

THE WAR BELOW: LITHIUM, COPPER, AND THE GLOBAL BATTLE TO POWER OUR LIVES

By Ernest Scheyder
Reviewed by Timothy J. Lundgren[*]

I. INTRODUCTION

The War Below's Prologue describes a botanist, Jerry Tiehm, who was collecting samples of Nevada flowers and plants for the New York Botanical Garden in 1983 when he came upon clusters of a small, flowering plant at a place called Rhyolite Ridge, which he collected and returned to New York. The plant he found was a previously unknown species, which came to be called "Tiehm's buckwheat." It turned out that this plant grows only on this one ridge in Nevada and nowhere else on Earth. In 2016, it was also discovered that this same ridge contains a large deposit of lithium, which the mining company ioneer proposes to extract via open pit mining. Thus, the book establishes its central dilemma and neatly encapsulates in it the competition of interests between preservation of biological diversity in the form of this rare flower and access to minerals necessary for the technologies needed to battle climate change, in the form of this lithium deposit. The rest of the book explores these competing interests across several examples spanning continents; across a set of five critical minerals that all agree are necessary to combat climate change, to continue driving technological change, as well as to promote national security; and across changes in governmental policy and governing political party.

The Prologue is followed by an Introduction that provides a quick primer on the Paris Climate Accords and global concerns over climate change. This is followed by a brief summary of the importance of lithium-ion batteries to global attempts to move away from fossil fuels as primary energy sources and of the minerals necessary for these batteries, as well as such associated technologies as wind turbines and Teslas. The minerals of primary interest here are lithium, nickel, cobalt, copper, antimony, and rare earth minerals. Scheyder presents this information as a bulleted list of statistics and facts, such as that two of the world's largest lithium companies are Chinese and that the Chinese control much of the world's lithium processing capability. Meanwhile, the US has enough untapped lithium supply to build millions of EVs but produces only small amounts and has no large-scale processing facilities.[1] In fact, the US is expected to produce 3% of the world's annual lithium needs by 2030 despite holding about 24% of the world's lithium reserves. Similar facts are presented for copper, nickel, cobalt, and rare earths.[2] He notes auto industry concerns that at least 90% of the battery supply chain — including mines — that are needed to meet EV transformation targets for

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1. ERNEST SCHEYDER, THE WAR BELOW: LITHIUM, COPPER, AND THE GLOBAL BATTLE TO POWER OUR LIVES 10 (2024) [hereinafter THE WAR BELOW].

2. *Id*. at 10-11.

the global transportation sector do not exist yet.[3] By contrast, he points out that by 2023 China "had cemented its EV supply chain process and it cost about 10,000 euros less to build an EV in China than in Europe."[4]

In his Introduction, Scheyder also highlights conflicts between policy goals and what happens in actual practice, stating that "[t]he United States wants to go green, but to do that, it will need to produce more metals, especially lithium, rare earths, and copper. That means more mines."[5] At the same time, government agencies and regulation have made opening new mines in the US all but impossible.[6] Such clashing policies in governmental agencies, across both Democratic and Republican administrations, are thus another theme of the book. As one example of a lack of alignment within government, Scheyder explains that magnets made from rare earth minerals are necessary for modern fighter jets, laser-guided missiles, and military-grade night vision goggles.[7] Yet, he observes that "[w]hile the Pentagon grew increasingly concerned at the dawn of the twenty-first century about China's control of the industry that makes rare earths and other weapons-grade minerals, one of its divisions for years, under Democratic and Republican presidencies alike, sold domestic stockpiles of minerals considered strategic."[8]

II. VARIOUS MINING PROJECTS AND THE QUESTIONS THEY FRAME

In the chapters that follow, the book explores such timely questions as: Can we as a nation prevent critical materials from being used as leverage against us by others hostile to our interests? Can we produce the minerals necessary for a clean energy future either domestically or in other countries under environmental and labor standards we approve of? Despite the need for these minerals, are some places too special to mine, such as sacred sites, sites of special natural beauty, or sites reserved for public recreational use? The book is successful in highlighting the voices and interests on either side of these key questions but does not advocate for one point of view or another. Instead, the goal seems to attempt to spark a conversation between these competing views, which might lead to more consistent and successful approaches to addressing our need for these critical minerals going forward. The book raises as many questions as it answers, but it demonstrates plainly that relying on vacillating policies changing with each change in administration or political commitments to competing goals that prevent a focused and efficient approach to the challenges faced by this transition cannot succeed in enabling us to meet our needs for these critical minerals.

