



Developing a Wind Energy Project using GIS

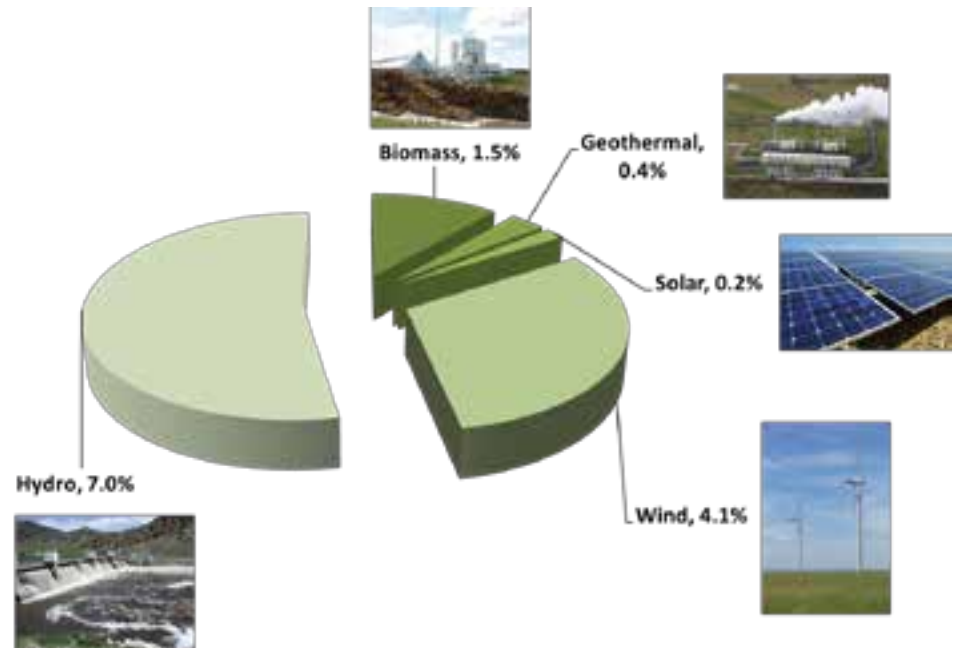
Matt Jacobs – Director of GIS

7/22/15

Wind Energy: A Growing Industry

Solid Growth

Wind energy has become more than 4% of the electrical generation in the U.S. and can power the equivalent of 15.5 million homes. Over the last 5 years, the U.S. wind industry has invested \$15 billion annually on average while providing over 30% of all new power capacity installed.



Wind Energy: A Growing Industry

Market Drivers

- Rising Fuel Price and Uncertainty
- Declining Wind Costs
- Federal and State Policies & Incentives
- Local Economic Development
- Environmental Stewardship
- Energy Security
- Consumer Demand



Wind Energy: Future Growth



Smoky Hills Wind Farm

The environmental benefits of wind power coupled with its competitive economics will continue to drive the expansion of wind power in the US.

4%

Current percentage of US electricity generated by wind power.

10%

Approximate amount of US electricity generated by wind power as called for by 2020 in the most recent proposed Federal legislation.

20%

Feasible limit of US electrical generation from wind power by 2030 as determined by the US Department of Energy without significant cost and reliability concerns.

