U.S. Fish And Wildlife Service
Southwest Region

# Rulemaking Updates & Lessons Learned: Invasive Fish Management

August 2026 – GCDAMP AMWG

# Recent Federal Register Notices

## Removing the "blanket rule" option for protecting newly listed threatened species

Published: 7/21/26 **Effective: 8/20/26**

- "Blanket rules," for threatened species automatically applied all section 9(a) prohibitions to threatened species, unless we issued a species-specific "special rules".
- In 2019 we removed the "blanket rule" and aligned with NMFS's practice of developing species-specific 4(d) rules.
- In 2024 we reinstated "Blanket Rule"
- **This returns to the 2019 Reg changes** and adds that the Service will consider conservation and economic impacts.

## Regulations for Designating Critical Habitat

Published: 7/21/26 **Effective: 8/20/26**

- Section 4(b)(2) requires consideration of the economic, national security, and any other relevant impacts of designating critical habitat and authorizes the exclusion of areas from critical habitat if the benefits of excluding the area outweigh the benefits of designating it as critical habitat.
- In 2016 we set policy describing how we consider "other relevant impacts," including conservation plans, agreements, and partnerships.
- In 2020 we finalized new regulations that set forth a new process for excluding areas of critical habitat, superseding the 2016 policy
- In 2022 we rescinded the 2020 regulations
- **This returns to 2020 Reg Changes**.

# Recent Federal Register Notices

## Reclassification of the Razorback Sucker From Endangered to Threatened With a Section 4(d) Rule

Published: 7/17/26

**Effective: 8/17/26**

- Still listed under ESA
- 4(d) rule: Incidental take **exceptions** for State and Federal actions that further recovery of the species: propagation and stocking, educational display, habitat restoration, catch-and-release angling, and nonnative control efforts.
- Populations rely on ongoing management actions (population augmentation and the removal of nonnative fish) to maintain resiliency.

**Reclassification does not change:**

- Most Section 9 Prohibitions
- Recovery planning Section 7 Consultation requirements
- Primary threats: Current and potential future alterations to flow regimes and predation by nonnative fish

## Rescinding the Definition of "Harm" Under the Endangered Species Act

Published: 7/14/26

**Effective: 9/14/26**

- The Service, in conjunction with DOI, is still working on implementation guidance at this time

# Lessons Learned on SMB Invasion and Long-Term Control

- Synthesis of lessons learned from peer-reviewed literature, agency reports, and mitigation programs
  - Risks, impacts, and management challenges associated with smallmouth bass (SMB) establishment below Glen Canyon Dam and throughout the Colorado River ecosystem.


