A Silver Lining: Interpreting the Endangered Species Act to Envision Management of the Rio Grande Silvery Minnow in a Broader Cultural, Ecological, and Political Context

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Abstract

The Rio Grande silvery minnow, listed as an endangered species in 1994, is the subject of significant debate, litigation, and water management decisions. This article documents the history of the minnow as it relates to the Endangered Species Act. Even as outcomes for the species fail to improve, the minnow plays an important role in Middle Rio Grande water management. The water supplied for the minnow also provides benefits to the human community and larger ecological community. This article posits that the next era of minnow management, beginning with the upcoming 2028 Biological Opinion, should consider a wider set of values, to provide benefits for both the Rio Grande silvery minnow and the larger Middle Rio Grande community.

Table of Contents

1. Katherine H. Tara is a Staff Attorney and Water Policy and Governance Analyst with the Utton Center at the University of New Mexico School of Law. They stand on the shoulders of giants in this field—this paper would not be possible without the valuable contributions of Adrian Oglesby, John Fleck, Robert Berrens, Dagmar Llewellyn, Stephanie Russo Baca, Thomas Archdeacon, and Debbie Lee. They also wish to thank Rachel Swanteson-Franz for her splendid research assistance and Hannah Cohen for their incredible illustration of the silvery minnow on page 3.

Introduction

The Rio Grande silvery minnow (minnow) population is unwell. Most autumns, along the Middle Rio Grande in New Mexico, thousands of these tiny fish are released to support the dwindling population in the river, and to comply with the Endangered Species Act (ESA).[2] From 2002 to 2010, some of the minnows were wild stock, collected as eggs or fry, and released as juveniles. Now, the lack of available wild stock eggs results in releases of only hatchery stock to supplement the waning wild stock.

This fish used to thrive in the Rio Grande, prior to the dramatic alterations in river flow and habitat resulting from twentieth century human development along the river valley from Colorado to Mexico. As the minnows swim through the river, searching for gentle currents and ideal places for spawning, they are seeking habitat that no longer exists. The Rio Grande silvery minnow is existentially engaged in "heimsuchen," a German word that means "haunting" but literally translates to "home seeking." Without the historical habitat that served its life cycle, the minnow has no home. However, anthropogenic habitat creation efforts continue.

The Rio Grande silvery minnow is an unassuming fish, the largest of which measure about four and half inches long.[3] This pelagic-spawning fish releases eggs into the water where the eggs are disbursed by river currents. The minnow favors nursery habitat for reproduction along the Middle Rio Grande that was once common before the development of upstream dams,[4] but has since been relegated to human-constructed side channels that only run when flows on the Middle Rio Grande exceed between 1,500 and 3,500 cubic feet per second (cfs).[5] In an effort to protect the population, U.S. Fish and Wildlife Service (FWS) listed the Rio Grande Silvery Minnow as an endangered species in 1994.[6] The years that followed saw a slew of litigation aimed at establishing critical habitat for the minnow. After critical habitat was designated in 2003 and a Biological Opinion was released, water management agencies engaged in habitat and repopulation efforts, but controversy surrounding the ESA-supported minnow continued.[7]

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2. Thomas P. Archdeacon, Rio Grande Silvery Minnow Augmentation in the Middle Rio Grande, New Mexico 6 (2024), https://webapps.usgs.gov/mrgescp/documents/2023-Annual-augmentation-Report-FINAL.pdf.

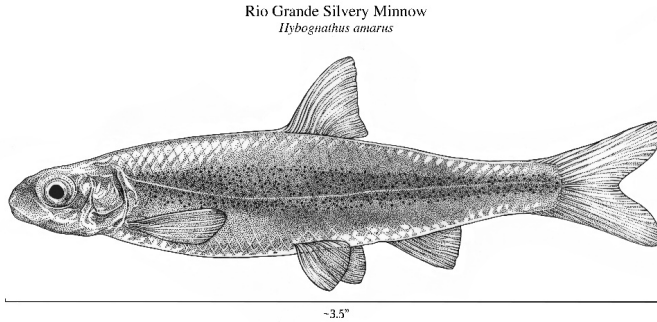
3. *Rio Grande Silvery Minnow*, U.S. Fish and Wildlife Serv., https://www.fws.gov/species/rio-grande-silvery-minnow-hybognathus-amarus [https://perma.cc/PXK9-PKB8] (last visited Jun. 24, 2024).

4. *See generally* Gigi Richard & Pierre Julien, *Dam Impacts on and Restoration of an Alluvial River – Rio Grande, New Mexico*, 18 Int. J. of Sediment Rsch. 89–96 (2003) (detailing the dams upstream of silvery minnow habitat).

5. For an example of this overbanking is the Albuquerque Overbank Project, *see* Esteban Muldavin, et al., Elizabeth Milford & Nancy Umbreit, A Model for Large River Riparian Ecosystem Restoration in the Southwest (2016), http://bemp.org/wp-content/uploads/2016/01/BEMP-AOP.pdf [https://perma.cc/U242–2TNS]. The Middle Rio Grande sees flows about 2500 CFS more or less every year, though the duration of these peaks varies dramatically, *see generally Rio Grande at Albuquerque, NM – 08330000,* U.S. Geological Surv., https://waterdata.usgs.gov/monitoring-location/08330000/#parameterCode=00060&period=P365D&showMedian=false [https://perma.cc/355X-CNU9] (last visited Jun. 24, 2024).

6. *Rio Grande Silvery Minnow*, *supra* note 2.

7. *See generally* TetraTech EM, Habitat Restoration Plan for the Middle Rio Grande



FWS released the first complete silvery minnow Biological Opinion in 2003.[8] After this document was released, the minnow population did not recover sufficiently to be delisted.[9] In 2016, FWS published a new Biological Opinion with updated benchmarks for the minnow's success,[10] a continued requirement to release the hatchery-raised ghost minnows of the Middle Rio Grande.[11] These new criteria did nothing to improve outcomes for the minnow.[12] At the end of 2024, FWS, the Middle Rio Grande Conservancy District (MRGCD), and the nonprofit WildEarth Guardians

(2004); Memorandum from U.S. Fish and Wildlife Serv. Regional Director, Region 2 to Area Manager, Albuquerque Area Office, Bureau of Reclamation on the Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations to the Area Manager, Albuquerque Area Office, Bureau of Reclamation on the Biological and Conference Opinions (Mar. 17, 2003) (on file with author); Endangered Species Act, 16 U.S.C. § 1540(g) (1973). These documents exemplify the ongoing effort to preserve the minnow and comply with the ESA.

8. *See* Memorandum from U.S. Fish and Wildlife Serv. Regional Director, Region 2 to Area Manager, Albuquerque Area Office, Bureau of Reclamation on the Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations . . . (Mar. 17, 2003) (on file with author).

9. U.S. Fish and Wildlife Serv., Rio Grande Silvery Minnow Recovery Plan, First Revision 16 (2010), https://www.wildlife.state.nm.us/download/fishing/management/rio_grande_and_pecos/Rio-Grande-Silvery-Minnow-Recovery-Plan.pdf.

10. Memorandum from U.S. Fish and Wildlife Serv. Regional Director, Region 2 to Area Manager, Albuquerque Area Office, Bureau of Reclamation on the Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico (Dec. 2, 2016) (on file with author). This population criteria defines the parameters under which the minnow population requires augmentation and establishes population density goals.

11. *Id.* at 32.

12. *See generally* Thomas P. Archdeacon et al., *Effects of flow recession regime on stranding of Rio Grande silvery minnow suggests that conservation actions must overcome evolutionary traps*, 32 Aquatic Conservation: marine and freshwater ecosystems Aquatic Conservation 1817 (2022) (explaining that ongoing efforts to preserve the minnow and comply with the ESA have been thus far ineffective).

entered into a settlement, which requires FWS to issue a new Biological Opinion for the minnow by October 30, 2028.[13]

Our existing laws are silent on how to approach the management of a species population that would be long extinct absent serious human intervention and may still face extinction even with the aid of extraordinary measures (sometimes called a "conservation-reliant" species).[14] If the hatcheries where Rio Grande silvery minnows are raised by the thousands before being released into the river closed tomorrow, the minnow population in the river would likely not remain viable.[15] Absent a formal definition that captures the legal and biological limbo of the minnow, we can assign it a colloquial status: haunting. The minnow is haunting the Middle Rio Grande.

This little fish, that human efforts keep alive, is a powerhouse for dictating river flows in the Middle Rio Grande. This paper contends that the Middle Rio Grande community would greatly benefit from active management of the implementation of the ESA requirements for Biological Opinions to benefit not only the minnow but also the greater bosque ecosystem and the human community of the Middle Rio Grande. The article proposes that the parameters set through the Biological Opinions required by the ESA to protect the minnow can be interpreted broadly to optimize habitat for beneficial species in the Middle Rio Grande and to reflect community values relating to river flow and habitat protection, while also minimizing the Sword of Damocles posed by the threat of traditional ESA litigation.[16]

This paper covers the legal history of the Rio Grande silvery minnow, more or less chronologically. In doing so, it examines the language of the Endangered Species Act, particularly 16 U.S.C. § 1532 which pertains to the establishment and maintenance of critical habitat, and the context in which this law was written. It contrasts the legislative history of the ESA with the legal realities for the minnow, with particular emphasis on the procedural posture of minnow-related litigation and the status of critical habitat for the minnow.

This paper then compares the language of the ESA with FWS standards for creating Biological Opinions and Species Management Plans. Additionally, this paper reviews various programs aimed at improving minnow outcomes. The paper notes that despite significant expenditures, the outcomes for the minnow have not markedly improved. The evidence suggests that the next Biological Opinion for

13. Settlement Agreement, WildEarth Guardians v. U.S. Fish and Wildlife Serv. (No. 1:22-cv-914-GJF-JMR Settlement Agreement (D.N.M., Nov. 19, 2024).

14. Danielle Prokop, *Rescuing Silvery Minnows Like 'Slapping a Band-Aid on a Severed Limb,'* SOURCE NM (Feb. 15, 2023) https://sourcenm.com/2023/02/15/rescuing-silvery-minnows-like-slapping-a-band-aid-on-a-severed-limb/. For a definition of "conservation-reliant," see Dale D. Goble et al., *Conservation-Reliant Species*, 62 BIOSCIENCE 869 (2012).

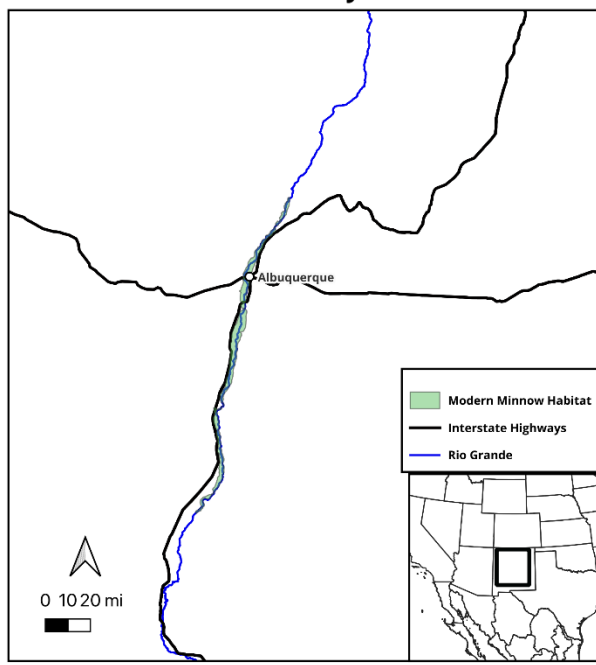
15. *See generally* Megan J. Osborne et al., *Genetic erosion in an endangered desert fish during a megadrought despite long-term supportive breeding*, 38 CONSERVATION BIOLOGY e14154 (2024) (explaining the significant limitations of existing minnow conservation efforts).

