, these concerns were echoed by members of the Corps and IRTs. One overarching barrier is a general inclination to use standard language or protocols or

approved templates that, despite their utility in streamlining the review and approval processes,[192] can impede innovation and inclusion of adaptive management provisions that specifically account for the effects of climate change. While sites are supposed to be "self-sustaining"[193] (*e.g.*, able to deliver long-term ecological benefits as the site matures over time), there is relatively little emphasis placed on the site's long-term ability to adapt to changing site conditions to meet this goal under the current program structure. One bank provider noted that the Corps and their IRT ask about how the providers are addressing climate change but are resistant to changing the standard protocols. Ultimately, as one provider observed, the inability to be adaptive can result in providers working against natural forces that are favorable to wetlands (*e.g.*, the removal of invasive species like phragmites, even if they help to establish or maintain a wetland landscape).

The 2008 Rule is sufficiently flexible to permit providers—and the Agencies and IRTs by extension via review processes—to develop compensatory mitigation projects that can adapt to changing landscape conditions that are caused by or attributable to climate change.

Support for this assertion can be found in several parts of the 2008 Rule. First, this assertion is aligned with the "**watershed approach**" that the 2008 Rule contemplates, which expressly "considers how the types and locations of compensatory mitigation projects . . . will continue to function over time in a changing landscape."[194] District engineers are required to "use a watershed approach to establish compensatory mitigation requirements in DA permits to the extent appropriate and practicable."[195] Notably, "[t]he ultimate goal of a watershed approach is to maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites."[196]

Second, due consideration of climate change and changing landscapes is implicit in the 2008 Rule provisions governing **site selection** considerations in the required mitigation plans. As such, providers should consider the "practicability of accomplishing ecologically self-sustaining aquatic resource restoration" in describing the factors that were used in selecting a given site.[197]

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[192] Kihslinger, R. et al. (Aug. 2020) *Improving Compensatory Mitigation Project Review*. p. 21. *Available at*: improving-compensatory-mitigation-project-review.pdf (eli.org) (finding that while "standards and templates can be highly useful," "a lack of templates and standard operating procedures [can] lead[] to inconsistencies among projects and delays among providers;" developing templates that identify specific methods to incorporate adaptive management can serve both providers and IRTs in achieving common understanding about what is needed to assure the site's resiliency in the face of changing conditions).
[193] 33 C.F.R. § 332.7(b).
[194] 33 C.F.R. § 332.3(c)(2)(i).
[195] 33 C.F.R. § 332.3(c)(1).
[196] *Id*.
[197] 33 C.F.R. § 332.4(c)(3).

Third providers should be **designing sites** "to the maximum extent practicable, to be self-sustaining once performance standards have been achieved."[198] Both individually and in conjunction, these provisions support the assertion that the 2008 Rule permits and encourages providers, the Agencies, and IRTs to design sites that can maintain health, longevity, and ecological function in face of landscape changes that are attributable to climate change. Put simply, thoughtfully considering and planning for climate change during the development of a given project helps determine whether the site will practicably accomplish self-sustainability over time.

Developing **adaptive management** plans is an opportunity for providers, the Corps, and IRTs to think toward the future of site performance, examine—even with noncomprehensive information—potential anticipated impacts, and manage how providers and the Agencies can plan for such impacts (including through securing financial assurances). ELI identified several examples of adaptive management plans that identify possible future issues and set up a process to address those issues when they arise. Identifying alternative endpoints, as discussed above, can also drive consideration of other possible outcomes at the outset of project planning, such as identifying where these outcomes are the result of natural processes, provide similar functional benefits, and are good for the watershed.

Providers also noted other related factors—like the emphasis on restoring wetlands and streams to historic conditions—that limit opportunities to integrate climate change considerations. Providers explained that the reliance on historic conditions, both to establish baseline targets and as a goal to recreate in the restoration process, is often not realistic given the rapid climatic changes seen today. Landscapes are undergoing a host of changes—changes in the level and frequency of precipitation events, increases in fire, rising sea levels, fluctuations in temperature, changes to species migration or encroachment of non-native species, etc.—which means current and future landscapes are not necessarily comparable to what they were historically. As such, restoring a site to historic conditions does not always ensure the long-term success of the site.