Over the course of eight chapters (Chapters 2, 5-8, 10, 11 & 14), Schreyder provides a series of case studies on attempts to mine minerals necessary for the renewable energy transition and the challenges these attempts face, both in the US and by US-based companies abroad. Here we learn about the importance of copper, nickel, cobalt, rare earths, and antimony, in addition to lithium, for addressing climate change. We also explore the viewpoints of key players in these conflicts,

3. *Id.* at 12-13.
4. *Id*. at 13.
5. THE WAR BELOW, *supra* note 1, at 14.
6. *Id*. at 19.
7. *Id*. at 98.
8. *Id*. at 14.

such as Native American tribes who are often impacted by these mines. So, in Chapter 2, Scheyder provides a brief history of the San Carlos Apache and their struggles, physical, cultural, and economic, with the US government and mining interests. He also highlights the history of mining in the area of their reservation and the economic boom/bust cycle so characteristic of 20th century mining which has left behind poverty and decaying facilities. Things looked up for the region economically when one of the largest untapped copper deposits in the world was found to be underneath an area known as Oak Flat and the Resolution Copper mine was proposed. However, this copper deposit is very deep, so the proposed method for accessing it involved "block caving," which Scheyder describes thus: "[A] large section of rock is undercut, creating an artificial cave that fills with its own rubble as it collapses under its own weight. That would cause a crater 2 miles wide and 1,000 feet deep."[9] However, Oak Flats is also sacred to the San Carlos Apache, so, as Schreyder frames it, "to harvest the copper would require the destruction of a site considered as important to the San Carlos Apache as St. Peter's Basilica is to Roman Catholics or al-Masjid al-Harām is to Muslims."[10] This and other concerns (environmental impacts, water use, etc.) have prevented successful permitting of the project, the process for which began in 2013. Across the intervening Democratic and Republican administrations, mixed signals and conflicting messages of support and opposition were received regarding the fate of the proposed mine. Furthermore, fierce opposition from those who see the site as sacred has given the mining company, Rio Tinto, pause. Exploring the viewpoints of those on both sides of this dispute, Scheyder admits that he keeps asking himself questions like, "Who should get to make a decision about whether their religious site was worth destroying for a metal that could help stem climate change?"[11]

In Chapter 11, we revisit the San Carlos Apache briefly, when we learn that they supply water necessary to operate the Morenci Copper Mine in Arizona.[12] The operator of the Morenci mine proudly noted (Scheyder tells us) that they "are very close to the San Carlos Apache."[13] As Scheyder notes, the water sales agreement "showed that the San Carlos Apache tribe was not opposed to copper or the green energy transition as a matter of policy."[14] He does note, however, that there is a difference between building a new mine and continuing to operate an existing one.[15] Back in Chapter 2, he also noted that there could be some flexibility on the part of Rio Tinto as to the mode of mining at Resolution and the level of cultural impact that might result.[16] Thus, Schreyder suggests implicitly if not explicitly that these conflicts may not be as intractable as they first appear, that parties may not be as dug-in to their opposing positions as one might assume — leaving room for hope that dialogue might help engender compromises.

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9. THE WAR BELOW, *supra* note 1, at 37.
10. *Id*.
11. *Id*. at 49-50.
12. *Id*. at 213, 218-19.
13. THE WAR BELOW, *supra* note 1, at 219.
14. *Id*. at 218.
15. *Id*. at 218-19.
16. *Id*. at 52-53.

Chapter 8, titled "Rebirth," appears in the middle of the volume and provides a similar contrast between two mines whose paths may help chart some paths forward. Here we're introduced to the Perpetua Resources Corporation's attempts to reopen mining at Yellow Pine, Idaho, and provided a summary of the attempts to open the Pebble Mine in Alaska. At Yellow Pine, the mineral of interest is antimony, which is a metal recognized since World War II as important for national security, as it is used in hardening bullets, tanks, and other armaments, as well as being used in flame retardants.[17] Antimony was mined heavily in the area, at the nearby Stibnite mine, to supply the US's war needs during the Second World War. The Stibnite mine, which used to produce gold and antimony, ceased large-scale mining in the 1950s.[18] It has now long been shuttered and neglected, largely due to environmental contamination from prior operations, its designation as a Superfund site, and resistance from the local Nex Perce tribe to further mining. However, by the start of the 21st century, Scheyder tells us, antimony was recognized as necessary for a transition to renewable energy, as it is used in making the glass used in solar panels and cell phones, to coat copper wiring in EVs, and in semiconductors.[19] Interest in the area's possible additional reserves of both antimony and gold led to an offer from Perpetua, a mining company run by financier John Paulson, to clean up the former contamination and reopen a mine with modern environmental controls. This is an interesting potential model — a new mining operation willing to undertake remediation of historical contamination at an orphan site in exchange for the ability to develop a new mine under modern environmental standards — but one does wonder how generalizable it is to other sites. Scheyder notes in his Epilogue that Perpetua and the Nez Perce tribe have reached an accord on a key issue that was preventing development of the mine and it appears that the project is likely to move forward.[20]

