Status of the Recovery Mandate Under Section 7(a)(1) of the U.S. Endangered Species Act

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The U.S. Endangered Species Act (ESA) is widely considered to be one of the strongest laws for protecting imperiled wildlife, with nearly all species protected under the law still existing today. Among the ESA's strongest provisions, at least as written, is the requirement under section 7(a)(1) that federal agencies use their authorities to help recover imperiled species. New initiatives like 30 x 30, the campaign to conserve at least 30% of U.S. lands and waters by 2030, offer opportunities to reinvigorate and expand 7(a)(1) programs to play a significant role in biodiversity conservation. To gauge the current status of 7(a)(1) plans and assess their effectiveness, we collected all section 7(a)(1) materials available to the public through internet searches and direct requests to agencies. We evaluated the scope of existing 7(a)(1) programs and found that despite the clear potential benefits of strong programs, the section has been significantly underused by federal agencies. Further, we show that existing plans are highly inconsistent in content and style, and we trace that inconsistency to the lack of policy guidance for their creation and implementation. Based on these findings, we recommend five strategies for improving 7(a)(1) implementation: establishment of formal guidance from the federal wildlife agencies, tailored guidance from other federal agencies to help them meet their 7(a)(1) obligation, dedicated funding, integration of 7(a)(1) into existing initiatives and opportunities, and top-level executive branch coordination and cooperation.

Keywords: Endangered Species Act (ESA), environmental policy, section 7(a)(1), section 7(a)(2), conservation, endangered species

INTRODUCTION

Biodiversity is declining globally, with about one million species at risk of extinction now and in the coming decades [Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019]. With threats like habitat loss or destruction, overexploitation, climate change, disease and invasive species contributing to this decline, the strength of environmental protections is increasingly important. The U.S. Endangered Species Act (ESA) is widely considered to be one of the strongest laws for protecting imperiled wildlife, with nearly all species protected under the ESA still around today. Part of this strength comes from section 7, described by researchers as the "sleeping giant of the ESA programs," which prescribes the roles and responsibilities of federal agencies to help conserve species (Ruhl, 1995). Among these responsibilities is the requirement through the first paragraph of section 7, 7(a)(1), which directs federal agencies to use their authorities to proactively develop programs to recover threatened and

endangered species (Ruhl, 1995; US Fish and Wildlife Service, 1998). The affirmative recovery requirement of 7(a)(1) provides an opportunity to advance imperiled species recovery and offset the effects of any more harmful actions greenlit after approval through ESA processes. Despite the importance of this part of the law, there are no recent assessments of how it has been implemented. We close that gap here.

BACKGROUND

Before we step into the details of 7(a)(1) and its implementation, we must place it in the broader context of the law. First, the implementation of any conservation law should be anchored in its express purpose. This is found in section 2(b) of the ESA: to prevent extinction and recover species to the point the protections of the law are no longer needed. This joint goal is the "North Star" for implementing the ESA, such that answers about the priorities for action in implementing the law will boil down to this purpose. Further, Congress made clear that the ESA was intended to "provide a program for the conservation of such endangered species and threatened species," that is, create mechanisms and authorities needed to recover species and prevent extinction. Given the jurisdiction of the U.S. Congress, this meant empowering federal agencies and giving them direction. To that end, section 2(c) further states "It is... the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Together, the purpose and policy set by Congress point to the important role of federal authority in and the goal of conserving imperiled species.

One of the great strengths of the ESA is the mechanisms provided in section 7 of the ESA, "Interagency Cooperation." While 7(a)(1) is the first paragraph of the section, most of the text focuses on what is known as the "consultation process" in section 7(a)(2), which is important to understand more about before turning to 7(a)(1). It requires all federal agencies to consult with the ESA's implementing agencies, the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (collectively, "the Services") to ensure they do not violate two prohibitions. First, no action authorized, funded, or carried out by a federal agency can jeopardize the existence of any listed species; second, those actions may not adversely modify or destroy any critical habitat designated for listed species. With the consultation process acting as a backstop against extinction, section 7(a)(2) is critical for ensuring the persistence of threatened and endangered species. Perhaps because of the details afforded in section 7 of the ESA and the seminal ESA case of the snail darter and the Tellico River Dam in *Tennessee Valley Authority vs. Hill (1978)*, the 7(a)(2) consultation process has long been the focus of federal agencies. That focus is then reflected in research and academic interest over the years, ranging from early analyses of consultations (Barry et al., 1992), to comparative analyses between the Services (Owen, 2012; Evansen et al., 2020), to program-level analysis of each Service (Malcom and Li, 2015; Evans et al., 2019).

However, while over the decades agencies have spent extensive attention to complying with their consultation obligations under section 7(a)(2), much less effort has been focused on their recovery obligations under section 7(a)(1). This imbalance is seen by some as a missed opportunity since 7(a)(1) is likely a more important mechanism for species' conservation because it is focused on the positive, recovery end of species conservation rather than the lower extinction threshold (Ruhl, 1995). While other ESA provisions are reactionary to specific proposed or existing actions as they seek to reduce impacts to listed species, section 7(a)(1) is unique in that it directs all federal agencies to use their authorities to proactively promote the recovery of listed species:

> "The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this Act. All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act."

The Congressional intent of this provision was for federal agencies to implement affirmative programs to help recover ESA-listed species in consultation with the Services (Gersen, 2009). However, the Services have largely ignored section 7(a)(1), despite the potential for this provision to lead the way toward threatened and endangered species recovery. In addition to the focus long remaining on the consultation process, the underuse of 7(a)(1) may be attributed to the lack of details about what the required 7(a)(1) programs should look like, and the lack of a consistent approach to the section as a result (Gersen, 2009). Some of the underuse of 7(a)(1) can also be attributed to the courts deferring to the agencies in how they comply with the provision. The Supreme Court has never directly addressed agency responsibilities under 7(a)(1), though federal appellate courts have ruled that agencies have an affirmative duty to carry out 7(a)(1) programs (Fla. Key Deer v. Paulison, 2008). While the courts have declared that inaction or minimal action on the part of federal agencies does not meet the affirmative requirement of the provision, the courts typically defer to agencies as to what specific programs they decide to follow/implement in the name of 7(a)(1). Though the affirmative conservation requirements of section 7(a)(1) have been in the ESA since it was written 50 years ago, federal agencies have in aggregate done very little to implement it in a meaningful way.