Providers, members of the Corps, and EPA all noted that political will is one factor beyond their control that has a direct effect on their work: changing political administrations and priorities at both the state and national levels affect the integration of climate considerations in compensatory mitigation efforts. However, one provider submitted that the thoughtful use of rhetoric—focusing on "resiliency" in the face of climate threats rather than "accounting for climate change"—may help quell political division over this issue.

Providers also expressed that more guidance would be helpful in integrating climate into the compensatory mitigation process (*e.g.,* Agency-developed watershed climate resiliency plans that providers could follow to promote regional resiliency). The review

[198] 33 C.F.R. § 332.7(b).

workbooks and checklists published by the EPA in November 2022 provide some useful, albeit limited, guidance. The workbooks are geared toward interagency reviewers and state and federal regulators and contain limited examples where climate change might be considered in the review process. One member of the Corps suggested that a lack of specificity in this existing guidance does permit some flexibility, as the guidance is applicable across different types of wetlands and streams. A limited number of Corps guidance documents include climate provisions,[199] however ELI did not identify any existing guidance that fully addresses the providers' requests for guidance tailored to incorporating climate considerations in mitigation projects.

On one hand, most providers expressed a need for some iteration of agency guidance. Guidance that articulates, for example, how to develop performance standards, credit determination processes, and monitoring protocols that integrate climate science may help providers design, develop, and maintain climate-resilient projects. On the other hand, however, some providers, as well as EPA staff who serve as IRT members, expressed concern that some providers may not begin incorporating climate considerations unless and until required by regulation or agency directive. This scenario would conceivably require more of the EPA and Corps than issuing non-binding guidance.

Finally, while providers are beginning to incorporate climate change into programs and new projects, an outstanding question remains regarding how to manage existing banks and sites that are farther along in the 404 process and experiencing the detrimental effects of changing climatic conditions. Often, these sites were designed and created without earnest consideration of future climate scenarios. ELI heard very little on this topic from providers, the Corps, or EPA other than the general sentiment that providers and agencies should take action to ensure the health and functionality of these existing sites.

Agency decision-makers should feel comfortable exercising their regulatory discretion in the compensatory mitigation process to effectively incorporate climate considerations and allow for the fulfillment of long-term goals. Providers are looking to the Agencies for guidance on this issue. While there are many ways that climate could be incorporated, use of best available climate data from the earliest stages of the planning process provides a solid foundation to accomplish this goal.

Some providers also noted the utility of designing compensatory mitigation projects in tandem with other programs or initiatives. The North Carolina Department of Environmental Quality Division of Mitigation Services houses a state flood resiliency

[199] U.S. Army Corps of Engineers South Pacific Division. (2015) *Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines: For South Pacific Division USACE*. p. 33. The Wilmington District has guidance about how to address the increased likelihood of tropical events for resiliency in stream projects. The current guidance is out of date but is in the process of being updated.

program, the Natural Infrastructure Flood Mitigation Program, that is tasked with "incorporating flood storage capacity enhancement projects into the divisions activities."[200] Part of this effort includes activities that will be integrated into broader watershed planning, including the creation of statewide flood resiliency blueprint and subsequent river basin-specific action strategies. The Blueprint is an online tool to support decision-making for river basin communities that are experiencing flooding. One of the key goals of the blueprint is the establishment of "a repeatable, statewide methodology for prioritizing, and selecting flood mitigation strategies for future implementation."[201]

Providers also recommended that compensatory mitigation programs draw upon the successes of other non-404 programs that have integrated climate considerations. In conversations with ELI, some providers expressed that conservation banks authorized under the Endangered Species Act might have developed a more refined literacy on this topic. For example, the U.S. Fish and Wildlife Service's (FWS) 2023 "Endangered Species Act Compensatory Mitigation Policy" describes FWS's preference for the siting of compensatory mitigation

