# Wildlife-Forward Transmission Siting Toolkit

A PRACTICAL GUIDE FOR CONSERVATION ADVOCATES TO SHAPE RESPONSIBLE TRANSMISSION BUILDOUT

NATIONAL WILDLIFE FEDERATION

# Wildlife-Forward Transmission Siting Toolkit

## A PRACTICAL GUIDE FOR CONSERVATION ADVOCATES TO SHAPE RESPONSIBLE TRANSMISSION BUILDOUT


## National Wildlife Federation

CLEAN ENERGY TRANSMISSION



**2026**



## Authored by

SHRIYA PAI, PH.D.
SENIOR POLICY SPECIALIST, CLEAN ENERGY TRANSMISSION,
NATIONAL WILDLIFE FEDERATION



**The author would like to thank and extend sincere appreciation to the following individuals, whose insightful feedback and input greatly shaped this document: Jessica Arriens, TJ Brown, Edie Juno, Lindsay Kuczera, Shannon Heyck-Williams, Corina Newsome, and Diane Pataki.**

*Cover photo: Brandon Bell Staff/Getty Images*

# Table of Contents

# About This Toolkit

This toolkit is aimed at making the transmission development process accessible. It will help you identify the opportunities and entry points where your knowledge of wildlife, habitats, and community concerns can make the most difference.

This toolkit covers the full transmission development lifecycle, from early planning through long-term operations. For many conservation advocates who are new to the transmission space or juggling other priorities with limited resources, it may seem overwhelming. It is not meant to be tackled all at once. Some engagement is better than none; we encourage you to figure out which pieces are feasible, timely, and strategic for your community or organization, and save the rest for later.

**Please contact NWF's Clean Energy Transmission team with any questions or for support.**

## Who is This Toolkit For?

This toolkit is for conservation advocates and wildlife professionals who engage in transmission planning, **siting**, and permitting processes. This includes staff and volunteers at conservation organizations, state and federal wildlife agency personnel, land managers, local government officials, tribal liaisons and environmental staff, sporting and outdoor recreation groups, community organizations concerned about local land use and natural resources, and any stakeholder seeking to ensure that transmission development accounts for wildlife, habitat, and biodiversity conservation.

Transmission development involves complex regulatory, engineering, ecological, and community engagement dimensions, and intersects with land use planning at various levels of government.

## Why Use This Toolkit?

The United States needs large-scale grid capacity expansion and transmission buildout for grid reliability, energy affordability, and the clean energy transition. This means that hundreds of routing decisions will be made across every region of the country in the coming years, many of them through landscapes that support vital wildlife habitat, migration corridors, wetlands, intact forests, and working lands. Each of those decisions is a moment where conservation input can make the difference between a project that fragments an intact landscape and one that follows existing corridors with far less ecological harm.

Conservation advocates frequently learn about projects after the route has already been selected, when the window for meaningful influence is narrow. This toolkit is designed to help you engage earlier, when corridor alternatives are still being evaluated and when the cost of incorporating wildlife considerations is lowest.

# Wildlife-forward planning reduces delays

**Projects with robust upfront environmental review and stakeholder involvement move through permitting faster and face fewer legal challenges.**

## How to Use This Toolkit

This toolkit is modular. Each section is designed to stand alone, so you can focus on the phase of development most relevant to your situation. It is organized to follow the transmission development lifecycle, from early planning through operations, but you do not need to read it in order. Use the sections that match where your project or process currently stands.

Throughout the toolkit, you will find: (i) explanatory text providing context and guidance for each phase of development; (ii) call-out boxes highlighting key principles, data points, and real-world examples; and (iii) worksheets with checklists of questions to raise at each stage. We have also included a glossary of transmission-related terms at the end of this toolkit in **Appendix B.** Terms in the text that appear in **light brown** are explained in the glossary and are hyperlinked for quick reference.

This toolkit focuses on wildlife and ecological considerations in transmission siting. For guidance on community engagement, environmental justice, and equitable participation in transmission development, see NWF's Toolkit for Community Participation and the Cultivating Rural Communities' Approaches to Nature and Electrification (CRANE) Workbook, which complement the wildlife-focused evaluation tools presented here.

**Please share with us your comments and questions about this toolkit. We will update these materials to meet the needs of impacted stakeholders.**

**Throughout the toolkit, you will find: (i) explanatory text providing context and guidance for each phase of development; (ii) call-out boxes highlighting key principles, data points, and real-world examples; and (iii) worksheets with checklists of questions to raise at each stage.**

Section 1

Faina Gurevich/Getty Images

# Why Transmission, Why Now, and How Wildlife Fits In

## The Grid We Have vs. The Grid We Need

The United States electric grid is one of the largest engineered systems on the planet, spanning more than 600,000 miles of transmission lines and roughly 5.5 million miles of local distribution lines. It delivers electricity to more than 160 million customers every day. However, this infrastructure was built for a 20th century model of large, centralized fossil fuel plants and stable, predictable demand.

Today, the grid faces a convergence of pressures that it was not designed to handle. Electricity demand, which was largely flat for over a decade, is now surging, driven by data center expansion, manufacturing reshoring, building and transportation electrification, and population growth. U.S. electricity demand is expected to grow by 25 percent by 2030 and by 78 percent by 2050, compared to 2023. By 2030, data center demand alone is expected to grow by 133 percent compared to 2024 levels. At the same time, the generation mix is shifting dramatically as low-cost solar and wind resources replace aging fossil fuel plants. These new generation sources are often located far from population centers, in windy plains, sundrenched deserts, and offshore areas where transmission capacity at the scale required does not yet exist.

Meanwhile, most existing transmission lines in the U.S. are 40–70 years old and are highly vulnerable to severe weather events such as extreme heat, wildfires, ice storms, and hurricanes. These are growing in frequency and intensity due to climate change. The grid we have is no longer sufficient to guarantee reliability, energy affordability, or support a clean energy transition.

The Department of Energy (DOE) 2024 National Transmission Planning Study found that the country needs to at least double its regional transmission capacity and increase interregional transfer capacity by more than fivefold to maintain reliability and support economic growth through 2050. In practical terms, that translates to roughly 5,000 miles of new high-capacity transmission lines per year. However, current transmission planning and grid capacity expansion are insufficient to meet this demand while maintaining a reliable and resilient grid.

## The Scale of the Challenge

In 2024, the U.S. completed buildout of fewer than 900 miles of new high-voltage transmission (345 kilovolts, or kV, and above). For comparison, in 2013, nearly 3,500 miles of high-voltage transmission were constructed across multiple regions. This peak demonstrates that building at scale is achievable when proactive regional planning and clear cost allocation frameworks are in place, as seen with the successful deployment of major transmission project portfolios in the Midwest and Texas during that period. **Today's opportunity is to match that pace with conservation- and wildlife-forward siting practices that were largely absent from that earlier buildout.**

The interconnection queue tells a parallel story. As of 2025, more than 2,500 gigawatts (GW) of proposed generation and storage capacity (over 10,000 projects) were waiting to connect to the grid. The vast majority of these projects were solar, wind, and battery storage. Many cannot move forward without new or upgraded transmission infrastructure. Every year of delay in building transmission means delayed access to cleaner, more affordable, and more reliable energy.

## The Policy Landscape: A Window of Opportunity

The federal policy framework for transmission planning is undergoing its most significant reform in over a decade. In May 2024, the Federal Energy Regulatory Commission (FERC) issued Order No. 1920, requiring transmission providers to conduct long-term regional transmission planning over at least a 20-year horizon; evaluate at least three plausible future scenarios; consider seven categories of benefits including reliability, economic value, and public policy goals; and conduct extreme weather sensitivity analyses. Notably, the order does not require planners to account for environmental impacts of transmission infrastructure itself, which is one reason why conservation advocates' participation in these planning processes is essential. Subsequent orders (1920-A and 1920-B) significantly expanded the role of

**The grid we have is no longer sufficient to guarantee reliability, energy affordability, or support a clean energy transition.**

state regulators, giving state public utility commissions new authority to shape planning scenarios, influence cost allocation formulas, and participate in engagement periods with transmission providers.

Throughout 2026, regional grid operators and transmission providers will submit compliance filings for FERC Order 1920. This implementation period represents a significant opportunity for advocates to ensure that ecological constraints, wildlife corridor data, and habitat maps are incorporated into the planning scenarios that will drive transmission development for decades to come.

## Why Transmission Matters for Communities

**Reliability and resilience.** A more interconnected grid can reroute power around outages, reducing the length and severity of blackouts during extreme weather by enabling regions to share resources during emergencies. Greater transmission capacity and interregional connections are among the most effective tools for keeping the lights on when regional systems are stressed.

**Affordability.** Transmission allows electricity to flow from where it is cheapest to produce to where it is needed most. High-capacity 765 kV lines can deliver power at up to 75 percent lower cost per megawatt than lower voltage alternatives like 230 kV. Grid congestion costs consumers over $10 billion annually in higher electricity prices, and new transmission directly reduces these costs.

**Economic opportunity.** Transmission projects create jobs in construction, engineering, surveying, land management, and ongoing operations. They generate revenue for local and state governments through property taxes, sales taxes during construction, lease payments, and royalties. For rural communities hosting infrastructure, transmission can provide a long-term source of economic activity, especially when paired with community benefit agreements, workforce development programs, and local hiring commitments.

**Environmental health.** By enabling the retirement of aging fossil fuel plants and connecting cleaner generation sources to the grid, transmission is essential infrastructure for reducing air and water pollution. More than 46 million people in the U.S. live within a mile of fossil fuel infrastructure, with disproportionate impacts on marginalized communities. Expanding clean energy transmission helps address these longstanding environmental health disparities by shifting the energy mix toward cleaner sources and reducing localized pollution.

## The Wildlife Dimension

The health of human communities and the health of natural ecosystems are directly linked. Biodiversity is essential for clean water, food production, pollination, carbon storage, flood control, and the outdoor recreational and sporting traditions that define many communities. Yet across the world, natural ecosystems and their biodiversity are at risk. A 2023 NatureServe report found that 34 percent of plant species and 40 percent of animal species in the U.S. are at risk of extinction, and 41 percent of ecosystems are at risk of range-wide collapse, with habitat degradation and fragmentation among the leading causes.

Climate change is now the most pervasive threat for species listed as endangered or threatened under the Endangered Species Act (ESA) and is projected to lead to the extinction of as much as 31 percent of insects and 44 percent of vertebrate species globally under worst case scenarios. Transmission infrastructure interacts with wildlife and ecosystems in several significant ways, such as:

- **Habitat fragmentation:** Transmission corridors, including towers, lines, access roads, and rights-of-way, create linear disturbances that can fragment large, intact habitat blocks. In diverse landscapes across the country, fragmentation can sever connectivity and reduce habitat quality far beyond the immediate footprint of the project. For example, in the sagebrush steppe of the American West, fragmentation threatens an ecosystem that supports more than 350 species, while in the biodiversity hotspots of the Southeast, similar disturbances impact a region that has suffered widespread habitat loss, including over 90 percent of the previously widespread longleaf pine savannas. New access roads associated with transmission projects can drive additional long-term disturbance through off-road vehicle use, invasive species spread, and increased wildfire ignition risk.

- **Barrier effects and disrupted movement:** Wildlife corridors allow species to move between seasonal habitats, access water, find mates, and respond to changing conditions. Transmission infrastructure can create barriers that disrupt these movements for everything from wide-ranging ungulates like mule deer and pronghorn in the West to sensitive interior forest species like the salamanders of Appalachia. These smaller terrestrial species can become effectively trapped in "habitat islands" by the altered microclimates of cleared utility corridors, even when the project does not directly destroy primary habitat. A single transmission line may not block a migration corridor on its own, but when combined with roads, fences, and other infrastructure, it can create a composite barrier that effectively severs seasonal connectivity. Pinch points, where topography already constrains movement, are especially vulnerable.

- **Avian collision and electrocution:** Power lines are a well-documented source of bird mortality, particularly in open landscapes, near water bodies, and along migratory flyways. Raptors, waterfowl, migratory shorebirds, cranes, and other large-bodied birds are especially vulnerable. The U.S. Fish and Wildlife Service (USFWS) has published Avoidance and Minimization Measures for Power Lines, and the Avian Power Line Interaction Committee (APLIC) has developed the industry standard guidelines for avian-safe design, including conductor spacing to prevent electrocution, bird flight diverters to reduce collision risk, and perch deterrents. These standards should be applied to all transmission projects. Proper siting, including the avoidance of the highest-risk flight zones, remains the most effective form of collision risk reduction. Design measures are important *complements* to siting, not substitutes for it.

- **Long-term landscape change:** Transmission infrastructure operates for decades. Over that time, access roads can widen through unauthorized use, invasive species can colonize disturbed soils, and fire dynamics can shift. In the Great Basin, where wildfire can promote the conversion of native

Poorly sited transmission can cause lasting harm to wildlife habitats and ecosystem functions. Conversely, responsibly sited projects, designed with early attention to ecological risk, can integrate with healthy landscapes and even support positive conservation outcomes. This is the core objective of

# wildlife-forward siting.

sagebrush habitat to invasive annual grasses, the interaction between transmission corridors and fire risk is a significant long-term concern. In the eastern and southern U.S., these corridors can serve as conduits for invasive plants, which degrade the quality of adjacent forest interiors over time. Responsible siting must account for these long-term dynamics along with construction phase impacts.

## Where the National Wildlife Federation Stands

The National Wildlife Federation (NWF) supports the expansion of clean energy transmission as essential infrastructure for addressing climate change and its significant threat to biodiversity, ensuring grid reliability, and delivering affordable energy. We advocate for transmission that is sited responsibly, in ways that protect wildlife habitat, maintain landscape connectivity, respect community values, and apply the mitigation hierarchy rigorously. This position reflects five core pillars that guide our transmission advocacy:

**1. Avoid and minimize impacts to wildlife habitat in siting, while prioritizing already disturbed areas**

**2. Center and empower local communities and Tribal Nations in decision making**

**3. Apply mitigation measures that conserve and restore biodiversity, wildlife habitat, and wildlife populations**

**4. Apply proactive, long-term, and interregional transmission planning that equitably invites collaboration among Tribes, regulators, local communities, and stakeholders at the local, state, regional, and federal levels**

**5. Maximize coordination and information-sharing among decision makers, including conservation advocates and scientists, wildlife experts, ecologists, developers, and local communities with practical knowledge**

## These pillars are practical

standards that can and should be applied to every transmission project. The sections that follow translate them into specific guidance for each phase of the development process.

# The Case for Early, Constructive Engagement

Conservation advocates can sometimes be hesitant to engage in transmission development, fearing that participation implies blanket endorsement. This toolkit is grounded in a different premise: **The most powerful conservation tool is early, science-based engagement that shapes where and how projects are built.**

The transmission development process has clear phases (described in detail in Section 2), and each phase has decision points where wildlife and ecosystem needs can be either integrated or overlooked. Once a route is selected and permits are filed, the window for meaningful influence narrows dramatically. By that stage, developers have invested heavily in a preferred alignment, regulators are bound by a defined project scope, and changing course becomes both expensive and contentious. Advocates and partners who engage during the pre-filing and corridor evaluation stages have far more leverage to:

- Steer routes away from the highest conflict landscapes before alignments are finalized
- Ensure corridor alternatives are evaluated transparently using ecological data
- Advocate for colocation with existing infrastructure to minimize new habitat fragmentation, while avoiding additional environmental and health burdens on communities already hosting multiple infrastructure corridors
- Secure enforceable mitigation commitments, seasonal construction windows, and long-term monitoring
- Build relationships with developers and regulators that create ongoing channels for wildlife-informed decision making
- Contribute local and traditional ecological knowledge that may not appear in regional datasets

Engaging early in science-based siting can lead to better outcomes for wildlife while helping resolve the environmental and stakeholder friction that characterizes many transmission projects. While the average federal environmental review takes 4.3 years, permitting and siting timelines can stretch to 11 years due to unresolved environmental conflicts, litigation, and community opposition. Analysis of nearly a decade of transmission data has shown that these delays are not explained by line length alone, but by the kinds of siting and engagement failures that this toolkit is designed to prevent.

Proactive engagement ensures that the urgent expansion of our grid moves forward to efficiently meet climate, energy affordability, and reliability needs while protecting the ecosystems we depend on. Ultimately, this collaborative approach helps clear the path for the essential infrastructure required for a secure and just clean energy future.

Section 2

Huizeng Hu/Getty Images

# Transmission Development Lifecycle Overview

Understanding the transmission development lifecycle is essential for knowing when and how to engage. Transmission projects move through distinct phases, each with different decision makers, types of decisions, and opportunities for conservation input. This section provides a roadmap for that lifecycle and identifies the specific moments where wildlife-forward engagement is most effective.

A typical large transmission project takes [7–15 years](#) from initial planning to energization, though some projects have taken considerably longer. Understanding where a project sits in this timeline helps advocates calibrate their engagement strategy, whether that means pushing for ecological data to be included in planning scenarios, commenting on route alternatives, or monitoring construction compliance.