Today, initiatives like "30x30," the campaign to protect 30% of U.S. lands and waters by 2030, offer new opportunities for 7(a)(1) to be used to its full potential (Dinerstein et al., 2019; Executive Order 14008, 2021). A strong 7(a)(1) program with clear implementation guidance can help protect areas under 30 x 30 where biodiversity is most at risk. This provision's inherent flexibility can help further recovery efforts and conservation initiatives for ESA-listed species, advance current biodiversity mandates, and help make 7(a)(2) consultations more efficient and more effective.

Here, we explore the current state of 7(a)(1) plans, examine implementation strengths and gaps, and provide policy recommendations that can help improve the use of 7(a)(1) to move species toward recovery. First, we describe the availability and basic characteristics of 7(a)(1) program guidance and available 7(a)(1) plans, then describe available 7(a)(1) plans including a brief case study on a well-regarded plan. Next, we describe what we learned about the effectiveness of 7(a)(1) programs and plans, then pivot to implementation barriers. Last, we make four recommendations that we believe would systematically improve the implementation of 7(a)(1) and the recovery of ESA-listed species.

CURRENT STATE OF 7(a)(1) DOCUMENTS

7(a)(1) Guidance

We found that there is little official guidance from the Services or other federal agencies on 7(a)(1) and it is not currently the subject of implementing regulations. This lack of guidance and regulation stands in stark contrast to many other ESA sections (Ruhl, 1995; Evansen et al., 2021). As a result, there is a lack of clarity on what constitutes a 7(a)(1) program, guidance on how much benefit is enough to meet Congressional intent of the obligation, or what should be included in a plan for it to be adequate for guiding action. Currently, the only official guidance from the Services comes from the Northeast region, Region 5, with their "Better Conservation More Efficiently: A Guide for Federal Agency Compliance with Section 7(a)(1)." This policy guidance sets forth 7(a)(1) plan criteria to reach the goal of "net conservation (recovery) benefit for listed species" (Smith, 2018). Included among those criteria are a need to address both the adverse effects of agency programs on listed species, as well as identify conservation opportunities within agencies' areas of authority (Smith, 2018).

Other federal agencies similarly offer little in the way of official 7(a)(1) guidance, though some agencies seem to have prioritized 7(a)(1) more than others. The U.S. Army Corps of Engineers (USACE) has been a leader in the application of 7(a)(1), likely driven in part by efforts to reduce conflicts around 7(a)(2) consultations, as the number of formal consultations completed by the USACE far outstrips all other federal agencies (Malcom and Li, 2015). The USACE has developed a technical note on the benefits of 7(a)(1) programming that describes the broad strokes of components that should be in a plan, such as target species status and baseline, an effects analysis of the proposed conservation program, and an adaptive management strategy (Hartfield et al., 2017). While this work provides an important first step, the overall lack of guidance on 7(a)(1) stands in stark contrast to the guidance offered for other provisions of the ESA, including the 7(a)(2) consultation process, by way of detailed handbooks that offer further instruction and direction.

Available 7(a)(1) Plans

We carried out Internet searches and consulted with federal agency staff to collect all of the section 7(a)(1) materials available to the public. Federal agency staff were consulted with during individual meetings and through email requests, as well as

through discussions as part of coalition groups. As we discuss in greater detail below, part of the challenge in gathering data for this effort was the ambiguity around what the Services and federal agencies consider to be a plan under 7(a)(1); some documents were clearly marked as 7(a)(1) plans while others were closer to reports or biological assessments. For inclusion in our analysis, plans must have been programmatic in nature and focused on species recovery rather than preventing extinction. In total, we were able to identify 12 7(a)(1) plans through our investigations (**Table 1**).

Of the 12 established 7(a)(1) plans, seven of the plans were referenced within species-specific documents developed as part of the implementation of the ESA, including recovery plans, five-year reviews, Species Status Assessments (SSAs; USFWS, 2016), and biological opinions. Most of the references to 7(a)(1) plans within those documents were broad, with statements regarding the purpose, goals, actors, and geographical range. Species' five-year status review documents gave more description into the possible success or limitations of the programs. For example, the 2019 five-year review for the bonytail chub (*Gila elegans*) attributes the two 7(a)(1) plans that cover the chub for "successfully maintain[ing] genetic diversity and refuge for populations of the species" (USFWS, 2019a). SSA documents for the humpback chub (*Gila cypha*) highlight the "great strides in the past 15 years" taken by the Upper Colorado River Endangered Fish Recovery Program (UCRRP) stakeholders to "restore important aspects of intra and inter-annual flow variability necessary to support Humpback chub populations" (USFWS, 2018d). Currently, all species covered in detail within the twelve 7(a)(1) plans are still listed under the ESA with the exception of the interior least tern (*Sterna antillarum*), which was proposed for delisting in 2019 and removed from the list in early 2021.

Four potential 7(a)(1) plans were not included in our analysis as they did not meet our threshold for inclusion because they had been found inadequate by the courts, were at a preliminary stage in their development, or contained little information on the implementation of recovery efforts for species. Additional information on these plans can be found in our **Supplementary Materials**. All plans examined for this project can be found at the Open Science Framework data repository: https://osf.io/2m7sk/.