40%

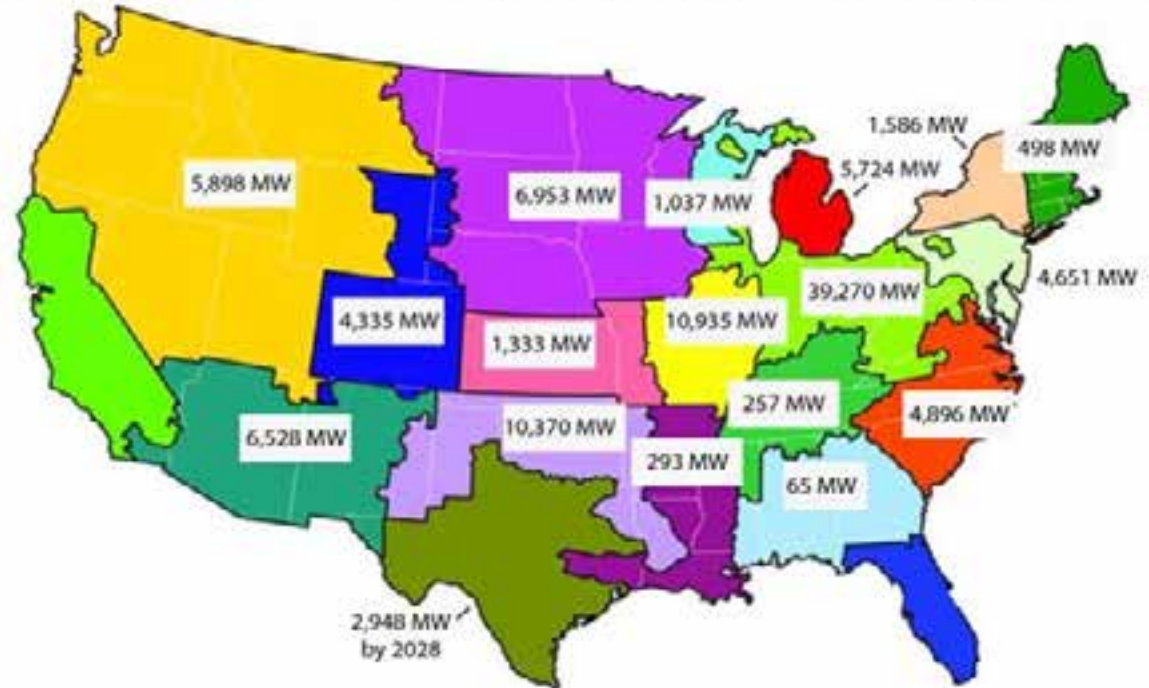
Upper limit of the amount of energy wind can contribute to maintain a reliable electrical system without major advancements in technology.

Wind Energy: Future Growth

Responsible Development

With wind energy predicted to grow as much as 500% in the next 10-15 years, siting decisions will need to be made responsibly to maintain healthy stable growth.

EIA Projection for Additional Wind Build in 2025 for Cost-Effective CPP Compliance, By Region