16. The use of the word "beneficial" rather than "native" is deliberate—there is data that indicates introduced species provide some benefits to the ecosystem. *See, e.g.,* M.K. Sogge et al., *Saltdecar and Southwestern Willow Flycatchers: Lessons From Long-term Studies in Central Arizona*, U.S.D.A. FOREST SERV. PROCEEDINGS RMRS-P-42CD 238 (2006).

the minnow presents an opportunity to re-envision Biological Opinions as a tool for meeting broader ecosystem-wide goals.

The analysis finds that, in the case of the minnow, the ESA serves a markedly different purpose than the one originally envisioned for it. While the ESA was originally drafted to be a tool for protecting biodiversity regardless of the cost, the ESA now functions as a bureaucratic conservation tool, hobbled by economic limitations. Rather than viewing the ESA as a limited tool, enforced by litigation, the paper contends that the ESA can be interpreted more broadly as a tool for ecosystem management, guided by the minimum needs of federally-listed species like the minnow. The Middle Rio Grande is haunted by the Rio Grande silvery minnow—the larger ecological community should benefit from the minnow's liminal existence.

Modern Rio Grande Silvery Minnow Habitat



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I. The Minnow Plays a Complex Role in the Deeply Managed Middle Rio Grande System.

The Middle Rio Grande corridor is a heavily altered riverine ecosystem that is host to myriad species beyond the minnow.[17] However, the specter of the Rio

17. Muldavin et al., *supra* note 4 at 2.

Grande Silvery Minnow haunts much of the conversation dictating flows in the Middle Rio Grande.[18]

The Endangered Species Act fails to define "extinction."[19] It appears that Congress intended to leave the definition of "extinction" to agency discretion, though the courts have attempted to define it.[20] FWS defines extinction to mean that no living members of the species remain in the wild or in captivity.[21] General definitions of extinction vary, yet all emphasize that extinction occurs when there are no members of a species alive in the wild.[22] Therefore, the minnow is either nearing functional extinction or already functionally extinct.[23] FWS criteria for extinction classifies the minnow as non-extinct on a technicality, even if the wild population dwindles further.

The success of the minnow is fundamentally incompatible with human life along the Rio Grande as it exists today. Far before the Endangered Species Act existed, farmers in New Mexico, and later in Colorado, began diverting (and effectively reducing mainstream) Rio Grande flow to water their crops.[24] Channelization of the Middle Rio Grande in the 1950s, through the installation of jetty jacks, isolated the floodplain from the river and narrowed the channel of the river available for the

18. *See generally* Ashley Veihl, *Securing Environmental Flows for the Rio Grande Silvery Minnow* (May 1, 2023) (Master's thesis, University of New Mexico, UNM Digital Repository), https://digitalrepository.unm.edu/wr_sp/201/ (explaining the flow regimes in the Middle Rio Grande designed to benefit the minnow).

19. Endangered Species Act (ESA) of 1973 16 U.S.C. § 1532 Definitions indicates that no definition of extinction or extirpation provided. The only use of extinction is in § 1532 (6) ("The term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this chapter would present an overwhelming and overriding risk to man.").

20. Defenders of Wildlife v. Norton, 258 F.3d 1136, 1142–43 (9th Cir. 2001). This case provides a good overview of legislative history and court interpretation of "extinction throughout a significant portion of range." The opinion notes that the Act does not define extinct (and that its usage of extinction is contradictory to the general definition of 'extinct' as being equal to 'no living members left'), likely for reasons of providing agency discretion. It further explains that Congress had included the understanding that "extinction is a gradual process" in the definition for "threatened species." Finally, it tracks the history of pre-ESA legislation that defined endangered species very narrowly as those facing *total* extinction, but ESA expanded the definition to species in danger of extinction *anywhere* within its range (citing to H.R. Rep. No. 412, 93rd Cong., 1 Sess. (1973)) (emphasis added).

21. Endangered and Threatened Wildlife and Plants; Removal of 21 Species From the List of Endangered and Threatened Wildlife, 88 Fed. Reg. 71644 (Oct. 17, 2023) (to be codified at 50 C.F.R. pt.17).

22. *Extinction Over Time*, Smithsonian https://naturalhistory.si.edu/education/teaching-resources/paleontology/extinction-over-time [https://perma.cc/JMD2-BEXN] (last visited Jun. 24, 2024).

23. Functional extinction is sometimes defined as a species "becoming too rare to fulfill its ecological, interactive role in the ecosystem." Bo Ebenman et al., *Ecologically Effective Population Sizes and Functional Extinction of Species in Ecosystems*, in 4 Food Webs: Complexity and Stability 45 (2017).

24. *San Luis Valley*, History Colorado, https://coloradoencyclopedia.org/article/san-luis-valley [https://perma.cc/MXW3-N7JY] (last visited Jun. 24, 2024).

life stages of the minnow. The creation of levees and drains all along the Rio Grande reduced flooding and increased arable lands.[25] Dams for water use and later flood control dams disconnected river reaches from each other, further fragmenting the minnow's habitat.[26] By the advent of the ESA in the 1970s, the minnow's habitat was almost completely eliminated.

The current Biological Opinion, required by the ESA, mandates minnow population augmentation efforts where hatchery stock are added to the river population to ensure the minnow's survival, with the goal of ultimately creating a self-sustaining minnow population.[27] Currently, minnow augmentation occurs in three river reaches—Angostura, Isleta, and San Acacia.[28] The number of fish needed at each augmentation site is determined using a formula based on a sampling of fish collected in September of the preceding year.[29] The number of minnows released annually, under the current formula, considers spring streamflow at the Otowi river gage near Los Alamos and the September sampling data.[30] Consequently, the lower the river flow, the higher the number of minnows are raised in hatcheries. As river reaches dry in the summer, the need to augment the minnow population increases and a second sampling determines how many minnows to release into the river.[31]

Without minnow management efforts, like the Middle Rio Grande Endangered Species Collaborative Program,[32] the minnow would not exist.[33] Federal and State government spending for minnow recovery varies annually from 7 million dollars to more than 12 million dollars.[34] Over the course of the last 20 years, more than 230 million dollars have been dedicated to the minnow, adjusted for inflation, which averages out to almost 14 million dollars annually.[35]

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25. James R. Bartolino & James c. Cole, Ground-Water Resources of the Middle Rio Grande Basin, Chapter 4 at 43 (U.S. Geological Surv., Water-Resources Circular 1222), https://pubs.usgs.gov/circ/2002/circ1222/pdf/chap4.pdf [https://perma.cc/P8P7–2HD6]. Additionally, scientist Marjorie Van Cleave observed the dramatic changes in the Middle Rio Grande in real time—see generally Marjorie Van Cleave, Vegetative Changes in the Middle Rio Grande Conservancy District (Master's Thesis, UNM Biology Department, 1935).

26. *Id.* at 41–44; 67.

27. See Memorandum from U.S. Fish and Wildlife Serv. Regional Director, *supra* note 9. *See also* Thomas P. Archdeacon, *supra* note 1, at 8.

28. *Id.* at 10.

29. *Id.*

30. *Id.* at 12.

31. *Id.* at 18.

32. *Middle Rio Grande Endangered Species Collaborative Program*, U.S. Geological Surv., https://webapps.usgs.gov/mrgescp/ [https://perma.cc/EK4Q-3KQQ] (last visited Jun. 24, 2024); Thomas P. Archdeacon et al., *Fish Rescue during Streamflow Intermittency May Not Be Effective for Conservation of Rio Grande Silvery Minnow*, 12 Water 3371 (2020), https://www.mdpi.com/2073–4441/12/12/3371 [https://perma.cc/AQ8D-5ND4].

33. *See generally* Thomas P. Archdeacon et al., *supra* note 31 (explaining the tenuous survival of the minnow, even with significant conservation actions); *see infra* Section III.B for more discussion of the Middle Rio Grande Endangered Species Act.

34. U.S. Fish and Wildlife Serv., Fed. and State Endangered and Threatened Species Expenditures, Fiscal Year Reps. 2003–2020.

35. Id., adjusted for inflation in 2024 using the *U.S. Inflation Calculator*, CoinNews, https://

Multiple groups invest significantly to secure flows to maintain summertime minnow habitat. The Bureau of Reclamation (Reclamation) leases water, mostly from San Juan-Chama Project contractors, to provide flows to create habitat for the minnow.[36] Audubon Southwest has worked closely with the MRGCD to increase leased water added to the river at outflows along the Middle Rio Grande with the goal of increasing minnow habitat, while also benefitting other endangered species in the area like the southwestern willow flycatcher.[37] Additionally, Audubon has leased San Juan-Chama water for the same purposes.[38] Albuquerque Bernalillo County Water Utility Authority has also released water from storage through the City of Albuquerque when flows on the river drop below a certain level at the Paseo del Norte gage, for the benefit of the minnow.[39] Lastly, operations of the reservoir systems upriver from minnow habitat also support the Rio Grande silvery minnow.[40]

The Rio Grande Compact, which governs Rio Grande flow allocations between Colorado, New Mexico, and Texas, also impacts flows available to the minnow.[41] Article VII of the Compact limits how much native Rio Grande water may be stored in New Mexico reservoirs when there is less than 400,000 acre feet of combined storage in Elephant Butte Reservoir and Caballo Reservoir.[42] This limitation impacts the amount of water available for use in environmental flows for the minnow because water that would otherwise be stored for in-state purposes–like flows for the minnow–instead must flow to Texas.

All these moving pieces involved in minnow management on the ground are constrained by the Endangered Species Act, which creates an ongoing threat of litigation related to minnow management decisions.

II. The Conservation History of the Silvery Minnow is Deeply Influenced by the Endangered Species Act.

A. The Endangered Species Act's Designation of Critical Habitat Functions Very Narrowly, Despite Early Attempts to Broaden Its Scope.

The ESA defines critical habitat as:

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www.usinflationcalculator.com/ (last visited Jul. 24, 2024). *See also* U.S. Bureau Labor Statistics, *CPI Inflation Calculator*, https://www.bls.gov/data/inflation_calculator.htm (last visited Jan. 15, 2025).

36. Ashley Veihl, *supra* note 17, at 2.

37. *Southwestern Willow Flycatcher*, Middle Rio Grande Endangered Species Collaborative Program, https://webapps.usgs.gov/MRGESCP/species/southwestern-willow-flycatcher [https://perma.cc/UZX4-WPWL] (last visited Jun. 25, 2024).

38. Ashley Veihl, *supra* note 17, at 17.

39. *Id.* at 12–13.

40. *See, e.g.,* U.S. Fish and Wildlife Serv. & Aislinn Maestas, *New Mexico Water Managers Coordinate in Response to High Temperatures and Return of Dry Conditions* (Jul. 21, 2022), https://www.fws.gov/press-release/2022–07/taking-action-support-endangered-rio-grande-silvery-minnow [https://perma.cc/4TAS-C6YG].

41. Rio Grande Compact § 41.009 (1939).

42. Rio Grande Compact, Art. VII (1939).

> the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection
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> and the
>
> specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary [of the Interior] that such areas are essential for the conservation of the species.[43]

The ESA also states, however, that critical habitat should generally "not include the entire geographical area which can be occupied by the threatened or endangered species."[44] Critical habitat decisions should be made "on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat."[45] Furthermore, the Secretary is given the freedom to exclude critical habitat for which the cost of protecting the habitat will outweigh the benefits unless exclusion of that habitat "will result in the extinction of the species concerned."[46]

During the House's consideration and drafting of the 1973 ESA, which did not yet address critical habitat with any real teeth, the House Committee on Merchant Marine and Fisheries reported that,

> The most significant of those [factors contributing to extinction] has proven also to be the most difficult to control: the destruction of critical habitat. Clearly it is beyond our capability to acquire all the habitat which is important to those species of plants and animals which are endangered today, *without at the same time dismantling our own civilization* [emph. added]. On the other hand, there are certain areas which are critical and should be set aside. It is the intent and purpose of this legislation to see that our ability to do so, at least within this country, is maintained.[47]

This statement is significant, especially when taken in context with the broader legislative discussion of habitat destruction as the primary threat to endangered species.[48] The first iteration of the 1973 ESA intended to provide funds to purchase critical habitat for endangered species, with one House member stating that, "if we are serious about preserving our environment we are going to have to spend some

43. Endangered Species Act of 1973, 16 U.S.C § 1532(5)(A)(i-ii).

44. *Id.* § 1532(5)(C).

