MINING OUR FUTURE CRITICAL MINERALS: DOES DARKNESS AWAIT US?

by Sam Kalen

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SUMMARY

We are told the transition to a zero-carbon economy will depend upon the United States' ability to assure a sufficient supply of rare earths and minerals such as cobalt, nickel, or lithium. The Biden Administration is intent on promoting some new form of a critical mineral policy, and calls for reforming the 1872 Mining Law have persisted for well over one hundred years. This Article is designed to provoke a meaningful conversation about a critical minerals policy informed by our past. It cautions against a myopic focus on critical minerals, and suggests that moving forward demands reforming the 1872 law. That reform could incorporate streamlining efforts tethered to a modern public land planning process that mirrors the approval of renewable energy projects on public lands. Arresting climate change and ensuring an adequate supply of inputs to a new green economy necessitates sacrifices, but our treasured public land resources should not succumb to hasty decisions.

We have become great in a material sense because of the lavish use of our resources, and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soils shall have been still further impoverished and washed into the streams, polluting the rivers, denuding the fields, and obstructing navigation. These questions do not relate only to the next century or to the next generation. One distinguishing characteristic of really civilized men is foresight; we have to, as a nation, exercise foresight for this nation in the future; and if we don't exercise that foresight, dark will be the future!

—Theodore Roosevelt[1]

The threat of climate change is so devastating that occasionally we seemingly accept that the *end* of arresting its threat justifies employing some troublesome *means*. We might conjure in our minds the poignant lectures by Harvard philosopher Michael Sandel on the nature of justice—his utilitarian dialogues on how best to assess whether to elevate the end or appreciate the significance of the means.[2] If the earth's growing population, barreling toward nine billion inhabitants, cannot unify and reduce carbon dioxide (CO_2) levels in the atmosphere and prevent global average temperatures from rising another 2 or potentially 4 degrees Celsius,[3] the already devastating disruptions will only grow more dramatic. The world will confront an undoubtedly peerless end, one that seemingly warrants accepting that this propitious moment demands considerable sacrifice. Possibly employing troublesome means. But how far, and with what sacrifices?

With the transition toward a net-zero carbon economy, the demand for materials essential for that transition, and that also might be mined from public lands, is poised to present a challenge for public land managers. As the International Energy Agency (IEA) recently reported, the acceleration of the world's deployment of wind, solar, and electric vehicles (EVs) could subject "these rapidly growing

Author's Note: The author would like to thank John Leshy and Mark Squillace for their comments.

1. Theodore Roosevelt, Opening Address by the President (Feb. 26, 1908), *reprinted in* The American Environment: Readings in the History of Conservation 46, 50 (Roderick Nash ed., Addison-Wesley Publishing Co. 1968).

2. Michael J. Sandel, Justice: What's The Right Thing to Do? (2010).

3. J.B. Ruhl & Robin Craig, *4° Celsius*, 106 Minn. L. Rev. (forthcoming 2021).

markets for key minerals" used in these industries to "price volatility, geopolitical influence and even disruptions to supply."[4] Indeed, when IEA announced its findings, the agency's executive director warned that, if we leave unaddressed the threat to sufficient production of copper, lithium, nickel, cobalt, and rare earth elements, the transition toward a clean energy future might be "slower and more costly—and therefore hamper international efforts to tackle climate change."[5]

Conventional cars, for instance, might not require measurable amounts of graphite, manganese, nickel, cobalt, and lithium, while conversely they are essential—by today's technology—for electric cars, and EVs require almost double the amount of copper.[6] A similar pattern exists for the wind, solar, and nuclear industries when compared to the coal and natural gas industries.[7] Computer chip shortages, for instance, reportedly have retarded new automobile manufacturing.[8] And computer chips require critical minerals.[9] Even the possible commercialization of carbon capture, utilization, and storage technology, where CO_2 is captured and stored in underground geological formations, may depend upon the cost and availability of critical minerals.[10]

Depending upon the pace of the energy transition, IEA suggests we are on track for either doubling or quadrupling our "overall mineral requirements for clean energy technologies by 2040."[11] The World Bank projects that the demand for graphite, lithium, and cobalt might increase by up to 500% by 2050.[12] The U.S. State Department goes even further, suggesting it might go up by 1,000% by then.[13] But where these minerals will come from is problematic.

The country confronts a Hobson's choice: engage with the geopolitical winds and continue to rely heavily on imports from countries or ramp up domestic production where and when feasible. The State Department warns that "[o]ver 80 percent of the global supply chain of rare earth elements, important minerals for electric vehicles and wind turbine components, is controlled by one country," while similar constraints exist for other minerals.[14] Presently, China, for instance, produces almost all of the world's rare earths used in EV batteries (such as neodymium, terbium, and dysprosium).[15]

More than 50% of the world's production of cobalt, an essential ingredient in the batteries powering our growing reliance on EVs, is from the Democratic Republic of the Congo.[16] The roughly 94 million tons of nickel reserves in the world occur primarily outside the United States, particularly in Indonesia, Australia, Brazil, Russia, Cuba, and the Philippines.[17] Lithium too is primarily produced today in Australia and South America—currently in Chile (Bolivia has large deposits that are not being mined, as well).[18] Cadmium telluride solar cells are the second most common photovoltaic technology,[19] yet China, Korea, and Japan account for 64% of current cadmium production.[20]

Although the United States possesses large deposits of lithium and rare earths, as well as copper—albeit Chile outproduces and enjoys larger deposits than the United States—a considerable amount of its rare earths or critical minerals are located in sensitive areas, particularly on

4. IEA, The Role of Critical Minerals in Clean Energy Transitions: World Energy Outlook Special Report 1 (2021) [hereinafter World Energy Outlook Special Report], https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions.
5. Press Release, IEA, Clean Energy Demand for Critical Minerals Set to Soar as the World Pursues Net Zero Goals (May 5, 2021), https://www.iea.org/news/clean-energy-demand-for-critical-minerals-set-to-soar-as-the-world-pursues-net-zero-goals.
6. *See Executive Summary*, *in* World Energy Outlook Special Report, *supra* note 4, at 4.
7. *Id.*
8. Chris Isidore, *These Are the Real Winners From the Record Car Prices*, CNN Bus., July 19, 2021, https://www.cnn.com/2021/07/18/business/car-prices-dealers-winners/.
9. *See* Michael Stumo, *Semiconductor Shortage Highlights Urgency of U.S. Import Dependence*, Review, Mar. 29, 2021, https://www.reviewonline.com/opinion/local-columns/2021/03/semiconductor-shortage-highlights-urgency-of-u-s-import-dependence/.
10. Kirsten Hund et al., World Bank Group, Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition 32 (2020).
11. *Id.*
12. *See id.*
13. Bureau of Energy Resources, U.S. State Department, Energy Resource Governance Initiative (ERGI) (2019), https://www.state.gov/wp-content/uploads/2019/06/Energy-Resource-Governance-Initiative-ERGI-Fact-Sheet.pdf [hereinafter ERGI]. The ERGI initiative is a collective effort by the United States, Canada, Australia, Botswana, Peru, Argentina, Brazil, the Democratic Republic of the Congo, Namibia, the Philippines, and Zambia to promote supply chain security and the reuse or recycling of critical materials. The Mackay School at the University of Nevada, Reno, has partnered with ERGI to establish an Energy Resource Governance Initiative Academy, as well. Jennifer T. Kent, *Energy Resource Governance Initiative (ERGI) Academy to Facilitate Global Governance of Energy Resource Minerals*, Nev. Today, Apr. 7, 2021, https://www.unr.edu/nevada-today/news/2021/ergi-academy. For a thorough treatment of critical minerals and their uses, see Alexandra B. Klass & Allison J. Mitchell, *The Energy Transition and Mining: Reconciling the Growth of Renewable Energy With the Need for New Mineral Development*, 67 Rocky Mtn. Min. L. Ann. Inst. (forthcoming 2021).
14. ERGI, *supra* note 13.
15. *See* Elsa Dominish et al., Institute for Sustainable Futures, Responsible Minerals Sourcing for Renewable Energy iv (2019). *See also* Wayne M. Morrison & Rachel Tang, Congressional Research Service, China's Rare Earth Industry and Export Regime: Economic and Trade Implications for the United States (2012). While rare earths are not necessarily located primarily in China (production occurs in the United States, Myanmar, and Australia—with Lynas operating the Mt. Weld mine in Western Australia as the largest producer outside of China), China's dominance led it to impose a troublesome tax and quota on exports, prompting a U.S. trade dispute before the World Trade Organization, ultimately resulting in the lifting of the export tax in 2015. *See generally* Yuzhou Shen et al., *China's Public Policies Toward Rare Earths, 1975-2018*, 33 Min. Econ. 127 (2020), *available at* https://link.springer.com/article/10.1007%2Fs13563-019-00214-2; Congressional Research Service, In Focus: Trade Dispute With China and Rare Earth Elements (2019); Tom Daly, *China Hikes Half-Year Rare Earth Output Quotas to Record Level*, Reuters, Feb. 19, 2021, https://www.reuters.com/article/us-china-rareearth/china-hikes-half-year-rare-earth-output-quotas-to-record-level-idUSKBN2AJ18O.
16. *See* Dominish et al., *supra* note 15, at iv.
17. *See Profiling the Top Six Countries With the Largest Nickel Reserves in the World*, NS Energy, Feb. 11, 2021, https://www.nsenergybusiness.com/features/nickel-reserves-countries/. *See also* Priscila Barrera, *10 Top Nickel-Producing Countries*, Nickel Investing News, July 21, 2020, https://investingnews.com/daily/resource-investing/base-metals-investing/nickel-investing/top-nickel-producing-countries/.
18. *See* Dominish et al., *supra* note 15, at 28.
19. *See* Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy (DOE), *Solar Energy Technologies Office: Cadmium Telluride*, https://www.energy.gov/eere/solar/cadmium-telluride (last visited Oct. 8, 2021).
20. *See* Dominish et al., *supra* note 15, at 28.

public lands.[21] And thus the choice: do we accede to the geopolitics of import reliance (I choose "reliance" over "dependence") or embark on what might be called "mineral independence," and develop the country's resources under the mantra of doing so more responsibly than we have in the past?

This Article engages that question, offering insights into whether or how we ought to approach that trade off. Rep. Mark Amodei (R-Nev.), for instance, would favor accelerating the permitting process for critical minerals.[22] As one reporter commented, "[his] bill comes as both major political parties look to enact their visions for mining reform in light of a potential supply crunch for minerals used to manufacture clean energy technologies."[23]

Others, notably U.S. House of Representatives Natural Resources Chair Rep. Raúl Grijalva (D-Ariz.), advocate for long-overdue reform of the Hardrock Mining Law, an 1872 law that allows for mining many critical minerals on open public lands without affording any monetary return to the United States. Those who favor mining law reform, including this author, shy away from promoting activities under the Mining Law until reform occurs.[24] Either way, with attention shifting toward critical minerals necessary to support a transition to a zero-carbon economy, how this debate unfolds during our energy transition could inform or possibly affect that transition.

To engage this debate, Part I of the Article portrays how an appreciation for critical minerals has entered mainstream conversations, followed by a discussion in Part II of how the 1872 Mining Law often operates as the statutory regime for mining critical minerals on federal public lands. For present purposes, I employ the phrase *critical minerals* to embrace broadly the resources presently deployed in energy transition technologies, whether identified as rare earth elements or critical materials.[25] This is not to suggest, however, that we should accept such a broad category or that all critical minerals ought to be treated similarly. This second part also describes the nation's struggle to develop a meaningful national policy toward critical minerals, including reforming the anachronistic 1872 Mining Law.

Next, Part III suggests that mining law reform ought to be tethered to a thoughtful path forward for how to promote critical mineral production on public lands. My argument favors protecting our public lands from precipitous decisions and accepting that mining should occur only where and when appropriate, after deliberate planning; effective land management planning can identify lands suitable for mining and assist in streamlining the process for subsequent review of mining plans of operation. Planning should occur, however, only once the U.S. Congress reforms the 1872 Mining Law and abandons the 19th-century location system and, instead, establishes a leasing system for hard-rock and critical minerals. These changes could foster, for the first time, a meaningful and effective national critical minerals policy capable of assisting the market and technological changes presently indispensable for the transition to a green economy. Part IV, therefore, concludes that the time for change is upon us.

I. Critical Minerals Enter Center Stage

Dialogues surrounding critical minerals have intensified during the past decade. In 2015, when I testified before Congress on a proposed critical minerals bill, it seemed like the conversation had not yet engulfed conventional consideration.[26] It remained divorced from the mainstream, for example housed in the 2013 creation of the Critical Materials Institute, led by Ames Laboratory as part of the U.S. Department of Energy (DOE).[27] In 2017, Sen. Lisa Murkowski (R-Alaska) lamented how she felt like a "voice in the wilderness" when touting the need to address critical minerals.[28]

That has now changed. The attention afforded mining critical minerals, the environmental concerns, and associated permitting processes, presents a paradox, one for instance where Senator Murkowski has questioned "whether the administration is willing to accept what is going to be necessary in order to achieve this goal to have these secure supply chains," when it may "require approval of mining projects."[29] The chief executive officer for the

21. *See id.*; *see infra* notes 177-79 and accompanying text. Although White House Climate Advisor Gina McCarthy suggests that the United States possesses lithium deposits in states other than Nevada, it is not clear whether they are in sensitive lands. *See* Joe Deaux, *U.S. Identifies Many Lithium Mines Beyond Nevada: Climate Chief*, Bloomberg L., July 13, 2021, https://news.bloomberglaw.com/environment-and-energy/u-s-identifies-many-lithium-mines-beyond-nevada-climate-chief.
22. *See infra* note 162 and accompanying text.
23. James Marshall, *Nev. Republican Looks to Accelerate Project Permitting*, E&E News, May 14, 2021, https://subscriber.politicopro.com/article/eenews/1063732649.
24. *See infra* notes 141-48 and accompanying text.
25. In the Consolidated Appropriations Act, 2021, Congress amended the Energy Independence and Security Act of 2007 to include, as a definition, that
> [t]he term "critical material or mineral" means a material or mineral that serves an essential function in the manufacturing of a product and has a high risk of a supply disruption, such that a shortage of such a material or mineral would have significant consequences for United States economic or national security.

Pub. L. No. 116-260, §6003, 134 Stat. 1182 (2020).
26. *E.g.*, H.R. 761, National Strategic and Critical Minerals Production Act of 2013, 113th Cong. (2013); H.R. 1937, National Strategic and Critical Minerals Production Act of 2015, 114th Cong. (2015); H.R. 520, National Strategic and Critical Minerals Production Act, 115th Cong. (2018); H.R. 2531, National Strategic and Critical Minerals Production Act, 116th Cong. (2019); S. 1537, Strategic Energy and Minerals Initiative Act of 2021, 117th Cong. (2021) (introduced by Sen. Lisa Murkowski (R-Alaska)).
27. Office of Energy Efficiency and Renewable Energy, DOE, *Advanced Manufacturing: Critical Materials Institute: An Energy Innovation Hub*, https://www.energy.gov/eere/amo/critical-materials-institute-energy-innovation-hub (last visited Oct. 8, 2021). In 2010, DOE issued the *Critical Materials Strategy* report, as part of its effort to elicit a dialogue about how to ensure "reliable access to critical materials" to "advance a clean energy economy." DOE, Critical Materials Strategy (2010).
28. Dylan Brown, *Murkowski Gears Up to Launch New Critical Minerals Bill*, E&E News, Mar. 29, 2017, https://subscriber.politicopro.com/article/eenews/2017/03/29/murkowski-gears-up-to-launch-new-critical-minerals-bill-061439. The senator resurrected her bill two years later, after President Trump focused on critical minerals. Dylan Brown, *Murkowski Resurrects Critical Minerals Bill*, E&E News, May 3, 2019, https://subscriber.politicopro.com/article/eenews/2019/05/03/murkowski-resurrects-critical-minerals-bill-029517.
29. Dean Scott & Stephen Lee, *Pitfalls Await Biden's Bid to Boost Mineral Mining for EVs (1)*, Bloomberg L., June 8, 2021, https://news.