> . . . in locations already identified in landscape-scale conservation plans or mitigation strategies that will meet conservation objectives and provide the greatest long-term benefit to the listed, proposed, and at-risk species and other resources of primary concern.[202]

In making determinations based on existing conservation plans, FWS will rely on plans that "incorporate the best available scientific information, consider climate change adaptation, and contain specific objectives aimed at the biological needs of the affected resources."[203] CWA section 404 compensatory mitigation providers may consider leveraging the successes and lessons learned from the conservation banking industry as they move to more meaningfully account for future climatic conditions in their compensatory mitigation projects

Providers expressed a desire for clear guidance on the incorporation of climate considerations into compensatory mitigation projects and recommended who was best suited to advise on this sort of guidance and contribute to ongoing conversations on the issue. Providers explained to ELI that long-term convening on these issues should

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[200] North Carolina Department of Environmental Quality. (N.d.) "Natural Instrastrucutre Program," *available at:* https://www.deq.nc.gov/about/divisions/mitigation-services/natural-infrastructure-program.
[201] North Carolina Department of Environmental Quality. (N.d.) "Flood Resiliency Blueprint," *available at:* https://www.deq.nc.gov/about/divisions/mitigation-services/flood-resiliency-blueprint. (To view the tool, visit: https://ncfloodblueprint.com/).
[202] U.S. Fish & Wildlife Serv. (June 2023). Endangered Species Act Compensatory Mitigation Policy, p. 7, *available at*: https://www.fws.gov/sites/default/files/policy/pdfs/FWS-ESA-Compensatory-Mitigation-Policy-amend_1.pdf.
[203] *Id*.

include representatives from the Agencies, ILFPs, banks, and other restoration practitioners and entrepreneurs.

Conclusion

Integrating climate change considerations into project planning, design, management, and maintenance turns both on available science and forward-thinking policy decisions. Forward-thinking policy decisions, such as whether to afford additional credits for projects that incentivize climate resiliency, can help drive the integration of climate change in compensatory mitigation projects. Available climate data sources and new methodologies can help promote site evolution and adaptability; however, the successful integration of a range of climate scenarios are not met without challenges.

1) Climate is being discussed in every region; however, not every provider and/or Corps district is discussing climate. Regions that are discussing climate may not note so explicitly in writing.

2) By and large, ELI's research revealed that providers are placing emphasis on the early stages of project development to account for climate.

(a) The focus of providers and the Agencies often targets the suitability of sites and project design when incorporating climate. One EPA member informed ELI that when commenting on projects, their aim is to: minimize future adaptive management; let the site progress as naturally as possible; and ensure the site will not turn into a mud flat (a significant issue in their area).

3) Many of the projects that are incorporating climate are still in an early stage of development and monitoring and have not yet reached long-term management. Many projects will likely experience the effects of climate as they move into long-term management.

4) Certain considerations, such as invasive species or the use of up-to-date and accurate climate data, are important across programmatic components (*e.g.*, design, long-term management, etc.).

5) Different areas will experience different climate impacts. For example, coastal areas will face sea level rise, and thus different guidance or policy development may be useful.

6) Crediting and performance standards are programmatic components that need significant work to incorporate climate change. Agencies should collaborate with the scientific community and restoration practitioners and providers to accomplish this goal.

Despite the support in the 2008 Rule that permits those involved in the compensatory mitigation industry to meaningfully consider climate change in project development, ELI generally identified only limited examples of how this is being accomplished on the ground throughout this research.

Notwithstanding these limited examples, several providers also indicated to ELI their desire to meaningfully incorporate climate change considerations in site development but expressed a need for clearer direction. Barring a regulatory incentive or clear guidance, these providers may feel less empowered to do so.

Looking Forward

Providers, the Agencies, and IRTs should feel encouraged to convene regularly and often to identify responsive solutions to this issue. As the component parts of a centralized information hub and the ultimate decision-making processes, the Agencies and IRTs may be best suited to determine what is working on the ground and aggregate information on best practices that may or may not be retrievable through documentation found on RIBITS. Developing guidance, for example, that features examples of banks and programs that have successfully integrated the flexibility the 2008 Rule proffers and, in doing so, have better designed and maintained their sites in the face of changing conditions caused by or attributable to climate change may be an actionable step in the right direction.

