
CHAPTER 4: CUMULATIVE EFFECTS

4.1 INTRODUCTION

“Cumulative impact” is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). Interactive effects could be either countervailing, where the net cumulative effect is less than the sum of the individual effects, or synergistic, where the net cumulative effect is greater than the sum of the individual effects. The Council on Environmental Quality (CEQ) handbook for considering cumulative effects advises the cumulative effects analysis should “count what counts,” meaning the analysis should not consider a long list of issues with little relevance to the effects of the proposed action (CEQ 1997). This analysis focuses on the cumulative effects of the proposed action (wind park, transmission tie-line, and switchyard), alternative action (transmission tie-line alternative), and no action alternative when considered together with other past, present, and reasonably foreseeable future actions that affect the same resources. The goal of the analysis is to provide the decision makers with a “big picture” view of the effects, not only of the proposed action and alternatives, but all other actions occurring within the same geographic region on the future sustainability of important resources.

4.2 CUMULATIVE EFFECTS ANALYSIS AND METHODOLOGY

Thus far, the EIS has focused on the direct and indirect impacts from the project as a whole, including the effects of the proposed wind park, transmission tie-line, and switchyard; transmission tie-line alternative; and no action alternative. RPMs, outlined in Section 2.7, have been incorporated into the design of the proposed project components to minimize the direct and indirect effects of the project and thereby minimize any potential cumulative impacts.

In order to identify and understand the cumulative effects that would result from implementing any of the alternatives under consideration in this EIS, a three-step process was followed.

1. Identify other past, present, and reasonably foreseeable future actions that have had, or would have, broad influences on shaping the environmental conditions of the area.
2. Identify the cumulative effects of past, present, and reasonably foreseeable future actions on each resource and the additional incremental effect that would result from implementing each alternative.
3. Determine if the incremental (additional) affect of the proposed project creates a significant cumulative effect.

4.2.1 Identify Past, Present, and Reasonably Foreseeable Future Actions

Spatial and temporal boundaries are important in defining the limits of the cumulative effects analysis. These limits are variable, dependent on the reach of each affected resource and for purposes of identifying other actions to consider as part of this analysis, are defined by the impact zone of each resource.

Geographic limits of the analysis have been defined for each resource in Chapter 3, with the exception of biological resources, and are defined as resource evaluation areas. Resource evaluation areas include an area as large as Coconino and Navajo counties, to as small of an area no larger than the footprint of the proposed wind park, transmission tie-line, and Western’s proposed switchyard.

The geographic limit of the cumulative impacts analysis for biological resources was expanded beyond the evaluation area described in Chapter 3.

The timeframe for considering past activities extends back 50 years. Actions occurring in the more distant past, such as prehistoric and historic settlement, are incorporated into the environmental baseline. The reasonably foreseeable future actions considered are those that can be identified from recent decisions, plans, proposed projects, or from reasonable extensions of current or emerging trends.

Following the identification of past, present, and reasonably foreseeable future actions, these actions were looked at in the context of each resource to determine if the resources have been or would be affected. If an action has not, or would not, occur within the geographic or temporal impact zone of a particular resource it was not considered in the cumulative effects analysis of that resource.

Past, present, and reasonably foreseeable future actions that have had, or would have, broad influences on shaping the environmental conditions of the area are identified and described in Table 4.2-1.

TABLE 4.2-1 SUMMARY OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS		
Action	Description	Affected Resources
Bar T Bar/Anderson Springs Allotment Management Plan (Future)	The plan describes livestock management practices on the Bar T Bar and Anderson Springs Allotments. The plan proposes numerous activities that address livestock management, livestock grazing, waterfowl nesting on wetlands, habitat conditions for pronghorn on Summer and Winter range, and canopy densities in pinyon-juniper and ponderosa pine vegetation types in areas that have been historical grasslands. Specifically, the plan provides measures to protect wetlands and develop new water sources to replace previously used wetlands; construct new upland stock tanks; maintain and construct new barbwire fences in certain areas and remove barbwire fence to facilitate pronghorn movement in other areas; install cattle guards; and harvest and remove pinyon pine, juniper and ponderosa pine trees in areas that have been historical grasslands.	<ul style="list-style-type: none"> ● Land Use ● Biological Resources ● Geology and Soils ● Water Resources
Community settlement/development	The communities of Flagstaff and Winslow were established in the late 1800s and continue today. Dispersed settlement and smaller communities have also been established throughout northern Arizona. These communities operate as centers for economic development, learning, and social interaction.	<ul style="list-style-type: none"> ● Air Quality ● Water Resources ● Socioeconomics ● Environmental Justice
Construction and on-going use of utility infrastructure	Utility infrastructure is located throughout developed and undeveloped areas of the region. One example is the twin 345-kV electrical transmission tie-lines operated by Western that are located approximately seven miles west of the wind park study area. Utility infrastructure can be above or underground and typically includes a right-of-way and an access route for routine inspection and maintenance.	<ul style="list-style-type: none"> ● Land Use ● Biological Resources ● Visual Resources
Ongoing prescribed burning on the Mogollon Rim and Mormon Lake Ranger districts	Fuels reduction projects are ongoing and are located throughout the Mogollon Rim and Mormon Lake Ranger districts of the Forest. The purpose of these projects is to reduce fire risk and improve forest health. This is accomplished by a variety of treatments including prescribed fire management activities.	<ul style="list-style-type: none"> ● Biological Resources ● Air Quality

