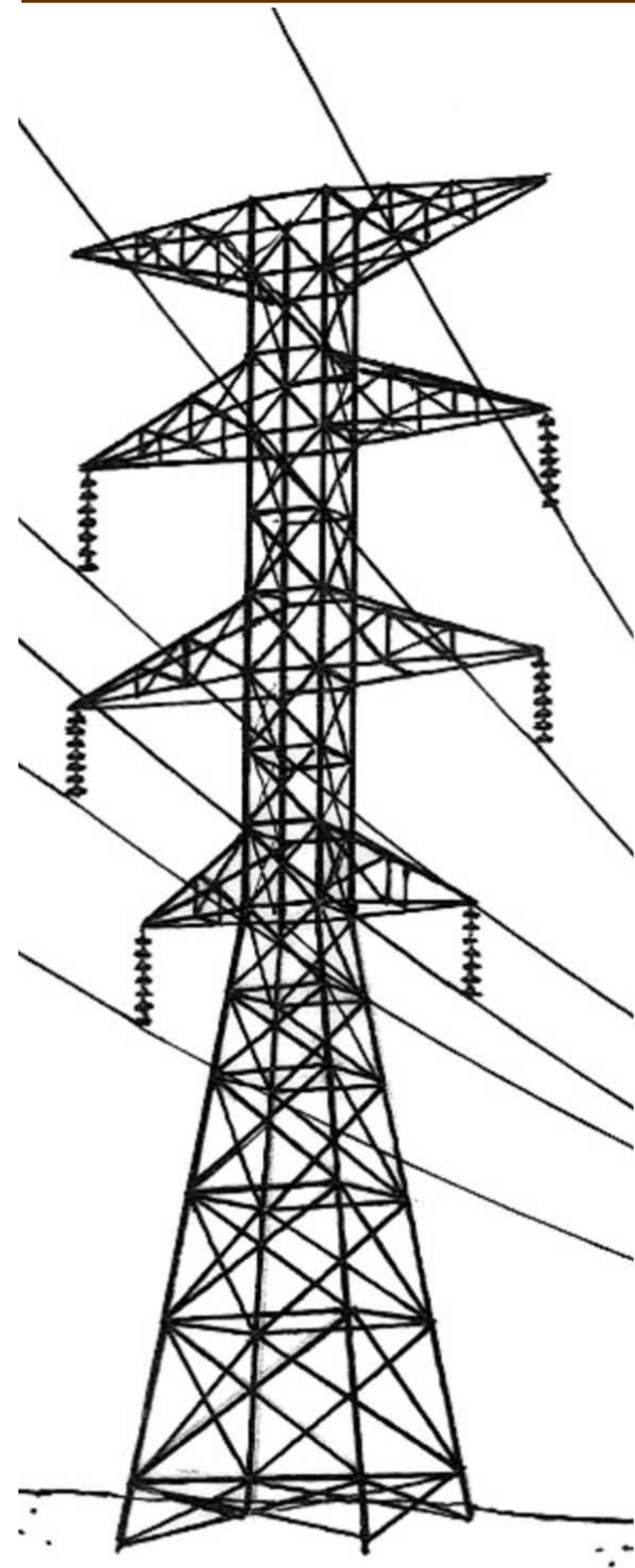


# THE PLIGHT OF THE CONDOR

## Burying power lines to protect California condors



Anne Christian

MCM 591: GIS for Conservation  
Medicine

Presented on Dec. 16, 2016

Projection: WGS 1984 UTM Zone  
10N

Data Sources: ESRI Datamaps 10,  
Monterey County GIS, BirdLife  
International, USGS, California  
Protected Areas Database