Thacker Pass mine lamented how it took his project nine years to wind through the permitting process, for example.[30] One mining industry report opines that it can take on average 10 years to permit a new mine, arguably costing a company millions.[31]

In his first year, President Donald Trump issued Executive Order No. 13817, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials.[32] Pursuant to that order, the U.S. Geological Survey (USGS), in May 2018, published a list of 35 mineral commodities it considered vital to the economic and national security interests of the United States—for instance, materials whose supply is mostly dependent on imports.[33] President Trump then followed his initial Executive Order with yet another directive, Executive Order No. 13953 issued in September 2020.[34] He observed how the 35 critical minerals "are necessary inputs for the products of our military, national infrastructure, and economy," and while they are "indispensable to our country, we presently lack the capacity to produce them in processed form in the quantities we need."[35] In fact, "American producers depend on foreign countries to supply and process them"—with more than 50% of 31 of those materials being imported annually and with 14 of the materials not even being domestically produced.[36]

President Trump singled out how the United States now imports 80% of its rare earth elements, such as barite, graphite, and gallium from China, while in the 1980s, the United States had been the major supplier for those minerals. China's production of lithium, moreover, has become an environmental and international human rights issue.[37] He then used his ostensible emergency powers to declare that this supply chain risk poses a national emergency and that the United States ought to "enhance its mining and producing capacity," even, he added, "for minerals not identified as critical and not included within" his national emergency order.[38] And in the waning days of the Trump Administration, Congress directed that the USGS review and, if necessary, revise its methodology and list of critical minerals at least every five years.[39]

Indeed, DOE under President Trump concluded that "[p]ermitting is a large barrier to increasing production from primary sources. The complex regulatory landscape often leads to lengthy permitting timelines."[40] This ostensible permitting hurdle purportedly justified the Trump Administration adding non-energy minerals to the list of projects capable of being "fast tracked" under the Fixing America's Surface Transportation (FAST) Act, administered by the Federal Permitting Improvement Steering Council (FPISC); and it precipitated a parade of congressional proposals to facilitate the production of critical minerals.[41]

In early 2021, as the mantle passed to President Joe Biden, he issued an Executive Order on reviewing domestic supply chain risks, including for rare earths and materials such as lithium used in large-capacity batteries for electric motors and generators.[42] His Executive Order employed the same definition of "critical materials" used by President Trump in Executive Order No. 13953. Six months later, the Administration released its corresponding report *Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth*.[43]

The report highlights the United States' growing demand for several minerals, such as lithium, graphite, nickel, copper, and cobalt, all presumably integral in either the development of batteries for the next generation of zero emission vehicles or for our economic stability and growth.[44] It observed how the "United States has limited raw material production capacity and virtually no processing capacity" for the lithium-based battery supply chain.[45] Although there are lithium deposits and some extraction here in the United States, most of the processing and other raw materials necessary for lithium-ion batteries occurs overseas.[46]

The report noted how trade policies might, as with the recent trade skirmishes with China involving the solar

bloomberglaw.com/environment-and-energy/pitfalls-await-bidens-bid-to-boost-u-s-mineral-mining-for-evs.

30. *Id.*
31. SNL Metals & Mining, Permitting, Economic Value, and Mining in the United States (2015).
32. Exec. Order No. 13817, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals, 82 Fed. Reg. 60835 (Dec. 26, 2017).
33. 83 Fed. Reg. 23295 (May 18, 2018); Nedal T. Nassar & Steven M. Fortier, USGS, Methodology and Technical Input for the 2021 Review and Revision of the U.S. Critical Mineral List (2021) (Open File Report 2021-1045); s*ee also* James Marshall, *Interior Poised to Nix Uranium From "Critical Mineral" List*, E&E News, July 9, 2021, https://subscriber.politicopro.com/article/eenews/1063736801. *See generally* USGS National Minerals Information Center, *Home Page*, https://www.usgs.gov/centers/nmic (last visited Oct. 8, 2021).
34. Exec. Order No. 13953, Addressing the Threat to the Domestic Supply Chain From Reliance on Critical Minerals From Foreign Adversaries and Supporting the Domestic Mining and Processing Industries, 85 Fed. Reg. 62539 (Oct. 5, 2020).
35. *Id.*
36. *Id.*
37. *The Environmental Impact of Lithium Batteries*, Inst. for Energy Rsch., Nov. 12, 2020, https://www.instituteforenergyresearch.org/renewable/the-environmental-impact-of-lithium-batteries/.
38. *Id.* The Executive Order tasked the U.S. Department of the Interior (DOI), in consultation with other departments, to investigate and prepare a report on our reliance on critical materials, and, inter alia, it promoted increasing mineral production and processing capabilities. Of course, in April 2020, DOE released a white paper on supply chain issues for critical materials. Office of Energy Efficiency and Renewable Energy, DOE, Critical Materials Rare Earths Supply Chain: A Situational White Paper (2020). The report detailed the nation's vulnerabilities and offered a strategic response.
39. Pub. L. No. 116-260, §7002, 134 Stat. 1182 (2020).
40. Office of Energy Efficiency and Renewable Energy, *supra* note 38, at 8.
41. *See infra* note 193 and notes 158-63.
42. Exec. Order No. 14017, America's Supply Chains, 86 Fed. Reg. 11849 (Mar. 1, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/. Presidential candidate Biden campaigned he would strengthen U.S. supply chains. Scott & Lee, *supra* note 29.
43. The White House, Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth: 100-Day Reviews Under Executive Order 14017 (2021).
44. *Id.* at 9, 14-15, 22, 48, 57, 86-87, 89, 91, 96, 200, 202.
45. *Id.* at 95.
46. *Id.* at 93, 97.

industry, impact clean energy programs.[47] It further recommended that the United States increase production of these minerals, albeit touting the need for stronger environmental controls (including strengthening agency regulations), a comprehensive sustainability standard, and consultation programs with affected stakeholders, particularly Tribal Nations.[48] The latter is elemental and potentially determinative, as many energy transition materials, such as nickel, lithium, cobalt, and copper, are located near Native American reservations and traditional cultural properties.[49]

II. A New Mining Era?

Traditional mining projects often evoke vocal opposition. Pebble Mine in Alaska, which would have threatened an iconic wild sockeye salmon run in Bristol Bay, is all but moribund.[50] Both the Rosemont and Resolution Copper mines in Arizona have received considerable notoriety—and little suggests the former is likely to secure sufficient authority to proceed anytime soon, while the latter required congressional involvement.[51] So too with uranium mining near the Grand Canyon[52]; a road project across the iconic Gates of the Arctic National Park and Preserve that would tap copper deposits in the Brooks Range[53]; a gold mine in the Mojave Desert that could threaten cultural sites and other resources[54]; or mining the copper and nickel prospects near the Boundary Waters Canoe Area Wilderness.[55]

Not surprisingly, therefore, companies like Battery Mineral Resources, that explore for and develop cobalt, lithium, and graphite here in the United States and elsewhere, including on public lands,[56] occasionally encounter resistance when they propose mining plans on public lands.[57] One of the largest lithium projects in the United States is Thacker Pass in Humboldt County, Nevada, an open pit mine covering about 5,700 acres of public lands (the entire project is 17,933 acres), and its footprint undoubtedly will impact the landscape, water resources, and golden eagles, as well as any resources contaminated by the disposal of the resulting sulfuric acid waste.[58] The Bureau of Land Management (BLM) proudly touted the project as one that would "provide a long term solution for the growing need for lithium while providing economic benefits for Humboldt County."[59]

47. *Id*. at 16, 45. The report also noted how our transition to a zero-carbon economy will depend upon the semiconductor industry and the materials necessary for it. *Id*. at 73.
48. *Id*. at 14.
49. Avery Ellfeldt, *Metals Needed for Climate Tech Often Found Near Tribal Lands*, E&E News, June 4, 2021, https://subscriber.politicopro.com/article/eenews/2021/06/04/metals-needed-for-climate-tech-often-found-near-tribal-lands-001058.
50. *See* Joel Reynolds, *Pebble Mine: Permit Denial Is Not Enough*, NRDC, June 17, 2021, https://www.nrdc.org/experts/joel-reynolds/pebble-mine-permit-denial-not-enough; *see also* Dino Grandoni & Joshua Partlow, *EPA to Protect Alaska's Bristol Bay, Blocking Major Gold Mine*, Wash. Post, Sept. 9, 2021, https://www.washingtonpost.com/climate-environment/2021/09/09/biden-bristol-bay-gold-mine/. The U.S. Environmental Protection Agency (EPA) as of this article is now considering whether to withdraw the site from being a disposal site. Another Alaskan project involves a gravel road through a park to access minerals. *See* James Marshall, *Alaska Native Tribes Urge Feds to Reconsider Mining Road*, E&E News, July 30, 2021, https://subscriber.politicopro.com/article/eenews/2021/07/30/alaska-native-tribes-urge-feds-to-reconsider-mining-road-275906 (copper road threatening Native Alaskan subsistence rights).
51. *See* Center for Biological Diversity v. U.S. Fish & Wildlife Serv., 409 F. Supp. 3d 738, 49 ELR 20130 (D. Ariz. 2019) (Rosemont Copper), *appeal pending*; Center for Biological Diversity v. U.S. Fish & Wildlife Serv., 441 F. Supp. 3d 843, 50 ELR 20036 (D. Ariz. 2020) (Rosemont Copper), *appeal pending*; Michael Doyle & James Marshall, *Ariz. Mine Developer Loses Bid to Shrink Jaguar Habitat*, E&E News, Sept. 3, 2021, https://www.eenews.net/articles/ariz-mine-developer-loses-bid-to-shrink-jaguar-habitat/; Ernest Scheyder, *U.S. Forest Service Rescinds Environmental Report for Rio's Arizona Copper Mine*, Reuters, Mar. 1, 2021, https://www.reuters.com/article/us-usa-mining-resolution/u-s-forest-service-rescinds-environmental-report-for-rios-arizona-copper-mine-idUSKCN2AT3JA; *Grijalva Announces Bill to Reverse Land Swap for Copper Mine*, AP News, Mar. 16, 2021, https://apnews.com/article/arizona-phoenix-raul-grijalva-legislation-forests-9ba67603f7c5c1e2627f91ba61477d4c; Anita Snow, *Apaches Ask Appeals Court to Oppose Transfer of Arizona Land*, AP News, Oct. 22, 2021, https://apnews.com/article/business-lifestyle-religion-environment-and-nature-arizona-690d196449d4a78b52273f02f9a10083. *See also infra* note 146 (regarding Resolution Copper).
52. *E.g.*, Havasupai Tribe v. Provencio, 906 F.3d 1155, 48 ELR 20182 (9th Cir. 2018) (involving challenge to the canyon mine project); National Mining Ass'n v. Zinke, 877 F.3d 845, 47 ELR 20162 (9th Cir. 2017) (challenge to withdrawal to protect the Grand Canyon).
53. James Marshall, *Greens Sue Interior Over Road to Alaska Copper Deposits*, E&E News, Aug. 4, 2020, https://subscriber.politicopro.com/article/eenews/1063684243.
54. James Marshall, *Gold Exploration Plan Advances in Mojave Desert*, E&E News, Aug. 2, 2021, https://subscriber.politicopro.com/article/eenews/2021/08/02/gold-exploration-advances-in-mojave-desert-279093.
55. Two projects are in the region, one by PolyMet and the other by Twin Metals. *See generally* James Marshall, *Court Sends Copper-Nickel Mine Air Permit Back to Regulators*, E&E News, July 20, 2021, https://subscriber.politicopro.com/article/eenews/2021/07/20/court-sends-copper-nickel-mine-air-permit-back-to-regulators-238145; James Marshall, *BLM to Redo NEPA Review in Minn. Mining Case*, E&E News, Dec. 1, 2020, https://subscriber.politicopro.com/article/eenews/2020/12/01/blm-to-redo-nepa-review-in-minn-mining-case-008097; Niina H. Farah, *Lawsuit: Minn. Copper Mine "Not Compatible" With Wilderness*, E&E News, Aug. 5, 2020, https://subscriber.politicopro.com/article/eenews/2020/08/05/lawsuit-minn-copper-mine-not-compatible-with-wilderness-012290. Efforts to invalidate the mining leases supporting the project have so far failed. *See* Voyageur Outward Bound Sch. v. United States, No. 18-cv-01463, 2021 WL 1929123, 51 ELR 20084 (D.D.C. May 13, 2021) (describing the unique history of changing administrations' approach toward the company's mining leases), *appeal pending*. In 2016, the DOI Solicitor concluded that the Department possessed authority to deny the renewal of Twin Metal's preference right leases. Solicitor's Opinion M-37036, Twin Metals Minnesota Application to Renew Preference Right Leases (Mar. 8, 2016). An effort by the Barack Obama Administration to pause any mineral activity in the area was reversed by the Trump Administration, and the Biden Administration announced in October 2021 that it would examine banning mining near the wilderness area. *See* Darryl Fears, *Biden Launches Review That Could Ban Copper Mining Near Minnesota Wilderness Area*, Wash. Post, Oct. 20, 2021, https://www.washingtonpost.com/climate-environment/2021/10/20/biden-launches-review-that-could-ban-copper-mining-near-minnesota-wilderness-area/; Dan Kraker, *Twin Metals to Appeal Federal Decision on Proposed Mine, Says Project Still Viable*, MPRNews, Oct. 27, 2021, https://www.mprnews.org/story/2021/10/27/twin-metals-to-appeal-federal-decision-on-proposed-mine.
56. Battery Mineral Resources, *Panamint Lithium Project, CA*, https://bmrcorp.com/projects/lithium/panamint-li-project/ (last visited Oct. 8, 2021).
57. *See* Friends of the Inyo, *Panamint Valley Lithium Mine Update*, https://friendsoftheinyo.org/panamint-valley-lithium-mine-update/ (last visited Oct. 8, 2021).
58. *See* Press Release, Bureau of Land Management, Humboldt River Field Office Issues a Record of Decision for the Thacker Pass Lithium Mine (Jan. 15, 2021), https://www.blm.gov/press-release/humboldt-river-field-office-issues-record-decision-thacker-pass-lithium-mine. *See also* James Marshall, *Nev. Lithium Project Close to Gaining Approval*, E&E News, Dec. 7, 2020, https://subscriber.politicopro.com/article/eenews/2020/12/07/nev-lithium-project-close-to-gaining-approval-007862.
59. Press Release, *supra* note 58.

