A Guide to Responsible Development of Wind and Solar Resources on Public Lands and Waters

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Cover image: The Ocotillo Wind project supplying power to San Diego is located on BLM land. Photo by Daxis.

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Mounting solar panels to buildings and parking lots, like at the Grand Canyon NP visitor center, is a common sense way to produce renewable energy without major disruptions to wildlife. Photo by Michael Quinn/NPS.

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Solar development will require an additional 3.5 million acres of land.
Climate change poses a significant threat to people and wildlife. Rising sea levels, increased flooding and drought, warming and acidifying oceans, melting sea ice, increasing fire frequency and intensity, and extreme weather events all jeopardize many wildlife species. Studies suggest that the already-existing threats from habitat loss are compounded by climate change, which will accelerate habitat loss for many species and exacerbate emerging infectious diseases, invasive species, and the degradation of the surrounding environment. Many species of wildlife are already experiencing range losses and threats to food sources. Climate change is contributing to population declines in moose in the Northeast, native trout in the West, polar bears and walruses in the Arctic, and sea turtles and shorebirds on the southern coasts.

Swiftly and responsibly transitioning from fossil fuels to renewable energy sources, like wind and solar energy, is an important part of preventing potential large-scale disruption of ecosystems and ecological processes that would likely result from the warming projected without switching to low-carbon energy sources. The Earth’s ability to support the diversity and abundance of wildlife that is found on earth today depends on humans making changes now. Climate experts agree that keeping global temperature increases below 1.5°C is crucial to preventing the mass destruction of ecosystems and the forms of life they sustain. The Biden administration plans to achieve this goal by decarbonizing the power sector by 2035 and achieving net-zero domestic carbon emissions economy-wide by 2050. Additionally, the United States has re-entered the Paris Agreement,
The international effort focused on tackling the climate crisis, agreed to by 192 countries plus the European Union. And, in August 2022, the President signed into law the Inflation Reduction Act, the largest investment in climate action in U.S. history, centered on a vast expansion of incentives for wind and solar generation. But meeting these goals and obligations requires an immense and rapid buildout of renewables.

The renewable energy buildout is already moving at a rapid pace. In 2022, close to 23 percent of electricity in the national grid came from renewable sources, and the U.S. Energy Information Agency (EIA) currently forecasts a 62 percent increase in renewable electricity generation by 2030. This projected buildout will entail a more than three-fold increase in solar, a 33 percent increase in onshore wind, and a 24-fold increase in offshore wind power.

However, this buildout is not fast enough to achieve the needed levels of carbon reduction. To put us on pace to keep temperatures at safe levels, the Biden administration has set a goal of 80 percent of electric power coming from low-carbon sources by the end of the decade. Achieving this goal will require three times more renewable energy expansion than the current EIA forecast. According to the Princeton University’s Net Zero study (the Princeton Study), U.S. wind and solar generation must grow by more than four-fold by the end of this decade, with growth to 1.5 terawatts of utility-scale solar, 1.5 terawatts of onshore wind, and 200 gigawatts of offshore wind by 2050 to hit a net zero target and safe levels of emissions.

This buildout is essential; it will also take a lot of land. According to the Princeton Study, under a net zero scenario that does not rely on nuclear energy and natural gas with carbon capture, the U.S. energy footprint quadruples in size. Wind farms would occupy land areas equivalent to Arkansas, Iowa, Kansas, Missouri, Nebraska, and Oklahoma combined. Even if we rely heavily on the buildout of many new nuclear plants and natural gas plants with carbon capture and storage, there would still be a need for another 59 million acres of new wind farms and 3.5 million acres of solar developments, an area larger than Illinois and Indiana. Offshore wind development may need to occupy over 15 million acres of ocean by 2050.

Development on public lands and waters, where there are significant wind and solar energy resources, may help us achieve our climate goals. But, such development must be done responsibly in a way that avoids, minimizes, mitigates, or compensates for habitat degradation, loss, or fragmentation, and that respects the concerns of local communities and those that have borne disproportionate burdens of a fossil fuel energy system. Particularly as it relates to onshore wind, which has been studied relatively extensively, existing renewable development has already taught us a great deal about how wildlife—such as bats, birds, tortoises, and big game—are impacted by renewable development. We are beginning to develop effective strategies to mitigate these impacts, but with the scale and speed of renewable energy development needed to slow carbon pollution we face tremendous challenges in the future. To maintain an ecologically
healthy and biodiverse world, we must continue to invest in research into how wind and solar development may affect wildlife that rely on public lands and waters and identify ways to avoid, minimize, or offset impacts.

Solar and wind development on public lands and waters will also require robust coordination between federal, state, Tribal and local governments, as well as stakeholders who recreate, hunt, fish, visit, and value public lands and waters. Public lands and waters are used for many purposes, including for activities of deep cultural importance that ought not to be disturbed by renewable energy development. For example, Indigenous Peoples’ interest in public lands include traditional cultural lands, burial remains, and sacred sites, such as the sacred nature of and many historical and cultural sites in Bears Ears National Monument or Chaco Culture National Historic Park. We must also be cognizant of the potential socioeconomic and health impacts utility-scale development may have on neighboring communities. Successful and equitable development that is publicly supported requires that the use of public lands and waters for wind and solar energy production must be done in a way that is deliberate, transparent, inclusive, and responsible.

To this end, this report discusses the benefits of wind and solar development and outlines the legal and regulatory landscape of developing utility-scale wind and solar energy on public lands and waters. It then addresses the impacts—known and potential—that this kind of development has on wildlife and its habitat as well as ways of avoiding and minimizing such impacts. The report concludes with a set of recommendations on how solar and wind energy should be thoughtfully and deliberately developed on public lands and waters.

This report does not include a discussion of the transmission infrastructure necessary for moving wind and solar power from its source to where it would be used, which is, in and of itself, a major undertaking with similar associated risks to wildlife, habitat, and local communities. Nor does it address the challenges of sourcing the critical minerals upon which these technologies rely. Further, while there are other sources of low carbon energy that may help us reduce our reliance on fossil fuels, this report focuses only on wind and solar development. These topics are or will be addressed elsewhere and will continue to be part of the conversation about transitioning to clean energy. This report also does not make comparison to the many longstanding negative impacts from fossil fuel extraction, processing, and combustion and their related infrastructure, which include a host of localized air and water pollutants, habitat fragmentation, and the greenhouse gas emissions fueling today’s global climate crisis.

Successful and equitable development that is publicly supported requires that the use of public lands and waters for wind and solar energy production must be done in a way that is deliberate, transparent, inclusive, and responsible.
II. Benefits of Renewable Energy on Public Lands and Waters

A. Climate Impacts

Climate change is a pervasive threat to the long-term survival of wildlife. Impacts of climate change include “worsening megafires and hurricanes; harmful algal outbreaks; habitat loss; the spread of disease, pests, and invasive species; and a host of other dangerous conditions for people and wildlife.”

The U.S. Fish and Wildlife Service (USFWS) points to wide-ranging threats and disruption to plant and wildlife species across the country thanks to changing climate conditions and the effects of more-severe weather events. At-risk species include the Key deer, whooping crane, and loggerhead sea turtle in the South, moose and migratory birds in the North, and any number of species in the West forced to flee the mammoth wildfires in recent years.

The National Wildlife Federation also has documented how the increased frequency of “unnatural disaster” events fueled by climate change is not only costing households, communities, and governments billions of dollars in damages, but killing and disrupting wildlife populations at the same time.
For migratory populations, changing landscapes and habitats can have major implications on a continental scale. The Great Basin encompassing parts of Oregon, Idaho, California, Nevada, and Utah holds a system of wetlands making up a large portion of the Pacific Flyway migratory route linking waterfowl habitats across North, Central, and South America. But a warmer, drier climate over the last 40 or more years has been linked to a dramatic decrease in these wetlands and the ability of water birds to use and thrive in them. For caribou traveling on land, a warming climate means that animals have to work harder to slog through wet, muddy terrain and avoid pests in order to get to their breeding grounds. This could have important consequences to population survival.

Marine ecosystems, of course, are not immune to the ravages of climate change and, in fact, have borne much of the brunt so far. A recent study found that nearly all marine species – almost 90 percent – will be at high or critical risk if climate emissions remain high. These species represent crucial sources of food and employment for billions of people, particularly for lower-income populations, and important links in the relatively less understood web of life within the oceans.

These are the stakes against which we must measure potential tradeoffs associated with energy development on public lands and whether this development is contributing to further climate-fueled destruction, or if it is part of the ultimate solution.

B. Jobs and Economic Development

1. Solar and Wind Jobs

The renewable energy sector already generates significant employment, and it is one of the fastest-growing sources of jobs in the United States. Last year, 2022, saw the solar and wind energy industry continue to rebound from the major losses of the pandemic, growing by 5 percent over the previous year to reach 75 percent of pre-pandemic levels. The clean energy economy employed more than 3.2 million people, with strong growth in renewable energy generation and manufacturing of the electric vehicles powered by it. These jobs are in all 50 states, pay higher than average, though sometimes not as high as other energy related jobs, offer significant opportunities, and are frequently local, on-site jobs. In 30 states, led by California and Texas, renewable energy jobs outnumber coal and gas jobs. In fact, total wind and solar jobs across the nation outnumbered coal and gas jobs by 3.5 to 1, with the fossil fuel industry losing rather than adding employment. Already projected to be among the highest growth industries, federal investments in wind and solar generation enacted in fall 2022 are only expected to amplify that growth. A transition to renewables may also help some regions economically by alleviating the harmful externalized costs of extractive fossil fuel industries, reducing pollution that poses public health risks and can be a deterrent to economic growth in sectors like outdoor recreation and tourism.
While current and future potential development of renewable energy resources on public lands and other remote sites holds the promise of significant job opportunities, often in locations subject to chronic underemployment, it is important to acknowledge and prepare for some of the limitations of the shift to renewable energy for the workers and communities who experience it. Jobs in renewable energy often are not a one-for-one trade. Frequently, wind and solar jobs do not pay as well as corresponding fossil fuel energy positions — though this may change as the emerging renewable energy sector unionizes and encounters wage competition. Skills developed over generations are not necessarily or easily transferrable from one industry to another. And temporary boons in construction of renewable energy projects may not be sustained over the life of relatively low-maintenance facilities. Renewable energy development on public lands should best be viewed as one part of an overall strategy, rather than a panacea, to help largely rural communities improve their employment and economic positions while moving on from reliance on polluting fossil fuels.