TABLE 4.2-1
SUMMARY OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Action	Description	Affected Resources
Operation of the Bar T Bar Ranch	The land that comprises Bar T Bar Ranch has been acquired from several ranches. Bar T Bar extends across approximately 326,200 acres. The ranch is located on private land, ASLD grazing leases, and grazing allotments from the Forest Service.	<ul style="list-style-type: none"> • Land Use • Biological Resources • Geology and Soils • Water Resources • Socioeconomics
Operation of the Flying M Ranch	Flying M Ranch is a combination of a number of historic homesteads. The ranch covers approximately 90,000 acres, a quarter of which is located on private land, and the remainder of which consists of grazing allotments from the Forest Service and leased from ASLD.	<ul style="list-style-type: none"> • Land Use • Biological Resources • Geology and Soils • Water Resources • Socioeconomics
Operation of Meteor Crater development	Meteor Crater Enterprises, Inc. operates visitor services and a museum, gift shop, and fast food restaurant near the north rim of Meteor Crater. In addition, Meteor Crater Enterprises, Inc. operates another development located at the Meteor Crater Road exit, south of I-40. The development includes an RV park, convenience market with gas sales, and a fast food restaurant. Business offices for Meteor Crater Enterprises, Inc. are also located in this development.	<ul style="list-style-type: none"> • Land Use • Socioeconomics
Recreation and hunting	Recreation opportunities including camping, all-terrain vehicle use, picnicking, hiking, rock climbing, horseback riding, mountain biking, and permitted hunting of big and small game.	<ul style="list-style-type: none"> • Land Use • Biological Resources • Geology and Soils • Socioeconomics
Sunshine Wind Project (Future)	The proposed Sunshine Wind Park is located just north of the wind park study area. This project received a Conditional Use Permit from Coconino County in 2005 and would advance pending a power purchase agreement. The Sunshine Wind Park is designed to include approximately 40 state-of-the-art wind turbines to provide approximately 60 MW of generating capacity, enough electricity to serve the average annual electricity needs of more than 14,000 homes.	<ul style="list-style-type: none"> • Land Use • Biological Resources • Cultural Resources • Water Resources • Socioeconomics • Visual Resources
Travel Management Rule (Future)	Identification of a system of roads and trails across the Forest to remain open to motorized use. The Travel Management Rule (TMR) also designates camping corridors where off-road travel is permitted a short distance from roads to facilitate camping.	<ul style="list-style-type: none"> • Land Use • Biological Resources • Geology and Soils • Transportation
Use of I-40 and State highway system	The National Interstate Highway System was formed in 1957, but I-40 was not officially completed in Arizona until 1984. The interstate along with State highways are used heavily for commercial transportation of goods and personal travel.	<ul style="list-style-type: none"> • Air Quality • Socioeconomics • Transportation

4.2.2 Identify the Cumulative Effects of Other Past, Present, and Reasonably Foreseeable Future Actions

The cumulative effects of other past, present, and reasonably foreseeable future actions on individual resources are provided in Table 4.2-2. In addition, a summary of the incremental effects of the proposed project, alternatives, and no action alternative are included for reference.

