

The Ecological Effects of a Native Wind Energy Project - Navajo Nation

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Abstract

The Navajo Nation is pursuing the potential for a large-scale wind farm at Gray Mountain. In an effort to determine if there are sufficient wind energy resources to generate electric power, there are certain other considerations that have to be taken into account by the Navajo Nation. As an intern in the Tribal Energy Program, I am focusing on a few of the potential impacts that any wind energy installation might have on an important environmental issue - specifically the impact on wildlife (birds and bats) in the area.

Utility Scale Tribal Wind Energy

The following graph (Figure 1) shows that the Gray Mountain region of the Navajo Reservation has “superb” wind capabilities for commercial production of energy. Gray Mountain is situated in the western Navajo reservation in the Cameron Chapter. The site encompasses 450,000 acres, adjacent to Coconino National Forest and Grand Canyon State Park. This is the first site initially studied for the sole purpose of obtaining energy for utility companies.

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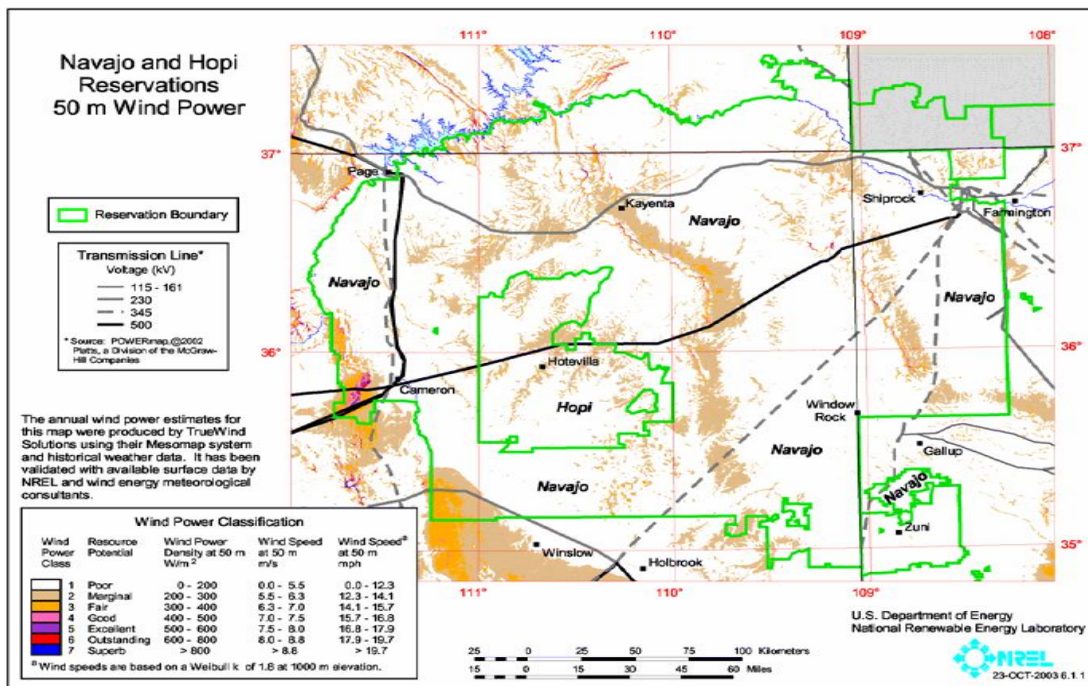


Figure 1. Wind Power Availability

There are only a few tribes within the United States that have operational utility-scale wind farms. These tribal nations can be an example for the Navajo Nation to follow in their endeavors to commence the project. At the time of this research, the tribes who are developing utility-scale wind farms are the Campo Indian reservation located in California, the Rosebud Reservation in South Dakota, and the Three Affiliated Tribes in North Dakota.