2. Royalties and Cost Competitiveness of Wind and Solar Development

In addition to providing significant job-based benefits, new renewable energy development projects generate substantial rent and royalty payments directly to federal, state, and local governments. This is an important consideration since local revenue sharing is a substantial source of income for local governments that forego potential tax revenue due to the presence of federal or state public lands. Considering solar, wind, and geothermal projects on public lands, their combined rent and royalty payments since 1982 topped $600 million, split between all three levels of government. Since 1982, however, renewable energy technology has rapidly advanced, leading to steady declines in cost — to the point where new solar and wind plants “are now often less expensive than new coal and natural gas power plants.”

A 2020 report found the cost of energy generated from new solar and wind plants is likely to trend below the cost of coal. This transition in economics should favor development of renewable energy resources on public lands over fossil fuel extraction.

Governments collect three different types of rent and royalties revenue: “(1) Per-acre land rental fees; (2) Royalties (for geothermal) or megawatt capacity fees (for solar and wind); and (3) Minimum and bonus bids as part of the competitive leasing process.” In sum, solar and wind generated over $194 million in annual revenues by the end of 2019. However, the offering of offshore wind leases under the Biden administration has demonstrated the potential for vastly higher revenues from coastal resources. According to American Clean Power, areas recently being proposed for leasing could generate up to $4.5 billion in leasing revenue, supporting 40GW of offshore wind power and $120 billion of economic investment.
III. The Regulatory Landscape

Any wind and solar development on public lands and waters must be consistent with applicable laws and regulations. The following examines relevant federal policies and their implications for development.

A. National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires all federal agencies to consider the environmental impacts of proposed federal actions, including approving, permitting, and funding activities, before they commence and to communicate these potential impacts to the public. While NEPA does not require any particular substantive outcome, it does outline procedural steps that agencies must take if their actions would “significantly affect [ ] the quality of the human environment.” NEPA directs agencies to consider whether an action significantly impacts the environment through an environmental assessment (EA). If the EA shows no significant impacts, the agency will issue a Finding of No Significant Impact (FONSI). If an agency finds impacts will be significant, it must prepare an environmental impact statement (EIS).

An agency must consider the impacts of the proposed action to the “fullest extent possible,” and provide a detailed analysis of “reasonable alternatives to the proposed action.” NEPA also requires federal agencies to give the public opportunities to participate in the analysis by identifying issues for

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the agency’s consideration during the early scoping process, reviewing and commenting on a draft EIS and attending public meetings. This allows potentially impacted communities and stakeholders to have a say in how a project is developed, what impacts are considered, and what reasonable alternatives are analyzed that may minimize or avoid impacts.

Solar and wind development and related activities—roads and transmission lines, for example—on federal lands are subject to NEPA. The Bureau of Land Management (BLM) has attempted to make the NEPA and permitting process for wind and solar more efficient and deliberate by preparing programmatic EISs intended to establish a consistent permitting process for wind and solar development, to identify appropriate areas for development and to review potential impacts of development on a regional scale. For example, in 2005, the BLM issued a Programmatic EIS on Wind Energy Development on BLM-administered lands in the Western United States, concluding a years-long process to update the agency’s land management plans and consistently permit wind development on public lands. In 2012, the BLM prepared a programmatic EIS reviewing changes to the way the agency permits utility-scale solar development in six southwestern states—Arizona, California, Colorado, Nevada, New Mexico, and Utah. The agency must still consider the impacts of a specific wind or solar project, but the analysis can tier to the programmatic EIS and may be completed with a shorter analysis.

In the context of offshore wind development in public waters, some level of NEPA process occurs at four stages of development: (1) planning and siting, (2) lease issuance, (3) site assessment and characterization, and (4) approval of the construction and operation plan (COP) phase. Currently, the Department of Interior Bureau of Ocean Energy Management (BOEM) only performs a full environmental impact statement at the COP phase and does a less comprehensive environmental assessment at the other levels. While BOEM can conduct more comprehensive NEPA review prior to the construction and operation phase, comprehensive NEPA review typically does not take place until late in the process. Conservation groups have suggested BOEM do a comprehensive programmatic EIS earlier in the process to look at impacts, in particular cumulative impacts, and alternatives on a regional level prior to making siting decisions. While BOEM has not done a PEIS for offshore wind siting, it has made substantial improvements in the process to increase transparency and stakeholder engagement such as releasing draft wind energy areas for public comment and engaging in multiple stakeholder meetings before siting decisions are made.

### B. The Federal Land Management Policy Act

The Federal Land Policy and Management Act of 1976 (FLPMA) requires the BLM to sustain “the health, diversity, and productivity of public lands” for the use and enjoyment of present and future
generations through its management of approximately 1 in 10 acres in the United States. FLPMA mandates BLM manage public lands for multiple use, which the Supreme Court has called a “deceptively simple term that describes the enormously complicated task of striking a balance among the many competing uses to which land can be put, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and [uses serving] natural scenic, scientific and historical values.” Further, the agency is to manage lands for sustained yield, defined as the “achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use.”

To this end, the BLM inventories public lands and provides for their management through the preparation and periodic revision of land use plans, also called resource management plans (RMPs). Per FLPMA, land use plans must be developed and revised with public involvement and are subject to NEPA’s procedural requirements, discussed above. The BLM uses its land use planning process to identify where on the landscape renewable energy should or should not be allowed. Any use of public lands, including any solar or wind development, must be consistent with an RMP. As noted above, through broad policy changes and programmatic EIs, the agency has revised many of its RMPs to consider, site, and permit wind and solar development consistently.

In 2016, the BLM issued rules providing for a competitive leasing process for solar and wind development on public lands. Under these regulations, BLM permits and incentivizes solar development in areas with “high energy generation potential, access to transmission (either existing or proposed), and low potential for conflicts with other resources.” These “designated leasing areas,” or DLAs, are “identified by the BLM land use planning process as being a preferred location[.]” The BLM may consider a variety of factors when identifying DLAs, including impacts on cultural and natural resources.

DLAs include areas designated in BLM programmatic planning processes, such
as Solar Energy Zones (SEZs), Renewable Energy Development Areas (REDAs), and Development Focus Areas (DFAs). The BLM incentivizes development within DLAs by waiving or reducing fees, offering variable offsets under certain circumstances, streamlining the issuance of a lease and relaxing bonding requirements. BLM also prioritizes solar and wind energy applications based on certain criteria, including whether the proposed site is in a DLA, the appropriateness of the proposed site for energy development, whether the site has been previously disturbed or is near previously disturbed lands, and the proposed site’s visual resource values. BLM gives medium and low development priority to lands with important cultural resources, sensitive wildlife habitat, valuable visual resources, lands with wilderness characteristics and proximity to specially designated areas.

The BLM has announced some recent policy changes relating to solar and wind development on public lands, including renewed focus on Renewable Energy Coordinating Offices (RECOs) to coordinate federal permitting efforts. The BLM is in the process of revisiting how it sites and regulates solar development on public lands and intends to revise its regulations related to renewable energy and transmission lines as well.

C. Outer Continental Shelf Lands Act

The Outer Continental Shelf Lands Act (OSCLA) governs activities in submerged lands in the outer continental shelf, which begins three to nine miles offshore and generally ends 200 miles offshore. While the outer continental shelf has...
historically been leased primarily for oil and gas development,\textsuperscript{55} the Energy Policy Act of 2005 amended OCSLA to allow for renewable energy development.\textsuperscript{56} The Bureau of Ocean Energy Management (BOEM) manages this development, and can lease portions of the outer continental shelf to renewable energy developers.\textsuperscript{57} BOEM does not have authority to lease in offshore National Parks, National Wildlife Refuges, National Marine Sanctuaries, or National Monuments.\textsuperscript{58} OCSLA requires that, among other considerations, BOEM account for “protection of the environment” and “conservation of the natural resources of the outer Continental Shelf” when leasing offshore wind projects.\textsuperscript{59} This means that BOEM must separately consider environmental and natural resource considerations under OCSLA in addition to its obligations to consider these factors under other laws.

Under current BOEM regulations, development occurs in four phases: a request for interest followed by a Call for Information and Nomination to ascertain interest in regional development that informs the siting identification of wind energy areas (WEAs) within an ocean region; the sale of leases within identified WEAs; site assessment and characterization of lease sites by lessees; and construction and operation plans for development of specific offshore wind projects, or COPs.\textsuperscript{60} BOEM reserves the right to reject any project up until the construction and operation (COP) phase of this process.\textsuperscript{61} A new rule is being proposed for this process that, if promulgated, would make some relatively modest changes including the removal of request for information process, the requirement of a five year leasing schedule to be published, and measures to better ensure lessees fulfill lease obligations.\textsuperscript{62}

OCSLA regulations also allow BOEM to consider “multifactor bidding” to determine the winner of leases.\textsuperscript{63} This gives BOEM considerable discretion to define how it will award leases. These factors can include incentives for bidders to include workforce training and development, contracting with and supporting communities and businesses that serve communities of color, low wealth communities, and other frontline communities, supporting environmental justice initiatives, support of domestic supply chains, and credits for environmental protection. BOEM has already taken steps in this direction. For instance, in 2018 for a Massachusetts bid, the agency considered offering 5 percent credit for a company that would provide a community benefit agreement to help marginalized communities, but ultimately went with a more traditional bid structure.\textsuperscript{64} It again considered such a multifactor bid for the New York Bight region in 2022, but again decided to award leases to the highest cash bidder.\textsuperscript{65} Also in 2022, BOEM sought input on a bid that considers credits for workforce training and development of domestic supply chain production for the Carolina Long Bay.\textsuperscript{66} Thus, OCSLA gives BOEM both the direction and the discretion to set the bid process in a manner that protects wildlife and natural resources, and ensures the advancement of projects that will support local economies and promote The National Wildlife Federation has been at the forefront of working with project developers, communities, labor organizations, and other stakeholders to ensure that projects go beyond the statutory requirements to optimize overall benefits.
equity and environmental justice. Although BOEM’s decisions could go further in this direction, the National Wildlife Federation has been at the forefront of working with project developers, communities, labor organizations, and other stakeholders to ensure that projects go beyond the statutory requirements to optimize overall benefits.