Wind Energy: GIS Applications

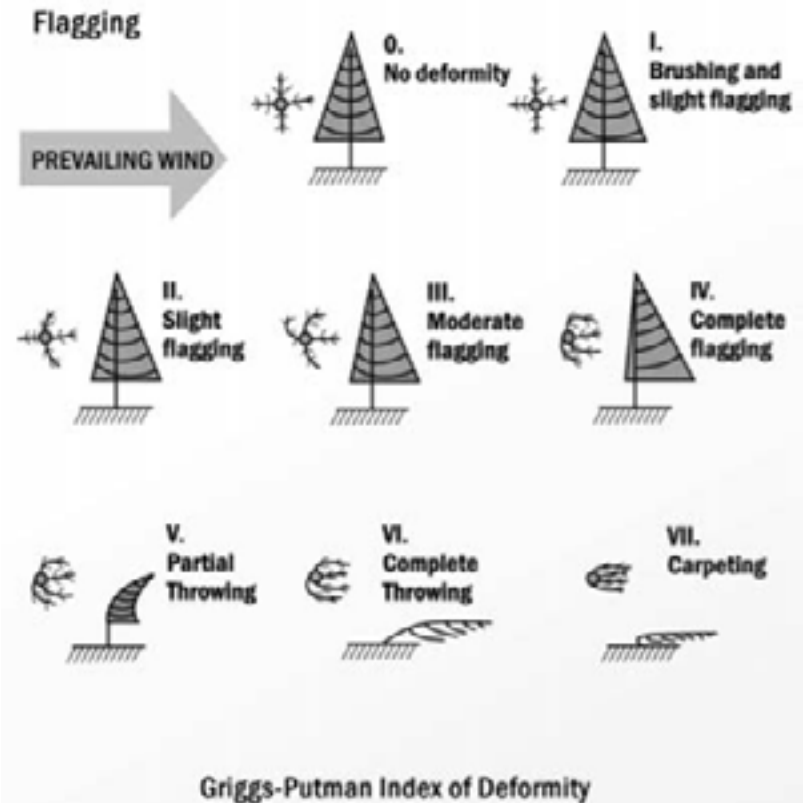
Minimizing Impacts using GIS

- **Siting**
 - Find the optimal sites based a growing number of stakeholders and sources
- Development
 - Develop responsibly by making project level efforts to avoid/minimize local impacts
- Marketing
 - Help policy makers and utilities understand the value of wind energy

Wind Energy: Siting

Responsible Siting

In the beginning...



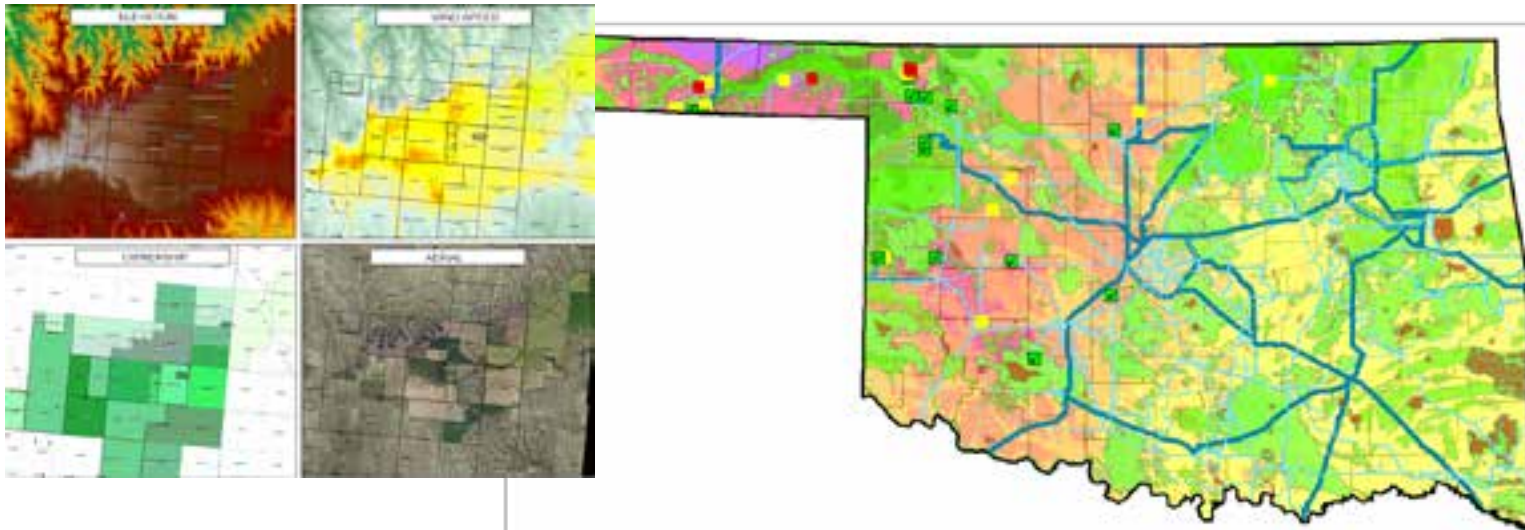
INDEX	I.	II.	III.	IV.	V.	VI.	VII.
WIND mph	7-9	9-11	11-12	13-16	15-18	16-21	22+
SPEED m/s	3-4	4-5	5-6	6-7	7-8	8-9	10