Appendix 1: Questionnaires

Environmental Law Institute Questionnaire for ILF Programs:
Improving Success of Compensatory Mitigation Under Changing Conditions

The Environmental Law Institute (ELI), with a Wetland Program Development Grant from the U.S. EPA, is working on a project focused on improving the success of compensatory mitigation initiatives in the face of changing climatic conditions. This project aims to help compensatory mitigation programs and projects effectively address rapidly changing conditions and events to ensure functions lost to permitted impacts are effectively and permanently replaced. The requirements in the 2008 compensatory mitigation regulations were designed to achieve successful resource replacement projects. Yet, many mitigation providers, stewards, and state and tribal regulators are now starting to think about how to design, implement, manage, and oversee projects given sometimes unforeseen and changing conditions that affect the achievement of compensatory mitigation objectives. This project will develop a report that identifies challenges and provides practical recommendations for improving practice. ELI is seeking your input on a brief (10 minute or less) questionnaire about how you consider climate change in the design and siting of compensation projects and where, if at all, this factors into the project timeline. Thank you for your assistance with this project.

1. In what state do you operate? *(required)*

2. In what Corps district(s) do you operate? *(required)*

3. Are there specific climate change threats that affect your area or the wetlands/streams in your area (e.g., sea level rise, wildfires, etc.) *(required)*

4. Do you consider climate change in the siting, management, or design of projects? *(required)*
   - ○ Yes
   - ○ No

   If so, please elaborate below.

5(a). In what stages of the process relating to the Instrument or program operation do you consider climate change? Please check all that apply.
- ☐ Force majeure provisions
- ☐ Service area determination
- ☐ Compensation Planning Framework
- ☐ Contracting provisions
- ☐ Other: _____ *(fill in)*

5(b). In what stages of the process relation to design/approval/implementation do you consider climate change? Please check all that apply.
- ☐ Site selection
- ☐ Project design

- ☐ Credit determination
- ☐ Adaptation plans
- ☐ Long-term management plans
- ☐ Other: _____ *(fill in)*

6. Have you had to implement adaptive management as a result of the impacts of climate change or extreme natural disaster? With what obstacles and outcomes? What resources aided your response?

7. Have you ever had, or do you regularly have, conversations with members of your Corps District and/or IRT around climate change as related to the project development or review process or project implementation? If you work in multiple districts, please consider listing the certain Districts that have resilience considerations in their criteria versus other districts that do not.

8. Is consideration community resilience benefits included in site selection or credit determination criteria? More specifically, are the provisions of social benefits related to increased climate resiliency considered during the site selection process? Again, please consider naming certain Districts if applicable.

9. Do you consult climate adaptation or hazard mitigation plans (or related plans) in project development?

10. Are you aware of any policies, guidance, or best practices for integrating climate change in mitigation project development?

11. What tools and resources are currently available to you or are needed to support evaluation of future climate change impacts or resiliency benefits associated with a potential mitigation site?

12. If we have follow up questions, can we contact you? If so, please leave your name and email address.

Environmental Law Institute Questionnaire for Mitigation Bankers:
Improving Success of Compensatory Mitigation Under Changing Conditions

The Environmental Law Institute (ELI), with a Wetland Program Development Grant from the U.S. EPA, is working on a project focused on improving the success of compensatory mitigation initiatives in the face of changing climatic conditions. This project aims to help compensatory mitigation programs and projects effectively address rapidly changing conditions and events to ensure functions lost to permitted impacts are effectively and permanently replaced. The requirements in the 2008 compensatory mitigation regulations were designed to achieve successful resource replacement projects. Yet, many mitigation providers, stewards, and state and tribal regulators are now starting to think about how to design, implement, manage, and oversee projects given sometimes unforeseen and changing conditions that affect the achievement of compensatory mitigation objectives. This project will develop a report

that identifies challenges and provides practical recommendations for improving practice. ELI is seeking your input on a brief (10 minute or less) questionnaire about how you consider climate change in the design and siting of compensation projects and where, if at all, this factors into the project timeline. Thank you for your assistance with this project.