It is also worth noting that these phases are not always strictly sequential. Permitting and construction can overlap on multi-segment projects. Some regional transmission organizations are now conducting planning and corridor identification simultaneously. And developers sometimes present a project as being in an early phase when key routing decisions have already been made informally—transmission infrastructure historically has been developed through a **"decide, announce, defend" approach,** where project routes and details were determined by developers with minimal input from communities. Understanding where a project sits in this process, rather than where the developer says it sits, helps advocates determine what kind of engagement will be most effective.

## Phase 1: Regional and System Planning

**Regional Transmission Organizations or Independent System Operators (RTO/ISOs)** and utilities conduct system-wide studies to identify where additional transmission capacity is needed. These studies evaluate grid reliability, congestion patterns, generation resource adequacy, and long-term load forecasts. They produce lists of identified needs that drive the development of specific transmission projects. **FERC Order No. 1920**, finalized in 2024 and now entering compliance across all planning regions, requires transmission providers to conduct long-term regional planning over at least a 20-year horizon. Regional grid operators are currently submitting and implementing their initial compliance filings, creating a critical window to embed wildlife data into the foundational scenarios used to justify new lines.

- **Who leads:** RTOs/ISOs, transmission planners, state regulators (now with expanded roles under FERC Order 1920/1920-A/1920-B)

- **Key decisions:** What transmission needs exist, where capacity should be added, what benefits are evaluated, which scenarios are used to identify future needs

- **Conservation opportunity:** The priority is ensuring that ecological constraints, including wildlife corridors, sensitive habitats, interior forest cores, migratory stopover points, and intact landscape blocks, are treated as factors in the development of long-term planning scenarios. This means making wildlife corridor data, habitat maps, and connectivity models available to planners before scenarios are finalized, participating in the stakeholder processes that RTOs and transmission providers are conducting for their Order 1920 compliance filings, and working with state regulators to ensure that environmental siting criteria are met. This is a once-in-a-generation opportunity to embed wildlife considerations into the foundational planning frameworks that will shape transmission development for the next few decades.

## Phase 2: Corridor Identification and Alternatives Analysis

Once a transmission need is identified, developers or planners evaluate potential corridors. This phase involves screening landscapes for engineering feasibility, environmental constraints, land ownership, topography, and cost. Multiple alternatives are typically evaluated and compared, though the rigor and transparency of this process vary widely. Modern planning now increasingly considers **Grid-Enhancing Technologies (GETs)**, such as advanced conductors and **dynamic line ratings**, which can increase capacity on existing lines and potentially defer or eliminate the need for new greenfield corridors.

This is the phase where the geographic footprint of a project begins to take shape. It is the single most important phase for wildlife-forward engagement. Decisions made here about which corridors to study, how alternatives are ranked, and what data layers are used will determine whether the project avoids or impacts the most ecologically sensitive landscapes.

Conservation advocates should push for a clear corridor preference hierarchy in the alternatives analysis: first, parallel existing transmission corridors; second, parallel highway or major transportation corridors; third, previously disturbed or degraded lands (e.g., reclaimed mine lands, capped landfills, brownfields, former industrial sites, among others); and last, new greenfield corridors through undisturbed landscape of low ecological value, which should require documented, engineering-based justification for why higher-ranked options were infeasible. Across all tiers of this hierarchy, corridor evaluation should also consider whether a proposed route would concentrate additional infrastructure burdens on communities already disproportionately affected by existing development.

A transparent alternatives analysis should include quantitative comparison metrics across all alternatives, including new corridor miles, access road miles, crossings of priority habitat layers, fragmentation impact, and cost. Advocates should request a route alternatives map book with consistent spatial overlays so they can visually compare potential constraints and conflicts across alternatives. Without this information, it is impossible to evaluate whether the selected route truly represents the lowest long-term ecological and community conflict pathway.

- **Who leads:** Project developers, utilities, engineering consultants, and sometimes RTO/ISO staff

- **Key decisions:** Which corridors to study in detail, how alternatives are ranked, what ecological and environmental data layers are used in screening, whether colocation with existing infrastructure is prioritized

- **Conservation opportunity:** The central goal at this phase is pushing for a transparent alternatives analysis grounded in quantitative ecological data, rather than solely relying on engineering feasibility and cost. Advocates should flag high-conflict landscapes early, advocate for colocation with existing infrastructure as the default starting point, and request that the proponent provide a side-by-side quantitative comparison of all alternatives evaluated, with documented justification for any alternative that was dismissed. If this information is not made available, it is a red flag that the alternatives analysis may not have been conducted rigorously.

## Phase 3: Siting and Route Selection

The developer selects a preferred route and begins detailed environmental studies, field surveys, and landowner outreach. State siting agencies, public utility commissions, or federal agencies (for projects on federal land) conduct formal reviews. This phase typically includes detailed biological and cultural resource surveys, wetland delineations, and geotechnical investigations along the preferred alignment.

Within the selected corridor, specific routing decisions determine which habitats are crossed, which landscape features are affected, and how much new disturbance is created. Even within a generally appropriate corridor, the alignment can be shifted to avoid specific high-value habitats and features such as coastal marshes, wetland complexes, vernal pools, riparian corridors, known nesting sites, buffer zones, or migration corridor pinch points.

- **Who leads:** Project developers, state siting authorities, state environmental protection or natural resource agencies, public utility commissions, federal land management agencies including the **Bureau of Land Management (BLM)**, U.S. Forest Service (USFS), USFWS, the National Park Service (NPS), and other relevant agencies. In some states, a single agency handles siting, in others, multiple agencies are involved.

- **Key decisions:** The specific alignment, right-of-way width, tower placement, access road locations, **substation** siting

- **Conservation opportunity:** This phase is where site-specific ecological knowledge matters most. Advocates should submit formal comments during environmental review scoping and provide species-specific data, habitat maps, and local ecological knowledge that may not appear in regional datasets. Hunters, anglers, birders, and landowners often know things about wildlife movement, nesting locations, and seasonal patterns that desktop analyses miss. Beyond commenting on the proposed alignment, advocates should request **micrositing** adjustments where the route crosses sensitive features and push for micrositing flexibility to be preserved in permit conditions, so that individual tower placement and span lengths (horizontal distance between two consecutive support structures such as towers or poles) can be adjusted in the field when construction crews encounter wildlife features that were not visible during planning.

## Phase 4: Permitting

Before construction, the project undergoes regulatory review across multiple jurisdictions. Federal permits may include ***National Environmental Policy Act (NEPA)*** review (that includes preparation of an **Environmental Impact Statement (EIS)** or conducting an Environmental Assessment), **Endangered Species Act** section 7 consultation, *Clean Water Act* section 404 permits, *National Historic Preservation Act* section 106 review, and others. State permits typically include a **Certificate of Public Convenience and Necessity (CPCN)** or equivalent. DOE's **Coordinated Interagency Transmission Authorizations and Permits Program (CITAP)**, launched in 2024, aimed to create a coordinated federal process with a two-year timeline. To qualify, developers must implement a comprehensive Public Participation Plan early in the process, ensuring meaningful engagement with Tribes, local communities, and stakeholders before formal applications are even filed. **Continuation of CITAP** will depend on federal administration priorities and the availability of funding through congressional appropriations. More broadly, the federal permitting landscape for transmission is evolving rapidly. Advocates should verify the status of federal permitting programs, timelines, and agency authorities and guidelines before relying on any specific federal program described in this toolkit.

For projects crossing federal lands, the lead agency is determined by land ownership: BLM typically leads in the West, while USFS often leads in the East and South. Additionally, because Eastern projects frequently traverse extensive networks of wetlands and waterways, the U.S. Army Corps of Engineers

# Permit conditions are where mitigation commitments become enforceable.

**Conservation advocates should push for conditions that are specific and measurable rather than general best practice language.**

(USACE) plays a central regulatory role through section 404 permitting, often serving as the primary federal touchpoint for environmental review.

- **Who leads:** Federal agencies (USFWS, the Environmental Protection Agency, USACE, BLM, etc.), state agencies, local governments

- **Key decisions:** Permit conditions, required mitigation, construction timing windows, monitoring requirements, compensatory mitigation obligations

- **Conservation opportunity:** Permitting is where commitments become binding, so the quality of permit conditions matters enormously. Advocates should participate in public comment periods, NEPA scoping sessions, and formal intervenor processes where available, and should review and comment on EIS drafts with attention to whether the mitigation hierarchy (see Figure 2) has been followed. The most important advocacy at this stage is pushing for permit conditions that are enforceable and specific, and ensuring that mitigation commitments include measurable performance standards, defined monitoring duration, and adaptive management triggers that require corrective action if ecological outcomes fall short.

## Phase 5: Construction

Once permitted, the project enters construction. This phase typically spans one to four years for major projects, depending on length, terrain, and seasonal restrictions. Environmental compliance during construction is critical because this is when habitat disturbance, wildlife displacement, and erosion risk are highest.

Construction activities include clearing and grading the right-of-way, building access roads, excavating tower foundations, erecting towers, stringing conductors, and constructing substations. Each of these activities has specific wildlife implications that depend on timing, location, and methods. Clearing can destroy active nests or permanently fragment forest canopies, significantly altering light and temperature levels for sensitive understory species. Construction noise and activity near vital breeding or nesting sites during breeding seasons can cause sensitive wildlife to permanently abandon established habitats. Uncontrolled erosion and sedimentation near streams and wetland complexes can degrade aquatic habitat and bury sensitive spawning gravels far beyond the footprint of the construction site. Construction equipment can also introduce invasive species, such as the seeds of invasive plants that can have drastic impacts across the entire ecosystem.

Seasonal timing windows are a primary tool for reducing construction phase wildlife harm. For example, these may include winter tree clearing restrictions to protect hibernating bats, lek buffers to protect ground nesting birds during breeding, and “in water” work windows to prevent sediment from smothering spawning fish. However, these timing restrictions are only effective if they are monitored and properly enforced.

- **Who leads:** Construction contractors, developers, environmental monitors, regulatory compliance staff

- **Conservation opportunity:** Construction is where commitments made on paper are tested in the field, and conservation advocates have a role in verifying that they are followed. The priority is ensuring that qualified, independent environmental monitors are on site and reporting to the regulatory agency, rather than solely to the developer. Advocates should track whether seasonal construction restrictions are being observed and report violations when they occur. It is also worth verifying that invasive species and pathogen prevention protocols are in place and being followed. These can include equipment wash stations, soil management plans, restrictions on moving uncertified timber, and use of certified weed-free materials. This is crucial, for example, in dense eastern forests where construction equipment can spread soil-borne pathogens or speed up compaction of sensitive hydric soils, and in the West to prevent fire-prone grass cycles.

## Phase 6: Operations, Maintenance, and Long-Term Stewardship

After energization, the transmission line enters its operational phase, which typically lasts 40 to 60 years or more. Ongoing activities include vegetation management within the right-of-way, access road maintenance, equipment inspection, line repair, and periodic upgrades. Wildlife impacts during this phase can be significant and cumulative, even though they receive far less attention than construction phase impacts.

Across ecosystems, the long-term ecological footprint of a transmission corridor can exceed construction phase impacts. Access roads that remain open can facilitate unauthorized off-road vehicle use, which degrades habitat far beyond the original construction footprint. Vegetation management practices can favor non-native species if not designed with ecological goals. Conversely, in the East and Midwest, these corridors offer a rare opportunity to maintain early successional habitats, such as scrub-shrub lands that are increasingly scarce but vital for pollinators, monarch butterflies, and songbirds.

Decommissioning planning is another long-term consideration that is best addressed during the permitting phase rather than deferred to end of life. Decommissioning plans should address structure removal, materials recycling and disposal, road reclamation, and habitat restoration. Critically, they should include funding mechanisms (e.g., bonds, escrow accounts, or surety instruments) and clear legal obligations that ensure adequate resources and accountability for decommissioning regardless of changes in project ownership or the operator's financial circumstances.

- **Who leads:** Transmission owner/operator, regulatory oversight agencies, and independent environmental monitors in some cases

- **Conservation opportunity:** The completion of a project is the beginning of a multi-decade operational phase where long-term commitments must be upheld. Priority should be placed on advocating for robust monitoring frameworks that include defined ecological indicators, clear corrective action triggers, and transparent reporting requirements. Such frameworks ensure that integrated vegetation management plans, which prioritize the use of selective herbicides and mechanical clearing to promote native low-growing shrubs and grasses, achieve their intended habitat goals over time. Advocates should push for these plans to include pollinator-friendly seed mixes and the removal of invasive vines that threaten adjacent forest health.

Advocates also play a critical role in monitoring access road conditions to prevent sediment runoff into protected wetlands and pushing for strict controls to prevent unauthorized use. It is essential to monitor "edge dwelling" invasive species that can use transportation corridors as a highway to invade core habitats. In high-risk areas, it is essential to verify that avian mortality monitoring follows established USFWS and APLIC protocols, providing the data necessary to refine mitigation strategies. Finally, looking toward the end of the project's life cycle, early engagement in decommissioning planning ensures that the landscape can eventually be restored to its natural state.

# When Engagement Happens Too Late

**When developers and regulatory agencies fail to create early engagement opportunities, conservation priorities risk being left out of key decisions, leading to worse outcomes for wildlife, communities, and the environment. By then, the route is selected, the developer has invested heavily, regulators are working within a defined project scope, and changing course is expensive and contentious. The result is often an adversarial process where conservation advocates feel they are fighting a project rather than shaping it.**

Section 3

*Labsas/Getty Images*

# Core Principles for Wildlife -Forward Transmission

These principles establish NWF's framework for evaluating transmission projects. They are not meant to replace community-defined priorities but to provide a consistent, science-based lens that conservation advocates can apply across projects and regions. They are derived from NWF's five pillars of responsible and fair clean energy transmission, from the practical experience of partners and advocates engaged in siting processes across the country, and from the ecological science on how linear infrastructure affects wildlife and landscapes.

## Principle 1: Avoidance First, Mitigation Second

The most effective way to protect wildlife and habitats is to avoid impacting them in the first place. Routing decisions that steer projects away from the highest conflict landscapes, before micrositing or mitigation is considered, produce the best outcomes for both wildlife and project timelines. This is both an ecological principle and a *practical* one. A route that avoids a major migration corridor does not need a migration corridor

# Wildlife-forward transmission siting treats avoidance as the primary design goal,

**recognizing that some ecological losses (such as the removal of old growth forest, continuous tree canopy, or the severing of a migration corridor) are effectively irreversible. The mitigation hierarchy exists to reduce harm, not to provide a mechanism for purchasing permission to cause it.**

mitigation plan. A route that avoids specialized or protected habitat does not need a complex species management plan. Avoidance eliminates the need for complex, expensive, and often uncertain mitigation.

Mitigation should address residual impacts that remain after avoidance and minimization have been exhausted, not substitute for poor siting. A project that relies primarily on compensatory mitigation or offsets without demonstrating meaningful avoidance does not meet the standard of responsible siting, regardless of how much money is committed to compensation programs.

In practice, avoidance must be map-based. It requires documented routing decisions showing how ecological constraints influenced the alignment, with side-by-side comparison of avoided vs. selected segments. Avoidance is critical in ecosystems where recovery is slow, such as sagebrush steppe (where reestablishment can take 25 to 50 years), high-elevation boreal peatlands, or old growth deciduous forests in the East, where the removal of a centuries-old canopy cannot be mitigated by simple replanting. It is also critical where impacts are effectively irreversible, such as severing a migration corridor, disrupting sensitive temporary wetlands, or fragmenting the last intact habitat block in a landscape.

## Case Study — Empire State Line's Path of Least Resistance

NextEra Energy Transmission's Empire State Line, a 20-mile, 345 kV project commissioned in June 2022, serves as a model for the avoidance principle in the ecologically complex landscape of Western New York. During the routing phase, the project **prioritized the utilization of an existing** 500-foot-wide New York State Electric & Gas (NYSEG) utility **corridor** for most of its length.

By sticking to this **pre-disturbed path**, the developer avoided new fragmentation of the Niagara Escarpment, a globally significant geological feature and biodiversity corridor. This choice **prevented the *barrier effect*** that a new greenfield route would have created, preserving a continuous wildlife highway for sensitive species and avoiding the creation of new predation lanes into the forest interior. This routing strategy also allowed the project to bypass high-value wetlands and mature woodlands that would have otherwise required extensive compensatory mitigation. Furthermore, the use of steel monopoles **minimized the ground footprint** compared to traditional lattice towers, and the project employed horizontal directional drilling to go underneath the New York State Thruway, avoiding surface disturbance in that sensitive area. This demonstrates that even in regions with intense land use competition, prioritizing the colocation of new lines within existing corridors can be an effective avoidance tool.