Case Study: Lower Mississippi River 7(a)(1) Plan

The Lower Mississippi River 7(a)(1) conservation plan, developed by the U.S. Army Corps of Engineers in consultation with FWS, is often referenced as an example of what can be accomplished through section 7(a)(1). The plan itself was officially established in 2014, though the roots of the issues it addresses began in 1927 with the Mississippi River and Tributaries (MR&T) project, initiated by the USACE in response to flooding in the lower Mississippi River region (LMR). To combat the flooding issues throughout the lower Mississippi region, the MR&T project focused on the goals of building levees and floodwalls, improving and stabilizing

TABLE 1 | 7(a)(1) plans included in the analysis.

Plan title	Federal agency	Species	Area covered	Year	Document type	Monitoring	Mitigation
Conservation Plan for the Interior Least Tern, Pallid Sturgeon, and Fat Pocketbook Mussel in the Lower Mississippi River (LMR)	USACE, USFWS	Interior least tern, pallid sturgeon, fat pocketbook mussel	Lower Mississippi River	2014	Conservation plan	Detailed	Mentioned
Conservation Plan for the Interior Least Tern in the Arkansas, Canadian, and Red River Basins (ACRRB)	USACE, USFWS	Interior least tern	Arkansas, Canadian, and Red River Basins	2016	Draft conservation plan	Detailed	Mentioned
USDA National Forest Service Land Management Planning Rule (FSLMPR)	USFS, USFWS, NMFS	Any listed, proposed, or candidate species on Forest Service land	National Forest Service Lands	2011	Biological assessment and rule text	Discussed	None
Red-cockaded Woodpecker Recovery and Sustainment Program (RCW)	USDOD	Red-cockaded woodpecker	Marine Corps Base Camp Lejeune Range and Training Area	2012	Biological assessment	Discussed	Mentioned
Collaborative Wildlife Protection and Recovery Initiative (CWPRI)	USACE, USFWS, USDOD, USFS, USDA NRCS, BLM, USBR	Least Bell's vireo	Vireo focal regions (California)	Ongoing	CWPRI plan updates document	Plan under development	Plan under development
A Conservation Strategy for Managing Threatened and Endangered Species in Redwood National and State Parks (RNSP)	NPS	Federal and state (CA) listed species present in park areas	Redwood National Park, Prairie Creek Redwoods State Park, Del Norte Coast Redwoods State Park, Jedediah Smith Redwoods State Park	2003	Conservation plan	Discussed	None
San Juan River Basin Recovery Implementation Program (SJRRP)	NPS	Colorado pikeminnow, razorback sucker	San Juan River basin	1995	Recovery implementation plan	Detailed	None
Upper Colorado River Endangered Fish Recovery Program (UCRRP)	USBR, NPS, USFWS	Humpback chub, bonytail, Colorado pikeminnow, razorback sucker	Upper Colorado River basin upstream of Glen Canyon Dam, excluding the San Juan River	1988	Recovery implementation plan (RIPRAP)	Detailed	Mentioned
Conservation Plan for the Pallid Sturgeon, Interior Least Tern, Northern Great Plains Piping Plover, Gray Bat, Indiana Bat, and Northern Long-Eared Bat in the Missouri River Mainstem and Associated Tributary Projects	USACE	Pallid sturgeon, interior least tern, piping plover, gray bat, Indiana bat, northern long-eared bat	Missouri River basin	2017	Conservation plan	None	Detailed
Conservation Plan for the Endangered Fat Pocketbook Mussel in the St. Francis River Basin (SFRB)	USACE, USFWS	Fat pocketbook mussel	St. Francis river basin in southeastern Missouri and northeastern Arkansas	2018	Conservation plan	Detailed	None
Programmatic Endangered Species Act section 7 consultation package for the Atlantic Salmon (CPAS)	FEMA, USACE	Atlantic salmon	State of Maine	2017	Consultation package	Discussed	None

(Continued)

TABLE 1 | Continued

Plan title	Federal agency	Species	Area covered	Year	Document type	Monitoring	Mitigation
Programmatic Biological Assessment for Transportation Projects for the Gulf of Maine Distinct Population Segment of Atlantic Salmon and Designated Critical Habitat (MDOT)	FHWA, USACE	Atlantic salmon	State of Maine	2016	Biological assessment	Detailed	Detailed

channels and waterways, improving tributary basins, and instituting floodways. While successful in engineering a system for reduced flood risk, natural river realignments and the resulting construction from the MR&T project altered patterns of surface water drainage within the LMR region and reduced the waterways connectivity to floodplain habitats within the region. Decades later, these cumulative impacts noticeably affected the populations of three endangered species in the LMR, all of whom depend on the flooded habitats and channels of the LMR: the interior least tern *(Sternula antillarum)*, pallid sturgeon *(Scaphirhynchus albus)*, and fat pocketbook mussel *(Potamilus capax)* (**Figure 1**).

In response to the altered floodplain, the USACE developed the Channel Improvement Program (CIP) for the LMR. The primary mission of the CIP is to provide flood risk management infrastructure and to facilitate navigation. However, during consultation with the USFWS on the impacts of the program, the Service, USACE and their state partners recognized that activities conducted under the CIP may be important (and cost-effective) tools for maintaining and enhancing the ecological functions necessary for the tern, sturgeon and mussel. Thus, a conservation plan for the interior least tern, pallid sturgeon and fat pocket mussel was developed by the U.S. Army Corps of Engineers in pursuant to section 7(a)(1) to describe how the Channel Improvement Program can be used to help conserve these ESA-listed species in the lower Mississippi River region.

