WHITE PAPER | BY TREY SHAFFER

The energy sector's blind spot: The case for treating natural systems as enterprise assets

Executive Summary — Ecology as strategic infrastructure for the energy and power sectors

The energy and power sectors are at a critical crossroads where traditional, compliance-driven approaches to ecological responsibility are no longer sufficient. This white paper contends that the industry's true blind spot is the failure to recognize ecology as strategic infrastructure. Natural systems such as wetlands, soils, forests, and watersheds are not environmental backdrops; they are enterprise assets that directly influence operational resilience, cost efficiency, and long-term value creation.

For decades, companies have operated within organizational and regulatory structures that reinforced project-level, compliance-driven action. Distributed teams, budget cycles, and regulatory frameworks made incremental decisions the default, allowing ecological systems to be addressed only after impacts occurred. That approach is now misaligned with the scale and nature of emerging risk. Water scarcity, land degradation, wildfire exposure, and climate-driven disruptions are no longer abstract environmental concerns; they are operational, financial, and strategic challenges.

At the same time, the energy and power sectors maintain one of the largest managed land footprints among industries. This includes oil and gas development, transmission and distribution networks, generation assets, and extensive rights-of-way that intersect critical ecosystems. This scale is often viewed as a liability. It is more accurately understood as a strategic opportunity.

While ecological systems serve multiple stakeholders, energy and power companies have a uniquely direct relationship with these assets through their physical footprint, operational dependencies, and risk exposure. The case is not that companies should assume responsibility for entire ecosystems, but that they should actively manage the portions of those systems that directly affect operational performance, reliability, and long-term cost. In this context, ecological investment is not a public obligation; it is an operational decision.

A growing body of empirical data demonstrates that ecological systems deliver measurable financial and operational benefits when managed intentionally. Wetlands reduce flood damage, soils stabilize infrastructure, watersheds protect water supply, and vegetation systems influence wildfire risk and maintenance costs. These outcomes translate into reduced operating expense, improved asset performance, and greater predictability in capital planning. The challenge is not a lack of value, but a

lack of integration. These benefits are often dispersed across functions and not captured within traditional project-level decision frameworks.

The central argument of this paper is that ecological systems should be managed with the same discipline applied to other enterprise assets. This requires a shift from fragmented, project-based activity to coordinated, portfolio-level management of ecological performance across assets, regions, and time horizons.

Leadership now faces a clear choice: continue operating within a model that treats ecological performance as a compliance obligation, or adopt an approach that integrates natural systems into capital planning, risk management, and operational strategy. By treating ecology as infrastructure, companies can move beyond reactive stewardship and instead position ecological performance as a source of resilience, cost efficiency, and competitive advantage.

Context and framing

The problems of today often echo lessons long understood, and the stories we inherit can illuminate patterns hidden in plain sight. A proverb with roots in Middle Eastern and African folklore warns against misplaced trust: *"The forest was shrinking, but the trees kept voting for the axe. For the axe was clever and convinced the trees that because his handle was made of wood, he was one of them."* [1] This timeless lesson, echoed across cultures, aptly speaks to the energy sector's current dilemma, where familiar solutions may mask systemic risks and diminish natural assets. The realities of natural systems are making clear not only the limits of past approaches, but the opportunity to build ecological performance into the core of operational strategy. The forest didn't shrink because the axe was strong; it shrank because the trees trusted something that only appeared to be aligned with them.

For decades, companies in the energy and power sectors have operated within organizational and regulatory structures that naturally favored familiar, project-level approaches to ecological responsibility, reinforcing trust in established practices. Distributed teams, budget cycles, and compliance-driven frameworks made incremental, localized actions the default rather than coordinated, enterprise-level strategy.

Today, the consequences of that misplaced trust are becoming impossible to ignore.

Energy production and power delivery occur within landscapes, watersheds, and ecosystems that provide essential services like water filtration, flood mitigation, soil stability, carbon storage, wildfire buffering, and biodiversity support. As these systems deteriorate, the risks to operations rise. Water scarcity, land degradation, wildfire exposure, and climate-driven disruptions are no longer abstract environmental concerns; they are operational, financial, and strategic risks.

