



# Improving Mitigation Under the Endangered Species Act



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This page: Red-cockaded woodpecker,  
Eric Spadgenske, USFWS

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## A PRESSING NEED TO IMPROVE ENDANGERED SPECIES MITIGATION

**ALTHOUGH SPECIES LISTINGS** get most of the public's attention under the Endangered Species Act (ESA), the status of a species after it's listed is often dictated by ESA permits and authorizations for activities that affect the species. At the crux of permitting is how those impacts are avoided, minimized, and offset. Depending on the extent of these mitigation measures, a species can be left worse off (net loss), the same (no net loss), or better off (net benefit) as a result of a proposed project. From this perspective, mitigation is one of the most important factors in determining the ESA's effectiveness and whether we save or lose species.

Despite the importance of mitigation, it has historically lacked a uniform approach under the ESA. Until 2016, the U.S. Fish and Wildlife Service (FWS) had never issued national mitigation policy for the ESA. Mitigation decisions were often made at regional or local levels through negotiation with project proponents. Although important insights come from decisions at those levels, the absence of national policy resulted in inconsistent mitigation outcomes even for the same species. In 2016, FWS adopted two mitigation policies that should have begun to address this and other problems. Rather than continue to make mitigation more predictable and transparent, the Trump administration rescinded these and other Obama-era mitigation policies in 2018.

The Biden administration has the opportunity to not only restore the 2016 mitigation policies but improve mitigation to meet the growing challenges of recovering ESA-listed species. These improvements will be particularly important given the administration's ambitious plans to repair and rebuild our nation's roads, bridges, and other infrastructure, and to promote large-scale renewable energy development. Many of these activities could impact endangered species and their habitats. Transportation projects are already the second most frequently reviewed projects for their impacts on ESA species.<sup>1</sup> And many renewable energy projects, which help combat climate change that threatens biodiversity, have nonetheless faced opposition for their impacts to desert tortoises, endangered bats, and other federally protected species. Better approaches to mitigation are needed to minimize the friction between our nation's species conservation goals and our climate and infrastructure goals.

In this report, we offer ideas for improving ESA mitigation to address past gaps in mitigation practice and to confront future challenges arising from infrastructure development. The report first provides background on ESA mitigation, including the relevant laws and policies. The report then offers near- and longer-term recommendations to improve ESA mitigation. These recommendations should form a core component of how the Biden administration approaches ESA permitting.

### Legal and policy overview

**UNDER THE ESA**, activities that cause harm to listed species or their critical habitat generally trigger mitigation requirements. Two types of harms are relevant to this report. First, the ESA prohibits any person from “taking” any listed animal species without the prior authorization of FWS or the National Marine Fisheries Service (NMFS). Take is defined broadly to include harassing, harming, or attempting to do so. Second, the ESA also prohibits all federal agencies from “jeopardizing” the continued existence of any listed species and from “destroying or adversely modifying” any critical habitat designated under the ESA. Federal agencies must consult with the Services to ensure their proposed actions do not violate the jeopardy/adverse modification prohibitions.

In practice, the process for determining ESA mitigation requirements depends on whether a proposed activity has any federal connection (i.e., is funded, permitted, or carried out by any federal agency). If so, then mitigation is determined as part of a federal agency’s consultation with the Service under section 7(a)(2) of the ESA. If not, then mitigation is determined as part of a conservation plan that the project proponent must develop and submit to the Service for approval under section 10 of the ESA. These section 10 plans can take one of two forms: for listed species, the project proponent must develop a habitat conservation plan (HCP); for unlisted species, a candidate conservation agreement with assurances (CCAA) is the appropriate vehicle.

In practice, most section 7 consultations involve a federal agency proposing a mix of avoidance and minimization measures such that no take of a listed species is likely. Those measures are built into the proposed project undergoing consultation and are called “conservation measures.” According to one study, about 93% of all 88,290 FWS consultations from 2008-2015 were resolved using this process, also known as “informal consultation.”<sup>2</sup> For the remaining 7% of projects that were likely to cause take, the consultation evaluated whether the project effects will cause jeopardy/adverse modification. If so, the Service must identify avoidance, minimization, and/or offset (also known as compensatory mitigation) measures to avoid jeopardy/adverse modification. These measures are known as reasonable and prudent alternatives (RPAs). Even when jeopardy/adverse modification is not triggered (which is the case in over 99.99% of all FWS consultations), federal agencies must also minimize the effects of any incidental take. These minimization measures are called reasonable and prudent measures (RPMs). Table 1 summarizes the role of avoidance, minimization, and offsets for each of the three types of section 7 mitigation actions discussed above.

As explained earlier, if a project is likely to cause take but has no federal nexus, then a section 10 agreement is required to obtain authorization for take that is incidental to the purpose of the project (also known as “incidental take”).<sup>3</sup> For incidental take of listed species, an HCP that will, “to the maximum extent practicable, minimize and mitigate the impacts of such taking,” is required for the Service to authorize the take.<sup>4</sup> This requirement does not specifically address avoidance of impacts, but the Services’ HCP Handbook strongly encourages project proponents to start with avoidance before considering minimization and offsets.<sup>5</sup>

Non-listed species are not protected by the ESA’s take prohibition. Many landowners and businesses, however, have voluntarily developed CCAAs for certain species at risk of becoming listed, with the goal of either avoiding the need for listing or, if listing is triggered, providing the landowners with the assurance that the Service will impose no ESA requirements beyond those in the CCAA. In the latter scenario, the CCAAs also authorizes incidental take of the covered species, functioning effectively as an HCP. The standard for the Service to approve a CCAA, however, is different from that for an HCP. CCAAs must provide a “net conservation benefit,” which means “the cumulative benefits of the CCAA’s specific conservation measures designed to improve the status of a covered species by removing or minimizing threats so that populations are stabilized, the number of individuals is increased, or habitat is improved.”<sup>6</sup> On paper, this is a higher conservation standard than the HCP’s “maximum extent practicable” standard, although in practice the distinction is often difficult to decipher.

<b>Type of ESA conservation action or agreement</b>	<b>Avoidance</b>	<b>Minimization</b>	<b>Offsets</b>
<b>Section 7 Consultations</b>			
<b>Section 7 “conservation measures”</b>	Yes. Can be incorporated into measures.	Yes. Can be incorporated into measures.	Yes. Can be incorporated into measures.
<b>Reasonable and prudent measures (RPMs)</b>	N/A.	Yes. This is the focus of RPMs.	Yes. Can be incorporated into RPMs. <sup>7</sup>
<b>Reasonable and prudent alternatives (RPAs)</b>	Yes. Can be incorporated into RPAs.	Yes. Can be incorporated into RPAs.	Yes. Can be incorporated into RPAs.
<b>Section 10 Agreements</b>			
<b>Habitat conservation plans (HCPs)</b>	Can be voluntarily offered by permittee and is encouraged by the Services.	Yes. Must be incorporated to the “maximum extent practicable.”	Yes. Must be incorporated to the “maximum extent practicable.”
<b>Candidate conservation agreements with assurances (CCAAs)</b>	Can be incorporated as part of “net conservation benefit” standard.	Can be incorporated as part of “net conservation benefit” standard.	Can be incorporated as part of “net conservation benefit” standard.

