



CRITICAL MINERAL MINING ON U.S. PRIVATE LANDS: BIODIVERSITY AND LAND USE

FACT SHEET

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Without strong regulatory oversight, mining for critical minerals can reduce biodiversity and degrade habitats. Studies suggest that mining activities may reduce native biodiversity. Reported restoration failure rates also differ, with some ecosystems unlikely to fully recover to pre-mining conditions. To address these risks, experts recommend robust biodiversity and land-use protections, including landscape-scale assessments, integration of climate change projections and adaptation strategies into environmental permitting processes, enforceable no-net-loss standards, and support for Indigenous co-management.

What Are Biodiversity and Land Use Protections?

Biodiversity and land use protections are essential to prevent habitat loss, safeguard imperiled species, and maintain ecosystem health during and after mineral extraction. These protections include federal regulations such as the Endangered Species Act (ESA)ⁱ and Clean Water Act (CWA),ⁱⁱ state-level permitting, financial assurances for restoration, and landscape-scale planning that accounts for cumulative impacts beyond individual mine sites. As domestic mining for lithium, copper, rare earths, and other critical minerals expands to support the clean energy transition, strengthening biodiversity protections (including enforceable restoration standards and integration of climate projections into permitting) is essential to achieving genuinely sustainable development.

Why Biodiversity Protections Matter for Private Land Mining

- **Regulatory gaps result in uneven protections.** Mining on private land is not automatically subject to federal environmental review under the National Environmental Policy Act (NEPA). State agencies primarily oversee it, though federal permits (such as Clean Water Act Section 404 permits for wetland impacts) may still apply. In contrast, projects on public land must comply with NEPA.^{iii, iv} This leads to inconsistent biodiversity protections depending on land ownership and whether federal permits are triggered.
- **Current restoration methods face challenges.** Some studies report high failure rates for restoration efforts on degraded lands in achieving biodiversity goals, and ecological recovery can take decades.^{v, vi} Climate change may further complicate these challenges, with projections indicating a significant portion of species could face unsuitable conditions by 2050.^{vii}
- **Mine sites could threaten sensitive habitat.** The U.S. Geological Survey (USGS) has identified more than 800 focus areas for potential critical mineral resources across the United States, including lithium deposits in North Carolina, Arkansas, and the western United States.^{viii} These areas can overlap with the habitats of imperiled species and sensitive ecosystems, underscoring the need for strong biodiversity protections.^{ix}
- **Biodiversity funding falls short of estimated needs.** Some estimates place current global annual investment in biodiversity at \$208 billion, though as much as \$1.15 trillion may be needed by 2030.^x Meanwhile, substantial funding continues to support activities considered harmful to nature, leading to a significant imbalance.

Current Policy and Gaps

Federal Framework

The Endangered Species Act (1973) offers primary federal protections for biodiversity. The ESA prohibits “taking” of protected species on public and private land.^{xi} In April 2025, the Trump administration proposed rescinding the regulatory definition of “harm,” which, if enacted, would remove “significant habitat modification or degradation” from federal protections.^{xii} Combined with the recently reinstated 2017 interpretation of the Migratory Bird Treaty Act, which limits liability to intentional bird deaths.^{xiii} These changes could weaken biodiversity safeguards as mining activity increases.

The Clean Water Act safeguards wetlands,^{xiv} but the Supreme Court’s May 2023 *Sackett* decision significantly narrowed federal jurisdiction by requiring wetlands to have a “continuous surface connection” to traditionally navigable waters.^{xv} Following a September 2023 conforming rule, many wetlands near potential mining sites,

particularly isolated wetlands, may no longer qualify for Section 404 permit requirements.^{xvi}

State Variations and Private Land Gaps

- **California (stronger protections):** Western Joshua Tree Conservation Act (2023) provides state-level species protection exceeding federal ESA with private land permit processes.^{xvii}
- **Montana (stronger protections):** Mandatory sage-grouse habitat consultation and enhanced environmental guarantees.^{xviii}
- **Pennsylvania (weaker protections):** Conventional oil and gas well bonds capped at \$2,500 per well, far below projected plugging costs of approximately \$25,000 per well.^{xix}
- **Nevada (weaker protections):** Nevada’s Habitat Conservation Framework covers approximately 70.7 million acres of total state land area, but enforcement mechanisms for private lands remain limited despite the state's Conservation Credit System.^{xx}