## Principle 2: Corridor Reuse and Colocation

New transmission lines should be colocated with existing infrastructure wherever feasible, alongside existing transmission corridors, highway rights-of-way, railroad tracks, or pipelines. Building parallel to existing disturbance minimizes new fragmentation, reduces the need for new access road construction, and limits the creation of new spines (linear infrastructure corridors that bisect and divide large habitat blocks) across intact landscapes. This principle recognizes a clear hierarchy of corridor preference. Each step down this hierarchy should come with a documented, engineering-based explanation for why higher-ranked options were infeasible:

- **First choice:** Parallel existing transmission corridors, using shared right-of-way adjacency or parallel alignments that avoid creating a new greenfield corridor

- **Second choice:** Parallel highway or major transportation corridors where engineering constraints allow

- **Third choice:** Previously disturbed or degraded lands, including legacy disturbance footprints, existing industrial corridors, reclaimed lands, brownfields, or already converted landscapes

- **Last resort:** A greenfield corridor through undisturbed habitat and/or landscapes of high ecological value, which should be treated as a decision requiring affirmative justification, not the default

Colocation is not without its own challenges. Corridor stacking, meaning the placement of multiple linear features in close proximity, can create composite barriers for wildlife movement and compound existing infrastructure burdens on nearby communities. The benefits of colocation must be weighed against the potential for barrier effects, and design measures such as maintaining open space between parallel features may be needed to retain functional connectivity. The key is transparent, case-by-case evaluation instead of rigid rules applied without ecological context.

### Case Study: Rail-to-Grid Integration (SOO Green HVDC Link)

The SOO Green HVDC Link, a 350-mile high-voltage direct current (HVDC) transmission line, represents an application of the colocation principle. Designed to connect 2,100 MW of wind and solar resources from the MISO (Iowa) market to the PJM (Illinois) market, the project is sited entirely underground along **existing** Canadian Pacific Kansas City railroad **rights-of-way.**

By utilizing a rail-to-grid model, SOO Green achieves a **near-zero additional surface footprint**. Because the 525 kV cables are buried within a pre-disturbed transportation corridor, the project **avoids surface barrier effects for land-based wildlife** and **eliminates the avian collision and electrocution risks** associated with overhead towers once operational. (However, the construction phase might still cause temporary disturbance and require careful management of thermal dissipation.) This strategy **bypasses the habitat fragmentation typically associated with high-voltage infrastructure** in the Midwest's remaining prairie and forest patches. While this underground HVDC model is a good option for wildlife protection, it is typically reserved for long-distance projects due to the higher costs and heat dissipation requirements compared to traditional overhead alternating current (AC) lines.

## Principle 3: Early and Continuous Engagement

Conservation advocates, wildlife scientists, and local communities should be involved from the earliest planning stages, before corridors are identified and before routes are selected. Engagement should continue through construction and into operations. One-time consultation is not sufficient for a multi-decade infrastructure project.

Early engagement goes beyond commenting on proposals. For wildlife managers and advocates, it means building relationships with developers, planners, and regulators before specific projects are proposed. It means facilitating the *proactive sharing* of any available ecological data (for instance, from state agencies, academic partners, project developers, or advocacy groups) before it is requested. It means offering constructive alternatives (in addition to any objections), so that conservation advocates are seen as problem solvers rather than obstacles. And it means maintaining a presence throughout the project lifecycle, from the initial planning scenarios through construction monitoring and into long-term operational stewardship. In regions dominated by private land, early engagement is the only way to ensure that local conservation priorities (which may not be captured in broad federal or state datasets) are reflected in the developer's initial corridor screening.

***NWF's community participation toolkit for transmission siting can be accessed here.***

### Case Study: Landowner-First Transmission Siting (North Plains Connector)

The North Plains Connector (NPC), a 420-mile interregional HVDC line running from Montana to North Dakota, is a good example of proactive, standing engagement. Rather than presenting a final route to the public, the developer (Grid United) initiated a **landowner-first** approach in 2022, years before seeking formal permits. By meeting directly with landowners and over 23 Tribal Nations before finalizing the alignment, the developer **identified cultural sites and biological and environmental** constraints, including sensitive wetlands and local wildlife movement areas, that desktop modeling missed. This early flexibility resulted in a "zigzagging" route that added 50 miles to the project length but avoided the most sensitive habitats and eminent domain, securing wide stakeholder buy-in. Furthermore, the project leveraged its early engagement to help rural communities in Montana and North Dakota win over $62 million in federal grants for local infrastructure. This model proves that **intensive, upfront investment in community and conservation relationships** can effectively de-risk a project by **resolving siting friction** before it reaches the regulatory stage.

## Principle 4: Landscape-Scale Planning

Wildlife does not respect project boundaries. A single transmission line may have modest impacts on its own, but when combined with existing roads, pipelines, wind farms, solar arrays, fences, and other infrastructure in the same landscape, the cumulative effect can push an ecosystem past ecological thresholds. Transmission siting decisions should consider the cumulative effects of all existing and planned infrastructure in a landscape, not just the individual project under review. This includes evaluating fragmentation thresholds, infrastructure density, and the combined barrier effects of transmission lines, roads, fences, and energy development.

This requires thinking at the scale of landscapes and ecosystems instead of project footprints. For example, in the Southern and Eastern U.S., new transmission lines often traverse landscapes already fragmented by dense road networks and suburban sprawl; here, the cumulative impact of a new corridor can be the tipping point that degrades the last remaining forest cores or eliminates migratory stopover points. Similarly, in the Great Basin, transmission corridors are being built in landscapes that are simultaneously experiencing rapid expansion of solar and wind development, new access roads, and ongoing grazing infrastructure. Each individual project may appear to have limited impact when evaluated in isolation. But the cumulative effect of multiple projects can transform an intact ecosystem into a fragmented, infrastructure-dominated landscape where wildlife populations may no longer be able to persist. This is why the landscape-scale avoidance screening and cumulative impact evaluation tools presented later in this toolkit (**Section 5**) require that projects account for existing and reasonably foreseeable buildout, not just their own footprint.

It also requires looking forward, including accounting for how climate change will shift species ranges, alter migration routes, and modify the location and viability of critical habitats over the coming decades. Responsible siting must consider not just what infrastructure exists today, but what is planned or likely to be built in the same landscape over the next decade. This requires moving away from project-by-project siloed reviews toward regional transmission portfolios that evaluate how a network of new lines will collectively interact with core habitat blocks across multiple states.

### Case Study: Wide Angle, Small Footprint: BLM's Western Solar Plan 2024

BLM's *Updated Western Solar Plan,* finalized in 2024, is a significant federal example of **landscape-scale planning** that accounts for **cumulative ecological impact** across an entire region. Covering 11 western states and roughly 162 million acres of BLM-administered land, the plan does not evaluate individual solar projects in isolation. Instead, it **screens at the programmatic level**, using 21 resource-based exclusion criteria to identify lands where development would conflict with wildlife, cultural resources, hunting and fishing, or conservation values. **Excluded areas include designated and proposed critical habitat** for ESA-listed species, Areas of Critical Environmental Concern, wilderness study areas, big game migration corridors, and old growth forests. The plan also reflects a smart-from-the-start approach to solar siting.

At the same time, the plan directs development toward lands near existing transmission infrastructure and previously disturbed areas, reducing cumulative pressure on intact landscapes. The approach demonstrates that it is possible to plan at the scale of entire ecosystems, not just individual project footprints, and to make binding land use decisions based on where cumulative conflict is likely to be unacceptable. While this plan applies to solar development rather than transmission directly, its framework of landscape-scale exclusion screening combined with development area designation is a model for how transmission corridor planning could apply similar principles at a regional scale.

## Principle 5: Transparency and Information Sharing

Route alternatives should be evaluated using **consistent, publicly available ecological data where possible** (recognizing that some analyses may also draw on sensitive data shared with developers under data use agreements that cannot be made public), **and transparent comparison metrics.** Communities and stakeholders should be able to access the same information developers and regulators use to make decisions. Alternatives that are dismissed should come with documented, engineering-based explanations.

In practical terms, this means that conservation advocates should be able to request and receive a **quantitative alternatives comparison** table that includes metrics such as new corridor miles, new access road miles, crossings of priority habitat layers, fragmentation impact, connectivity change, and cost. Without this information, it is impossible to evaluate whether the selected route truly represents the lowest long-term ecological and community conflict pathway or simply the cheapest option.

Transparency also applies to the ecological data itself. Advocates should have access to the non-sensitive Geographic Information System (GIS) data layers and constraint maps that developers and planners are using in their screening process. If a developer is unwilling to share this information, that reluctance is itself a red flag suggesting that the alternatives analysis may not have been conducted with the rigor the project warrants.

**Case Study**

### TransWest Express and the Case for Public Data Access

The 732-mile TransWest Express transmission project (currently under construction and slated for completion in 2029) is an example of spatial transparency in transmission planning, owing to its publicly available refined corridor data. By allowing stakeholders to download the GIS datasets for the project's footprint, access roads, and engineering alignments, the developer provided the same source of truth used by federal regulators. This **open data approach** enabled **conservation advocates to independently verify impacts** on sensitive landscapes, such as greater sage-grouse habitat, transforming the environmental review into a **verifiable, science-based dialogue.** However, the project also highlights the limits of transparency alone, as a 15-year permitting timeline and conflicts over local impacts on private lands in Utah demonstrate that even a data rich, transparent process can remain deeply polarized and susceptible to interagency bureaucratic delays.

## Principle 6: Adaptive Management Over the Project Lifespan

A responsibly sited project includes a plan for monitoring and adaptive management that extends through the full operational life of the infrastructure. Such a plan should clearly define ecological indicators, monitoring duration, corrective action triggers, and reporting commitments. Wildlife impacts do not end at energization, and neither should management attention.

Adaptive management only works if the triggers for corrective action are specific, enforceable, and automatic. Examples of meaningful triggers include: invasive species cover within the right-of-way or adjacent buffer exceeding a defined percentage of total cover; failure to establish native, low-growing plant communities that support local biodiversity (such as pollinators or grassland birds); avian mortality exceeding a defined rate (birds per mile per year, adjusted for detectability); unauthorized access road use exceeding a defined threshold; or erosion affecting adjacent waterways beyond baseline conditions. Each trigger should have a defined corrective action, a timeline for implementation, and a mechanism for verification.

Adaptive management is especially important both in arid ecosystems where recovery is slow, and in temperate or tropical regions where aggressive vegetation growth and high rainfall require constant oversight to prevent habitat degradation. A commitment to adaptive management over the full project lifespan is what distinguishes responsible stewardship from a one-time construction mitigation effort.

## Case Study: Stewardship Beyond Construction: CHPE's Environmental Trust

The Champlain Hudson Power Express (CHPE), a 340-mile underground and underwater HVDC transmission line delivering 1,250 MW of Canadian hydropower from the Quebec border to New York City, demonstrates a **funded, governance-based approach to long-term ecological stewardship**. As a condition of its permits, the project established the Champlain-Hudson Environmental Trust (CHET), a $117 million stewardship fund disbursed over 35 years to protect, restore, and improve aquatic habitats and fisheries resources in Lake Champlain, the Hudson River, the Harlem River, and the East River. The Trust is overseen by a governance committee that includes representatives from CHPE, New York state agencies, and environmental and community organizations that had advocated during the permitting process for route changes to avoid polychlorinated biphenyl (PCB) hotspots and critical habitats for endangered Atlantic sturgeon.

In its first round of awards, CHET committed $3.5 million to seven projects advancing research and habitat enhancement in Lake Champlain and the Hudson and Harlem Rivers. The CHPE model shows what long-term stewardship funding can look like when it is structured as a binding, independently governed commitment rather than a one-time mitigation payment. The 35-year **funding horizon, the multi-stakeholder governance** structure, and the **focus on monitoring and adaptive restoration,** alongside **compensation**, distinguish this approach from the more common practice of a developer writing a check and walking away. Conservation advocates evaluating other transmission projects can point to CHET as a precedent for what a serious long-term stewardship commitment looks like.

The sections that follow translate these principles into specific guidance, worksheets, and checklists for each phase of the transmission development lifecycle.

# Building a Wildlife-Forward Grid

Applying these principles transforms transmission from a high-conflict industrial footprint into a durable landscape asset. These standards ensure that the clean energy transition does not come at the cost of wildlife and intact habitats. This framework also provides regulatory certainty by resolving ecological friction and community opposition before the permitting stage, effectively de-risking the path to a modernized grid. By **centering transparency, avoidance, and long-term stewardship,** we move toward building a resilient energy future that **respects the ecological integrity of the landscapes** it crosses.

Section 4

Aydinmutlu/Getty Images

# Regional Environmental Risk Profiles

Different landscapes present different ecological risks for transmission development. This section provides a high-level reference (see **Table 1**) for identifying the landscape types proposed transmission projects might cross and the ecological concerns most likely to arise in each. It is not a comprehensive species list or a field guide. It is a *starting point* for knowing what to look for and where to find the data.

Many transmission projects cross multiple landscape types along their route. A high-voltage line from Ohio to Virginia may cross Appalachian forests, agricultural bottomland, wetland complexes, and ridgeline flyway concentration points. A line from Wyoming to Nevada may traverse sagebrush rangeland, desert basin, and big game migration corridors. Advocates evaluating a project should identify every landscape type along the proposed route using the matrix below to identify impacts to wildlife, habitats, and natural resources.

### TRANSMISSION, WILDLIFE, AND HABITAT BY THE NUMBERS*

9–11 million acres of land area currently occupied by transmission rights-of-way

40 miles of new abrupt forest edges created per 20 miles of transmission line cleared

12–64 million birds killed annually by power line collisions and electrocutions

As much as 12–36 acres of habitat cleared per mile of high voltage transmission line

5,000 miles of new high-capacity lines needed annually through 2050 to meet energy demand and bring clean energy online

**All figures in this infographic pertain to the United States*

## Cross-Cutting Ecological Functions, Tools, and Data Sources

Several ecological functions and regulatory designations cut across multiple landscape types and should be evaluated for any transmission project, regardless of the specific ecoregion. *(Note that in addition to the tools and sources listed below, local ecological knowledge from wildlife experts, Tribes, conservationists, community members, and landowners is essential for identifying features and patterns that do not appear in regional/national databases):*

- **Wildlife connectivity and movement corridors.** Transmission infrastructure can disrupt landscape connectivity through barrier effects, avoidance behavior, and cumulative stacking of linear features, even where it does not directly destroy habitat. The composite barrier concept is important: A single transmission line may not block movement on its own, but when combined with roads, fences, and other infrastructure, it can sever functional connectivity at geographic pinch points. Primary **data sources** might include:
  - USGS GAP Analysis Project: Spatial database that has data layers of land cover and species ranges against protected status to identify gaps in biodiversity protection, helping planners avoid areas where new infrastructure would further fragment underrepresented ecosystems
  - USGS WebDART Ecological Assessment Tool: Launched in 2025, this tool allows developers to compare disturbed sites with unspoiled reference areas, specifically looking at soil condition and rangeland health

- **USGS Ungulate Migrations of the Western United States:** Detailed mapping of high-use corridors for Western big game (mule deer, pronghorn)

- **State Wildlife Action Plans:** Comprehensive conservation blueprints that identify species of greatest conservation need and their habitats, providing a non-federal roadmap for protecting sensitive species before they require listing under the Endangered Species Act

- **Aerial migration flyways and high-use corridors.** North America's four major flyways (Atlantic, Mississippi, Central, Pacific) host billions of birds, bats, and migratory insects in predictable corridors. These species navigate using, in part, landscape handrails (ridgelines, river valleys, and coastal peninsulas) that concentrate flight activity and heighten collision risk. Beyond direct strikes, transmission lines can act as behavioral barriers (via avoidance) or, in the case of bats, attraction points where towers are mistaken for roosting trees. Primary **data sources** might include:

  - **USFWS Information for Planning and Consultation (IPaC) screening tool:** Project-specific screening tool that generates automated reports of threatened and endangered species and migratory birds, providing a baseline for initial environmental compliance and avoidance

  - **USFWS Environmental Conservation Online System (ECOS) Critical Habitat Maps:** Centralized database providing authoritative GIS data for federally designated critical habitat, which can be used to avoid adverse modification from transmission projects

  - **USGS Breeding Bird Atlas Species Maps:** National portal for state breeding bird atlases that identifies specific nesting blocks where species are confirmed to breed, allowing for avoidance mapping and precise corridor adjustments

  - **Audubon Important Bird Areas:** Science-based inventory of keystone landscapes vital for bird population persistence, can be used to identify high-risk bottlenecks where transmission lines would pose significant collision and displacement threats

  - **BirdCast** and **APLIC Guidelines:** Real-time migration forecasts and industry standard manuals from the Avian Power Line Interaction Committee (APLIC) to inform avian-safe design and identify high-risk areas where improper siting would increase collision potential

  - **North American Bat Monitoring Program:** Bat distribution and activity data; essential for identifying high activity migration zones for bats

- **Monarch Joint Venture:** Tool for identifying important nectar corridors and migration pathways for insects, which can help reduce overlap with the open rights-of-way that transmission lines occupy

- **Infrastructure, regulatory, and screening overlays.** Beyond biological data, specific federal designations and land cover maps serve as the starting point for all transmission environmental reviews. Aligning with pre-screened corridors and avoiding national interest conflicts can significantly streamline the permitting timeline. Primary **data sources** might include:

  - **Our Grid Future Planned Transmission Database:** Interactive map tracking the progress of roughly 200 high-capacity (230kV+) transmission projects across the U.S.; useful for visualizing future grid overlays, identifying where planned routes might converge on sensitive habitats, and cross-referencing permitting milestones to better time wildlife surveys and mitigation strategies

  - **DOE NIETC Designation Maps & Geospatial Data:** Federal GIS data to pinpoint where DOE has prioritized high-capacity transmission of national interest; as of 2026, the Southwestern Grid Connector (CO/NM/OK), Tribal Energy Access (ND/SD/NE), and Lake Erie-Canada (PA/Lake Erie) corridors are in active public engagement and environmental review, providing a roadmap for developers to align with federal financing and streamlined permitting

  - **DOE RAPID Toolkit:** Database for state-specific regulatory and permitting information, including environmental review requirements and lead agency contacts

  - **BLM Section 368 Energy Corridor Maps & Geospatial Data:** Designated corridors on western federal lands where environmental screening and land use compatibility have already been partially completed

  - **EPA RE-Powering Mapper:** Identifies over 190,000 pre-screened contaminated lands, landfills, and abandoned mine sites for energy redevelopment; can help identify brownfields for transmission development to spare high quality, intact habitats *(Note: Planners must ensure these recommendations do not further overburden communities already experiencing disproportionate environmental harms from existing or historic industrial activities.)*

The detailed questions to raise with developers and planners for various landscape types and ecological functions are provided in the worksheets in Sections 5–8.