Global ecological data makes this clear. The World Wide Fund for Nature's *Living Planet Index* reports an average 69% decline in vertebrate species populations since 1970. Ramsar estimates that more than 75% of the world's land surface is now degraded. And the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), the UN-supported global scientific body often described as the "IPCC for biodiversity," reports that 85% of wetlands had been lost by 2000, with losses continuing. [2]

The oil and gas sector, in particular, has a uniquely large ecological footprint. Typical U.S. well-spacing regulations illustrate the scale of this presence: heavy-oil and shallow conventional oil fields often operate on 5–10 acres per well (sometimes tighter), light oil and unconventional shale developments commonly range from 40 to 160 acres per well, and conventional natural gas wells are frequently spaced from 40 up to 640 acres per well, with coalbed methane and similar low-pressure gas developments often in the 80–160 acre range. Applied across basins and decades, these norms underscore the sector's substantial physical footprint and its corresponding capacity to influence ecological outcomes at scale. [3]

But the power sector's ecological footprint is equally significant and often overlooked. The United States has more than 600,000 miles of high-voltage transmission lines and over 5.5 million miles of distribution lines. Transmission corridors typically span 100 to 200 feet in width, meaning a single mile represents 12 to 24 acres of linear ecological influence. When multiplied across the national grid, utility rights-of-way represent millions of acres of land; land that intersects forests, grasslands, wetlands, agricultural systems, and wildfire-prone landscapes. Add to this the watershed dependencies of thermal and hydropower generation, the land requirements of substations and solar arrays, and the vegetation-management obligations across the grid, and the power sector emerges as one of the largest land stewards in the country. [4]

This combined Energy + Power footprint is often framed as a liability. But it is also one of the greatest untapped opportunities for value creation in the modern energy system.

While ecological systems serve multiple stakeholders, the energy and power sectors have a uniquely direct relationship with these assets through their physical footprint, operational dependencies, and exposure to risk. The case is not that companies should assume responsibility for entire ecosystems, but that they should actively manage the portions of those systems that directly affect operational performance, reliability, and long-term cost. In this context, ecological investment is not a public obligation; it is an operational decision tied to asset performance and risk management.

Ecology is an asset class — We just haven't managed it like one

Every major energy and power company already manages a diverse portfolio of physical and operational assets with rigor and discipline, supported by established governance, data systems, and long-term planning frameworks:

- Pipelines are monitored, maintained, and replaced based on risk and lifecycle value.
- Rights-of-way are mapped, secured, and managed as strategic corridors.
- Water access is treated as a critical operational dependency requiring long-term planning.
- Transmission and distribution corridors are inspected, cleared, and maintained to reduce outages and wildfire risk.
- Capital programs are governed through portfolio frameworks that balance risk, return, and timing.

Ecological systems like wetlands, soils, forests, watersheds, biodiversity corridors function no differently. They are productive assets that deliver measurable services essential to the resilience of both sectors:

- Wetlands attenuate floods and protect substations, compressor stations, and generation facilities.
- Healthy soils stabilize land under pipelines, transmission towers, and solar arrays.
- Watersheds regulate water availability for cooling, hydropower generation, and community reliability.
- Biodiversity corridors reduce vegetation-management burdens and improve long-term ROW stability.
- Forests and grasslands store carbon, buffer climate volatility, and reduce wildfire intensity.

Yet unlike other asset classes, ecological systems are not consistently managed through enterprise-level frameworks. Instead, they are addressed project by project, outage by outage, or vegetation cycle by vegetation cycle, often only after impacts occur. When companies manage pipelines, transmission lines, water systems, or capital programs this way, they experience the same volatility, unplanned spend, and operational risk that we see today with ecological systems.

The sector's ecological "portfolio" has been allowed to depreciate.

A strategic shift: From compliance to ecological asset management

To manage ecological systems with the same rigor applied to other strategic assets, companies must adopt practices that elevate nature from a project-level consideration to an enterprise-scale component of operational strategy. This means:

- Planning ecological investments across entire basins and grid regions, not individual projects
- Consolidating fragmented mitigation and vegetation-management efforts into enterprise-scale portfolios
- Restoring degraded landscapes to reduce long-term operational risk
- Protecting critical habitats that stabilize watersheds, reduce wildfire exposure, and support grid reliability
- Investing in nature as a durable, appreciating asset

This shift is not theoretical; it is being institutionalized through emerging global frameworks and financial methodologies such as natural capital valuation, avoided-loss modeling, and risk-adjusted return analysis, as reflected in TNFD, the Natural Capital Protocol, and FEMA's BRIC program, which translate ecological performance into decision-grade metrics.