TABLE 4.2-2
SUMMARY OF CUMULATIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE
FUTURE ACTIONS AND THE INCREMENTAL EFFECTS OF THE PROPOSED PROJECT

Resource	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Project	Alternative Tie-Line	No Action Alternative
Land Use	Present actions have introduced two primary ongoing land uses to the area, including livestock grazing and recreation opportunities. The development of Meteor Crater and utility infrastructure have increased recreational opportunities by providing access through either a developed facility or use of access roads. In addition, utility infrastructure has increased available forage within the rights-of-way by removing overstory vegetation. Future actions would reduce grazing and recreation by reducing the total number of acres available for grazing and range improvements and road closures that would reduce access to recreation sites.	Would result in a permanent conversion of 591–627 acres of land from grazing to other use, but would not incrementally increase cumulative impacts.	Would result in a permanent conversion of 592–628 acres of land from grazing to other use, slightly more than under the proposed transmission tie-line, but would not incrementally increase cumulative impacts.	Would result in no change to existing land uses.
Biological Resources	Grazing affects the habitat of several threatened and endangered species, including southwestern willow flycatcher, bald eagle, Mexican spotted owl, black-footed ferret, Chiricahua leopard frog, and Little Colorado spinedace. In addition, grazing affects the habitat of several species of migratory birds and several Forest Service MIS. Temporary construction impacts on wildlife species as a result of the Sunshine Wind Project would be expected to be similar to those of the proposed project; namely, displacement would be short-term and localized, and individuals could return to the area.	Would result in a permanent conversion of 591–627 acres of land from scrub-shrub, grassland, pinyon/juniper woodlands, and ponderosa pine. This conversion would result in lost habitat for common and special-status species, but would not incrementally increase cumulative impacts.	Would result in a permanent conversion of 592–628 acres of land from scrub-shrub, grassland, pinyon/juniper woodlands, and ponderosa pine. This conversion would result in lost habitat for common and special-status species, but would not be noticeably different than under the proposed project and would not incrementally increase cumulative impacts.	

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Biological Resources (continued)	In general, past and present activities affect plant composition, increase spread of noxious weeds, increase sedimentation in streams, and increase competition for forage. Grazing management plans and the proposed TMR would reduce many of the negative effects of grazing and actually improve habitat. The Sunshine Wind Project would result in ground disturbance and could affect specific special status plant and wildlife species, including birds, raptors, and bats.	<p>Upon completion of construction of the proposed project facilities, the level of impact would not significantly impact populations even when considered in context of other ongoing or reasonably foreseeable future projects or activities.</p> <p>The long-term effects on wildlife species from the proposed project, in combination with the Sunshine Wind Project, could result in cumulative impacts on wildlife, particularly migratory birds, raptors, and bats. Past, present, and anticipated developments with aerial features, such as wind turbines and transmission tie-lines, could reasonably cause collisions to increase over current conditions. Consideration of the areal extent of these projects and the incorporation of mitigation measures to minimize impacts, however, would result in incremental cumulative impacts to birds, raptors, and bats.</p>	Impacts to common and special status plant and wildlife species would not be noticeably different than under the proposed project. Likewise, cumulative impacts on migratory birds, raptors, and bats would be identical to the proposed project, and incremental cumulative impacts to birds, raptors, and bats would occur.	

TABLE 4.2-2
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Resource	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Project	Alternative Tie-Line	No Action Alternative
Cultural Resources	The Sunshine Wind Project would result in ground disturbing activities in the vicinity of Historic Route 66 and areas known to have been used prehistorically and historically. Ground disturbance could result in the destruction of an NRHP-eligible or listed site. In addition to the potential for direct impact to sites, increased access to the area could result in inadvertent disturbance or vandalism to otherwise undisturbed sites. Visual intrusions on TCPs in the region are also likely.	Would directly disturb between 2,419–2,630 acres of land within areas known to have been used prehistorically and historically. Archaeological, Tribal or historical sites listed, or eligible for listing, on the NRHP would be avoided to the extent possible and no significant direct impacts would occur. Visual intrusions on TCPs in the region are likely and would result in indirect adverse impacts. The proposed project would not incrementally increase cumulative effects.	Would directly disturb between 2,420–2,631 acres of land within areas known to have been used prehistorically and historically, slightly more than the proposed project. Impacts would not be noticeably different than under the proposed project. The alternative transmission tie-line would not incrementally increase cumulative effects.	Would have no effect on cultural resources.
Geology and Soils	Ranching and recreation have affected soil protective mechanisms, causing erosion and lost productivity. Grazing management plans and the proposed TMR would lead to increases in ground cover which would decrease erosion.	Would temporarily disturb between 2,419–2,630 acres of land and would permanently remove vegetation from and alter the surface of 591–627 acres of land. This would result in increased erosion and the permanent loss of soils, but not at a level that would result in significant incremental addition to cumulative impacts to soils.	Would temporarily disturb between 2,420–2,631 acres of land and would permanently remove vegetation from and alter the surface of 592–628 acres of land. Impacts would be slightly greater than under the proposed project because the transmission tie-line associated with the alternative action requires a new access road across moderately erosive soils that are difficult to revegetate, but still not a significant incremental increase.	Would have no effect on geology and soils.