D. National Forest Management Act

The National Forest Management Act (NFMA) is the primary statute governing the administration of national forests and grasslands. NFMA requires the Secretary of Agriculture to assess forest lands and grasslands to develop programs based on multiple use, sustained yield principles. Multiple use means the “management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people.” Sustained means the “achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land.” NFMA further requires the Secretary to implement a resource management plan for each unit of the National Forest System that balances environmental and economic interests. Permitted projects on national forests and grasslands must be consistent with land management plans. To the extent there is renewable energy development on national forests, projects should be consistent with the plan.
Like the BLM, the Forest Service may issue rights-of-way for the generation, transmission, and distribution of electric energy. Unlike the BLM, the Forest Service does not provide for competitive bidding nor has it codified its permitting processes in a rulemaking.

E. Endangered Species Act

The Endangered Species Act (ESA) prohibits the take of species that have been listed as either endangered or threatened with extinction. Under the ESA, “take” means killing or harming, intentionally, incidentally or inadvertently a threatened or endangered species. The ESA also protects habitat for listed species. A project that might affect listed species and requires federal permitting or other federal action must undergo consultation under Section 7 of the ESA before it can proceed. Consultation occurs between an acting agency and an expert federal wildlife agency—the U.S. Fish and Wildlife Service (USFWS) for terrestrial species or the National Marine Fisheries Service (NMFS) for marine species. The acting agency must determine that the project will not jeopardize the continued existence of the listed species or result in the destruction or adverse modification of habitat for the species. The agency may allow for certain incidental (or inadvertent) take of listed species that may occur as a result of the action being taken (like constructing and operating a wind or solar farm) and require that measures to protect the species be put in place. Those that do not require a federal permit—which would be few to none on public lands or waters—must get a separate protective permit under Section 9 of the ESA to incidentally (or inadvertently) take any listed species. In addition to federal law, many projects must also abide by state endangered species laws.

In practice, agencies conduct a “biological assessment” (BA) to determine whether a project or action will jeopardize the continued existence of a species or result in the destruction or adverse modification of habitat for the species. If the BA indicates that the project may affect but is not likely to adversely affect a listed species and concurrence from the wildlife agency is obtained in writing, that is generally the end of the inquiry. If, however, the BA concludes that the proposed project or action may adversely affect a listed species, then formal consultation occurs. This process results in a more formal biological opinion (BO). If the BO finds that
the project will jeopardize the continued existence of the listed species, then either the USFWS or NMFS must suggest “reasonable and prudent alternatives” to the proposed activity that would not violate Section 7’s mandate. BOs also generally contain an incidental take statement (ITS), which describes the proposed anticipated take of listed species that will result from the project. An ITS provides a shield from liability under Section 9 of the ESA, but the project must also comply with the reasonable and prudent alternative measures and other implementing terms and conditions in the ITS to avoid such liability.

F. Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) prohibits the taking of marine mammals without a permit. To “take” is “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” Harassment is further defined as Level A harassment and Level B harassment. Level A harassment is any act that “has the potential to injure a marine mammal or marine mammal stock in the wild.” Level B harassment is an act that has “the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.” If an activity is at risk of taking a marine mammal, the MMPA requires an Incidental Take Authorization (ITA), issued by NMFS or USFWS. ITAs can only be issued for activities that will have a negligible impact on marine mammals and where adverse impacts can be mitigated.

If an activity will incidentally harass, but not injure, a marine mammal, NMFS or USFWS may issue an Incidental Harassment Authorization (IHA) for a project. Since offshore wind development can harass marine mammals through noise from pile driving of turbine foundations and other activities, an IHA must be obtained for...
disturbances such as survey activities and construction. NMFS may condition the permit on implementation of mitigation strategies to reduce risks. Measures can include seasonal restrictions on pile driving, the use of monitors to ensure that marine mammals are not present before noise occurring activities commence, reductions on vessel speeds, requirements that noise causing activities shut down if a marine mammal gets within a certain distance, and the use of technologies like underwater bubble currents that reduce the transmission of noise.

G. Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) is intended to ensure the sustainability of protected migratory bird species. The MBTA prohibits the “take” of migratory birds except as permitted in federal regulation. The MBTA authorizes the Secretary of the Interior to issue regulations permitting the take of protected birds under certain circumstances, giving “due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times of migratory flight.” The USFWS is considering a rulemaking that would codify the long-standing interpretation of take as including incidental or unintentional takings. The agency also solicited input on whether it should institute a permitting system for incidental takes. Such a system may give solar and wind energy developers more clarity on measures needed to protect migratory birds and reduce liability.

H. Bald and Golden Eagle Protection Act

Like the MBTA, the Bald and Golden Eagle Protection Act of 1940 (BGEPA) prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald or golden eagles, including their parts, nests, or eggs. BGEPA defines take as to “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” While the USFWS may issue take permits, it has been criticized for doing so only occasionally. The agency has initiated a rulemaking to review and revise its incidental take permitting process.

I. National Historic Preservation Act and Tribal Consultation

The National Historic Preservation Act (NHPA) establishes a national preservation framework to protect historic properties—those sites and objects eligible for the nation’s official list of historic places because of their significance to American history or culture. Although the NHPA generally does not mandate substantive protection for historic properties, it does require federal agencies to consider preservation and consult with states and Indigenous Peoples (with the requirement limited to federally-recognized Tribes), officials, local governments, and members of the public to assess agencies’ possible impacts on historic properties. The NHPA recognizes that engagement and participation of Indigenous Peoples are critical to preserving historic and cultural resources and help establish programs to preserve historic properties in accordance with Indigenous values.
critical to preserving historic and cultural resources and help establish programs to preserve historic properties in accordance with Indigenous values.

Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties and resources and consult with Tribes who may attach religious and cultural significance to potentially affected historic properties. If a federal agency determines through this process that an action will have adverse effects on a historic property, it must attempt to resolve the conflict through further consultation with Indigenous Peoples or states. The agency can resolve conflicts by entering into a binding agreement.

Renewable energy development on public lands and waters can risk harm to historic and cultural resources, including prehistoric archeological sites, ancient landforms, Indigenous cultural properties, burial grounds, historic buildings, submerged lands, shipwrecks, and other significant locations of historic or cultural value.

Consultation with Tribes and consideration of Indigenous resources is a key component of the NHPA. These considerations should guide development of renewables on public lands and waters, and tribal consultation is required under other mandates as well.

Additionally, tribal consultation is required under Executive Order 13175, which directs federal agencies to consult with Indigenous Peoples on actions and policies that impact Indigenous interests. The Department of Interior also requires its agencies (such as BOEM and BLM) to develop and participate in consultation with federally recognized Indigenous Peoples where impacts may arise.

J. The Coastal Zone Management Act

The federal Coastal Zone Management Act (CZMA) gives states and localities a voice in the management of activities in waters that are beyond the state’s jurisdiction but that might impact the state’s coastal areas, such as offshore wind development in federal waters. The CZMA supports states in crafting coastal management programs that delineate a state’s coastal zone and define uses that “have a direct and significant impact on the coastal waters” of the state.

For states with approved programs, federal agencies such as BOEM that approve offshore wind and other renewable energy construction in federal coastal and ocean waters are subject to the consistency provisions of the CZMA. This requires that a federal agency issue a determination that
any “agency activity within or outside the coastal zone that affects land or water use or natural resource of the coastal zone” is consistent with the enforceable policies of a state’s coastal management program “to the extent practicable.”

The state has an opportunity to review the determination and offer alternatives or conditions that would allow the activity to be consistent with the state’s program. However, the federal agency gets an effective veto and can continue with the project over the state’s objection.

The CZMA also gives states the ability to develop Specialized Management Plans that can provide for increased specificity in protecting certain resources. These plans also need to undergo a consistency review and provide another tool for states to put forth conditions and alternatives to protect coastal resources from any impacts from federal renewable energy projects.

Rhode Island has adopted such a plan for offshore wind and it helped inform the development of the Block Island Wind Farm, the nation’s first. Such plans are useful tools in guiding stakeholder processes to give input on potential impacts to help craft solutions to any conflicts between offshore wind development and coastal resources, such as fisheries, beaches, and marine life, that are important to states and localities.

**K. Inflation Reduction Act of 2022**

The Inflation Reduction Act of 2022 (IRA) includes provisions that tether onshore and offshore oil and gas development to the permitting of wind and solar development on public lands and waters. Regarding onshore development, the IRA prohibits the Secretary of the Interior from...
issuing a right-of-way (ROW) for “wind or solar energy development” on federal lands for ten years following the IRA’s enactment, unless:

an onshore [oil or gas] lease sale has been held during the 120-day period ending on the date of the issuance of the right-of-way for wind or solar energy development; and

the sum total of acres offered for lease in onshore lease sales during the 1-year period ending on the date of the issuance of the right-of-way for wind or solar energy development is not less than the lesser of—

(i) 2,000,000 acres; and

(ii) 50 percent of the acreage for which expressions of interest have been submitted for lease sales during that period.[117]

This provision has the potential to limit the BLM’s ability to expand renewable energy capacity on public lands unless the agency continues to offer public lands for oil and gas leasing.