Source: AWEA

Wind Energy: Siting

Responsible Siting

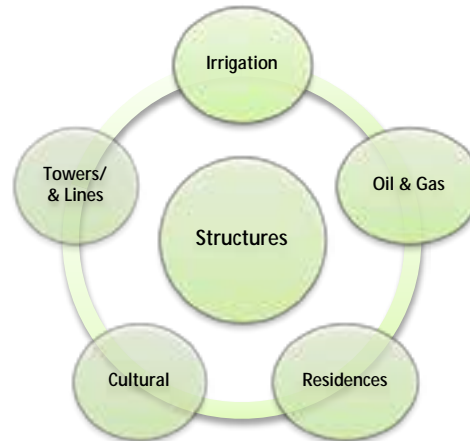
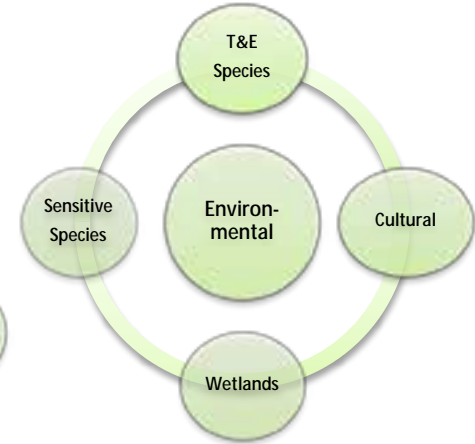
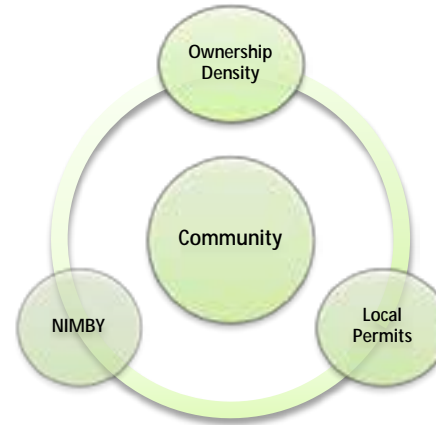
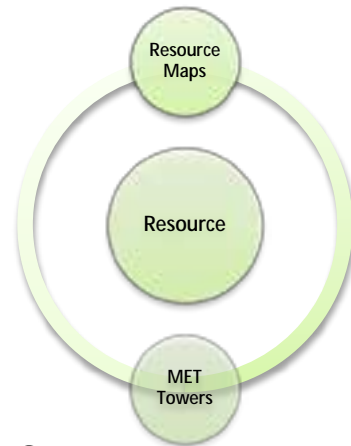
Mapping has become the premier siting tool.



Wind Energy: Siting

Responsible Siting

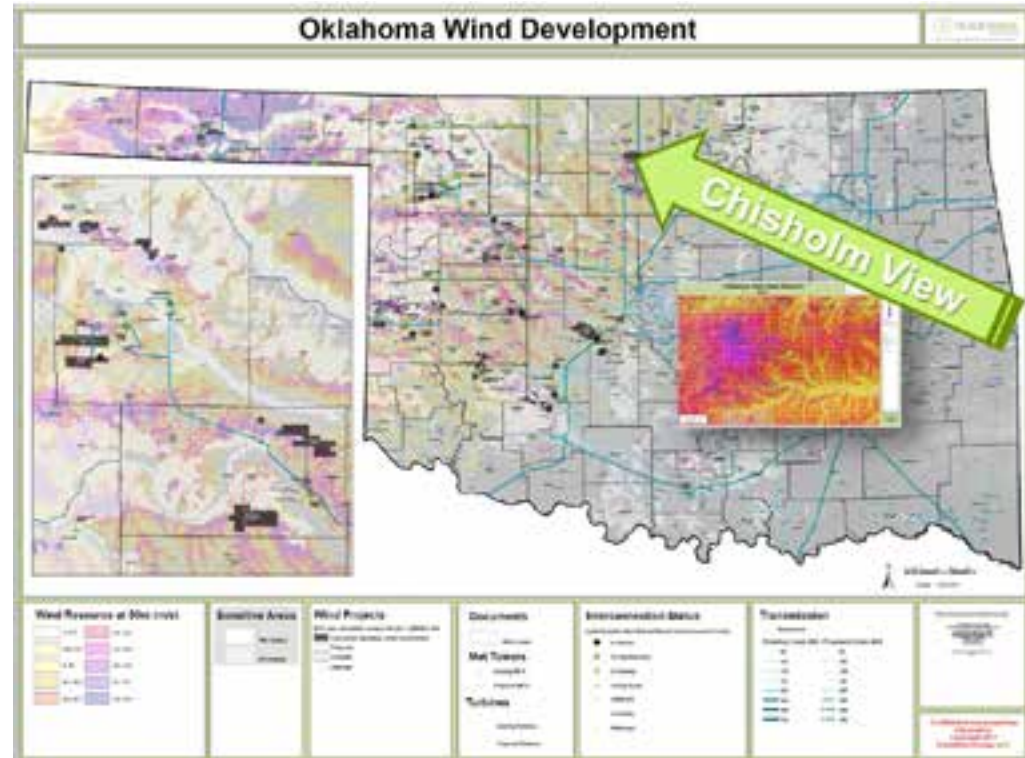
GIS is now a requirement to manage the growing number of sources and stakeholders.