The conservation plan for the listed species included "strategies and actions to minimize adverse effects of the CIP, and to mitigate for past and potential future loss of LMR channel habitat quantity and complexity" (Killgore et al., 2014). The plan noted that the listed strategies and actions had been previously implemented and tested for more than a decade to assess their effectiveness, following the general formula of the adaptive management process (Craig et al., 2017). As a result of all these efforts, in part due to the 7(a)(1) conservation plan, the interior least tern was delisted from the ESA in 2021, and other species have been recommended for delisting in their 5-year review or recovery planning documents. On the agency side, the USACE was able to reduce costs and achieve positive conservation outcomes using existing mechanisms and resources. Planning and continuous refinement of the LMR 7(a)(1) plan also allowed for improved communication and coordination among the various partners involved, benefitting
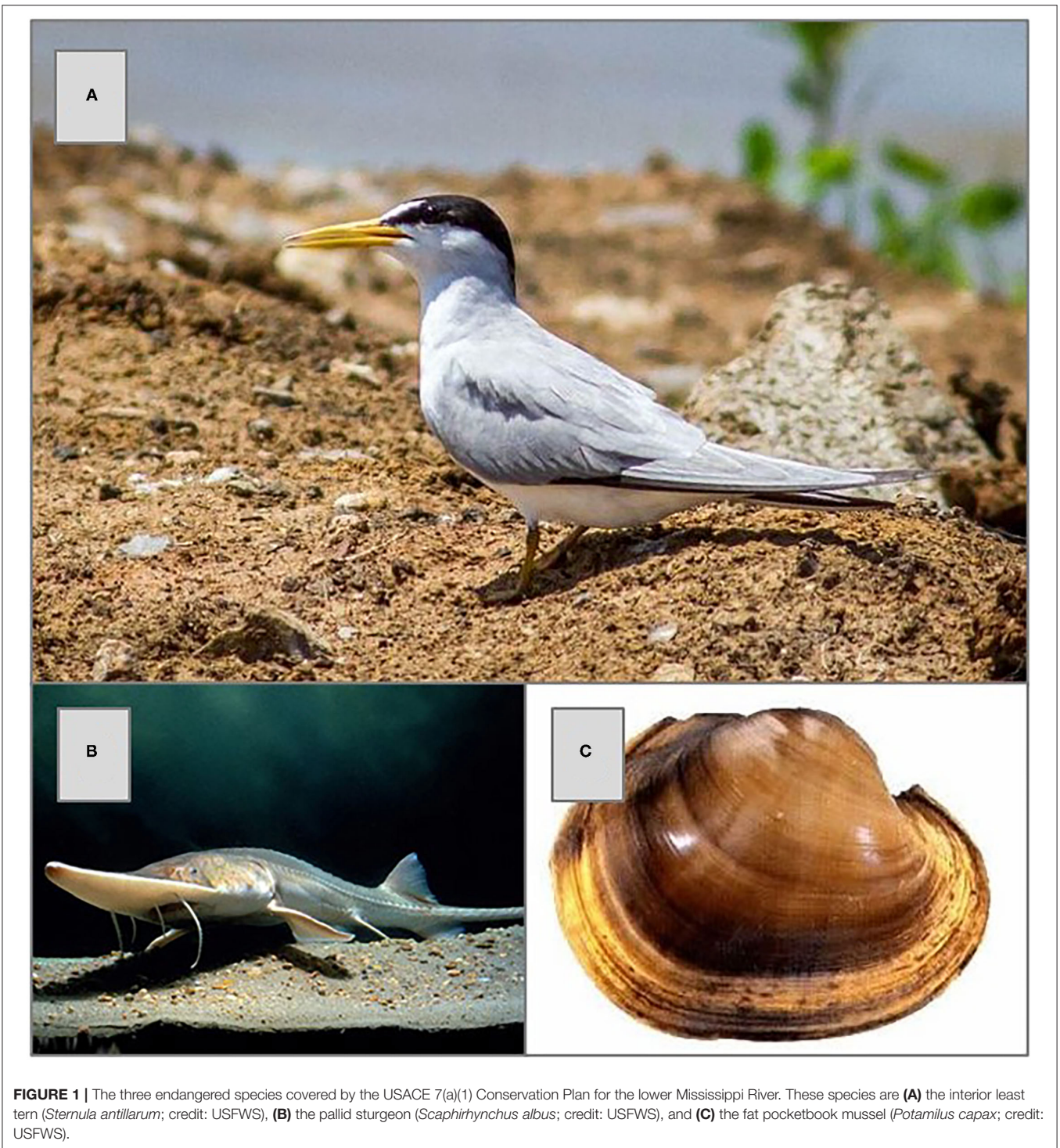
the species in the LMR and improving stewardship of the region (Killgore et al., 2014).

Plans such as the CIP offer concrete evidence of what solid 7(a)(1) programming could do for species recovery and for ESA implementation on the whole. The conservation plan and the associated CIP demonstrate that dedicating resources to planning, implementation and monitoring of their recovery efforts can help lead to species recovery, provide benefits to the surrounding habitat, reduce costs and lead to mutually beneficial outcomes for species and agencies alike. There is one particular challenge with this plan, however: it was costly and time-consuming to develop. As a result, we have heard practitioners in federal agencies flag this plan as a daunting challenge rather than a model to be implemented, a matter we return to in *7(a)(1) Implementation Barriers*.