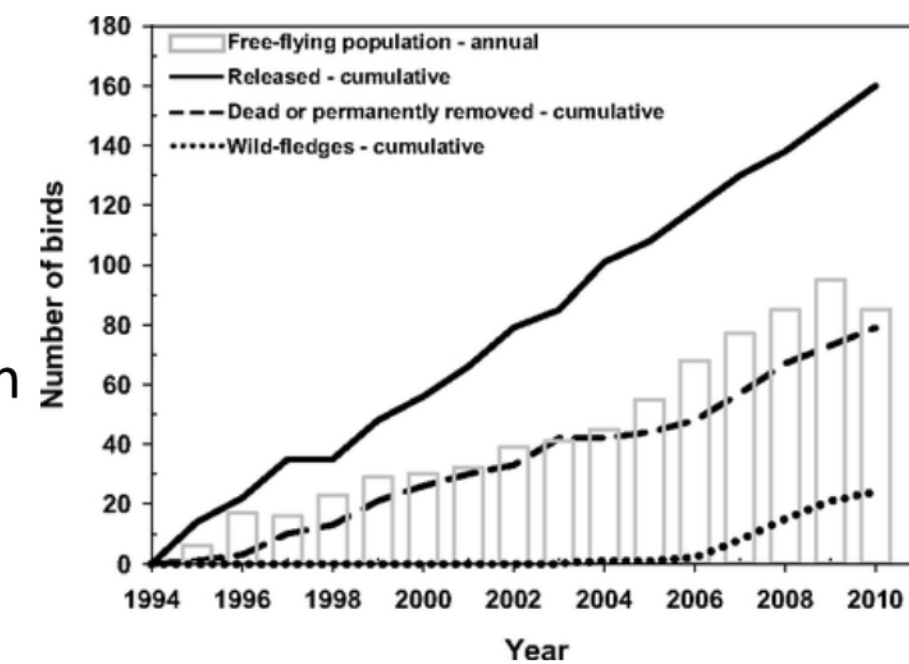
The California condor is a charismatic and culturally significant bird. This bird is often used as a symbol of the American west, and several Native American tribes hold them sacred. This species features on the California state quarter. California condors went extinct in the wild in 1987 when the last 3 wild birds were captured by scientists. Reintroduction programs began in 1992 and the wild population is growing, although the mortality rate still exceeds the birth rate. Condors still face threats from anthropogenic factors including lead poisoning, trash ingestion, and collision with power lines.

Burying power lines will prevent condors from flying into them, but such a construction project is also environmentally destructive and can damage the habitat of other endangered species. In addition, human settlements and the condition of the landscape can put restrictions on where power lines can be buried. This project will examine locations in Monterey County, CA where power lines can be buried to protect California condors. The results of this analysis will allow developers to mitigate risks to California condors, improving survival rates to help the species recover.