USFWS photo by David Ward

# Invasion Patterns

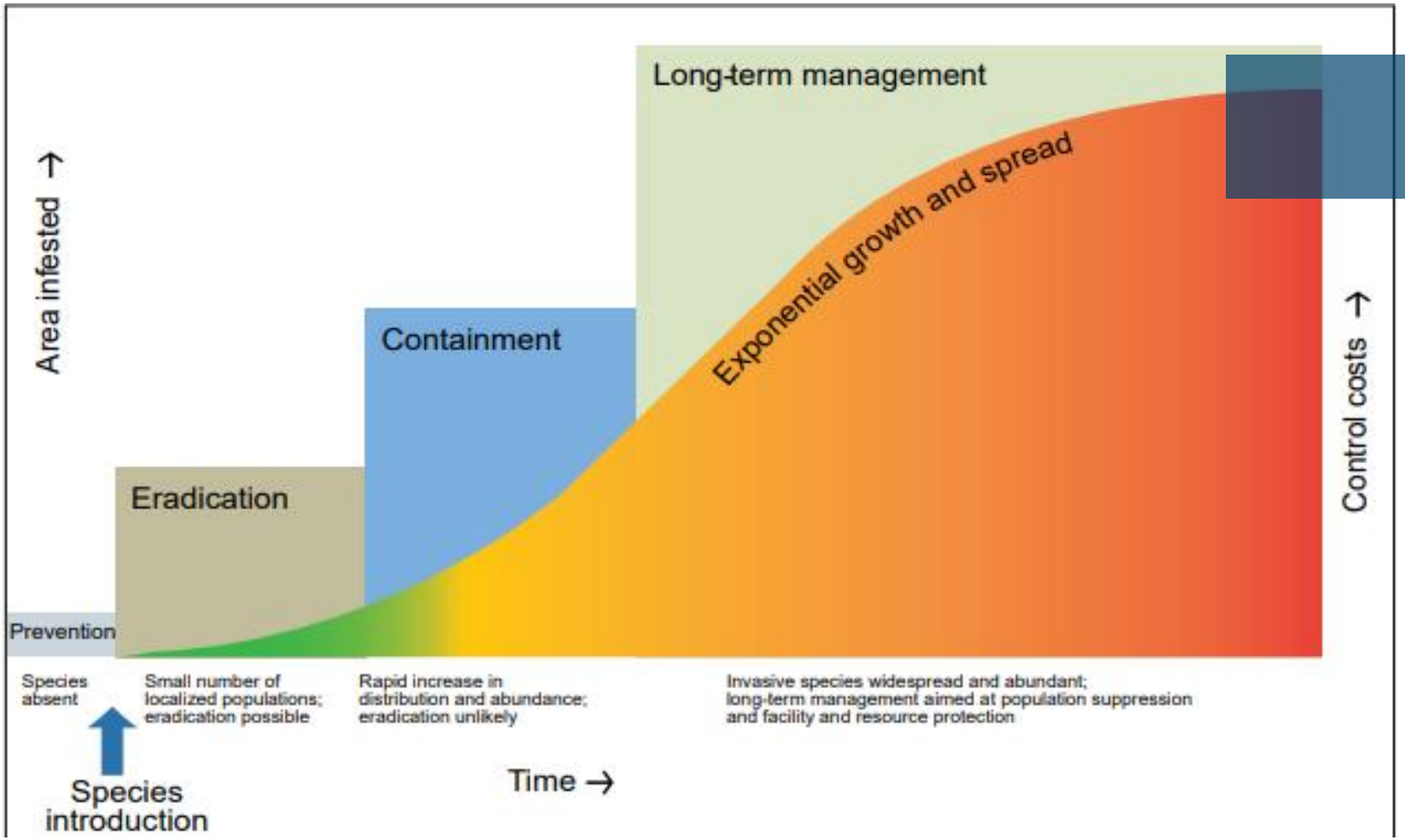
- SMB invade rapidly, often following consecutive low-flow, warm years. Once established, they cause dramatic declines in native fish populations, including functional extirpation of some chub populations.
- Yampa Canyon and Lower Yampa River Invasion Example*
  - Introduced 1992 following partial drainage Elkhead reservoir - 2002 common following low flow years
  - Lower Yampa 1% 2001; 19% 2004 in response to consecutive low-flow and warm years; 45% 2025

Image courtesy Chat GPT



*Haines and Modde 2007, Bestgen et al. 2026, Tuttle et al. 2025

# Invasion Curve




- Our goal is Maximum Control
- All effort to avoid exponential growth and costly long-term management
- Introduced ≠ Established

DOI defines an '**established species**' as a species with a self-sustaining, reproducing population. FWS **does not yet** consider smallmouth bass established below Glen Canyon Dam due to limited reproduction and they are not currently self-sustaining.



*U.S. Department of the Interior. 2021. U.S. Department of the Interior Invasive Species Strategic Plan, Fiscal Years 2021-2025. Washington, D.C., 54p.