*Table 1. Summary of when avoidance, minimization, and offset measures are used as part of section 7 consultations and section 10 agreements.*

## 2016 FWS mitigation policies

The ESA mitigation requirements described above do not specifically address many operational and policy issues about mitigation or our understanding of effective mitigation that has emerged in recent decades. To begin filling that gap, FWS in November 2016 finalized its first-ever mitigation policy that covered all of the agency’s trust species, including ESA species.<sup>8</sup> A month later, the agency finalized another policy specific to ESA compensatory mitigation.<sup>9</sup> The two policies did not modify any ESA regulations but did provide principles, a framework, goals for appropriate levels of mitigation, recommendations, and other information to guide how mitigation programs should be developed and implemented. For example, the policies confirmed the agency’s recommendation to apply the mitigation hierarchy of first avoiding impacts and then minimizing and offsetting any unavoidable impacts. Further, the policies established an agency goal “to improve (i.e., a net gain) or, at minimum, to maintain (i.e., no net loss) the current status of affected resources” through mitigation programs. This goal, however, was interpreted by some people as creating a new requirement that would raise the standards for ESA mitigation, despite language in the policies that limited that goal only to circumstances where it was allowed by statutory authority. Interior Secretary Zinke rescinded both policies in 2018, leaving the agency with no overall ESA mitigation policy through January 2021.

NMFS has not adopted agency-wide mitigation policy, although it has adopted mitigation policy and guidelines for California eelgrass<sup>10</sup> and a handbook for coral reef impact mitigation.<sup>11</sup> Further, the agency announced it was developing mitigation policy for all of its trust resources in 2017, but never offered a draft for public review.

### Overview of 2016 FWS Mitigation Policies revoked in 2018

#### **2016 FWS Mitigation Policy (November 21, 2016)**

- **Applies to all FWS trust species, including ESA-listed species, and is the first FWS policy to do so, superseding the 1981 FWS mitigation policy that excluded ESA-listed species.**
- **Covers the full mitigation sequence of avoidance, minimization, and offsets.**
- **Intended to implement the Obama Presidential Memorandum on Mitigating Impacts on Natural Resource from Development and Encouraging Related Private Investment (November 3, 2015).**
- **Provides **overarching guidance** for all actions for which FWS has authority to recommend or require mitigation.**
- **Establishes eight mitigation **principles**, including creating a mitigation goal of a “net conservation gain”; following the sequence of first avoid, then minimize, then offset impacts; adopting a landscape approach to mitigation; and preferring offsets that are implemented before the impacts of an action occur.**
- **Establishes a nine-part **framework** for how FWS will approach mitigation, including integrating mitigation into landscape-scale planning; providing principles for assessing the impacts of proposed projects and mitigation measures; describing factors that FWS will use to assess the value of habitat for species; and summarizing the different types of mitigation actions.**

## **2016 FWS ESA Compensatory Mitigation Policy (December 27, 2016)**

- Applies only to ESA-listed species.
- Adopts the principles in the November 2016 Mitigation Policy and focuses on offsets/compensatory mitigation rather than avoidance or minimization.
- Provides **guidance** for applying offsets under each relevant section of the ESA. For example, the policy explains that under section 7(a)(1), the goal is to achieve a “net gain” for the conservation of at-risk and listed species. The policy also establishes a general process for transitioning candidate conservation agreements with assurances and safe harbor agreements into long-term/permanent conservation that can serve as offsets for other actions.
- Provides **standards** for ESA offsets, including appropriate siting of offset actions; use of reliable and consistent metrics for measuring beneficial and harmful impacts; duration of offset measures; maintaining transparency of offset actions; and compensating for temporal losses when offsets are delayed after impacts occur.
- Sets **general considerations** for offsets, including preference for offsets performed before permitted impacts occur; whether offsets can occur on public lands; and selection of metrics for calculating mitigation credits and debits.
- Identifies future FWS “implementation guidance” that will cover specific operational details of offsets. No such guidance has been developed.

## **Types of ESA offsets**

There are three primary types of offsets that permittees can use. Below, we briefly discuss each type and its advantages and disadvantages.

Under permittee-responsible mitigation, the permittee carries out all the offsets as required by the terms of an ESA permit and retains legal liability for the long-term performance of the offsets. This makes the permittee solely responsible for ensuring the offsets are implemented and effective. Most permittees, however, have little to no expertise in natural resource mitigation, creating a risk of unplanned financial and ecological problems during implementation or later. For permittees that do have the expertise and resources to carry out their own mitigation, permittee-responsible mitigation can offer the most flexibility.

A second type of offsets are in-lieu fee compensation, in which the permittee pays a fee to a public agency or nonprofit and in exchange is relieved of any liability for ensuring the offset measures are completed and successful.<sup>12</sup> Like permittee-responsible mitigation, in-lieu fee programs generally perform the offsets after the permitted impacts have occurred. This approach can be very risky for covered species for which effective offset techniques have not yet been demonstrated.<sup>13</sup> Further, FWS has had very limited capacity to track the implementation of mitigation programs, creating a risk that



post-impact mitigation commitments are not implemented diligently or at all. Unlike with permittee-responsible mitigation or conservation banks, in-lieu fee programs involve the transfer of mitigation liabilities from the permittee at the time of sale/transfer of credits but often do not legally transfer specific, enforceable liabilities for the mitigation or restoration outcomes to the recipient of the funds.

The third type of offsets are conservation banks, which FWS defines as “a site or suite of sites that provides ecological functions and services expressed as credits that are conserved and managed in perpetuity for particular species and are used expressly to offset impacts occurring elsewhere to the same species.”<sup>14</sup> Overall, conservation banks provide the best option for offsetting impacts, as is the case in wetland mitigation.<sup>15</sup> One reason is that the offsets are typically provided before the permitted impact occurs, thus greatly reducing the risk of relying on ineffective offsets. Further, FWS policy requires that conservation banks are managed in perpetuity and have permanent endowments to fund the conservation measures and required habitat maintenance needs. These rigorous standards, however, also mean that conservation banks are the least used of the three offset types. Although FWS finalized guidance on conservation banks in 2003, the agency has approved only about 150 banks to date.<sup>16</sup> The November 2016 Mitigation Policy would have begun to increase the number of banks by establishing a preference for offsets that are completed before a permitted impact occurs. Presumably with the goal of clarifying and expanding the use of conservation banks, the National Defense Authorization Act for Fiscal Year 2021 (H.R. 6395 / S. 4049) includes a requirement for FWS to develop regulations that establish objectives, measurable performance standards, and criteria for use of conservation banks under the ESA.



