WHITE PAPER | BY TREY SHAFFER

Ecological portfolios: The strategic leap beyond traditional stewardship

Executive Summary — Ecology as strategic infrastructure

The energy and power sectors are confronting a structural blind spot: natural systems such as wetlands, soils, forests, watersheds, and biodiversity corridors have long been treated as environmental considerations rather than strategic infrastructure. Yet these systems deliver essential services that underpin operational resilience, cost stability, and long-term value creation. As ecological degradation accelerates, the risks to energy systems are no longer abstract—they are operational, financial, and strategic.

Traditional environmental tools such as impact assessments, biodiversity action plans, water-use efficiency measures, and mitigation hierarchies remain essential, but they were designed for projects, not portfolios. They manage impacts in isolation, not ecological performance across landscapes, basins, and grid systems. The sector now needs an enterprise-level architecture that integrates dependencies on biodiversity, water, land, and climate into a coherent strategy.

Ecological portfolios provide that architecture. They elevate natural systems into the same governance, planning, and investment frameworks that guide physical infrastructure. They unify fragmented mitigation actions into coordinated, performance-oriented investments. And they align directly with emerging global frameworks, including IPIECA's biodiversity and water stewardship guidance—while moving beyond compliance toward resilience, reliability, and long-term value.

This white paper outlines why ecological portfolios are the next strategic step for the energy system, how they differ fundamentally from project-level tools, and what it takes to build one. It concludes with a practical first-steps framework and a clear model for building and managing ecological portfolios at the enterprise level.

The strategic leap beyond traditional stewardship

The energy and power sectors are at an inflection point. Ecological degradation, once treated as an externality, has become a direct operational and strategic threat. Flood exposure, watershed instability, soil degradation, wildfire intensity, and biodiversity loss now shape outage frequency, maintenance cycles, capital planning, and long-term reliability. The familiar, project-level tools of environmental management have delivered incremental improvements, but they cannot keep pace with accelerating ecological decline. The sectors must choose: continue managing nature as a compliance obligation, or elevate it into the realm of strategic infrastructure.

Ecological portfolios provide the foundation for that shift. They begin with a simple premise: natural systems are productive assets that deliver measurable services essential to operational resilience and cost stability. For decades, companies have managed pipelines, transmission corridors, substations, and water systems through disciplined asset-management frameworks, while ecological systems were treated as peripheral. The result is visible everywhere: degraded watersheds, eroding soils, shrinking wetlands, and rising wildfire exposure. Ecological portfolios correct this imbalance by placing nature within the same governance, planning, and investment structures that already guide physical infrastructure—thereby turning ecological performance into business performance.

The stakes are rising faster than the sector's response

Energy systems depend on ecological systems in ways that are becoming increasingly vulnerable. Wetlands buffer against floods around substations and compressor stations; soils stabilize pipelines and transmission towers; watersheds regulate cooling water, hydropower flows, and community reliability; and forests and grasslands shape wildfire behavior along transmission corridors.

The scale of these dependencies is staggering. In the oil and gas sector, typical U.S. well-spacing regulations illustrate the magnitude of the footprint: heavy-oil and shallow conventional fields often operate on 5–10 acres per well, light oil and shale developments commonly span 40–160 acres per well, and conventional natural gas wells range from 40 up to 640 acres per well, with coalbed methane often in the 80–160 acre range.[1] Applied across basins and decades, these norms reveal a continental-scale ecological presence.

The power sector's footprint is equally vast. The United States has over 600,000 miles of high-voltage transmission lines and more than 5.5 million miles of distribution lines. Transmission corridors typically span 100–200 feet in width—meaning a single mile represents 12–24 acres of linear ecological influence.[2] When multiplied across the national grid, utility rights-of-way represent millions of acres intersecting forests, grasslands, wetlands, agricultural systems, and wildfire-prone landscapes.

IPIECA's biodiversity guidance reinforces this reality, noting that biodiversity "contributes essential economic, ecological and cultural benefits to society" and that its loss "undermines global goals such as reducing poverty, increasing food security, access to water and good health."[3] It also warns that energy activities "in or near sensitive environments… could have direct and secondary impacts on biodiversity and ecosystem services (BES)."[4]

The water stewardship guidance echoes the same operational dependency: "Energy companies rely on an adequate supply of water of the right quality to ensure smooth operations and business continuity."[5] It further highlights that population growth, climate change, and competing demands "exert significant pressure on water availability, posing risks when demands are unmet."[6]

The message is unmistakable: ecological decline is now a multiplier of operational risk.