# Removal Limitations

## Electrofishing, Netting, Chemical Application

- Labor-intensive, costly
- Not species-specific; risk to non-target species
- Risks to recreational users
- Yet to be effective in large river systems

# Why Ineffective in Large River Systems?

- Overcompensation" or "Hydra Effect"
- Removal of adults accelerates juvenile recruitment
- Temporary reductions followed by population rebounding from remaining fish sources


USFWS photo by Tildon Jones

- Extirpation of smallmouth bass is unlikely, and suppression will require multiple efforts in perpetuity*



*Loppnow, Vascotto, and Venturelli. 2013. Invasive smallmouth bass (Micropterus dolomieu): history, impacts and control. Management of Biological Invasions (2013) Volume 4 Issue 3: 191-206

# Upper Basin Removal Rates vs. Model Thresholds


USFWS photo by Mike Pillow

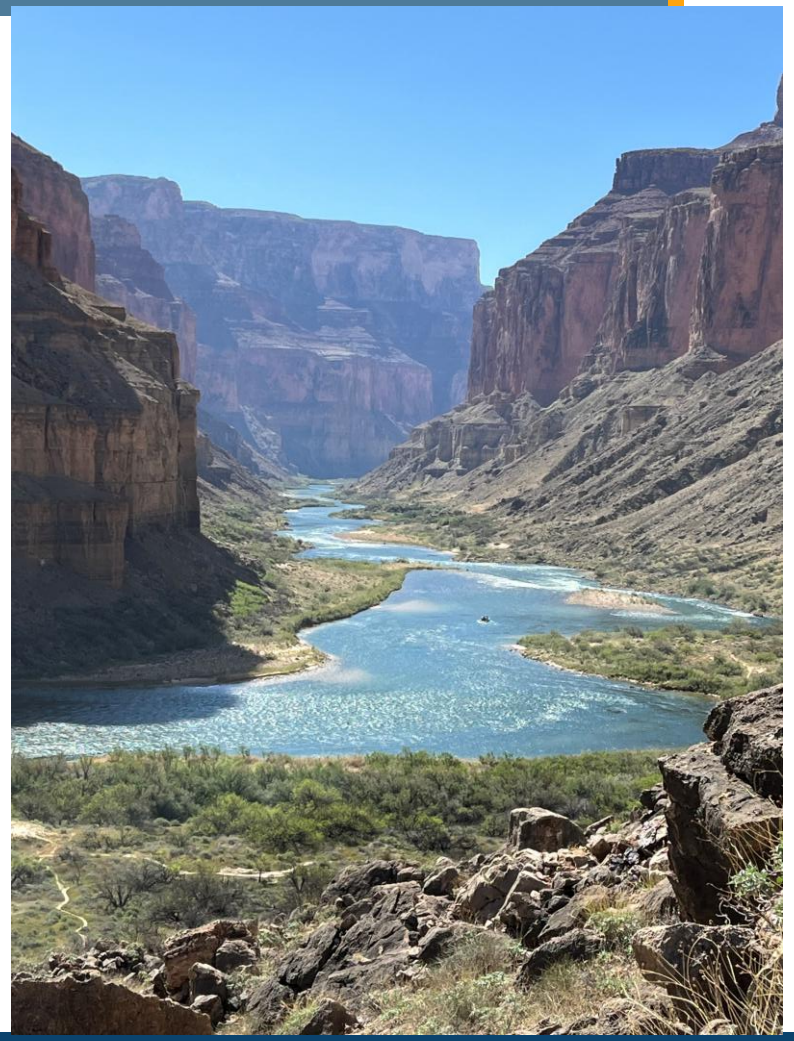
- A river-wide population reduction is dependent on reducing the entire SMB population, including all sources of recruitment
- SMB population models show >60% annual removal needed for long-term reduction*
- Upper Basin removal efforts peak at 21–38%**



*e.g. Haines and Modde 2007 and 2021; Schmidt *et al.* 2024; Bruckerhoff *et al.* 2025
**Lawry *et al.* 2025, Tuttle *et al.* 2025

# Economic and Logistical Barriers

- Scale and remoteness of Grand Canyon
- Safety, staffing, and permitting constraints
- Exponential costs compared to Upper Basin



- Schmidt et al. (2024)* modeled the effort it might take to implement a large-scale mechanical removal effort in just the Glen Canyon area.
- They broke down the area into 224 250-m sites
- They assumed 1 boat could sample 12 sites per night
- They assumed a constant average capture probability for SMB of 5%
- They assumed no additional entrainment
- They assumed no reproduction