45. *Id.* § 1533(b)(2).

46. *Id.*

47. H.R. Rep. No. 93–412, at 5 (1973), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973, as amended in 1976, 1977, 1978, 1979, and 1980, at 144 (1982).

48. 119 Cong. Rec. 29995, 30162 (statement of Rep. Leonor K. Sullivan), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973, as Amended in 1976, 1977, 1978, 1979, and 1980, at 192 (1982).

real money."[49] This philosophy, however, failed to consider the full scope of the economic and human conflict within critical habitat protection.

In 1976, Congress revisited and amended the ESA because FWS had been thus far unable to designate critical habitat due to funding shortages.[50] Although there were 109 proposed studies, and 9 ongoing studies for the designation of critical habitat, the Department of the Interior (DOI) assigned only nine staff members to handle ESA issues.[51] Furthermore, there was no budget for any of the desired studies.[52] Nevertheless, the Senate Committee report for the 1976 ESA authorization stated that the primary goal of the ESA was "to maintain a diversity of species and to preserve in their natural ecosystems both endangered and threatened species."[53]

By 1978, Congress's tune on critical habitat had changed because of the Tellico Dam and snail darter controversy and related economic repercussions.[54] In 1973 the construction of the Tennessee Valley Authority's Tellico Dam was delayed for two years due to a lawsuit over the dam's impact to the endangered snail darter, a small fish.[55] After the economic repercussions of delaying dam construction, the actual definition of critical habitat within the ESA was addressed in 1978, which narrowed the land that could be protected as critical habitat, stating that critical habitat can be designated only if the loss of the habitat "would significantly decrease the likelihood of conserving the species in question."[56] This amendment had a chilling effect on the designation of critical habitat, as noted by the Committee on Merchant Marine and Fisheries Report on H.R. 2218, which describes how the Department of the Interior (DOI) withdrew all pending critical habitat proposals and delayed listings to comply with the new requirements that they consider economics and other factors prior to designating critical habitat.[57] The 1979 Amendments followed a similar vein and

49. *Id.* at 202.

50. H.R. Rep. No. 94–887, at 3 (1976), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973, as amended in 1976, 1977, 1978, 1979, and 1980, at 497 (1982).

51. *Id.*

52. *Id.*

53. S. Rep. No. 94–837, at 2 (1976), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973 as amended in 1976, 1977, 1978, 1979, and 1980, at 518 (1982).

54. *Department of the Interior Celebrates Recovery of the Snail Darter*, U.S. Dept. of the Interior (Oct. 4, 2022) https://www.doi.gov/pressreleases/department-interior-celebrates-recovery-snail-darter [https://perma.cc/A9PN-ZUPV]. The snail darter is a small fish identified immediately after the passage of the ESA. The fish was found in a stretch of river that would be dramatically altered by the construction and filling of the Tellico Dam in the Tennessee Valley. The designation of the fish as endangered halted the construction of the Tellico Dam indefinitely. To remedy this, Congress passed an exemption from the ESA to finish construction of the dam, at great risk to the fish. While the snail darter was eventually delisted, it demonstrated Congress' unwillingness to sacrifice potential economic losses for the sake of a fish.

55. *Id.*

56. H.R. Rep. No. 95–1625, at 25 (1978), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973, as amended in 1976, 1977, 1978, 1979, and 1980, at 749 (1982).

57. H.R. Rep. No. 96–167, at 7 (1979), *reprinted in* Cong. Rsch. Serv., No. 97–6, A

imposed further economic restrictions on the designation of critical habitat, likely in an attempt to further reduce the original potency of the ESA due to the greater-than-anticipated cost of adhering to the original text of the ESA.[58] These narrower standards of protection for critical habitat watered down the ESA, and the resulting partial protection of necessary habitat for endangered species is still evident today.

Despite the limitations to the establishment of critical habitat, the ESA still provides significant protections for endangered species.[59] Furthermore, the legislative history for the 1973 ESA and its subsequent amendments indicate Congress's intention to protect critical habitat as an integral part of securing a future for endangered species. This is reflected in the caselaw surrounding the minnow and the fraught designation of the minnow's critical habitat.

B. The Bosque Biological Management Plan Predates the Endangered Species Act Action on Minnow Welfare.

The Bosque Biological Management Plan (BBMP) was first released in 1993 by an interagency biology team concerned with the management of resources in the Middle Rio Grande, before the minnow was listed.[60] At the time the BBMP was released, there was a growing understanding of human impact on the bosque between Cochiti Dam and San Marcial and a group of federal and local partners collaborated to develop a new approach for resource management in that area.[61] It sought to identify key species and biological processes that were integral to the bosque habitat and develop new ways to protect them.[62] The BBMP acknowledges that as Spaniards, and later Anglos, moved into the Middle Rio Grande Valley, irrigation practices for agriculture dramatically altered the floodway, first with levees and then with drainage systems, before the construction of large dams like Cochiti.[63] It notes that these modifications to the river led to the near extinction of the minnow,[64] and further explains that a large number of minnows in the Middle Rio Grande are found with deformities consistent with water quality problems.[65] The BBMP finally notes that without significant action, Rio Grande silvery minnow population fragmentation will continue and the species will continue to decline.

Legislative History of the Endangered Species Act of 1973, as amended in 1976, 1977, 1978, 1979, and 1980, at 1323 (1982).

58. *See* 125 Cong. Rec. 29266, 29434 (1979), *reprinted in* Cong. Rsch. Serv., No. 97–6, A Legislative History of the Endangered Species Act of 1973, as amended in 1976, 1977, 1978, 1979, and 1980, at 1361 (1982).

59. *See supra* earlier in this section.

60. Clifford S. Crawford et al., Middle Rio Grande Ecosystem: Bosque Biological Management Plan 1 (1993). The BBMP was updated once in 2005 but generally remains unchanged. *See* Lisa Robert, Middle Rio Grande Ecosystem Bosque Biological Management Plan The First Decade: A Review and Update (2005).

61. Clifford S. Crawford et al., *supra* note 59 at vii.

62. *Id.*

63. *Id.* at viii-ix.

64. *Id.* at 40.

65. *Id.* at 71.

The BBMP made several valuable recommendations for improving minnow outcomes, though the suggestions lacked the specificity necessary to measure progress on these recommendations. Firstly, the BBMP advised preventing the loss of native aquatic habitat where possible and creating additional habitat where loss was not possible, with special attention to the presence of the minnow.[66] It also recommended additional studies to determine the specific biological needs of the minnow, since many of these needs were unknown in 1993.[67] Other recommendations included the monitoring of water quality in minnow habitat and the management of introduced nonnative fishes.[68] Finally, the report noted that the minnow would likely be listed as an endangered species, which would lead to the creation of more robust minnow support systems.[69] An interagency team, the BBMP noted, would be beneficial for the management of the minnow.[70]

C. The Minnow Was Listed as an Endangered Species in 1994 Without a Final Critical Habitat Designation, Which Led to Legal Action.

In 1993, FWS proposed listing the Rio Grande silvery minnow as an endangered species and designating related critical habitat.[71] This announcement came two years after FWS notified relevant state and federal government agencies, as well as the New Mexico congressional delegation, that the agency was considering listing the minnow,[72] and eight years after New Mexico listed the minnow as an endangered species through the New Mexico Wildlife Conservation Act.[73] In its justification for listing the minnow, FWS cited dewatering of the minnow's habitat as the primary mechanism for population endangerment.[74] The critical habitat described in this proposal reached from just below Cochiti Dam all the way to San Marcial Dam.[75] FWS noted that possible threats to the proposed critical habitat included, "any activity that would lessen the amount of the minimum flow or would significantly alter the natural flow regime."[76] It also noted potential threats from alterations to channel morphology, degradation in water quality, and introduction of predatory species to the proposed critical habitat.[77]

When the endangered species designation for the minnow was finalized a year later, it did not include critical habitat designation.[78] The final listing addressed

66. *Id.* at 174–175.
67. *Id.* at 176.
68. *Id.* at 179, 181.
69. *Id.* at 182.
70. *Id.*
71. Endangered and Threatened Wildlife and Plants; Proposed Rule to List the Rio Grande Silvery Minnow as Endangered, With Critical Habitat, 58 Fed. Reg. 11822 (Mar. 1, 1993) (codified at 50 C.F.R. pt. 17).
72. *Id.*
73. *Id.* at 11824.
74. *Id.* at 11823–24.
75. *Id.* at 11824.
76. *Id.* at 11825.
77. *Id.*
78. Endangered and Threatened Wildlife and Plants; Final Rule To List the Rio Grande

twenty-three distinct concerns from the comment period, many of which were critical of FWS' decision to list the minnow.[79] There were also concerns about the minnow's endangered species designation interfering with legally required water deliveries.[80]

The first lawsuit after the Rio Grande silvery minnow received its endangered status was focused on FWS' failure to designate critical habitat within the timeframe imposed by the ESA.[81] The final ruling in the case required FWS to designate critical habitat for the minnow. In *Forest Guardians v. Babbitt*, which was decided in 1999, FWS stated that the designation of critical habitat for the minnow would only provide a small increase in protection for the species and that designation at the time of the lawsuit was not fiscally possible due to a Congressionally-imposed spending moratorium.[82] Forest Guardians later became WildEarth Guardians. The Tenth Circuit found that these justifications were insufficient to permit FWS to violate the ESA's requirement that critical habitat designations be issued within one year of listing an endangered species.[83]

This case also elucidates the stark lack of scientific knowledge on the minnow at the time of its designation—in 1994, FWS stated that it was unable to determine the minnow's critical habitat with the contemporary research, which contributed to FWS missing the deadline to establish critical habitat.[84] The *Forest Guardians* case reveals the significant limits of the efficacy of the ESA in protecting species for whom little information is known or for whom their habitat is so altered that it would take extraordinary action to create viable habitat.

Although the Court held that FWS was required to designate critical habitat for the minnow,[85] the Court noted in the same case that the minnow population was suffering due to "dam construction and dewatering of a large percentage of its habitat."[86] This language suggests that while the court found a nondiscretionary requirement in the language of the ESA, it also recognized the potential futility of establishing critical habitat for a species whose essential habitat has already been destroyed. The Court appears to contend the fate of the minnow was sealed with the creation of the MRGCD and the construction of dams in the Middle Rio Grande.[87]

The *Forest Guardians* ruling required FWS to release a critical habitat designation on a very short timeline, outside of the schedule originally designated by

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Silvery Minnow as an Endangered Species, 59 Fed. Reg. 36988 (July 20, 1994) (to be codified at 50 C.F.R. pt. 17).

79. *Id.* at 36989–92.

80. *Id.* at 36989.

81. Forest Guardians v. Babbitt, 174 F.3d 1178, 1181–82 (10th Cir. 1999).

82. *Id.* at 1183.

83. *Id.* at 1181–2.

84. *Id.* at 1182.

85. *Id.* 1186.

86. *Id.* 1181.

87. Leeanna T. Torres et al., U.S. Fish & Wildlife Serv., Habitat Assessment for Rio Grande Silvery Minnow (*Hybognathus amarus*) in the Cochiti Reach, at Peña Blanca, New Mexico, 10–12 (2008).