Ecological Applications

The chosen region of Gray Mountain is characterized as a Juniper-Pine Woodland. The mean elevation is 5000-7000 ft. It can also be distinguished as desert

scrub lands, receiving only 10-15 inches of rainfall per year, primarily concentrated during the monsoon season. The dominant vegetation consists of grama grass, Indian grass, soap yucca, snakeweed, rabbit brush, and fourwing saltbush. This region is primarily used as a grazing area for domesticated and wild animals.

Gray Mountain is considered a desert so commercial development could cause irreversible damage to the habitat primarily because the native vegetation would be replaced by invasive weeds. The natural vegetation is better able to hold organic matter in the topsoil layer. When native plants no longer hold nutrient rich soil, it blows away in the wind or is washed away - both leading to erosion. One season of trampled vegetation can take another two years to re-vegetate the landscape. Loss of vegetation can cause damage further into the food chain - possibly affecting the protected and endangered avian species. As construction begins, careful execution of the project must be taken in order to avoid damage to the delicate ecosystem.

Environmental Concerns

Currently the main issue of concern is whether the Gray Mountain region can sustain the incredible amount of damage due excessive use. It must also be mentioned that there has been a 10-year drought, making the already delicate ecosystem more susceptible to the harsh demands of the site.

Not only is there concern for the direct placement of the wind turbines, but also the development that would occur with the distribution of the turbines, such as roads, paths, building, and parking spaces. This could be considered a direct form of habitat destruction. This is a controversial issue, because there is so much undeveloped land on

the reservation compared to the rest of the United States. Currently, there is little or no development on Gray Mountain save only a few dirt roads that lead in and around the area.



Figure 2. View from Gray Mountain Facing South Toward the San Francisco Peaks



Figure 3. Gray Mountain from a Southeast Perspective

Feasibility Study for Wind Development

At the time of this study, there are no wind facilities producing energy for commercial sale in Arizona. As a result, a regional protocol will be created for Northern Arizona and also the Southern Colorado Plateau. There are many steps that must be

successfully accomplished before the project can begin. This process involves the collaboration of several entities including Navajo Tribal Utility Authority, the Department of Energy, Arizona Public Service (APS), Dine Power Authority, Northern Arizona University, the local Cameron Chapter, and the IPP Construction Company.

The early stages of the Gray Mountain wind project involve informing residents and grazing members of the wind project. The grazing issue is a complicated one because the Navajos do not own the land -- instead they are allocated grazing rights. While the grazing lands are not privately owned, over the past years families have claimed particular areas as family grazing land, further complicating the issue.

After the proposal is submitted to the Cameron Chapter Planning Committee, that committee determines if the proposal includes useful information and is worthy of review and a vote of approval is taken by the community members during a chapter meeting. If the planning committee allows it to proceed, it then passes to the chapter meeting in the form of a resolution. Only after this legal process at the local chapter level has been approved are plans made to begin research on Gray Mountain.

The Navajo Nation is a sovereign tribal nation. This means the reservation is trust land and Federal law regulates the political and economic rights of the Tribal Government. The Navajo tribe recently drafted an energy policy, but the Tribal Council has not officially approved the policy. All these factors make the process more complicated. In addition, the process involves cooperation among the entities listed above, including grant writing to fund the project and permits to conduct a study.

Avian

There are many birds that inhabit the region of Gray Mountain perhaps due to its location between the highest point in Arizona, Humphrey's Peak (12,633 feet) and the base of the Grand Canyon. This transition region supports both desert and forest species, and there are many local birds that inhabit the region.

It is imperative during the study that certain aspects focus on the lifestyle of the avian species. First, the nesting areas and prey densities must be determined. Next, the topography is examined to determine if the avian species will use the updraft to their advantage. The updraft can be used as an aid to reach higher elevations with less input of energy. This phenomenon is often manifested as a bird hovering in one spot as the wind blows. Next, it must be determined if the birds that are observed are local birds or migratory birds.