Similarly, for a period of ten years, the IRA has a provision that prohibits the leasing of offshore wind under OSCLA unless:

(A) an offshore lease sale has been held during the 1-year period ending on the date of the issuance of the lease for offshore wind development; and

(B) the sum total of acres offered for lease in offshore lease sales during the 1-year period ending on the date of the issuance of the lease for offshore wind development is not less than 60,000,000 acres.[118]

This provision, like the onshore provision, requires BOEM to continue to offer oil and gas leases in order to continue leasing offshore wind. However, as of September 2021, more than half (55 percent) of the offshore acres leased by oil and gas companies were not under active production, demonstrating a more-than-adequate supply of currently leased areas.[119]
IV. Impacts of Solar and Wind Development on Public Lands and Waters

While wind and solar resources will play an essential role in transitioning to low carbon energy, this type of development is not without consequences. It is critical that we are thoughtful and deliberate about where this infrastructure is sited, how and when it is constructed, and what types of measures are put in place to offset impacts. It is also equally important that we continue research into the effects—actual and potential—that wind and solar developments have on wildlife, wildlife habitat, and communities. The following is a discussion of the effects wind and solar development may have on public lands, waters, and the people and wildlife that depend on these resources, as well as methods of mitigating the negative impacts.

Many of the challenges mirror those of other large-scale development projects in the United States and are not unique to solar or wind energy production.

A. Public Lands: Impacts of Solar and Wind Development

1. Habitat Loss and Fragmentation

Many public lands serve as important safe havens or provide habitats for various wildlife populations, adding weight to decisions altering this habitat. Wind and solar energy projects can impact wildlife by reducing, fragmenting, and altering wildlife habitat, and communities. The following is a discussion of the effects wind and solar development may have on public lands, waters, and the people and wildlife that depend on these resources, as well as methods of mitigating the negative impacts.
habitat. Moreover, fragmenting a species’ habitat reduces gene flow between species populations and decreases their ability to adapt to climate change.121

Utility-scale wind and solar projects regularly occupy thousands of acres with varying degrees of disruption to wildlife. Solar energy development often has a more compact footprint than wind development but, because it requires clearing, occupation, and fencing of all land, its direct impacts are greater.122 The infrastructure associated with wind energy projects, including turbines, pads, and roads, only occupies a fraction of a project’s total footprint. Land between wind turbines remains available to wildlife and can serve other uses.123 Further, each development’s impacts will vary depending on aridity, weather, vegetation, topography, and other onsite and landscape factors.124

There are ways to avoid and minimize this habitat loss and fragmentation. Prioritizing wind and solar development on previously disturbed lands such as brownfields, abandoned mine lands, cultivated agricultural lands, rooftops, along roadways, and on areas surrounding airports can reduce the footprint of energy development and limit effects on habitat.125 Further, designing development—especially solar development—in a way that allows for movement among panels and turbines may allow wildlife to continue to access forage and habitat. Actions such as planting native pollinator forage can even enhance habitat and species diversity.126

2. Indirect Impacts and Operations and Management

There is concern that wind energy projects may pose a unique indirect potential threat to some ground dwelling species: the tall structures may be prime perching points for predatory birds.127 If so, this would give predators an additional advantage, even if unintentional, and may force ground birds such as sage grouse, prairie chickens, and other small prey to move away from the wind project.128 This could in turn further affect population distribution, gene flow, and migration patterns of any number of species. However, there does not appear to be support for a conclusion that modern industrial turbines, which are quite tall, provide perching points for predators.

Additionally, transmission lines, road networks, and irregular travel are all required to maintain and operate renewable energy projects, which necessarily impacts lands outside of the projects’ immediate footprint.129 These indirect effects create population bottlenecks across landscapes, further limit gene flow between species populations, and create non-chemical pollutants such as noise and light.130

Increases in noise pollution, even by a few decibels, can cause serious impacts on wildlife and their activity patterns.131 For instance, “increases in stress, weakened immune systems, reduced reproductive success, altered foraging behavior, increased predation risk, degraded
communication, . . . and damaged hearing” can all potentially result from noise pollution. Many species rely on acoustic signals for communication, for example, including many amphibians, birds, insects, and mammals who use sound for vital business like finding mates or warning about predators.

Additionally, in desert environments, construction-related ground-disturbing activities can affect “soil density, water infiltration rate, vulnerability to erosion, secondary plant succession, invasion by exotic plant species, and stability of . . . soil crusts.” PV solar facilities can alter microclimates and soil properties in a manner that can change plant communities.

3. Risks to Birds

Bird fatalities are an unavoidable consequence of wind and solar energy projects, though methods exist to mitigate impacts. An estimated hundreds of thousands of birds die each year as a result of collisions with wind turbine blades at the current level of build-out. This overall level of bird mortality is relatively low when compared to other causes of death, including power lines (30 million deaths), pesticides (67 million), automobiles (200 million), buildings and windows (600 million) and cats (2.4 billion). However, that impact will grow as additional wind capacity is installed. Furthermore, not all species are affected equally, with raptors posing particular concern. It has been estimated that future levels of wind development could pose challenges to several species, which should factor into project design and mitigation efforts. For a detailed discussion of impacts to wildlife from wind development, and how to mitigate them, see Responsible Wind Power and Wildlife, a recent brief issued by the National Wildlife Federation and National Audubon Society.

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Bird fatalities are an unavoidable consequence of wind and solar energy projects, though methods exist to mitigate impacts.
Solar energy development also poses several potential threats to birds, including collision risks, burns (mostly related to concentrated solar power), and habitat alteration. Recent studies suggest that there are more than 100,000 bird mortalities each year as a result of utility-scale solar development. Some reports indicate collisions may occur disproportionately among water birds because of the “lake effect,” where birds mistake solar panels for bodies of water given the way light interacts with the panels, attempt to land on them, and become stranded, but further study is needed.

Ground-dwelling birds, including sage grouse and prairie chickens, which nest and reside mostly on the ground, face risks outside of direct contact. Collisions with wind turbine blades or solar energy panels are unlikely as their physical and behavioral characteristics, namely being heavy-bodied, ground-feeding species, prevent them from flying long distances. The potential impacts of wind and solar energy development on ground-dwelling birds include habitat loss, fragmentation, and reduction in quality habitat due to infrastructure, roads, and human activity. However, one recent study suggested that sage grouse populations may actually increase around some solar developments, with the birds using panels as refuge from heat and for foraging, but more research is needed.

Greater sage-grouse populations have been declining across the West, and public lands provide some of their best remaining habitat. Photo by Mark Thonhoff/BLM.
Densities of ground-dwelling bird populations increase with distance from wind turbines. This reduction in avian habitat use near turbines is attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness. Disturbances caused by solar infrastructure production, roads, and human activity can have damaging effects on ground-dwelling bird populations. Most large-scale solar panel energy production occurs within three meters of the ground. Ground-dwelling birds are one of the most frequently sighted species detected at or in the proximity of most solar energy facilities in the United States, a particular concern since grassland birds lead the way in overall species decline. To protect ground-dwelling birds, continuing to collect conservation metrics for evaluating future renewable energy development is needed.

4. Risks to Bats

At least 25 species of bats have suffered collision fatalities caused by wind turbines in North America, with the potential for cumulative impacts to cause population-level declines if mitigation measures are not taken. Three migratory tree bat species—hoary bat, eastern red bat, and silver-haired bat—account for more than 72 percent of total bat fatalities at wind facilities, and most of the fatalities are made up of three migratory tree-roosting species. The vast majority of total fatalities occur during seasonal migration.

Research indicates some bat species may be attracted to wind turbines. Bat collision fatalities are highest in the upper Midwest and eastern forests and tend to be much lower throughout the Great Plains and western United States. Wind turbine site-specific analysis and planning can assist in identifying new development areas so impacts to bats are minimized where possible. Bat species have relatively low reproductive rates, potentially making populations especially susceptible to localized extinction. Added mortality from wind turbine collisions may exacerbate declines among vulnerable bat species, such as those impacted by the white-nosed syndrome.

Little information is available on the direct impact of solar energy development on bats. However, construction of solar energy facilities, the increased light during the night, and human presence related to solar energy production have been shown to negatively impact bat habitat.

5. Impacts to Big Game

Wind and solar energy installations and associated activity may affect big game such as deer, elk, and pronghorn. There are relatively few studies on the interaction between wind and solar development and big game on public lands. One recent study of the effects of solar development suggest that pronghorn will alter movement and behavior following the installation of a facility, resulting in decreased access to forage and increased risk of vehicle collisions.

In the absence of specific findings, researchers have looked to impacts that conventional energy development and industrial activity has on big game.
To reduce the potential consequences of disposal on land and waters, we should pursue the recycling of materials and infrastructure necessary for wind and solar development.

Large-scale wind development can result in areas of vegetation removal, habitat loss, and fragmentation for some species. Removing vegetation from big game habitats, either manually or by using herbicides, can cause behavioral and physiological changes. Herbicides used to control low-growth vegetation at renewable energy generation sites can pose direct and indirect threats to big game species. Direct contact or ingestion can cause damage to organs, decreased health of offspring, or death. A diversity of wildlife species experience decreased reproductive rates and population densities after application of herbicides. Herbicide use may change plant species diversity, which can reduce areas used for foraging, breeding, and habitat. Plant species diversity and density can alter territorial boundaries, breeding behaviors, and migration routes.

6. Sourcing and Disposal of Solar Panels and Wind Turbines

Consideration of what happens during the productive life of a renewable
energy project is only one component of a full cradle-to-grave analysis. There has been increased attention to where critical minerals and other renewable energy components are sourced and the accompanying social, environmental, and political risks associated. Some of these minerals may be sourced on public lands. Once produced, the equipment and infrastructure used in wind and solar energy development has a limited lifespan, and it is important we consider where and how these materials will be managed upon retirement. There are already concerns about wind blades filling up landfills in Wyoming and rooftop solar panels improperly disposed of in California. To reduce the potential consequences of disposal on land and waters, we should pursue the recycling of materials and infrastructure necessary for wind and solar development.

7. Impacts to Fresh Water Resources

Renewable energy development could present risks to such waters from degradation or destruction due to construction, just like any other development. Improperly sited renewable energy projects could alter or destroy stream and wetland hydrology or function. Additionally, particularly during construction, these projects could result in stormwater or other pollution events. It is important that these impacts be avoided, minimized, and compensated for to protect water resources multiple species rely on.

8. Mitigation

Many of these impacts can be avoided, minimized, or offset. It is important that the regulating agency—likely the BLM or Forest Service—also require developers to research and monitor impacts to wildlife to learn more about how wind and solar development affects wildlife, habitat, and the resources upon which the communities depend.