FWS.[88] The critical habitat designated at this time began in the main stem of the Rio Grande at the downstream side of New Mexico State Highway 22, south of Cochiti Reservoir, and ended 163 miles downstream at the Atchison Topeka and Santa Fe Railway crossing above San Marcial Dam.[89] The economic analysis associated with this designation of critical habitat was four years out of date.[90] FWS found that there were "no areas within the proposed designation where the benefits of exclusion can be shown to outweigh any benefits of inclusion."[91]

This 1999 critical habitat designation became the subject of further litigation. *Middle Rio Grande Conservancy District v. Babbitt* came on the heels of *Forest Guardians*—FWS complied with the *Forest Guardians* order to designate critical habitat for the minnow, but the Court ruled that the critical habitat designation was arbitrary and capricious in that it did not acknowledge the economic impact of the designated critical habitat.[92] Furthermore, the Court found that the designation did not meet ESA requirements or sufficiently consider federal activity within the critical habitat.[93]

Middle Rio Grande Conservancy District is notable because multiple plaintiffs with different motivations sued FWS (through the Department of the Interior) over the 1999 critical habitat designation.[94] Environmentalists, represented by WildEarth Guardians, feared that the designated critical habitat did not extend far enough into the Rio Grande floodplain. In contrast, those with economic and operational concerns, which included the MRGCD and the New Mexico Office of the State Engineer, believed the 1999 critical habitat designation was an overreach. The Court found that FWS' failure to consider alternatives between "no action" and the designation of the entire main stem Middle Rio Grande river as critical habitat was arbitrary and capricious.[95] Furthermore, the Court held that FWS needed to provide more specific information about what the minnow needed to survive in order to justify the designation of critical habitat.[96] Additionally, the Court found the draft economic analysis from 1994 to be insufficient for ESA requirements.[97] Finally, the Court determined that FWS did not consider federally required activities, such as Rio Grande Compact deliveries and flood management when establishing critical habitat designation for the minnow.[98]

Middle Rio Grande Conservancy District highlights one of the central dilemmas in the protection of the Rio Grande silvery minnow—the same riparian corridor

88. Final Designation of Critical Habitat for the Rio Grande Silvery Minnow, 64 Fed. Reg. 36274, 36277 (Jul. 6, 1999) (to be codified at 50 C.F.R. pt. 17).
89. *Id.* at 36288.
90. *Id.* at 36277.
91. *Id.* at 36280.
92. Middle Rio Grande Conservancy Dist. v. Babbitt, 206 F. Supp. 2d 1156 (D.N.M. 2000).
93. *Id.* at 1156.
94. *Id.* at 1161.
95. *Id.* at 1178.
96. *Id.* at 1178–79.
97. *Id.* at 1179–80.
98. *Id.* at 1191.

that was home for the minnow is also now home for people, irrigated farmland, industry, and a sprawling metropolitan area. The designation of critical habitat for the minnow had economic consequences because, as the economic outlook of the Middle Rio Grande improved, outcomes for the minnow declined.[99] Thus, the designation of critical habitat for the minnow would invariably affect human life and water use.[100] The competing values in this case exemplify the need for an economic analysis regarding the designation of critical habitat, but also demonstrate the need for a greater understanding of community values, beyond the legally required economic analysis.[101] The *Middle Rio Grande Conservancy District* case provides an excellent summary for the crux of the minnow issue: the success of the Albuquerque Metro area along the Middle Rio Grande has come at the expense of the minnow.[102]

In 2001, FWS released a Biological Opinion, which created a new opportunity for lawsuits. In 2002, the District of New Mexico ruled on *Rio Grande Silvery Minnow v. Keys*. The Court determined that Reclamation was required to provide a certain amount of water to the minnow, and that certain administrative processes were required if Reclamation was unable to do so.[103] This case is notable because the ruling required Reclamation to maintain a 50 cfs flow at the San Acacia Diversion Dam and to release water from Heron Reservoir to do so, if necessary.[104] This case was appealed to the Tenth Circuit, but the District of New Mexico's ruling was upheld.[105]

In 2003, FWS released a new critical habitat designation pursuant to the 2000 *Middle Rio Grande Conservancy District* ruling, which had determined that the critical habitat designation released in 1999 was arbitrary and capricious.[106] This updated designation reduced critical habitat for the minnow to a 157 mile-long and 300-foot-wide stretch of the mainstem of the Rio Grande from just below Cochiti Dam to a utility line in Socorro County, excluding levees and Pueblo lands.[107] This smaller critical habitat attempted to better balance economic values with minnow preservation.[108] The economic analysis for the designation of critical habitat also reveals that any use of water for the minnow in New Mexico was likely to result in a lost economic opportunity for another use of the same water within critical habitat.[109]

99. *Id.* 1162–63.

100. *Id.*

101. *See* Robert P. Berrens et al., A Joint Investigation of Public Support and Public Values: Case of Instream Flows in New Mexico, 27 Ecological Econ. 189 (1998).

102. Note that native people lived along the Rio Grande since time immemorial and never threatened the minnow.

103. Rio Grande Silvery Minnow v. Keys, 356 F.Supp.2d 1222, 1237–38 (D.N.M. 2002).

104. *Id.* at 1237.

105. Rio Grande Silvery Minnow v. Keys, 355 F.3d 1215 (10th Cir. 2004).

106. Designation of Critical Habitat for the Rio Grande Silvery Minnow, 68 Fed. Reg. 8088 (Feb. 19, 2003) (to be codified at 50 C.F.R. pt. 17).

107. *Id.* Santa Ana Pueblo was among the first to receive an ESA section 10 Safe Harbor Agreement for the minnow. *See* Availability of Proposed Safe Harbor Agreement for the Pueblo of Santa Ana, Sandoval County, New Mexico, 68 Fed. Reg. 20021, (Apr. 23, 2003).

108. *Id.* at 8091–92.

109. U.S. Fish and Wildlife Serv., *supra* note 93 at ES-1. Note that areas downstream from environmental flow areas tend to benefit economically from upstream environmental flows. *See,*

D. Endangered Species Population Recovery Is Often Independent from Critical Habitat Designations, Though Population Recovery Outcomes Are Improved by Increased Funding.

Research by economists in 2007 indicates that critical habitat designations do not affect listed species outcomes, however fiscal factors may play an important role.[110] An additional one million dollars in species-specific spending marginally reduces the likelihood that a population will become extinct, under the FWS definition.[111] In a similar vein, listed species whose requirements for recovery conflict with economic activity are marginally more likely to decline and eventually be scored extinct.[112] Another 2012 study affirms the 2007 findings—an increase in spending correlates to the most significant outcomes for listed species while the establishment of critical habitat shows no correlation to positive outcomes for species.[113] The researchers in the 2012 study speculate that this is the result of critical habitat designation lacking the necessary legal teeth to protect the habitat to the extent required for species recovery.[114]

In examining listed species that have demonstrated recovery, certain trends regarding critical habitat emerge. Most interestingly, protecting habitat for endangered species is necessary under the ESA but the designation of critical habitat may not actually improve outcomes for endangered species. The red-cockaded woodpecker is still listed as endangered but is improving, partially due to the very effective Safe Harbor Program, which allows private landowners to create habitat outside of a critical habitat designated area for the woodpecker, not the result of critical habitat.[115] The stabilization of the whooping crane population is mostly owed to the active introduction of breeding programs rather than the creation of critical habitat.[116] The Okaloosa darter fish was delisted in 2023, due to the restoration of the fish's historical habitat, entirely without the designation of critical habitat.[117] Finally, the Colorado pikeminnow exhibits the inverse—the population demonstrates continued

e.g., Frank S. Ward & James F. Booker, Economic Costs and Benefits of Instream Flow Protection for Endangered Species in an International Basin, 39 J. of the Am. Water Res. Ass'n. 427 (2003).

110. Joe Kerkvliet & Christian Langpap, Learning from Endangered and Threatened Species Recovery Programs: A Case Study Using U.S. Endangered Species Act Recovery Scores, 63 Ecological Econ. 499, 499 (2007).

111. *Id.* at 506.

112. *Id.* at 507.

113. Katherine E. Gibbs & David J. Currie, Protecting Endangered Species: Do the Main Legislative Tools Work?, 7 PLOS One e35730 (2012), https://doi.org/10.1371/journal.pone.0035730 [https://perma.cc/EQ4M-YLL8].

114. *Id.*

115. Reclassification of the Red-Cockaded Woodpecker From Endangered to Threatened With a Section 4(d) Rule, 87 Fed. Reg. 6118 (proposed Feb. 3, 2022) (to be codified at 50 C.F.R. pt. 17).

116. U.S. Fish & Wildlife Serv., Whooping Crane 5-Year Review: Summary and Evaluation 6–8 (2012), https://ecosphere-documents-production-public.s3.amazonaws.com/sams/public_docs/species_nonpublish/1902.pdf [https://perma.cc/H88G-862V].

117. Removal of the Okaloosa Darter from the Federal List of Endangered and Threatened Wildlife, 88 Fed. Reg. 41835, 41835–36, 41852–53 (June 28, 2023) (amending 50 C.F.R. §§ 17.11, 17.44).

low resiliency despite the establishment of critical habitat because the presence of dams and other man-made river alterations have made the restoration of critical habitat for the pikeminnow impossible.[118] It may be useful to study other western fish currently listed as "endangered" more broadly because the destruction of fish habitat through large-scale agricultural and municipal riverway manipulation poses a unique threat to fish.[119]

These two studies indicate that the legal designation of critical habitat appears to be less important than the presence of actual historic habitat for the listed species. This observation is further supported by the reality of the Rio Grande silvery minnow. Despite the legal establishment of critical habitat and the exceptionally high expenditures for conservation programs for the minnow, the fish continues to struggle with reproduction in the face of low spring runoff. The designation of critical habitat for the minnow did not set aside a preserve for the minnow, but rather designated a highly altered section of the Rio Grande as critical habitat. The legal protections and continued funding for silvery minnow programs cannot conjure the Rio Grande of a bygone era before dams and diversions and increased human impacts.

Despite the lack of minnow recovery at this time, a myriad of programs further the minnow's presence in the Rio Grande. Evidence indicates that none of the minnow-related programs in the Middle Rio Grande have come close to creating a home for the heimsuchen minnow. The haunting notwithstanding, designation of critical habitat for the minnow and the resulting environmental flows provide a wide variety of benefits for the entire Middle Rio Grande ecosystem and increase overall ecosystem function.

III. A Close Review of the 2003 Biological Opinion and Accompanying Policy for the Rio Grande Silvery Minnow Reveals an Undeveloped Understanding of the Potential Outcomes for the Minnow.

Despite significant expenditures and bureaucracy, the outcomes for the minnow have not markedly improved. Rather than establish independent criteria for evaluating minnow outcomes, this paper looks to the 2003 Biological Opinion (BiOp) and its successor, the 2016 BioOp. The 2003 BiOp came on the heels of the designation of critical habitat for the minnow, which was accompanied by the Economic Analysis of the Critical Habitat Designation for the Rio Grande Silvery Minnow.[120]

118. U.S. Fish & Wildlife Serv., Final Recovery Plan for Colorado Pikeminnow (*ptychocheilus lucius*) 5–7 (2023), https://ecos.fws.gov/docs/recovery_plan/20230804_FinalRP_Colorado%20pikeminnow_v4_AMMsigned.pdf [https://perma.cc/ZT9K-TMKF]. "Low resiliency" in this case refers to the fish's inability to survive past the first year of life in the wild.

119. For further reading, see Robert Lackey's body of work on salmon, e.g., Robert T. Lackey, Saving wild salmon: A 165 year policy conundrum (2013), https://forestpolicypub.com/wp-content/uploads/2014/01/165-Year-Salmon-Policy-Conundrum-R-T-Lackey.pdf [https://perma.cc/U665-AMWG].

120. Designation of Critical Habitat for the Rio Grande Silvery Minnow, 68 Fed. Reg. 8088 (Feb. 19, 2003) (codified at 50 C.F.R. pt. 17); U.S. Fish & Wildlife Serv., Final Economic Analysis of Critical Habitat Designation for the Rio Grande Silvery Minnow (David Brookshire with

The designation of critical habitat is a nondiscretionary requirement within the ESA following the listing of a species.[121] As evidenced by caselaw, however, there are notable limitations within the designation of critical habitat that were implemented in the wake of major economic concerns for the results of designating critical habitat without guardrails. The economic analysis portion of the critical habitat designation becomes particularly important in contexts like the Middle Rio Grande, where entire communities have grown around water management norms that are antithetical to the success of the minnow.