If all those assumptions held true – even what they called a high removal effort of 16 trips per year with 4 boats per trip only yielded removing 50.4% of the SMB population



*Schmidt, Pine, Korman, and Grippo. 2024. Smallmouth bass management review committee. Review of smallmouth bass management in the Colorado River ecosystem, final report. Available at Center for Colorado River Studies, Utah State University. https://qanr.usu.edu/coloradoriver/files/research/2024-SMB-Report-3.pdf

# Management Implications


Image courtesy Chat GPT

- DOI Policy is always for early intervention and prevention of invasions*
- If SMB establish below GCD – Mechanical/Chemical Removal alone will be insufficient. Need integrated strategies targeting early life stages (spawning, eggs, larvae, juveniles)
- Temperature management is effective
- New Ideas & Leverage Funds - Genetic biocontrol (e.g. Trojan males)



*U.S. Department of the Interior. 2021. U.S. Department of the Interior Invasive Species Strategic Plan, Fiscal Years 2021-2025. Washington, D.C., 54p.

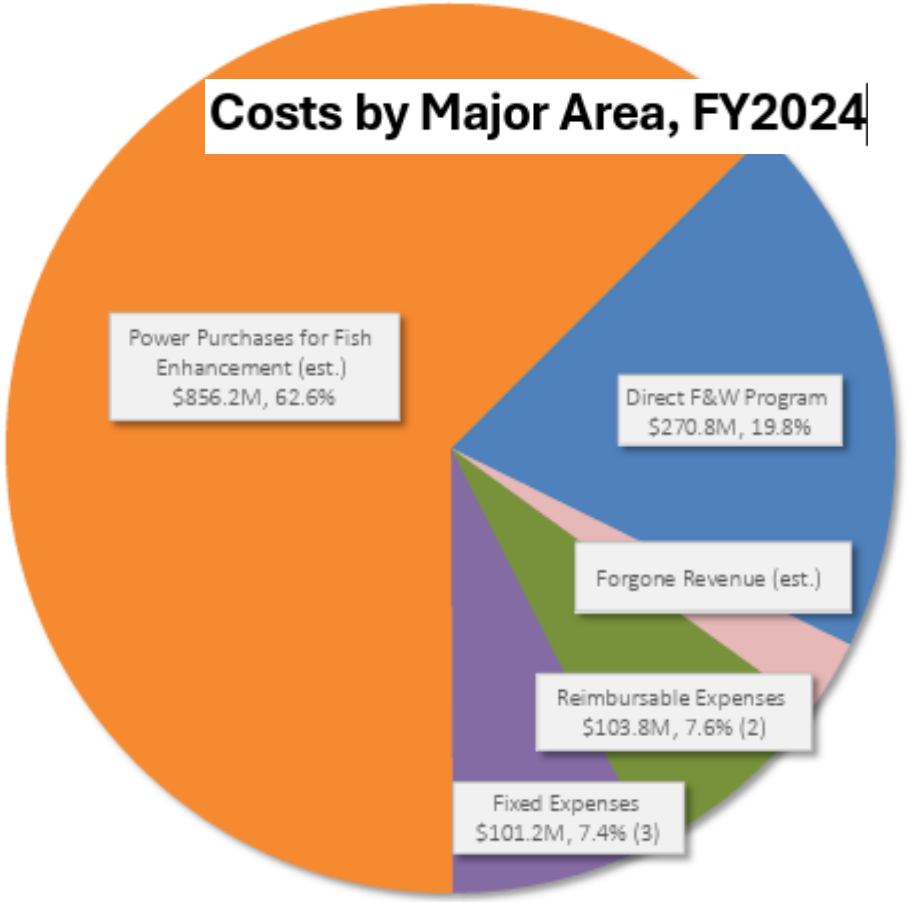
# Other Mitigation Program Examples

Columbia River Basin Fish and Wildlife Program

Northwest Power and Conservation Council

Bonneville Power Administration

- **Annual expenditures** generally range between **$600M to $800M**
- Include direct-funded programs, reimbursements to the U.S. Treasury, and forgone hydropower sales (lost revenue)
- **Total expenditures** have exceeded **$9 billion** in the past 40 years.
- Approximately **25%** of Bonneville's 2017-2019 **wholesale rate** was associated with its fish and wildlife program.