Avoidance, if possible, is the best way to mitigate adverse effects. Avoidance can often be achieved through siting choices or using technology or practices that eliminate the risk entirely. Impacts that cannot be avoided should be minimized and then compensated for (or offset). Mitigation can take forms like offsite habitat preservation or taking steps to eliminate or reduce other risks to species to make up for any losses.
Agencies and developers should adhere to best management practices and rely on the most current scientific information. Further, we recommend the following mitigation steps be taken:

- To avoid and minimize habitat loss and fragmentation, prioritize wind and solar development on previously disturbed lands and brownfields on or off public lands. More generally, siting renewable energy development on suitable agricultural lands, rooftops, along roadways, and on areas surrounding airports can reduce the footprint of energy development and limit habitat alteration. Further, designing development—especially solar development—in a way that allows for species movement among panels and turbines may allow wildlife to continue to access forage and habitat.

- To reduce consequences to birds from wind development, site individual turbines away from topographic features that attract concentrations of birds. This may reduce bird collision fatalities at wind energy facilities. Curtailing blade rotations at low wind speeds and implementation of selective shutdowns of high-fatality turbines may also result in substantial reduction of collisions. Mitigation efforts may also be improved with wind companies’ disclosure of bird fatality data.

- To reduce impacts to birds from solar development, employ systems that automatically monitor bird activity near the panels and automatize bird mortality data. This technology will allow researchers to collect valuable data on bird behavior including flight paths, migration schedules, and height of flight. Solar facilities have the largest potential adverse habitat impacts along migratory routes and near breeding or wintering grounds. Site planning is important to minimize harm to birds.

- Wind energy production facilities should be aware of ground-dwelling bird habitats and behavior patterns, and develop appropriate siting and operational procedures to accommodate them when developing new facilities.

- Despite well-established impacts to bats from renewable energy development, existing mitigation efforts to avoid them are less apparent. We must continue researching and developing mitigation strategies that are effective while allowing for levels of clean energy production that meet demand and are economically viable.

- For big game, raptors, bats, and other wildlife, it is best to avoid negative impacts by not siting projects in important habitat and migration corridors. Regulators and developers should use existing mapping and modeling tools to identify important and heavily used habitat for wildlife, including big game, raptors, and bats, and site wind and solar development elsewhere whenever possible. Further, developers can enable big game movement by increasing permeability of sites for solar installations, creating corridors or pathways among the panels. There is also the need for continued study and understanding of big game, raptor, and bat migration and

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Regulators and developers should use existing mapping and modeling tools to identify important and heavily used habitat for wildlife, including big game, raptors, and bats, and site wind and solar development elsewhere whenever possible.
routes and the effects of wind and solar development on these species, now and into the future.

- Whenever possible, planting of native vegetation for pollinator habitat, or use of development area and rights-of-way for livestock grazing or recreation trails should be employed, along with monitoring for the spread of invasive species that often occurs along with habitat disturbance. Especially in areas where re-vegetation may be hard, installation practices that leave native habitat between panels or along fencing undisturbed can preserve habitat.

B. Public Waters: Impacts of Wind and Solar Development

Like all major developments, offshore wind energy brings potential risk to ocean resources. For example, offshore wind development can affect marine mammals and sea turtles through noise and vessel strikes, birds and bats through potential collision, and disturb benthic (ocean bottom) habitat. As a new technology, monitoring and studying of offshore wind construction and operation are needed to better understand these impacts. In addition to reducing the risks of climate change to marine wildlife, offshore wind can also provide wildlife benefits, such as serving as artificial reefs that provide habitat. However, protecting species like the critically endangered North Atlantic right whale requires constant operational adaptation and planning flexibility. With climate change altering ocean conditions and the behavior of species, the risk of offshore renewable energy to wildlife becomes harder to predict.188

1. Vessel Strikes

One of the most severe threats to marine mammals, particularly large whales like the critically endangered North Atlantic right whale, is vessel strikes.189 Whales and other marine mammals that swim at or very near the surface of waters can be hit by boats and other vessels.190 Many marine mammals can be hard to detect because they swim just below the surface where they are not readily visible. Vessel strikes are of major concern for the North Atlantic right whale. With fewer than 350 North Atlantic right whales known to remain, the death of one individual can cause detrimental effects to the entire species.191

During the construction of offshore wind farms, vessels carrying construction personnel frequently make trips from the mainland to the wind energy area. Offshore wind developers must abide by the National Marine Fisheries Service (NMFS) current vessel speed restriction, which limits vessels 65 feet in length or longer to speeds of no more than 10 knots in Seasonal Management Areas—areas where speed restrictions are in place during certain times of the year when whales are more likely to occur there—to reduce the likelihood of serious injury or death to the whales.192 NMFS is considering...
new regulations that would expand speed restriction zones and apply these restrictions to vessels 35 feet in length or longer.193

2. Noise

Wind development can also cause noise. Many marine species, in particular marine mammals, use sound to navigate their environments, including detecting food and mates.194 Offshore wind can produce potentially harmful noise in two ways: during construction, in particular from pile driving (effectively hammering) turbine foundations into the ocean floor;195 and noise emitted from the operation of the turbines. Sound is also emitted during surveying activities. Sound emitted by offshore wind turbine activities, especially the potentially loud sounds of pile driving, can physically injure or disrupt the behavior of whales and other marine mammals.

Before constructing an offshore wind facility, high-resolution geophysical (HRG) surveys are used to collect geological and geophysical (G&G) data.196 HRG surveys use sound-emitting devices to show the physical attributes of the sea floor.197 BOEM mandates HRG surveys for both oil and gas development, and any other activity that could disturb the sea floor such as offshore wind development.198 Although HRG surveys are useful tools to mitigate destruction of important sea-floor structures, the sound emitted from HRG survey devices can pose a threat to marine mammals.199

Marine mammals rely on a span of different frequencies to forage, find mates, communicate, and detect predators. Noise from wind turbine construction can cause physical injury to the inner ear and long-term hearing loss.200 Whales are most at risk to experience severe effects from intense sounds due to the inner ear’s ability to amplify sounds.201 Even lower level noise can disrupt the mammal’s ability to find food and detect predators.202 Similarly, intense sounds can impact a fish’s ability to detect food and
predators. Fish with swim bladders can be affected by sound pressure waves created by offshore wind construction. Pile driving can cause physical injury and even mortality to fish located near the construction area. Even less intense noise can cause stress for fish, resulting in behavior changes, depleted energy, and loss of individual or group fitness.

Noise from the operation of turbines, while less studied, may also impact species. This operational noise—which, while not as loud, persists over a much longer period of time—can be reduced by using quieter technologies like direct drive turbines instead of gear-box turbines.

3. Displacement

Noise, visual and spatial disturbances, vessel traffic, and artificial light can also cause certain species to avoid offshore wind farm areas, a phenomenon called displacement. This is of special concern for migratory sea birds and whales, because wind farms may act as a barrier to accessing important feeding and breeding areas. Displacement can cause stress for wildlife and reduce their long-term fitness.

While research is still needed, the long-term, low-level noise of wind turbine generators may also contribute to displacement for some marine organisms.

4. Creation of Artificial Reefs

Wind turbine foundations can act as a hard bottom habitat, or an artificial reef, which can increase local biodiversity. This can create benefits by increasing native species and creating additional habitat. For example, Block Island Wind Farm off the coast of Rhode Island has seen an increase in existing species that are benefitting from the five turbines located there. However, it is possible that invasive species that thrive on hard bottom habitats may also take advantage of this new habitat and disrupt the existing ecosystem. A shift in species composition of the benthic zone can create ripple effects across the marine food web, impacting species such as the grey whale.

Diversifying the sea floor substrate can benefit wildlife and create recreational fishing opportunities. However, as offshore wind farms proliferate on the outer continental shelf, it is imperative that we study the effects on native species to help predict and mitigate potential adverse effects.

5. Collisions Risks

Turbine collision is one of the primary dangers to birds and bats from wind turbines. Although bats’ use of the offshore environment is not well understood, there is indication of their presence over 40 km offshore, creating potential collision risks. Collision risk also exists for birds, including ESA-listed species such as the rufa red knot, piping plover, and roseate tern, and while risks are likely lower than for onshore wind, more research is needed to more fully understand these risks.

Diversifying the sea floor substrate can benefit wildlife and create recreational fishing opportunities. However, as offshore wind farms proliferate on the outer continental shelf, it is imperative that we study the effects on native species to help predict and mitigate potential adverse effects.
6. Cable and Turbine Installation

During the installation and operation of wind turbines, sediments from the sea floor can be suspended into the water column, which can affect marine species' ability to find food and smother benthic marine life. Dredging, jetting, pile driving, and other installation activities can displace sediments.

During operation, the stationary foundation of the wind turbine can obstruct natural water flow from currents and tides. As the water flows around the foundation, the flow accelerates, causing a wake effect much like a boat speeding on a lake. This turbulent wake effect erodes sediments at the base of the foundation, creating a scour hole. The eroded sediments are suspended into the surrounding water column until they settle outside of the scour hole.

Spawning fish and benthic invertebrates can be smothered by displaced sediments, and sediment changes can shift benthic community structure. If sediments contain harmful chemicals, like arsenic or heavy metals, marine life in the area would be more likely to experience acute toxicity.

7. Electromagnetic Fields

Both marine and diadromous (migrating between salt- and freshwater) species can sense electric or magnetic fields and the generation of electromagnetic fields (EMFs) from power cables may affect the ability of organisms to navigate and detect prey. Elasmobranchs (sharks and rays) and sea turtles have the highest likelihood of being affected by exposure to power cable EMFs. Studies have shown that some fish species are magneto-sensitive and use geomagnetic field information for orientation purposes.

EMF effects can alter the ability to detect or respond to natural magnetic signatures, potentially altering fish survival, reproductive success, or migratory patterns. EMF exposure may affect sea turtles since they are known to use earth's magnetic field for orientation and migration.