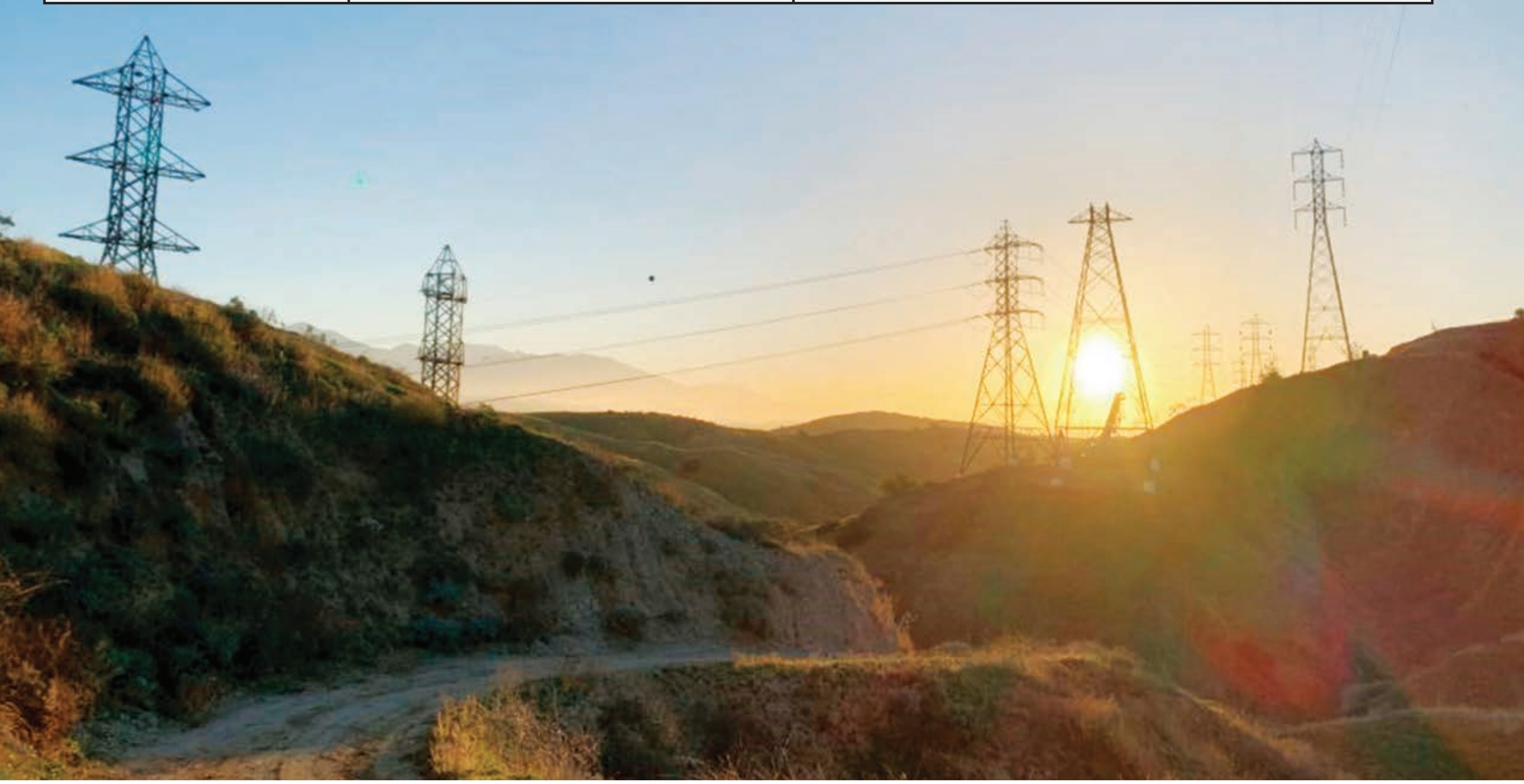
**Table 1:** Environmental risk profiles and useful data sources by landscape type

| **Landscape Type** *(where in the U.S.)* | **Potential Transmission-Related Impacts on Wildlife & Ecosystems** | **Primary Data Sources** *(not an exhaustive list)* |
|---|---|---|
| **Forests and Woodlands**<br>*Appalachia,*<br>*Great Lakes,*<br>*New England,*<br>*Southeastern (Pine),*<br>*Pacific Northwest (Conifer),*<br>*Northern Rockies* | • **Edge effects & fragmentation:** Canopy clearing creates "edges" extending 100–300 ft into the interior, impacting significantly more acreage than the physical footprint; creates predation corridors<br>• **Impediment to bat conservation:** Disruption of bat hibernacula in karst landscapes and loss of summer roost trees<br>• **Vegetation shift:** Improper long-term right-of-way (ROW) management often converts diverse forest understory into non-native, invasive monocultures | • USFS Forest Inventory and Analysis Database: Census of trees, providing landscape-scale data on forest composition, age, health<br>• USFWS Range-Wide Bat Survey Guidelines: Range-wide standards for acoustic and mist netting surveys<br>• TNC Resilient Land Mapping Tool: Mapping suite that identifies forests with geographical diversity to remain resilient as climate-driven species migration occurs<br>• State Natural Heritage Programs: Localized databases managed by state agencies that provide the most granular records available for rare plants, endemic insects, and natural community types |
| **Grasslands, Prairies, and Agricultural Lands**<br>*Great Plains,*<br>*Midwest,*<br>*Mid-Atlantic farmland* | • **Habitat fragmentation:** Loss of remaining native prairie fragments (less than 4 percent of tallgrass remains); fragmentation of grassland blocks for area-sensitive nesting birds (grassland birds have declined more than 50 percent since 1970)<br>• **Avian disturbance:** Disruption of prairie chicken leks and breeding display areas; increased collision risk for migratory waterfowl and raptors<br>• **Soil & drainage:** Soil compaction affecting drainage and long-term crop productivity; drain tile disruption in Midwest cropland (IA, IL, IN, OH) causing flooding on adjacent fields<br>• **Farmland operational conflicts:** Herbicide drift from ROW management affecting sensitive crops; disruption of prescribed fire cycles essential for prairie health; soil disturbance facilitating woody encroachment by non-native species | • USDA Web Soil Survey: Essential for identifying prime farmland, soil productivity, and drain tile likelihood<br>• USDA Easement Data: Maps of lands protected by agricultural or wetland reserve easements<br>• SAGE Lab Farms Under Threat 2040 Dashboard: Spatial planning tool to identify and protect nationally significant agricultural land by modeling future infrastructure and development pressure<br>• USFWS Open Data Portal: Critical habitat spatial data for current and delisted species, including the lesser prairie chicken<br>• Bird Collision Risk Data: Longitudinal study quantifying avian collision risks with high-voltage transmission lines to provide a scientific baseline for mitigation<br>• Southern Great Plains Crucial Habitat Assessment Tool: To identify high-priority habitat and focal connectivity areas across KS, OK, TX, NM, CO<br>• Drained Area Tool: Predictive mapping resource to identify subsurface tile drainage systems across the Midwest, to prevent soil compaction and drainage failures due to construction<br>• State Natural Heritage Programs: Localized databases that provide the most granular native prairie records<br>• Audubon North American Grasslands & Birds Report: Comprehensive report with targeted regional data on specific habitat requirements for declining grassland bird species<br>• State Wildlife Agency Lek Databases: Confidential, high precision records of active breeding display grounds (leks) maintained by state biologists (typically accessed via formal data requests or restricted agency portals requiring confidentiality agreements), which provide highly granular data for establishing "no build" buffers and timing construction |

| Landscape Type<br>*(where in the U.S.)* | Potential Transmission-Related Impacts on Wildlife & Ecosystems | Primary Data Sources<br>*(not an exhaustive list)* |
|---|---|---|
| **Shrublands and Rangelands**<br>*Sagebrush Steppe (13 western states), Great Basin, Chaparral (CA), Southwestern Scrub* | • **Fragmentation & lek disturbance:** Fragmentation of intact shrubland blocks; sage-grouse lek disturbance due to noise and predator perching (measurable decline in attendance within several miles of infrastructure)<br>• **Fire feedback loop:** Soil disturbance facilitates cheatgrass and other invasive annuals, creating a *fire cycle* where frequent burns contribute to the conversion of native shrublands (which can take 50+ years to recover) into invasive grasslands<br>• **Access & edge effects:** New access roads facilitate unauthorized vehicle use, increased fire ignition, and invasive species spread. Overlapping projects (renewable energy + transmission + road development) create cumulative pressure across shared landscapes and migration corridors | • USDA Rangeland Analysis Platform: High-resolution (10–30m) spatial tool that tracks vegetation trends and biomass production (can help identify intact grassland cores + avoid fragmenting resilient rangeland ecosystems)<br>• USFWS Grassland Geospatial Visualization: Map highlighting priority grassland areas for strategic habitat conservation<br>• BLM Sage-Grouse Habitat Management Areas (2025–26): Spatial dataset that designates priority habitat management areas and disturbance caps across ten western states<br>• USGS Sagebrush Ecosystem Tool & USFWS Sagebrush Geospatial Visualization: Mapping tools to visualize spatial trends in ecological integrity and assess impacts of invasive grasses, conifer encroachment, and human modification on the sagebrush biome<br>• USGS Sage-Grouse Population Monitoring Framework (2026): Standardized, range-wide monitoring system that utilizes a targeted annual warning system to distinguish local population declines from regional trends and harmonized different state lek count methods, enabling siting teams to identify areas where infrastructure would pose the greatest risk to sensitive breeding clusters<br>• LANDFIRE Vegetation & Disturbance Data: Comprehensive national dataset providing 25+ geospatial layers on existing vegetation type, height, and structure, updated annually to reflect recent wildfires, harvests, and land cover changes |
| **Deserts**<br>*Mojave, Sonoran, and Chihuahuan deserts in CA, NV, AZ, NM, west TX* | • **Biological soil crust (biocrust) destruction:** Heavy equipment destroys living soil crusts (moss, cyanobacteria, lichens) that stabilize sand and fix nitrogen; these take decades to reform and can lead to dust bowl conditions<br>• **Desert tortoise habitat fragmentation:** Loss of vital habitat and connectivity corridors for the threatened desert tortoise; infrastructure creates barriers to mating and forage migration<br>• **Hydrological hotspots:** Disruption of springs, seeps, and natural rock tanks (often the only survival points for desert wildlife in vast arid zones)<br>• **Altered fire regimes:** Compacted surfaces and non-native grass introduction (e.g., buffelgrass, red brome) introduce fire to an ecosystem not evolutionarily adapted to it, leading to type conversion of desert scrub to invasive grassland | • USGS Biocrust Science & Mapping: High-resolution data on soil crust health; helps rule out generic reclamation plans that don't account for microbial soil life<br>• USFWS Desert Tortoise Critical Habitat: Spatial dataset for Desert Tortoise; its relevance was underscored by a January 2026 federal court ruling ordering BLM to close roughly 2,200 miles of off-highway vehicle routes crossing designated critical habitat in the West Mojave<br>• USGS Dryland Ecology and Management Support: Suite of land treatment exploration tools that provide vegetation cover maps and soil stability frameworks to guide restoration and reclamation in arid ecosystems<br>• Groundwater Dependent Ecosystem (GDE) Pulse: Specialized database and mapping tool that identifies GDEs and desert springs, which serve as reliable hydration hubs for wildlife in arid corridors<br>• BLM Desert Renewable Energy Conservation Plan Dataset: Foundational land use plan for Southern CA that balances renewable energy with desert species protection |

| **Landscape Type** *(where in the U.S.)* | **Potential Transmission-Related Impacts on Wildlife & Ecosystems** | **Primary Data Sources** *(not an exhaustive list)* |
|---|---|---|
| **Wetlands, Rivers, and Floodplains** *Nationwide. Great Lakes Marshes, Gulf and Atlantic Coast Tidal Wetlands, Prairie Potholes (Dakotas, MN), Southeast Bottomland Hardwood Forests, Western Riparian Corridors* | • **Hydrological & soil disruption:** Alteration of flow patterns from construction grading and fill placement; sedimentation of waterways from disturbed upland soils; disruption of natural hydrology<br>• **Regulatory complexity:** Triggers Clean Water Act Section 404 permits and jurisdictional determinations under a shifting WOTUS definition (a proposed 2026 rule would narrow jurisdiction to waters with a continuous surface connection)<br>• **Loss of productive hardwoods:** Permanent loss of bottomland hardwood forests, which are among North America's most productive but slowest recovering ecosystems<br>• **Avian & aquatic risk:** High collision risk for waterbirds near major water body crossings; introduction of invasive riparian plants; impacts on freshwater mussels from streambed disturbance | • USFWS National Wetlands Inventory and Wetlands Mapper: Primary mapper for the status and extent of wetlands and deepwater habitats<br>• USGS National Hydrography Dataset: High-resolution 3D stream network dataset derived from LiDAR<br>• National Aquatic Barrier Inventory & Connectivity Tool: High-resolution data layers identifying priority watersheds and fish passage barriers<br>• FEMA Flood Map Service Center: Identifies floodplains vulnerable to erosion and instability to guide responsible infrastructure siting<br>• NOAA Restoration Atlas: Maps active and completed habitat restoration projects. Avoidance of these sites is critical to protect existing conservation investments |
| **Coastal and Marine** *Atlantic Coast, Gulf Coast, Pacific Coast* | • **Landfall & dune disruption:** Cable landfall construction (horizontal drilling or trenching) affecting sensitive dune systems, beach nesting bird habitats, and intertidal flora<br>• **Flyway collision risks:** High collision risk along coastal flyways where bird movement concentrates at headlands, barrier islands, and peninsulas<br>• **Benthic & estuarine habitat:** Physical disruption of seafloor (benthic) ecosystems and essential fish habitat during cable burial; temporary increases in turbidity and sedimentation<br>• **Infrastructure resiliency:** Extreme vulnerability to storm surges and sea level rise; Gulf Coast infrastructure is at high risk for hurricane-driven outages and damage<br><br>*See NWF Wires & Wildlife report on Offshore Transmission Development and the Benthos* | • NOAA Offshore Wind Marine Life & Habitat Data Mapper: Highlights significant marine features, can be used for identifying where transmission might cross key habitats<br>• NOAA Benthic Data Hub: Provides high-resolution maps of the seafloor, essential for choosing "soft bottom" paths for cables that avoid sensitive reef habitats<br>• NFWF Coastal Resilience Evaluation and Siting Tool: Decision support tool that identifies coastal areas where habitat conservation provides high flood protection; helps prioritize nature-based solutions for coastal infrastructure and to identify areas where transmission siting could disrupt natural storm buffers<br>• Regional Ocean Data Portals: Portals containing wildlife layers specifically curated for regional offshore energy siting (Northeast, Mid-Atlantic, West Coast)<br>• MarineCadastre.gov: Repository for all U.S. offshore spatial data, including existing subsea cables, vessel traffic (important for strike risk), federal lease boundaries<br>• NOAA Coastal Flood Exposure Mapper: Maps showing places and natural resources exposed to coastal flooding<br>• USFWS Coastal Barrier Resources System Mapper: Identifies protected coastal barriers where federal expenditures (including certain infrastructure subsidies) are restricted<br>• State-specific coastal zone management program: consistency standards that offshore projects must meet to avoid conflict with local coastal protection laws<br>• NOAA Sea Turtle Stranding and Salvage Network: State liaison contact information and data visualization tool |

| Landscape Type *(where in the U.S.)* | Potential Transmission-Related Impacts on Wildlife & Ecosystems | Primary Data Sources *(not an exhaustive list)* |
|---|---|---|
| **Developed Urban and Fragmented Landscapes** *Suburban & Exurban Areas Nationwide* | • **Connectivity severance:** Severing remaining corridors (greenways, stream buffers) between habitat patches; these stepping stones are vital for urban-adapted wildlife<br>• **Urban heat & canopy loss:** Removal of urban tree canopy increases heat island effects and removes vital nesting sites for birds; construction impacts stormwater management in areas with high impervious surface<br>• **Social & equity impacts:** Disproportionate siting in marginalized communities due to prioritization of previously disturbed landscapes (environmental justice concerns); high visual and noise disruption; interference with local open space and recreation goals<br>• **Regulatory multi-layering:** Coordination required with municipal tree ordinances, conservation overlay zones, and local land use plans that may be more restrictive than state law | • **National Conservation Easement Database:** Identifies local land trust easements that protect suburban pocket forests and trails<br>• **Trust for Public Land ParkServe:** Identifies "park deserts," if a line impacts a rare urban or suburban green space, the community might have no alternative nature access<br>• **EJScreen** (formerly EPA, now mirrored): Tool for identifying overburdened communities to ensure equitable infrastructure siting<br>• **WRI Cool Cities Lab Urban Heat Maps:** Platform for mapping heat risks block by block; can be used to prevent tree canopy removal in heat vulnerable neighborhoods<br>• Municipal Comprehensive Plans: Local zoning and conservation overlays that designate *environmental protection districts*<br>• County Open Space Inventories: Maps of lands targeted for future preservation or current recreation use |



*Morongo Transmission LLC*

Thomas Northcut/Getty Images

Section 5

# Planning & Corridor Development: What to Ask for Early

The planning and corridor identification phase offers the greatest opportunity to influence a transmission project's wildlife outcomes. Decisions made here about where to study, what alternatives to evaluate, and what data to use, set the trajectory for everything that follows.