Wind Energy: Siting

Responsible Siting

Unique/new siting map products are being created to facilitate decision making ranging from the field to the board room.

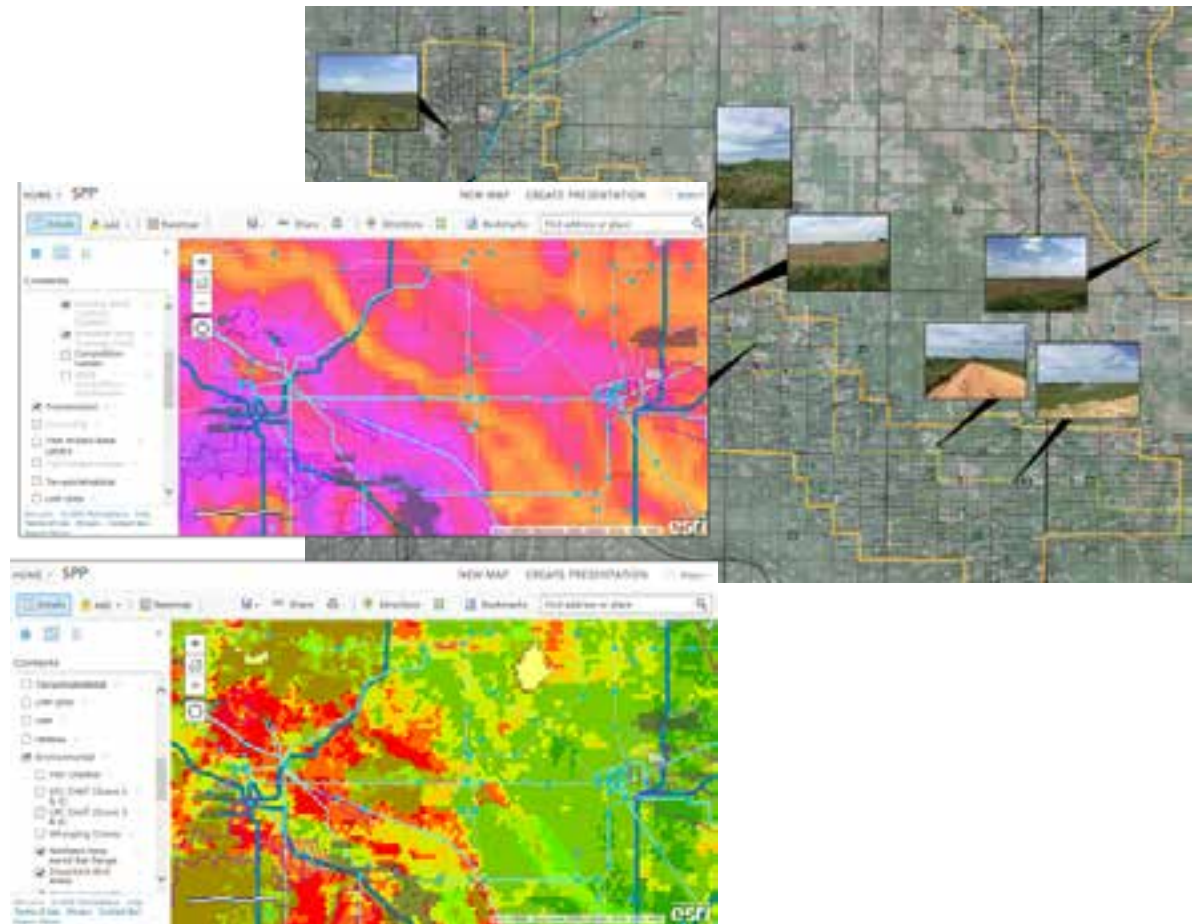


Wind Energy: Siting

Responsible Siting

Gathering and sharing GIS siting data has become streamlined.

- Mobile
- Web
- Desktop
- Server



Wind Energy: GIS Applications

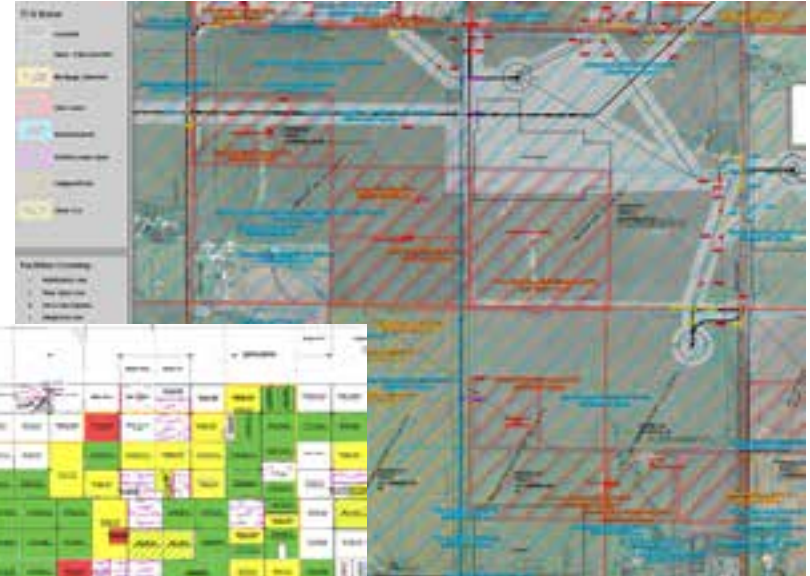
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Wind Energy: Development

Responsible Development

“What gives you the
right” ...



Wind Energy: Development

Responsible
Development
Geo-processing has
become common
in the development
process.