1. In what state do you operate? *(required)*

2. In what Corps district(s) do you operate? *(required)*

3. Are there specific climate change threats that affect your area or the wetlands/streams in your area (e.g., sea level rise, wildfires, etc.) *(required)*

4. Do you consider climate change in the siting, management, or design of projects? *(required)*
   - ○ Yes
   - ○ No

   If so, please elaborate below.

5. In what stages of the process do you consider climate change? Please check all that apply.
   - □ Site selection
   - □ Project design
   - □ Service area determination
   - □ Credit determination
   - □ Contracting provisions
   - □ Force majeure provisions
   - □ Adaptation plans
   - □ Long-term management plans
   - □ Other: _____ *(fill in)*

6. Have you had to implement adaptive management as a result of the impacts of climate change or extreme natural disaster? With what obstacles and outcomes? What resources aided your response?

7. Have you ever had, or do you regularly have, conversations with members of your Corps District and/or IRT around climate change as related to the project development or review process or project implementation? If you work in multiple districts, please consider listing the certain Districts that have resilience considerations in their criteria versus other districts that do not.

8. Is consideration community resilience benefits included in site selection or credit determination criteria? More specifically, are the provisions of social benefits related to increased climate resiliency considered during the site selection process? Again, please consider naming certain Districts if applicable.

9. Do you consult climate adaptation or hazard mitigation plans (or related plans) in project development?

10. Are you aware of any policies, guidance, or best practices for integrating climate change in mitigation project development?

11. What tools and resources are currently available to you or are needed to support evaluation of future climate change impacts or resiliency benefits associated with a potential mitigation site?

12. If we have follow up questions, can we contact you? If so, please leave your name and email address.

Appendix 2: Guiding Questions for Conversations

Guiding Questions for Conversations with Providers

1. Please tell us a bit more about how you are integrating climate.
2. Please tell us a little bit about your conversations with the Corps around the topic of climate change in compensatory mitigation.
3. Please tell us a little bit about your conversations with the IRT around the topic of climate change in compensatory mitigation.
4. What guidance or tools do you look to when considering possible climate change impacts on your sites? Are these provided by the Corps/IRT, or are they found elsewhere?
5. Are there individuals in your Corps District you would recommend we reach out to?
6. We are going to be looking a project instruments and CPFs to see how programs are integrating climate change or its effects into these documents.
    a. How do you anticipate this might be included?
    b. Are there other considerations we should incorporate into this review?
7. What would be most helpful for your program in integrating climate change for site resiliency?

Guiding Questions for Conversations with Members of the Corps

1. In your experience, how is climate change integrated into compensatory mitigation project development and program implementation (if at all)? In what specific components of the instrument or mitigation plan is climate considered (*e.g.,* long-term management, adaptive management, credit determination, site selection, project design, etc.)?
2. Are you aware of any policies, guidance, or best practices for integrating climate change in mitigation project development? Are there tools and resources that exist for providers interested in integrating climate change?
3. Do you know of, or have you worked with, programs or projects that might be good examples?

Guiding Questions for Conversations with Members of the EPA 404 Working Group

1. In your experience, how is climate change integrated into compensatory mitigation project development and program implementation (if at all)? In what specific components of the instrument or mitigation plan is climate considered (*e.g.,* long-term management, adaptive management, credit determination, site selection, project design, etc.)?
2. What threats or considerations are driving discussions around climate and compensatory mitigation (*e.g.,* drought, sea level rise)
3. Is there consideration of community resilience benefits in discussions around site selection or credit determination criteria? More specifically, are the provision of social benefits related to increased climate resilience considered during the approval process?

4. Are you aware of any policies, guidance, or best practices for integrating climate change in mitigation project development?
5. What tools and resources exist for providers interested in integrating climate change?
6. Do you know of, or have you worked with programs that had to implement adaptive management as a result of climate change or extreme natural disaster?
    a. With what obstacles and outcomes?
    b. What resources aided the response?