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FUTURE ACTIONS AND THE INCREMENTAL EFFECTS OF THE PROPOSED PROJECT

Resource	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Project	Alternative Tie-Line	No Action Alternative
Air Quality	Communities and transportation infrastructure deteriorate air quality through vehicle emission, heating, etc. However, air quality standards are currently being met. Prescribed fires on the Forest would contribute short-term smoke into the airshed; however, all prescribed burns are permitted by ADEQ and fall within established air quality limits. Wildfires could create smoke that exceeds air quality standards.	Due to the short duration, air impacts from the proposed project would not incrementally increase cumulative impacts.	Due to the short duration, air impacts from the proposed project would not incrementally increase cumulative impacts.	Would have no effect on air quality.
Water Resources	Water quality is affected by erosion and sedimentation as a result of grazing and other ground disturbing activities. Water is consumed in Coconino County by municipal, industrial, and agricultural activities at a rate of approximately 105,000 acre-feet of groundwater and 51,000 acre-feet of surface water annually. If constructed, the Sunshine Wind Park could increase erosion and sedimentation and would consume a relatively small amount of water during construction.	Construction would require approximately 307 acre-feet of groundwater. Operations would require a negligible amount of water. Soil erosion and sedimentation would increase as a result of the temporary disturbance of between 2,419–2,630 acres of land and the permanent disturbance and removal of vegetation from 591–627 acres of land. With the proposed RPMs, the proposed project would not incrementally increase cumulative water resource impacts.	Construction and operations would require the same amount of water as the proposed action. Between 2,420–2,631 acres of land would be disturbed temporarily and 592–628 acres of land would be permanently disturbed resulting in erosion and sedimentation. Impacts would not be noticeably different than under the proposed transmission tie-line. With the proposed RPMs, the proposed project would not incrementally increase cumulative water resource impacts.	Would have no effect on water resources.

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Resource	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Project	Alternative Tie-Line	No Action Alternative
Socio-economics	Established communities, such as Flagstaff and Winslow, and existing transportation infrastructure have lead to economic activity and an increase in population and employment. Ranching, recreation and other developments such as Meteor Crater further contribute to employment opportunities and subsequent population growth. The Sunshine Wind Project would create some jobs and would provide other forms of revenue to the economy.	Would result in the employment of approximately 400 workers during peak construction activities and between 17–40 workers during regular operations if fully built out to 500 MW. In addition, it would create a supplemental source of revenue to ranchers. The proposed project would result in a positive incremental increase to cumulative socioeconomic impacts.	Would be the same as the proposed project.	Would not realize the economic objectives of the Diablo Canyon RPA since no similar economic development proposals are currently under consideration.
Environmental Justice	The region is the historic home to Native American populations whose current socioeconomic conditions result in higher percentages of persons living below the Federal poverty level. The cities of Winslow and Flagstaff also contain percentages of low-income, minority, and Native American populations.	Since the proposed project would result in additional employment opportunities and tax revenue, the proposed project would not incrementally increase cumulative effects to minority and low-income populations.	Would be the same as the proposed project.	Would have no effect on environmental justice, beneficial or otherwise.