BiOps contain multiple components. First, the opinion indicates whether FWS believes the federal action in question will negatively impact the survival of the listed species.[122] Second, the BiOp provides conservation recommendations, which are voluntary measures proposed by FWS that are likely to improve outcomes for the listed species.[123] Finally, the BiOp provides reasonable and prudent measures which are mandatory actions to minimize take of the listed species.[124]

A. The 2003 Biological Opinion and Economic Analysis Indicate a Nascent Understanding of the Silvery Minnow and a Lack of Flexibility in Water Management.

The 2003 Biological Opinion recommended an increased flow on the Rio Grande between April 15 and June 15 to serve as a "spawning spike."[125] There was no recommended duration or flow measurement for this spike.[126] The BiOp also required, as a reasonable and prudent measure, fish passage constructed at San Acacia and Isleta Diversion Dams.[127] Most importantly, the 2003 BiOp required, even in dry years, a continuous winter flow from Cochiti to San Marcial, with special attention to maintaining a year-round minimum flow of 100 cfs from Cochiti to Isleta, measured at the Central Avenue Bridge gage.[128]

From the outset, this requirement was difficult to meet.[129] This recommendation was notably dropped from the 2016 BiOp,[130] likely to allow water managers

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Indus. Econ., 2002) (final draft on file with author).

121. Forest Guardians v. Babbitt, 174 F.3d 1178, 1186 (10th Cir. 1999).

122. 50 C.F.R. § 402.02 (2024).

123. *Id.*

124. *Id.* See this citation for the full definition of "take", as well.

125. U.S. Dep't of Interior., Consultation No. #2–22–03-F-0129, Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations, Army Corps of Engineers' Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico 91 (2003).

126. *Id.*

127. *Id.* at 96.

128. *Id.* at 93. In wet years, the 100 CFS flow should be measured from the Isleta Gage. *Id.*

129. USGS Water Data shows that this 100 CFS flow requirement was not met in 2005 or 2009. After the 2016 BiOp was released, this same stretch ran dry in 2018, 2020, 2021, 2022, and 2023. See generally data from the U.S.G.S. Rio Grande gages, e.g., U.S. Geological Surv., *supra* note 4.

130. U.S. Dep't of Interior, Consultation No. 02ENNM00–2013-F-0033, Final Biological

more flexibility in determining how to best maintain habitat for the minnow and to eliminate the significant risk of litigation posed by the continuous flow requirement. In 2022, the Rio Grande ran dry at Central and although in 2023 it did not run dry, the river through that stretch hit 50 cfs.[131]

Numerical goals, such as the 100 cfs flows, call to mind Goodhart's Law, which states that establishing specific numerical criteria for project success encourages the management of a number rather than the success of the underlying conceptual goal for which the criteria was established.[132] In other words, it is possible that in establishing a 100 cfs flow at Central (or Isleta), FWS created a situation in which water managers would be more preoccupied with the presence of the 100 cfs than with the success of the minnow. This is evident in the anecdotal recollections of individuals involved in water management through the Middle Rio Grande during this time, who recall the scramble to increase releases from outfalls just above Central when the flow through the valley became worryingly low.[133]

The 2003 Economic Analysis on the designation of critical habitat emphasizes the economic cost of leaving water in the river to support the designated critical habitat rather than diverting it from the river to support economic uses.[134] The report considers that environmental flows for uses like critical habitat are generally nonconsumptive, in that environmental flows generally only result in evaporative losses or conveyance losses of water supply in the basin.[135] The report goes on to explain that directing existing consumptive water rights to be used for environmental flows to create critical habitat for the minnow would not significantly decrease total system water available on the Rio Grande.[136]

The 2003 Biological Opinion reflects limited scientific understanding about the Rio Grande silvery minnow. Advice on a spawning spike reflects the limited amount of knowledge available about the minnow at the time the BiOp was written. Furthermore, the lack of specificity about the parameters of the spawning spike suggests potential uncertainty in how to coordinate river operations for the benefit of the minnow. These ambiguities have been lessened by the development of the Upper Rio Grande River Operations Model (URGWOM), which allows for

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and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico 110 (2016), https://www.fws.gov/sites/default/files/documents/20161202_MRG%20BiOp_Final%20%281%29.pdf [https://perma.cc/VB2Q-ZBGB].

131. U.S. Geological Surv., *supra* note 4.

132. Christopher Mattson et al., *When a Measure Becomes a Target, It Ceases to be a Good Measure*, 31 J. Grad. Med. Educ. 2, 2 (2021), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7901608/ [https://perma.cc/F7B9-PT89].

133. Interview with Adrian Oglesby, Dir., Utton Transboundary Res. Ctr., Univ. of N.M. Sch. of L., in Utton Center (Feb. 1, 2024); Interview with Thomas Archdeacon, Fish Biologist, U.S. Fish & Wildlife Serv., in Albuquerque, N.M. (Feb. 13, 2024).

134. U.S. Fish and Wildlife Serv., *supra* note 119.

135. *Id.* at ES-8. Note that the report does not speak to conveyance losses for instream flows.

136. *Id.*

the modelling of a vast array of water management scenarios, including those that benefit the minnow.[137]

B. The Middle Rio Grande Endangered Species Collaborative Program was Established Concurrently with the 2003 BiOp.

The Middle Rio Grande Endangered Species Collaborative Program (MRGESP) was formalized in 2003 with the signing of a Memorandum of Understanding (MOU), though meetings began years prior.[138] It was reaffirmed in both 2008 and 2022 with new Memoranda of Agreement (MOAs) to protect the species federally listed as endangered or threatened, including the minnow, in the Middle Rio Grande.[139] It bears noting that none of the species the MRGESCP was seeking to protect were recovering with existing efforts. The MRGESCP functions similarly to the program described hypothetically by the BBMP.[140] Although the MRGESCP does not have independent authority to implement any adaptive management or engage in decision-making,[141] the parties to the Collaborative Program do individually have the capacity and authority to implement such programs. The Collaborative Program is a "collaborative forum to support scientific analysis and implementation of adaptive management to the benefit and recovery of the listed species pursuant to the Endangered Species Act within the Program Area."[142] The first MOA was signed in 2008.[143] There are currently 17 signatories to the 2022 MOA, which include federal, tribal, state, local, and NGO participants.[144] Though the MRGESCP functions on a drawn-out timescale—perhaps one slower than the demise of the minnow—the Collaborative Program is valuable in its gathering of scientists, policymakers, and community members.

137. *Continued Development*, U.S. Army Corps of Eng'rs, https://www.spa.usace.army.mil/Missions/Civil-Works/URGWOM/Continued-Development/ [https://perma.cc/R8BE-FM7F] (last visited Jun. 26, 2024).

138. *Program Overview*, Middle Rio Grande Endangered Species Collaborative Program, https://webapps.usgs.gov/mrgescp/about/overview [https://perma.cc/FF2R-GNSZ] (last visited Apr. 15, 2025).

139. *Id.*; Middle Rio Grande Endangered Species Collaborative Program, 2022 Memorandum of Agreement for the Middle Rio Grande Endangered Species Collaborative Program 1 (2022), https://webapps.usgs.gov/mrgescp/documents/2022-MOA-and-Signature-Pages_2022.03.23_Final.pdf [https://perma.cc/Z62U-REXN] [hereinafter 2022 Memorandum of Agreement].

140. Clifford S. Crawford et al., *supra* note 60, at 182.

141. Western EcoSystems Technology, Inc., Middle Rio Grande Endangered Species Collaborative Program Long-Term Plan for Science & Adaptive Management Version 2.0.1, at 6 (2022), https://webapps.usgs.gov/mrgescp/documents/Long-Term-Plan-for-Science-Adaptive-Management_EC-approved-2022.03.23_revised-2022.06.23.pdf [https://perma.cc/F338-UXGM].

142. *Guiding Principles*, Middle Rio Grande Endangered Species Collaborative Program, https://webapps.usgs.gov/mrgescp/about/guiding-principles [https://perma.cc/EK4Q-3KQQ] (last visited Apr. 25, 2025).

143. *See* 2022 Memorandum of Agreement, *supra* note 138, at 1.

144. *Id.* at 3–18.

IV. Judicial and Administrative Processes After 2003 Attempted to Secure More Water for the Silvery Minnow While Also Creating More Flexibility in Middle Rio Grande Water Management.

Following the release of the updated Biological Opinion and critical habitat designation, several groups brought suits to secure more water for the minnow. Yet those cases were largely unproductive,[145] in part due to Congress's development of statutory language attached to the 2003 Water Development Appropriations Act called the "minnow rider."[146] The minnow rider, in conjunction with other policy riders in 2004 and 2005, removed Reclamation's full discretion to release San Juan Chama water and established that compliance with the reasonable and prudent actions and incidental take statements in the 2003 minnow BiOp would constitute compliance with the ESA.[147]

In 2010, the Tenth Circuit heard *Rio Grande Silvery Minnow v. Bureau of Reclamation*, in which NGOs argued that Reclamation should reallocate water from other San Juan-Chama Project contractors directly to the environment, as required by the ESA.[148] The foundation for this case began in 2002, and, as the opening sentence of the decision reads, "[t]his case involves one battle in a prolonged war over a finite and elemental resource—Rio Grande water."[149] The central issue in all the minnow litigation is that the minnow, like all other fish, needs water to live. Groups bringing these suits alleged that Reclamation failed to adequately consult under the ESA when setting their San Juan-Chama Project releases and that the Army Corps of Engineers failed to consult adequately under the ESA when actually releasing the water.[150] In part resulting from the statutory language of the minnow rider, the Tenth Circuit dismissed all of the claims brought by environmentalists.[151]

A. The 2016 Biological Opinion Reflects a More Developed Understanding of Silvery Minnow Survival Needs but Did Not Improve Outcomes for the Minnow.

The 2016 Biological Opinion recommended measures to promote spawning and to increase general minnow survival.[152] Promoting spawning contributes to a self-sustaining population, whereas general survival measures also benefit the hatchery stock

145. *See* Rio Grande Silvery Minnow v. Keys, 355 F.3d 1215 (10th Cir., 2004); Rio Grande Silvery Minnow v. Keys, F.Supp.2d 1003 (D.N.M., 2005); Rio Grande Silvery Minnow v. Bureau of Reclamation, 601 F.3d 1096 (10th Cir., 2010).

146. Rio Grande Silvery Minnow v. Bureau of Reclamation, 601 F.3d 1096, 1108 (10th Cir. 2010).

147. *Id.* at 1108.

148. *Id.* 1109.

149. *Id.* at 1103.

150. *Id.* at 1106. SJCP releases are only a small portion of the total water in the Rio Grande River system.

151. *Id.* at 1133.