Wind Energy: Development

Responsible Development

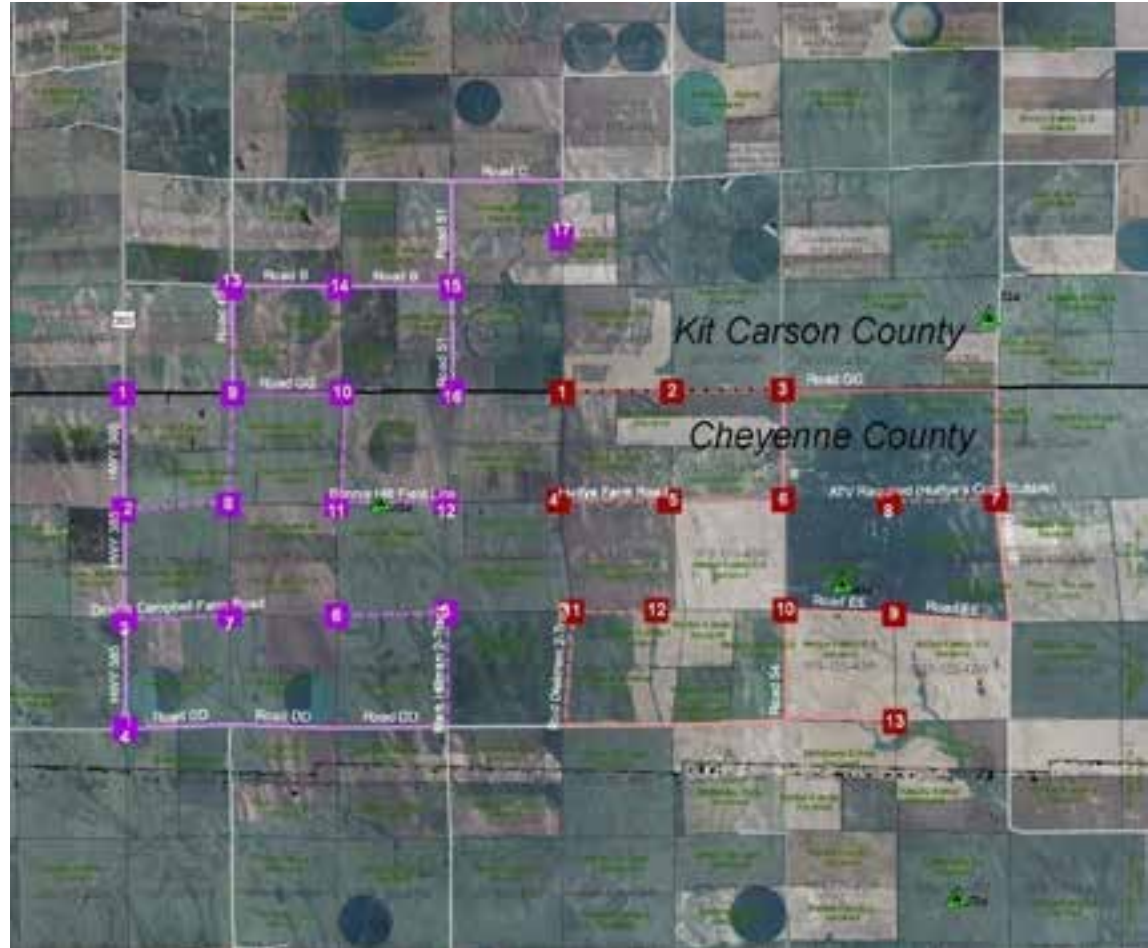
Keeping track of ALL project level spatial constraints requires multiple GIS competencies including data management and a multi-user database environment.

Constraint ID	Constraint Name	Buffer Distance	Constraint Type	Constraint Status
1	100m Wetland Buffer	100m	Environmental	Active
2	50m Wetland Buffer	50m	Environmental	Active
3	100m Wetland Buffer	100m	Environmental	Active
4	100m Wetland Buffer	100m	Environmental	Active
5	100m Wetland Buffer	100m	Environmental	Active
6	100m Wetland Buffer	100m	Environmental	Active
7	100m Wetland Buffer	100m	Environmental	Active
8	100m Wetland Buffer	100m	Environmental	Active
9	100m Wetland Buffer	100m	Environmental	Active
10	100m Wetland Buffer	100m	Environmental	Active
11	100m Wetland Buffer	100m	Environmental	Active
12	100m Wetland Buffer	100m	Environmental	Active
13	100m Wetland Buffer	100m	Environmental	Active
14	100m Wetland Buffer	100m	Environmental	Active
15	100m Wetland Buffer	100m	Environmental	Active
16	100m Wetland Buffer	100m	Environmental	Active
17	100m Wetland Buffer	100m	Environmental	Active
18	100m Wetland Buffer	100m	Environmental	Active
19	100m Wetland Buffer	100m	Environmental	Active
20	100m Wetland Buffer	100m	Environmental	Active
21	100m Wetland Buffer	100m	Environmental	Active
22	100m Wetland Buffer	100m	Environmental	Active
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25	100m Wetland Buffer	100m	Environmental	Active
26	100m Wetland Buffer	100m	Environmental	Active
27	100m Wetland Buffer	100m	Environmental	Active
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45	100m Wetland Buffer	100m	Environmental	Active
46	100m Wetland Buffer	100m	Environmental	Active
47	100m Wetland Buffer	100m	Environmental	Active
48	100m Wetland Buffer	100m	Environmental	Active
49	100m Wetland Buffer	100m	Environmental	Active
50	100m Wetland Buffer	100m	Environmental	Active



Wind Energy: Development

Responsible
Development
GPS/Mobile GIS
applications can
aid in efficient field
data collection for
biological, cultural,
and civil studies.