EMFs can also pose indirect consequences to seabird, fish, and marine mammal foraging patterns if distributions of prey fish are disrupted. However, results of scientific studies have been mixed or not significant. In addition, while field studies have been conducted on the effects of EMF from cables buried in the seabed, there is a limited understanding of the EMF impacts of cables suspended in the water column, as in floating wind dynamic power cables. More work needs to be done to understand attraction or aversion effects of suspended, dynamic power cables, particularly on pelagic species.

8. Entanglement

Approximately 115 species in the U.S. are known to be impacted by entanglement, including marine mammals, sea turtles, birds, fish, and invertebrates. Entanglement risk takes two forms; primary entanglement occurs when an organism is caught or injured directly by offshore wind
cables or structures. Primary entanglement is thought to pose a low risk to marine animals given the tautness and diameter of offshore wind infrastructure (cables and mooring lines), though monitoring has not been extensive enough to rule it out as a threat. Secondary entanglement from offshore wind facilities, particularly floating wind, is thought to pose a greater risk to marine animals, particularly the North Atlantic right whale, as entanglement is one of the major threats (including vessel strikes) driving the species towards extinction. Secondary entanglement occurs when abandoned, lost, or discarded fishing gear and other marine debris becomes caught around mooring lines and inter-array cables, which then ensnares marine animals. Both forms of entanglement can lead to death through drowning or starvation, serious physical injury and infection, and restricted mobility and foraging success. Ultimately, the injury and reduced fitness can also result in lower reproductive success (NOAA Fisheries; SEER 2022).

9. Mitigation

Fortunately, as with onshore development, many of these impacts can be mitigated. It is important that BOEM ensure that as projects are built, monitoring is required to learn more about how offshore wind affects wildlife, habitat, and resources that communities depend on. It is also important that BOEM follow the mitigation hierarchy of avoid, minimize, and compensate for those impacts that cannot be avoided or minimized.

Specifically, we recommend including the following mitigation measures:

- Vessel speed restrictions can reduce the risk of collisions with marine mammals and sea turtles, and observers can be used on vessels to spot whales or other wildlife in order to avoid collisions. Development of new technologies may also allow for better detection of species to mitigate collision risk and such development should be encouraged and funded.

- Quiet foundation technology, such as gravity based or suction bucket foundations, can greatly reduce or eliminate harmful noise from pile-driving.

- Noise from pile driving can be mitigated with noise reduction techniques like bubble curtains. Observers can be used to ensure that pile driving does not occur when marine mammals are too close and at risk of being harmed.

- Seasonal and nighttime (when visibility is low) restrictions on potentially harmful activities, like pile driving, can reduce the likelihood species like the critically endangered North Atlantic right whale will be present when such activities occur.

- Cables can be buried and co-located to reduce risks and the amount of areas affected. Similarly, cable landings can avoid sensitive or undisturbed habitat areas.

- Regional construction activities can be staggered and timed to reduce cumulative impacts such as the amount of vessel traffic or noise in a particular region.
V. Environmental Justice and Implications for Indigenous Peoples

A. Environmental Justice, Climate Change, and Renewable Energy

Environmental justice analysis focuses on the disproportionate health and environmental impacts on people of color and under-resourced populations, as well as the exclusion of those communities from meaningful participation in environmental decision-making. Large-scale deployment of renewable energy is critical to promoting environmental justice. Fossil fuels disproportionately harm communities of color and low-income communities by exacerbating pollution and climate change. For example, communities with environmental justice concerns have disproportionately high exposure to air pollution from coal-fired power plants, and they also suffer from elevated rates of asthma, chronic airway diseases, and cardiovascular diseases. Although renewable energy projects can lead to localized disturbances, responsibly transitioning electricity generation from fossil fuel sources to renewable energy sources will generate benefits and reduce a major driver of environmental injustice—pollution from fossil fuel extraction and fossil-fuel power plants and engines—in the United States.
1. Environmental Justice Benefits and Impacts from Onshore Wind and Solar

Although wind and solar projects can emit some greenhouse gases, predominantly during construction and manufacturing, net emissions of harmful pollutants are significantly reduced or eliminated when renewable energy production replaces fossil fuel production. Solar and wind improve air quality in areas that experience reduced use of fossil fuels. Additionally, solar and wind development can benefit local and regional economies by creating new jobs, raising regional incomes, and potentially increasing sales and tax revenues in certain areas.

However, wind and solar development can present potential adverse impacts to resources that are culturally significant, especially to Indigenous Peoples. Many cultural resources exist on and around public lands. They often include historic, physical resources like religious sites, trails, and cemeteries. Depending on the community or cultural group, they can encompass intangible resources (e.g., spiritually significant geological features and viewsheds) and natural resources (e.g., ecosystems, water, and air). Accordingly, renewable energy projects can degrade or even destroy cultural resources. These risks must be accounted for and avoided, minimized or, as a last resort, compensated for in consultation with affected communities.

In contrast to the documented positive health effects of replacing fossil generation with renewable resources, scientists are trying to understand better any long-term health consequences tied to renewable projects—wind in particular. Evidence exists that the constant low-level noise from turbines can affect heart health and background anxiety levels of nearby residents. Until these effects are better understood, caution should be used when citing projects near residential communities.

Wind and solar energy also present potential economic challenges for communities of color and low-income populations as well as Indigenous communities. Both renewables—particularly solar—can decrease or preclude other commercial and recreational uses of public lands and change the character of particularly rural areas. Reduced public lands access for hunting, fishing, hiking, grazing, and other types of uses could adversely affect the livelihoods and traditions of nearby communities, who have cultural and social ties to public lands. Renewable projects may also affect property values by creating aesthetic concerns or increasing vehicle traffic. They may additionally alter the existing uses of private lands surrounding projects.
Finally, as discussed above, extraction of critical minerals and other materials from public lands poses very real risk to wildlife populations, water quality, cultural resources, scenic values and characteristics, and community impacts. These must be weighed against the economic opportunities and national security implications of such mining activity.249

2. Community Benefits and Impacts from Offshore Wind

Offshore wind development displaces energy generation from fossil fuels and reduces carbon emissions. This can reduce air pollution in local communities and have other benefits like reducing the threat of sea-level rise for low-lying coastal communities.250 Wind energy on the outer continental shelf may also benefit communities of color and low-income populations through increased economic activity and job opportunities in marine trades and offshore wind.251 Massachusetts’ Brayton Point power plant exemplifies the possibilities: a cable manufacturing company has finalized plans to acquire Brayton Point—the state’s last coal-fired power plant—and transform it into the first offshore wind manufacturing facility in Massachusetts.252

On the other hand, energy projects can complicate operations for commercial fishing, for-hire fishing, and marine recreation, thereby impacting the communities of color and low-income workers in those businesses, as well as subsistence fishing.253 Changes to those marine industries can in turn affect the economic wellbeing of coastal Indigenous Peoples and fishing communities.254 Offshore wind can also disturb the diversity of cultural resources important to coastal communities, including submerged ancient landforms and shipwrecks, wildlife, and sacred landscapes and viewsheds.255 Lastly, construction and installation activities at ports can temporarily increase traffic, noise, and emissions of smog-inducing and greenhouse gases, thereby impacting communities of color and low-income communities that live nearby.256

B. Methods of Agency-Community Consultation

Federal law provides several ways for communities to express their interests and influence decisions regarding environmental harms, renewable energy, and public lands. FLPMA and OCSLA respectively task BLM and BOEM to involve communities in decisions over public lands and the outer continental shelf.257 NEPA, the NHPA, and several Executive Orders complement FLPMA and OCSLA, in that they also mandate federal agencies to consider and consult with communities.258 Indigenous Peoples have a unique relationship with the federal government because of their original sovereign and independent status as defined in treaties, statutes, Executive Orders, and court decisions; accordingly, government-to-government consultation with Tribes must be particularly robust.259
C. Assessment of Agency-Community Consultation

Federal law provides avenues for communities to shape decisions on renewables and public lands, and it helps create instruments that allow development while fulfilling community interests. For example, consultation with communities has led agencies to exclude culturally significant areas from development, commit to further research and recognition of certain resources, and mandate that developers create plans to hire from local and Indigenous Peoples. However, some communities argue that agency approaches to consultation—particularly under NEPA and the NHPA—are not meaningful, but merely boxes to check in a legal process. Inadequate consultation can lead to legal disputes and tarnish relations across communities, agencies, and project developers, ultimately stifling both renewable energy development and environmental justice.

Federal agencies should, instead, move toward implementing the principles of free, prior, and informed consent (FPIC) as laid out in the United Nations Declaration on the Rights of Indigenous Peoples. Article 32 of this document mandates that nation states consult with Tribal Nations—here known as Indian Tribes—"...in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources." Free, prior, and informed consent is a specific right of all Indigenous Peoples and is embedded in the universal right to self-determination. This right allows Indigenous peoples to give or withhold consent to a project that may affect them or their territories. Notably, once Indigenous Peoples give their consent, they can withdraw it at any stage. Moreover, the requirement for the federal government to attain FPIC enables Indigenous peoples to negotiate the conditions under which the project will be designed, implemented, monitored, and evaluated.
Further development of public lands and waters is likely going to be a necessary piece of the solution to protect wildlife and communities against the growing threat of climate change. Our public lands and waters can provide a key resource in the build-out of the clean, renewable energies that give us a chance to power our economy and communities in a manner that averts catastrophic levels of warming.

However, any such development must proceed in a manner that protects wildlife and communities from potential harm. Responsible development of renewable energy: (i) avoids, minimizes, mitigates (compensates for or offsets), and monitors for adverse impacts on wildlife and habitats; (ii) minimizes negative impacts on other uses of public lands and waters; (iii) includes robust consultation with Indigenous Peoples and communities; (iv) meaningfully engages state and local governments and stakeholders from the outset; (v) includes comprehensive efforts to avoid negative impacts to underserved communities; and (vi) uses the best available scientific and technological data to ensure science-based and stakeholder-informed decision making.