**Section 2** and **Section 3** outlined *what* should happen during planning and corridor selection and *why*: the corridor preference hierarchy, the importance of transparent alternatives analysis, early agency coordination, landscape-scale cumulative assessment, and the avoidance first principle. This section focuses

Carlos Ciudad/Getty Images

on *how to evaluate whether those things are actually happening* on a specific project, and what to do if they are not. The worksheet at the end provides a structured scoring tool to help you assess a project's planning process and determine your next steps.

## Verifying the Avoidance Screen

Before engaging in corridor specifics, the threshold question is whether the project started its routing work from the right foundation. A responsible planning process begins by mapping the highest conflict landscapes and excluding them from consideration before any corridor comparison begins. This is distinct from the alternatives analysis itself; it is the step that determines where the alternatives analysis takes place.

The ecological constraints and data sources described in **Section 4** provide a starting point for evaluating whether the screening was adequate. Advocates should verify that the screening accounts for the relevant wildlife, habitat, and connectivity concerns for every landscape type the project crosses, and should flag gaps where state wildlife agency data, Tribal input, or connectivity information were absent. **A project that skipped this step, or conducted it using incomplete or outdated data, is building on a weak foundation regardless of how many alternatives it evaluated afterward.**

This is <u>not</u> a veto system. It is a quality check on the starting point. If the screen was conducted rigorously, engagement can focus on the details of corridor comparison, design, and mitigation. If it was not, that gap is worth flagging for both the developer and regulatory agencies. Advocates play an important role in identifying screening deficiencies and elevating concerns, but the responsibility for conducting a rigorous screening process rests with the developer, and the responsibility for requiring one rests with the permitting authority.

## Corridor Design: Where Alignment Ends and Engineering Begins

Sections **2** and **3** address corridor *selection*, meaning which corridor to choose. But even within a well-chosen corridor, specific design decisions determine the project's actual ecological footprint, and these decisions are often made quietly by engineering teams without conservation input.

Corridor width is one example. The right-of-way for a high-voltage transmission line is typically 150 to 200 feet wide, but developers sometimes request wider corridors than engineering requires, either for construction convenience or to preserve future expansion options. Every additional foot of width means additional habitat clearing, edge effect, and long-term maintenance disturbance. Advocates should ask whether the requested width is the minimum required for safe construction and operation, or whether it includes a buffer that could be narrowed.

Access road planning is another. New permanent access roads are often the single largest driver of long-term ecological impact from a transmission project, yet road layouts are frequently treated as an engineering detail rather than an ecological decision. In the arid West, new roads can drive invasive species spread, fire ignition, and unauthorized vehicle access for decades. In Eastern forested landscapes, new roads can create permanent edge habitat and fragment interior forest. In both cases, the principle is the same: Use existing roads wherever possible, minimize new permanent roads, and commit to physically closing and restoring temporary construction roads rather than allowing "road creep," the well-documented tendency of temporary roads to become permanent through gradual use and widening.

A third issue is barrier stacking within colocated corridors. **Section 3** notes that colocation can create composite barriers when multiple linear features run in close proximity. In practice, the most common version of this problem is a new transmission line with a new parallel access road, creating two barriers where one existed. Advocates should ask whether the project's access plan uses existing roads on the colocated corridor or creates new parallel roads alongside the line.

These **design commitments should be documented before the project moves to permitting,** because they are far harder to secure after permits are filed.

## Where Does the Project Actually Stand?

**Section 2** notes that developers sometimes present a project as being in an early planning phase when key routing decisions have already been made informally. This matters because the value of planning stage engagement depends entirely on whether it is still genuinely open.

Signs that a project's corridor selection may already be effectively locked include: the developer has begun landowner outreach or option agreements (preliminary contracts that pay landowners for the exclusive right to purchase a future easement along a specific path); engineering studies reference a "preferred route" with no documented comparison to alternatives; the developer describes the project as "in planning" but has already filed for key permits; or public materials present a single route with requests for feedback on design details rather than corridor alternatives.

If you encounter these signs, the project may have moved past the point where this section's planning phase questions are most useful. In that case, shift your engagement to **Section 6** (routing and design within the selected corridor) and **Section 7** (mitigation hierarchy), where the leverage points are different.

## Getting to the Table

The worksheets in this toolkit depend on relationships that may not yet exist. If you are engaging with a transmission project for the first time, three steps improve your chances of a substantive conversation:

**1. First, identify the right contact.** For projects in early planning, this is usually the developer's environmental lead or community liaison, not the communications office. For projects in regulatory proceedings, the lead agency's project manager is often more responsive than the developer.

**2. Second, lead with what you bring.** Developers respond to organizations that can provide local ecological knowledge, species data, or community relationships they do not have. An introductory email that offers specific information (e.g., "We have ten years of breeding bird survey data for the corridor you are evaluating.") opens more doors than a general request for a meeting. That said, **do not hold back from engaging because you lack formal data**. Familiarity with the landscape, knowledge of local wildlife behaviors and patterns, traditional ecological knowledge and Tribal cultural practices, relationships with landowners and community groups, and a willingness to ask informed questions are incredibly valuable contributions that developers and regulators may lack or not have access to otherwise.

**3. Third, put it in writing.** Verbal conversations are useful for building relationships, but written correspondence (emails, letters, formal comments) creates a record that regulators can reference. If a developer tells you something important in a meeting, follow up with an email summarizing what was discussed.

**Worksheet 1** on the following page provides a structured set of questions and a scoring framework to help you evaluate the quality of a project's planning process and determine your next steps.

# Worksheet 1: Planning Phase Evaluation

*Use this worksheet when engaging with planners, developers, or regulators during corridor identification. These questions can be adapted for written comments, verbal presentations at public meetings, or meetings with project proponents.*

## How to Score

For each question, assess the quality of the response you received:

### Strong: 3 points

Substantive, well-documented information provided, and reflects genuine engagement with issue

### Partial: 2 points

Some information provided, but with significant gaps / outdated data / incomplete analysis

### Weak/Absent: 1 point

Information not provided/dismissed, or the question was not meaningfully addressed

Record your score for each question, then total your points at the end and use the gating guidance to determine your next steps.

## Part A - Landscape-Scale Screening

| Ask these questions of the developer or project proponent | | Score (1–3) |
|---|---|---|
| ☐ | Before corridors were identified, did the developer map ecological constraints across the study area, such as priority wildlife habitat, migration corridors, connectivity zones, Tribal and cultural landscapes, conservation lands, and projected climate-driven shifts in critical habitat viability? | |
| ☐ | Is the ecological data used in the screening current (within the last ~5 years) and from credible sources, or does it rely on outdated or incomplete datasets? | |
| ☐ | Did the screening flag areas where existing infrastructure and development have already concentrated enough that additional construction could cause significant cumulative harm or degrade the landscape beyond the point of recovery? | |
| ☐ | Can you access the maps, spatial data, and screening criteria the developer used, or were results summarized without sharing the underlying information? | |
| **Part A Total** | | ____/12 |

## Part B - Corridor Strategy

| | Ask these questions of the developer or project proponent | Score (1–3) |
|---|---|---|
| ☐ | What existing transmission lines, highway corridors, rail corridors, pipeline routes, or other infrastructure rights-of-way were considered for colocation? Were previously disturbed or degraded lands such as brownfields, reclaimed mine lands, or former industrial sites also evaluated? | |
| ☐ | Was the four tier corridor preference hierarchy applied (parallel existing transmission → parallel transportation corridors → previously disturbed lands → greenfield as last resort)? If a lower-ranked option was selected, is there a science-based explanation, or was it just a general assertion? | |
| ☐ | Is there a side-by-side quantitative comparison of alternatives (new corridor miles, new access road miles, priority habitat crossings, landscape connectivity impact, cost), or were alternatives described only in narrative form? | |
| ☐ | Does the design minimize new permanent access roads, prioritize existing roads, and include commitments to physically close and restore temporary construction roads? | |
| ☐ | For colocated alignments, has the developer evaluated whether paralleling existing infrastructure would create a composite barrier to wildlife movement, and if so, what design measures are proposed? | |
| **Part B Total** | | ____/15 |

## Part C - Agency, Tribal, & Stakeholder Engagement

| | Ask the developer these questions, and independently verify with the agencies and organizations named | Score (1–3) |
|---|---|---|
| ☐ | Were state wildlife agencies consulted before corridors were narrowed to a preferred alternative, or only after the route was already effectively selected? | |
| ☐ | Were Tribal Nations engaged early and consistent with Free, Prior, and Informed Consent principles, or was consultation limited to notification after key decisions? | |
| ☐ | Were conservation organizations, sporting groups, land trusts, and community groups given the opportunity to provide input on corridor selection before the preferred route was announced, or only invited to comment on a chosen route? | |
| ☐ | For federal agencies involved (such as USFWS, BLM, or USFS), did coordination begin early enough to influence corridor selection, or only at the permitting stage? | |
| **Part C Total** | | ____/12 |

## Part D - Alternatives Analysis & Planning Context

| | Ask these questions of the developer, and cross-check against publicly available RTO/ISO planning documents and regional transmission plans | Score (1–3) |
|---|---|---|
| ☐ | Were non-wires alternatives (GETs, energy storage, demand response) evaluated as part of the needs assessment, or was new construction treated as the only option from the outset? | |
| ☐ | Is this project consistent with the regional transmission plan and long-term grid planning, or is it being developed outside of the regional planning process? | |
| ☐ | Were cumulative impacts from existing and reasonably foreseeable infrastructure in the same landscape considered, such as total road density, linear features crossing wildlife corridors, and planned projects currently in permitting? | |
| ☐ | Were multiple corridor scenarios evaluated and documented, or was a single “preferred” corridor presented without evidence that other options were seriously considered? | |
| **Part D Total** | | ____/12 |

## Part E - Data Transparency

| | Assess these questions based on your direct experience engaging with the developer | Score (1–3) |
|---|---|---|
| ☐ | When asked about ecological screening and alternatives analysis, did the developer provide substantive responses with supporting documentation, or only general assurances? | |
| ☐ | Has the developer made any project maps, constraint summaries, or alternatives comparison materials available through public meetings, regulatory filings, or direct request? | |
| ☐ | When asked why a particular corridor was selected or an alternative dismissed, does the developer provide specific, documented reasoning or vague and dismissive responses? | |
| **Part E Total** | | ____/9 |

# Total Score:___/60

## Scoring Guidance

This scoring framework is not a regulatory instrument. It is a practical tool to help you assess the quality of a project's planning process and decide how to engage.

### 47 to 60: Strong Planning Foundation

The planning process reflects genuine engagement with ecological constraints, transparent alternatives analysis, and early agency coordination. The foundation is sound, though individual concerns may still need attention.

**Next steps:** Proceed to **Section 6** (Routing and Design) and **Section 7** (Mitigation Framework) to evaluate alignment choices and mitigation commitments within the selected corridor.

### 30 to 46: Conditional, Needs Improvement

The planning process has positive elements, but significant gaps remain, such as incomplete ecological data, late agency consultation, missing quantitative alternatives comparison, or colocation dismissed without adequate justification.

**Next steps:** Identify the questions where you scored 1 or 2 and focus your advocacy on closing those gaps before the project advances to route selection and permitting. Refer to Sections **2** and **3** for the standards each area should meet. Then proceed to Sections **6** and **7**.

### Below 30: Elevated Concern

The planning process has fundamental deficiencies: constraint screening was absent or perfunctory, only one alternative was evaluated, wildlife agencies were consulted too late, or the developer is unwilling to share decision making rationale. The project carries elevated ecological, permitting, and community risk regardless of mitigation proposed later.

**Next steps:** Submit formal written concerns to the developer and regulatory agency. Request that planning gaps be addressed before the project advances. Coordinate with other conservation organizations, wildlife agencies, and Tribal governments to present a unified message and identify additional warning signs. Consider contacting NWF's Clean Energy Transmission team for strategic support.

Section 6

Veronica Ung-Kono/NWF

# Routing and Design Considerations

Once a corridor has been identified, specific routing and design decisions determine the project's actual on-the-ground footprint. This section addresses whether the project is designed well within that corridor. Even a well-chosen corridor can produce poor wildlife outcomes if the specific alignment, structure design, and access infrastructure are not tailored to the ecological context of each segment. The worksheet at the end provides a structured evaluation tool to score the quality of routing and design decisions.

The key concept in this section is segment-by-segment design: A responsible project does not apply a single engineering template across its entire length. It adapts tower type, span length, right-of-way width, and access road strategy to the specific ecological conditions of each segment, with the most sensitive segments receiving the most careful treatment.

## Alignment Selection

**Section 2** (Phase 3) describes the types of alignment shifts advocates should request and the value of local ecological knowledge in identifying features that desktop analysis misses. Here we focus on a different question: how to evaluate whether the alignment decisions the developer has already made reflect ecological consideration or engineering convenience.

One practical test is to compare the proposed alignment against the constraint data from the sources listed in **Section 4.** If the alignment repeatedly crosses high-value features where a shift of a few hundred feet within the same corridor would have avoided them, that pattern suggests ecological constraints were not weighted meaningfully in the routing process. Another test is whether the alignment follows the path of least landowner resistance rather than least ecological conflict, a common pattern where developers route around properties with engaged owners and through ecologically sensitive areas with absent or less organized landowners.

It is also worth understanding whether the alignment treats the corridor boundary as a hard constraint or a starting point. In some cases, the corridor identified in Phase 2 is wide enough to accommodate multiple possible alignments, and the choice among them is where ecological outcomes are determined. In other cases, the corridor is so narrow that the alignment is effectively predetermined, meaning the real decisions were made in Phase 2, not Phase 3.

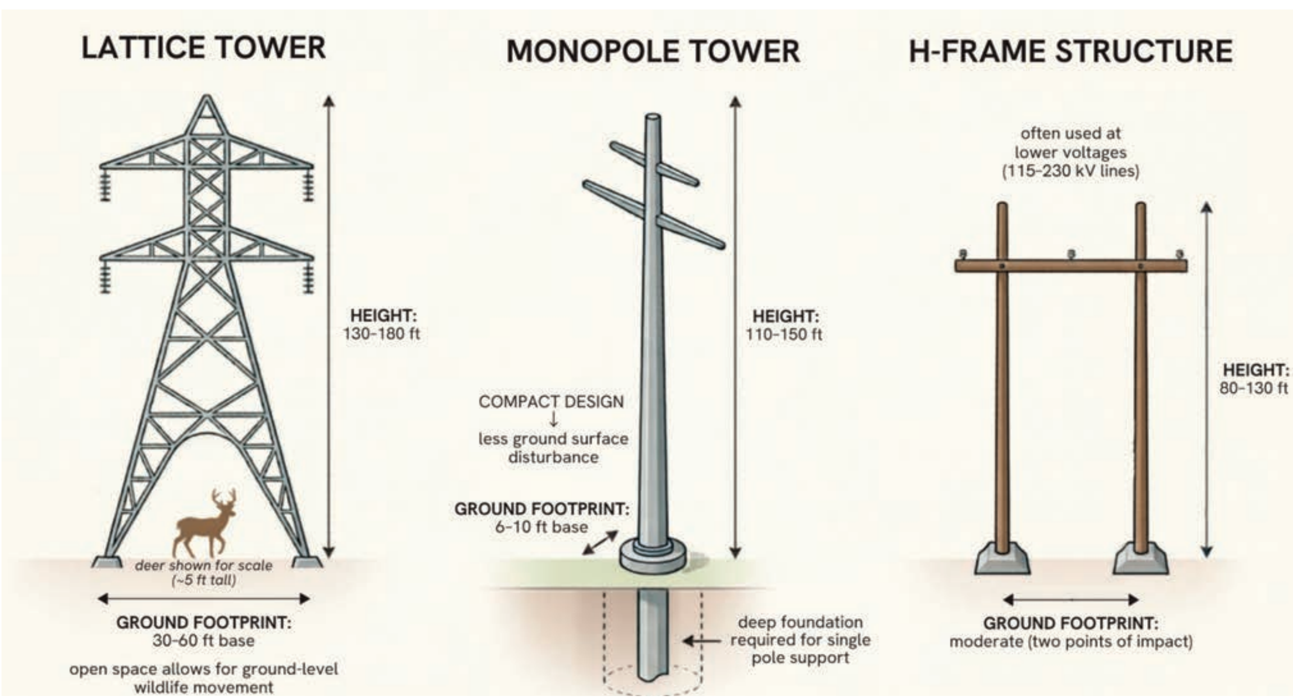



*Figure 1: Common transmission tower types and their ground footprints (Credit: NWF)*

## Structure Design, Spacing, and Right-of-Way

Three engineering decisions—tower type, span length, and right-of-way width—collectively determine the project's physical footprint within the corridor. Each involves tradeoffs that have ecological implications, and each can be varied segment by segment.