Wind Energy: GIS Applications

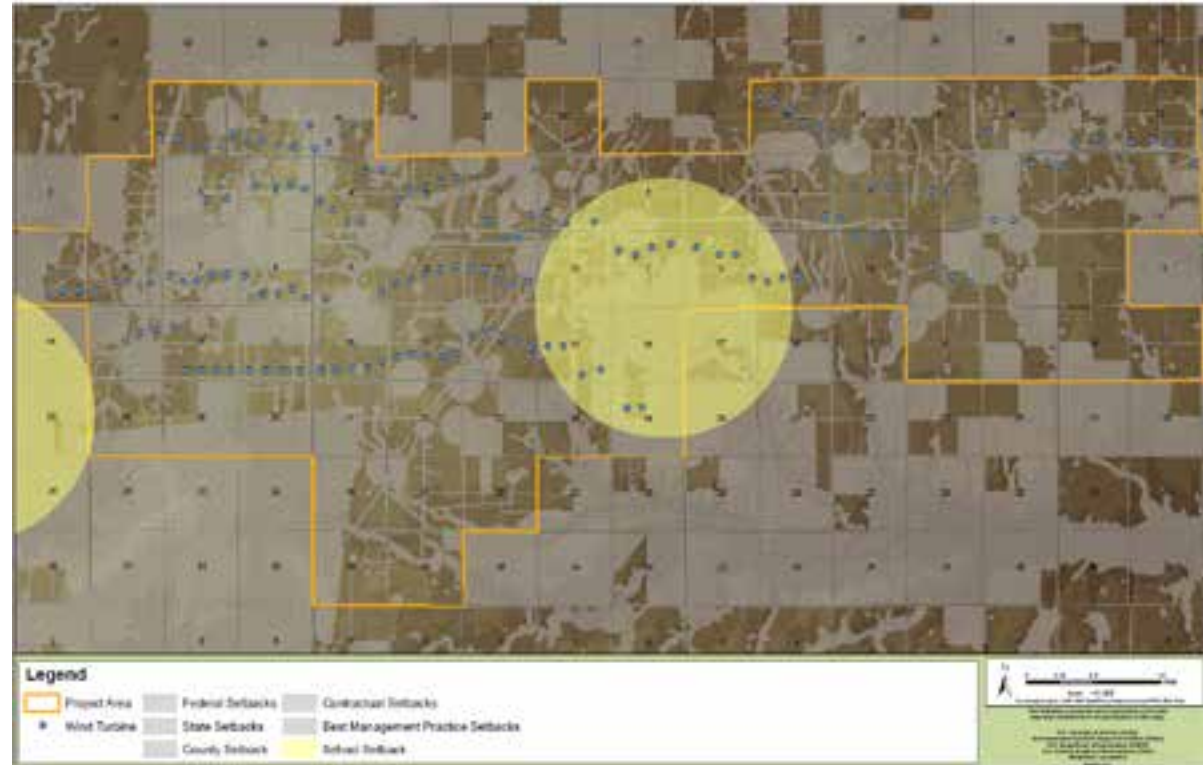
Minimizing Impacts

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Wind Energy: Marketing

Responsible Marketing

GIS can help demonstrate industry and community concerns.



Wind Energy: Marketing

Responsible Marketing

Advanced analysis can illuminate the benefits of mitigation measures.



Wind Energy: Conclusion

GIS needs to play a large role to ensure the healthy growth of an industry that is predicted to generate over 20% of all the electricity in the US by 2030.