152. U.S. Fish & Wildlife Serv., Consultation No. 02ENNM00–2013-F-0033 at 149–50 (2016), https://www.fws.gov/sites/default/files/documents/20161202_MRG%20BiOp_Final%20%281%29.pdf [https://perma.cc/R4UV-TAHC].

minnows that are added to the river after the wild-stock minnows spawn in the river. The spawning measures recommended using supplemental San Juan Chama water for high spring pulse flows.[153] Secondarily, the BiOp recommended modifying river morphology to create optimal areas for minnow spawning, through overbank projects and the like.[154] Other spawning-related conservation measures included (1) increasing supplemental water available through operational changes in the Middle Rio Grande, (2) overbank project maintenance, and (3) constructing new refuge areas for the minnow.[155]

The recommended measures for general minnow survival success in the 2016 BiOp included the measures for spawning success and expanded the overbank and water management recommendations.[156] FWS strongly recommended using MRGCD operations to maximize the amount of water available for environmental flows for the minnow.[157] The limitation of the Conservation Recommendations is their discretionary nature—unenforceable policy changes beyond the power of FWS to implement or the power of the ESA to enforce.[158]

The 2016 BiOp also contained significant reasonable and prudent measures that are required for minnow survival and compliance with the ESA. These mandatory measures still left significant room for discretion in determining releases to optimize minnow survival.[159] The 2016 BiOp described mandatory implementation of the reasonable and prudent measures using "[s]uch discretionary water management options shall be used to attain a self-sustaining population (1.0 fish per 100 m^2), or when opportunities exist, of meeting recovery goals (5.0 fish per 100 m^2)."[160] The 2016 BiOp also required habitat restoration actions, beyond the scope of this paper.[161] Finally, this BiOp required the creation of fish passages at three MRGCD diversion dams.[162]

In many ways, the 2016 BiOp reflects a deeper understanding of the biology of the minnow and the wider human and non-human ecosystem to which it belongs. The 2016 BiOp incorporated lessons learned from the 2003 BiOp in a few key ways. This BiOp did not set flow minimums, perhaps avoiding the pitfalls of Goodhart's Law.[163] However, the 2016 BiOp did not avoid implicating the complex management

153. *Id.* at 149–150.

154. *Id.* See Memorandum from U.S. Fish and Wildlife Serv. Regional Director *supra* note 9, at 14–19 for spawning conditions. Overbanks projects are designed to lower the main riverbank to create conditions to encourage local flooding for environmental benefits.

155. U.S. Dep't of Int., *supra* note 151 at 157–60, 166–68.

156. *Id.* at 150–51.

157. *Id.* at 151–52.

158. *Id.* at 116.

159. *See id.* at 110.

160. Memorandum from U.S. Fish and Wildlife Serv, *supra* note 9 at 110.

161. *Id.* at 111.

162. *Id.*

163. Note that the BiOp does indicate that "[s]uch discretionary water management options shall be used to attain a self-sustaining population (1.0 fish per 100 m^2), or when opportunities exist, of meeting recovery goals (5.0 fish per 100 m^2)." *Id.* at 110.

framework of the deeply altered Rio Grande, because the recommended spawning measures require coordinated actions from multiple water managers across the Middle Rio Grande. These measures also involve coordination of multiple reservoirs, including Heron, El Vado (the only reservoir for storage of native water in the Rio Grande System in New Mexico upstream of Elephant Butte Reservoir), Abiquiu, and Cochiti. The complex regulatory and potentially legislative action required to complete the recommended spawning measures require voluntary action far beyond FWS' purview. They are, however, squarely within the authority of the signatory groups to the Middle Rio Grande Endangered Species Collaborative Program. The MRGESCP cannot force action, however, and is reliant on individual signatories acting independently.

Beyond the limitations of the MRGESCP, there are functional conflicts between minnow recommendations and Middle Rio Grande management operations. Notably, as of 2025, the spawning measures using supplemental San Juan Chama water stored in El Vado must be reconsidered in light of the current damage to El Vado Dam.[164] Similarly, ideal spawning releases for the minnow are not obviously compatible with New Mexico's Rio Grande water delivery obligations to Texas or Rio Grande Compact restrictions under Article VII of the Rio Grande Compact.[165]

More practically, the 2016 BiOp recommends the maintenance of existing overbank projects and the construction of new minnow refuge areas. These actions are more easily taken, particularly because they occur at a local scale, with actions from both in-state groups like the MRGCD and Federal groups like Reclamation and the Army Corps. Everyone involved in the collaborative management of the Middle Rio Grande engages in these projects, often through the lens of the MRGESCP.[166] Unfortunately, research shows that individual small-scale, local projects do not meaningfully improve the broader habitat.[167]

The original ESA legislation was written with the intention of protecting biodiversity and loss of species, regardless of cost. Both the 2003 and 2016 Biological Opinions are limited by subsequent ESA amendments, and the implementation of both BiOps was constrained by external realities, such as interstate water delivery requirements. Thus, the minnow is left without a clear path for species recovery. While current measures preserve the minnow as a ghost species seeking the once-common braided channels and backwaters, it may be possible to interpret existing ESA requirements differently. If analyzed more broadly, the Rio Grande

164. John Fleck, *The Loss of El Vado Dam*, Inkstain (Apr. 10, 2024, 9:20 AM) https://www.inkstain.net/2024/04/the-loss-of-el-vado-dam/ [https://perma.cc/52RV-WZKZ].

165. Veihl, *supra* note 17 at 29. It is possible to meet Compact delivery requirements and also create a spawning spike, it just takes a re-envisioning of the timing requirements on Compact deliveries.

166. U.S. Geological Surv., *supra* note 137.

167. Charles B. Yackulic et al., *Quantifying Flow and Nonflow Management Impacts on an Endangered Fish by Integrating Data, Research, and Expert Opinion*, 13 Ecosphere at 3 (2022), https://www.researchgate.net/publication/363574036_Quantifying_flow_and_nonflow_management_impacts_on_an_endangered_fish_by_integrating_data_research_and_expert_opinion.

silvery minnow's listing as an endangered species can be used to manage a wider set of ecological and economic outcomes on the river, since the minnow population will likely never be self-sustaining.

B. Post-2016 Minnow Litigation Centered Around a Lack of Flexibility in Middle Rio Grande River Management, Much Like the Litigation Following the 2003 BiOp.

The litigation in the wake of the 2016 BiOp reckons with the operational realities of the Rio Grande. *WildEarth Guardians v. United States Army Corps of Engineers* is a series of cases in which the plaintiff claimed that the federal government's reservoir management violated the ESA, primarily through Army Corps of Engineer dam operations. The first published opinion denied WildEarth Guardians' motion in full.[168] The second published opinion, filed a year later, was related to the first. In this case, the plaintiff argued that the Army Corps' decision not to complete consultation with FWS violated the ESA.[169] Here, the Court determined narrowly that the Army Corps does not have the requisite discretion over Middle Rio Grande operations to consider ESA compliance but remanded the larger discretion question back to the agency.[170]

In the third round of *WildEarth Guardians v. Army Corps of Engineers*, the Court determined that the Army Corps had no consultation obligation with FWS.[171] The reasoning behind this ruling was that the Army Corps had no discretion in how they managed San Juan Chama Project and flood control operations under federal law, and thus, there was no requirement to consult on how reservoir operations might impact the minnow.

This final installment shows an institutional preference for the economic and operational concerns related to water management over the ecological concerns related to the minnow. *WildEarth Guardians v. United States Army Corps of Engineers* was decided in favor of the Army Corps, stating that the Corps was required to manage flood control operations in conjunction with Rio Grande Compact obligations and was not obligated to consider benefits to the minnow in setting a flow schedule for floodwater releases.[172] If the Court believed what they stated in 1999, that the minnow was already doomed, it follows that the letter of the ESA was insufficient to sway the Court towards a more holistic interpretation of the law twenty-five years later. It appears futile to spend over 175 million dollars on the Rio Grande silvery minnow,[173]

168. WildEarth Guardians v. U.S. Army Corps of Eng'rs, 264 F. Supp. 3d 1136 (D.N.M. 2017).

169. WildEarth Guardians v. U.S. Army Corps of Eng'rs, 314 F. Supp. 3d 1178 (D.N.M. 2018).

170. WildEarth I, 264 F. Supp. 3d at 1204.

171. WildEarth Guardians v. U.S. Army Corps of Eng'rs, 947 F.3d 635, 637 (10th Cir. 2020).

172. *Id.* at 640–41.

173. U.S. Fish and Wildlife Serv., Fed. and State Endangered and Threatened Species Expenditures, Fiscal Year 2020 (2020), https://www.fws.gov/sites/default/files/documents/endangered-threatened-species-expenditures-%20report-to-congress-fiscal-year-2020.pdf.

only for the Tenth Circuit to rule that the entity responsible for releasing the high flows that most benefit the minnow need not consider the success of the minnow.

Four years later, WildEarth Guardians filed a Notice of Intent to Sue. They eventually reached a settlement with FWS and MRGCD [174] in which FWS agreed to work with Reclamation to issue a new BiOp for the minnow by October 30, 2028.[175] Within the next four years, FWS will implement any measures from the 2016 BiOp that remain unfinished.[176] In the same period, MRGCD will pursue fallowing and efficiency upgrades within their benefitted area with the goal of dedicating more water to flows benefitting the minnow.[177] If MRGCD is unable to use saved water to meet its commitments to the minnow, the Conservancy District agrees to dedicate 10% of its San Juan Chama Project water to flows for the minnow.[178] The upcoming 2028 BiOp presents an opportunity to think differently about the role of the ESA and the future of the silvery minnow.

V. History Suggests that Conservation Efforts Focused on the Minnow Individually Have Not Yielded the Desired Results.

There is no statutory or regulatory framework for how to make moral determinations for a species, like the Rio Grande silvery minnow, that is approaching functional extinction but important for keeping water in the mainstem of the Rio Grande. The Endangered Species Act requires conservation efforts, like those being taken now, to continue in perpetuity unless the species either improves enough to be delisted or becomes entirely extinct.[179] There are robust systems in place for raising hatchery stock minnow and releasing them, combined with annual efforts to relocate stranded minnows from sections of the river that are not connected.[180] Although these efforts produce a much less diverse genetic stock and are found to have a comparatively low success rate,[181] they appear to be sufficient to maintain a minnow presence in the river.[182] The minnow is trapped in a purgatorial existence, searching for a home that has not existed since before the creation of Cochiti Dam in

174. Settlement Agreement at 1, WildEarth Guardians v. U.S. Fish and Wildlife Serv., No. 1:22-cv-914-GJF-JMR (D.N.M., Nov. 19, 2024).

175. *Id.* at 2.

176. *Id.* at 3.

177. *Id.* at 3–4.

178. *Id.* at 4.

179. Endangered Species Act of 1973, § 4, 16 U.S.C. § 1531–1544.

180. *See*, *e.g.*, Maestas, *supra* note 39.

181. Megan J. Osborne & Thomas F. Turner, *Genetic Monitoring of the Rio Grande Silvery Minnow: Genetic Status of Wild and Captive Stocks in 2021*, Annual report FY 2021, Department of Biology and Museum of Southwestern Biology MSC 03–2020, Univ. of N.M. 4 (2021), https://webapps.usgs.gov/mrgescp/documents/Osborne-and-Turner_2021_Genetic-Monitoring-of-the-RGSM-Genetic-Status-and-Captive-Stocks-in-2021.pdf; *See also* Osborne et al., *supra* note 14.

182. Thomas P. Archdeacon et al., *Hatchery supplementation increases potential spawning stock of Rio Grande Silvery Minnow after population bottlenecks*, 152 Transactions of the Am. Fisheries Soc. 187 (Jan. 5, 2023), https://afspubs.onlinelibrary.wiley.com/doi/full/10.1002/tafs.10398.

the 1970s—if not Elephant Butte Dam and Reservoir more than 50 years earlier—with an annually supplemented population. Our ghost fish population is neither extinct nor self-sustaining, because the ESA requires continued efforts to maintain the minnow population in a river that is no longer suited for it.

The requirements of the ESA have created an entire economy around preserving the minnow population.[183] As noted earlier in the paper, government spending for minnow recovery varies annually from 7 million dollars to more than 12 million dollars.[184] Over the course of the last 20 years, more than 175 million dollars have been dedicated to the minnow.[185] There is an extensive cohort of scientists, policymakers, and academics dedicated to determining how best to maintain the minnow population in a river stretch now ill-suited for the fish that evolved here.[186] Furthermore, water management by the Middle Rio Grande Conservancy District, the Bureau of Reclamation, Interstate Stream Commission, and sometimes the Army Corps of Engineers is influenced by the ecological needs of our ghost fish.