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Resource	Past, Present, and Reasonably Foreseeable Future Actions	Proposed Project	Alternative Tie-Line	No Action Alternative
Transportation	Transportation routes, including I-40, SR 87 and a system of County and Forest Service roads have been established and are generally considered adequate. The proposed TMR would designate a road system on the Forest and would close the Forest to cross-country travel.	Would result in a short-term (12–18 month) increase in construction related traffic of over 400 two-way vehicle trips each day on I-40 and Meteor Crater Road and approximately 25 two-way vehicle trips each day on Lake Mary Road and FS 125. It would result in a minimal long-term increase in vehicular traffic on I-40 and Meteor Crater Road. Due to the short duration of construction, the proposed project would not incrementally increase cumulative impacts to transportation.	Would be the same as the proposed project.	Would have no effect on transportation.
Visual Resources	Utility infrastructure has introduced contrasting elements of form, line, and color. The Sunshine Wind Project would further introduce contrasting elements of form, line, and color over a large area and reduce the quality of background views. The development of the Sunshine Wind Project would actually minimize the direct visual impact of the proposed wind park by introducing similar elements in closer proximity to the greatest number of viewers near I-40.	Would result in a visual contrast by introducing contrasting elements of form, line, and color. In addition, the proposed transmission tie-line would be located within an area on Forest Service-managed lands managed with a VQO of Partial Retention. The proposed project would be considered a negative incremental impact to visual resources on Forest Service-managed lands.	Effects would generally be the same as the proposed action, except the transmission tie-line would be routed to avoid the more sensitive area (Partial Retention) on Forest Service-managed lands. Incremental impacts associated with the alternative transmission tie-line would not result in a significant cumulative impact to visual resources.	Would have no effect on visual resources.

4.2.3 Cumulative Effects of the Proposed and Alternative Actions when Added to Past, Present, and Reasonably Foreseeable Future Actions

This third and final step involves determining whether or not the incremental effects of each alternative, when added with the effects of past, present, and reasonably foreseeable future actions, would result in a significant cumulative effect. In other words, would the additional impacts to a resource, resulting from the implementation of the proposed action, alternative action, or no action alternative, when added to the impacts to that resource that have or would result from other past, present, or reasonably foreseeable future actions, push that resource over the edge. The same standards of significance identified for each resource in Chapter 3 are utilized.

Impacts are anticipated to be negligible to air quality, and no relevant past, present, or reasonably foreseeable future actions affecting health and safety, or noise were identified; therefore, incremental impacts to these three resources would not contribute to cumulative effects. In addition, the overall effects to socioeconomics and environmental justice would be beneficial; therefore, these two resources would not contribute adversely to cumulative effects.

The incremental effects to land use, biological resources, cultural resources, geology and soils, water resources, transportation, and visual resources, including a determination of significance, are described in the following paragraphs under separate headings. Information in support of the determination is included in Tables 4.2-1 and 4.2-2.