The area must also be assessed for the presence of endangered and threatened species. Endangered species are avian species that are in danger of becoming extinct - an example is the California condor. In the past, the condor was listed as an endangered species. Shortly, thereafter it was determined their only means of survival was to capture all remaining 23 condors living in the wild. In 1996, the California condors were released along the Vermillion Cliffs in Arizona. They continue to thrive in the Grand Canyon, and most condors can be seen in late summer from the South Rim. The condor is the most endangered species in the world. Although the condor inhabits the Grand Canyon and is of great concern, the homing device implanted on the bird has not indicated that these birds will fly further south.

A threatened species is a species that can become an endangered species. There are many birds in Arizona that are listed as threatened. The only means to keep the birds from becoming an endangered species is to prevent habitat loss. Habitat loss can occur with the construction of roads to the site and the new construction of buildings.

Protected species are not in imminent danger, but are protected to keep them from becoming threatened. The most notable act of avian protection is the North American Migratory Act, which allows for birds to migrate across the country, without being hunted and without development in the waiting or nesting regions.

Bats

In Arizona, there are 28 species of bats found representing four families. Of the 28 species, 19 are found near Grand Canyon. Seven bat species are federally protected. (www.gcr.org) Bats are important in the desert ecosystem because they are the primary pollinators of cacti and agave. (Newsletter of the Northern Arizona Audubon Society) Bats primarily forage on insects, which aids the environment by keeping the insect population low. The bark beetle has recently become a threat to Ponderosa Pine Forest in the Flagstaff region. Bats ingest the bark beetle (Audubon Society.) Even though many may be unaware, bats are very important to the State of Arizona - Arizona was the first to have a full-time position within its state wildlife agency specifically designated to work with bats.

There is over 1,100 different species of bats in the world. Despite their abundance, little is known about bats because they are nocturnal animals. Information on bats' population size or their population trends is scarce. In colder temperatures, bats

have the ability to hibernate and wake-up to eat insects when weather permits. Bats do not migrate over long distances due to their inability to fly for long periods.

Bats have an amazing physiology. They are the only mammals capable of flying. - Their front forelimb serves as a wing. Bats can vary in size and shape from a few inches to almost a foot in length. They have poorly developed eyes, but have clear vision at long distances. The wings of bats are thinner than birds' wings, and thus are capable of precise maneuvers and quick movements; more so than birds. Bats are also characterized by their large ears.

Since the eyes of bats are not developed at short distances, they have developed echo-location, which serves to catch the echoes of their high pitched sounds to determine distances. It serves as a sort of sonar. It has been determined that bats are better able to judge the distances of moving objects, but yet are often killed by stationary objects such as buildings, guy wires, lighthouses, and tall windmills. This makes studying the impact on this species critical to plans for wind energy development.

Study Design

Specifics site are chosen which will foster the best wind production in the area of Gray Mountain. The avian and bat studies will be conducted to evaluate the impact of these species if they were to collide with a wind turbine. This study will also enable the developers to construct a wind project that is less likely cause harm to the birds and bats. The study should also serve as a foundation for post-construction to evaluate the avian and bat communities in the future. Northern Arizona University will be conducting the research, which is set to begin on November 2009. The study will be conducted in a

manner similar to that of the Sunshine Wind Farm in Winslow, Arizona, and will include three types of surveys: fixed point survey, paired-plot counts, and an in-transit survey.

The fixed point survey will be conducted by a point count survey with the focus on the spatial and temporal use by raptors and large bird species. The strategy for the point survey is to study the area in circles about one mile in diameter to observe the bird species passing through this area. There will be numerous circles, and the circles will not overlap, to prevent duplication of data extracted from each site. The habitat within the vicinity of the circle will also be described as to ponds, trees, rock outcroppings, and general topography. These points will have a permanent marker to prevent error in data collection and for use at a later time. Each session of data collection will last 30 minutes.

The following is a list of information that needs to be obtained:

Weather

- Temperature
- Wind Speed
- Wind Direction
- Cloud Cover

Bird Identification

- Species
- Sex
- Age
- Number of Individuals in Group

Other Data

- Time bird first seen
- Estimated distance of flight over the ground
- Behavior
- Activity – perching, landing, hunting soaring, gliding, flapping.