*If properly sited, large scale solar energy projects like this one in California can help meet our nation's energy goals without unduly harming endangered species.* CC BY 2.0 BUREAU OF LAND MANAGEMENT

## Performance of offset programs

An unfortunate reality of ESA implementation is the Services lack the capacity to properly monitor the implementation and effectiveness of most mitigation commitments. One study of four ESA mitigation programs in California found that “while I anticipated some difficulties, the tale is more alarming than expected. The government entities involved struggled to locate and understand the permits themselves, let alone the details of the compensatory mitigation projects.”<sup>17</sup> These findings are consistent with those that one of us (Li) has experienced in response to Freedom of Information Act Request for ESA monitoring reports for certain section 7 consultations and HCPs. Many of the reports were missing or difficult for FWS to find, strongly suggesting that the agency does not consistently review the reports to determine whether mitigation measures have been implemented and are effective. This is a problem for tracking not only permittee-responsible and in-lieu fee mitigation but also the long-term performance of conservation banks. As the most recent (2017) study on conservation banks reported, “lack of data availability and limited tracking continue to pose the barriers to analyzing banking and other types of compensatory mitigation practices identified.”<sup>18</sup>

## IMPROVING ENDANGERED SPECIES MITIGATION

**CONSIDERING THAT MITIGATION** is one of the most important aspects of any ESA permitting action, the Biden administration should prioritize improving FWS’s mitigation policies and practices and developing an ESA mitigation policy for NMFS. Effective mitigation practices are particularly important given Biden’s national infrastructure plan, which will invest in much needed infrastructure repair but also impact species and their habitats. Without a strategic approach to reconciling construction activities and conservation, costly conflicts between the two will likely arise. Below, we first make the case for reinstating the 2016 FWS mitigation policies and then describe near- and longer-term actions that the Biden administration should consider for improving ESA mitigation.

### Why restore the 2016 FWS mitigation policies

Restoring the two 2016 mitigation policies is a crucial step toward creating a workable ESA mitigation program that can support the Biden administration’s infrastructure, climate change, and conservation goals. The policies offer good principles, guidance, and a framework that the administration can readily adopt as a starting point for more detailed directions on how to apply those policies to individual permitted activities. The administration should thus promptly restore the policies and then focus on developing the best ways to implement them, rather than try to develop new mitigation policies from scratch. Most of the contents of the policies are not self-implementing; whether the goals of the policies are realized will depend on how they are implemented through step-down guidance, policies, and permitting decisions. The administration should focus its efforts on proper implementation rather than waste precious time rewriting the policies. Below we discuss several benefits of using the policies as the foundation for future mitigation.



*Federal lands support a large variety of ESA-listed and at-risk species, including the dwarf bearclaw poppy. Getting mitigation right on federal lands is crucial to conserving these species.* CC BY 2.0 BUREAU OF LAND MANAGEMENT

## BETTER CONSERVATION OUTCOMES

The policies offer many principles that, if properly implemented, will improve conservation outcomes. For example, the November 2016 Mitigation Policy recognizes that assessing a habitat’s value must consider its scarcity, suitability, and importance. Thus, unique habitats should rank very high in terms of ecological importance and require strong avoidance measures because they are irreplaceable. The policy explains that “preventing impacts to these habitats is the most effective means of maintaining the current status of a species, which is the minimum goal of this Policy.”<sup>19</sup>

Another example is the requirement for offsets to provide benefits beyond those that would otherwise have occurred. This “additionality” requirement is often overlooked or poorly executed in permitting decisions. In those situations, the harmful impacts of a permitted project to species may be far greater than anticipated. Other important concepts in the policies are ensuring that offsets are sustained for the entire duration of the associated impact (“durability”), the requirement for permittees to ensure that mitigation projects meet their performance criteria, and limits on the use of public lands to offset impacts on private lands.

## PREDICTABLE MITIGATION REQUIREMENTS AND LANDSCAPE-SCALE PLANNING

The policies create an important step toward more predictable mitigation requirements, which will be crucial for ensuring efficient permitting of infrastructure projects. For example, the ESA Compensatory Mitigation Policy provides general direction on creating and using mitigation credits to offset permitted impacts. Rather than reinvent this guidance, FWS should focus on determining how to apply it to species that will be the subject of frequent ESA permitting for infrastructure projects.

Another example comes from the strong emphasis on proactive, landscape-scale mitigation plans, encouraging the development of mitigation actions *before* permitted actions are proposed. For example, if the administration anticipates a certain amount of solar energy development in Nevada over the next 20 years, upfront planning for impacts to desert tortoises, rare plants, and other protected species would identify mitigation requirements before specific projects are proposed and minimize conflicts when those projects break ground and ideally invest in or incentivize others investment in offsets whose needs can be anticipated based on the plans. Those policies should also involve early government-to-government coordination with tribal governments to identify and support ways to maximize natural resource benefits and treaty rights for tribes.

The Desert Renewable Energy Conservation Plan, which covers 22.5 million acres in southern California, is an example of how a landscape-scale plan can jointly promote renewable energy and conservation goals. One way is by streamlining permitting and mitigation requirements for renewable energy projects in areas with minimal potential conflicts with natural and cultural resources.<sup>20</sup>

## FASTER, BETTER OFFSETS CREDITS

The two policies offer various guidance for faster approval of offset credits that are effective at compensating for species impacts. Most importantly, the policies encourage mitigation providers to create a supply of offset credits before impacts occurs. Having a supply of credits not only reduces the risk of biologically ineffective offsets but also streamlines the process for permittees to fulfill their mitigation requirements.

Another example comes from the ESA Compensatory Mitigation Policy, which describes the requirements for transitioning CCAAs and safe harbor agreements to offset credits. By describing the requirements, the policy creates a faster, clearer process for qualified agreement participants to supply credits.



*Nesting boxes are a common type of offset for the red-cockaded woodpecker.* CC BY 2.0 JACKSON S.C. MIDDLE SCHOOL

# NEAR-TERM MITIGATION RECOMMENDATIONS FOR THE BIDEN ADMINISTRATION

## I. Reinstate 2016 FWS mitigation policies and begin developing step-down guidance

As explained earlier, the FWS 2016 Mitigation Policy and 2016 ESA Compensatory Mitigation Policy provide a good foundation for guiding ESA mitigation. The policies generally meet the 10 principles of the Business and Biodiversity Offsets Program (BBOP), which is the international standard for biodiversity offset programs.<sup>21</sup> Given the pace at which the Biden administration is expected to proceed with its infrastructure plan, the administration should promptly reinstate the policies so that it can focus on developing step-down guidance that will help the agency better review and authorize or permit actions that affect listed species and more effectively structure mitigation to avoid, minimize, and offset impacts.

As part of future implementation of the policies, several issues warrant particular attention.

- **Applying the mitigation sequence to highly vulnerable or irreplaceable resources.**

The 2016 Mitigation Policy explains that irreplaceable or difficult to replace habitats will be deemed “important” as part of applying the mitigation sequence and that FWS staff “will recommend avoidance of all impacts to high-value habitats as the only effective means of mitigating impacts at these locations.” These principles are a step in the right direction but require further guidance to apply them effectively as part of ESA section 7 consultations and section 10 permitting, especially when FWS has not specified whether a species or its habitat scores high on the irreplaceability or high-value scale.<sup>22</sup> To better integrate these principles into ESA decisions, we recommend that species recovery plans, species status assessments, or other similar FWS documents specifically describe whether a species’ vulnerability or the irreplaceability of its habitat requires a greater emphasis on avoidance and, if so, which parts of the species’ range are the highest priorities for avoidance.