Voluntary Standards

The Initiative for Responsible Mining Assurance (IRMA) includes 82 mining companies engaged as of March 2024, though forest protection gaps remain.^{xxi} The Task Force on Nature-related Financial Disclosures released its final recommendations in September 2023 and now has over 500 organizations committed to adopting its framework.^{xxii}

Four Critical Policy Gaps

Gap 1: Site-Based Assessments Ignore Cumulative Impacts

- Environmental reviews usually assess projects on a site-by-site basis and do not consider landscape-level impacts such as habitat fragmentation and watershed degradation.
- Mining can reduce native biodiversity through habitat fragmentation, although the magnitude of loss is highly context-dependent. Infrastructure development and population growth can cause additional impacts beyond mine boundaries. Some reports estimate that 8 percent of global metal mining occurs within protected areas,⁹ and that a significant proportion of waste facilities are located near protected boundaries.^{xxiii}

Gap 2: Climate Adaptation Not Considered

- Traditional five- to ten-year restoration cycles do not account for the accelerating impacts of climate change on species survival and ecosystem recovery.

- Restoration targets based on historical conditions become obsolete as climate change shifts suitable habitat ranges for many native plant species.⁷ Restored habitats may not support target species in future climate conditions.^{xxiv}

Gap 3: No Enforceable "No Net Loss" Standards

- U.S. regulations do not require *no net loss* of biodiversity on private lands. International best practices require biodiversity gains to offset losses, but these standards are not enforced domestically. Additionally, *no net loss* must include attention to species richness, as well as the species assemblages present in ecosystems prior to mining operations.
- Research indicates that wetland mitigation projects frequently fail to achieve *no net loss* of habitat productivity, with many conservation banks issuing credits before successful restoration is demonstrated.⁶ Given documented restoration failure rates, current offset ratios may be insufficient to ensure functional habitat replacement, potentially resulting in net habitat loss.

Gap 4: Indigenous Rights and Knowledge Excluded

- Free, prior, and informed consent is not required for mining activities on private land that affect Indigenous sacred sites or traditional territories. This results in the exclusion of Indigenous voices in projects such as Resolution Copper and Thacker Pass lithium mine. There is also a loss of Traditional Ecological Knowledge, a knowledge source which has resulted in measurable restoration success in Indigenous-led projects.^{xxv} Separately, the Jarrah Forest restoration demonstrated that rehabilitated mine sites can achieve species richness equivalent to unmined reference forest.^{xxvi}

NWF Policy Recommendations for Responsible Private Land Mining

Recommendation 1: Mandate Landscape-Scale Biodiversity Assessments

- Federal agencies could expand FAST-41 (the Federal Permitting Improvement Steering Council) coordination to require cumulative impact analysis at watershed or ecoregional scales before permitting mining operations on private lands. The Bipartisan Infrastructure Law provided \$320 million for mineral mapping that could support landscape biodiversity assessments.^{xxvii}
- Assessments should analyze habitat connectivity for species of concern and migratory species, water consumption impacts in water-stressed regions, and climate change projections across multiple scenarios. Oregon's Priority Wildlife Connectivity Areas methodology demonstrates feasible approaches.^{xxviii}
- States can require landscape-scale biodiversity assessments as a condition for operations that receive state incentives or permits.

Recommendation 2: Require Climate-Integrated Restoration Planning

- Operations should replace five- to ten-year restoration cycles with adaptive approaches that require at least twenty to thirty years of monitoring where necessary to account for climate change trajectories and species with longer maturation periods.
- Integrate projected climate conditions on relevant timescales into habitat restoration decisions. Update bonding requirements to reflect long-term water treatment obligations and climate uncertainty.
- Employ effective monitoring methods and technologies, which may include use of real-time satellite imagery and automated monitoring systems to track restoration outcomes and support adaptive management.

Recommendation 3: Establish Enforceable "No Net Loss" Standards

- Amend environmental laws to require mining operations to achieve no net loss of biodiversity with third-party verification. State legislatures should enact no net loss requirements following California's Western Joshua Tree Conservation Act model.
- Federal agencies could make critical mineral tax credits contingent on verified biodiversity performance. Conservation banking should shift to a savings bank model, providing credits only after successful restoration is demonstrated.