Opponents of the mine counter how the mine's impact and the environmental statutes were "swept under the rug" by BLM when it approved the project.[60] Similarly, another lithium mine in Nevada precipitated an inquiry into the likely impact on a rare wildflower that some believe should be protected under the Endangered Species Act (ESA).[61] And *High Country News* presciently observed how these types of mines reflect "a new era of Western extraction."[62]

A. The 1872 Mining Law

> *Had the mining region of the West been occupied in such a manner as to have placed all the mineral lands in private ownership, it is not probable that the first discovery would have led to any great system of prospecting, as the adventurer would have been barred from private lands, and the mining industry which has so rapidly grown up in this country would have been delayed for years, perhaps for centuries.*[63]

With Western extraction, though, comes public land challenges. Critical minerals are often locatable minerals under the 1872 Mining Law. After all, as of 2018, roughly 83% of solid mineral mining on public lands occurred under the 1872 Mining Law.[64] This now anachronistic law affords citizens the ability to enter, explore, and ultimately develop open (federal) public lands that contain *valuable mineral deposits*.[65] Congress passed this law during the era when easterners were being encouraged to go west and establish homesteads and mines.[66]

When the Mining Law surfaced initially in 1866[67] and then was later amended in 1870 and 1872,[68] it codified the mining industry's general practice for locating and otherwise developing lands containing valuable mineral deposits.[69] Many old mining customs could continue, but Congress allowed miners the option of acquiring a patent to lands containing a *valid mining claim* for $2.50/acre for placer claims and $5.00/acre for lode claims.[70] Notably, though, to support a *valid mining claim*, a miner must satisfy certain requirements, including principally establishing the location of a valid mining claim.[71]

60. Complaint for Vacatur, Equitable, Declaratory, and Injunctive Relief, Western Watersheds Project v. U.S. Dep't of the Interior, No. 21-cv-00103 (D. Nev. filed Feb. 2, 2021). *See* James Marshall, *Tribes Seek Order Banning Digging at Nev. Lithium Mine*, E&E News, July 30, 2021, https://subscriber.politicopro.com/search?q=lithium%20mine; James Marshall, *Greens Sue BLM to Block Nev. Lithium Project*, E&E News, Mar. 1, 2021, https://subscriber.politicopro.com/article/eenews/2021/03/01/greens-sue-blm-to-block-nev-lithium-project-004889; *see also* Cayte Bosler, *Plans to Dig the Biggest Lithium Mine in the US Face Mounting Opposition*, Inside Climate News, Nov. 7, 2021, https://insideclimatenews.org/news/07112021/lithium-mining-thacker-pass-nevada-electric-vehicles-climate/; Associated Press, *Tribes: New Evidence Proves Massacre Was at Nevada Mine Site*, U.S. News, Oct. 5, 2021, https://www.usnews.com/news/best-states/nevada/articles/2021-10-05/tribes-new-evidence-proves-massacre-was-at-nevada-mine-site. A rancher too has questioned the project's impact on water resources. Associated Press, *Nevada Rancher Cites "Shroud of Secrecy" at Lithium Mine*, U.S. News, Oct. 29, 2021, https://www.usnews.com/news/best-states/nevada/articles/2021-10-29/nevada-rancher-cites-shroud-of-secrecy-at-lithium-mine.

61. 6 U.S.C. §§1531-1544, ELR Stat. ESA §§2-18. *See* Maya Earls, *Ioneer Mine Plans at Risk as Feds Move to Protect Wildflower*, Bloomberg L., June 3, 2021, https://news.bloomberglaw.com/environment-and-energy/ioneer-mine-plans-at-risk-as-feds-move-to-protect-wildflowers (Rhyolite Ridge lithium mine and the Tiehm's buckwheat flower); *see also* Scott Sonner, Associated Press, *Endangered Status Proposed for Nevada Flower at Lithium Mine*, ABC News, Oct. 1, 2021, https://abcnews.go.com/Business/wireStory/endangered-status-proposed-nevada-flower-lithium-mine-80358450.

62. Maya L. Kappor, *Nevada Lithium Mine Kicks Off a New Era of Western Extraction*, High Country News, Feb. 18, 2021, https://www.hcn.org/issues/53.3/indigenous-affairs-mining-nevada-lithium-mine-kicks-off-a-new-era-of-western-extraction.

63. Report of the Public Lands Commission, Created by the Act of March 3, 1879, Relating to the Public Lands in the Western Portion of the United States and the Operation of Existing Land Laws xix, H. Exec. Doc. No. 46, 46th Cong., 2d Sess. (1880).

64. Letter from the U.S. Government Accountability Office (GAO) to Raúl Grijalva, Chairman, House Committee on Natural Resources, Mining on Federal Lands: More Than 800 Operations Authorized to Mine and Total Mineral Production Is Unknown (May 28, 2020) [hereinafter GAO Letter to Chairman Grijalva].

65. 30 U.S.C. §22. *See* Andrus v. Shell Oil Co., 446 U.S. 657, 658, 10 ELR 20457 (1980).

66. Perhaps, one of the most noted public land law historians, Samuel P. Hayes succinctly observed that "[f]ederal policies encouraged rapid exploitation of [public] resources by encouraging land to pass easily from federal ownership into private hands," adding that lax enforcement of these laws and the ability of claimants to file false affidavits allowed for even more ready acquisition of valuable minerals or timber. Samuel P. Hayes, The Response to Industrialism, 1885-1914, at 117 (1957). *See also* Benjamin H. Hibbard, A History of the Public Land Policies (1965); Morton Keller, Affairs of State: Public Life in Late Nineteenth Century America 384-94 (1977).

67. An Act Granting the Right of Way to Ditch and Canal Owners Over the Public Lands, and for Other Purposes, 14 Stat. 251 (1866). The lode law exacerbated litigation surrounding the dubious practice of apex litigation, where parties would claim extralateral rights and attempt to lock up entire formations for miles by locating at the apex of a lode. *E.g.*, Del Monte Mining & Milling Co. v. Last Chance Mining & Milling Co., 171 U.S. 55, 65-69 (1898). *See* John D. Leshy, The Mining Law: A Study in Perpetual Motion 95 (1987); *see also* Gordon M. Bakken, The Mining Law of 1872: Past, Politics, and Prospects 28 (2008); Otis E. Young Jr., Western Mining: An Informal Account of Precious-Metals Prospecting, Placering, Lode Mining, and Milling on the American Frontier From Spanish Times to 1893, at 227-29 (1970). For how these early laws were shaped by a mining law proponent, see Rodman W. Paul, Mining Frontiers of the Far West 1848-1880, at 172-75 (rev. ed. 2001).

68. An Act to Amend "An Act Granting the Right of Way to Ditch and Canal Owners Over the Public Lands, and for Other Purposes," 16 Stat. 217 (1870); An Act to Promote the Development of the Mining Resources of the United States, 17 Stat. 91 (1872).

69. *See* Paul W. Gates, A History of Public Land Law Development (1969); Patricia N. Limerick, The Legacy of Conquest: The Unbroken Past of the American West 66 (1987). *See also* Leshy, *supra* note 67.

70. Placer claims involve mineral deposits that generally are located on the surface rather than in a vein or lode. *See* 30 U.S.C. §35; United States v. Iron Silver Mining Co., 128 U.S. 673, 679 (1888). A lode claim conversely is a deposit found in a "vein[ ] or lode[ ] of quartz or other rock in place bearing gold, silver, cinnabar, lead, tin, copper, [or] other valuable deposits." *See* 30 U.S.C. §23; Eureka Consolidated Mining Co. v. Richmond, 8 F. Cas. 819 (1877), *aff'd*, 103 U.S. 839 (1880) (definition of lode). A claim, however, must be either a lode or placer claim, not both. *See* Cole v. Ralph, 252 U.S. 286, 295 (1920). There also are tunnel sites, which can lead to a valid lode claim, 30 U.S.C. §27, as well as mill sites, or lands not themselves being mined but used for mining purposes. 30 U.S.C. §42. *See generally* Solicitor's Opinion M-37057, Authorization of Reasonably Incident Mining Uses on Lands Open to the Operation of the Mining Law of 1872 (Aug. 17, 2020); Solicitor's Opinion M-36988, Limitations on Patenting Millsites Under the Mining Law of 1872 (Nov. 7, 1997); Solicitor's Opinion M-37012, Legal Requirements for Determining Mining Claim Validity Before Approving a Mining Plan of Operations (Nov. 14, 2005); Solicitor's Opinion M-37011, Recession of 2001 Ancillary Use Opinion (Nov. 14, 2005); Solicitor's Opinion M-37010, Mill Site Location and Patenting Under the 1872 Mining Law (Oct. 7, 2003); Solicitor's Opinion M-3704, Use of Mining Claims for Purposes Ancillary to Mineral Extraction (Jan. 18, 2001).

71. *See* Hafen v. United States, 30 Fed. Cl. 470, 473-74 (1994).

Location consists of performing the requisite acts justifying granting a right of exclusive possession vested in the locator.[72] To perfect a location, "a claimant must comply with the requirements of the General Mining Law, other applicable Federal laws, and applicable state laws."[73] Once a miner establishes a valid claim, they enjoy certain exclusive possessory rights.[74]

But two cardinal rules persist: mining claims can only be located on open public lands, BLM and U.S. Forest Service lands not otherwise withdrawn, and the Act only applies to valuable mineral deposits—lands containing locatable minerals that a prudent person would develop because the minerals can be mined and marketed at a profit.[75] Locatable minerals generally include not only metallic minerals, such as gold, silver, and lead, but also nonmetallic minerals, such as certain forms of limestone, bentonite, fluorspar, block pumice, and asbestos.[76] And while a pernicious aspect of the 1872 Mining Law remains generally undisturbed, Congress effectively halted the patenting process.[77]

The 1872 Mining Law stands alone in its vigil, starkly isolated from the nation's other federal resource programs. From 1917 on, Forest System lands acquired by the United States have been leased rather than subject to the 1872 law.[78] The 1920 Mineral Leasing Act (MLA) protected federal lands by ensuring that lands would remain in federal ownership and that fossil fuels, such as oil, gas, oil shale, phosphates, sodium, sulfates, chlorides, carbonates, borates, bitumen, silicates, and coal, would be leased at fair market value.[79] Congress through the MLA sought to prevent the "development of monopolies, to discourage holding mineral rights without development for speculative purposes, and to provide a return to the U.S. Treasury for the exploitation of public resources."[80]

Seven years later, as John Leshy notes, Congress required that minerals from public lands conveyed to states could only be leased by states to aid the "common or public schools," or risk forfeiture back to the United States.[81] The 1978 Outer Continental Shelf Lands Act Amendments too continued the MLA's program of leasing oil and gas in offshore public lands,[82] and today the offshore program includes almost 1.8 million acres of leased lands for renewable energy development.[83] The Materials Act of 1947, amended by the 1955 Multiple Surface Use Act, opted for allowing the sale to the highest bidder of material resources (not the underlying lands), such as vegetative materials, and gravel, stone, clay, or common varieties of pumice, pumicite, and cinders.[84]

The 1947 Mineral Leasing Act for Acquired Lands applied a leasing program to resources that otherwise would have been locatable minerals, if the lands passed into federal ownership by acquisition or receipt.[85] BLM similarly enjoys the authority to administer geothermal leasing on 245 million acres of federal property.[86] And it can offer right-of-way leases at fair market value for onshore renewables as well, such as for wind and solar development on public lands.[87] Helium, a critical mineral not only employed in our modern technological economy,[88] but one that experi-

72. American Colloid Co., 128 IBLA 257, 263 (1994) (Mullen, J., concurring).
73. *Id.* Since 1976, the Federal Land Policy and Management Act added additional filing requirements. 43 U.S.C. §1744(a), (b); *see also* United States v. Locke, 471 U.S. 84 (1985) (risking forfeiture).
74. *See Hafen*, 30 Fed. Cl. at 473.
75. United States v. Coleman, 390 U.S. 599 (1968); *see also* Layman v. Ellis, 52 L.D. 714 (1929) (early articulation that the deposit must be profitable); Ferrell v. Hoge, 29 L.D. 12, 13 (1899) ("That non-mineral land can not be disposed of under the mining laws is a cardinal rule in the administration of the public land laws."); Castle v. Womble, 19 L.D. 455 (1894) (enough gold to justify further development).
76. Prior to the 1920 Mineral Leasing Act, the Placer Act of 1897 allowed locating oil shale claims. 29 Stat. 526 (1897) (petroleum and other mineral oils). The 1897 Act obviated DOI's decision to the contrary in *Union Oil Co.*, 23 L.D. 223 (1896). Pre-1920 claims survived if a claimant satisfied the Mining Law requirements. *See* Andrus v. Shell Oil Co., 446 U.S. 657, 10 ELR 20457 (1980).
77. In 1994 and since, there has been a moratorium on new patents. Pub. L. No. 103-332, 108 Stat. 2519 (1994). Previously, Congress in 1992 amended the administration of patents for oil shale claims. Pub. L. No. 102-486, 106 Stat. 2776, 3109-11 (1992).
78. Appropriations Act for Fiscal Year Ending June 1918, Pub. L. No. 390, 39 Stat. 1134, 1150 (1917) (authorizing the utilization of lands for mineral resources development for lands acquired under the 1911 Weeks Act, 36 Stat. 961).
79. Pub. L. No. 146, 41 Stat. 437 (2020) (30 U.S.C. §§181 et seq.).
80. James Rasband et al., Natural Resources Law and Policy 1187 (3d ed. 2016).
81. Leshy, *supra* note 67, at 338; *see* Pub. L. No. 570, 44 Stat. 1026-27 (1927).
82. 43 U.S.C. §§1331-1356b. While the Trump Administration DOI suggested it likely must promulgate a leasing program under the Act, Solicitor's Opinion M-37062, Secretarial Discretion in Promulgating a National Outer Continental Shelf Oil and Gas Leasing Program (Jan. 13, 2021), that interpretation was withdrawn only a few months later during the early days of the Biden Administration. Solicitor's Opinion M-37068, Withdrawal of M-37062 (Apr. 16, 2021). Outer Continental Shelf (OCS) marine minerals, including some critical or strategic minerals, are managed under the Outer Continental Shelf Lands Act as well. 30 C.F.R. pt. 581 (2020); *see* Bureau of Ocean Energy Management, U.S. DOI, *Competitive Leasing of OCS Marine Minerals*, https://www.boem.gov/Leasing-C-Marine-Minerals (last visited Oct. 8, 2021).
83. Peter Daniels, Harvard Law School, Environmental & Energy Law Program, Siting Renewable Energy on Public Lands: Existing Regulations and Recommendations (2021).
84. 30 U.S.C. §§601-604; 43 C.F.R. pts. 3710, 3711 (2020). *See also* Solicitor's Opinion M-36998, Disposal of Mineral Materials From Unpatented Mining Claims (June 9, 1999) (BLM can dispose of mineral materials on unpatented mining claims).
85. Pub. L. No. 382, 61 Stat. 913 (1947) (30 U.S.C. §§351-359).
86. *To Examine Energy Development on Federal Lands, Focusing on the Current Status of the Department of the Interior's Onshore Oil and Gas Leasing Program: Oversight Hearing Before the Senate Committee on Energy and Natural Resources* (2021) (testimony of Nada W. Culver, Deputy Director, Policy and Programs, BLM). Leasing occurs pursuant to the Geothermal Steam Act of 1970, Pub. L. No. 91-581, 84 Stat. 1566, 30 U.S.C. §1001, as amended. *See also* Energy Policy Act of 2005. In 2018, for instance, federal geothermal resources reportedly supplied more than 40% of the country's geothermal energy capacity. *Opportunities and Challenges for Advanced Geothermal Energy in the United States: Hearing Before the Senate Committee on Energy and Natural Resources,* 116th Cong. (2019) (statement of Tim Spisak, State Director for New Mexico, Oklahoma, Texas, and Kansas, BLM). And "[i]n FY[fiscal year]2019, BLM managed 317 geothermal leases on onshore federal lands, covering 484,204 acres" and generating about $18 million in revenues in FY 2020. Congressional Research Service, Federal Lands and Related Resources: Overview and Selected Issues for the 117th Congress 18 (updated 2021).
87. *See* 43 C.F.R. pt. 2800 (2020); *see also* Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes, 81 Fed. Reg. 92122 (Dec. 19, 2016).
88. Helium is mined as a byproduct of natural gas extraction. *See generally* Mihai Andrei, *Yes, There Is a Helium Shortage, and It Will Affect More Than Just Balloons*, ZME Sci., Jan. 22, 2021, https://www.zmescience.com/other/feature-post/helium-shortage-geology-feature-08082020 (discussing its uses and processes). Wyoming currently produces the largest share of helium in the United States at ExxonMobil's LeBarge field. For an excellent summary of helium, its uses, and challenges, see Amy E. Seneshen & David M.

enced a shortage between 2018 and 2020,[89] is treated similarly to natural gas and leased on public lands.[90] The norm, consequently, is ensuring a fair return to the public fisc, not free exploitation.