- **Standardize metrics for calculating harms and benefits to determine overall conservation effect.**

One of the main barriers to efficient and effective offsets is the absence of standardized metrics for calculating how much a proposed project will harm a species and how much conservation measures will benefit the species. For example, suppose a project will eliminate 20 acres of habitat for a species, while the corresponding offset measure will help fund the reintroduction of the species. Overall, is the species closer to recovery? The use of consistent impact and benefit quantification methods is widespread for Clean Water Act mitigation of streams and wetlands. Except for a small number of species (e.g., California red-legged frog), such quantification tools are lacking for ESA species. Without metrics to enable an “apples-to-apples” comparisons of those effects, answers to this question are prone to inconsistencies and ad hoc determinations, making it very difficult to determine if a project has resulted in a net loss or net benefit to the species. Direction to develop these metrics is already in the ESA Compensatory Mitigation Policy, but additional step-down guidance is needed to institutionalize a process for the agency to review and approve metrics and make them readily available to permittees and mitigation providers.

• **Public availability of monitoring data on mitigation outcomes.** Considering that effective mitigation techniques do not yet exist or are poorly documented for many ESA species, monitoring the outcomes of mitigation programs is of utmost importance to determining whether those programs achieve their conservation goals. Too often, the Services permit activities without having the capacity to review whether the associated mitigation measures have been implemented and are effective, and without clear compliance criteria for enforcing those measures. The 2016 Mitigation Policy briefly addresses the effectiveness issue, explaining that “the Service encourages, supports, and will initiate, whenever practicable and within our authority, post-action monitoring studies and evaluations to determine the effectiveness of recommendations in achieving the mitigation planning goal.” It further explains that “should a mitigation project fail to meet its performance criteria and therefore fail to provide the expected conservation for the species, the responsible party must provide equivalent compensation through other means.” Although these statements



*The California red-legged frog is one of the few dozen species for which species conservation banks have been established.* CC BY-NC-ND 2.0 AZ3

are a step in the right direction, they presume that FWS has the capacity to (1) monitor whether implementation is occurring and (2) evaluate whether the measures are effective. Unfortunately, the agency is persistently understaffed and monitoring often falls by the wayside. In addition to seeking adequate funding from Congress to perform monitoring, FWS should also provide the public with access to permitting data so that they can help the agency identify lapses in implementation and evaluate the performance of mitigation measures. Those evaluations can then inform the selection of future conservation measures using an evidence-based approach. This approach aligns with the 2019 OPEN Government Data Act, which creates a government-wide mandate for all federal agencies to publish their information as open data using standardized, non-proprietary formats. The U.S. Environmental Protection Agency has adopted a similar approach through its NextGen program, which posts permitting documents online to enable the public to help the agency monitor permitted activities.

• **Role of research in mitigation.** Scientific data on many listed species are limited. As a result, research is needed to determine the most effective conservation techniques, including mitigation measures. FWS, however, has provided limited guidance on this issue. The 2016 Mitigation Policy explains that in “rare circumstances, research or education that is directly linked to reducing threats, or that provides a quantifiable benefit to the species, may be included as part of a mitigation package,” but defers providing implementation details to “future step-down guidance” or case-by-case determinations by agency staff. Step-down guidance on offset crediting for research, such as research tied to lowering the impacts of wind turbines on birds and bats, should lead to better incentivizes to pursue research that contributes to mitigation. We believe that in some circumstances, FWS should consider offering some mitigation credits for research that is strongly associated with efforts to identify effective species restoration or augmentation techniques or that is very likely to increase the effectiveness of already known techniques. Reissued or new mitigation policy should address this opportunity more clearly.

## II. Expand development of refined species range maps

In September 2019, FWS issued an important but little-known standard operating procedure (SOP) on creating refined range maps for ESA species.<sup>23</sup> The SOP describes the parameters for creating those maps, which will replace the less refined (often county-level) maps that FWS currently posts on its website. Refined maps will allow the regulated community to offer far more targeted mitigation measures because they will have a better understanding of areas where a species is likely to occur. In particular, avoidance measures can be more targeted, minimizing the risk of overregulation as might occur with a coarse range map that includes areas where a species does not actually occur. Further, providing refined maps to the public allows the regulated community to design activities to avoid and minimize impacts on listed species *before* they propose those activities to FWS through a section 7 consultation or section 10 permitting process. Thus, refined maps are essential to supporting good mitigation decisions and an efficient ESA permitting process. This efficiency will be vital to realizing the Biden administration’s infrastructure plan in a timely manner.

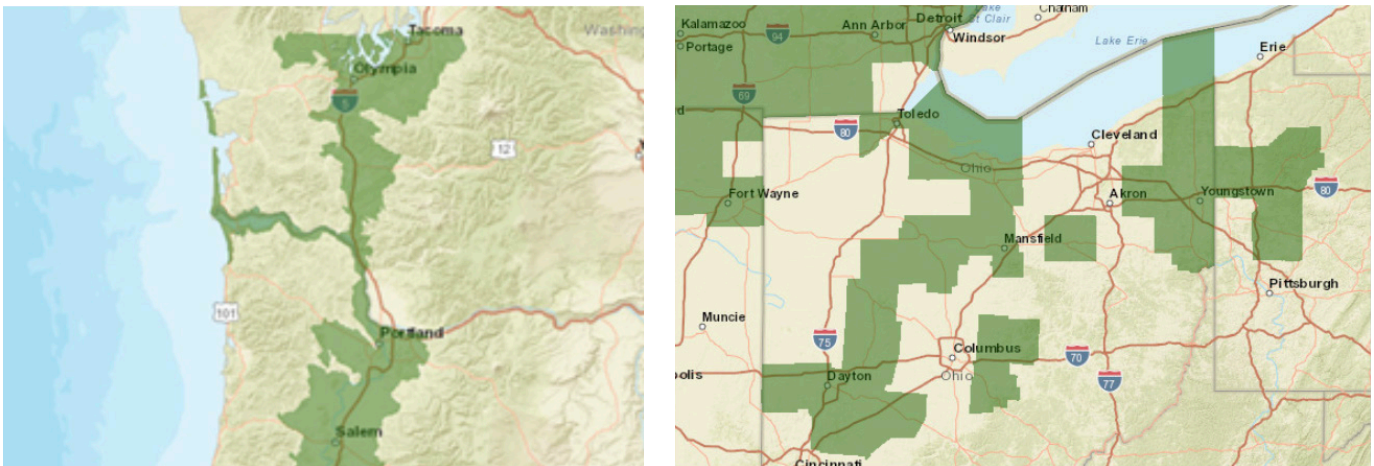


Figure 1. *The coarse range map for the eastern massasauga rattlesnake compared to the refined map for the streaked horned lark. The rectilinear lines in the first map largely follow county boundaries, rather than biophysical boundaries that more accurately depict the species’ true range.*

To date, FWS has created, finalized, and upload to its ECOS website refined maps for over 175 ESA-listed species, following the SOP. Although the agency has maps for dozens of other species queued for review and final approval, it could benefit from expanding the mapping effort to cover far more species within the next few years. Key to this expansion is to create a clearer path for external partners like NatureServe to provide the agency with draft maps that it can review using the SOP. Doing so would also reduce the amount of work for FWS to create maps from scratch.