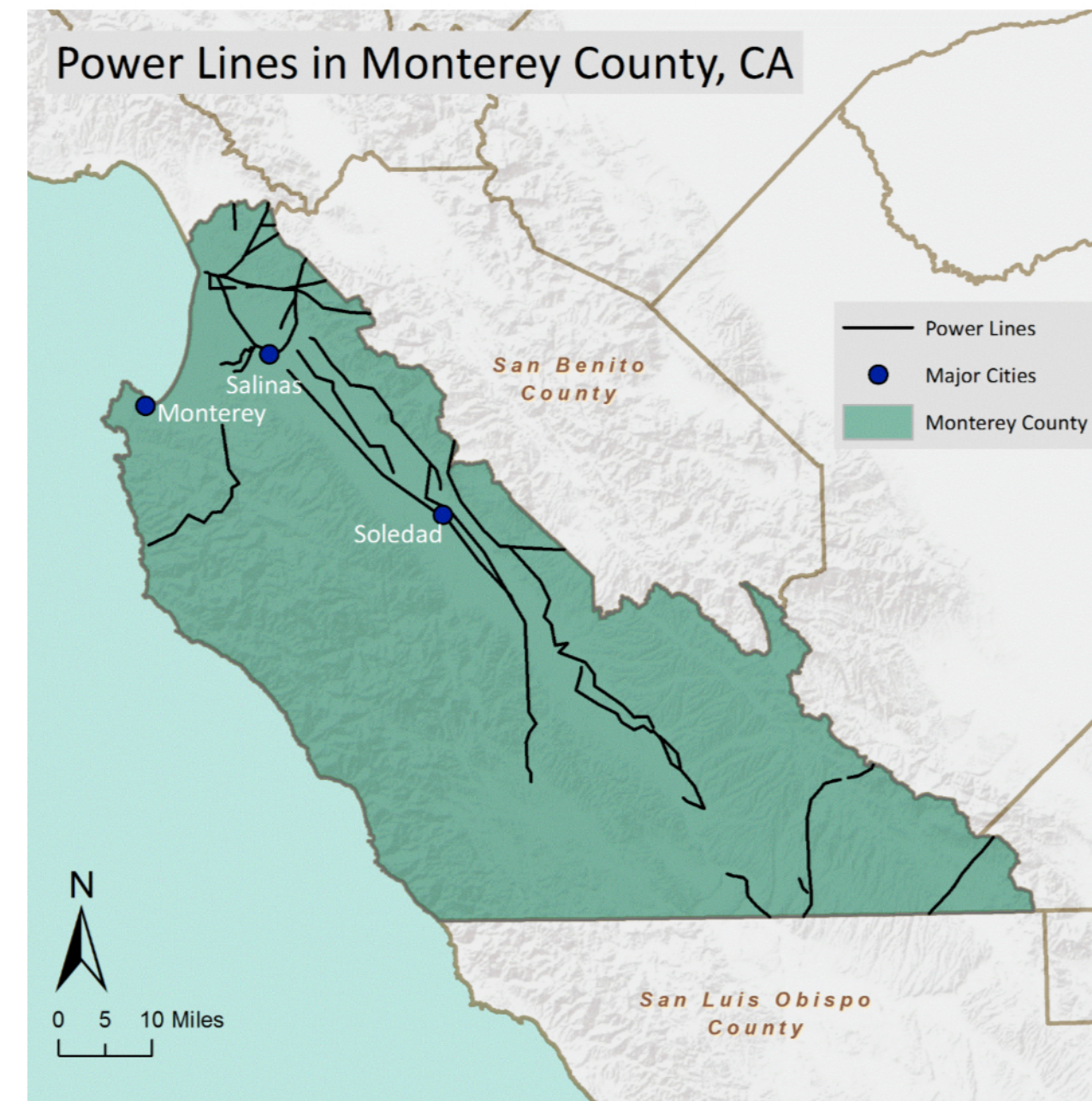
### METHODS: SUITABILITY ANALYSIS

Regions were assessed for suitability based on the criteria outlined in the following table.

Limiting Factors	Specifics	Use of Factor	Selection
Condor Range	Within the range of the California condor	Inclusive	Current range
Land Use	On undeveloped land, where burial of power lines will not be illegal or disruptive	Inclusive	CPAD Protected Lands
Slope	On land that is not too steep, where construction projects are feasible	Inclusive	Slope < 20.6 degrees
Soil Stability	On soft soil where digging is possible	Inclusive	Rock hardness = "soft"
Land Protections	Not on land that is protected to conserve the environment or other endangered species	Exclusive	Land Use = "farmlands" or "permanent grazing"
Archaeology	Not on land that has high archaeological sensitivity, to protect Native American history and culture	Exclusive	Arch. Sens. = "low" or "moderate"



Condor population demographics over time. The death rate far exceeds the wild fledge rate, which means that the population is not sustainable without human intervention.



### DISCUSSION

This analysis finds that about 5% of power line length (about 95,000 feet) in Monterey County could be buried to protect California condors. This project assumed that power lines could be buried in sections. Most of these power lines lie on farmland, so working with local farmers would be vital to ensure the success of this project. The burial would also protect other bird species, and could improve the appearance of the landscape.

In this analysis, most of the power lines appear to already be located on land that has characteristics that would make it suitable for burial or other construction projects. Most are already on flat ground, undeveloped and unprotected land, and in areas that lack archaeological significance. The two most important limiting factors in this analysis appear to be soil stability and the condor range. Much of the county lacks data concerning soil stability, which makes it possible for the ground to be dug up. Since condors frequently fly long distances, it may be useful to consider power lines for burial that lie close outside of the official range.

Correlating buriable power lines with lead poisoning mortalities can inform decisions about which power lines to bury. Burying power lines has the potential to reduce deaths from lead poisoning that are due to condors eating carrion containing bullet fragments. The toxicant causes erratic behavior and poor decision making, which can lead to collisions with power lines and other accidental deaths.

This analysis has not factored in proximity to California condor nests. Young condors who are learning how to fly are especially vulnerable to deadly collisions with power lines. Nest location information is classified, however, to protect this endangered species from enthusiastic birdwatchers. If power line burial projects were under consideration in Monterey County, nest location could be considered on a case-by-case basis.

Ultimately, financial resources and the cooperation of farmers are likely to prove the limiting factors for power line burial. This analysis has demonstrated that in many locations burying power lines may be a viable strategy to protect the endangered California condor and increase the

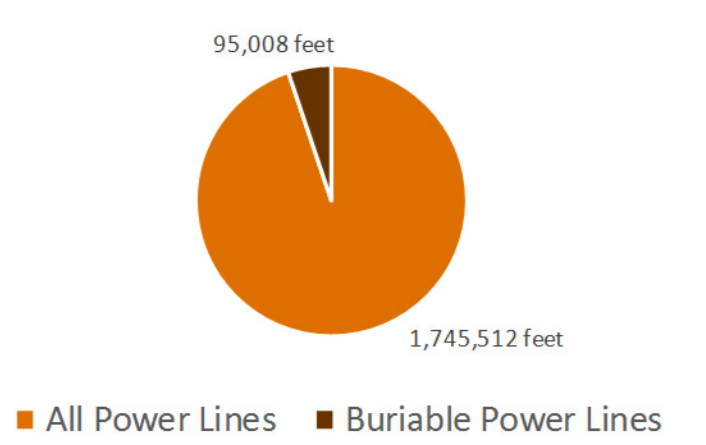
#### Acknowledgements

Thank you to Carolyn Talmadge for your endless help and inexhaustible patience. Thank you to Mike Stake for giving me the idea for this project and teaching me about California condors.