B. *The Elusiveness of Policy Coherence*

When, therefore, we consider unleashing the nation's potential for producing critical minerals, every administration at least since President Franklin D. Roosevelt has confronted the dilemma of how to address some aspect of developing a coherent national approach toward resource utilization.[91] Historian John G. Clark observes how, prior to World War II, the Natural Resources Committee arguably examined resources policy, but its recommendations failed to garner enough political appeal.[92] To be sure, energy-related resources often overshadowed non-energy-related resources. For instance, in 1934, FDR established the National Power Policy Committee, tasked with developing a unified national power policy. That was followed by President Harry Truman's National Security Resources Board in 1947, the same year Congress passed the Materials Act of 1947.[93]

Discussions surrounding a national mineral policy became more pronounced in the early 1950s, with the release of a report by the Materials Policy Commission (known as the Paley Commission). The 1952 Paley Commission report recommended a comprehensive mineral-fuels policy as well as a more modern approach toward nonfuel minerals,[94] which was followed by President Dwight D. Eisenhower's Cabinet Committee on Energy Supplies and Resources Policy, with the U.S. Departments of Defense, Interior (DOI), Commerce, Labor, State, Treasury, and Justice. Congress too was beginning to soften its approach toward resource development, when in the 1954 Multiple Mineral Development Act it fostered the principle of multiple use.[95]

In 1963, while President John F. Kennedy was establishing his Interdepartmental Energy Study Group, DOI Secretary Stewart Udall was warning of a quiet crisis in conservation.[96] And it was in that year when Resources for the Future presciently observed that the United States could not expect to continue to depend upon nonfuel resources "from domestic sources beyond a relatively brief time, if at all," and that for all but a few metals the country would likely need access to resources beyond its borders—and back then, the report examined more traditional nonfuel resources.[97]

By 1970, Congress codified a fundamental shift in policy toward the nation's resources. In 1964, it not only had established the Public Land Law Review Commission, but also declared that its policy toward public lands would be to retain and manage those lands and only dispose of them to the extent it would "provide the maximum benefit for the general public."[98] Congress established a national "materials policy" in 1970, passing the National Materials Policy Act of 1970, where it evinced its intent to "enhance environmental quality and conserve materials."[99]

The Act responded to a 1969 report by the Legislative Reference Service (LRS), *Toward a National Materials Policy*, with the LRS addressing the necessity of ensuring "an adequate supply of all types of materials needed in appropriate balance for our production requirements,"

Seneshen, *The Modern Day Gold Rush: The Race for Helium and Why You Should Care*, 67 Rocky Mtn. Min. L. Ann. Inst. (forthcoming 2021).

89. *See* David Kramer, *Helium Shortage Has Ended, at Least for Now*, Physics Today, June 5, 2020, https://physicstoday.scitation.org/do/10.1063/PT.6.2.20200605a/full/; Heather Murphy, *The Global Helium Shortage Is Real, but Don't Blame Party Balloons*, N.Y. Times, May 16, 2019, https://www.nytimes.com/2019/05/16/science/helium-shortage-party-city.html.
90. Helium was excluded from being produced from oil and gas leases under the 1920 MLA. Helium's importance to the Defense Department led Congress to pass the Helium Act of 1925. Pub. L. No. 544, 43 Stat. 1110. Congress later amended that Act in 1937, by essentially nationalizing the helium industry, and then once again in 1960 by allowing nongovernmental development. Pub. L. No. 75-411, 50 Stat. 885; Helium Act Amendments, Pub. L. No. 86-777, 74 Stat. 918 (1960). But the more complete privatization did not occur until the Helium Privatization Act of 1996. Pub. L. No. 104-272, 110 Stat. 3315. This 1996 Privatization Act subjected helium on public lands to the same leasing process as natural gas. Subsequent issues with DOI's administration of the 1996 Act and its disposal of federal helium triggered another amendment, the Helium Stewardship Act of 2013, Pub. L. No. 113-40, 127 Stat. 534. For a history, see Seneshen & Seneshen, *supra* note 88, at 8-24-25. Some helium production occurs in sensitive areas, such as the Labyrinth Canyon Wilderness, in southern Utah, designated as wilderness in the Dingell Act, Pub. L. No. 116-9, 113 Stat. 580 (2019). *See* Southern Utah Wilderness All. v. Bernhardt, 512 F. Supp. 3d 13, 51 ELR 20008 (D.D.C. 2021); *see generally Enviros Sue BLM Over Helium Project in Utah Wilderness*, E&E News, Dec. 21, 2020, https://subscriber.politicopro.com/article/eenews/2020/12/21/enviros-sue-blm-over-helium-project-in-utah-wilderness-007359.
91. As early as President Teddy Roosevelt, warnings about resource depletion for both fuel and nonfuel resources animated conservation dialogues. *See* Duane A. Smith, Mining America: The Industry and the Environment, 1800-1980, at 83 (1980). The Bureau of Mines emerged, after all, in 1915. *Id.* at 89.
92. John G. Clark, Energy and the Federal Government: Fossil Fuel Policies, 1900-1946, at 369 (1987).
93. Congress intended the 1947 law to apply to materials not otherwise covered by the mining laws. Pub. L. No. 291, 61 Stat. 681 (materials not otherwise authorized for disposal or prohibited from disposal and including but not limited to sand, stone, gravel, yucca, manzanita, mesquite, cactus, common clay, timber, and forest products), amended in 1950, Pub. L. No. 744, 64 Stat. 571 (relating to receipt of revenues and allowing disposal of sand, stone, gravel, and vegetative materials located below the high-water mark of navigable waters in Alaska), amended in Surface Resources Protection Act of 1955 (or Multiple Surface Use Act of 1955), Pub. L. No. 167, 69 Stat. 367, 368. This followed a 1944 temporary wartime measure. 2 Public Land Law Review Commission, Nonfuel Mineral Resources of the Public Lands S-3 (1970). In 1962, Congress repealed its earlier burnt timber disposal statutes for lands outside national forests (47 Stat. 1015 (1913), as amended July 3, 1926) (sale to highest bidder of salvage timber). Pub. L. No. 87-689, 76 Stat. 587. And it clarified that common varieties of certain materials were excluded from the 1872 Mining Law. Pub. L. No. 87-713, 76 Stat. 652 (1962). The Forest Service acquired additional authority to dispose of materials under the 1947 Act, by the Act of June 11, 1960, Pub. L. No. 86-509, §1(l), 74 Stat. 205, transferring functions to the Secretary of Agriculture, but excluding the authority to dispose of minerals or adjudicate the validity of mining claims. *Id.* §2(b), (c).
94. The President's Materials Policy Commission, Resources for Freedom: A Report to the President by the President's Materials Policy Commission (1952).
95. Pub. L. No. 585, 68 Stat. 708 (1954). For a discussion of the contemporary conflicts between leasing and the 1872 Act, as well as the early iterations of multiple mineral development, see Gates, *supra* note 69, at 750-55.
96. Stewart Udall, The Quiet Crisis (1963).
97. Hans H. Landsberg et al., Resources in America's Future: Patterns of Requirements and Availabilities 1960-2000, at 35-36 (1963).
98. Pub. L. No. 88-606, 78 Stat. 982 (1964).
99. Pub. L. No. 91-512, 84 Stat. 1234 (1970).

including the development of "new materials with novel properties to satisfy the more stringent demands of advanced technologies."[100] And in 1970, the Public Land Law Review Commission observed that "our survival as a leading nation depends on our mineral supplies. The close relation between minerals and our national security is too apparent to require detailed explanation."[101] This supported a policy designed to enlist our public lands in the march toward "encourag[ing] the exploration, development, and production of minerals."[102]

Yet in 1980, Congress observed that the nation still "lacks a coherent national materials policy and a coordinated program to assure the availability of materials critical for national economic well-being, national defense, and industrial production."[103] Congress sought to promote an "economically sound and stable domestic materials industry" that included minerals, metal, and mineral recycling.[104] Sen. Wendell Ford (D-Ky.), then chair of the U.S. Senate Subcommittee on Energy Resources and Materials Production, explained how the lack of any nonfuel mineral policy, as demonstrated by the Paley Commission in the wake of the 1950s shortages and supply interruptions during the Korean War, was creating once again a problem as a consequence of contemporary Russian and Cuban activities in Africa—potentially threatening supplies of cobalt, manganese, chromium, and platinum.[105] The National Materials and Mineral Policy, Research, and Development Act of 1980, therefore, declared it would be "the continuing policy of the United States to promote an adequate and stable supply of materials necessary to maintain national security, economic well-being and industrial production with appropriate attention to the long-term balance between resource production, energy use, a healthy environment, natural resources conservation, and social needs."[106]

But the 1980 Act failed to promote a national policy, and congressional inquiry into critical minerals continued almost immediately afterward.[107] William Perry Pendley, who later would become a controversial figure during the Trump Administration, testified about the urgency of addressing the country's vulnerability for critical minerals and about his involvement in numerous efforts to develop a national minerals policy, including during President Ronald Reagan's 1980 campaign and on an advisory panel on national minerals policy—culminating in a 1982 minerals policy announcement.[108]

In 1984, Congress noted how its "concern for critical minerals goes back many years," when, for instance, the 1970s oil embargo alerted policymakers to vulnerabilities for "critical materials such as cobalt, chromium, or manganese."[109] And added that the "importance of strategic materials to the economy and to the national security of this Nation has been acknowledged but, unfortunately, largely ignored for many years."[110] Congress succeeded in passing the National Critical Materials Act of 1984, recognizing that the "availability of adequate supplies of strategic and critical industrial minerals and materials" is essential for our economic and national security, important for avoiding dependency upon imports, and establishing a National Critical Materials Council and critical materials reserves, as well as bolstering research and development efforts.[111]

The new council would coordinate critical minerals policies and research, alert the public and Congress to any issues and concerns, and work on technological advancements with the public and private sectors.[112] But only a year later, the Hill lamented that the Act was not being implemented, that "our mining and basic materials industries" were in "ruinous decline," and that problems in South

100. LRS, Toward a National Materials Policy: A Report on a Proposed Commission on National Materials Policy, Prepared for the Use of the Committee on Public Works, U.S. Senate V (1969). *See generally* Karl S. Landstrom, *The National Materials Policy of 1970*, 6 Nat. Res. L. 265 (1973). Shortly after the 1970 Minerals Policy Act, Congress passed the Mining and Minerals Policy Act of 1970, Pub. L. No. 91-631, 84 Stat. 1876, focusing on the development of the nation's resources.

101. Public Land Law Review Commission, One Third of the Nation's Land 121 (1970).

102. *Id.* at 121-22. *See generally* Hard Minerals Committee, *Public Land Law Review Commission Report—Hard Minerals Recommendations*, 4 Nat. Res. L. 183 (1971).

103. Pub. L. No. 96-479, 94 Stat. 2305 (1980); *see also Materials Policy, Research, and Development Act: Hearing Before the Subcommittee on Energy Resources and Materials Production, Committee on Energy and Natural Resources, U.S. Senate, on H.R. 2743, Pub. L. No. 96-142*, 96th Cong. 2 (1980) [hereinafter *Hearing on Pub. L. No. 96-142*]. Congress, in the National Science and Technology Policy, Organization, and Priorities Act of 1976, already had declared that science and technology ought to contribute to "increasing the efficient use of essential materials," as well as fostering the "frugal use of materials." Pub. L. No. 94-282, 90 Stat. 459, 460, 462. And in 1979, Congress passed the Strategic and Critical Materials Stockpiling Revision Act, Pub. L. No. 96-41, 93 Stat. 319, for stockpiling three years of materials.

104. *Hearing on Pub. L. No. 96-142*, *supra* note 103, at 4.

105. *Id.* at 10.

106. Pub. L. No. 96-479, 94 Stat. 2305-06 (1980).

107. *Oversight, Pub. L. No. 96-479—National Materials and Minerals Policy, R&D Act of 1980 and Consideration of H.R. 4281—Critical Materials Act of 1982, No. 117: Hearings Before the Subcommittee on Transportation, Aviation, and Materials and the Subcommittee on Science, Research, and Technology, Committee on Science and Technology, U.S. House*, 97th Cong. (1982). A subcommittee chair remarked how "I think we are all in agreement as to the need for high level coordination of materials policy and related programs." *Id.* at 3. *See also National Minerals Security Act, Serial No. 97-24: Hearings Before the Subcommittee on Interior and Insular Affairs, on H.R. 3364, to Establish a National Mineral and Material Policy and Council, to Provide for a Secure Mineral and Materials Base for the National Economy and National Security, and for Other Purposes, U.S. House*, 97th Cong. 1 (1981) ("Over the past 3 years the Subcommittee on Mines and Mining has investigated the importance of long-term national minerals policy to a stable economy and secure national defense.") (statement of Rep. James D. Santini, Chair).

108. *Oversight*, *supra* note 107, at 213-14. In 1982, President Reagan presented Congress with a policy statement focusing on domestic mining and mineral independence. *See* Dale Russakoff, *Reagan Promotes Mining*, Wash. Post, Apr. 6, 1982, https://www.washingtonpost.com/archive/politics/1982/04/06/reagan-promotes-mining/708f20c2-f4a6-416c-87c1-280481f94575/. This followed from then-Secretary James Watt's notion of opening our public lands to widespread resource utilization. *Id.*

109. *The National Critical Materials Act of 1984, No. 65: Hearings Before the Subcommittee on Transportation, Aviation and Materials, Committee on Science and Technology, U.S. House*, 99th Cong. 1 (1985) [hereinafter *Hearing on the Materials Act of 1984*].

110. *Id.* at 2.

111. National Critical Materials Act of 1984, tit. II, Pub. L. No. 98-373, 98 Stat. 1248.

112. *Id.* §§202, 204, 98 Stat. at 1249, 1250.

Africa were "underscor[ing] our import vulnerability for critical materials."[113]

C. *Mining Law Reform Proposals*

Abuses of the 1872 Mining Law have long since engendered conversations about reforming what Charles Wilkinson aptly dubs a "lord of yesterday."[114] Lands not necessarily suitable for mining have passed into private ownership with little scrutiny. For roughly the Act's first 50 or so years, companies employed techniques such as using dummy locators to obtain the rights to mineral lands in excess of the acreage allowed under the 1872 Mining Law. One notorious scheme involved Ralph Henry Cameron's attempt to capitalize on tourism in the Grand Canyon by securing alleged control through the Mining Law,[115] and another early 19th-century case involved an attempt to operate a saloon on a mining claim.[116]

While today the Federal Land Policy and Management Act (FLPMA),[117] the 1897 Forest Service Organic Administration Act and subsequent Forest Service statutes,[118] the Mining Claim Occupancy Act,[119] and the Surface Resources Act of 1955[120] all furnish ample authority to protect against both abuses and ecological harms associated with mining,[121] historic mining operations continue to remind us of the devastation attributable to old mining practices.[122] All this has occurred, meanwhile, as these public resources continue to be developed for private gain absent any monetary benefit back to the United States.