THE EFFECTIVENESS OF 7(a)(1)

Monitoring and 7(a)(1)

A recent examination of ESA monitoring efforts recommended the creation of a consistent monitoring policy to improve the consistency and effectiveness of the law's implementation (Evansen et al., 2021). Among our collection of documents, we found that while monitoring was usually considered in plan development, how much information could be found on monitoring programming varied widely from plan to plan. Most (11/12) of the plans acknowledged the benefits and importance of monitoring within plan documents, but some were scarce on the details of how monitoring should and would be implemented on the ground. Six of the 12 plans had full details on how the 7(a)(1) monitoring program would be implemented: LMR, ACRRB, SJRRP, UCRRP, SFRB, and MDOT (**Table 1**). The 2020 updated work plan on the SJRRP plan went one step further, including monitoring data collected throughout the process of implementing recovery actions for the endangered razorback sucker *(Xyrauchen texanus)* (San Juan River Recovery Implementation Program Biology Committee, 2019). The plan update laid out the impact of recovery efforts on the sucker's population thus far, and included what future monitoring will look like, including cost breakdowns, timing, and tools needed. Conversely, two plans, the CWPRI plan and the Missouri River Basin 7(a)(1) had little to no monitoring mentioned. While this is expected of the CWPRI plan, which is still in development

FIGURE 1 | The three endangered species covered by the USACE 7(a)(1) Conservation Plan for the lower Mississippi River. These species are **(A)** the interior least tern (*Sternula antillarum*; credit: USFWS), **(B)** the pallid sturgeon (*Scaphirhynchus albus*; credit: USFWS), and **(C)** the fat pocketbook mussel (*Potamilus capax*; credit: USFWS).

stages, the Missouri River Basin 7(a)(1) plan was lacking in significant monitoring details, with the words "monitor" or "monitoring" appearing only three times throughout the 11-page plan (USACE, 2017).

We found that three of 12 plans contained the directive to create more specific, step-down monitoring plans or programs, but the details were not necessarily included within the

7(a)(1) text itself. The biological assessment of the National Forest planning rule falls under this category, containing a detailed list of requirements for more localized, step-down monitoring programs. These broader requirements laid out the questions monitoring should address, the timing of all monitoring, and the responsible parties, among other details. The biological assessment also included the requirement for

a biennial evaluation of new information gathered through the plan monitoring program, to make adjustments to the monitoring procedures as needed [U.S. Forest Service (USFS), 2011]. The authors have been unable to find any record of this requirement being implemented. Similarly, the USACE Southwestern Division's Conservation Plan for the Interior Least Tern in the Arkansas, Canadian, and Red River Basins (ACRRB) contained the implementation details for both a post-listing and post-delisting monitoring program for the interior least tern, which specifically included the expectation to evaluate and adjust operations as needed in order to improve bird habitat (USACE, 2016).

Though the majority of the plans highlight monitoring as a priority, finding these step-down monitoring programs or the results of monitoring actions already in progress in associated documents was an additional challenge; many of the plans do not appear to have their monitoring data available. The lack of reporting on monitoring results creates high uncertainty around whether the actions in the plans were successful, or whether the conservation actions were iteratively revised as part of the adaptive management process. For example, the programmatic biological opinion for the Marine Corps Red-cockaded Woodpecker 7(a)(1) Recovery and Sustainment Program details the requirements for off-base properties to monitor the woodpecker populations, but we have not found any monitoring reports. Annual reporting requirements for the plan state that a report summarizing monitoring results and other data collected should be provided to the FWS each year, but those reports are similarly unavailable. If monitoring occurred through other means, it does not appear to be associated with the 7(a)(1) plan.

The difference in the attention paid to monitoring efforts between 7(a)(1) plans that mention the idea of monitoring and those that clearly report and build off monitoring data highlights the need for more consistent guidance for 7(a)(1) planning. Lack of clear guidance on what should be included in monitoring, how it should be used in the adaptive management cycle of the plan, and how the data should be reported leads to more difficulty in assessing whether species under 7(a)(1) plans are moving toward recovery. This results in uncertainty around whether these agency plans are fulfilling their responsibilities under 7(a)(1) as intended. However, having a consistent plan alone does not mean the agencies are fulfilling their duties under 7(a)(1); the ESA directs agencies to do more than plan under 7(a)(1), they must also carry out programs for the conservation [recovery] of listed species. For example, FEMA's purported 7(a)(1) plan, which aimed to give discounts to stakeholders participating in Habitat Conservation Plans (HCPs), was found to be invalid since no HCPs were subsequently created (Fla. Key Deer v. Paulison, 2008). This case is a prime example of an agency unable to demonstrate that their conservation programs affect outcomes for species, and thus failing to meet the statute's requirements.

Integration of 7(a)(1)

Increasing the role of 7(a)(1) in ESA implementation provides many opportunities for integration with other parts of the law, particularly section 7(a)(2). While these two responsibilities under section 7 are independent—they are not cross-referenced in the statute—neither is there a prohibition against considering them in concert. Such coordination is not a novel concept, and in fact, sections 7(a)(1) and 7(a)(2) were originally written in the text of the ESA as one paragraph. These sections were separated in 1979, but the original Congressional intent was for 7(a)(1) and 7(a)(2) to be integrated and complementary. There are multiple reasons why explicit integration of these two subsections may prove beneficial (**Box 1**).

The precedent for consistent integration of 7(a)(1) and 7(a)(2) has already been set by some of the current 7(a)(1) plans. First, we found an example of this integration with the UCRRP 7(a)(1) plan. The UCRRP has an associated action plan for implementation, the Recovery Implementation Program Recovery Action Plan ("RIPRAP"), which was created partially with the intent to provide reasonable and prudent alternatives for projects undergoing 7(a)(2) consultations in the upper basin (UCRRP, 2020). Second, the 2003 amended biological opinion created for the Missouri River Mainstem System Operations during the consultation process includes several requirements for the USACE from the Propagation and Augmentation Program for the pallid sturgeon, created under the 7(a)(1) conservation plan (USACE, 2017). Despite these two examples, the available data indicate that much more could be done to integrate 7(a)(1) and 7(a)(2).

Mitigation and 7(a)(1)

Next, we evaluated the relationship between mitigation and existing ESA 7(a)(1) plans. Mitigation is a critical component of modern biodiversity conservation efforts, characterized by the hierarchy to avoid, minimize, or offset any harmful impacts to species resulting from actions that may harm species or their habitat (USFWS, 1981). The FWS developed a mitigation policy in 2016 that established a framework, guidance, and recommendations for FWS mitigation programs (Li and Male, 2021), though it was revoked in 2018 (USFWS, 2018e). In our analysis, we treated mitigation and minimization as separate strategies, with mitigation referring to restoration, enhancement, land acquisition and protection, among others. In this way, mitigation is one way to help federal agencies meet their 7(a)(1) responsibilities to help recover species, and effective 7(a)(1) plans should expressly discuss, if applicable, how mitigation works for their plan and which federal and non-federal actors are responsible.