### III. Support establishment of species conservation banks and improve systems to measure their effectiveness

As explained earlier, conservation banks generally offer the highest standard for offsetting impacts to species or habitat. The 2021 National Defense Authorization Act creates an opportunity for FWS to expand the use of conservation banks by requiring it to develop regulations that establish objectives, measurable performance standards, and criteria for conservation banks. As part of the rulemaking and subsequent implementation, FWS should pursue the following actions

- **Ensure that market demand for mitigation credits from conservation banks is not undermined by lower conservation standards for in-lieu fee and permittee-responsible mitigation.** Because conservation banks are generally held to the Services' highest standards for mitigation, the incentive for permittees to buy banking credits diminishes if they can meet their ESA mitigation requirements through other forms of mitigation that are less expensive (often because of lower conservation standards, such as the absence of perpetual management requirements). Thus, at the outset of any conservation banking rulemaking, FWS should ensure that it also addresses the requirements for in-lieu fee and permittee-responsible mitigation. In particular, in-lieu fee species mitigation lacks any transfer of liability that makes the recipient of mitigation funds legally responsible for performing the mitigation activities and meeting required performance outcomes. Without addressing the problems with these two alternatives to conservation banks, the agency cannot create enough pressure for permittees to acquire banking credits. This problem was reflected in FWS's 2016 study on conservation banks, which found that weak demand for banking credits ranked in the highest category of barriers to creating conservation banks.<sup>24</sup> The 2016 FWS Mitigation Policy specified a preference for offsets performed before a permitted impact has occurred, thus creating a general preference for banking credits to other forms of offsets. That preference, however, was more of a loose recommendation than a requirement. On its own, the preference seems unlikely to create a meaningful shift to banking credits. Supporting measures, such as better standards for in-lieu fee and permittee-responsible mitigation, will likely be needed. A complementary approach is to create a stronger requirement for permittees to use credits for mitigation done prior to impacts, assuming those credits are available. The Clean Water Act section 404 regulations in 2008 did just that, creating far more demand for strong advanced mitigation.
- **Update the 2003 Banking Guidance to support new banking rules.** Conservation banking rules can only achieve so much on their own—the mechanics of how to develop and administer conservation banks are far too extensive to capture in rules and should instead be addressed through updated guidance. According to a 2016 survey, there is strong support for updating the guidance and issuing conservation banking rules.<sup>25</sup>
- **Establish timelines for FWS to review conservation bank applications.** Although not a requirement of the NDAA, FWS regulations on conservation banks should establish timelines for the agency to review submissions for approval of banks. The agency's 2016 survey identified this as a primary barrier to the creation of conservation banks.



- **Establish metrics and monitoring systems to evaluate the effectiveness of conservation banks, individually and programmatically.** The most important issue when it comes to banks is the extent to which they are contributing to conservation. Contributions to species recovery should be the primary metric by which to evaluate banks, because a bank would not exist but for the need to conserve the species under the ESA. Nearly every evaluation of conservation banks, however, has identified the inadequacy of metrics and monitoring data to evaluate bank effectiveness. For example, the FWS 2016 report identified strong support for metrics to evaluate the ecological success of banks and that monitoring reports on ecological performance are “not comprehensively available or easily accessible” in the RIBITS (Regulatory In-Lieu Fee and Bank Information Tracking System) database maintained by the U.S. Army Corps of Engineers.<sup>26</sup> Similarly, a 2017 study on conservation banks found that they “tend not to fulfill criteria that relate to the success of the strategy from a scientific perspective, including the consideration of basic offset technicalities (proximity to impact area, time-lags, leakage, etc.), and the implementation of methods to address uncertainties and risks,” and underscored that “greater transparency through reporting is an urgent need that has been identified by previous researchers.”<sup>27</sup> FWS should address these gaps in performance evaluation and reporting as part of future revisions to the 2003 guidance and new regulations.

#### IV. Improve opportunities for tribes to provide conservation offsets

The 2016 FWS mitigation policies state that tribal lands are acceptable locations for compensatory mitigation, but the policies offer limited guidance on this topic. For example, the ESA Compensatory Mitigation Policy dedicates only 76 words on how to do so and states that guidance on coordination with tribes on mitigation is beyond the scope of the policy. Likewise, the general Mitigation Policy covers tribal issues at length only in a brief section on NEPA, describing early planning coordination with tribes and incorporation of tribal recommendations into mitigation measures. Elsewhere the policy identifies preferences for where to site offsets for impacts to public and private lands but makes no similar mention of siting offsets on tribal lands.

We recommend FWS address at least two major issues in any future policy or guidance on mitigation and tribal lands.

- First, the ESA Compensatory Mitigation Policy suggests that tribes need to grant another entity with rights through an easement to meet FWS’s durability requirements, even though those same requirements do not apply to federal lands. This is a nearly impossible requirement for tribes to meet and is inconsistent with how tribes view their sovereignty over those lands. FWS should recognize there are additional ways to secure durable use of a mitigation restoration site on tribal lands that respect tribal self-determination and laws, such as through tribal land use zoning, insurance, or bonding requirements. The agency should consult with tribes to identify how they can meet FWS’s durability requirements when mitigation is sited on tribal lands.
- Second, FWS should commit to developing step-down guidance on coordination with tribes about mitigation and specific steps to encourage the development and approval of mitigation banks on tribal lands where tribes have an interest in doing so. On average, there is likely to be more additionality available from projects sited on tribal or trust lands than on federal lands. FWS should thus consider creating a preference for mitigation credits generated on tribal or trust lands.

# LONGER TERM MITIGATION RECOMMENDATIONS FOR THE BIDEN ADMINISTRATION

## I. Use species recovery goals to inform mitigation measures

Because recovery is the goal of the ESA, it should inform all ESA permitting and mitigation decisions. In practice, however, the link between recovery and mitigation is often vague at best. Recovery plans, for example, typically lack guidance on how ESA permitting should minimize the adverse effects to a species' recovery status and what mitigation measures are most likely to advance recovery. To address this disconnect, the Services should develop mitigation guidance for a species as part of recovery planning. Doing so would allow a species' recovery needs to direct ESA permitting decisions, rather than the opposite in which permitting decisions can undermine recovery. Here are several examples of how a recovery-oriented approach to mitigation would improve on current approaches.