4.2.3.1 Land Use

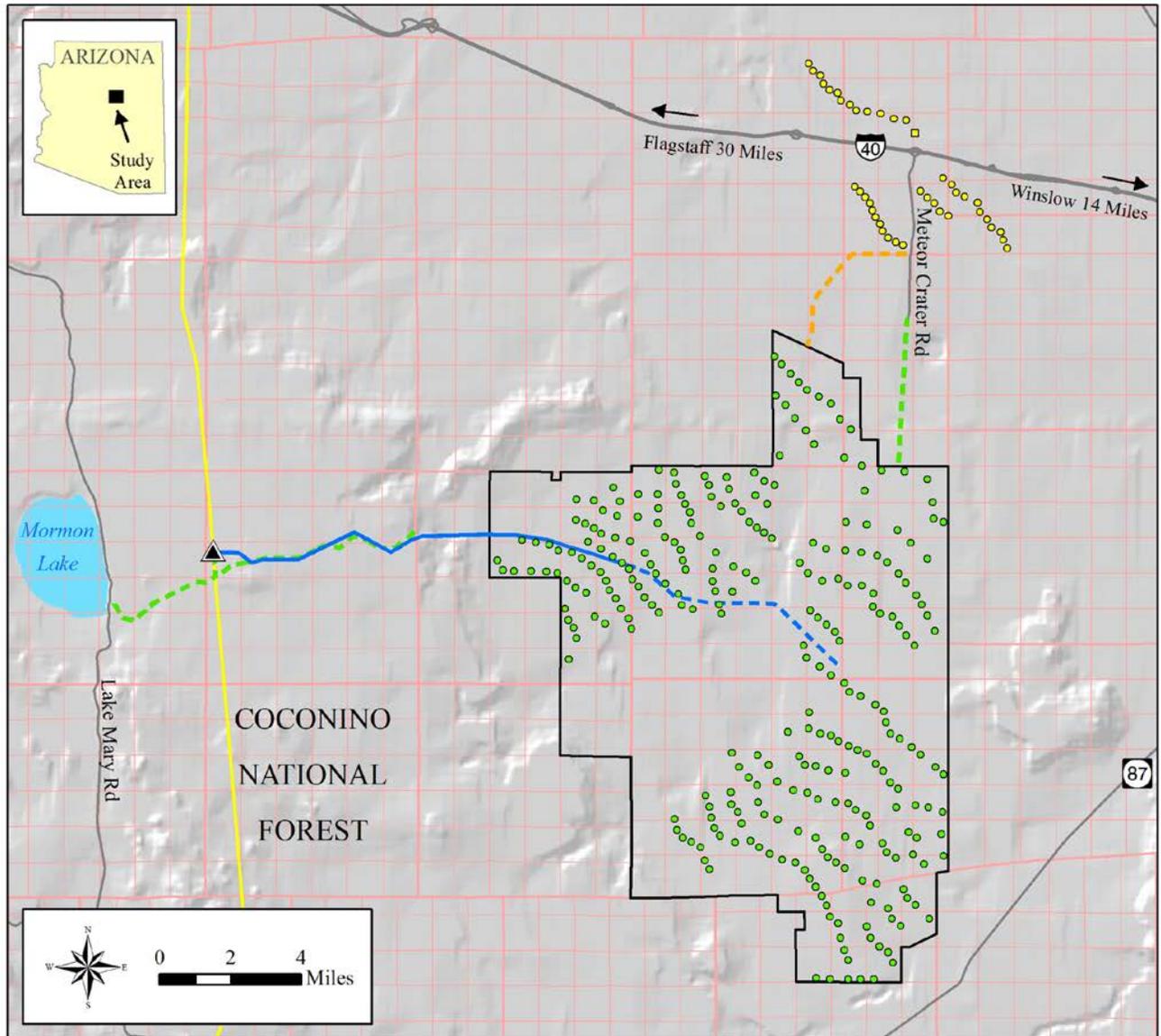
The resource evaluation area for land use included the proposed project components and a two-mile buffer area extending beyond these components. No past actions were identified within this evaluation area. Present actions affecting land use include construction and on-going use of utility infrastructure, operation of Bar T Bar and Flying M ranches, operation of Meteor Crater and Meteor Crater Enterprises, Inc. facilities, and recreation and hunting. These actions have introduced two primary ongoing land uses to the area, including livestock grazing and recreation opportunities.

Future actions affecting land use include the Bar T Bar/Anderson Springs Allotment Management Plan, the proposed Sunshine Wind Project (Figure 4.2-1), and the recently published Travel Management decision that will be implemented in March 2012. These actions would reduce grazing and recreation by reducing the total number of acres available for grazing and range improvements and restrictions on cross-country travel that would reduce access to recreation sites.

The proposed action and alternative action would reduce grazing opportunities by permanently converting approximately 591 to 627 acres of land from grazing to other use if the project is built out to 500 MW. The incremental decrease in the amount of grazing land, when added to other actions, would not affect the economic viability of ranching operations considering the amount of grazing land available and would not result in exceedance of land use significance criteria.

4.2.3.2 Biological Resources

The resource evaluation area for biological resources included the proposed project components and a two-mile buffer area extending beyond these components. No past actions were identified within this evaluation area. Present actions affecting biological resources include construction and on-going use of utility infrastructure, operation of Bar T Bar and Flying M ranches, operation of Meteor Crater and Meteor Crater Enterprises, Inc. facilities, and recreation and hunting. Future actions affecting biological resources are the continued livestock grazing, recreation, and the proposed Sunshine Wind Project.



Legend

- Wind Park Study Area
- Proposed 345-kV Tie-line Alignment
- Proposed Tie-line Extension
- Proposed New Site Access Road
- Existing Site Access Road
- Proposed Interconnection Switchyard
- Existing Western 345-kV Transmission Lines
- Grapevine Wind Turbines (preliminary layout)
- Sunshine Wind Turbines (project layout)
- Sunshine Wind Microwave Relay Station

Sunshine Wind and
Grapevine Canyon Wind Projects
Grapevine Canyon Wind Project

Sources: Foresight 2011, Sunshine Wind 2009

FIGURE 4.2-1

The proposed action and alternative transmission tie-line alignment would result in a permanent conversion of 591–627 acres of land from scrub-shrub, grassland, pinyon/juniper woodlands, and ponderosa pine. This conversion would result in lost habitat for common and special-status species, but when added to other actions, would not result in substantial losses of vegetation or habitat considering the amount of similar land cover in the area and region. These incremental losses would not result in significant cumulative effects.