https://www.nwcouncil.org/fs/19438/2025-4.pdf

# Other Mitigation Program Examples

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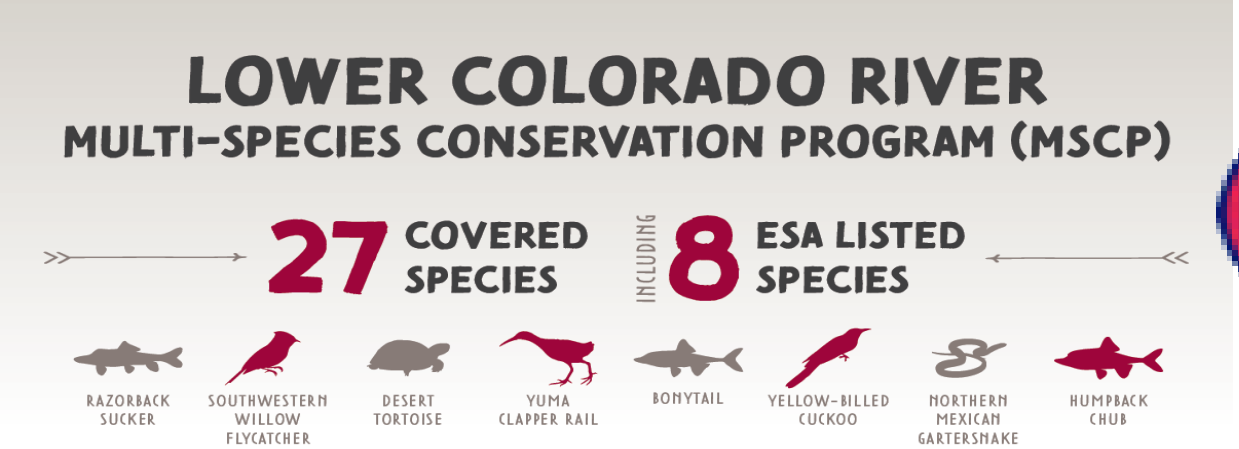
- FY2024, Bonneville spent **$270.8M** on the Fish and Wildlife Program, which includes mitigation projects like habitat restoration and protection; research, monitoring, and evaluation; and artificial production projects. They also reported a cost of **$36.6M** in forgone revenue and **$856.2M** in power purchases for fish.
- FY2019, Bonneville spent **$240.4M** on the direct Fish and Wildlife Program. They also reported a cost of **$174.4M** in forgone revenue and **$177.6M** in power purchases for fish.
- In 2024 the program expended **$43.4M** on Resident Fish (bull trout, sturgeon, cutthroat trout and non-listed burbot). Includes **$3M** Hatchery O&M costs.
- Non-native SMB are one of the many issues being mitigated by this program.



https://www.nwcouncil.org/fs/19438/2025-4.pdf
https://www.nwcouncil.org/sites/default/files/2020-2.pdf




# Other Mitigation Program Examples

- The total baseline cost (2005) for the 50-year program was budgeted at **$626 million**. This scales to roughly **$1.04 billion** in today's inflation-adjusted dollars.
- More than **$381M** was expended during the first fourteen years (2005 through 2019). This includes **$28.3M** for fish augmentation; **$118.5M** for research, monitoring, and adaptive management; **$22.8M** for securing land and water; and **$172M** for habitat development.
- The fisheries conservation effort is composed of fish augmentation, system monitoring, and species research

# Conclusion & Recommendations

- Still working to **prevent establishment**
- Mechanical/chemical removal alone is insufficient
- Early action, proactive, integrated strategies needed that target early life history stages
- Importance of a cohesive, comprehensive management action plan that evaluates efficacy and impacts
- Adequate funding