We found that the inconsistencies among available 7(a)(1) plans made it difficult to determine what, if any, mitigation is present as part of the agency's program. Five of the 12 plans had a small amount of concrete information about mitigation. For example, the Red-cockaded woodpecker Recovery and Sustainment Program (RASP), touches on mitigation only briefly and seemingly places little of the responsibility on the plan itself, stating, "The RASP may complement mitigation tools and conservation programs currently available, such as conservation banking, and in some cases, provide linkage between these programs (USACE, 2012)." Instead of providing further details, plans would state the future intention to engage

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BOX 1 | Potential Benefits of Integrative Implementation of Endangered Species Act Sections 7(a)(1) and 7(a)(2)

There are at least three general reasons why 7(a)(1)-7(a)(2) implementation could benefit the conservation of ESA-listed species. First and foremost, the natural relationship between 7(a)(1) and 7(a)(2) is the conservation status of the species: if species are moved closer to recovery then it would reduce the likelihood of the Services finding jeopardy or adverse modification during 7(a)(2) consultation. However, if the Services believe an activity will lead to jeopardy or adverse modification despite a 7(a)(1) plan, they could use the plan to develop "reasonable and prudent alternatives" to the proposed action, which are essentially conservation measures that modify the activity and allow it to proceed (Evansen et al., 2020).

Second and related, the integration would be expected to result in streamlined 7(a)(2) consultations. With a 7(a)(1) plan in place, recovery actions and conservation measures for imperiled species have already been identified and can be adapted into consultations. If these recovery actions have been implemented in the past, the Services can assess their effectiveness at reducing or mitigating any adverse impacts from proposed projects. These benefits allow for consultations to be more effective and completed sooner, saving on resources and costs associated with long consultation processes (USFWS, 2018a). Further, species are likely to benefit because the certainty of outcomes will be higher for those activities of 7(a)(1) programs that have been implemented previously, rather than species bearing the cost of uncertain effectiveness (USFWS, 2018a).

Third, because effective 7(a)(1) program implementation can help recover species and remove them from the ESA, the integration of these two provisions could lead to faster recovery and ultimately render 7(a)(2) consultations on those species unnecessary, reducing workload. For example, the interior least tern has been delisted, and other species have been recommended for delisting, in part due to the implementation of 7(a)(1) plans. For instance, under section 4 of the ESA, status reviews are to be completed every five-years for listed species (five-year reviews), many of which give insight into how well-prescribed recovery actions are working to recover species. Five-year reviews for the fat pocketbook mussel *(Potamilus capax)*, the razorback sucker and the humpback chub recommend delisting due in part to management actions over the last few decades that include 7(a)(1) programs (USFWS, 2018b,c, 2019b). Even species that remain on the list could show such improvement that the Services could come to a "no jeopardy" conclusion faster because the threshold for reaching a jeopardy conclusion is further away.

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in mitigation but remained vague on what that mitigation would look like or what mitigation methods would be used (easements, mitigation banking, etc.). In contrast to the minimal yet available information on mitigation presented in those plans, five others barely touched on the topic, if at all. The San Juan River Basin Recovery Implementation Program has no instance of the word "mitigate" or "mitigation" throughout the entire plan (San Juan River Recovery Implementation Program Biology Committee, 1995). Only two plans, the Missouri River Tributary Projects and the MDOT plan, had established mitigation strategies in place: the Missouri River Bank Stabilization and Navigation Project (BSNP) Fish and Wildlife Mitigation Project and the Maine Atlantic Salmon In-Lieu Fee Program, respectively. These programs have attempted to offset some of the adverse effects to species occurring as these federal agencies carry out their authorities. For example, through the BSNP mitigation project, the USACE has acquired ~66,333 acres of the Congressionally authorized 1,66,750 acres to mitigate any detrimental effects of the bank stabilization process (USACE, 2017).

One reason why minimal attention has been paid to mitigation within 7(a)(1) plans thus far may be tied back to the lack of guidance from the Services on how mitigation should be implemented in concert with the ESA. With no current NMFS guidance (NOAA Fisheries has recently solicited public comments on a proposed mitigation policy; NOAA, 2021) and FWS guidance only published in 2016 and quickly revoked, the majority of the 7(a)(1) plans in circulation were developed without formal guidance on mitigation. Granted, many of the plans mentioned restoration and acquisition of offsite habitat, which can be considered mitigation in some contexts, but these strategies were rarely used with the word "mitigation" and whether criteria like additionality were met is unclear (USACE, 2016, 2017; San Juan River Recovery Implementation Program Biology Committee, 2019; UCRRP, 2020). A reestablishment of strong mitigation guidance from the Services could help any

future 7(a)(1) plans be clear-cut with their mitigation approach and help propel species toward their recovery goals.