Scheyder closes out Chapter 8 by balancing his account of the Perpetua Company's efforts against those of the proposed Pebble Mine in Alaska, which Scheyder notes, "is in a wilderness that has never been touched before."[21] The Pebble Mine project, proposed for one of the largest untapped copper and gold resources in the world, has faced a stop-and-start regulatory approval process as federal administrations change and policy priorities shift. Conservation groups have taken advantage of the delays to buy up land around the project site in an effort to prevent the company from building an access road.[22] But the underlying point Scheyder appears to be making in his comparison of the Pebble and Yellow Pine mines is that, as with the examples of the Resolution and Morenci copper mines, while people may be willing to allow further mining at sites with a history of such activities, new mines in pristine sites or those with deep cultural significance may be less worth spending effort on attempting to establish. This may not be a surprising insight, but it could help to prioritize efforts by governmental agencies and mining

17. THE WAR BELOW, *supra* note 1, at 151.
18. *Id*. at 154.
19. *Id*. at 157-158.
20. *Id*. at 296.
21. THE WAR BELOW, *supra* note 1, at 165.
22. *Id*. at 169.

companies alike, at least initially, on sites that provide a greater likelihood of achieving approval for operation on a reasonable time frame.

A similar dynamic plays out in several chapters devoted to attempts to mine lithium (Chapters 1, 7, 9, 10 & 15). Here, we go deeper into the Rhyolite Ridge story (Chapters 1, 9 & 15), learn about the Thacker Pass project (Chapter 7), and learn about how a community has apparently successfully fended off a proposed open pit lithium mine in North Carolina's farming country (Chapter 10). The Thacker Pass project is interesting in that it has divided environmentalists, some of whom are willing to support this open pit mine project in Nevada because they see the lithium to be extracted as essential to the fight against climate change.[23] Here, Scheyder's explorations of the backgrounds of the main players pays off, as we learn that the head of the mining company behind the Thacker Pass project, Jon Evans of Lithium Americas, is himself motivated by a desire to leave a positive lasting legacy by championing the production of lithium as a necessary resource to combat climate change.[24] Thus, the company asserts a vision for its project that aligns with the priorities of many environmental groups who would otherwise ordinarily oppose a mining project. The company received a boost in 2023 when General Motors became its largest shareholder, supplanting a Chinese company and thus removing a source of political difficulties for Lithium Americas. In contrast, the North Carolina effort Scheyder describes in Chapter 10 was headed by a company whose CEO was hired "with the express purpose of 'value creation' for the company's shareholders."[25] Scheyder tells us that "value creation" is "a Wall Street term with a very clear meaning: sell the company or get the stock price soaring."[26] The company, Scheyder implies, had its eye on the wrong ball — creating value for shareholders rather than resource extraction to aid in national priorities. There was thus a mismatch between the goals of the company and those not only of the local community but also of governmental regulators and grant funding agencies that ultimately led to its failure to gain traction at the critical permitting stage.

III. RHYOLITE RIDGE

The true heart of the book, though, is the story of the proposed lithium mine at Rhyolite Ridge in Nevada, and to tell it, Scheyder features two antagonists who present the pro and con arguments for the mine. The first is James Calaway, Chairman of the Board of ioneer, who is featured in Chapter 1 and who comes from a Texas oil and gas family but has made his life's mission, as Scheyder describes it, "saving the planet from the ravages of extreme temperatures and climate change."[27] Calaway sees the mine as a necessary part of the battle against climate change and thus as an ecological good. The second figure Scheyder highlights is Patrick Donnelly with the Center for Biological Diversity, who is featured in Chapter 9 and who champions the Tiehm's buckwheat while rejecting the mine's plans to either transplant the plants to a new location or to attempt to mine around

23. *Id*. at 135.
24. *Id*. at 146-49.
25. THE WAR BELOW, *supra* note 1, at 205
26. *Id*.
27. *Id*. at 22.

islands of the ridge which would be devoted to the plant's habitat. As Scheyder frames his views, "[F]or Donnelly, and the Center for Biological Diversity, saving the planet from climate change would be meaningless if the planet lost even a small fraction of the biological diversity that they saw as making the Earth unique and livable."[28]