# Primary Citations


Bestgen, Zelasko, Kluender, Smith, and Jones. 2026. Invasive predators overwhelm natural and re-regulated flow and temperature benefits and decimate native fish. Report. https://coloradoriverrecovery.org/uc/wp-content/uploads/sites/2/2026/02/Lodore-WhirlpoolTextJanuary2026Final.pdf

Bruckerhoff, Yackulic, Eppehimer, Bestgen, Jones, and Michaud. 2025. Estimating drivers and identifying uncertainties in smallmouth bass population dynamics in an invaded river network. Can. J. Fish. Aquat. Sci. 82: 1–24 (2025) | dx.doi.org/10.1139/cjfas-2024-0183

Dibble, Yackulic, Kennedy, Bestgen, and Schmidt. 2020. Water storage decisions will determine the distribution and persistence of imperiled river fishes. Ecological Applications. https://doi.org/10.1002/eap.2279Digital Object Identifier (DOI)

Eppehimer et al. 2025. Declining reservoir elevations following a two-decade drought increase water temperatures and non-native fish passage facilitating a downstream invasion. Can. J. Fish. Aquat. Sci. 82: 1–19 | dx.doi.org/10.1139/cjfas-2024-0187

Friesen, Pennock,and Budy. 2026. Invasion potential of nonnative fishes through a large western dam into an iconic and vulnerable ecosystem. *Hydrobiologia* 853, 3249–3268 (2026). https://doi.org/10.1007/s10750-026-06137-8

Haines and Modde. 2021. Colorado River Fish Project – Vernal U.S. Fish and Wildlife Service 2021 A review of smallmouth bass removal in Yampa Canyon, with notes on the simulated effort needed to reduce smallmouth bass in the Green River subbasin.

Lawry, K., C. Smith, A. Amidon, S.J. Hyder, K.R. Bestgen, E. Kluender, M.S. Partlow. 2025. Smallmouth bass removal in the Green River subbasin. Projects FR-115, 123a, 123b and 123d Annual report to the Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, CO

Loppnow, Vascotto, and Venturelli. 2013. Invasive smallmouth bass (Micropterus dolomieu): history, impacts and control. Management of Biological Invasions (2013) Volume 4 Issue 3: 191-206

Pine, Korman, Valdez, and Walters. 2025. Assessing the potential for Smallmouth Bass population establishment in Grand Canyon. *Transactions of the American Fisheries Society,* 154(5), 469–489.

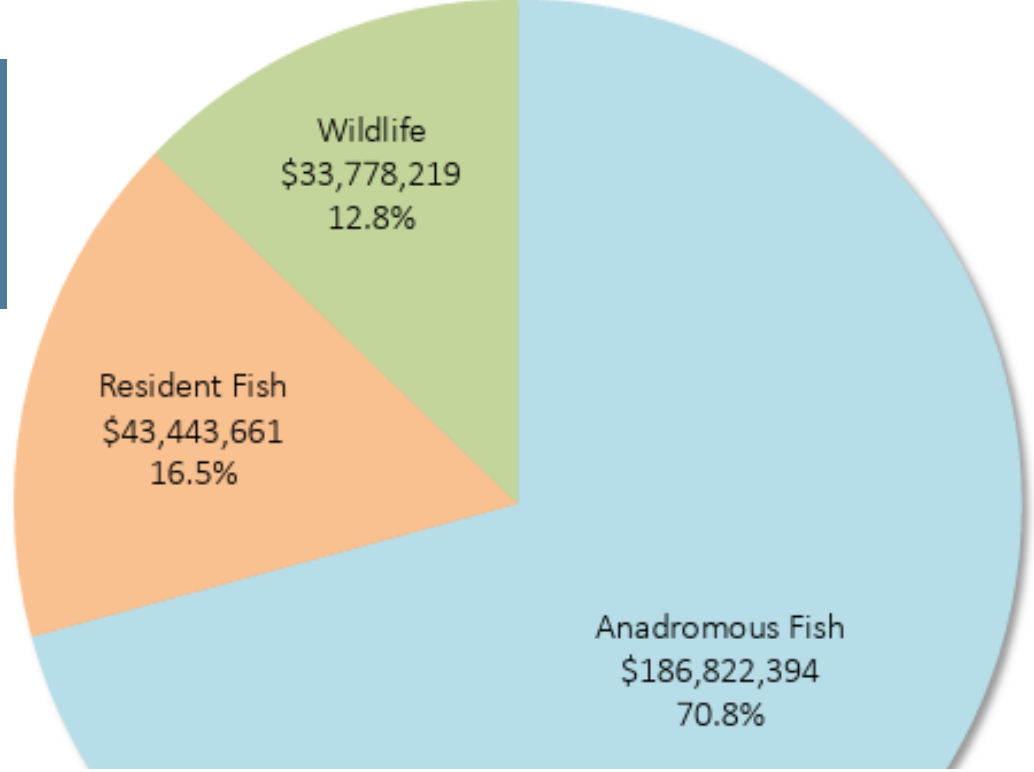
Schmidt, Pine, Korman, and Grippo. 2024. Smallmouth bass management review committee. Review of smallmouth bass management in the Colorado River ecosystem, final report. Available at Center for Colorado River Studies, Utah State University. https://qanr.usu.edu/coloradoriver/files/research/2024-SMB-Report-3.pdf