This is different than other public resources—we even have to pay to just visit our nation's parks! And I suspect no other nation gives away its resources, like gold, copper, or lithium, for free, either. Equally problematic and oddly absurd, some federal officials abjure any obligation to engage in any inquiry into whether a proposing mining claimant even holds valid mining claims—a pending issue with both the Thacker Pass and Rosemont mining plans.[123]

For more than a century, the urgency for reform has been evident and yet elusive.[124] A Public Land Commission in 1880 identified some of the widespread abuses that occurred just in roughly the Act's first decade.[125] The 1950s Paley Commission recommended establishing a leasing system.[126] Reforming the old law surfaced as a recommen-

113. *Hearing on the Materials Act of 1984*, *supra* note 109, at 2. Creating a separate council apart from the White House Office of Science and Technology Policy (OSTP) apparently proved problematic. *Id*. at 5 (testimony of deputy director of OSTP). That office, after all, released a report in May 1985, *Strategic Materials: Technologies to Reduce U.S. Import Vulnerability* (1985). The 1985 report addressed how South Africa, Zaire, and Russia were producing more than 50% of the world's supply of chromium, cobalt, manganese, and platinum group metals, with little domestic production. *Id*. at 3, 5. It recommended promoting production in other countries to diversify the supply and reduce vulnerabilities, decreasing demand by improving manufacturing processes and enhancing recycling, and developing alternatives to the existing critical minerals. *Id*.

114. Charles F. Wilkinson, Crossing the Next Meridian: Land, Water, and the Future of the West (1992).

115. *See* Cameron v. United States, 252 U.S. 450 (1920).

116. United States v. Rizzinelli, 182 F. 675 (D. Idaho 1910).

117. 43 U.S.C. §§1701-1785, ELR Stat. FLPMA §§102-603.

118. 16 U.S.C. §§482, 551; 36 C.F.R. pt. 228 (2020). *See* National Forests, 39 Fed. Reg. 31317 (Aug. 28, 1974); *see also* United States v. Shumway, 199 F.3d 1093, 1106-07, 30 ELR 20278 (9th Cir. 1999). The Trump Administration had questioned existing Forest Service regulations. Locatable Minerals, 83 Fed. Reg. 46451 (Sept. 13, 2018); Locatable Minerals, Notice of Intent to Prepare an Environmental Impact Statement, 85 Fed. Reg. 18186 (Apr. 1, 2020).

119. Pub. L. No. 87-851, 76 Stat. 1127 (1962).

120. Pub. L. No. 167, 69 Stat. 367 (1955), 30 U.S.C. §§601 et seq.; 43 C.F.R. pt. 3710 (2020). The Act confirms that "[a]ny mining claim hereafter located . . . shall not be used . . . for any purpose other than prospecting, mining, or processing operations." 30 U.S.C. §612(a). "The Multiple Use Act empowers the Forest Service to regulate non-mining activity upon mining claims, so long as the non-mining activity does not interfere with mining activities or 'uses reasonably incident thereto.'" *Shumway*, 199 F.3d at 1105.

121. FLPMA allows DOI to prevent "unnecessary or undue degradation" (UUD) of the public lands. 43 U.S.C. §1732(b); 43 C.F.R. §3809.5 (2020). BLM's regulations repeat the necessity of protecting against adverse environmental effects that would otherwise be unnecessary and violate the UUD standard. *See* Mining Claims Under the General Mining Laws; Surface Management, 65 Fed. Reg. 69998, 70053 (Nov. 21, 2000). Administrations, admittedly, apply the UUD authority differently. *E.g.*, Mining Claims Under the General Mining Laws; Surface Management, 66 Fed. Reg. 54834 (Oct. 30, 2001). *See also* 45 Fed. Reg. 78902 (Nov. 26, 1980) (earlier surface management regulations). Also, DOI has interpreted its mandate to ensure that mining operations are consistent with any applicable resource management plan. *See* Mineral Policy Ctr. v. Norton, 292 F. Supp. 2d 30, 49 (D.D.C. 2003). Even the 1872 Mining Law allows mining subject to "regulations prescribed by law." 30 U.S.C. §22. Federal environmental laws, as well, provide an overlay applicable to both the federal agencies and miners. *See* Karuk Tribe of Cal. v. U.S. Forest Serv., 681 F.3d 1006, 42 ELR 20116 (9th Cir. 2012) (§7(a)(2) of the ESA applied to a notice of intent to mine on Forest Service lands when there will be a significant disturbance); Sierra Club v. El Paso Gold Mines, Inc., 421 F.3d 1133, 35 ELR 20175 (10th Cir. 2005) (Clean Water Act); Beartooth All. v. Crown Butte Mines, 904 F. Supp. 1168, 26 ELR 20639 (D. Mont. 1995) (same). In the 1970s, states too started to enact stricter reclamation and other laws for mining activities. *See* Bakken, *supra* note 67, at 118-19. *E.g.*, California Coastal Comm'n v. Granite Rock Co., 480 U.S. 572, 17 ELR 20563 (1987) (state environmental programs not necessarily preempted for activities on public lands); Bohmker v. Oregon, 903 F.3d 1029, 48 ELR 20160 (9th Cir. 2018) (Oregon restrictions applicable to mining on public lands).

122. *See infra* note 148 and accompanying text.

123. *See* Western Watersheds Project v. U.S. Dep't of the Interior, No. 21-cv-0013 (D. Nev. filed Feb. 26, 2021) (Thacker Pass); Center for Biological Diversity v. U.S. Fish & Wildlife Serv., 409 F. Supp. 3d 738, 49 ELR 20130 (D. Ariz. 2019) (Rosemont), *appeal pending*. BLM's practice, problematic as it seems, presumes the validity of mining claims. *See* Earthworks v. U.S. Dep't of the Interior, 496 F. Supp. 3d 472, 50 ELR 20243 (D.D.C. 2020). A questionable practice, however, should not sanction agency decisionmaking when it is contrary to the modern policy of retaining and protecting public lands. This is not to discount BLM's discretion in deciding whether to contest a claim's validity, *see* Best v. Humboldt Placer Mining Co., 371 U.S. 334 (1963), but a woefully outmoded practice (which became evident and problematic during the Bruce Babbitt Administration prior to the annual moratorium on patenting) ought to be discontinued. Notably, the Forest Service in some instances has ensured that, when a company engages in mining an uncommon variety (i.e., a locatable) mineral it does not commensurately mine and sell a common variety (leasable) mineral. Copar Pumice Co. v. Tidwell, 603 F.3d 780, 40 ELR 20127 (10th Cir. 2010). And while it arguably did so poorly, the Forest Service examined the validity of mining claims when lands around the Grand Canyon were withdrawn from mining subject to "valid existing rights." Havasupai Tribe v. Provencio, 906 F.3d 1155, 48 ELR 20182 (9th Cir. 2018).

124. Sam Kalen, *An 1872 Mining Law for the New Millennium*, 71 U. Colo. L. Rev. 343 (2000); Clyde O. Martz, *Pick and Shovel Mining Laws in an Atomic Age: A Case for Reform*, 27 Rocky Mtn. L. Rev. 375 (1955); Mark Squillace, *The Enduring Vitality of the General Mining Law of 1872*, 18 ELR 10261 (July 1988).

125. Report of the Public Lands Commission, *supra* note 63, at xxxv. *See id*. at xxxvi ("If the capitalists of London and New York, Chicago and San Francisco, had anything to do with mine locations, they would clamor for a change."). For a history of this commission (and others) and how John Wesley Powell's involvement might have impacted Congress' reaction to the report, see Mark B. Lambert, Public Land Commissions: Historical Lessons and Future Considerations (2003) (M.S. thesis, University of Montana).

126. Leshy, *supra* note 67, at 301.

dation of the 1960s Public Land Law Review Commission.[127] In its 1970 report, *One Third of the Nation's Land*, it observed how "[t]he General Mining Law of 1872 has been abused, but even without that abuse, it has many deficiencies," and recommended a combination of elements of the leasing system and ensuring a fair return to the United States.[128] When digesting the Commission's work, the *New York Times* reported how "all mineral interests known to be of value should be reserved with exploration and development discretionary in the Federal government and a uniform policy adopted relative to all reserved mineral interests."[129] Reform conversations continued throughout the 1970s[130]; the U.S. Government Accountability Office (GAO), for example, carried forward a recommendation for reform in 1979,[131] to name just one.

The nation's premier mining law expert, John Leshy, forcefully explained in 1987 how the law has remained in perpetual motion for decades, evading reform and yet universally acknowledged to be ill-suited to modern times.[132] He, for instance, describes the history of considering critical minerals legislation in the 1980s as demonstrating a "continuing concern" for how strategic minerals "were beginning to assume center stage in" mining law reform debates—albeit with little substantive progress or consensus on how best to proceed.[133] Mining law historian Gordon Bakken further chronicles some of the reform battles, noting how even a 1989 GAO report echoed the propriety of reforming the law.[134] While accepting the need to protect legitimate mining operations, Wilkinson commented in 1992 that "any fair reform of the 1872 law is bottomed on the idea that too much of the old law has been twisted by nonminers and opportunists."[135]

Sen. Dale Bumpers (D-Ark.) observed how President Ulysses S. Grant would "turn over in his grave if he knew what had become of the mining law," and that the law "is probably the biggest single scam that continues in effect in American today" as the senator tirelessly sought to "modify or repeal" it.[136] Even Clinton Administration Interior Secretary Bruce Babbitt could not move the reform needle enough when he staged an elaborate ceremony giving away potentially $10 billion of the public's resources for $10,000—using a pen from President Grant's era to underscore the weighty age of the old law.[137]

Perhaps, President Barack Obama Interior Secretary Ken Salazar, however, best captures the hurdle when he said that the Mining Law

> has been on the books now for 137 years. Despite decade after decade of fights about how it is that we should reform the Mining Law all of those efforts have failed. Many a Senator and Congressman who has sat in these Committees has tried to make those changes. Yet getting across the finish line has proven to be very, very elusive.[138]

This imploration too failed throughout the President Obama years.

Today's discussions about critical minerals might serve as a propitious moment to examine this roughly sesquicentenarian law once again. The Biden Administration already has begun to review how best to approach oil, gas, and coal development on public lands. Soon after taking office, the Administration initiated a pause on oil and gas leasing until it could ensure that leasing was consistent with modern environmental requirements and sufficiently accounted for the climate change impacts associated with continuing to develop even more fossil fuel resources.[139] During the presidential campaign, reformers, such as Sen. Elizabeth Warren (D-Mass.), recommended that we just ban all mining on public lands—albeit with an exception for critical minerals.[140]

Unsurprisingly, therefore, mining law reform has become inextricably linked with today's conversations about facilitating critical mineral production. "For Democrats, who control both chambers of Congress" as well as the White House, this "heightened focus on minerals like lithium, cobalt and copper, means the time is right to completely overhaul the nation's foundational hardrock min-

127. For a summary of the Commission's effort and responses, see *id*. at 302-03.
128. Public Land Law Review Commission, *supra* note 101, at 124-29.
129. *Digest of the Commission's Report and Recommendations on Public Land Use*, N.Y. Times, June 24, 1970, https://www.nytimes.com/1970/06/24/archives/digest-of-the-commissions-report-and-recommendations-on-public-land.html.
130. Leshy, *supra* note 67, at 304-05.
131. GAO, Mining Law Reform and Balanced Resource Management (1979) (EMD-78-93).
132. Leshy, *supra* note 67.
133. *Id*. at 308-09; *see also id*. at 345-46.
134. *See* Bakken, *supra* note 67, at 106-15, 126-87.
135. Wilkinson, *supra* note 114, at 74.
136. *Mineral Exploration and Development Act of 1993: Hearing Before the Subcommittee on Mineral Resources Development and Production of the Committee on Energy and Natural Resources, on S. 257, U.S. Senate*, 103d Cong. 108 (1993); 143 Cong. Rec. 4293 (daily ed. May 12, 1997) (statement of Sen. Dale Bumpers).
137. Tom Kenworthy, *A $1 Billion Return for $275*, Wash. Post, Sept. 7, 1995, at A17. To be sure, Congress has since then imposed an annual moratorium on new patents, however. *See supra* note 77 and accompanying text.
138. *Mining Law Reform: Hearing Before the Committee on Energy and Natural Resources, Receive Testimony on S. 796, Hardrock Mining and Reclamation Act of 2009 and S. 140, Abandoned Mine Reclamation Act of 2009, U.S. Senate*, 111th Cong. (2009) (statement of Ken Salazar, Secretary, DOI). The Pew Charitable Trusts had hoped that 2009 would be the year of reform. The Pew Campaign for Responsible Mining, The 1872 Mining Law: Time for Reform (2009), https://www.pewtrusts.org/-/media/assets/2009/01/24/mining-law-time-for-reform.pdf.
139. *See* Exec. Order No. 14008, 86 Fed. Reg. 7619 (Feb. 1, 2021); Secretarial Order No. 3395, Temporary Suspension of Delegated Authority (Jan. 20, 2021). Two principal challenges to the pause are being litigated, one in Louisiana and one in Wyoming, with the court in Louisiana already accepting the argument against the pause. *See* Louisiana v. Biden, 2021 WL 2446010, 51 ELR 20110 (W.D. La. June 15, 2021), *appeal pending*; Wyoming v. Haaland, No. 21-cv-56 (D. Wyo. Mar. 24, 2021); *see also* Continental Res., Inc. v. de la Vega, No. 21-cv-00034 (D.N.D. filed Feb. 23, 2021). *See generally* Niina H. Farah, *Biden Admin Pushes Back on Oil Leasing Freeze Lawsuits*, E&E News, June 9, 2021, https://subscriber.politicopro.com/article/eenews/2021/06/09/biden-admin-pushes-back-on-oil-leasing-freeze-lawsuits-000919.
140. Maddie Stone, *Elizabeth Warren Wants to Ban Mining on Public Lands—With One Exception*, Grist, Feb. 26, 2020, https://grist.org/politics/elizabeth-warren-wants-to-ban-mining-on-public-lands-with-one-exception/.

ing law," reports *E&E* journalist James Marshall.[141] House Natural Resources Chairman Grijalva appears committed to modernizing the Act. In April 2021, he, along with others, wrote the Administration and encouraged that it adopt stricter regulations and to more meaningfully consult with Tribal Nations and indigenous peoples.[142] He undoubtedly, therefore, will once again promote mining law reform mirroring what he attempted in 2019.[143]

Earthworks, for instance, identifies seven commonly accepted elements for successful mining law reform, as reflected in the congressman's earlier proposal.[144] At the outset, activities under the 1872 law ought to follow the pattern of other programs and be governed by a leasing and royalty program, with the United States and the public receiving a fair return off the value of the resource. Next, mining should occur only if Tribal Nations and indigenous peoples have a sufficient voice in whether, where, and when it can occur. Third, sensitive areas, whether because of their status, importance to Tribal Nations or indigenous peoples, or ecological value, ought to be protected. In 2008, Sen. Jeff Bingaman (D-N.M.) lamented that approximately 13,000 mining claims were in what he referred to as "treasured places."[145] This is epitomized today with the fight to save the Oak Flat area of the Tonto National Forest from Resolution Copper's proposed mining operations.[146]

Fourth, where mining is allowed to occur, operations must follow stringent enough environmental standards to protect against groundwater contamination, ensure adequate disposal of mine wastes, avoid unnecessary surface disturbance, and ensure compliance with sufficient reclamation requirements. The Associated Press, in 2019, reported that "[e]very day many millions of gallons of water loaded with arsenic, lead and other toxic metals flow from some of the most contaminated mining sites in the U.S. and into surrounding streams and ponds without being treated."[147] That year, Sen. Michael Bennet (D-Colo.) introduced a mining law reform bill and commented how the Gold King spill ought to serve as a visible reminder of the continuing difficulty with the 1872 Mining Law.[148]