As discussed in the Critical Habitat Section above, the ESA defines critical habitat as "the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" and the "specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary [of the Interior] that such areas are essential for the conservation of the species."[187] At the heart of this issue is the reality of the available minnow habitat in 1994. By the late 1990s, essential minnow habitat was already gone—eliminated by a century of water management in the Rio Grande. Furthermore, the proximate cause of the minnow's decline, which necessitated its listing under the ESA, was the elimination of its floodplain habitat, that is now home to roughly a quarter million people in the Albuquerque Metropolitan Statistical Area. In other words, we built human communities where the minnow used to live.

The intention behind the designation of critical habitat, as noted in an early ESA hearing report, was "to maintain a diversity of species and to preserve in their natural ecosystems both endangered and threatened species."[188] Another report notes "[c]learly it is beyond our capability to acquire all the habitat which is important to those species of plants and animals which are endangered today, without at the same time dismantling our own civilization."[189] This is the crux of minnow management.

183. *See generally* U.S. Geological Survey, *supra* note 4 (describing the myriad measures that contribute to minnow preservation and conservation).

184. U.S. Fish and Wildlife Serv., *supra* note 33.

185. *Id.*

186. *2024 Science Symposium*, Middle Rio Grande Endangered Species Collaborative Program, https://webapps.usgs.gov/MRGESCP/science-symposiums/2024-science-symposium (last visited Jun. 26, 2024).

187. Endangered Species Act of 1973, § 5, 16 U.S.C § 1532.

188. S. Rep. No. 94–837, *supra* note 53 at 518.

189. *Id.* at 144.

There are vast differences between the sentiment behind ESA law on critical habitat and the reality for the Rio Grande silvery minnow. Furthermore, the Courts (like all other actors on the Middle Rio Grande) are unable to improve minnow outcomes because the Middle Rio Grande cannot be converted into a preserve, essentially rendering the ESA's litigation clause useless to create functional minnow habitat.

VI. The Middle Rio Grande Endangered Species Conservation Program Offers an Opportunity to Discuss Ecosystem-wide Management of the Middle Rio Grande.

There is limited opportunity within the Middle Rio Grande to create space for ongoing conversations about ecosystem-wide habitat management that includes the minnow.[190] Despite the lack of enforcement capacity by MRGESCP and the lengthy timescale for developing the current Long-Term Plan for Science and Adaptive Management following the 2016 decision to adopt an adaptive management framework,[191] it is valuable to have an entity making recommendations directly to FWS based on science and on-the-ground observations. It is also valuable to have a group whose primary purpose is the development of adaptive management, particularly in a place like the Middle Rio Grande, where climate change continues to dramatically alter the ecosystem. It would be even more beneficial if there were room in the MRGESCP to discuss competing values and tradeoffs of continuing to maintain the minnow. The Department of the Interior has generated a manual on adaptive management, which states that adaptive management should be used to improve "resource management by learning from management outcomes."[192] This principle aligns closely with the intended mission of the ESA, especially when species management can improve species outcomes.

VII. Since Current Minnow Conservation Efforts Have Not Met ESA Goals, It May Be Useful to Consider Alternative Approaches Involving Larger Middle Rio Grande Water Management Values.

Despite the clear species preservation goals within the ESA, and the significant efforts that went into the creation of both the 2003 and the 2016 BiOps, the minnow is not improving. In 2020, a FWS biologist in the Middle Rio Grande Basin began suggesting in peer-reviewed literature that current ESA measures for the minnow

190. For information on another group that served a similar purpose, *see* Esteban Muldavin et al., *Middle Rio Grande Conservation Action Plan Framework and Status Assessment*, Colorado Nat'l Heritage Program (2015), https://cnhp.colostate.edu/download/documents/2015/MRG_CAP_final.pdf [https://perma.cc/4NYH-M2DL].

191. See The Program Support Team & Western EcoSystems Technology, Inc., *supra* note 140 for the current version. The first long-term plan was approved in Dec 2021, 18 years after the signing of the initial MOU.

192. Byron K. Williams et al., *Adaptive Management: The U.S. Department of the Interior Technical Guide 1* (2009), https://www.doi.gov/sites/doi.gov/files/migrated/ppa/upload/TechGuide.pdf.

are not addressing the ecological needs of the minnow,[193] leading to the publication of a paper detailing the utter lack of success in restoration of the species' population in the river.[194] FWS and Army Corps of Engineers teamed up to evaluate the efficacy of fish rescue, that is, physically moving the minnow from isolated pools to areas with perennial flows.[195] The study found that less than ten percent of minnows transferred survived more than five weeks past the transfer.[196] The authors state that reactive actions, such as minnow transfers, are ineffective for species recovery, and the minnow will require more proactive actions to limit the streamflow intermittency that necessitates minnow transfer.[197]

The need for year-round streamflow management to mimic an unaltered river was reaffirmed in a 2022 study organized by the University of New Mexico, the Army Corps, and FWS, which found that the isolated pools resulting from streamflow intermittency often have poor water quality that result in loss of at-risk fish species like the minnow.[198] Another 2020 study further concluded that extreme low flows, like those seen in the part of the Middle Rio Grande that dry with regularity, result in the minnow's inability to live.[199] These studies are damning (no pun intended) for the future of the minnow, particularly in light of the ongoing flow management troubles in the Middle Rio Grande, related to a host of issues including the loss of El Vado Dam, sediment plugs on the Rio Chama, and ongoing Rio Grande Compact debt.[200]

As flows in the Middle Rio Grande increase in April and May and then decrease to less than 100 cfs in some places, and to zero in other places, in August,[201] the image of the Rio Grande silvery minnow as a ghost, seeking ancestral aquatic refuges that

193. Thomas Archdeacon et al., *No quarter: lack of refuge during flow intermittency results in catastrophic mortality of an imperiled minnow* (Sept. 8, 2020), https://www.doi.gov/sites/doi.gov/files/migrated/ppa/upload/TechGuide.pdf.

194. Archdeacon et al., *supra* note 32.

195. *Id.* at 1.

196. *Id.* at 6.

197. *Id.* For further reading see Thomas P. Archdeacon & Justin K. Reale, *No quarter: Lack of refuge during flow intermittency results in catastrophic mortality of an imperiled minnow*, 65 Freshwater Biology 2023 (2020).

198. *See* David J. Van Horn et al., *Water quality in three potential drought refuges in an arid-land river: assessing habitat suitability for at-risk fish species,* 7 Knowledge and Mgmt. of Aquatic Ecosystems 423 (2022), https://www.kmae-journal.org/articles/kmae/pdf/2022/01/kmae210081.pdf.

199. *See generally* Thomas P. Archdeacon et al., *Drought Results in Recruitment Failure of Rio Grande Silvery Minnow (Hybognathus amarus), an Imperiled, Pelagic Broadcast-Spawning Minnow*, 103 Env't Biology Fishes 1033 (2020), https://link.springer.com/article/10.1007/s10641–020–01003–5 [https://perma.cc/3JVX-GJ9E]. Another 2022 study indicates that regardless of how slowly the river dries, the minnow is unable to escape the drying. Thomas P. Archdeacon et al., *Effects of Flow Recession Regime on Stranding of Rio Grande Silvery Minnow Suggests that Conservation Actions Must Overcome Evolutionary Traps*, 32 Aquatic Conservation 1817 (2022), https://onlinelibrary.wiley.com/doi/full/10.1002/aqc.3852.

200. John Fleck, *In New Mexico's Middle Rio Grande, the Wheels Are Coming Off*, Inkstain (Jul. 15, 2024, 1:52 PM), https://www.inkstain.net/2024/07/in-new-mexicos-middle-rio-grande-the-wheels-are-coming-off/ [https://perma.cc/A6X8-LMP5].

201. *See* U.S. Geological Surv., *supra* note 4 at the one-year graph.

no longer exist, is a salient one. Despite ESA management of both the critical habitat and the minnow itself, the minnow's outcomes have not improved. Some scholars have suggested that the definition for critical habitat be expanded from the current statutorily constrained definition to a definition that more closely comports with scientific understanding of critical habitat.[202] This suggestion, however idealistic, is impracticable in places where the decline of a species is intimately tied to the current success of the human population, as is true with the minnow. As the 2028 BiOp will need to contemplate, there is no clear answer for what to do in cases like these. Some research indicates that multispecies conservation plans are one option for making the most biological and economic use of designated critical habitat.[203]

A. A Strong Focus on the Rio Grande Silvery Minnow Serves as a Catalyst for Greater Ecosystem Protection, Even if It Does Not Lead to a Self-sustaining Minnow Population.

For system functionality, it is important not to value the preservation of the minnow, as an individual species, over the management of the entire Middle Rio Grande ecosystem. If we accept that the minnow population will never recover, due to the potent double whammy of river management decisions of the twentieth century and the ongoing decrease in water supplies in the Southwest, it can shift the perspective on the utility of the ESA. Rather than taking action to comply with the ESA defensively, in an attempt to fend off potential lawsuits, it may be possible for FWS to construe the ESA more broadly when drafting BiOps by asking two questions: (1) what are the minimum possible actions necessary to maintain the Rio Grande silvery minnow population at its current numbers and distribution and (2) what are the maximum possible actions for river and ecosystem management that can be taken pursuant to both the reasonable and prudent actions and the conservation actions of the Biological Opinions.

The space between the minimum actions necessary for the minnow and the maximum actions encouraged by the ESA is an area in which there is room to manage the ecosystem with broader values in mind; this space brackets the possibility for a zone of consensus. The Middle Rio Grande will never be a home for the minnow as it was before the construction of dams, but it is a home for myriad human and nonhuman communities as it is now. The 2028 BiOp is an opportunity to reframe minnow protections as one component of a larger Middle Rio Grande management plan.

202. Isabella Kendrick, *Critical Habitat Designations Under the Endangered Species Act in an Era of Climate Crisis*, 121 Columbia L. Rev. 81, 112 (2021), https://columbialawreview.org/content/critical-habitat-designations-under-the-endangered-species-act-in-an-era-of-climate-crisis/ [https://perma.cc/PDE9-ZZZ7].

203. Ya-Wei (Jake) Li, *When Does Critical Habitat Designation Benefit Species Recovery?* (Utah State U. 2020), https://www.thecgo.org/wp-content/uploads/2020/10/When-Does-Critical-Habitat-Designation-Benefit-Species-Recovery.pdf [https://perma.cc/4P5L-VAHL].

B. Regulations for Writing Biological Opinions Offer Opportunities for Considering the Needs of the Endangered Species in Question in the Context of the Larger Ecosystem.

Broadly, a formal biological opinion (BiOp) includes "a description of the proposed action, status of the species/critical habitat, the environmental baseline, effects of the action, cumulative effects, the Services' conclusion of jeopardy/no jeopardy and/or adverse modification/no adverse modification, and reasonable and prudent alternatives, as appropriate."[204] The requirements for describing the listed species and critical habitat are specific and serve as a background for justifying the BiOp.[205] The next required section, the environmental baseline, poses some difficulties. The section is intended to describe the historical status of the species or critical habitat and contrast it with current conditions.[206] The FWS guidance on developing BiOps is silent on how to describe historic species requirements or habitat in the absence of thorough information about the success of the fish prior to human intervention, as is the case with the minnow.[207]

The section of the BiOp guidance on the analysis of potential effects of the proposed action is detailed and creates subcategories of effects.[208] The section on cumulative effects includes all future state, tribal, local, or private actions that are certain to occur within the action area.[209] It is intended to consider all of the non-federal actions that may interact with the proposed action, which can influence the determination of species jeopardy.[210] The fundamental difficulty here is the realm of the unknown that cannot be predicted using the current system.

A final potential point of improvement to the existing BiOp manual is the criteria for whether a federal action will result in destruction or adverse modification of critical habitat, which is evaluated much in the same way as the determination for jeopardy.[211] While the guidelines are clear for species for whom there are clear records of their original habitat, they fall short for species whose habitat has been seriously impacted since before modern records existed. If there are no records of what the species habitat used to look like, or conditions in which the species should thrive, any analysis of whether the proposed action will harm the species will fall short.