VI. Recommendations: Renewable Energy Development on Public Lands and Waters

It is critical that we examine other opportunities for clean energy generation in a way that reduces our reliance on public lands and waters.
Moreover, it is critical that we examine other opportunities for clean energy generation in a way that reduces our reliance on public lands and waters, including distributed generation of wind and solar power, expansive rooftop solar build-out, and locating wind and solar development along with transmission and transportation corridors and other appropriate types of development and activity.

Considering this, we make the following recommendations for how to ensure we move forward responsibly with renewable energy development on our public lands and waters.

**A. Legislation, Regulation, and Policy Matters**

- **Modernize the Regulatory Landscape:** Existing laws and agency mandates should be examined for ways to modernize the regulatory landscape for renewable energy developers in ways that avoid impacts to wildlife, natural, and cultural resources.

  Providing the private sector with consistent and reliable regulations will promote financial investments and job security as the renewable energy industry continues to grow.

  For solar and wind development on public lands:
  - Push for a regulatory environment at the federal, state, and local level that:
    - Prioritizes development off of public lands first, particularly on already developed land and where energy will be consumed or moved along existing or permitted transmission infrastructure;
    - Ensures robust community engagement and protection of impacted resources, particularly with Tribes and Indigenous Peoples;
    - Addresses net-metering concerns at the utility level to better facilitate distributed solar development off public lands; and
    - Establishes fees, taxes, or royalties that are robust enough to replace government income lost from fossil fuels.
  - The Bureau of Land Management (BLM) should revise its wind and solar rules to identify specific criteria the agency will use in designating designated leasing areas (DLAs), including the wildlife, cultural, and natural resources, adjacency to existing development, already disturbed areas, and proximity to existing or permitted transmission facilities.
  - The BLM should amend resource management plans (RMPs) at the state, district office, or field office level to identify more areas suitable and unsuitable for wind and solar energy development.
  - The Forest Service should expand its regulatory framework to incentivize responsible development, learning from BLM’s successes and setbacks.
  - Continue to support and urge Congress to fund Renewable Energy Coordinating Offices across the West to help
coordinate solar and wind development on public lands. RECO offices should focus on long-term planning and analysis of where and how to site renewable development as well as considering specific projects.

For offshore development:
- The Bureau of Ocean Energy Management (BOEM) should ensure there is broad and robust stakeholder engagement, including with potentially impacted Indigenous Peoples, at the earliest stages of regional siting decisions to ensure that the most appropriate wind energy areas are identified, areas of high conflict are avoided, and cumulative impacts are identified.
- The National Oceanic and Atmospheric Administration and other relevant agencies should put in place regulations that address ocean wide stressors on key species like the North Atlantic right whale to ensure that most acute threats to the whale are effectively addressed and undue pressure is not put on offshore wind, which has a comparably lesser, though real, threat.
- The Nature Conservancy and others have and continue to develop mapping tools to help industry, regulators and stakeholders identify renewable energy sites considering these and other factors. For example, their Brightfields Energy Siting Initiative can be used to identify previously disturbed lands that would be appropriate for renewable development.

➤ Encourage coordination among federal, Tribal, state, and local governments to ease regulatory duplicity for developers.

➤ Support the passage of federal legislation, such as the Public Lands Renewable Energy Development Act, that would, among other measures, incentivize development on already disturbed areas and identify revenue streams for local and state governments affected by renewable projects.

B. Wildlife

➤ Co-locate Development: Prioritize and incentivize co-locating renewable energy facilities and related infrastructure with existing development to reduce land use and wildlife impacts.

➤ Avoid Sensitive Habitat Areas: Avoid areas that have high and irreplaceable value to wildlife or are extremely sensitive to impacts that cannot be successfully mitigated.

➤ Prioritize Already Disturbed or Degraded Sites: To the extent practicable, prioritize areas for siting that already have been impacted, such as areas that have seen previous energy development, fossil fuel extraction, or mining activity.
Avoid Impacts to Waters and Aquatic Ecosystems: To the extent possible, development should not involve the destruction or degradation of existing water bodies and aquatic ecosystems like streams and wetlands. To the extent such impacts are unavoidable, they should be minimized and compensated for.

Collaborate with Local Communities and Indigenous Peoples: Work with communities and Indigenous Peoples near potential development to better understand the social, cultural, economic, and environmental impacts of wind and solar energy development and to help identify ways to address and offset these effects. In particular, when engaging with Indigenous Peoples, project developers and federal agencies should adhere to practices and principles of free, prior, and Informed consent as recognized in the United Nations Declaration on the Rights of Indigenous Peoples.

Coordinate with State and Local Agencies: State and local agencies should be involved in planning and permitting processes early on to the extent practicable and necessary, especially given that many of these state and local entities have expertise that can help with mitigation measures and other efforts to avoid impacts.

Expand on Existing Research: Independent, reliable research can aid agencies and private developers in more efficiently siting projects, speeding up the rollout of renewable energy projects, and reducing impacts to wildlife. For example, research into the effects of offshore wind projects on marine species can help developers and agencies determine areas of low impact early in the leasing process. Such research cannot be limited to project-specific studies funded by economically interested parties. Rather, adequate funding should be dedicated by federal and state agencies to establish comprehensive baselines, risk factors, and population dynamics.

Require Project Monitoring: To aid research, it is important that developers be required to monitor impacts and make that information available. Wherever possible, before-after-control-impact (BACI) studies should be required to provide an understanding of the direct effects of development on wildlife. Data collection should be standardized, coordinated, and transparent. This can inform research on potential risks as new technologies emerge on new landscapes, or the scale of development increases.

Ensure There is Adaptive Management: It is important that as we learn more about the effects of renewable energy on public lands, new and existing projects be required to put in place mitigation measures and technology that are informed by the latest research and monitoring.

Develop Technology: Advances in technology can deter collisions, minimize disruption to migration paths, and decrease bird and bat mortality stemming from large solar and wind projects.
C. Environmental Justice

- **Early and Consistent Consultation:** Communities of color, Indigenous Peoples, and low-income communities have diverse interests in public lands and experience diverse impacts from renewable energy development. Federal agencies and developers should collaborate with these communities early and often to understand their interests, assess how renewable energy projects may benefit or harm these interests, and devise tools to ensure their interests are protected and benefits can be equitably shared. Agency-community consultation should be more robust than that required under federal laws like NEPA and the NHPA. EPA should also be enlisted to assess and publicize the public health benefits of displacing fossil fuel extraction and energy generation with renewables, and to answer community questions about environmental and health effects of wind and solar development.

- **Extend Economic Benefits to Communities:** Renewable energy development on public lands and waters generate economic benefits for communities. However, it can also adversely impact the economic wellbeing of communities by reducing other commercial uses of public lands and waters, altering property values surrounding renewable energy projects, and displacing workers from fossil fuel industries. Federal agencies and developers should avoid or minimize adverse impacts by adopting tools that ensure the economic benefits of projects return to communities. Workforce training programs and hiring plans, for example, can provide opportunities for local, rural communities and help sustain employment for those displaced from other industries operating on public lands and waters. Similarly, incentivizing developers to adopt “high road” labor practices can improve the distributional equity of impacts of renewable energy projects by creating stable employment, directing project resources to community members, and increasing union density in the renewable energy sector. These tools also complement the Biden administration’s goal of creating well-paying and stable jobs through the development of renewable energy. In the offshore space, BOEM and DOE are already taking steps to give incentives to developers to develop community benefit agreements and take other measures that ensure benefits flow to environmental justice communities. This includes giving credits for such measures in assessing lease bids. These practices should be expanded.

- **Codify Executive Order 12898:** Federal agencies generally execute Executive Order 12898 through their NEPA analyses. However, the executive order lacks the permanence of law. Congress should codify Executive Order 12898, as amended by Executive Order 14008, to ensure federal agencies have a lasting directive to halt environmental injustices and achieve environmental justice.
D. Tribes and Indigenous Peoples

- Regulators and developers should review and incorporate Indigenous Knowledges and existing mapping and modeling tools to identify wildlife habitat and migration corridors and connectivity, and site energy projects in the least interfering way possible.

- Federal and state agencies should apply Indigenous Knowledges in reviewing project permit applications.

- Federal and state agencies and developers should apply free, prior, and informed consent throughout contact with Indian Tribes and Indigenous Peoples.

- Federal and state regulators should begin building meaningful relationships based on trust with Indian Tribes and communities, before a developer proposes a project.

- Indigenous Knowledges should be accorded appropriate stature alongside Western science.

- Agencies and permit applicants must ensure sacred sites, locations, and Indigenous Knowledges are protected from public disclosure.

- Congress and federal and state agencies should expand the areas that may qualify as sacred sites and cultural resources.

- Agencies must devote sufficient and culturally informed staff and financial resources for proper consultation to fulfill their trust responsibility.

E. Supporting the Transition to Renewable Energy

- **Prompt an All-encompassing Transition:** To limit climate change and its dangerous effects, a rapid transition away from traditional energy generation towards renewables is vital. GHG emissions from the electric sector have been decreasing since 1990 thanks largely to a shift toward gas-over coal-fired power; however, large-scale transition to renewables will be necessary to keep our planet habitable for wildlife and human populations.

- **Minimize Externalities:** Renewable energy emits far less air and water pollution than oil and gas projects do, from NOx and SOx to chemical and thermal water returns. Still, transitioning away from traditional energy production should focus on further reducing harmful chemicals and pollutants, including along the renewables manufacturing and supply chain.
VII. Conclusion

Since the onset of the industrial revolution, the large-scale combustion of fossil fuels has brought us to the brink of climate and ecological disaster. To avoid additional impacts associated with a changing climate, we must transition from fossil fuels to an economy that relies on cleaner sources of energy, including the wind and sun. Transitioning to a clean energy economy at the pace and scale needed to meet climate goals will require us to explore as many options as possible, as soon as possible. The development of renewable energy, including wind and solar, on public lands will be a necessary part of our energy mix.

However, we must ensure that the impacts of such a build-out—and the transmission infrastructure necessary to accommodate it—do not compound the habitat loss and fragmentation that wildlife is already experiencing as a result of climate change and other activities. Being deliberate and forthright about the tradeoffs for wildlife and people that will accompany wind and solar development on public lands and waters, thoughtful and cautious in implementing that development, and rigorous in avoiding, minimizing, and mitigating damage will be the key to transitioning responsibly. Further, we must prioritize other opportunities for wind and solar development that would reduce overall impacts to and reliance on public lands and waters. Such opportunities may include distributed generation of wind and solar power, expansive rooftop solar, and co-locating wind and solar development along or within existing roads, transmission corridors, or other energy development.