- **Tower type** (see **Figure 1**) affects ground disturbance and canopy clearing. Lattice towers have larger bases (often 30–60 feet) but may allow ground level wildlife movement between legs. Monopoles are compact but require deeper foundations. H-frame structures have moderate footprints and are common at lower voltages. Taller structures can reduce the number of towers needed but may increase avian collision risk. The choice of tower type should be informed by the specific ecological context of each segment. For example, a project might use monopoles through a forested segment to minimize canopy clearing, then switch to a design with longer spans at a migration corridor crossing to reduce ground disturbance in that segment.

- **Span length,** or the horizontal distance between two consecutive support structures such as towers or poles, determines how many towers are needed and therefore how much ground is disturbed. Longer spans (1,000–1,500 feet under favorable conditions) mean fewer foundations, fewer access points, and less fragmentation in sensitive segments. But longer spans require stronger, taller towers and heavier conductors, so there are engineering limits, in addition to ecological costs such as increased avian collision risk. The question is whether the project's engineering evaluated these tradeoffs segment by segment or applied a uniform design.

- **Right-of-way** width determines how much habitat is cleared and how far edge effects extend. In forested landscapes, edge effects from canopy removal can extend as much as 300 feet or more into the forest on each side, meaning the ecological impact zone can be several times wider than the right-of-way itself. Width is not purely an engineering decision; it is also a commercial one. Developers sometimes request wider corridors than the minimum needed for safe operation, either for construction convenience or to preserve future expansion options. Every additional foot of width translates directly to additional habitat loss and additional edge effect.

    - *Vegetation management* within the right-of-way during operations can either degrade or support habitat values. Broadcast clearing that removes all vegetation is ecologically destructive. However, rights-of-way can be managed as vital habitat for grassland and shrubland species, such as shrubland birds, insects, and more. In the Northeast, it has been estimated that as much as 50 percent of continuously managed grassland habitats occur beneath power lines. When informed by state and local experts, intentional management that retains native low-growing shrubs, grasses, and pollinator-friendly plants can provide functional habitat within the corridor. The vegetation management approach should be specified as an enforceable condition in the project permit, not described only in the environmental review or left to the discretion of maintenance crews years later.

## Access Road Strategy

At the routing and design stage, the issue of access roads becomes more granular. The distinction that matters here is between a general commitment to “minimize” new roads and a documented plan that identifies each road segment, classifies it as permanent or temporary, and specifies what happens to temporary roads after construction ends. The former is a statement of intent; the latter is an enforceable commitment. In practice, the difference between these two approaches is often the difference between roads that get restored and roads that become permanent through gradual use and widening.

## Substation Siting

Substations require relatively large cleared and fenced areas (often 5–200+ acres for major facilities) and may include permanent lighting, noise from transformers and cooling equipment, and increased vehicle traffic. Their ecological footprint extends beyond the fence line: lighting can disorient nocturnal migrants and disrupt nearby wildlife behavior; noise can displace sensitive species; and impervious surfaces can alter stormwater patterns, affecting adjacent wetlands and waterways.

Colocation with existing substations or industrial facilities is preferred because it concentrates these impacts within previously disturbed areas.

## Essential Design Stage Commitments

Several categories of design decisions become dramatically harder to influence once permits are filed and construction begins. Avian-safe design measures such as bird flight diverters and line marking cost a fraction of their retrofit price when incorporated into the original engineering. Seasonal construction timing restrictions that are written into permits as enforceable, segment-specific conditions hold up under schedule pressure; the same restrictions framed as general guidelines frequently get waived. And the ability to adjust individual tower locations in the field when construction encounters wildlife features not visible during planning depends on whether that flexibility was built into the permit language from the start.

**Worksheet 2** on the following page provides a structured set of questions and a scoring framework to help you evaluate the quality of a project’s routing and design decisions and determine your next steps.

# Worksheet 2: Routing and Design Evaluation

*Use this worksheet when reviewing proposed route alignments and design specifications. These questions can be adapted for written comments, public meetings, or developer outreach.*

## How to Score

For each question, assess the quality of the response you received:

### Strong: 3 points

Substantive, well-documented information provided, and reflects genuine engagement with issue

### Partial: 2 points

Some information provided, but with significant gaps / outdated data / incomplete analysis

### Weak/Absent: 1 point

Information not provided/dismissed, or the question was not meaningfully addressed

Record your score for each question, then total your points at the end and use the gating guidance to determine your next steps.

## Part A - Alignment

| | Ask these questions of the developer or project proponent | Score (1–3) |
|---|---|---|
| ☐ | Does the alignment avoid intact habitat blocks and core wildlife areas, or does it bisect them when an alternative within the transmission corridor was available? | |
| ☐ | Where the route crosses migration corridors, does it cross at the widest feasible point, or at pinch points and bottlenecks where wildlife movement is already constrained? | |
| ☐ | Are stream, wetland, and riparian crossings of transmission infrastructure minimized, and where they occur, are crossing methods specified (such as spanning rather than placing structures in the waterway)? | |
| ☐ | Does the alignment avoid ridgelines, mountain passes, and other landscape features that host concentrated bird flight activity? | |
| **Part A Total** | | ____/12 |

## Part B - Structure Design

| | Ask these questions of the developer or project proponent | Score (1–3) |
|---|---|---|
| ☐ | Is the tower type tailored to the ecological context of each segment (for example, minimizing canopy clearing in forests, reducing predator perching risk in grasslands), or is a single design applied uniformly across the entire route? | |
| ☐ | Were span lengths extended in ecologically sensitive segments (e.g., migration corridor crossings, riparian zones, wetlands) or are spans uniform throughout? | |
| ☐ | Is the requested right-of-way width the requisite engineering minimum for safe construction and operation, or does it include additional buffer that can add to habitat fragmentation? | |
| ☐ | Is there a vegetation management plan that commits to retaining and restoring native species within the ROW, or is vegetation management unaddressed in the design documents? Is the plan long-term in nature? | |
| **Part B Total** | | ____/12 |

## Part C - Access Roads & Substations

| | Ask these questions of the developer, and cross-check against the access road plan in the permit application | Score (1–3) |
|---|---|---|
| ☐ | Is there a documented access road plan that identifies each road segment as permanent or temporary, specifies which existing roads will be used, and includes closure and restoration standards for temporary roads? | |
| ☐ | Does the plan prioritize existing roads for both construction and long-term maintenance, or does it propose new parallel roads alongside the power line? | |
| ☐ | Are substations designed to avoid sensitive habitats and colocated with existing facilities where feasible, with stormwater, lighting, and noise impacts addressed? | |
| **Part C Total** | | ____/9 |

## Part D - Avian Safety, Construction Timing, and Field Flexibility

| | Ask these questions of the developer, and cross-check against permit conditions and environmental review documents | Score (1–3) |
|---|---|---|
| ☐ | In segments with elevated avian collision risk, are bird flight diverters, conductor spacing, and line marking specified in the engineering documents, or are these measures deferred to post-construction? | |
| ☐ | Are seasonal construction timing restrictions specified for each sensitive segment and species, with enforceable windows written into permit conditions, or are they described only as general guidelines? | |
| ☐ | Is micrositing flexibility preserved in the permit so that individual tower locations and span lengths can be adjusted in the field when construction encounters wildlife features not identified during planning? | |
| **Part D Total** | | ____/9 |

# Total Score: ___/42

## Scoring Guidance

This scoring framework is not a regulatory instrument. It is a practical tool to help you assess the quality of a project's routing and design decisions and decide how to engage.

### 33 to 42: Strong Design Foundation

The project's routing and design reflect ecological tailoring across segments, with documented access road planning, and enforceable avian safety and timing commitments. The design foundation is sound, though individual elements may still need refinement.

**Next steps:** Proceed to **Section 7** (Mitigation Framework) to evaluate how residual impacts are being addressed, and **Section 8** (Construction Monitoring) to prepare for verifying that these design commitments are implemented in the field.

### 21 to 32: Conditional, Needs Improvement

The design has positive elements, but significant gaps remain, such as uniform engineering applied without ecological tailoring, access road plans lacking segment-by-segment documentation, vegetation management left unspecified, or avian safety measures deferred to post-construction.

**Next steps:** Focus on the lowest-scoring questions and raise them in written comments or directly with the developer's engineering team before permit applications are finalized. Where design gaps involve species-specific concerns, engage state wildlife agency field biologists who can provide technical backing for your requests. Proceed to Sections **7** and **8** as the project advances.

### Below 21: Elevated Concern

The design shows little evidence of ecological consideration: no segment-by-segment variation, no documented access road plan, timing restrictions framed as advisory, or avian and micrositing measures absent from engineering documents. At this stage, the corridor may have been well chosen, but the design is undermining whatever ecological benefit that corridor selection provided.

**Next steps:** Submit formal written comments to the state siting authority or permitting agency identifying specific design deficiencies and requesting revisions before permits are issued. Engage state wildlife agency staff who can reinforce the technical basis for your concerns in the regulatory record. If the permitting process allows formal intervention, consider whether the design gaps warrant it. Consider contacting NWF's Clean Energy Transmission team for strategic support.

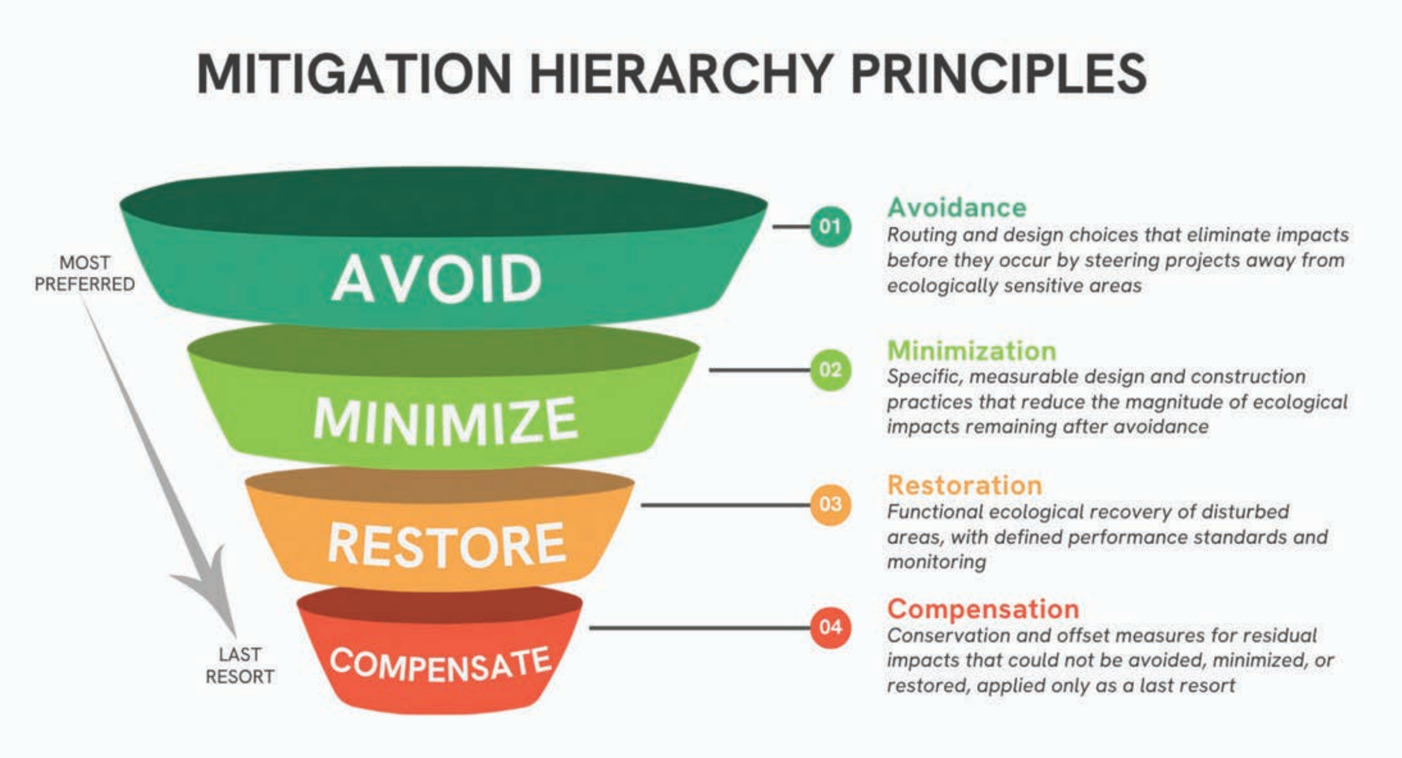



*Figure 2: The mitigation hierarchy must be followed in sequence; later steps do not replace earlier obligations (Credit: NWF)*

# The Mitigation Framework

The mitigation hierarchy (Avoid → Minimize → Restore → Compensate) is a core principle of wildlife-forward transmission development. This section focuses on how to evaluate whether a specific project has actually followed the hierarchy (see **Figure 2**) in practice. The hierarchy is easy to state and routinely invoked in environmental documents, but the rigor with which it is applied varies enormously.

## How the Hierarchy Breaks Down in Practice

Though developers typically do not reject the mitigation hierarchy outright, they can often compress or skip the early steps. An environmental review might state that "avoidance was considered" without documenting what alternatives were evaluated and why they were rejected. Minimization measures might be described as "industry best practices" without specifying what those practices are for the project in that specific landscape. Restoration plans might promise revegetation without defining what success looks like or how long monitoring will continue, or whether native plants will be used. And compensation packages might be proposed as part of the initial project design, before avoidance has been demonstrated, which reverses the hierarchy's logic entirely.

The practical consequence is that the later steps in the hierarchy end up carrying the weight that the earlier steps were supposed to bear. Compensation is asked to address impacts that could have been avoided through better routing. Restoration is asked to recover ecosystems that minimization measures could have left intact. **The result is a project that is**

**more expensive to mitigate, more ecologically harmful, and more vulnerable to legal challenge than one where the hierarchy was followed in sequence.**

## Step 1: AVOID

**Section 3** (Principle 1) of this toolkit explains why avoidance is the most effective and least costly form of impact reduction. At the permitting stage, the question shifts from "should this project avoid high-conflict landscapes?" to "did it?" The answer lies in the documentation.

Avoidance that exists only as a narrative claim, such as "the project was designed to minimize impacts to sensitive habitats," is functionally unverifiable. Avoidance that is documented spatially, showing where the route started, what constraints were mapped, how the alignment evolved in response to those constraints, and what alternatives were evaluated and rejected, can be independently reviewed by regulators, agencies, and the public. The difference between these two forms of documentation is often the difference between a project that survives legal scrutiny and one that does not.

The relationship between **Section 5** (corridor selection) and avoidance documentation is direct: If the landscape-scale screening and corridor evaluation described in Section 5 were conducted rigorously, the avoidance record at the permitting stage will reflect that work. If they were not, there would be little to document.

## Step 2: MINIMIZE

Minimization refers to design and construction practices that reduce the magnitude of remaining impacts after avoidance has been applied. **Section 6** covers the specific design decisions (tower type, span length, right-of-way width, access roads, avian safety, timing restrictions) that constitute minimization in practice. At the permitting stage, the question is whether those design decisions are documented as specific, measurable, enforceable commitments or described in generic language.

The distinction is consequential. A condition stating "the developer will implement best management practices for wildlife" is effectively unenforceable. Conversely, a condition stating, "span lengths shall be extended to a minimum of 1,200 feet across Segment 7 of the Elk Creek corridor, with a total construction moratorium between March 15 and June 30 to protect spring migration and calving," provides a clear, monitorable, and verifiable baseline for enforcement. The specificity of minimization language in permit conditions is one of the strongest predictors of whether those commitments will be honored during construction.

## Step 3: RESTORE

Restoration addresses disturbed areas following construction. It encompasses soil decompaction and recontouring, restoration of drainage patterns and stream crossings disrupted by grading, physical closure and removal of temporary roads and staging areas, revegetation with native species, and ongoing invasive species control. Each of these components can be done to a cosmetic standard or a functional one, and the difference determines whether the landscape recovers.