The second type of survey is the paired-plot survey which is conducted during the breeding seasons for passerines. Passerines are song birds that have the ability to sing or call. To begin the survey, a point is chosen to spot where a wind turbine will be possibly

located. Then another point is determined at random, thus the survey will be conducted in pairs relative the wind turbine site. There will be about 15 pair points in the survey. The point-survey will be conducted about four times during the breeding season. Passerines that are heard but not seen will be noted and the estimated distance of rocks, trees, and bushes are noted relative to the observer. The distance of birds in mid-air is also noted relative to the observer.

Each survey will be conducted for ten minutes with the times broken down into three timed intervals within the ten minutes. Additional information will be submitted such as whether the detection of the passerine was visual or aural, to determine if sounds heard were calls or songs, and to determine if the sounds could have been heard at another paired-point survey (this will eliminate double counting.)

The in-transit survey will be conducted on any given day, primarily on roads where observers are traveling to their locations of study. This study will include birds not surveyed in either the fixed-point survey, or the paired-point survey. Despite the specific applications of each survey, all birds seen within the area will be observed and all relevant information pertaining to the species will be recorded.

Other observed wildlife species including reptiles, amphibians, large and small game mammals will be recorded which could be harmed by the construction of a wind turbine. The wildlife observations can be obtained at any point during the avian study.

The information collected during the study is compiled for an Environmental Impact Statement. At this point, officials with environmental jurisdiction review the information and can give consent to approve an EIS application. The construction phase can begin after the EIS is approved.

Bat Survey

The survey will be conducted during the night when bats are most active. A device will be used that can catch the bats without hurting or causing damage to the bat. Since the device is an expensive instrument, there will not be many instruments available. Once the bat has been caught, the species, sex, age, and other characteristics must be determined.

Previous Results

Since the study to be conducted on top of Gray Mountain has not been completed, I have compiled data from different locations in the western United States. The Sunshine Wind Park is the closest utility-scale wind turbine farm to the proposed Gray Mountain Wind Project. In both the fixed-point and the paired-point survey the most common species observed were the horned lark (a passerine) and the common raven, both of which are both threatened and endangered.

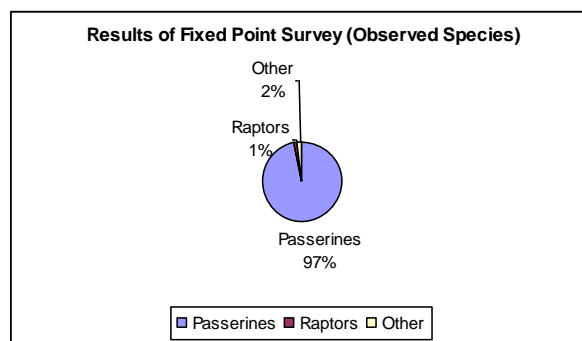


Figure 4. Results of Fixed Point Survey

The in-transit survey had recorded one sighting of a bald eagle near Diablo Canyon, but the sighting was not an issue because it was far from the proposed Sunshine Wind Park. No other species observed were endangered, threatened or protected.

In Wyoming, studies have shown that over time birds have avoided the presence of a wind farm altogether by flying around the turbines and even flying through. According to the following graph, some birds had been observed going through the turbines unhurt.