Tuttle, Dean, Smith, and Bestgen. 2025. Yampa River Smallmouth Bass Management 2025 Annual Report. https://coloradoriverrecovery.org/uc/wp-content/uploads/sites/2/2026/01/YampaSMB-FY25-AR-final.pdf

U.S. Department of the Interior. 2021. U.S. Department of the Interior Invasive Species Strategic Plan, Fiscal Years 2021-2025. Washington, D.C., 54p. https://www.doi.gov/sites/doi.gov/files/doi-invasive-species-strategic-plan-2021-2025-508.pdf

2019 Annual Report to Congress by Northwest Power and Conservation Council
2024 Annual Report to Congress by Northwest Power and Conservation Council
2024 Report on Bonneville Power Administration's Fish and Wildlife Expenditures

# EXTRA INFO – FY24 $$




| Species Type [1] | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Expense Expenditures*** | | | | | | | | | | |
| Anadromous Fish | $181,979,402 | $187,926,101 | $174,955,973 | $181,907,429 | $168,490,894 | $163,848,363 | $173,556,193 | $164,788,858 | $176,625,976 | $176,925,814 |
| Resident Fish | $36,131,999 | $42,949,759 | $41,626,757 | $41,544,634 | $34,601,360 | $35,251,201 | $33,209,380 | $36,502,616 | $40,237,684 | $40,600,082 |
| Wildlife | $16,630,031 | $14,091,922 | $12,514,234 | $12,569,629 | $13,576,360 | $17,035,067 | $15,107,376 | $18,246,154 | $17,233,714 | $21,536,923 |
| ***Capital Expenditures*** | | | | | | | | | | |
| Anadromous Fish | $10,173,686 | $4,896,855 | $122,159 | $5,368,928 | $12,711,401 | $27,436,953 | $19,779,123 | $2,951,841 | $2,758,400 | $9,896,580 |
| Resident Fish | $2,603,188 | $2,164,485 | $241,080 | $13,564,447 | $455,850 | $2,320,569 | $11,091,883 | $1,954,445 | $1,175,889 | $2,843,579 |
| Wildlife | $9,789,350 | $8,973,342 | $5,038,680 | $11,735,362 | $9,795,748 | $9,602,782 | $10,707,995 | $11,203,015 | $10,715,958 | $12,241,296 |
| **TOTAL SPECIES COSTS [2]** | **$257,307,656** | **$261,002,463** | **$234,498,883** | **$266,690,429** | **$239,631,613** | **$255,494,935** | **$263,451,950** | **$235,646,929** | **$248,747,621** | **$264,044,274** |