Temporary construction impacts on wildlife species as a result of the Sunshine Wind Project would be expected to be similar to those of the proposed project; namely, displacement would be short-term and localized, and individuals could return to the area. Upon completion of construction of the proposed project facilities, the level of impact to wildlife would be reduced, even when considered in context of other ongoing or reasonably foreseeable future projects or activities. The long-term effects on wildlife species from the proposed project, in combination with the Sunshine Wind Project, could result in cumulative impacts on wildlife, particularly migratory birds, golden eagles and other raptors, and bats. Past, present, and anticipated developments with aerial features, such as wind turbines and transmission tie-lines, could reasonably cause collisions to increase over current conditions. The areal extent of these projects and the incorporation of mitigation measures to minimize impacts, however, would minimize possible impacts, but still result in incremental cumulative impacts to birds, raptors, and bats. The proposed project, when added to other past, present, and future actions, would result in increased cumulative impacts to birds, raptors, and bats, but would not result in exceedance of biological resources significance criteria.

4.2.3.3 Cultural Resources

The resource evaluation area for cultural resources included the wind park study area and a three-mile buffer and the proposed transmission tie-line and switchyard along with a one-mile buffer extending beyond these two components. No past or present actions were identified within the cultural resources evaluation area. One future action affecting cultural resources was identified, the proposed Sunshine Wind Project. This action would result in ground disturbing activities in the vicinity of Historic Route 66 and areas known to have been used prehistorically and historically. If encountered, ground disturbance could potentially result in the destruction of NRHP-eligible or listed sites. In addition to direct impact to sites, increased access to the area could result in inadvertent disturbance or vandalism to otherwise undisturbed sites. Visual intrusions on TCPs in the region are also likely.

The proposed project and alternative action would directly disturb between 2,419 and 2,630 acres of land within areas known to have been used prehistorically and historically if the proposed project is built out to 500 MW, resulting in the potential for similar impacts to cultural resources as the Sunshine Wind Project. However, the likelihood of this occurring is low because NRHP-eligible and listed sites would be avoided to the extent possible as outlined in the PA. If a site were destroyed, it would be considered a significant impact. Because the proposed action is not likely to destroy any NRHP-eligible or listed sites, there would be no direct contribution to cumulative effect to cultural resources. However, the visible WTGs from both the Grapevine Canyon Wind Project and the Sunshine Wind Project could be perceived as incremental intrusions on a sacred or historic landscape. This incremental increase in visual effects, when added to other actions, would have a cumulative effect on TCPs. However, the significance of any increase cannot be determined until the completion of consultations outlined in the PA and whether or not there would be an intrusion on a TCP determined to be eligible to the NRHP.

4.2.3.4 Geology and Soils

The resource evaluation area for geology and soils included the footprint of the proposed project components. No past actions were identified within this evaluation area. Present actions affecting

geology and soils include operation of Bar T Bar and Flying M ranches and recreation and hunting. These actions have affected soil protective mechanisms causing erosion and lost productivity. Future actions affecting geology and soils include the Bar T Bar/Anderson Springs Allotment Management Plan and the Forest's proposed TMR. These actions would lead to increases in ground cover which would decrease erosion.

The proposed project would temporarily disturb between 2,419 and 2,630 acres of land and would permanently remove vegetation from and alter the surface of 591 to 627 acres of land if the project is built out to 500 MW. This would result in increased erosion and the permanent loss of a minimal volume of soils. This incremental effect on geology and soils would not cause appreciable, accelerated soil erosion or cause long-term, negative impacts to rangeland or wildlife habitat. Applicable geology and soils significance standards would not be exceeded.

The alternative action would temporarily disturb between 2,420 and 2,631 acres of land and would permanently alter the surface and remove vegetation from 592 to 628 acres of land if the project is built out to 500 MW. Impacts would be slightly greater than under the proposed action because the transmission tie-line associated with the alternative action requires a new access road across moderately erosive soils that would be difficult to revegetate leading to increased soil erosion. Though the alternative action would lead to slightly greater soil erosion, the incremental effect, when added to other actions, would not result in appreciable, accelerated soil erosion or cause long-term, negative impacts to rangeland or wildlife habitat, and applicable geology and soils significance standards would not be exceeded.