Why familiar tools are no longer enough

The sector's environmental toolkit, including impact assessments, biodiversity action plans, water-use efficiency measures, and mitigation hierarchies, remains essential. But these tools were designed for projects, not portfolios. Projects are inherently narrow; they solve for footprints measured in acres, timelines measured in months, and impacts measured in isolation. They optimize for compliance, permitting, and local mitigation—important work, but fundamentally reactive and bounded by the life of a single asset. Portfolios operate on an entirely different plane. They solve for landscapes, watersheds, and ecological systems that unfold over decades. They integrate risk, resilience, and value across thousands of miles of infrastructure. Where projects ask, "How do we minimize our impact here?" portfolios ask, "How do we strengthen the ecological systems that our entire enterprise depends on?" Projects mitigate; portfolios perform. Projects reduce harm; portfolios create resilience; and most importantly, projects manage consequences, while portfolios manage the future.

IPIECA's mitigation hierarchy is clear that it is "most effective when applied at the very early stages of resource development planning."[7] Its six BES management practices provide procedural rigor, but they remain bounded by project scopes.

Similarly, the water stewardship guidance organizes actions around sustainable water balance, water quality, governance, important water-related areas (IWRAs), and WASH. It introduces a water mitigation hierarchy—avoid, replace, reduce, reuse/recycle, replenish—designed to guide responsible water use.[8]

These frameworks are indispensable, but they cannot address basin-scale water stress, regional biodiversity decline, or the cumulative ecological footprint of millions of acres of ROWs, well pads, and substations, as well as watershed dependencies.

The sector needs a unifying architecture that elevates these tools into an enterprise-level strategy capable of delivering resilience at scale.

Ecological Portfolios: The architecture that makes stewardship strategic

Ecological portfolios transform biodiversity and water stewardship from scattered actions into coordinated, performance-oriented investments at the enterprise level.

They shift the center of gravity from compliance to strategy

IPIECA calls for the integration of nature conservation into development policies and for companies to measure and report biodiversity and ecosystem services performance. Ecological portfolios operationalize these expectations by establishing portfolio-level baselines, performance metrics, and investment strategies.

They move from site-level actions to basin- and grid-scale resilience

The water stewardship guidance emphasizes that sustainable water balance requires that "total net water abstractions do not exceed natural replenishment of water bodies."[11] This cannot be achieved through isolated site actions. Ecological portfolios coordinate investments across entire basins.

They turn nature-based solutions into strategic assets

IPIECA encourages companies to "participate in watershed restoration projects to replenish local water sources "[12] and to apply "nature-based solutions to improve surface and groundwater quality."[13] Ecological portfolios elevate these actions from discretionary projects to long-term resilience investments.

They make ecological performance legible to executives

By grouping ecological assets into portfolio units such as watersheds, soil corridors, wildfire buffers, and biodiversity corridors, companies can manage nature with the same rigor applied to physical infrastructure.

Ecological portfolio architecture

The Enterprise Ecological Portfolio is the overarching structure that organizes and manages ecological assets across the enterprise. This architecture enables companies to coordinate and evaluate actions at both the portfolio and asset levels, aligning efforts with performance objectives, strategic priorities, and long-term resilience investments.

Ecological portfolios organize natural systems into portfolio units such as watersheds, soil corridors, wildfire buffers, and biodiversity corridors, each with defined performance metrics, investment pathways, and long-term management strategies.

Example portfolio units

- **Watershed Performance:** Focuses on managing and improving the health and functionality of watersheds, ensuring water resources are sustainably maintained.
- **Soil Stability Corridors:** Addresses the management of soil resources, aiming to prevent erosion and support landscape resilience.
- **Wildfire Buffer Landscapes:** Involves the creation and preservation of landscapes that help buffer against and mitigate wildfire risks.

Example Supporting Asset Classes

- **Biodiversity Corridors:** Facilitate wildlife movement and genetic exchange, supporting overall ecosystem health.
- **Floodplain Systems:** Manage areas prone to flooding to enhance water retention and reduce flood risk.