The Taskforce on Nature-related Financial Disclosures (TNFD) (https://tnfd.global) is developing guidance to identify, assess, and manage nature-related risks and dependencies, aligning ecological performance with enterprise risk management and capital allocation.5 Similarly, the Natural Capital Protocol (https://naturalcapitalcoalition.org/standard/) provides a standardized framework for measuring and valuing natural assets, enabling companies to quantify ecosystem services in financial and operational terms.[6]

In parallel, public-sector investment models such as FEMA's Building Resilient Infrastructure and Communities (BRIC) program (https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities) are reinforcing the economic case for nature-based solutions by systematically valuing avoided losses, including flood damage reduction, infrastructure protection, and community resilience, in funding decisions.[7] These approaches demonstrate that ecological systems are not externalities; they are measurable contributors to asset performance and risk mitigation.

A growing body of empirical research demonstrates that ecological systems deliver quantifiable operational, financial, and risk-reduction benefits when managed intentionally. What the data shows:

- Flood Risk Reduction: Wetland restoration can reduce flood damages by up to 29% and provide significant avoided-loss protection for infrastructure and communities (NOAA; The Nature Conservancy).[8]
- Infrastructure Stability: Healthy soils reduce erosion-related maintenance costs by 20–40% across pipelines, transmission systems, and rights-of-way (USDA/NRCS).[9]
- Water System Reliability: Watershed protection reduces long-term water treatment costs and supply risk by 20–60% (EPA).[10]
- Return on Investment: Nature-based solutions deliver approximately 4:1 returns compared to traditional gray infrastructure (World Bank).[11]
- Avoided Losses: Hazard mitigation investments, including nature-based solutions, deliver roughly 6:1 returns in avoided damages and business interruption (FEMA / National Institute of Building Sciences).[12]

These are not environmental charity metrics. They are risk-reduction, cost-avoidance, lifecycle cost efficiency, operational performance, and value-creation metrics.

For energy and power companies, these benefits translate into familiar financial and operational outcomes: reduced maintenance costs, lower outage risk, improved asset performance, and greater predictability in capital planning. The challenge is not a lack of value, but a lack of integration. These benefits are often realized indirectly and across different parts of the organization, making them difficult to capture within traditional project-level decision frameworks. Treating ecological systems as enterprise assets enables these value streams to be evaluated, prioritized, and managed in ways that align with existing capital allocation and risk management processes.

Importantly, the time horizon over which these benefits are realized is compressing. In many operating environments, the impacts of ecological degradation and the value of restoration are no longer distant or theoretical; they are immediate and measurable within typical planning and capital cycles. This

alignment between ecological performance and near-term operational outcomes further reinforces the case for treating natural systems as enterprise assets.

Beyond cost avoidance, new market mechanisms are beginning to recognize and monetize ecological performance. Concepts such as nature insetting, investing within a company's own operational footprint to generate measurable ecological uplift, are gaining traction as a way to directly link environmental performance with enterprise value. Emerging instruments, including resilience-focused environmental credits (such as coastal resilience or wetland function credits), signal a broader shift toward treating ecosystem services as financial assets rather than compliance obligations. While these markets are still evolving, initiatives such as the Ecosystem Services Market Consortium (https://ecosystemservicesmarket.org) demonstrate how ecological uplift can be quantified, verified, and increasingly integrated into financial and operational decision-making.[13]

Healthy ecological systems reduce flood damage, stabilize soils, protect infrastructure, buffer wildfire risk, and ensure water reliability. They lower regulatory uncertainty, strengthen community relations, and reduce the volatility that increasingly shapes project timelines, outage frequency, and capital allocation.

In other words: ecology is infrastructure, and infrastructure is strategy.

The proverbial forest is shrinking — But leadership determines what happens next

The question is no longer whether ecology matters to the energy and power sectors. It is a question of whether leadership will treat the growing body of ecological data as a reporting obligation or as the foundation for strategic transformation.

As companies work to capture nature-related data for disclosure, most of the effort today sits above the horizon line: aggregation, reporting, compliance, and alignment with emerging frameworks. These are necessary steps, but they are not leadership. They are table stakes.