Recommendation 4: Ensure Indigenous Co-Management and FPIC

- Extend Free, Prior, and Informed Consent (FPIC) requirements to all operations affecting Indigenous sacred sites, traditional territories, or treaty rights regardless of land ownership.
- Follow Canada's model of over 500 formal Indigenous agreements, with some including 1-2 percent life-of-mine revenue sharing.^{xxix, xxx}
- Integrate FPIC requirements into FAST-41 coordination for critical mineral projects.
- Support Indigenous-led monitoring teams and integrate Traditional Ecological Knowledge into restoration planning. Provide technical assistance and funding to enable Tribal participation in permitting processes.

Conclusion

Biodiversity and land use protections are necessary to prevent habitat loss, protect imperiled species, and maintain healthy ecosystems. As domestic mining for critical minerals expands to support clean energy and technology, pressures on biodiversity and habitats will increase.^{9 xxxi} Current protections on private lands are inadequate, leading to inconsistent safeguards, insufficient restoration, limited climate adaptation, and exclusion of Indigenous perspectives. Strengthening U.S. biodiversity and land use

policy requires landscape-scale biodiversity assessments, climate-integrated resource planning, enforceable no net loss standards, and Indigenous co-management.

This paper was written with the assistance of the 2025 Fellows of the Dow Sustainability Program, University of Michigan. For more information, please contact Dr. Simone H. Stewart, Senior Industrial Policy Specialist StewartS@nwf.org

Cover photo: The New Cornelia mine is an inactive open-pit copper mine in Pima County, Arizona. Steve Proehl/Getty Images

ⁱ Endangered Species Act of 1973, Pub. L. No. Pub. L. 93-205, 16 U.S.C. (1973).

ⁱⁱ Federal Water Pollution Control Act (Clean Water Act), Pub. L. Nos. 92-500, 33 United States Code (1972).

ⁱⁱⁱ National Environmental Policy Act of 1969, Pub. L. Nos. 91-190, 42 United States Code (1969).

^{iv} Council on Environmental Quality, *A Citizen's Guide to NEPA* (Council on Environmental Quality, 2021), <https://ceq.doe.gov/docs/get-involved/citizens-guide-to-nepa-2021.pdf>.

^v R.E. Young et al., "International Principles and Standards for the Ecological Restoration and Recovery of Mine Sites," *Restoration Ecology* 30, no. 4 (2022): e13771, <https://doi.org/10.1111/rec.13771>.

^{vi} Martine Maron et al., "Faustian Bargains? Restoration Realities in the Context of Biodiversity Offset Policies," *Biological Conservation* 155 (2012): 141-48, <https://doi.org/10.1016/j.biocon.2012.06.003>.

^{vii} Urban, M. C. (2024). Climate change extinctions. *Science*, 386(6726), 1123-1128.

^{viii} Jane M. Hammarstrom et al., *National Map of Focus Areas for Potential Critical Mineral Resources in the United States*, vols. 2023-3007, U.S. Geological Survey Fact Sheet (U.S. Geological Survey, 2023), <https://doi.org/10.3133/fs20233007>.

^{ix} Laura J. Sonter et al., "Renewable Energy Production Will Exacerbate Mining Threats to Biodiversity," *Nature Communications* 11, no. 1 (2020): 4174, <https://doi.org/10.1038/s41467-020-17928-5>.

^x Hugh Bromley, *Biodiversity Finance Factbook: COP16 Edition* (BloombergNEF, 2024), https://assets.bbhub.io/professional/sites/24/Biodiversity-Finance-Factbook_COP16.pdf.

^{xi} Endangered Species Act of 1973.

^{xii} Sara Dewey, "Trump Administration Targets Endangered Species Act Habitat Protections," *Environmental & Energy Law Program*, Harvard Law School, May 2025, <https://eelp.law.harvard.edu/trump-administration-targets-endangered-species-act-habitat-protections/>.

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^{xiv} Federal Water Pollution Control Act (Clean Water Act).

^{xv} *Sackett v. Environmental Protection Agency*, 598 U.S. 651 (Supreme Court of the United States 2023).

^{xvi} Federal Water Pollution Control Act (Clean Water Act); U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, *Revised Definition of "Waters of the United States"; Conforming*, Federal Register (2023), 88:61964, <https://www.federalregister.gov/documents/2023/09/08/2023-18929/revised-definition-of-waters-of-the-united-states-conforming>.

^{xvii} "California Legislature Passes Joshua Tree Protection Law," Center for Biological Diversity, June 27, 2023, <https://biologicaldiversity.org/w/news/press-releases/california-legislature-passes-joshua-tree-protection-law-2023-06-27/>.

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