- Recovery plans would identify the preferred mitigation measures for a species, based on the species' recovery goals and actions. During ESA permitting, deviations from these preferred measures would require explanation. In developing the preferred mitigation measures, the Services would consider a species' vulnerability and irreplaceability of populations and habitats. A species with high scores for vulnerability and irreplaceability would require more avoidance than a species for which offsets can effectively compensate for adverse impacts from permitted projects. These scores would directly inform how the Services apply the "mitigation sequence" to the species, thus providing permittees with far clearer, biologically based standards about how much avoidance and minimization are needed before resorting to offsets. For data poor species, recovery plans can also describe how much to credit scientific research as part of fulfilling mitigation requirements.
- Recovery plan would identify the most important populations and habitats for recovery, encouraging permittees and the Services to direct mitigation measures to those areas and enabling a better understanding of the effects of incidental take depending on the populations/habitats affected. For example, the effects of take on high-priority areas would be far more significant than the effects on low-priority areas. This information can then inform the amount of mitigation needed to achieve a no net loss or net benefit outcome. To help identify important areas for recovery, the Services should make better use of "recovery units" for species.<sup>28</sup>
- Successful implementation of mitigation measures would improve a species' recovery status in measurable ways and would be reflected in five-year status reviews for the species or similar documents, allowing the Services to track exactly how mitigation has furthered a species' recovery status. This information can in turn inform future decisions about the best mitigation measures for a species and allow permittees to appreciate how their mitigation dollars have advanced recovery.
- Incidental take and other adverse effects to a species' recovery would also be reflected in status reviews or similar documents, providing greater transparency and accountability about how permitted actions could impede recovery status and whether those effects are fully offset by mitigation measures.

## II. Develop a system to track the implementation and effectiveness of mitigation techniques and use the results to inform future mitigation actions

Under the ESA, there is currently no national system to track the countless number of mitigation actions that permittees implement to determine the effectiveness of those actions. In fact, FWS staff are usually too overworked to even review many monitoring reports or to ensure they are submitted. Yet monitoring data on mitigation actions are particularly important considering the limited information for most listed species on how they respond to threats and conservation actions. At the global level, scientists have begun to address this problem through the Conservation Evidence initiative, which summarizes evidence from the scientific literature about the effectiveness of conservation actions, organized by groups of species and habitats.<sup>29</sup> In the U.S., however, there is no similar national effort or a system to curate and integrate the data from ESA monitoring reports into the Conservation Evidence evaluations or comparable framework. This is an enormous missed opportunity to ensure that mitigation actions generate the highest return on investment for conservation and contribute to recovery. We strongly recommend FWS begin creating a national system that, at a minimum, does the following:

- Standardizes the data and reports that permittees submit to facilitate analysis of that information
- Stores all ESA monitoring data and reports in one or more central repositories
- Makes those repositories freely accessible to the public online
- Creates a process to periodically evaluate and summarize the effectiveness of mitigation techniques for each species, perhaps as part of a species' 5-year status review
- Makes the evaluations publicly available to inform future mitigation programs.

Beyond these minimum features, a national system should also have a spatial database to publicly track the implementation of all mitigation actions, especially those occurring over many decades. This feature would allow FWS to easily track contract and permit obligations using a single system, rather than pull up stacks of permits to determine the obligations that apply in any particular area of the country. States can also help with this effort. Many states are now developing registries for water quality projects, and those efforts could expand to cover species permitting.

As a starting point for developing a national tracking system, FWS could look at the Army Corps RIBITS (Regulatory In lieu fee and Bank Information Tracking System), which tracks species mitigation credits, wetland and stream credits, and nutrient credit markets for state agencies. Further, the National Oceanic and Atmospheric Agency (NOAA) is currently investing millions of dollars to address a similar challenge with fisheries data, focusing on expanding electronic monitoring and reporting to improve data for fishermen and fisheries managers, including in response to climate change.<sup>30</sup> NOAA, Army Corps, EPA, and other federal agencies are already using data and technology to improve the collection and use of monitoring data. A similar effort for ESA data would improve the effectiveness of mitigation programs in ways that support recovery.

### **III. Establish methods to credit conservation measures for use as debits in future permitting actions**

Although conservation banks meet the highest standards under the ESA for mitigation, those standards also make it impossible for many landowners to establish a conservation bank on their land. For example, many landowners are unwilling to put a permanent easement on their property. A different system to credit conservation measures that do not meet the standards of conservation banks would expand the opportunities for advanced, pre-impact mitigation, which is FWS's preferred form of mitigation. Of course, those credits should not necessarily be used to offset the same types of impacts that require credits from a permanent bank. But for the many impacts that are temporarily or minor, credits from banks that are easier to establish than permanent banks are likely appropriate. We recommend FWS create an advance notice of proposed rulemaking to seek ideas on how to structure an alternative crediting system and what types of impacts can be offset using those credits.

For many years, FWS has used a crediting-debiting system in some section 7 consultations by allowing conservation measures under section 7(a)(1) to count toward mitigation under section 7(a)(2). The 2016 ESA Compensatory Mitigation Policy encourages this approach by describing how federal agencies can develop section 7(a)(1) conservation plans that include mitigation programs that contribute to species recovery. Existing FWS guidance on use of section 7(a)(1) as an advance mitigation tool, however, is limited, especially with the rescission of the Compensatory Mitigation Policy. Nonetheless, this tool shows that it is possible to credit advance conservation even when no permanent easement or fee-simple land acquisition is involved.

## **A mitigation program for national pesticide consultations**

The most complex and time-consuming ESA consultations are those for EPA's pesticide registration decisions. To date, the small number of pesticide consultations completed can easily take years to complete, generating a biological opinion that exceeds 1,000 pages. Over 700 existing pesticides will require EPA review in the coming years, and this cycle repeats every 15 years when a pesticide's EPA registration comes up for review. In addition, newly developed pesticides will require review for the first time. Neither the EPA nor the Services currently have the resources to keep pace with this workload, so major improvements to the pesticide consultation process are needed.

A key part of the solution is to develop a national-level mitigation program tailored to the unique challenges of pesticide consultations. Below are our recommendations on several elements of this program.

- Developing mitigation guidance specific to pesticide consultations. This includes working with EPA to create opportunities for pesticide registrants to adopt mitigation measures during the EPA review process to reach “no effect” and “not likely to adversely affect” determinations that eliminate the need for formal consultation.
- Identifying mitigation measures that build on existing conservation practices that farmers and other pesticide applicators are already familiar with. This include not only minimization measures such as pesticide spray restrictions but also offset measures based on stewardship or best management practices, including those funded through the U.S. Department of Agriculture's various conservation programs.
- Working with pesticide registrants and mitigation service providers to develop a nationwide system to efficiently offset unavoidable impacts from pesticide use on ESA species, especially using advance offsets delivered in advance of foreseeable pesticide impacts. In many areas where pesticides are applied, multiple pesticides registered by multiple registrants are used. A system for those registrants to share the cost of offsets in an area would be more efficient than a piecemeal approach in which each registrant pays for its own offset requirements.
- Identifying the most important research questions to inform the types of pesticide mitigation measures to pursue. For many listed species, the benefits of specific mitigation measures have not yet been quantified, making it difficult to determine how much mitigation is needed to offset any particular amount of adverse effects from pesticides. The potential effectiveness of offset measures should then inform the extent to which the Services need to rely on avoidance and minimization.
- Prioritize species based on their vulnerability to each class of pesticides. This would provide advance information to pesticide registrants about how much mitigation the Service could expect for the species, allowing the registrants to plan for species before the start of an ESA consultation.