The final three elements are developing a better enforcement program, strengthening bonding and financial assurance requirements, and establishing an abandoned mine reclamation fund capable of providing resources to clean up and restore the more than 500,000 abandoned hardrock mines. The latter is necessary because, "[u]nlike the coal industry, the metal mining industry does not pay to clean up its legacy of abandoned mines."[149]

III. Moving Forward With Purpose

Enter a dilemma. Profs. J.B. Ruhl and James Salzman capture it quite cogently when they observe how the necessity of swiftly employing a Green New Deal, where we shift away from fossil fuels quickly, might demand examining whether our environmental law standards and procedures unnecessarily retard needed infrastructure change.[150] Indeed, they reflect the growing consensus that "decisive action *must* be taken, and *now*, to design New Green Laws for the Green New Deal."[151] The disastrous summer of 2021, after all, serves as "yet another portent of what humanity faces in coming decades if the world does not take dramatic steps to protect ecosystems and curb use of fossil fuels," scientists warned, according to the *Washington Post*.[152]

Should, therefore, those who favor curbing mining on public lands share Senator Warren's caveat for critical minerals? This could mean acknowledging some "trade-off[s]

141. James Marshall, *Biden Clean Energy Talks Fuels Mining Reform Bills*, E&E News, May 4, 2021, https://subscriber.politicopro.com/article/eenews/2021/05/04/biden-clean-energy-talk-fuels-mining-reform-bills-002290.
142. Letter from Raúl Grijalva et al., to Secretary Haaland and Secretary Vilsack (Apr. 27, 2021). In 2019, reform efforts followed, unsuccessfully, the change in the political majority in the House. *See* Dylan Brown, *Mining Reform Advocates Dust Off Battle Plan*, E&E News, Jan. 8, 2019, https://subscriber.politicopro.com/article/eenews/2019/01/08/mining-reform-advocates-dust-off-battle-plan-034160.
143. H.R. 2579, 116th Cong. (2019), https://www.congress.gov/116/bills/hr2579/BILLS-116hr2579rh.pdf.
144. Earthworks, *1872 Mining Law—Reform Requirements*, https://www.earthworks.org/issues/1872_mining_law_reform_requirements/ (last visited Oct. 8, 2021).
145. *S.H. 110-339, Reform of the Mining Law of 1872: Hearing Before the Committee on Energy and Natural Resources, U.S. Senate, Receive Testimony on Reform of the Mining Law of 1872*, 110th Cong. (2008) (opening statement of Sen. Jeff Bingaman).
146. *See* Press Release, Office of Rep. Raúl Grijalva, Chair Grijalva Introduces "Save Oak Flat Act" to Permanently Protect Tribal Sacred Site in Central Arizona From Destructive Mining (Mar. 15, 2021), https://grijalva.house.gov/chair-grijalva-introduces-save-oak-flat-act-permanently-protect-tribal-sacred-site/. Resolution Copper's proposed mining operations seemed destined to fade, until a 2015 congressional rider to the National Defense Authorization Act authorized a land exchange that would allow the project to proceed. This proposed transfer, according to the National Congress of American Indians, "contravenes the federal trust responsibility and Congress' longstanding support for the protection and preservation of tribal environmental, historical, and cultural resources." *The Irreparable Environmental and Cultural Impacts of the Proposed Resolution Copper Mining Operation: Hearing Before the House Subcommittee for Indigenous Peoples of the United States*, 116th Cong. (2020) (written testimony of Kevin J. Allis, Chief Executive Officer, National Congress of American Indians). *See* Apache Stronghold v. United States, 519 F. Supp. 3d 591, 51 ELR 20028 (D. Ariz. 2021) (denying injunction to prevent publication of environmental impact statement). Representative Grijalva has introduced the Save Oak Flats Act to effectively nullify the exchange and prevent harm to the area, H.R. 1884, 117th Cong. (2021). *See also supra* note 51.
147. Mathew Brown, *50M Gallons of Polluted Water Pours Daily From U.S. Mine Sites*, AP News, Feb. 20, 2019, https://apnews.com/article/sd-state-wire-nv-state-wire-north-america-mo-state-wire-in-state-wire-8158167fd9ab4cd8966e47a6dd6cbe96. In 2017, EPA reported that the mining industry is the most polluting industry. U.S. Environmental Protection Agency, *TRI National Analysis: Comparing Industry Sectors*, https://www.epa.gov/trinationalanalysis/comparing-industry-sectors (last updated Sept. 20, 2021).
148. Press Release, Office of Sen. Michael Bennet, Bennet Reintroduces Bill to Reform Antiquated Hardrock Mining Laws (May 13, 2019), https://www.bennet.senate.gov/public/index.cfm/2019/5/bennet-reintroduces-bill-to-reform-antiquated-hardrock-mining-laws.
149. *Mining Law Reform: Hearing Before the Committee on Energy and Natural Resources, Receive Testimony on S. 796, Hardrock Mining and Reclamation Act of 2009 and S. 140, Abandoned Mine Reclamation Act of 2009, U.S. Senate*, 111th Cong. (2009) (opening statement of Sen. Mark Udall).
150. *See* J.B. Ruhl & James Salzman, *What Happens When the Green New Deal Meets the Old Green Laws*?, 44 Vt. L. Rev. 693 (2020).
151. *Id.* at 700.
152. Sarah Kaplan & Brady Dennis, *Amid Summer of Fire and Floods, a Moment of Truth for Climate Action*, Wash. Post, July 24, 2021, https://www.washingtonpost.com/climate-environment/2021/07/24/amid-summer-fire-floods-moment-truth-climate-action/.

between short-term and long-term environmental protection goals" embodied in laws such as the National Environmental Policy Act (NEPA).[153] Do we tinker, amend, or dramatically alter the NEPA process to ensure that critical minerals are produced not only here in the United States. but also quickly enough to satisfy the growing demand?

NEPA serves as the nation's environmental Magna Carta. Briefly, Title 1 declares a national environmental policy and establishes goals.[154] It requires that all policies, regulations, and laws of the United States be interpreted and administered in accordance with the policies of the Act, and separately that agencies are required to "identify and develop methods and procedures" for ensuring that "presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."[155] The statute further contains what have since become its foci, the "action-forcing" mechanism, requiring the preparation of a "detailed statement," now referred to as an environmental impact statement (EIS), for any "proposals for legislation" or "other major federal actions significantly affecting the quality of the human environment."[156]

Notably, mining companies and congressional reformers often target NEPA in their reform proposals, floating the objective of streamlining environmental reviews for critical mineral production plans involving activities on public lands or that otherwise require a federal authorization or approval. The Trump Administration Commerce Department offered recommendations for "streamlining the permitting and review processes related to developing mining claims or leases and enhancing access to domestic critical mineral resources."[157] Rep. Michael Waltz's (R-Fla.) proposed American Critical Mineral Independence Act of 2021 ostensibly seeks to protect the U.S. demand for critical minerals from China's dominance. It would announce a sense of Congress that "the current Federal permitting process is an impediment to mineral production and the mineral security of the United States."[158] And it would promote early and broad collaboration and require the establishment and adherence to a permitting time line.[159]

For NEPA, that timetable would direct, unless otherwise agreed to by a project sponsor, that an agency must complete its review of a project proposal within 24 months.[160] NEPA compliance, moreover, could be avoided if the principal federal agency concludes that another state or federal agency already has addressed the NEPA §102 requirements.[161] Congressman Amodei's broader National Strategic and Critical Minerals Production Act of 2021 follows a similar pattern, although he would embrace an unbridled definition for critical minerals.[162] Senator Murkowski's Strategic Energy and Minerals Initiative Act of 2021 focuses instead on promoting financing reform for critical mineral development, while directing that the federal government implement the Commerce Department's streamlining recommendations.[163] None of these proposals, however, endorse Representative Grijalva's objective of marrying mining law reform to any discussion of streamlining environmental review for critical minerals.[164]

A. *Paths and Cautionary Potholes*

As such, four paths forward present themselves. First, we could maintain the status quo, an outcome seemingly untenable or at least foolhardy. The need for mining law reform has been evident for decades; and undoubtedly the nation and the green economy needs, at least presently, some critical minerals. Or, second, we could simply accept the emphasis on merely making environmental reviews more efficient and faster for critical minerals. Third, we could abjure touting critical minerals entirely and simply engage in the Sisyphean task of mining law reform. Fourth and finally, we could commend Representative Grijalva's apparent notion of securing mining law reform by accepting some measure of environmental streamlining for critical minerals.[165]

153. 42 U.S.C. §§4321-4370h, ELR Stat. NEPA §§2-209. Ruhl & Salzman, *supra* note 150, at 718.
154. 42 U.S.C. §4331.
155. *Id.* §4332.
156. *Id.* §4332(c).
157. *See* U.S. Department of Commerce, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals (2019), https://www.commerce.gov/sites/default/files/2020-01/Critical_Minerals_Strategy_Final.pdf.
158. H.R. 2637, at 13, 117th Cong. (2021).
159. *Id.* One provision would require that the principal federal agency must "consider deferring to, and relying on, baseline data, analyses, and reviews performed by State agencies with jurisdiction over the proposed critical mineral project"—arguably providing mining friendly states greater ability to influence the process.
160. *Id.*
161. *Id.* Other aspects of the bill would affect NEPA compliance as well, such as limiting an agency's consideration of issues raised during the commenting process. This Article, though, does not summarize all aspects of this or other proposals. Critical mineral discussions, after all, even surfaced as part of the COVID-19 stimulus proposals. *See* James Marshall, *GOP Lawmakers Plead for Minerals Bill in Stimulus*, E&E News, Aug. 6, 2020, https://subscriber.politicopro.com/article/eenews/2020/08/06/gop-lawmakers-plead-for-minerals-bill-in-stimulus-012270.
162. H.R. 3240, 117th Cong. (2021), https://www.congress.gov/117/bills/hr3240/BILLS-117hr3240ih.pdf. The congressman's proposal includes other NEPA-related measures as well, including a maximum 30-month time line and a possible upfront identification in a memorandum of agreement of environmental issues that would be addressed in a NEPA document. *See generally* Rachel Dahl, *Amodei Reintroduces Strategic and Critical Minerals Bill*, Fallon Post, June 1, 2021, https://www.thefallonpost.org/news/3449,amodei-reintroduces-strategic-and-critical-minerals-bill.
163. *See* Press Release, Office of Sen. Lisa Murkowski, Murkowski Introduces Strategic Energy and Minerals Initiative (May 12, 2021), https://www.murkowski.senate.gov/press/release/murkowski-introduces-strategic-energy-and-minerals-initiative. Senator Murkowski's earlier proposal focused on (1) establishing what would be a critical mineral; and (2) assessing and surveying critical mineral resources. It too, however, promoted a streamlined process that would truncate the time for federal review and approval. S. 1317, 116th Cong. (2019), https://www.energy.senate.gov/services/files/7A191CB5-7665-4338-865F-21CCBABB77F7. *See generally* Brown, *Murkowski Resurrects Critical Minerals Bill*, *supra* note 28.
164. *See supra* note 142 and accompanying text. In October 2021, though rejecting acting on mining law reform, a bipartisan group of senators expressed a modicum of willingness to explore mining law reform, if accompanied by measures to expedite mine plan approvals. *See* Dean Scott, *Democrats Warned Against Fast-Tracking Update to U.S. Mining Law*, Bloomberg L., Oct. 5, 2021, https://news.bloomberglaw.com/environment-and-energy/democrats-warned-against-fast-tracking-update-to-u-s-mining-law.
165. *See generally* Dean Scott, *Consensus Eludes Long-Debated Update to 1872 U.S. Minerals Law*, Bloomberg L., July 27, 2021, https://news.bloomberg

Yet, before we can meaningfully assess the appropriate path, a few fundamental cautionary notes. The arguably prevalent assumption is that today's critical minerals—lithium, cobalt, nickel, copper, and rare earths, to name just a few—will remain "critical" over the next several years to such a degree that it is worth possibly degrading potentially sensitive landscapes and our public lands. That assumption is then coupled with a fear that geopolitical circumstances warrant U.S. independence of critical minerals from foreign sources.

History teaches us that we should be tepid about acceding too quickly to either that assumption or fear. After all, today's critical minerals employed in EV batteries eventually might be replaced.[166] We, moreover, could diminish demand for new production by developing more effective recycling programs designed to augment our needed mineral supply.[167] Or we could recognize how processing capacity, not production capacity, often chokes U.S. supply: a California rare earth mine arguably has abundant resources, but its product must be shipped to China for processing.[168]

Also, the nation's history in solving the country's energy woes over roughly the past century cautions against tying our laws to current geopolitical conditions. I suspect the Biden Administration appreciates the interrelated nature of its policies toward liquified natural gas (LNG) exports in the context of the Nord Stream 2 pipeline between Russia and Germany, and the politics of allowing Russia to assert potentially some measure of energy leverage in Europe, which may elevate geopolitical considerations when deciding whether to promote the use of LNG for export markets to lessen Europe's dependence on Russia.[169] Climate change considerations decidedly tilt away from promoting LNG. But history is riddled with such responses that may later prove troublesome.

When, for instance, potash became essential in the manufacturing of explosives during World War I, Congress passed the Potash Leasing Act, which then was superseded by 1927 amendments to the MLA, and so today we have separate provisions for potash and associated minerals in the MLA.[170] The same is true today with helium.[171]

If anything, the history of our responses to contemporary energy issues is illustrative. Hydroelectric generation during the 1940s and 1950s, for instance, was considered a potential dominant resource—only to be shied away from as the environmental movement gained traction in the 1960s and 1970s.[172] Then, nuclear energy arrived on the scene, only to be marred shortly thereafter by untimely accidents and escalating costs.[173] Politics and ill-advised programs marred our mandatory oil import program from the post-World War II era through the next several decades, all contributing to an eventual crisis that, when joined with ill-advised decisions involving natural gas production and associated regulation, led to an (arguably incoherent) energy policy in the 1970s. That policy, while accepting the importance of renewables, promoted coal utilization and production—ultimately western coal development on the nation's public lands.[174]

The architects of the 1970s energy programs, as the mantra of achieving energy independence catapulted to center stage, understood the ramifications, including some of them to climate change, that could unfold with greater reliance on coal. To be sure, they anticipated the U.S. Environmental Protection Agency would, at least, regulate sufficiently to avert adverse health effects from, for instance,

law.com/environment-and-energy/consensus-eludes-much-needed-update-to-1872-u-s-minerals-law.

166. Elon Musk, for instance, lamented the supply problem with nickel. *See* "*Nickel Is Our Biggest Concern": Elon Musk on Tesla Now Producing Cars With Iron Batteries*, Livemint, Feb. 26, 2021, https://www.livemint.com/companies/people/elon-musk-says-nickel-is-biggest-concern-for-electric-car-batteries-11614298037396.html; *see also* Fred Lambert, *Elon Musk Says Tesla Is Shifting More Electric Cars to LFP Batteries Over Nickel Supply Concerns*, Electrek, Feb. 26, 2021, https://electrek.co/2021/02/26/elon-musk-tesla-shifting-more-electric-cars-lfp-batteries-nickel-supply-concerns/; Shanthi Rexaline, *Why Tesla Is Shifting More EVs to Lithium Iron Phosphate Batteries*, Yahoo, Feb. 26, 2021, https://www.yahoo.com/now/why-tesla-shifting-more-evs-230838161.html. Cobalt, at least, might be capable of being removed from some batteries. *See* Chris Hall, *Future Batteries, Coming Soon: Charge in Seconds, Last Months, and Power Over the Air*, Pocket-Lint, Mar. 22, 2021, https://www.pocket-lint.com/gadgets/news/130380-future-batteries-coming-soon-charge-in-seconds-last-months-and-power-over-the-air. Form Energy made news, moreover, when it announced it was developing an iron-air battery, potentially cheaper than a lithium-ion battery. *See generally* Form Energy, *Battery Technology: Enabling a 100% Renewable Grid*, https://formenergy.com/technology/battery-technology/ (last visited Oct. 8, 2021).