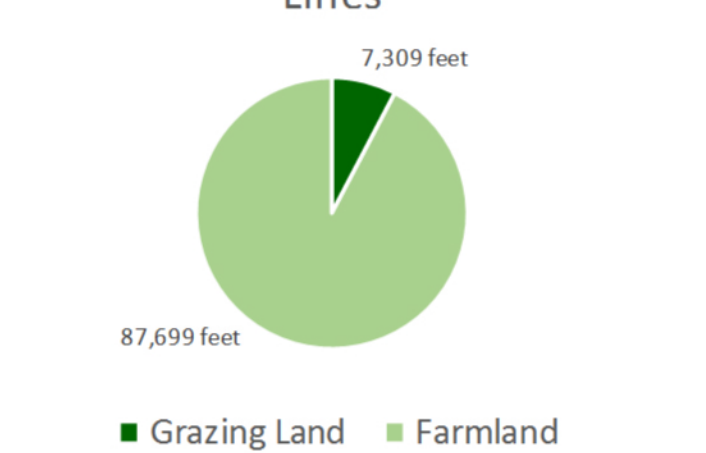
#### Image Sources

"California condor (*Gymnogyps californianus*)."  
Wikimedia commons. US Fish and Wildlife Service.  
"Condor on 2005 Commemorative Coin"  
United States Mint.  
Graham, Don. "California-condor-gymnogyps-californianus-078."  
Wikimedia Commons.  
Hines, Robert w. "Power Line Hazard Illustration."  
Wikimedia commons. US Fish and Wildlife Service.  
"Tufts University Wordmark."  
Tufts Brand Quick Guide.