## **IV. Create an efficient system to offset minor impacts to critical habitat**

One of the most controversial aspects of the ESA is the designation of critical habitat. Yet for all of the strife around critical habitat, all evidence indicates that the Services generally do not assign much weight to the section 7 prohibition on destruction or adverse modification of critical habitat, which is the only protection those areas receive under the ESA. There are multiple reasons for this outcome. One is that many authorized impacts to critical habitat result in only “small harms,” meaning impacts that are too minor to warrant individual consultations, especially for an agency that is perpetually understaffed.<sup>31</sup> The agencies do not appear to require offsets for those small harms, in part because no system exists for efficiently pursuing those offsets. To make all of the cost and controversial associated with critical habitat produce meaningful results for conservation, the Services need to create a highly efficient system for offsetting small harms to critical habitat and species. No such examples exist under the ESA but looking to other domains reveals approaches that the Services could evaluate for adoption.

One example is Virginia state’s approach to mitigating minor sources of water pollution. Virginia regulates phosphorus runoff from development sites and, since 2009, has allowed developers to achieve a portion of their phosphorus pollution reduction requirements by purchasing credits from nutrient banks elsewhere in the same river basin. These banks are typically established on former agricultural lands, put under permanent conservation easements, and reforested with native trees. Some banks also include stream restoration and reforestation. Developers building on less than 5 acres of land can choose to offset 100% of water quality impacts by buying credits from a nutrient bank under the Virginia Stormwater Management Program. State highway construction and other government activities are required to reduce their impacts on stormwater runoff and can purchase credits as well.<sup>32</sup> In recent years, the program has generated approximately \$15 million in annual credit sales. This current program is a vast improvement over the state’s historic approach to regulating phosphorus runoff. In the past, those impacts were either ignored or addressed exclusively onsite in ways that offer few environmental benefits, or were resolved with a fee that may not have funded water quality improvement. There are strong parallels here to how FWS either overlooks or inadequately addresses minor harms to critical habitat. The Virginia nutrient crediting program offers a promising model for FWS to consider.

## **V. Create an internal Services training and information exchange on mitigation**

Given the importance of mitigation to species recovery, the Services should develop a system for their staff to learn about mitigation best practices from each other and outside experts. Large mitigation programs that span multiple states and cover intensive industrial activities like energy development stand to benefit considerably from more internal coordination and learning within the Services. Very few individuals within the agencies have the experience to develop and administer these complex programs. Further, FWS’s mitigation policies have never provided much detail about what should go into large, complex ESA agreements nor how best to simplify them so that plan administrators are not overwhelmed with complexity (e.g., decisions for administering a plan that require an excessive number of approvals by administrators). The agency also lacks a process to systematically evaluate the strengths and weaknesses of its conservation plans and programs and to use this information to avoid future mistakes. All of these issues can be addressed through a structured program for Services staff to continually evolve their mitigation programs based on past failures and successes.

## VI. Establish a “net zero” or “no net loss” requirement for all ESA permitting actions through legislation

One of the most important parts of the 2016 FWS Mitigation Policy is its goal of maintaining (no net loss) or improving (net gain) affected resources through mitigation. Without a maintenance goal, wildlife and other affected resources could easily experience an overall decline from a permitted project. The goal in the 2016 policy, however, is just that—it does not change the legal standards for mitigation under any federal laws. For example, the ESA’s section 7 jeopardy definition does not protect against loss to a species’ survival or recovery, nor does the section 10 requirement for incidental take permits for HCPs.<sup>33</sup> Thus, a no net loss or equivalent net zero goal is a useful starting point for encouraging Services staff to negotiate for better mitigation outcomes, but it does not override the ESA’s less stringent permitting standards. Many ESA permitted projects are likely undercutting species recovery, in contravention of the ESA’s goal. The best way to address this problem is to, at a minimum, legally require that permitted projects result in no net loss to a listed species’ recovery status. Thus, we urge the Services, Congress, and stakeholders to begin a dialogue about how best to adopt and implement that requirement.

We have no doubt that such a requirement will be very controversial if proposed. But the reality is that America cannot simultaneously expect the ESA to recover the majority of listed species while annually permitting hundreds of projects that undercut that goal. To reduce the costs of a no net loss standard on businesses and landowners, the Services can adopt a variety of strategies as part of their future permitting and mitigation programs. For example, small landowners that face undue financial hardship in meeting the requirement could receive federal funding to help meet the standard. Further, more efficient permitting and monitoring protocols, such as the use of FWS’s online Integrated Planning and Consultation (IPaC) tool for section 7 consultations, would reduce the time and cost of permitting actions, helping to make a no net loss requirement easier to achieve.<sup>34</sup>

### MITIGATION AS A CENTERPIECE OF NATURAL RESOURCE MANAGEMENT

In closing, considering the large amount of permitting that occurs under the ESA, the corresponding mitigation framework is basic and in need of major improvements. The 2016 FWS mitigation policies represent an important milestone in the evolution of ESA mitigation standards. The Biden administration should promptly reinstate the policies. Policies and regulations alone, however, will not produce good conservation outcomes. Databases to organize and publish monitoring data, permitting systems that can handle large volumes of offset measures for “small harms” to critical habitat, and refined range maps that can avoid underregulation and overregulation are just a few examples of the actual work needed to operationalize a workable ESA mitigation program. The Biden administration should start these longer-term efforts to improve conservation outcomes and to support its infrastructure and economic recovery goals.