In addition, future 7(a)(1) programs could also meet the recovery standard of 7(a)(1) by working toward providing a net benefit for species. Some practitioners have suggested that Congress intended a net benefit with section 7 since it is hard to justify how agencies can further recovery as required in 7(a)(1) if the net balance of their effects on species with take authorized under 7(a)(2) is negative (Malcom, 2021). A credit/debit system in which beneficial recovery activities through 7(a)(1) programs act as credits while harmful actions authorized through 7(a)(2) are debits, a situation akin to mitigation banking, could help further a net benefit for species (USFWS, 2003). In doing so, recovery actions through a 7(a)(1) plan would not necessarily offset specific harms (take) authorized through 7(a)(2) consultation. That role would still be filled by Reasonable and Prudent Measures and Conservation Measures, as long practiced by the Services and federal agencies. Instead, the benefits accrued under 7(a)(1) programs would add toward an overall "positive balance" of the status of the species that would be debited by adverse impacts to threatened and endangered species. Agencies comply with their 7(a)(1) obligations by keeping a "positive balance." A word of caution is required here. A banking system such as this would inherently rely on quantifying benefits and harms to species but doing so may be difficult or impossible with any degree of precision. Care would need to be taken to avoid over-estimating the benefits or under-estimating harms and ensuring that any uncertainty of the impact is borne by the agency rather than the species (i.e., giving species the benefit of the doubt as required by case law; Hill, 1978; Sierra Club v. Marsh, 1987). Service practitioners should also take care to maintain the jeopardy/adverse modification standards; that is, the existence of a credit/debit system cannot change the threshold for reaching jeopardy or adverse modification. By adopting these strategies, 7(a)(1) can enhance efficient mitigation efforts and move the needle closer to recovery.

Other Opportunities Under 7(a)(1)

While we have focused on 7(a)(1)−7(a)(2) integration above, other opportunities may exist for integrating 7(a)(1) with existing legal mandates. For example, 30 x 30 presents an opportunity for federal agencies to meet their statutory obligations under the ESA while they advance the goal to conserve at least 30% of U.S. lands and waters for biodiversity, climate, and equitable access purposes by 2030 [U.S. Department of the Interior (DOI), 2021]. Federal land management agencies, for example, are integral to the 30 x 30 process, responsible for managing ∼27% of lands throughout the U.S. [Congressional Research Service (CRS), 2020; Rosa and Malcom, 2020]. Under 7(a)(1), these land management agencies are also required to use their authorities to protect threatened and endangered species under 7(a)(1). By prioritizing protections of lands that are integral to the conservation of imperiled species, these agencies may also be able to meet the requirements of 30 x 30. In this way, 7(a)(1) can be beneficial for both species and agencies alike, working to advance recovery and help agencies carry out their responsibilities. Because this application has not yet been implemented, we cannot judge the effectiveness of 7(a)(1)-30 x 30 integration, but hope to in the future.

7(a)(1) IMPLEMENTATION BARRIERS

Based on our reviews described above, we identified three main barriers to 7(a)(1) program implementation. First, as we described above, we found very little formal guidance on what constitutes a 7(a)(1) program. Based on the limited application of 7(a)(1), our review of the available plans, and discussions with federal agency staff, we believe that the lack of formal guidance from the Services or other federal agencies is a fundamental barrier to implementation. What the Services consider adequate for a 7(a)(1) program to meet the requirements of the ESA, what they believe is needed in 7(a)(1) plans, or guidance on the 7(a)(1) consultation process are all undescribed. As a result, there is little support for agencies to invest in 7(a)(1) program development when the target is undefined. Similarly, how federal agencies approach the development of 7(a)(1) programs and plans is unclear, and the qualifications appear to differ from agency to agency and is sometimes even variable within agency.

Second, and resulting from the first barrier, is that the plans are highly inconsistent from agency to agency. We found that some plans detail a multitude of recovery actions and how the implementing agency will address these actions. Other documents that seem to serve as a 7(a)(1) plan are more along the lines of small reports, with little comprehensive details about plan implementation, the scientific information that contributed to plan creation, decision-making, and the effects of proposed recovery actions on the covered species. In some cases, the only information provided on a 7(a)(1) plan was a biological assessment associated with the plan, with the actual plan document unable to be located. For example, a biological assessment is provided for the Red-cockaded Woodpecker Recovery and Sustainment Program developed by the Marine Corps, but beyond what is provided in the assessment,

there is little formal information about the program itself. In addition to the Marine Corps, the Atlantic Salmon programmatic consultation brought by Transportation Agencies in 2016 and the plan from USACE and FEMA in 2017 established goals to fulfill both their section 7(a)(1) and 7(a)(2) responsibilities (Maine, 2016; USFWS, 2017). The plans allowed the agencies to continue their stated departmental goals of constructing, repairing, maintaining, and improving crossing structures while implementing proactive plans that the agencies claimed would increase habitat connectivity, resulting in net stream habitat improvements as listed in the Atlantic Salmon Recovery Plan. While structured as 7(a)(2) consultations, there are elements within these that meet the recovery requirement, though the plan is structurally dissimilar from other 7(a)(1) plans. Such inconsistencies make it challenging to know how many 7(a)(1) plans exist and how to find them, leaving little opportunity to learn from existing 7(a)(1) efforts and coordinate with other ESA processes like recovery plan implementation and five-year reviews. With few requirements and a flexible structure, attempting to collect all 7(a)(1) plans for analysis is challenging. While the flexibility in the 7(a)(1) program can be a strength— one size fits all conservation rarely leads to efficient recovery (Liles et al., 2015)—the absence of any structure for 7(a)(1) planning means what constitutes a plan and where said pieces of that plan can be found amounts to a futile search.

Third, we cannot overlook the fact that resources are required for implementing any conservation program, whether developing formal guidance or resultant programs and plans, and this holds for 7(a)(1). Unfortunately, funding for the ESA has fallen short of what is needed for decades, with the FWS receiving only around 50% of the funding needed to fulfill the Congressional intent of the ESA (Malcom et al., 2019; Malcom, 2021). While section 7 on the whole does receive dedicated funding through the Ecological Services' "Planning and Consultation" budget, the authors have never found mention of 7(a)(1) in annual presidential budget requests [e.g., Office of Management Budget (OMB), 2021]. Similarly, many federal agencies often devote most or all of their ESA funding to section 7(a)(2) consultations, despite the potential long-term cost-savings from strong 7(a)(1) programming (Guilfoyle et al., 2019).