Cosmetic reclamation meets a visual standard: the ground is graded, seed is spread, temporary roads are smoothed over, and the site looks acceptable from a distance. Functional recovery meets an ecological standard: soil structure supports root growth and water infiltration, drainage patterns match pre-construction hydrology, temporary roads are physically impassable and revegetating, native plant communities are re-establishing in compositions consistent with the surrounding landscape, and invasive species are actively monitored and controlled before they establish.

The difference between these outcomes comes down to specificity. A restoration plan that defines measurable performance standards for each component, such as soil bulk density thresholds, percent native cover relative to reference conditions within a defined timeframe, or maximum allowable invasive cover, can be monitored and enforced. A plan that promises "reclamation in accordance with applicable standards" cannot. Similarly, a monitoring period must be long enough to detect whether restoration has succeeded in practice. For example, a two-year monitoring window may appear to show successful revegetation, but invasive species like stilt grass in Appalachian forest corridors can take three to five years to overtake initially successful native plantings, by which point the monitoring period has ended and the developer has moved on. Soil compaction and drainage problems may take even longer to manifest.

### Step 4: COMPENSATE

Compensatory mitigation should only be considered after avoidance, minimization, and restoration are exhausted. Compensation rarely replaces the full ecological function of what was lost, but that does not mean it should not be pursued for genuinely residual impacts. What matters is whether it is functional: whether the conservation action provides the same ecological functions in the same landscape, not just an area of similar size or appearance elsewhere.

Two patterns signal that the hierarchy has been short circuited. The first is a compensation package that appears in the initial project proposal before avoidance has been documented. If a developer leads with "we will protect 5,000 acres of habitat to compensate for project impacts," the question is why those impacts are assumed to be unavoidable before the routing process has demonstrated that they are. The second one corresponds to compensation that is geographically or ecologically disconnected from the project's actual impacts, such as funding conservation in a different watershed or ecosystem type than the one being affected. **Compensation that does not maintain ecological function in the same landscape where impacts occur is simply transferring the harm, not mitigating it.**

## Long-Term Ecological Performance

The mitigation hierarchy as typically applied focuses on the construction phase and its immediate aftermath. But transmission infrastructure operates for 40 to 60 years, and ecological performance over that full lifespan is what ultimately determines whether the project was responsibly sited. **Section 2** (Phase 6) and **Section 3** (Principle 6) describe the types of long-term commitments that matter: vegetation management, access road control, avian monitoring, wildfire risk management, and adaptive management triggers.
At the permitting stage, the question is whether those long-term commitments are structured to properly function over decades.

A monitoring plan with defined ecological indicators, specific corrective action triggers, mandatory reporting timelines, and dedicated funding is fundamentally different from a plan that says, "the developer will monitor and adaptively manage." The former creates accountability that survives changes in project ownership, corporate priorities, and regulatory staff. The latter is a promise with no mechanism for verification or enforcement.

The documentation package for a complete mitigation record, covering avoidance, minimization, restoration, compensation (if applicable), and long-term performance, is what regulators, reviewing agencies, and the public rely on to evaluate whether the hierarchy was followed.

## Making Your Comments Count in the Regulatory Record

The permitting stage often involves formal processes (public comment periods, NEPA scoping sessions, draft EIS reviews) where the format and specificity of your input can determine how much it influences the outcome. Three principles can make comments more effective:

**1. Be specific and reference the document.** A comment that simply says "the mitigation plan is inadequate" is noted and filed. A comment that says "the restoration plan on page X lacks measurable performance standards for native vegetation cover, relying instead on subjective visual assessment, which is inconsistent with the project's own commitment in the alternatives analysis to functional ecological recovery" requires a substantive response from the agency. Furthermore, framing your concern as a direct question (e.g., "What measurable performance standards will be used to evaluate restoration success, and over what timeframe?") can be especially effective, because agencies are compelled to respond to specific questions in the regulatory record.

**2. Propose alternatives, not just objections.** Agencies are required to respond to substantive comments, and a comment that proposes a specific permit condition (e.g., "require a minimum five-year monitoring period with annual reporting of native cover relative to reference plots") gives the agency something concrete to adopt or respond to.

**3. Coordinate with agencies.** If the state wildlife agency or USFWS has filed comment letters raising similar concerns, reference their findings in your own comments. This creates a reinforcing record that is harder for the permitting agency to dismiss.

**Worksheet 3** on the following page uses a sequential gating structure that mirrors the mitigation hierarchy itself, so that the evaluation of each step is informed by whether the previous step was genuinely completed. It also evaluates whether appropriate documentation exists and whether it is substantive.

# Worksheet 3: Mitigation Hierarchy Evaluation

*Use this worksheet when reviewing the mitigation commitments in a project's permit application, environmental impact statement, or other environmental review documents. These questions are meant to assess the developer's documentation: cross-check responses against the regulatory filings and any agency comment letters.*

## How to Score

For each question, assess the quality of the documentation you reviewed:

### Strong: 3 points

Substantive, well-documented, reflects genuine engagement

### Partial: 2 points

Some information provided, but with significant gaps, outdated data, or incomplete/inaccurate analysis

### Weak/Absent: 1 point

Information not provided/dismissed, or questions were not meaningfully addressed

**Important**: **This worksheet is sequential.** Score each part in order (A through E). A weak score on an earlier part changes the meaning of everything that follows. The part-by-part notes and gating guidance at the end will help you interpret what your scores mean in sequence.

## Part A - Avoidance

| | Review the developer's environmental documents and alternatives analysis to answer these questions | Score (1–3) |
|---|---|---|
| ☐ | Is there a spatial record showing how the route evolved in response to ecological constraints, including maps of alternatives evaluated and constraints that drove alignment changes? | |
| ☐ | Are route shifts documented with specific ecological justification (not just engineering or cost rationale) for each segment where the alignment changed? | |
| ☐ | Where the project rejected a higher-ranked corridor alternative from the colocation hierarchy, is the rejection supported by specific engineering constraints rather than general assertions of infeasibility? | |
| ☐ | Does the avoidance record address each landscape type and ecological concern along the route, or does it focus only on federally listed species while ignoring broader habitat and connectivity impacts? | |
| **Part A Total** | | ____/12 |

**If Part A scored 6 or below:** The avoidance step of the mitigation hierarchy has not been meaningfully demonstrated. Everything that follows, including minimization, restoration, and compensation, is being asked to address impacts that may have been avoidable through better routing. Flag this as a fundamental concern regardless of how Parts B through E score.

## Part B - Minimization

| | Review permit conditions and design specifications to answer these questions | Score (1–3) |
|---|---|---|
| ☐ | Are minimization measures described with specific, measurable commitments tied to identified impacts and project segments, or described only as "best management practices" or "industry standards"? | |
| ☐ | Are seasonal construction timing restrictions specified by species, segment, and date range in the permit conditions, or described as general guidelines subject to modification? | |
| ☐ | Are access road commitments documented segment by segment (permanent vs. temporary, closure method, restoration standard), or addressed only as a general commitment to minimize new roads? | |
| **Part B Total** | | ____/9 |

**If Part B scored 4 or below:** Minimization commitments are generic or absent. This means the restoration plan (Part C) is being asked to recover from impacts that better design could have prevented, and any compensation (Part D) may be addressing impacts that were minimizable rather than unavoidable.

## Part C - Restoration

| | Review any restoration and/or reclamation plans to answer these questions | Score (1–3) |
|---|---|---|
| ☐ | Does the plan address soil restoration, including decompaction, recontouring, and topsoil replacement where native topsoil was salvaged? | |
| ☐ | Does the plan restore drainage patterns and stream crossings to pre-construction hydrology, with proper attention to water flow? | |
| ☐ | Does the plan commit to physical closure and restoration of temporary roads and staging areas, with specific methods, timelines, and success criteria? | |
| ☐ | Does the plan specify native seed mixes and planting prescriptions matched to local ecological site conditions, or rely on generic regional seed mixes? | |
| ☐ | Are performance standards defined with measurable thresholds for each restoration component (such as soil bulk density, percent native cover, maximum invasive cover), or based on subjective visual assessment? | |
| ☐ | Is the monitoring period long enough to detect whether restoration has succeeded across all components, or limited to one or two growing seasons? | |
| ☐ | Is there an invasive species monitoring and rapid response plan with specific triggers for treatment? | |
| **Part C Total** | | ____/21 |

## Part D - Compensation

| | Review any compensatory mitigation proposal. If no compensation is proposed, skip this part and note "N/A" in the part total | Score (1–3) |
|---|---|---|
| ☐ | Was compensation proposed only after avoidance, minimization, and restoration were documented and exhausted? | |
| ☐ | Are the residual impacts being compensated for clearly identified and documented as unavoidable after design modifications were considered? | |
| ☐ | Is the compensation functionally connected to the project's actual impacts (same landscape, same ecosystem type, same ecological function)? | |
| ☐ | Is there a long-term funding mechanism (endowment, bond, escrow) and stewardship commitment for compensatory lands, or is the compensation a one-time payment with no ongoing management obligation? | |
| **Part D Total** | | ____/12 |

## Part E - Long-Term Performance and Monitoring

| | Review the monitoring and adaptive management plan to answer these questions | Score (1–3) |
|---|---|---|
| ☐ | Does the monitoring plan define specific ecological indicators (such as native vegetation cover, invasive species presence, avian mortality rates, access road condition), rather than general commitments? | |
| ☐ | Are corrective action triggers defined with specific thresholds that require mandatory response within a defined timeline, or are they discretionary? | |
| ☐ | Is monitoring duration specified and adequate for the ecosystem type? | |
| ☐ | Are monitoring reports required to be submitted to a regulatory agency on a defined schedule, or is reporting left to the developer's discretion? | |
| **Part E Total** | | ____/12 |

# Total Score: ____ /66 (or ____ /54 if Part D is N/A)

## Scoring Guidance

This scoring framework is not a regulatory instrument. It is a practical tool to help you assess whether the mitigation hierarchy has been followed in substance. Before interpreting your grand total, check your Part A and Part B scores. A high grand total with a weak Part A or Part B indicates that later steps are carrying weight the earlier steps should have borne.

### 52 to 66 (or 43 to 54 if no compensation): Strong Mitigation Foundation

The mitigation record demonstrates the hierarchy applied in sequence: documented avoidance, specific and enforceable minimization, ecologically grounded restoration, and (if applicable) compensation that addresses genuinely residual impacts. Long-term monitoring is structured with accountability. Individual commitments may still need strengthening, but the framework is sound.

**Next steps:** Review the draft permit conditions to confirm that the mitigation commitments documented in the environmental review are carried through into enforceable permit language. Commitments described in an EIS that do not appear in the permit itself are not binding. Then proceed to **Section 8** to prepare for monitoring whether those conditions are followed during construction.

### 34 to 51 (or 28 to 42 if no compensation): Conditional, Needs Improvement

The mitigation record addresses the hierarchy but with significant gaps, such as avoidance documented for some segments but not others, minimization that is specific in places but generic in others, restoration performance standards that are vague, or monitoring duration too short for the ecosystem type.

**Next steps:** Submit formal comments during the public comment period identifying the specific gaps in the mitigation record. Request that the permitting agency condition the permit on closing those gaps before construction begins. If state wildlife agencies or USFWS have filed comment letters on the project, review them for alignment with your concerns and reference their findings in your own comments to strengthen the regulatory record.

### Below 34 (or below 28 if no compensation): Elevated Concern

The mitigation record has fundamental gaps: avoidance is undocumented or merely asserted, minimization is described in generic language, restoration lacks performance standards, compensation is proposed for avoidable impacts, or monitoring is discretionary with no enforceable triggers. The hierarchy has been invoked but not followed.

**Next steps:** File detailed written objections with the permitting agency identifying where the mitigation hierarchy was not followed, using the sequential structure of this worksheet to demonstrate the pattern (weak avoidance leading to inflated reliance on later steps). Request that the permit not be issued until the deficiencies are corrected. If the permitting process allows formal intervention or contested case proceedings, the absence of a credible mitigation record is strong grounds for participation. Coordinate with any agencies that have raised similar concerns in their comment letters. Consider contacting NWF's Clean Energy Transmission team for strategic support.

Section 8

Veronica Ung-Kono/NWF

# Construction Phase Monitoring and Compliance

Construction is where commitments made on paper get tested in the field. Schedule pressure, budget constraints, and contractor convenience are common reasons permit conditions are not followed. The role of conservation advocates at this stage is to verify that what was promised is happening, document what you find, and report problems to the agencies responsible for enforcement.

## Effective Environmental Monitoring

The presence of an environmental monitor at a construction site does not, by itself, ensure compliance. What matters is whether the monitor has genuine independence. A monitor who is hired by the developer has a structural conflict of interest regardless of their professional qualifications. A monitor who reports to the regulatory agency, maintains daily logs that are submitted to the agency on a defined schedule, and has documented authority to halt work when permit conditions are being violated occupies a fundamentally different position.

The quality of documentation also matters. A monitoring program that produces daily field logs with photographs, GPS-referenced observations, and contemporaneous notes creates a record that can be independently reviewed. A program that produces weekly summary reports written in the office days after the observations were made is less reliable and harder to verify. Compliance documentation that is filed with the regulatory agency and available for public review creates accountability; documentation that remains internal to the developer does not.

## Fire Prevention During Construction

Fire risk during construction is a significant concern that is frequently under-addressed in permit conditions. In arid and semi-arid landscapes, construction activities create multiple ignition sources: welding and cutting (hot work), vehicle exhaust and catalytic converters on dry vegetation, equipment sparks, and human activity (cigarettes, campfires at staging areas). A single construction-ignited fire in sagebrush or chaparral can destroy thousands of acres and trigger invasive grass conversion that persists for decades. Even in humid Eastern and Southern forests, dry season construction in drought years creates real fire risk, particularly where slash and clearing debris accumulate.

Effective fire prevention involves a combination of measures: hot work permits with fire watch requirements, spark arrestors on equipment, vehicle parking restrictions on dry vegetation, slash management and debris removal protocols, on-site fire suppression equipment and trained personnel, and coordination with local fire agencies. These measures cost relatively little compared to the consequences of construction-ignited wildfire, but they must be specified in the construction plan and not left to individual contractor judgment.

## Seasonal Construction Timing Windows

Many species are most vulnerable during specific seasons: nesting, migration, denning, or calving periods. Permit conditions often include seasonal timing restrictions that limit or prohibit construction activities during these sensitive periods. Advocates should verify that timing windows are based on current species data and are enforceable. Timing waivers are common, and not all are unjustified; weather delays and equipment failures can create legitimate scheduling conflicts. But a pattern of repeated waivers, particularly during the same sensitive season across multiple segments, suggests that the construction schedule was never realistic within the timing constraints, and that the restrictions are being treated as negotiable rather than binding.

## Wildlife Encounters and Construction Crew Protocols

Construction crews routinely encounter wildlife during clearing, grading, and excavation: nesting birds in vegetation being cleared, reptiles and amphibians in staging areas, burrowing animals in excavation zones, bats in trees being felled. A defined wildlife encounter protocol specifies what to do when an animal is found (stop work, notify the monitor, establish a buffer), who has authority to make decisions, and how encounters are documented and reported. Without a protocol, the default response is whatever the crew decides in the moment, which typically prioritizes keeping work moving.

Night construction and temporary lighting present additional wildlife concerns. Nocturnal lighting at construction sites and along access roads can disorient migrating birds, disrupt foraging patterns of bats and nocturnal mammals, and alter predator-prey dynamics near the work zone. Where night work is necessary, directional and shielded lighting that minimizes light spill beyond the immediate work area reduces these effects.

The restoration and invasive species commitments documented in Section 7 begin during construction. Whether topsoil is salvaged before clearing, certified weed-free materials are used for erosion control, and temporary roads are restored promptly after use are examples of construction actions that determine whether the restoration plan has any chance of succeeding.

## Documenting and Reporting What You Find

If you observe construction activities that appear to violate permit conditions, documentation is more effective than verbal complaints. Photographs with dates and GPS coordinates, written descriptions of what you observed and when, and specific reference to the permit condition being violated create a record that the permitting agency's enforcement staff can act on. Submit observations in writing to both the environmental monitor and the permitting agency's compliance office. If the monitor is unresponsive or not independent, escalate directly to the agency. Keep copies of all correspondence; a documented pattern of violations over time is significantly more compelling than a single report.

**Worksheet 4** on the following page provides a structured set of questions and a scoring framework to help you evaluate construction phase compliance and determine your next steps.

# Worksheet 4: Construction Phase Monitoring and Compliance

*Use this worksheet during active construction to evaluate whether permit conditions and mitigation commitments are being followed in the field. These questions are assessed through your own site observations, review of compliance reports filed with the regulatory agency, and direct inquiry with the environmental monitor and permitting agency staff.*

## How to Score

For each question, assess what you observe or can verify:

### Strong: 3 points

Pre-construction commitments implemented, well documented, verifiable

### Partial: 2 points

Some implementation, but inconsistent, poorly documented, or difficult to verify

### Weak/Absent: 1 point

Commitments not being implemented, little to no documentation available, or unverifiable

Record your score for each question, then total your points at the end and use the gating guidance to determine your next steps.