The real work of leadership begins below the horizon line, where ecological data is interpreted not as a reporting requirement but as a set of operational signals that reveal risk, opportunity, and long-term value. It is here that leaders integrate those signals with capital planning, reliability strategy, and enterprise risk, turning insight into durable direction. This is the inflection point where ecological performance becomes business performance.

Leadership asks different questions:

- What does this data reveal about the performance of our ecological assets?
- Where are we exposed to avoidable risks like floods, erosion, wildfires, and water scarcity?
- Where do we have underperforming ecological assets that could be restored, strengthened, or repositioned?

- How should ecological performance and nature-based risk reduction be incorporated into capital planning and new investment decisions, given the evidence that nature-based solutions deliver higher long-term ROI and lower volatility than traditional gray infrastructure?
- How do we convert fragmented ecological liabilities into a coordinated portfolio designed to perform?
- How do we align basin-scale and grid-scale ecological strategy with capital planning, outage reduction, and long-term reliability?
- Which long-term partners are best positioned to deliver measurable ecological uplift while aligning with our capital planning, ecological asset management goals, and long-term cost strategy?

The proverbial forest is shrinking; the ecological foundations that support both our operations and the communities around them are degrading, narrowing the margin for stability and long-term resilience. Leadership determines whether we continue voting for the wooden handle, trusting familiar approaches that no longer serve us, or whether we build the ecological portfolios that allow the forest and the communities and companies that rely on it to grow stronger.

Ready to learn more?

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Footnotes

1. From the *Ecological Portfolios* white paper: "Typical U.S. well-spacing regulations illustrate the scale of this presence: heavy-oil and shallow conventional oil fields often operate on 5–10 acres per well (sometimes tighter), light oil and unconventional shale developments commonly range from 40 to 160 acres per well, and conventional natural gas wells are frequently spaced from 40 up to 640 acres per well, with coalbed methane and similar low-pressure gas developments often in the 80–160 acre range." These ranges reflect publicly available regulatory standards and technical norms reported by state oil and gas commissions (Texas Railroad Commission, North Dakota Industrial Commission, Colorado Oil & Gas Conservation Commission), federal land-management rules from the Bureau of Land Management (BLM), and assessments from the U.S. Geological Survey (USGS).
2. From the *Ecological Portfolios* white paper: "The United States has more than 600,000 miles of high-voltage transmission lines and over 5.5 million miles of distribution lines. Transmission corridors typically span 100 to 200 feet in width, meaning a single mile represents 12 to 24 acres of linear ecological influence." These figures reflect publicly available data from the U.S. Energy Information Administration (EIA) and corridor-width characteristics reported by the U.S. Department of Energy (DOE) Grid Deployment Office.
3. "Biodiversity contributes essential economic, ecological and cultural benefits to society. It aids in regulating climate and provides important support services to people. The loss of biodiversity and damage to land and marine ecosystems undermines global goals such as reducing poverty, increasing food security, access to water and good health." — IPIECA & IOGP, *Managing biodiversity and ecosystem services across the energy transition: Mainstreaming the mitigation hierarchy* (2022).
4. "Some of the energy industry's activities take place in or near sensitive environments, and if not sustainably and responsibly managed, could have direct and secondary impacts on biodiversity and ecosystem services (BES)." — IPIECA & IOGP (2022).
5. "Energy companies rely on an adequate supply of water of the right quality to ensure smooth operations and business continuity." — IPIECA, *Water stewardship: Guidance for the oil, gas and alternative energy industry* (2024).
6. "Global population growth, economic development and climate change exert significant pressure on water availability, posing risks when demands are unmet." — IPIECA (2024).
7. "It is most effective when applied at the very early stages of resource development planning, which can be before oil, gas or alternative energy companies are involved." — IPIECA & IOGP (2022).
8. IPIECA's water mitigation hierarchy: avoid, replace, reduce, reuse/recycle, replenish — IPIECA (2024).

9. “Integration of nature conservation into country-level development policies and plans…” — IPIECA & IOGP (2022).
10. “Select, measure and report BES performance indicators.” — IPIECA & IOGP (2022).
11. “For a sustainable water balance, total net water abstractions do not exceed natural replenishment of water bodies…” — IPIECA (2024).
12. “Participate in watershed restoration projects to replenish local water sources.” — IPIECA (2024).
13. “Apply nature-based solutions to improve surface and groundwater quality and restore affected habitats.” — IPIECA (2024).