In Chapter 15, "The Seedlings," Scheyder describes ioneer's attempt to approach the dispute over the plant from another angle — they hired a botanist to study the plant so that informed decisions could be made about its survival.[29] The move was a risky one, in that the report that the botanist issued stated that more studies were necessary to determine if the plants could be transplanted elsewhere, but that they appeared to be dependent on the lithium-rich soil conditions found at Rhyolite Ridge.[30] Scheyder notes that the US Fish and Wildlife Service relied on ioneer's botanist's report to determine that the mine would cause "permanent and irreversible damage to Tiehm's buckwheat and to propose listing it as an endangered species.[31] Obviously, this finding briefly derailed ioneer's attempts to obtain necessary permitting for the site. However, using the findings of the report, ioneer was able to quickly pivot to a strategy of building buffers around clusters of the plant and re-designing the layout of the proposed mine to accommodate these buffers.[32] Shortly after this, the US Bureau of Land Management decided to issue a Notice of Intent to push permitting forward. ioneer's website indicates that it has now obtained the necessary federal permits.[33] In the Epilogue, Scheyder tells us that ioneer has signed a deal with Ford to sell the automaker much of the lithium from the Rhyolite Ridge site, thus promising to fulfill Calaway's dream of providing a domestic supply of lithium for the US battery market.

IV. NEW STANDARDS, TECHNOLOGIES, AND SUPPLY CHAIN TRANSPARENCY

While the book opens and closes with the disputes over mining at Rhyolite Ridge and devotes chapters to other mining projects, along the way, Scheyder does take a few side jaunts away from strictly traditional mining. One such is in Chapter 3 to explore how the Initiative for Responsible Mining Assurance (IRMA), a new set of standards for responsible mining, came into being when Tiffany, the famous jewelry store, wanted to be sure that its suppliers were engaged in best practices for the industry. Tiffany ended up sparking the creation of new standards for the mining industry as a result of its interest in supply chain impacts. Then, in Chapter 4, Scheyder discusses the opacity of the minerals supply chain for common household items like leaf blowers and power tools — that consumers have no way to determine whether products they are buying are made with responsibly sourced minerals or mined by 7-year olds in the Congo (as he discusses happens in the

28. *Id*. at 185.

29. THE WAR BELOW, *supra* note 1, at 288-90.

30. *Id*. at 290.

31. *Id*.

32. *Id*. at 291.

33. *Permitting*, IONEER, https://www.ioneer.com/rhyolite-ridge-project/about-rhyolite-ridge/permitting/ (last visited Apr. 15, 2025).

context of cobalt in Chapter 5). In Chapters 13 and 14, he also explores new technologies for lithium extraction, called Direct Lithium Extraction (DLE), which promise to be less invasive and destructive than open pit mining, but which, in Scheyder's accounts, have so far failed to prove their ability to function on a commercial scale. Scheyder also looks at recycling as an alternative supply source for these critical minerals in Chapter 12. There, he explores, via the examples of two companies, one of them Li-Cycle, some of the challenges faced by this industry, but also notes the promise — that the largest source of lithium on our continent could be not from a mine but from old batteries.[34] Unfortunately, the rather hopeful note that this chapter ends on has not been borne out for Li-Cycle, whose 2024 Financial Results report states that:

> Li-Cycle requires additional financing to meet its obligations and repay its liabilities arising from the ordinary course of business operations when they become due in order to continue as a going concern. The Company is presently aware of no additional sources of financing to meet its obligations and repay its liabilities arising from the ordinary course of business.[35]

So, despite the promise of lithium battery recycling, practical efforts to implement it continue to face headwinds to being implemented on a commercial scale.

V. CONCLUSION

The book ends with an Epilogue that provides brief updates on major sites and players. It is a mixed bag, with some projects moving forward while others are either stuck where they are for now or have clearly failed. Thus, the book lacks a satisfying ending that ties together the various strands and arguments it explores. But, the book is not really about the success or failure of individual projects or companies. Instead, it is about the need to have a national dialogue to openly discuss the issues it raises — the conflicts between competing priorities such as preserving biodiversity and obtaining the minerals necessary to produce the products by which we can address climate change. The book's central thesis can be seen as embodied in questions asked by one of Scheyder's numerous interviewees at just about halfway through the volume, who says: "We really should be thinking longer and harder about where our things come from. And do I want it enough to accept its production in the United States? . . . If we need it, don't we have an obligation to produce it here?"[36] These questions can be coupled with Scheyder's conclusion that "Despite attempts to find alternate ways to produce metals for the green energy transition, there was no way around the fact that mining is loud, dangerous, and disruptive and will remain so for the foreseeable future, a reality that continued to fuel the global battle over our collective future."[37] That leaves us in a place where in each case we must examine and prioritize our values and decide which ones will win out when faced with the complicated and conflicting priorities raised by extraction of these critical minerals.

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34. THE WAR BELOW, *supra* note 1, at 240-41.

35. Press Release, Li-Cycle, Li-Cycle Reports Full Year 2024 Financial Results (Mar. 31, 2025), https://li-cycle.com/press-releases/li-cycle-reports-full-year-2024-financial-results/.

36. THE WAR BELOW, *supra* note 1, at 160-61.

37. *Id*. at 298.