## Part A - Timing Restrictions and Seasonal Compliance

| | Verify through compliance reports filed with the regulatory agency, and through direct observation where accessible | Score (1–3) |
|---|---|---|
| ☐ | Are segment-specific seasonal timing restrictions being observed in the field, or has construction activity occurred within restricted windows? | |
| ☐ | If any waivers or variances to timing restrictions have been granted, is the justification documented and filed with the regulatory agency? | |
| ☐ | Are daily construction logs being maintained with dates, locations, and activities that allow verification of timing compliance? | |
| **Part A Total** | | ____/9 |

## Part B - Monitor Independence and Documentation

| | Assess through the monitoring structure described in the permit, and through the quality of reports filed | Score (1–3) |
|---|---|---|
| ☐ | Does the environmental monitor report to the regulatory agency (not solely to the developer), and are monitor logs submitted to the agency on a defined schedule? | |
| ☐ | Does the monitor have documented authority to halt work when permit conditions are being violated, and has that authority been exercised when warranted? | |
| ☐ | Are monitoring reports detailed enough to independently verify compliance (daily logs with GPS-referenced observations and photographs), or limited to periodic summaries? | |
| ☐ | Are compliance reports filed with the regulatory agency and accessible to the public, or retained internally by the developer? | |
| **Part B Total** | | ____/12 |

## Part C - Habitat Protection and Erosion Control

| | Verify through site observation where accessible, and through compliance reports | Score (1–3) |
|---|---|---|
| ☐ | Are right-of-way clearing limits clearly staked in the field before clearing begins, and is clearing staying within approved boundaries? | |
| ☐ | Are erosion and sediment control measures (silt fencing, sediment basins, erosion blankets) installed before ground disturbance begins and maintained throughout? | |
| ☐ | Near waterways, are crossing methods following permit specifications (spanning versus in-stream placement), and is sedimentation being controlled? | |
| ☐ | Is native topsoil being salvaged and stored separately for restoration use, as specified in the restoration plan? | |
| ☐ | Are dust and noise control measures in place near sensitive wildlife areas and residential communities? | |
| **Part C Total** | | ____/15 |

## Part D - Invasive Species, Fire Prevention, and Biosecurity

| | Verify through site observation and compliance documentation | Score (1–3) |
|---|---|---|
| ☐ | Are equipment wash stations operational at project entry points, and is equipment actually being cleaned before entering the work zone? | |
| ☐ | Are certified weed-free materials being used for erosion control (straw, mulch, mats), and is documentation of certification available? | |
| ☐ | Are fire prevention measures in place, including hot work permits, spark prevention, slash and debris management, on-site suppression equipment, and coordination with local fire agencies? | |
| ☐ | In forested regions, are biosecurity protocols being followed to prevent spread of soil-borne pathogens and forest pests (equipment cleaning, restrictions on moving uncertified timber, soil management plans)? | |
| ☐ | Is invasive species monitoring occurring in disturbed areas during construction, with rapid response treatment when new populations are detected? | |
| **Part D Total** | | ____/15 |

## Part E - Wildlife Encounters, Lighting, and Crew Protocols

| | Verify through the construction plan and direct inquiry with the environmental monitor | Score (1–3) |
|---|---|---|
| ☐ | Is there a written wildlife encounter protocol that specifies stop work procedures, buffer distances, notification chain, and documentation requirements? | |
| ☐ | Are construction crews trained on the wildlife encounter protocol before beginning work, and is training documented? | |
| ☐ | Where night construction occurs, is lighting directional and shielded to minimize light spill beyond the immediate work area? | |
| ☐ | Are temporary disturbance areas (staging areas, laydown yards, temporary roads) being restored promptly after use, or left in disturbed condition? | |
| **Part E Total** | | ____/12 |

# Total Score: ___/63

## Scoring Guidance

This scoring framework is not a regulatory instrument. It is a practical tool for evaluating whether construction phase commitments are being honored in the field and deciding how to respond when they are not.

### 50 to 63: Strong Construction Compliance

Permit conditions are being followed, monitoring is independent and well-documented, and environmental protocols are functioning as designed. Continue periodic observation and review of compliance filings. Flag any individual questions that scored below 3 for follow up, even within an overall strong score.

**Next steps:** Maintain your monitoring presence and continue reviewing compliance reports as they are filed. Document positive compliance as well as concerns; a record of good performance supports the case for similar standards in future projects in your region. Proceed to **Section 9** (Operations and Long-Term Stewardship) as construction nears completion.

### 32 to 49: Conditional, Compliance Gaps Present

Some environmental protocols are functioning, but gaps are visible: timing restrictions observed in some segments but not others, monitoring documentation that is inconsistent or incomplete, erosion controls installed but not maintained, or fire prevention measures partially in place.

**Next steps:** Document the specific gaps you have identified, with dates, locations, and photographs where possible. Report them to the environmental monitor in writing and to the permitting agency's compliance or enforcement office. Request a written response describing corrective actions and timeline. If the monitor is not independent or not responsive, escalate directly to the permitting agency. Continue monitoring and documenting.

### Below 32: Elevated Concern

Construction is proceeding with fundamental compliance failures: timing restrictions being ignored or routinely waived, no independent monitoring or monitoring that is performative rather than substantive, erosion and sediment controls absent or non-functional, or no wildlife encounter protocols in place.

**Next steps:** File a formal complaint with the permitting agency's enforcement division, documenting the specific violations with dates, GPS locations, photographs, and reference to the permit conditions being violated. Notify any state or federal wildlife agencies that participated in the environmental review. If the project has a citizen suit provision or the permit was issued under a federal statute with enforcement mechanisms, consult with legal counsel about formal enforcement options. Also consider coordinating with advocates who have navigated similar construction compliance situations.

Section 9

*Creative Touch/Getty Images*

# Operations, Maintenance, and Long-Term Stewardship

Wildlife and environmental impacts do not end when the line goes into service. The multidecadal operational phase of transmission infrastructure often outlasts the people, institutions, and attention that secured the initial permit conditions and mitigation plans.

Transmission assets are routinely sold, merged, or transferred to new operators who may have no institutional knowledge of why specific ecological conditions were included in the permit. A vegetation management plan negotiated with input from state wildlife biologists in 2027 may be implemented by a maintenance contractor in 2045 who has never seen it.

This is not a hypothetical concern. It is the default trajectory of infrastructure stewardship when commitments are not structured to survive turnover. The difference between a commitment that holds for decades and one that fades within a few years comes down to whether it is tied to enforceable permit language with robust reporting requirements. This section addresses the key issue of ensuring ecological stewardship for the full operational lifecycle of the project.

## The Shift from Acute to Chronic Impacts

Construction phase impacts are acute: a nest is destroyed, a stream is silted, a road is cut. They happen, they are visible, and they can be documented. Operational phase impacts, however, are chronic: a right-of-way is managed with broadcast herbicide instead of selective clearing, and over a decade the native understory converts to invasive monoculture. An access road is used by unauthorized vehicles, and over years the disturbed zone widens. Avian mortality accumulates at a rate that is invisible in any single year but significant over the life of the line. These chronic impacts are harder to see, harder to attribute, and harder to mobilize around, which is precisely why they require structured monitoring with defined triggers rather than periodic attention.

## Staying Engaged Over Decades

For conservation advocates, the operational phase presents a practical challenge: how to maintain attention on a project that is no longer in the news, a regulatory proceeding, or generating public comment opportunities. Three approaches help:

- First, the monitoring and reporting requirements secured in the permit (Worksheet 3, Part E) create recurring touchpoints. If monitoring reports are required to be filed with the regulatory agency on a defined schedule, advocates can review them periodically without needing to generate their own data.

- Second, ownership transfers and operational changes often trigger regulatory review. When a transmission asset is sold, the new owner typically must demonstrate compliance with existing permit conditions. These transitions are moments where lapsed commitments can be identified and reinstated.

- Third, the vegetation management cycle itself creates opportunities. Most transmission rights-of-way are managed on a 3–5-year rotation. Each cycle is an opportunity to verify that the vegetation management plan is being followed, that native species are being retained, and that invasive species are being controlled.

## Decommissioning

While transmission lines have long operational lives, all infrastructure is eventually decommissioned. Decommissioning plans should be developed **during the permitting phase** and **should include funded mechanisms and legal obligations** for structure removal, materials recycling and disposal, road reclamation, and habitat restoration. The operational phase is where the adequacy of those plans is tested. A decommissioning plan with a dedicated funding mechanism (bond, escrow, or surety) that is adjusted for inflation and survives ownership changes will be there when needed. A plan that depends on the operator’s future willingness to fund restoration will not.

Section 10

Karen Desjardin/Getty Images

# Conclusion and Next Steps

The United States faces an unprecedented need to expand its transmission system while protecting the wildlife, habitats, and communities that the grid crosses. The scale of buildout required means that hundreds of routing decisions will be made across every region of the country in the coming years, each one a moment where conservation input can shape the outcome.

We hope this toolkit makes that input easier and more effective. The principles, worksheets, and evaluation tools in these pages are designed to help you show up early, ask the essential questions, and hold transmission projects to the standard of responsible siting that communities, wildlife, and the environment deserve.

## Next Steps

- Identify transmission projects proposed or under development in your area and determine whether they cross sensitive habitats, migration corridors, or other ecologically important landscapes (the data sources and tools in **Section 4** serve as a good starting point).
- Determine what phase each project is in and go to the corresponding section of this toolkit.
- Contact your state wildlife agency to identify what ecological data is available for the project area.
- Request a meeting with the project developer to introduce yourself, express interest in wildlife-forward siting, and establish a channel for ongoing communication.
- Reach out to other conservation organizations, sporting groups, land trusts, and community groups in your region to coordinate engagement.
- Connect with your local National Wildlife Federation affiliate. Find yours at affiliates.nwf.org/affiliate-directory.
- Access companion resources and updates at nwf.org/transmission.

# Appendix A: Additional Resources

These supplementary resources provide additional depth on policy positions, community engagement, and the science of wildlife and transmission interactions:

- **A Clean Energy Transmission Policy Platform for Thriving Communities and Wildlife**, *National Wildlife Federation* (2023)
- **Clean Energy Transmission Affiliate Toolkit,** *National Wildlife Federation*
- **Clean Energy Transmission: NWF's Toolkit for Community Participation,** *National Wildlife Federation* (2024)
- **Community Workbook: Cultivating Rural Communities' Approaches to Nature and Electrification (CRANE)**, *National Wildlife Federation* (2024)
- **Wires and Wildlife: Transmission Development and Western Migratory Species,** *National Wildlife Federation* (2024)
- **Wires and Wildlife: Offshore Transmission Development and the Benthos,** *National Wildlife Federation* (2024)
- **Beyond the Wires: Community Benefits from Transmission Projects,** *Environmental Defense Fund and Clean Air Task Force* (2025)
- **Powerless in the United States: How Corporate Utilities Drive Energy Unaffordability and Climate Chaos**, *Center for Biological Diversity* (2025)
- **Wildfires and Transmission Factsheet,** *Americans for a Clean Energy Grid* (2025)
- **The Pace of Trust: A Framework by Community Voices for Advancing Transmission,** *Americans for a Clean Energy Grid and DNV* (2025)
- **Incorporating GETs and HPCs into Transmission Planning Under FERC Order 1920,** *American Council on Renewable Energy* (2025)
- **National Transmission Planning Study,** *Department of Energy* (2024)
- **Connected West**, *Energy Strategies, Grid Works, and Grid Lab* (2024)
- **Birds and Transmission**, *Audubon* (2023)
- **Power of Place: Clean Energy Solutions that Protect People and Nature**, *The Nature Conservancy* (2023)
- **Transmission Line Vegetation Management**, *Federal Energy Regulatory Commission*
- **Transmission Possible Resource Hub**

# Appendix B: Glossary of Transmission Terms

Below is a glossary of transmission-related terms you might encounter in your advocacy:

**Avian Power Line Interaction Committee (APLIC):** A collaboration among electric utilities, resource agencies, and conservation organizations that develops industry standard guidelines for reducing bird collisions and electrocutions on power lines. Learn more.

**Bureau of Land Management (BLM):** The federal agency that manages public lands primarily in the Western U.S. and issues right-of-way grants for transmission projects crossing those lands.

**Certificate of Public Convenience and Necessity (CPCN) or Certificate of Public Good (CPG):** A certificate issued by an agency granting a company authority to operate a public service, primarily as a utility or transportation company.

**Dynamic Line Rating (DLR):** A grid-enhancing technology that adjusts transmission line rating based on local conditions. By increasing the current carrying capacity of power lines, DLR is a grid infrastructure solution to defer upgrades, support line outages, and increase yields of distributed power. Learn more.

**Endangered Species Act (ESA):** Federal law protecting species listed as threatened or endangered and the habitats they depend on. ESA Section 7 requires federal agencies to consult with USFWS or NOAA Fisheries before authorizing actions that may affect listed species.

**Environmental Impact Statement (EIS):** A detailed document required under NEPA for major federal actions significantly affecting the environment. An Environmental Assessment (EA) is a shorter review used when impacts are expected to be less significant.

**Federal Energy Regulatory Commission (FERC):** The independent, federal agency that regulates the interstate transmission of electricity, natural gas, and oil.

**FERC Backstop Siting Authority:** FERC's power to issue permits for interstate transmission lines in specific "national interest" areas, overriding or backing up state authority if a state fails to act or denies a project. Learn more.

**FERC Order No. 1920:** 2024 FERC rule requiring transmission providers to conduct long-term regional transmission planning over at least a 20-year horizon, using multiple scenarios and evaluating seven categories of benefits. Subsequent orders 1920-A and 1920-B expanded the role of state regulators, giving them authority to shape planning scenarios and influence cost allocation. Learn more.

**Free, Prior, and Informed Consent (FPIC):** A rights-based framework requiring that Indigenous peoples be consulted and give voluntary, non-coerced consent before any project or policy affects their lands, territories, or resources. It ensures that decision making power remains with the community through a process established well in advance of any activity. Learn more.

**Grid-Enhancing Technologies (GETs):** GETs are hardware and/or software that dynamically increase the capacity, efficiency, reliability, or safety of existing power lines, faster and at lower cost than traditional grid buildout. GETs include advanced power flow control, advanced conductors, DLRs, topology optimization, and voltage source converters. Learn more.

**Grid operators or Regional Transmission Organizations and Independent System Operators (RTO/ISOs):** Grid operators or RTOs/ISOs run wholesale electricity markets. They coordinate, control, and monitor the electric grid across many states. Their function to the power grid is similar in part to air traffic controllers. Grid operators are the electricity authority in their specific geographic area in charge of running the power grid to ensure it is reliable, safe, and economical. The seven RTO/ISOs in the U.S. are PJM (Mid-Atlantic and parts of the Midwest), MISO (Central U.S. from the Gulf Coast to the Great Lakes), SPP (Great Plains and parts of the South), CAISO (California), ISO-NE (New England), NYISO (New York), and ERCOT (most of Texas). Learn more.

**Interconnection:** The rules that new electricity generators must follow to connect to the electric grid and deliver energy to customers. The list of electricity generation projects waiting to connect to the transmission grid is called the **interconnection queue**, which currently exceeds 2,500 GW.

**Merchant Generator:** A non-utility or independent power producer that sells energy to competitive wholesale power marketplaces.

**Micrositing:** Field-level adjustments to individual tower locations, span lengths, or access road alignments during construction to avoid ecological or cultural features not identified during desktop planning and analysis. Micrositing flexibility must be written into permit conditions during the design phase of an infrastructure project to be available during construction.

**National Environmental Policy Act (NEPA):** Federal law requiring federal agencies to assess environmental effects of proposed major actions. Learn more.

**National Interest Electric Transmission Corridor (NIETC):** Department of Energy designation for geographic areas with urgent transmission needs. It enables federal support, financing, and streamlined permitting, including potential FERC backstop authority. **Learn more**.

**Public Comment Period:** The range of time the public has to submit input before an agency makes a final decision on a proposed rule.

**Public Utility Commission (PUC)/Public Regulation Commission (PRC):** Regulates electric, gas, telecommunications, water and wastewater utilities. In most states, a single agency will regulate these sectors; however, in some states, these functions may be split between more than one agency. **Learn more**.

**Right-of-Way (ROW):** The legal easement and physical strip of land used to construct and maintain a transmission line. Typically, 150–200 feet wide for high-voltage lines, the ROW must be managed to limit tall vegetation and ensure safe clearance from energized conductors.

**Siting:** The complex process of determining the location and design of new transmission facilities, including corridor selection, route alignment, and structure placement.

**State Wildlife Action Plan (SWAP):** A comprehensive conservation blueprint maintained by every US state and territory as a condition of federal wildlife funding. SWAPs identify Species of Greatest Conservation Need and the habitats they depend on, providing a non-federal ecological dataset for transmission corridor screening. **Learn more**.

**Substation:** A set of equipment that reduces the high voltage of electric power transmission to a lower voltage that can be used in homes, schools, and businesses.

**Utility:** A company that supplies an area with electricity, gas, water, or sewage.

*Thianchai Sitthikongsak/Getty Images*


National Wildlife Federation

11100 Wildlife Center Drive

Reston, VA 20190

www.nwf.org