Absent a robust, dedicated funding strategy for 7(a)(1) programming, practitioners in federal agencies may be left feeling as though 7(a)(1) programming is a significant hurdle rather than a clear path forward for recovering species. While many species have recovery actions laid out in recovery plans, hundreds of species are missing recovery plans or have plans that are largely out of date (Malcom and Li, 2018, and funding constraints frequently hamper comprehensive implementation of all recovery steps (Ruhl, 1995). The RNSP plan cites additional measures that could be implemented to provide additional protection to listed species, but the measures are partially contingent on additional funding. Conservation strategy 3 for the MRG&P 7(a)(1) plan calls for the development of cost-effective monitoring programs "as funding allows." Funding shortfalls mean plans do not have the resources to implement as many recovery actions as desired, curtailing possible recovery trajectories for threatened and endangered species.

STRATEGIES FOR IMPROVING 7(a)(1) IMPLEMENTATION

Based on these findings, we recommend five strategies for improving 7(a)(1) policy and implementation:

1. *The Services should develop formal guidance for 7(a)(1) programs and planning.* There currently exists no Service handbook or regulations specific to the development or implementation of 7(a)(1) programs. Formal guidance should be developed in the form of policy guidance, a handbook, or regulations. This could include:

    a) Setting minimum requirements for 7(a)(1) plans. This would include monitoring, reporting, and transparency requirements, and describe other recommendations for how plans can be most effective for 7(a)(1) consultation process and for agency implementation.

    b) Specifying the relationship between 7(a)(1) and 7(a)(2). The species' status is the common thread: improving the status under 7(a)(1) programs means that agencies are less likely to come near the jeopardy/adverse modification (J/AM) threshold of 7(a)(2) consultation. As a result, the analysis should be much faster since actions will be less likely to trigger a J/AM determination, one of the major bottlenecks of consultation.

    c) The Services and federal agencies may benefit from the establishment of a "Furtherance of Recovery" (FOR) standard to evaluate whether agencies are meeting their 7(a)(1) obligation. This would be the recovery complement of the J/AM standard—the floor of what agencies are prohibited from doing, articulated in implementing regulations—used in 7(a)(2) consultations. Just as J/AM analysis results in a clear yes/no outcome, the Services could establish sideboards that make it easy to determine whether the FOR standard has been met by agencies for their 7(a)(1) program. The guidance should clarify that the obligations of federal agencies and the evaluation of whether they meet a FOR standard is commensurate with agency authorities.

    d) Finally, we believe it is prudent for the Services to work with the federal agency community to establish a prioritization framework for 7(a)(1) program and plan development. The authorities of some agencies and the needs of some species should be better matches for program development and implementation, and establishing a schedule can help ensure resources are allocated most effectively and efficiently.

2. *Other federal agencies should establish guidance for their 7(a)(1) program development.* Guidance could range from simple memos for agencies with limited obligation to longer guides for high-obligation agencies. Any guidance developed should describe the relevant authorities of the agencies and specify monitoring and reporting requirements of 7(a)(1) programming. Additional coordination among federal agencies, including the Services, could be facilitated by guidance from the White House Council on Environmental Quality. Guidance along these lines would allow for consistency throughout planning processes, enable adaptive management strategies, and provide clarity on expectations and obligations for federal agencies.

3. *Agencies should request and Congress should fund 7(a)(1) programs.* Currently, no component of the FWS Ecological Services budget is dedicated to 7(a)(1) development. Presidential budget requests submitted to OMB should include dedicated 7(a)(1) funds, including from the Services and from other agencies. Agencies should propose meaningful performance management metrics related to funding (Executive Order 13450, 2007; Foundations for Evidence-Based Policymaking Act of 2018) and governmental and non-governmental organizations should evaluate and make recommendations on innovative funding mechanisms.

4. *Integration into 30 x 30 and other opportunities.* Section 7(a)(1) does not give federal agencies new authorities, but it does provide a basis for those agencies to conserve threatened and endangered species in flexible ways, and in turn offer regulated entities that same flexibility. If federal agencies implement 7(a)(1) to its full capacity, they would be able to help advance their 30 x 30 agenda as well as other obligations and directives that may exist.

5. *Improved top-level executive branch coordination and cooperation.* Greater coordination and cooperation from the executive branch can help ensure agencies prioritize 7(a)(1) programming. Given that certain aspects of ESA implementation are often hindered by a lack of political will, particularly in the face of limited resources, explicit mandates from political leadership could help focus agency attention on recovery. Ultimately, it may be helpful and/or necessary for the issuance of binding Secretarial Orders at the Department level, or even a Presidential Executive Order on 7(a)(1), setting guidance for what 7(a)(1) plans might look like and setting a schedule by which they must be developed. Congressional action could also fulfill or complement this direction; for example, 7(a)(1) could be included in the National Biodiversity Strategy resolution legislation currently being considered in the U.S. Congress (U.S. Congress, 2021).

CONCLUSION

The extinction crisis requires strong tools to lead species to recovery. Section 7(a)(1) of the ESA has the potential to be one of these tools. The available data show that the Services and federal agencies have a timely opportunity to improve 7(a)(1) policy and implementation. By addressing the implementation gaps through formal guidance from the Services and other agencies, providing dedicated funding for 7(a)(1) programming, and integrating 7(a)(1) with other ESA provisions and initiatives like 30 x 30, the strength of 7(a)(1) that Congress intended can be realized. To fully meet their obligations under the ESA, agencies must carry out 7(a)(1) programs that demonstrate recovery outcomes—planning alone is not sufficient. Revitalizing this underused provision of the ESA is not only reasonable, but a promising path for agencies to advance threatened and endangered species

conservation, fulfill their agency responsibilities, and meet their obligations as required by the Act.

AUTHOR CONTRIBUTIONS

ME, JM, and AC conceived of the idea. ME and AC collected the data. ME and HH performed the evaluation of the data. ME, JM, AC, and HH wrote the manuscript. JM helped supervise the project. All authors contributed to the article and approved the submitted version.

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