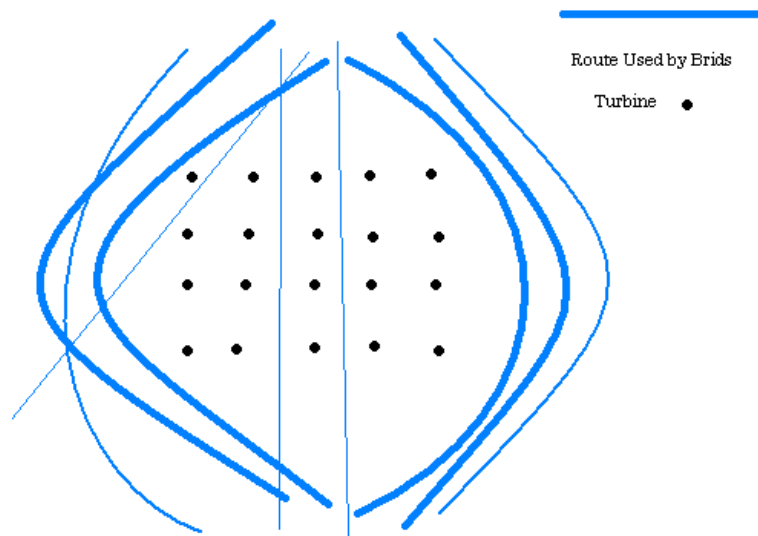


Figure 5. Top View - Bird Flight through Wind Turbines

In many cases, bird populations have decreased near wind farms. The main threat in turbine designs during the 1980s and 1990s has been the diameter of the blades. Smaller blades tend to spin at a faster rate, making it harder for the birds to maneuver or comprehend the velocity of the blades. Currently, the construction of the blades is larger and more time is allotted with each spin of the blade, so flight through the turbines is less an issue.

Cultural Issues

Possible impact to avian and bat populations are of great concern when attempting to develop utility-scale wind turbine farms. However, the possible cultural impacts on a tribal wind development project, such as with the Navajo tribe, are of great concern. One potential concern is that any proposed site might be located on a burial site. Navajos traditionally do not mark graves, nor are the sites recorded on maps. Although there are graveyards on reservations, many of the deceased members were simply buried on their ancestral grazing areas. The subject of death for the Navajos is a taboo, and to build a site near the location of a burial site is thought to bring sickness, misfortune and even death. Therefore, great caution must be exerted in choosing a construction site.

An archaeological assessment must be completed for the project. There is the possibility of impacting herbs and trails used for ceremonial purposes within the region. In the Navajo society these ceremonies are conducted in locations that are called sacred grounds – grounds not to be disturbed.

Energy Alternatives

While wind energy is the subject of this paper, the Navajo Nation is considering the development of a coal-powered plant for export sale. An Environmental Impact Statement had been released for the proposed construction of the Desert Rock Coal Plant. However, a detailed comparison between wind and coal is worthwhile research but beyond the scope of this paper. A few advantages will be mentioned.

An assumed advantage for wind development in the desert is that this type of development uses minimal amounts of water, where water is a precious resource. Most ranchers and shepherders haul water over long distances and are careful not to misuse it.

The construction of the Gray Mountain Wind Farm will reduce pollution and particulates circulating in the atmosphere. Since pollution has been correlated to negative health affects, it is possible that wind development could result in fewer children and senior citizens (vulnerable community members) being afflicted by emphysema, asthma, or other respiratory ailments. Finally, the Gary Mountain wind farm will not obstruct the scenic views in the area and the Grand Canyon will remain picturesque.

With a wind farm in this area, there could be less acid rain (no sulfur dioxide released into the atmosphere). Acid rain is more detrimental to the environment than the construction of roads. This toxic precipitation can be absorbed by plants, thus weakening and killing them. There can also be a reduction of mercury and other toxic materials that contribute to the growth of cancer in people living near these toxins. Another attribute could be less carbon dioxide added to the atmosphere.

Most importantly, the construction of the Gray Mountain Wind Farm (a renewable energy project) may assist to slow down climate change, which is a significant issue looming over our world. The Gray Mountain Wind Farm will also reduce the emission of methane, the most contributory factor in greenhouse gasses.

Conclusions

Based upon information observed and obtained during the limited time during of this internship, construction of a wind farm in the Gray Mountain region of the Navajo

Nation (state of Arizona) would not be detrimental to avian and bat species and would be effective in providing minimal environmental impacts on the residents of the area.