167. "Recycling relieves the pressure on primary supply," and "[a] strong focus on recycling . . . will be essential." World Energy Outlook Special Report, *supra* note 4, at 15. The 2021 report targeted recycling for nickel and cobalt recovery from recycled and unconventional sources, and it observed that "[r]ecycling of lithium-ion batteries presents one of the major challenges and opportunities for the United States to bolster its battery supply chain." The White House, *supra* note 43, at 87, 106; *see also id*. at 108-09.

168. John Xie, *California Mine Becomes Key Part of Push to Revive U.S. Rare Earths Processing*, VOA News, Dec. 31, 2020, https://www.voanews.com/usa/california-mine-becomes-key-part-push-revive-us-rare-earths-processing. *See also* James Marshall, *It's Not Just Mining. Refining Holds U.S. Back on Minerals*, E&E News, July 14, 2021, https://subscriber.politicopro.com/article/eenews/2021/07/14/its-not-just-mining-refining-holds-us-back-on-minerals-179844. The lack of processing capacity was a principal conclusion for a 1970s report on five critical minerals. Report to Congress, Comptroller General of the United States, U.S. Dependence on Imports of Five Critical Minerals: Implications and Policy Alternatives I (1976) [hereinafter CG 1976 Report].

169. *See Nord Stream 2: Biden Waives U.S. Sanctions on Russian Pipeline*, BBC News, May 20, 2021, https://www.bbc.com/news/world-us-canada-57180674; Andrea Shalal, *EXCLUSIVE U.S., Germany to Announce Deal on Nord Stream 2 Pipeline in Coming Days—Sources*, Reuters, July 19, 2021, https://www.reuters.com/business/energy/us-germany-announce-deal-nord-stream-2-pipeline-coming-days-sources-2021-07-19/. The Administration reportedly still opposes the pipeline, however. Lesly Clark & Carlos Anchondo, *Biden Administration Stokes Outrage With Deal on Russian Gas Pipeline*, E&E News, July 22, 2021, https://subscriber.politicopro.com/article/eenews/2021/07/22/biden-stokes-outrage-with-deal-on-russia-gas-pipeline-275494.

170. An Act to Authorize Exploration for and Disposition of Potassium, Pub. L. No. 65-49, 40 Stat. 297 (1917) (for chlorides, sulphates, carbonates, borates, silicates, and nitrates of potassium), *repealed by* An Act to Promote the Mining of Potash on the Public Domain, Pub. L. No. 69-579, 44 Stat. 1057 (1927). *See, e.g.*, Notice of Secretary's Order 3324, Oil, Gas, and Potash Leasing and Development Within the Designated Potash Area of Eddy and Lee Counties, NM, 77 Fed. Reg. 71814 (Dec. 4, 2012). *See generally* BLM, *Potash*, https://www.blm.gov/programs/energy-and-minerals/mining-and-minerals/nonenergy-leasable-materials/potash (last visited Oct. 8, 2021).

171. *See supra* notes 88-90 and accompanying text.

172. *See generally* Robert R. Nordhaus & Sam Kalen, Energy Follies: Missteps, Fiascos, and Success of America's Energy Policy (2018), *passim*.

173. *Id.*

174. *Id.*

sulfur standards. They, of course, were too optimistic; and they miscalculated how the future would unfold.[175] Technology, markets, and a changing society all contributed to changes that our laws could not keep pace with—and that today still linger and present problems.[176]

These past reactions counsel that, when examining today how or whether to promote critical mineral production and embrace streamlining or mining law reform, the nation act deliberately—appreciating the existential threat of climate change but not unwisely compromising the future of our treasured public land resources. Perhaps uranium mining on public lands in Wyoming can be tolerated, while such mining near a crown jewel, the Grand Canyon, is too inimical.[177] So too lithium mining in the Salton Sea may be less likely to engender widespread concern,[178] while such mining at Thacker Pass near the Nevada/Oregon border seems problematic.[179]

And what about the fluid nature of what minerals are critical. Is uranium a critical mineral? DOI recently signaled perhaps not, while the same administration floated developing a uranium reserve—arguably without sufficient analysis of the concept of developing stockpiles.[180] Lithium, seemingly a poster child for critical minerals, is widely touted for its function in EV batteries. And yet, as one source notes, "[w]hile lithium has long been touted as the future of advanced batteries, the technology's limitations and accidents at lithium facilities have encouraged manufacturers to consider alternatives to power the battery revolution."[181] Battery manufacturers, consequently, are pursuing an array of technologies that would render lithium less necessary in the net-zero carbon economy—and while we cannot predict which one will emerge as dominant, we can be assured that lithium will soon become less critical![182]

Five points, therefore, ought to drive discussions designed to facilitate greater U.S. production of critical minerals. First, the phrase "critical minerals" is overly capacious. Gold might oddly make someone's list of critical minerals, and yet today it is primarily used for jewelry.[183] Also, lumping all minerals together for similar treatment seems sloppy. Processing capacity, not resource availability, affects U.S. lithium availability. Here, we might take a page from the past: during the 1970s, GAO recommended that policy ought to reflect the unique markets for specific minerals.[184] That seems even more sensible today, given the fast pace of technological change and our almost myopic

175. *Id.*

176. *Id. Cf.* Joshua C. Macey, *Zombie Energy Laws*, 73 Vand. L. Rev. 1077 (2020).

177. *See* H.R. 803, Protecting America's Wilderness and Public Lands Act, 117th Cong. (2021) (includes the Grand Canyon Protection Act, banning mining on about one million acres near the Grand Canyon). *See* Daniel Modlin, *America's Most Iconic Natural Wonder Has a Uranium Mine Next Door*, Daily Beast, Apr. 11, 2021, https://www.thedailybeast.com/the-grand-canyon-americas-most-iconic-natural-wonder-has-a-uranium-mine-next-door. Even President Trump DOI Secretary Ryan Zinke questioned mining near Yellowstone National Park. Dylan Brown, *Zinke Pushes for Mining Ban Near Park*, E&E News, Aug. 29, 2017, https://subscriber.politicopro.com/article/eenews/2017/08/29/zinke-pushes-for-mining-ban-near-park-054598.

178. *See* Aaron M. Cantú, *In Search of "Lithium Valley": Why Energy Companies See Riches in the California Desert*, Guardian, Sept. 27, 2021, https://www.theguardian.com/us-news/2021/sep/27/salton-sea-california-lithium-mining; Sammy Roth, *Lithium Start-Up Backed by Bill Gates Seeks a Breakthrough at the Salton Sea*, L.A. Times, Mar. 16, 2020, https://www.latimes.com/environment/story/2020-03-16/lithium-startup-lilac-solutions-bill-gates-salton-sea; Elliot Spagat, *Electric Vehicles Need Batteries. Those Need Lithium. That's Where the Salton Sea Comes In*, Chi. Sun-Times, Aug. 31, 2021, https://chicago.suntimes.com/business/2021/8/31/22650462/lithium-fuel-salton-sea-batteries-electric-vehicles-california-energy-evs-geothermal-power; Mark Vaughn, *GM Will Suck Lithium From the Salton Sea to Make Batteries*, Autoweek, July 15, 2021, https://www.autoweek.com/news/green-cars/a37029490/gm-will-suck-lithium-from-the-salton-sea-to-make-batteries/.

179. While I suspect the decision or its effect will not survive, indigenous peoples recently were denied the ability to protect potentially important cultural resources at the Thacker Pass mining site, arguably reflective of the problematic nature of our existing process. *See* Associated Press, *Tribes Lose Bid to Block Digging at Lithium Mine in Nev.*, E&E News, Sept. 7, 2021, https://subscriber.politicopro.com/article/eenews/2021/09/07/tribes-lose-bid-to-block-digging-at-lithium-mine-in-nev-280270. In Arizona, species concerns continue to surface in connection with copper mining. *See* Michael Doyle & James Marshall, *Ariz. Mine Developer Loses Bid to Shrink Jaguar Habitat*, E&E News, Sept. 3, 2021, https://subscriber.politicopro.com/article/eenews/2021/09/03/ariz-mine-developer-loses-bid-to-shrink-jaguar-habitat-280223; James Marshall, *Succulent Near Ariz. Copper Project Gets ESA Protection*, E&E News, Aug. 31, 2021, https://subscriber.politicopro.com/article/eenews/2021/08/31/succulent-near-ariz-copper-project-gets-esa-protection-280125. S*ee also* Jael Holzman, *USGS Proposal Yanks Uranium From Critical Minerals List*, E&E News, Nov. 9, 2021, https://www.eenews.net/articles/usgs-proposal-yanks-uranium-from-critical-minerals-list/.

180. *See* Marshall, *Interior Poised to Nix Uranium From "Critical Mineral" List*, *supra* note 33; Request for Information Regarding Establishment of the Department of Energy Uranium Reserve Program, 86 Fed. Reg. 44007 (Aug. 11, 2021).

181. Umar Ali, *Beyond Lithium: Alternative Materials for the Battery Boom*, Power Tech., Feb. 6, 2020, https://www.power-technology.com/features/lithium-battery-alternatives/.

182. *See*, *e.g.*, Bogdan Petrovan, *10 Alternatives to Lithium-Ion Batteries: Which New Tech Will Power the Future?*, GreenAuthority, Apr. 28, 2021, https://greenauthority.com/10-alternatives-to-lithium-ion-batteries-79/. *See also* Ryan Brown, *Zinc-Ion Batteries Are a Scalable Alternative to Lithium-Ion*, POWER Mag., Jan. 4, 2021, https://www.powermag.com/zinc-ion-batteries-are-a-scalable-alternative-to-lithium-ion/; David Castelvecchi, *Electric Cars and Batteries: How Will the World Produce Enough?*, 596 Nature 336 (2021), https://media.nature.com/original/magazine-assets/d41586-021-02222-1/d41586-021-02222-1.pdf; Michael Taylor, *Developer of Aluminum-Ion Battery Claims It Charges 60 Times Faster Than Lithium-Ion, Offering EV Range Breakthrough*, Forbes, May 13, 2021, https://www.forbes.com/sites/michaeltaylor/2021/05/13/ev-range-breakthrough-as-new-aluminum-ion-battery-charges-60-times-faster-than-lithium-ion/?sh=5a3f73786d28. *Cf. New EV Battery Designs Unlikely to Dampen Metals Demand, Miners Say*, Reuters, Aug. 6, 2021, https://www.reuters.com/news/picture/new-ev-battery-designs-unlikely-to-dampe-idUSKBN2F7249. Others have begun to explore the human rights implications of continuing to use lithium, nickel, and cobalt in EV batteries. Editorial, *Lithium-Ion Batteries Need to Be Greener and More Ethical*, 595 Nature 7 (2021), https://media.nature.com/original/magazine-assets/d41586-021-01735-z/d41586-021-01735-z.pdf; Maddie Stone, *The U.S. Wants to Make EV Batteries Without These Foreign Metals. Should It?*, Grist, June 30, 2021, https://grist.org/transportation/the-us-wants-to-make-ev-batteries-without-these-foreign-metals-should-it/.

183. *See* Notice, Final List of Critical Minerals 2018, 83 Fed. Reg. 23295 (May 18, 2018). In 1982, for instance, GAO testified that "strategic" ought to relate to risk of supply disruption, while "critical" embraces the consequences of that risk occurring. Douglas L. McCullough, Deputy Director, Energy and Minerals Division, GAO, Statement Before the Subcommittee on Energy and Mineral Resources, Senate Committee on Energy and Natural Resources, on Strategic and Critical Minerals and Materials (1982). A year earlier, the agency identified gold as just such a mineral. Letter from GAO, to Henry M. Jackson, Ranking Minority Member, Senate Committee on Energy and Natural Resources, Minerals Critical to Developing Future Technologies, Their Availability, and Projected Demand 3 (June 25, 1981). Gold admittedly is used in some electronics. *See* Christopher McFadden, *How Much Gold Is in Your Computer and How Efficient It Is to Reclaim It*, Interesting Eng'g, Sept. 20, 2020, https://interestingengineering.com/how-much-gold-is-in-your-computer-and-how-efficient-it-is-to-reclaim-it.

184. CG 1976 Report, *supra* note 168.

focus on production rather than processing capacity and recycling opportunities.

Second, we ought to avoid fashioning today's federal programs on the assumption that geopolitical considerations dictate that we unwisely risk threatening our public lands. To be sure, we will need enough supply of resources for a green economy and to avoid being overly dependent upon potentially unreliable imports. Notably, though, some critical minerals are produced in countries that are U.S. allies, such as Canada and Australia. The country's relentless effort to develop a coherent fuel and nonfuel mineral policy demonstrates a propensity for hubris and yet shortsightedness, warranting a careful analysis of prior efforts and looking holistically at the future horizon. And the long-term future of our public lands ought to be shielded from precipitous decisions.

Third, a critical minerals policy ought to promote sustainable environmental practices and socially responsible mining. The Center for Strategic and International Studies (CSIS), for instance, describes how the U.S. industry should foster a social license to operate in the communities where mining might occur, by working with stakeholders to develop a consensus around responsible development.[185] And environmentally responsible mining ought to serve as the touchstone: lithium mining, for instance, should occur only where its impacts are close to benign. The Salton Sea possesses large lithium deposits that reportedly can be mined in an environmentally sensitive manner.[186]

That should be coupled with promoting responsible practices for companies importing critical minerals into the United States. The abuses flowing from cobalt mining in the Democratic Republic of the Congo are unfathomable.[187] U.S. policy cannot tolerate such human rights abuses; our policy must ensure sound labor practices along with environmental stewardship, demand economic transparency in third-world countries where money might otherwise be siphoned off from the citizenry, and strengthen corporate disclosure requirements and Foreign Corrupt Practices Act (FCPA) protections.[188] It also would mean developing a robust domestic recycling program: CSIS warns that, with a reduced international market for scrap materials, "a domestic market for the end-use" of critical minerals "is a critical first priority, as commodities must reach a critical mass to become profitable to recyclers."[189]

Fourth, we should accept that some critical mineral production here in the United States is unavoidable, but that to allow it to occur on public lands demands reforming the 1872 Mining Law. The typical details of mining law reform have been around for decades. The United States must receive a fair return for private exploitation of hardrock mineral resources. Companies ought to contribute to a fund for reclaiming old, contaminated mining sites. Mining on public lands should be a privilege, not a right—one that is within the discretion of the land managing agency to decide if, where, and when mining arguably *could* occur. Perhaps the only essential element not sufficiently addressed previously is ensuring that Native American Nations and indigenous peoples can decide whether mining can occur in an area that might directly or indirectly impact their reservations, resources (such as water, subsistence, or hunting and fishing rights), or traditional cultural properties.[190]

And, finally, perhaps the time is ripe to relent and agree that some measure of streamlining is appropriate to avoid protracted permitting processes.