By learning from our past mistakes, we see that we can—and must—do better to ensure that future generations have a thriving planet to inhabit, one that includes our nation’s vast and proud legacy of abundant wildlife, natural resources, and multicultural identity.
Endnotes

1 Amanda Staudt, et al., The added complications of climate change: understanding and managing biodiversity and ecosystems, FRONTIERS ECOLOGY AND ENV’T, 494 (2013).


4 Id.


8 See id. at Table 16. Renewable Energy Generating Capacity and Generation.


10 Id.

11 Id.

12 The Department of Interior has set forth a mitigation hierarchy that seeks to, in order, “avoid, minimize, and compensate for adverse impacts to particular resources or values.” E.g., Joel P. Clement, et al., A Strategy for Improving the Mitigation Policies and Practices of The Department of the Interior From The Secretary of The Energy and Climate Change Task Force, p. 2 (April 2014), available at, https://www.doi.gov/sites/doi.gov/files/migrated/news/upload/Mitigation-Report-to-the-Secretary_FINAL_04_08_14.pdf. When the general term “mitigation” is used in this report, it refers to this hierarchy of first looking avoid impacts, than minimize avoids that can’t be avoided, and, finally, compensate for—or offset—those impacts that cannot be avoided for or minimized.

13 In part because they are newer industries, especially in the case of offshore wind, there are fewer project related studies of solar and offshore wind.

14 Solar energy consists of both photovoltaic solar power (PV) and concentrating thermal solar power (CSP). Unless otherwise specified, the report generally referring to PV solar. While we do not qualify “utility-scale” with a certain megawatt size and there are varying definitions as to what constitutes “utility-scale,” we are generally referring to commercial scale solar rather than small solar projects such as home or small business rooftop solar.


25 Id. at 7.

26 E2 Report.


Id. § 4332(2)(C).

See id.


43 U.S.C. §§ 1701(7), 1702(h).

Id. §§ 1701(2), 1711, 1712.

81 Fed. Reg. at 92,123.

43 C.F.R. § 2801.5.

Id. § 2802.11.

SEZs were identified in the Western Solar Plan, discussed above. REDAs were designated in the BLM Arizona Restoration Design Energy Project and BLM California designated DFAs in its Desert Renewable Energy Conservation Plan. 81 Fed. Reg. at 92,136.

81 Fed. Reg. at 92,123.

43 C.F.R. §§ 2809.10(d) (prioritizing leases, which are only issued in DLAs, over grants, which BLM issues outside DLAs); 2804.35.

Id. § 2804.35.


43 U.S.C. § 1337(p)(1)(C) (allowing leases, easements, or rights-of-way that “produce or support production, transportation, or transmission of energy from sources other than oil and gas”).

See OCS Lands Act History.


See generally, 30 C.F.R. Part 585.


30 C.F.R. § 585.220.


87 Fed. Reg. 2,446 (Jan 14, 2022),


Id.

Id.

Id.

Id.


73 50 C.F.R. § 17.3.
75 Id.
77 Id. § 402.14.
78 Id.
79 Id.
80 Id.
82 Id. § 1362(13).
83 Id. § 1362(1B)(A)(i), (C).
84 Id. § 1362(1B)(A)(ii), (D).
85 Id. § 1371(a)(2).
87 See 50 C.F.R. Part 216.
88 See id.
89 Id.
91 Id. § 703(a).
92 Id. § 704(a).
94 Id.
95 16 U.S.C. 668-668(c).
96 50 C.F.R. § 22.6.
99 The NHPA and its codified status use the term “Indian tribes”; however, this report instead uses the term “Indigenous Peoples.” It is important to note that the limitation of the requirement to just “federally-recognized” Tribes can result in the exclusion of non-federally-recognized Tribes from the consultation process even if those Tribes may be impacted—sometimes substantially—by a project.
102 36 C.F.R. § 800.6.
103 Id.
104 See, e.g., Quechan Tribe of the Fort Yuma Reservation v. U.S. Dep’t of Interior, 755 F. Supp. 2d 1104, 1107, 1120 (S.D. Cal. 2010) (recognizing that a solar energy project on federally owned lands may destroy all archeological sites on the project area, where 459 cultural resources are located).
106 United States v. Payne, 264 U.S. 446, 448 (1924); accord Yukon Flats School Dist. V. Native Village of Venetie Tribal Gov’t, 101 F.3d 1286 (9th Cir. 1996) rev’d on other grounds 522 U.S. 520 (1998); see also 84 Fed. Reg. 1200–01 (Feb.1, 2019). Note that the trust doctrine includes duties to manage natural resources for the benefit of tribes and individual landowners, and the federal government has been held liable for mismanagement. See United States v. Mitchell, 463 U.S. 206 (1983).
108 Secretarial Order No. 3403 (Nov. 15, 2021); Bureau of Land Management, IM 2022-011: Co-Stewardship with Federally Recognized Indian and Alaska Native Tribes Pursuant to Secretary’s Order 3403 (Sep. 13, 2022).
110 15 C.F.R. Part 930.
111 Id. §§ 930.30-930.46; 16 U.S.C. § 1456(c)(1)(A).
113 15 C.F.R. § 930.43(d).
Rhode Island Coastal Resources Management Council, Rhode Island Ocean Special Area Management Plan (Oct. 19, 2010); see, e.g., Rhode Island Coastal Management Resources Council, Block Island Wind Farm, (Feb. 13, 2022), http://www.crmc.ri.gov/windenergy/dwblockisland.html (describing the wind farm as “[t]he first offshore wind farm in the United States”).

P.L. 117-169 § 50265(b)(1). Reading this provision as a whole, especially the “not less than the lesser of”, suggests that this “and” should be an “or”.

Id. § 50265(b)(2).


Id. It should be acknowledged that these areas alone will not allow for needed climate reductions goals to be met and can present development challenges such as, in the case of brownfields, issues of contamination and potential liability that may make some sites financially infeasible.


See Jade E. Keehn and Chris R. Feldman, Predator Attack Rates and Anti-predator Behavior of Side-Blotched Lizards (Uta stansburiana) at Southern California Wind Farms, USA, 13 HERPETOLOGICAL CONSERVATION AND BIOLOGY, 194 (Apr. 30, 2018). See id. (it is worth noting that this study—which looked at predator attack rates on a lizards—found that the attack rates appeared lower at turbine sites).


Id.

Id.

Id. It is worth noting that there is little existing evidence that the impacts listed are related to PV solar operations.

Id. at 985.


Jay E. Diffendorfer, et al., Demographic and potential biological removal models identify raptor species sensitive to current and future wind energy, 12 ECOSPHERE (June 2021).


See id.

Id.


Id.


Id.


Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.

Id.


Id.


See Monica A. Dorning et al., *Oil and Gas Development Influences Big-Game Hunting in Wyoming*, 81 J. OF WILDLIFE MGMT. 379, 379 (2017).


Id.


See Id.


214 Id.


216 See Sarah Horwath, et al., Comparison of Environmental Effects from Different Offshore Wind Turbine Foundations, BUREAU OF OCEAN ENERGY MGMT., 31-33 (2021); see also Delphine Byford Coates et al., Soft-Sediment Macrobenthos Around Offshore Wind Turbines in the Belgian Part of the North Sea Reveals a Clear Shift in Species Composition, in OFFSHORE WIND FARMS IN THE BELGIAN PART OF THE NORTH SEA: SELECTED FINDINGS FROM THE BASELINE AND TARGETED MONITORING, 47-63 (Steven Degraer et. al., eds., 2011).


218 Id.

219 Id.

220 Id.

221 Id.


226 Normandeau Associates, Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species, BUREAU OF OCEAN ENERGY MGMT. (May 2011).


229 E.g., Zoë L. Hutchison, et al., A modelling evaluation of electromagnetic fields emitted by buried subsea power cables and encountered by marine animals: Considerations for marine renewable energy development, 177 RENEWABLE ENERGY 72-81 (Nov. 2021).


*Final Solar PEIS*, Volume 1, 5-16.

*Final Wind PEIS* at 6-4, 6-20; *Final Solar PEIS* at 5-14.

See id.; Quechan Tribe of the Fort Yuma Reservation v. U.S. Dep’t of Interior, 755 F. Supp. 2d 1104, 1107 (S.D. Cal. 2010) (highlighting that a solar energy project on federally-owned lands “may wholly or partially destroy all archeological sites on the surface of the project area,” the site of 459 cultural resources).


*Final Solar PEIS*; see also *Final Wind PEIS*.

*Final Wind PEIS* at 6-20.

*Final Solar PEIS* at 5-11.

Id. at 5-4; but see *Final Wind PEIS* at 5-110 (flagging two studies suggesting wind power facilities do not cause any measurable negative impacts).

*Final Solar PEIS* at 5-4, 5-251.


259 Final Solar PEIS at 4-153, 4-166.
260 See e.g., U.S. Bureau of Land Mgmt., Summary of Public Scoping Comments, Wind Energy Development Programmatic Environmental Impact Statement, 8, (Jan. 2004) (“The public commented that the PEIS should consider impacts to sacred, historical, and cultural sites and traditional cultural properties and practices.”); see also U.S. Bureau of Land Mgmt., Record of Decision - Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments, A-2, B-5; see also U.S. Bureau of Land Mgmt., Executive Summary with Dear Reader Letter, 9, 10 (Jul. 2012) (excluding development of certain lands following consultation or assessed impact to historical/cultural resources).
263 See, e.g., Matthew J. Rowe, et al., Accountability or Merely “Good Words”? An Analysis of Tribal Consultation under the National Environmental Policy Act and the National Historic Preservation Act, 8 ARIZ. J. ENVTL. L. & POL’Y 1, 15 (2018) (noting that NHPA case law from 1995 to 2017 identifies inadequate consultation as a major basis for litigation).