- **Water Quality Systems:** Aim to protect and restore water quality through targeted interventions and monitoring.
- **Vegetation Management:** Encompasses all activities related to maintaining and enhancing plant cover, which supports ecosystem function and resilience.

The ecological portfolio blueprint: A practical first-steps framework

The Ecological Portfolio Blueprint provides a practical approach to integrating ecological systems into enterprise strategy. By recognizing natural systems such as wetlands, forests, and biodiversity corridors as formal asset classes, organizations shift from viewing ecology as a compliance issue to positioning it as a strategic priority. The blueprint maps an organization's ecological footprint, establishes clear connections between operations and the natural environment, and enables executive alignment for purposeful management of ecological assets and measurable improvement in operational performance.

Step	What It Means	Why It Matters	Early Outputs
1. Declare Ecology an Asset Class	Formally recognize wetlands, soils, forests, watersheds, and biodiversity corridors as enterprise assets.	Establishes governance logic; shifts ecology from compliance to strategy.	Enterprise definition of ecological assets: executive alignment.
2. Map the Ecological Footprint	Identify the basins, corridors, and ecological systems that operations depend on or influence.	Creates the spatial and functional boundaries of the portfolio.	Basin-scale and grid-scale ecological footprint maps.
3. Diagnose Ecological Performance	Assess water stress, soil degradation, flood exposure, wildfire risk, and habitat fragmentation across the portfolio.	Reveals ecological liabilities driving operational volatility.	Ecological risk assessment: prioritized hotspots.
4. Organize Assets Into Portfolio Units	Group ecological systems into manageable units (watersheds, soil corridors, wildfire buffers, biodiversity corridors).	Makes ecological performance legible to executives and planners.	Defined portfolio structure; early KPIs.
5. Align Units With Investment Pathways	Apply mitigation hierarchy principles, water stewardship actions, and nature-based solutions at the portfolio level.	Converts ecological liabilities into coordinated investments.	Portfolio-level investment plan; prioritized uplift projects.
6. Establish Governance and Long-Term Management	Integrate ecological portfolios into capital planning, risk management, and enterprise performance reviews.	Ensures durability, accountability, and measurable value creation.	Governance model; annual portfolio review cycle.

A new operating paradigm for sustainability leadership

Sustainability leadership in the energy and power sectors is entering a decisive phase. Familiar tools such as project-level mitigation, compliance-driven frameworks, and isolated ecological actions have delivered meaningful improvements, but they were not designed to manage ecological systems at the scale of the enterprise, the basin, or the grid. They cannot deliver the resilience, reliability, and long-term value the next decade will demand. Ecological portfolios offer a different operating paradigm: one that treats natural systems as strategic infrastructure and positions ecological performance as a core determinant of operational continuity and enterprise value.

This shift requires leaders to confront a new set of questions, not about aspiration, but about readiness, risk exposure, and the structural changes required to future-proof operations. These questions move beyond compliance and reporting and into the realm of strategic capability:

- Do we understand the ecological systems—watersheds, soils, floodplains, biodiversity corridors—that our operations depend on, and how those systems are trending over time?
- Are we evaluating ecological degradation as a form of operational risk with the same rigor applied to asset integrity, reliability, and safety?
- Do our governance structures allow ecological performance to influence capital planning, long-term maintenance strategies, and risk-reduction investments?
- Are we prepared to manage ecological assets at the scale at which they function—across basins, landscapes, and grid regions—rather than through isolated project-level actions?
- Can we quantify the operational and financial benefits of ecological uplift, such as reduced flood exposure, improved water reliability, stabilized soils, or lower wildfire risk?
- Are we ready to integrate nature-based solutions into long-term reliability and resilience strategies, rather than treating them as discretionary initiatives?
- Do we have the internal capabilities, partnerships, and data systems required to manage ecological portfolios as a durable, enterprise-level asset class?

These are not abstract considerations; they define the next frontier of sustainability leadership, where ecological performance becomes inseparable from operational performance, and where resilience is built not only through engineered systems, but through the health and stability of the natural systems that surround and support them.

IPIECA guidance documents illuminate the pathways for biodiversity management, mitigation hierarchy discipline, water stewardship, governance, and nature-based solutions. Ecological portfolios provide the architecture that allows those pathways to scale across the full geographic footprint of the energy system.

Ready to learn more?

Contact our team to discuss how RES can support your projects.

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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).