4.2.3.5 Water Resources

The resource evaluation area for water resources included the proposed project components and a one-mile buffer area extending beyond these components. In addition, drainages and aquifers were included in order to understand the potential for indirect impacts. No past actions were identified within the evaluation area. Present actions affecting water resources include community settlement and development and the operation of Bar T Bar and Flying M ranches. Water is consumed in Coconino County by municipal, industrial, and agricultural activities at a rate of approximately 105,000 acre-feet of groundwater and 51,000 acre-feet of surface water annually. In addition, these actions affect water quality by increasing erosion and sedimentation as a result of grazing and other ground disturbing activities.

Future actions affecting water resources include the Bar T Bar/Anderson Springs Allotment Management Plan and the proposed Sunshine Wind Project. These actions would increase erosion and sedimentation and would consume a relatively small amount of water.

The proposed project and alternative action would require up to approximately 307 acre-feet of groundwater if the project is built out to 500 MW in one or more phases. Project operation and maintenance would require a negligible amount of water. This incremental amount of water, when added to other actions, would not substantially deplete groundwater resources and applicable water resources significance standards would not be exceeded.

The proposed action would temporarily disturb between 2,419 and 2,630 acres of land and would permanently disturb between 591 and 627 acres of land if built out to 500 MW. The alternative action would disturb between 2,420 and 2,631 acres of land and would permanently disturb between 592 and 628 acres of land. The difference in the amount of ground disturbance is negligible between the two. Ground disturbance would lead to an increase in soil erosion and sedimentation. The incremental increase in sedimentation, when added to other actions, would not substantially degrade water quality, and applicable significance standards would not be exceeded.

4.2.3.6 Transportation

The resource evaluation area for transportation included the proposed project components and a one-mile buffer area extending beyond these components. In addition, the primary access routes that would be used for employees accessing the project components and for the delivery of equipment and materials are included as part of the evaluation area. No past actions were identified within this evaluation area. Present actions affecting transportation include the use of I-40 and the State highway system. These actions have established a system of County and Forest Service roads that are considered adequate.

One future action was identified that would affect transportation, the Forest's proposed TMR. This action would designate a system of roads on the Forest and restrict cross-country travel.

The proposed project and alternative action would result in a short-term (12 to 18 month) increase in construction related traffic of over 400 two-way vehicle trips each day on I-40 and Meteor Crater Road during peak construction activity and approximately 25 two-way vehicle trips each day on Lake Mary Road and FS 125 for a typical project phase of up to 250 MW. Over the long-term, the number of vehicles using I-40 and Meteor Crater Road daily for operations and maintenance would increase. This incremental increase in traffic, when added to other actions, would not result in a permanent disruption of local or regional traffic, and applicable transportation significance thresholds would not be exceeded.

4.2.3.7 Visual Resources

The resource evaluation area for visual resources extends three miles in all directions from the proposed wind park and extends north to I-40. In addition, the visual resources evaluation area extends one mile to either side of the proposed transmission tie-line and Western switchyard. No past actions were identified within this evaluation area. Present actions affecting visual resources include the construction and on-going use of utility infrastructure. These actions have introduced contrasting elements of form, line, and color into a naturally appearing setting.

One future action, the proposed Sunshine Wind Project, would affect visual resources within this evaluation area (see Figure 4.2-1). This action would introduce contrasting elements of form, line, and color over a large area and reduce the quality of background views from I-40. Additionally, the development of the Sunshine Wind Project would actually minimize the direct visual impact of the proposed wind park by introducing similar elements in closer proximity to the greatest number of viewers near I-40.

The proposed project would result in a visual contrast by introducing contrasting elements of form, line, and color over a large area. The incremental effect of the proposed wind park, together with other actions, would result in a substantial visual contrast to the area. This contrast would not conflict with the goals and policies of the Coconino County General Plan. The proposed transmission tie-line would be located within an area on Forest Service-managed lands managed with a VQO of Partial Retention. The presence of the transmission tie-line would not meet the VQO of Partial Retention, as prescribed by the Forest Plan, and would result in a movement down one level to a VQO of Modification. This contrast would be a negative incremental impact to visual resources on Forest Service-managed lands, although applicable visual resources significance standards would not be exceeded.

The alternative transmission tie-line would be routed to avoid the more sensitive area (Partial Retention) on Forest Service-managed lands and would not alter the VQOs prescribed by the Forest Plan. Therefore, incremental impacts associated with the alternative transmission tie-line would be minimal and visual resources significance standards would not be exceeded.