204. U.S. Fish & Wildlife Serv. & Nat'l Marine Fisheries Serv., *Endangered Species Consultation Handbook* 4–15 (1998), https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf [https://perma.cc/WG5Y-PMSP].

205. *Id.* at 4–19 to 4–21.

206. *Id.* at 4–22.

207. *Id.* There is also a useful document, Tips for Writing Biological Opinions, which is silent on this issue. Jerry Ziewitz & U.S. Fish & Wildlife Serv., *Tips for Writing Biological Opinions and Conference Opinions* 9–10 (2015), https://www.fws.gov/sites/default/files/documents/tips-for-writing-biological-opinions-2015–01–05.pdf [https://perma.cc/3473–93HE].

208. U.S. Fish & Wildlife Serv. & Nat'l Marine Fisheries Serv., *supra* note 203, at 4–23 to 4–31.

209. *Id.* at 4–31.

210. *Id.* at 4–31 to 4–32.

211. *Id.* at 4–34 to 4–39.

FWS guidance for BiOps may be more easily modified than the statutory language of the ESA, and potentially more impactful. Rules and regulations issued by FWS that become part of the Code of Federal Regulations require a public comment process but are not subject to the same partisan difficulties as legislation.[212] These rules then influence the creation of guidance, like the Consultation Handbook or the tips for writing Biological Opinions.[213] Despite the elimination of the Chevron Doctrine in *Loper*,[214] the administrative state still has the potential to be exceptionally useful in administering the ESA in a way that benefits both endangered species and the larger community in and around the critical habitat of the species.

C. Applying a Broader Perspective to a Minnow Biological Opinion Is Both Feasible and Realistic.

Guidelines for the creation of Biological Opinions leave significant room for recommendations that create incentive to take actions that positively impact the ecological community beyond the minnow.[215] Within the guidelines, the analysis of possible effects on the listed species must be extensive.[216] The possible effects on the species must include all certain future actions by private, local, state, tribal, or federal actors.[217] This analysis for the minnow will inevitably consider flows on the Rio Grande, as they are critical for minnow survival. Flows on the Rio Grande are critical not only for the minnow but also for other endangered species impacted by signatories to the MRGESCP, like the southwestern willow flycatcher. More broadly, these flows also benefit the irrigators within the MRGCD[218] and (hypothetically) some of the environmental flow water reaches Elephant Butte Reservoir, where it contributes towards making Rio Grande Compact deliveries to southern New Mexico and Texas.[219] Said differently, environmental flows can be scheduled

212. *Id.*

213. U.S. Gov't Accountability Off., *Guidance Documents from Federal Agencies*, https://www.gao.gov/assets/670/669721.pdf [https://perma.cc/CJN2-CFJW]. The author notes that following Loper Bright Enterprises v. Raimondo, 603 U.S. 369 (2024), the necessity of interpreting the ESA so as to avoid litigation whenever possible is absolutely critical.

214. Loper Bright Enters. v. Raimondo, 603 U.S. 369, 412 (2024).

215. Defining "positive" change is beyond the scope of this paper, but this ethos is evident in work by scholars like Clifford Crawford. *See generally* Clifford S. Crawford et al., *The Potential for Implementing Partial Restoration of the Middle Rio Grande Ecosystem*, *in* U.S. Dep't Agric. Gen. Tech. Rep. RM-GTR-272 (1996).

216. U.S. Fish and Wildlife Serv. & Nat'l Marine Fisheries Serv., *supra* note 202 at 4–23 to 4–31.

217. *Id.* at 4–31.

218. For an analysis of the economic benefits of instream flows to downstream irrigators, see Frank A. Ward & James F. Booker, *Economic Impacts of Instream Flow Protection for the Rio Grande Silvery Minnow in the Rio Grande Basin*, 14 Rev. in Fisheries Sci. 187, 197–200 (2006).

219. This analysis reflects the literal flow of water through the Rio Grande system, however water for environmental flows comes from a different accounting than the water for the MRGCD. Both Environmental Flows and water for irrigators in the MRGCD come from different accounts than the water used for meeting Compact obligations. As water supplies are reduced due to climate change, it would be useful to account for the overlap in these different pots. Additionally, it would be useful to study where water released for instream flows goes—between conveyance losses,

to deliver water for consumptive uses while providing benefits for the duration of the conveyance. Finally, these flows contribute to public green spaces along the river like Rio Grande State Park, which is free for everyone to access.[220] In complying with a BiOp, private, local, state, tribal, and federal groups have an opportunity to consider these values, in addition to the requisite minnow considerations.

Inversely, even if entities are exempt from considering minnow outcomes in determining their actions, it could benefit not only the minnow but also the surrounding community to include considerations from the governing BiOp in their decision matrix. This management framework, sometime referred to as the "ecosystem approach", was formally adopted by the MRGESCP in a move that indicates an institutional move towards a broader interpretation of the capacity of the ESA.[221] This shift towards a wider view on the human and non-human ecosystems has the potential to mark a new era for ESA implementation. As FWS prepares to begin drafting a new silvery minnow BiOp, to be completed by October of 2028, a whole ecosystem approach could be beneficial.

D. The Recommended Actions Set Through the ESA Biological Opinions to Protect the Minnow Can Be Expanded to Broadly Optimize Habitat for Beneficial Species in the Middle Rio Grande and to Reflect Community Values Relating to River Flow and Habitat Protection.

As the Southwest and the state of New Mexico contemplate a hotter, drier future,[222] the Rio Grande silvery minnow is further than ever from occupying its full ancestral range. Decisions will be made, both at the state and federal level and on a smaller community scale, about where to allocate water. The minnow is one of the influencing factors for water allocation. Furthermore, when flows on the Rio Grande are limited, potential ESA litigation threatens water managers, already tasked with the herculean feat of delivering water in a system that never anticipated such shortages, with further uncertainty around water deliveries.

In the twentieth century, as the Middle Rio Grande expanded with diversions from the river and flood control solutions, the minnow population began to suffer. Amendments to the ESA and the long history of litigation over the minnow in the Middle Rio Grande demonstrate a continued preference for maintaining human infrastructure and economic development over habitat protection for the minnow, as well as other species across the United States which haunt their own ecosystems.

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downstream users, and Compact deliveries.

220. City of Albuquerque, *Rio Grande Valley State Park*, https://www.cabq.gov/parksandrecreation/open-space/lands/rio-grande-valley-state-park (last visited Jun. 26, 2024) [https://perma.cc/Y5VZ-2MRA].

221. Middle Rio Grande Endangered Species Collaborative Program, *Annual Report* 3, 7 (2023), https://webapps.usgs.gov/mrgescp/documents/DRAFT-2023-MRGESCP-Annual-Report.pdf.

222. For further reading, see Nelia W. Dunbar et al., *Climate Change in New Mexico Over the Next 50 Years: Impacts on Water Resources*, 164 N.M. Bureau of Geology and Mineral Res. Bull. (2022) https://geoinfo.nmt.edu/publications/monographs/bulletins/164/ [https://perma.cc/QKC3-NYT5].

In a future with less water, however, the fate of the ribbons of green along the Rio Grande valley floor and the silvery minnow are intertwined. Without the measures taken pursuant to the ESA, there would likely be little incentive to keep any water at all in the Rio Grande channel during dry seasons. Minnow BiOp recommendations, made with information from the MRGESCP, do broadly and affirmatively benefit the Middle Rio Grande, beyond merely the silvery minnow. It is possible to envision the Endangered Species Act as a tool for flexible river management, rather than as a Sword of Damocles threat of litigation. For listed species like the minnow, which haunt the modern ecosystems that have replaced their ancestral habitat, this may be the most practical outcome for the future of the population.

Envisioning the ESA as a tool for water management that reflects community values requires a clear understanding of the community values in question. The same river that houses the ghost minnow is also the river that supplies water for the human-natural ecosystem—acequias and community ditches, recreation in the bosque (formally Rio Grande Valley State Park), agriculture, industrial development advancing human knowledge, people seeking shade and comfort, and much of the urban life in the Middle Rio Grande. The minnow is just one part of the varied life along this river. The health of the minnow's ecosystem is also the health of the Middle Rio Grande community. When Congress passed the ESA, they put to paper something that the Middle Rio Grande community has long understood—the entire ecosystem that comprises the tapestry of the community has value. These same values were later upheld by the Supreme Court, stating that the ESA was intended to reverse the trend toward species extinction, "whatever the cost."[223] In interpreting this body of law in the twenty-first century, under climate change and water use conditions that neither Congress nor the Supreme Court fully understood during the ESA's infancy, we have an opportunity to make the values of the Middle Rio Grande evident in minnow management.

Understanding the boundaries within which the ESA can legally be administered has taken on increased importance, legally, as well. The recent Supreme Court decision *Loper Bright Enterprises v. Raymondo* eliminated the Chevron deference on which FWS has long relied.[224] Without this deference toward agencies' legal interpretations, there is an increased potential for lawsuits related to the authority of FWS to act under the ESA. In communities like the Middle Rio Grande, the resources necessary for the indefinite ongoing litigation typical of suits under the ESA or the National Environmental Policy Act could be put to much more impactful use beyond litigation. This underscores the necessity of managing endangered species like the Rio Grande silvery minnow collaboratively, without litigation. Considering the wider implications of minnow management in drafting future BiOps could reduce the potential for litigation.

In accepting the indefinite limbo of the minnow, the 2028 Biological Opinion for the minnow should consider a broader list of recommended actions intended to

223. Tennessee Valley Auth. v. Hill, 437 U.S. 153, 174 (1978).

224. Loper Bright Enters. v. Raymondo, 603 U.S. 369, 412–13 (2024).

benefit not only the minnow but also the larger river ecosystem, including the humans who rely on it. In addition to existing formula for drafting BiOps, it may be useful to consider the questions posed in two sections previous to guide drafted recommendations: (1) what are the minimum possible actions necessary to maintain the Rio Grande silvery minnow population at its current numbers and distribution, and (2) what are the maximum possible actions for river and ecosystem management that can be taken pursuant to the recommendations of the Biological Opinions. These two questions can be used to guide the drafting of future BiOps and could be included in the next edition of the Consultation Handbook or tips for writing Biological Opinions.

Conclusion

Ultimately, the Rio Grande silvery minnow could remain indefinitely in this purgatorial state, heimsuchen with the aid of the species preservation requirements of the Endangered Species Act. The minnow is paradoxically both the source of some of the most important governing systems in water allocation, through local and state efforts, and is not a required consideration for Rio Grande Compact deliveries. It is likely unrealistic to expect river conditions, under current management constraints, to support a self-sustaining wild minnow population. In light of this reality, the thirty-year effort to maintain the existing minnow population through the ESA will continue.[225] The future of the minnow should raise questions about the Middle Rio Grande—how are benefits defined in a novel ecosystem; how much power should a fish with only five percent of its ancestral habitat remaining hold in governing the river; what does the larger human community of the Middle Rio Grande desire from their river?

Water managers in the Rio Grande Basin have demonstrated an opportunity to use the minnow as the onus for considering alternate water delivery frameworks, both in meeting interstate compacts and in deriving the maximum possible benefit for both human and nonhuman community as Rio Grande water is delivered according to the Law of the Rio Grande.[226] The role of this paper is not to provide examples of the alternative water delivery frameworks, but rather to spark conversation and curiosity about how the silvery minnow could positively influence water outcomes for the Middle Rio Grande.

This re-envisioning of the Endangered Species Act beyond the bounds of litigation offers a collaborative utility for the ESA. As ghosts go, the Rio Grande silvery minnow is a fairly benevolent one, offering us an opportunity to build a communal home in the Middle Rio Grande valley in exchange for one more search for the minnow's long-gone braided side channels.

225. This is relatively short by popular culture haunting standards, see the 125-year minimum time set for ghosts in the cult classic, Beetlejuice (Warner Bros. 1988).

226. The Law of the Rio Grande, also sometimes called the Law of the River, is the corpus of law, regulation, and custom that governs how the Rio Grande is allocated.