## ENDNOTES

- 1 See Jacob W Malcom & Ya-Wei Li, Data Contradict Common Perceptions About a Controversial Provision of the US Endangered Species Act, 112 Proc. Natl. Acad. Sci. U. S. A. 15844–15849 (2015). Some state transportation agencies, however, have also been very proactive at standardizing wetland and species mitigation and striving for mitigation outcomes that are ecologically meaningful. See, e.g., U.S. Dep’t of Transportation, Environmental Mitigation in Transportation Planning: Case Studies in Meeting SAFETEA-LU Section 6001 Requirements (2009), [https://www.environment.fhwa.dot.gov/env\\_initiatives/pel/pubcase\\_6001.aspx](https://www.environment.fhwa.dot.gov/env_initiatives/pel/pubcase_6001.aspx); James H. Thorne et al., The use of regional advance mitigation planning (RAMP) to integrate transportation infrastructure impacts with sustainability; a perspective from the USA, 9 Environ. Res. Lett. 065001 (2014).
- 2 Jacob W Malcom & Ya-Wei Li, Data Contradict Common Perceptions About a Controversial Provision of the US Endangered Species Act, 112 Proc. Natl. Acad. Sci. U. S. A. 15844–15849 (2015).
- 3 The Services do not authorize direct take through HCPs.
- 4 16 U.S.C. § 1539(a)(2)(B).
- 5 U.S. Fish and Wildlife Service and National Marine Fisheries Service, Habitat Conservation Planning and Incidental Take Permit Processing Handbook (2016).
- 6 U.S. Fish and Wildlife Service and National Marine Fisheries Service, Revised Policy for Candidate Conservation Agreements with Assurances, 81 Fed. Reg. 95,164 (2016).
- 7 The role of offsets in RPMs has not always been clear. The Services’ 2016 ESA Compensatory Mitigation Policy, however, clarifies that “RPMs can include mitigation, in appropriate circumstances, if such a measure minimizes the effect of the incidental take on the species, and as long as the measure is consistent with the interagency consultation regulations at 50 CFR 402.14.”
- 8 U.S. Fish and Wildlife Service, U.S. Fish and Wildlife Service Mitigation Policy, 81 Fed. Reg. 83,440 (2016) (hereafter 2016 Mitigation Policy).
- 9 U.S. Fish and Wildlife Service, Endangered Species Act Compensatory Mitigation Policy, 81 Fed. Reg. 95,316 (2016) (hereafter 2016 ESA Compensatory Mitigation Policy).
- 10 NOAA Fisheries, West Coast Region, California Eelgrass Mitigation Policy and Implementing Guidelines (2014), [https://archive.fisheries.noaa.gov/wcr/publications/habitat/california\\_eelgrass\\_mitigation/Final%20CEMP%20October%202014/cemp\\_oct\\_2014\\_final.pdf](https://archive.fisheries.noaa.gov/wcr/publications/habitat/california_eelgrass_mitigation/Final%20CEMP%20October%202014/cemp_oct_2014_final.pdf)
- 11 U.S. Coral Reef Task Force, Handbook on Coral Reef Impacts: Avoidance, Minimization, Compensatory Mitigation, and Restoration (2016), [https://www.ncei.noaa.gov/data/oceans/coris/library/NOAA/CRCP/other/USCRTF/mitigation\\_handbook\\_final\\_122216.pdf](https://www.ncei.noaa.gov/data/oceans/coris/library/NOAA/CRCP/other/USCRTF/mitigation_handbook_final_122216.pdf)
- 12 2016 Mitigation Policy at 83,478.
- 13 Martin Doyle, The Financial and Environmental Risks of In Lieu Fee Programs for Compensatory Mitigation (2019), <https://nicholasinstitute.duke.edu/publications/financial-and-environmental-risks-lieu-fee-programs-compensatory-mitigation>
- 14 2016 Mitigation Policy at 83,478.
- 15 U.S. Army Corps of Engineers, Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,594 (2008).
- 16 Maria Jose Carreras Gamarra and Theodore P. Toombs, Thirty years of species conservation banking in the U.S.: Comparing policy to practice, Biological Conservation 214 (2017) 6–12.
- 17 Jessica Owley, Keeping Track of Conservation, 42 Ecology L.Q. 79 (2015), [https://digitalcommons.law.buffalo.edu/cgi/viewcontent.cgi?article=1171&context=journal\\_articles](https://digitalcommons.law.buffalo.edu/cgi/viewcontent.cgi?article=1171&context=journal_articles)
- 18 Maria Jose Carreras Gamarra and Theodore P. Toombs, Thirty years of species conservation banking in the U.S.: Comparing policy to practice, Biological Conservation 214 (2017) 6–12.
- 19 2016 Mitigation Policy at 83,472.
- 20 Desert Renewable Energy Conservation Plan, Streamlined Permitting and Mitigation (2019), [https://www.energy.ca.gov/sites/default/files/2019-12/DRECP\\_Permitting\\_Fact\\_Sheet\\_ada.pdf](https://www.energy.ca.gov/sites/default/files/2019-12/DRECP_Permitting_Fact_Sheet_ada.pdf)
- 21 Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Design Handbook. BBOP, Washington, D.C.
- 22 These principles are consistent with the BBOP framework on “limits to what can be offset: There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.” Business and Biodiversity Offsets Programme (BBOP). 2013. To No Net Loss and Beyond: An Overview of the Business and Biodiversity Offsets Programme (BBOP), Washington, D.C.
- 23 U.S. FWS Ecological Services, Headquarters, USFWS Refined Range Maps for Threatened and Endangered Species (2019), [https://ecos.fws.gov/docs/SR\\_SOP/SDM\\_SOP\\_Final\\_14Nov2019.pdf](https://ecos.fws.gov/docs/SR_SOP/SDM_SOP_Final_14Nov2019.pdf)
- 24 DOI Office of Policy Analysis, Results from a Survey of Conservation Banking Sponsors and Managers (2016), page 27 [https://www.doi.gov/sites/doi.gov/files/uploads/cb\\_sponsors\\_and\\_managers\\_survey\\_report\\_final\\_092716.pdf](https://www.doi.gov/sites/doi.gov/files/uploads/cb_sponsors_and_managers_survey_report_final_092716.pdf).
- 25 US Fish and Wildlife Service, Guidance for the Establishment, Use, and Operation of Conservation Banks (2003), at [https://www.fws.gov/endangered/esa-library/pdf/conservation\\_banking\\_guidance.pdf](https://www.fws.gov/endangered/esa-library/pdf/conservation_banking_guidance.pdf)
- 26 DOI Office of Policy Analysis, Results from a Survey of Conservation Banking Sponsors and Managers (2016), page 35.
- 27 Maria Jose Carreras Gamarra and Theodore P. Toombs, Thirty years of species conservation banking in the U.S.: Comparing policy to practice, Biological Conservation 214 (2017) 6–12.
- 28 Recovery Units under the Endangered Species Act could be used more widely, <https://www.biorxiv.org/content/10.1101/2020.03.15.991174v2>
- 29 [www.conservationevidence.com/](http://www.conservationevidence.com/)
- 30 NFWF Announces \$4.1 Million in Awards from the Electronic Monitoring and Reporting Grant Program, [https://www.nfwf.org/media-center/press-releases/nfwf-announces-41-million-awards-electronic-monitoring-and-reporting-grant-program?utm\\_medium=email&utm\\_source=govdelivery](https://www.nfwf.org/media-center/press-releases/nfwf-announces-41-million-awards-electronic-monitoring-and-reporting-grant-program?utm_medium=email&utm_source=govdelivery)
- 31 Dave Owen, Critical Habitat and the Challenge of Regulating Small Harms, 64 Florida L. Rev. 141 (2012).
- 32 Timothy Male, The most efficient environmental market you’ve never heard of, <https://www.linkedin.com/pulse/most-efficient-environmental-market-youve-never-heard-timothy-male>
- 33 Daniel Rohlf, Jeopardy Under the Endangered Species Act: Playing A Game Protected Species Can’t Win, 41 Washburn L.J. 114 (2001).
- 34 <https://ecos.fws.gov/ipac/>