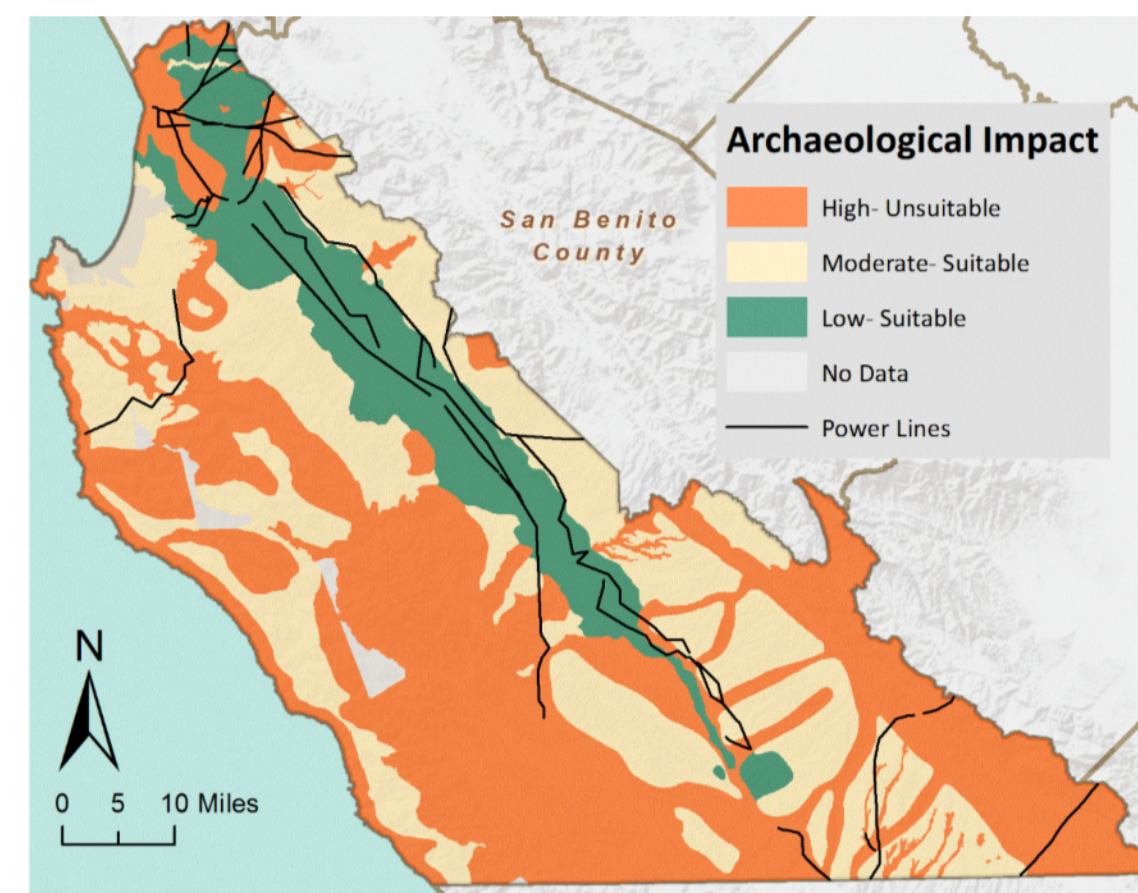
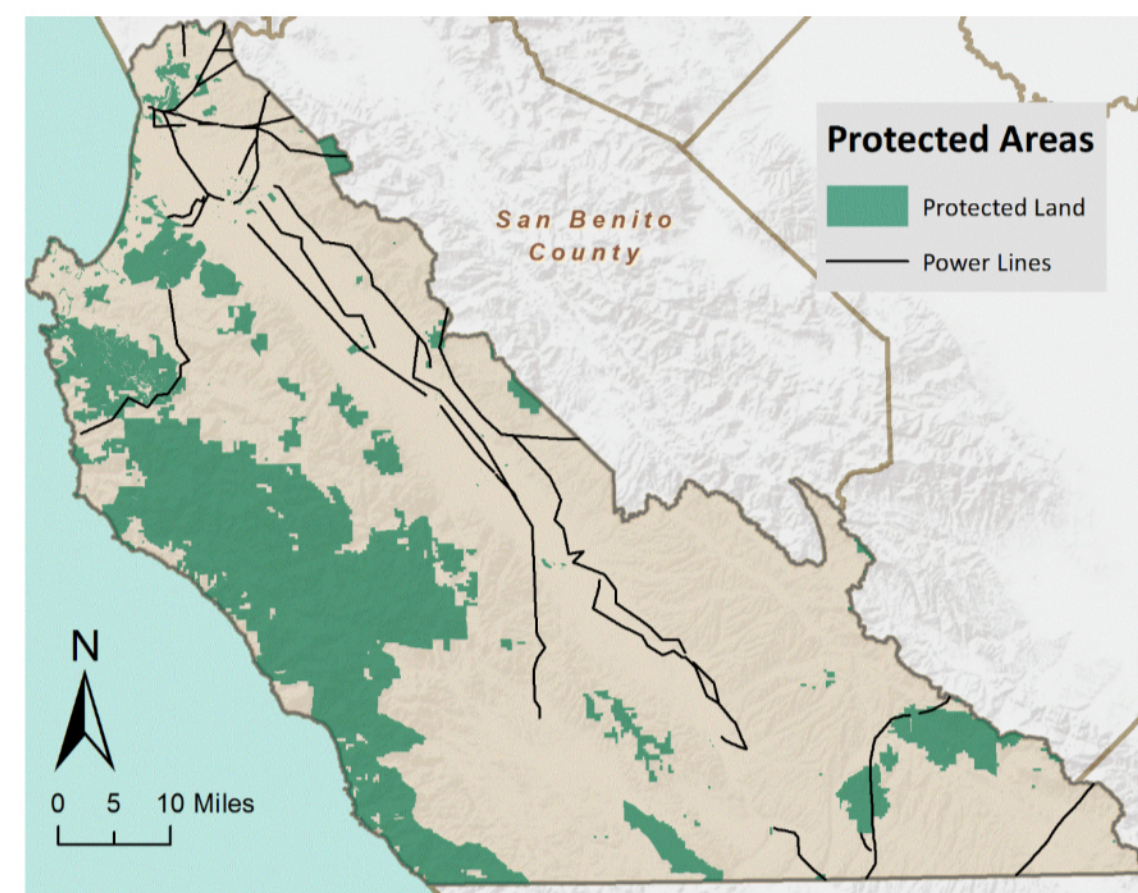
Fraction of Power Lines that are Buriable



Land Use of Buriable Power Lines



### EXCLUSIVE FACTORS



### California Condor Facts

Scientific name: *Gymnogyps californianus*

Wingspan: 10 feet (3 m)

Weight: 17-25 pounds (8-10 kg)

Diet: carrion

Lifespan: up to 70 years

Reproduction: 1 egg every 2 years

Closest relative: Andean condor

Current wild population: over 200 birds

### INCLUSIVE FACTORS