B. *Streamlining: Meaningful or Meaningless Mantra?*

Calls for streamlining the NEPA process have become a seemingly bipartisan common ground, where detractors fear treading. Since the 1980s, we have witnessed endless diatribes about alleged delays caused by NEPA and the corresponding desire to make the process quicker and more efficient. President George W. Bush established a task force for streamlining the review and approval of energy projects.[191] In the Energy Policy Act of 2005, Congress pro-

185. Sarah Ladislaw et al., Center for Strategic and International Studies, Critical Minerals and the Role of U.S. Mining in a Low-Carbon Future (2019).

186. *See supra* note 178.

187. *See* Nicholas Niarchos, *The Dark Side of Congo's Cobalt Rush*, New Yorker, May 24, 2021, https://www.newyorker.com/magazine/2021/05/31/the-dark-side-of-congos-cobalt-rush. Even the conservative Heartland Institute invokes these human rights abuses when it ironically fights against climate change. H. Sterling Burnett, *Green Energy Policies Are Built on Slavery, Child Labor*, Heartland Inst., June 3, 2021, https://www.heartland.org/news-opinion/news/green-energy-policies-are-built-on-slavery-child-labor. And recently some Republicans would favor blocking imports from a Taliban-controlled Afghanistan, although it seems likely that this effort is less about human rights than about promoting domestic mining. *See* James Marshall, *Republicans Push Administration on Afghan Mineral Riches*, E&E News, Sept. 14, 2021, https://subscriber.politicopro.com/article/eenews/2021/09/14/republicans-push-administration-on-afghan-mineral-riches-280538; James Marshall, *House Republicans Float Bill to Block Afghan Mineral Imports*, E&E News, Aug. 25, 2021, https://subscriber.politicopro.com/article/eenews/2021/08/25/house-republicans-float-bill-to-block-afghan-mineral-imports-279998.

188. *See* World Energy Outlook Special Report, *supra* note 4. This might require exploring the approach of the European Union and tinkering with §1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, and a conflict minerals rule. *Cf.* National Ass'n of Mfrs. v. Securities & Exch. Comm'n, 800 F.3d 518, 45 ELR 20155 (D.C. Cir. 2015) (conflict minerals rule for disclosure of Tg3 minerals—tin, tantalum, tungsten, and gold—produced in and around the Democratic Republic of the Congo violated First Amendment). It further requires reversing the Trump Administration's lax enforcement of the FCPA. *See* Renae Merle, *Trump Called Global Anti-Bribery Law "Horrible." His Administration Is Pursuing Fewer New Investigations*, Wash. Post, Jan. 31, 2020, https://www.washingtonpost.com/business/2020/01/31/trump-fcpa/.

189. Ladislaw et al., *supra* note 185, at 4. *See also* Dominish et al., *supra* note 15, at 18.

190. *See Hearing on Mining Law Reform Focused on Protecting Native American Rights and Interests*, 117th Cong. (2021) (statement of Rep. Raúl Grijalva). *See also* Scott, *Consensus Eludes Long-Debated Update to 1872 U.S. Minerals Law*, *supra* note 165. In September 2021, several Tribal Nations, indigenous peoples, and environmental organizations petitioned DOI to engage in a rulemaking to address threats to indigenous and public lands from mining. Notice of Petition and Petition for Rulemaking Bringing Hardrock Mining Regulations and Policy Into the 21st Century to Protect Indigenous and Public Lands Resources in the West, Sept. 16, 2021, https://www.biologicaldiversity.org/programs/public_lands/mining/pdfs/APA_DOI_Petition_091621.pdf.

191. Exec. Order No. 13212, Actions to Expedite Energy-Related Projects, 66 Fed. Reg. 28357 (May 22, 2001); Exec. Order No. 13274, Environmental Stewardship and Transportation Infrastructure Project Reviews, 67 Fed.

moted a presumably more efficient process for the review of natural gas pipelines along with the siting of electric transmission facilities.[192]

President Obama and Congress collectively agreed that the economic stimulus package to address the 2008 recession should include provisions for facilitating interagency coordination on NEPA implementation and expedition for transportation-related infrastructure projects. President Obama subsequently signed the FAST Act, furthering a growing chorus promoting NEPA streamlining.[193] The FAST Act contained provisions for "streamlin[ing] the environmental review and permitting process to accelerate project approvals."[194]

The Trump Administration aggressively pursued streamlining. Upon entering office, President Trump issued Executive Order No. 13766, Expediting Environmental Reviews and Approvals of High Priority Infrastructure Projects.[195] He announced how his Administration would conform to a policy

> to streamline and expedite, in a manner consistent with law, environmental reviews and approvals for all infrastructure projects, especially projects that are a high priority for the Nation, such as improving the U.S. electric grid and telecommunications systems and repairing and upgrading critical port facilities, airports, pipelines, bridges, and highways.[196]

He followed up with Executive Order No. 13783, Promoting Energy Independence and Economic Growth, directing that agencies review their regulations, policies, guidance, and orders to discern where unnecessary obstacles, delays, or costs might be impeding "siting, permitting, production, utilization, transmission, or delivery of energy resources."[197] Only a few months later, he issued yet another Executive Order, Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure.[198] The Executive Order posits that "[i]nefficiencies in current infrastructure project decisions, including management of environmental reviews and permit decisions or authorizations, have delayed infrastructure investments, increased project costs, and blocked the American people from enjoying improved infrastructure that would benefit our economy, society, and environment."[199]

A common theme pervading these streamlining entreaties is targeting coordination and timetables for NEPA compliance. The Establishing Discipline Order emphasizes interagency coordination and completion of environmental reviews and authorizations for infrastructure projects (broadly defined) within two years.[200] The Trump Administration's embrace of having one federal decision presumably provides a forum for promoting coordination. And the Council on Environmental Quality's (CEQ's) attempted revamping of its 1978 regulations would promote developing shorter, quicker, and arguably less informative NEPA documents.[201] Following suit, both the Trump Administration BLM and Forest Service promoted policies aimed at reducing alleged NEPA delays—favoring alternatives to developing an EIS, developing shorter documents, and touting time lines.[202]

These streamlining efforts admittedly respond to some legitimate concerns about the ability to coordinate and timely produce environmental documents. To be sure, the lack of agency coordination or incentives to move the process along efficiently and timely has fostered some delay. Much of the clamor, however, appears motivated by fabricated strawmen—projecting, for instance, that NEPA litigation is unduly dilatory or that the process itself is unnecessarily time-consuming. Most NEPA decisions

Reg. 59449 (Sept. 23, 2002); White House Task Force on Energy Project Streamlining, 68 Fed. Reg. 8607 (Feb. 24, 2003) (notice and request for comment). Some of the streamlining history is chronicled in Sam Kalen, *NEPA's Trajectory: Our Waning Environmental Charter From Nixon to Trump*, 50 ELR 10398 (May 2020).

192. The Federal Energy Regulatory Commission (FERC) became the lead agency responsible for channeling and coordinating the various federal authorizations associated with the review of natural gas infrastructure projects; and §1221 of the 2005 Act focused on transmission facilities. Pub. L. No. 109-58, 119 Stat. 594, 688-91, 946-51.

193. Pub. L. No. 114-94, 129 Stat. 1312 (2015); *see also* H. Rep. No. 114-357, FAST Act Conference Report to Accompany H.R. 22, at 497 (2015) (Joint Explanatory Statement of the Committee of the Conference).

194. H. Rep. No. 114-357, *supra* note 193, at 498. Previous programs included the 2012 Moving Ahead for Progress in the 21st Century Act, Pub. L. No. 112-141, 126 Stat. 405. The earlier 2005 Surface Transportation Project Delivery Program allowed states an expanded role in implementing NEPA. Safe, Accountable, Flexible, Efficient Transportation Equity Act, Pub. L. No. 109-59, 119 Stat. 1144 (2005). The 2005 streamlining effort included a limited period for judicial review, as well. Pub. L. No. 109-59, §6002(l), 119 Stat. 1144, 1864-65 (2005). Congress first included a program in the 1998 Transportation Equity Act for the 21st Century (TEA-21). Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, 112 Stat. 107 (1998), *amended by* Pub. L. No. 105-206, 112 Stat. 685 (1998). James Tripp and Nathan Alley explain how TEA-21 was partly fashioned from the ad hoc streamlining process for federally funded highway projects. James T.B. Tripp & Nathan G. Alley, *Streamlining NEPA's Environmental Review Process: Suggestions for Agency Reform*, 12 N.Y.U. Env't L.J. 74, 98 n.99 (2003).

195. Exec. Order No. 13766, 82 Fed. Reg. 8657 (Jan. 30, 2017).

196. *Id.* The Executive Order directed the Council on Environmental Quality (CEQ) chairman to "coordinate with the head of the relevant agency to establish, in a manner consistent with law, expedited procedures and deadlines for completion of environmental reviews and approvals for such projects." *Id*. President Trump subsequently issued another Executive Order establishing an advisory council on infrastructure. Exec. Order No. 13805, Establishing a Presidential Advisory Council on Infrastructure, 82 Fed. Reg. 34383 (July 25, 2017).

197. Exec. Order No. 13783, 82 Fed. Reg. 16093 (Mar. 31, 2017).

198. Exec. Order No. 13807, Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects, 82 Fed. Reg. 40463 (Aug. 24, 2017).

199. *Id.*

200. *Id*. at 40468.

201. Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 43304 (July 16, 2020). The regulations have been remanded, but not vacated. Wild Va. v. Center on Env't Quality, 2021 WL 2521561 (W.D. Va. June 21, 2021) (claims not justiciable), *appeal pending*. CEQ proposed some new implementing regulations in October 2021. National Environmental Policy Act Implementing Regulations Revisions, 86 Fed. Reg. 55757 (Oct. 7, 2021).

202. *See, e.g.*, Memorandum from Ryan Zinke, Secretary, U.S. Department of the Interior, to Acting Director, BLM, Improving the Bureau of Land Management's Planning and National Environmental Policy Act Processes (Mar. 27, 2017), *reprinted at* 82 Fed. Reg. 50551 (Nov. 1, 2017); Advance Notice, Locatable Minerals, 83 Fed. Reg. 46451 (Sept. 13, 2018); 85 Fed. Reg. 18186 (Apr. 1, 2020) (announcing EIS for rule).

involve either the preparation of an environmental assessment or the reliance on a categorical exclusion, both of which are not prolonged processes.

As of 2018, there were roughly 728 nonfuel mining operations able to mine on public lands under the 1872 law.[203] Between 2010 and 2014, according to the GAO, BLM and the Forest Service approved 68 mining plans of operation, taking on average only two years to complete their review. Some plans were approved within one month, while concededly some took more than 11 years, however. Of course, several mining proposals, such as the proposed Pebble Mine in Alaska, the copper mines in Arizona, or the mine in Minnesota, are quite controversial, undoubtedly contributing to longer permitting times and skewing the perception of delay. But GAO's survey suggests that agency officials attributed the longer review periods to 13 factors, primarily the lack of sufficient information provided by the operator and insufficient funding for the hard-rock mining program.

What, therefore, ought to be a palatable streamlining element of mining law reform, promoting critical mineral production but only where appropriate? At the outset, streamlining does not mean compromising the sufficiency of examining the effects and alternatives to a proposed agency action. It does not mean shorter documents; it does not mean unworkable generic timetables, but rather tenable, negotiated timetables tied to the specific circumstances of each proposal. Indeed, it ought to countenance even more robust analyses to ensure sounder decisions about the actual criticalness of the mineral and the appropriateness of it being mined in a particular location. It favors inviting the entire federal family to the table to assess the urgency or supply chain risks for a particular mineral presently or in the near future.

This could prove to be a more flexible, realistic, and iterative forum than the current process by USGS—USGS, though, would naturally participate in this process as well. And more concretely, it means, first, elevating the role programmatic NEPA documents could play in improvements to public land management planning, and second, addressing procedural reforms for NEPA compliance as each new project comes forward. Here, I only offer some broad contours for initiating the conversation.

Effective streamlining requires meaningful improvements to public land management planning. In conjunction with instituting a leasing process for critical minerals on public lands, in lieu of the antiquated 1872 Mining Law, BLM and the Forest Service could emulate the programs for onshore wind and solar: they could solicit input from the federal family and interested public about the criticalness of various minerals, with an opportunity to revisit and amend any decision document as the criticalness of a mineral changes; they could identify regions suitable for mining leases where adverse effects can be minimized or sufficiently mitigated.

This ought to entail comprehensive stakeholder involvement, designed to elicit early concerns about potentially sensitive areas. It could, as well, ensure that sufficient lands remain protected as the nation strives to conserve 30% of its land resources by 2030.[204] This also could furnish a forum for identifying potentially necessary migration corridors, as climate change exacerbates migration paths for species and their habitat affected by climate change.

The programmatic EIS accompanying this land management planning process could then assist in streamlining the NEPA process for subsequent leasing and mining plan reviews. Presumably, projects in sensitive areas will be avoided rather than stumble incessantly through a quagmire like with the Pebble Mine proposal. Subsequent NEPA documents for less overtly troublesome mining plans could then tier off the programmatic EIS. Then, either the FPISC or CEQ could be engaged to assist, monitor, and coordinate the review and permitting for site-specific critical mineral activities.[205]

Agencies also should develop better guidance for how to engage in pre-mine plan submittal meetings between the land agencies and the operator, inviting participation by other agencies and Tribal Nations as well.[206] Preliminary screening for areas of importance to Tribal Nations and indigenous groups, as well as for the presence of protected or sensitive species or potentially adverse effects on water quality, is essential. Next, agency budgets should be commensurate with their obligations; with resources (people and money) and motivation, an EIS can be prepared thoroughly and timely.

And if all of this is done deliberately and with adequate information, a national assessment of the likely critical mineral production from the nation's public lands might be attainable and available to assist policymakers in decisions about the transition to a green economy.

IV. Conclusion

The propriety of reforming the 1872 Mining Law has been lingering almost since its inception. The fear of U.S. vulnerability to the geopolitical forces that may affect the nation's access to critical minerals has been part of an ongoing conversation about mineral policy and U.S. domestic supply of minerals for more than 75 years. Yet we once again are confronted with dialogues about both. Achiev-

203. GAO Letter to Chairman Grijalva, *supra* note 64.

204. *See* Conserving and Restoring America the Beautiful, A Preliminary Report to the National Task Force Recommending a Ten-Year, Locally Led Campaign to Conserve and Restore the Lands and Waters Upon Which We All Depend, and That Bind Us Together as Americans (2021).

205. The trend concededly is away from having CEQ perform this function, but a sufficiently staffed CEQ might tilt toward ensuring the adequacy of NEPA documents, promote sounder decisionmaking that allows for monitoring and adaptation, and provide stakeholders with greater comfort that decisions are not politically driven as administrations change.

206. GAO, Hardrock Mining: BLM and Forest Service Have Taken Some Actions to Expedite the Mine Plan Review Process but Could Do More (2016) (GAO-16-165). About 10% of public lands are acquired lands subject to leasing. Congressional Research Service, R42346, Federal Land Ownership: Overview and Data (2020).

ing a net-zero carbon economy goal while simultaneously securing a supply chain capable of serving a green technological transition suggests that maintaining the status quo is potentially problematic.

Mining historian Duane A. Smith wrote in 1987 that "[m]ining and the American people have to plan for the long term, so that generations one hundred or more years from now will find 'a future not by default, but by design.'"[207] Critical minerals integral for clean energy resources and a world dominated by semiconductors suggests that, unless the United States accepts the geopolitical risks previously infecting fossil fuel dependence, the United States ought to tap some of its available resources. But mining ought to be allowed only if we can be assured, through planning, that it can occur in areas far removed from cultural resources, and in an environmentally acceptable manner with negligible impacts to landscapes and ecosystems.

207. Smith, *supra* note 91, at 170.