Public Utilities Commission
Capitol Building, 1st floor
500 E. Capitol Ave.
Pierre, SD 57501-5070

RE: Docket EL18-026

Madam Chairperson, South Dakota Public Utilities Commissioners and Support Staff:

I am writing to provide additional comments and share my concerns with regard to the Prevailing Wind Park Project (PWPP) proposal to erect 61 industrial wind turbines, associated infrastructure, and transmission poles within the three county region of Bon Homme County, Charles Mix County and Hutchinson County.

Recently scientists and agronomists are beginning to understand and recognize the potential of negative effects to cropland, grassland, and soil health that exists within the footprint and surrounding areas of an industrial wind turbine plant.

Negative Impacts on Vegetation and Soil Health

Representatives of Prevailing Winds have stated the project's wind turbines will not pose a threat to vegetation which is simply biased and not accurate. Included are "before and after" infrared satellite imagery maps (LandSat imagery) of 4 industrial wind turbines erected on prairie lands in Hyde County that show a much more significant area impacted on a "per turbine" basis. **EXHIBIT 1.** The yellow to red colors represent a reduction in photosynthesis. As you can see, the grass and plant health negatively impacted covers approximately 20-25 acres on a 75 acre parcel even 13 years later. This encompasses a much greater area than just the access roads erected. Besides access road infrastructure's "edge effect" on crop production and severe compaction issues, there is a negative impact on grass areas where turbulence from the turbine channels dryer air down, moist air upward resulting in a drying effect to occur. In regions of the country that receive 25-30 or more inches of rainfall such as Iowa, this drying effect could be considered beneficial by preventing or slowing down plant disease impacts by keeping the leaves of corn and beans dryer. This would reduce the disease potential due to spores requiring a wetter "host". However in arid regions where annual rainfall struggles to top 17", the drying effect becomes counterproductive to crop health.

To support the "drying effect" and negative impact industrial wind turbines pose on soil, grasslands and cropland, I have included the following article by Mr. Patrick Miller in UAS Magazine: {Kevin A. Adkins & Adrian Sescu (2017) Observations of relative humidity in the near-wake of a wind turbine using an instrumented unmanned aerial system, International Journal of Green Energy, 14:10, 845-860, DOI: 10.1080/15435075.2017.1334661} **EXHIBIT 2**
This 2017 study was conducted by Embry-Riddle Aeronautics University utilizing a drone by Kevin Adkins, assistant professor of aeronautical science and director of Embry-Riddle's Gaetz Aerospace Institute. He flew a drone into wind turbine wakes to measure differences in relative humidity levels. He and his colleague Adrian Sescu of Mississippi State University published their research findings in the International Journal of Green Energy. What they discovered was humidity at the plant level can decrease as much as 3 percent and that amount can be magnified as the concentration of wind turbines increases.

A third supplement I've attached **EXHIBIT 3** further supports the negative impact concerns on vegetation. Dr. Craig Idso – founder and former president of CO2 Science and current chairman of the Center for the Study of Carbon Dioxide and Global Change, wrote a Paper Reviewed article published in the August 2017 CO2 Science. Six Chinese scientists (Tang et al. 2017) compiled climate-related data over the span of 2003-2014 within the footprint of an industrial wind plant facility in northern China. Their report revealed wind turbines elevated both day and nighttime temperatures which they said "suppressed soil moisture and enhanced water stress in the study area". As a result, vegetative growth and the productivity of the surrounding vegetation (Approximately 53% grassland – 45% crop land) decreased.

Please accept this scientific material as additional evidence that must be taken into serious consideration before "Big Wind" completely dots the South Dakota landscape by way of their prowess ability to sell these projects as if they won't have any negative impacts and implications.

Sincerely,

Michael J Bollweg
Agronomist – '96 Graduate SDSU
Bollweg Farms
Tumbleweed Lodge
Harrold, SD 57536

EXHBIT 1-1
2003
4 TURBINES
HYDE COUTY

EXHIBIT 1-2

9 JULY 2001

PRE-TURBINE

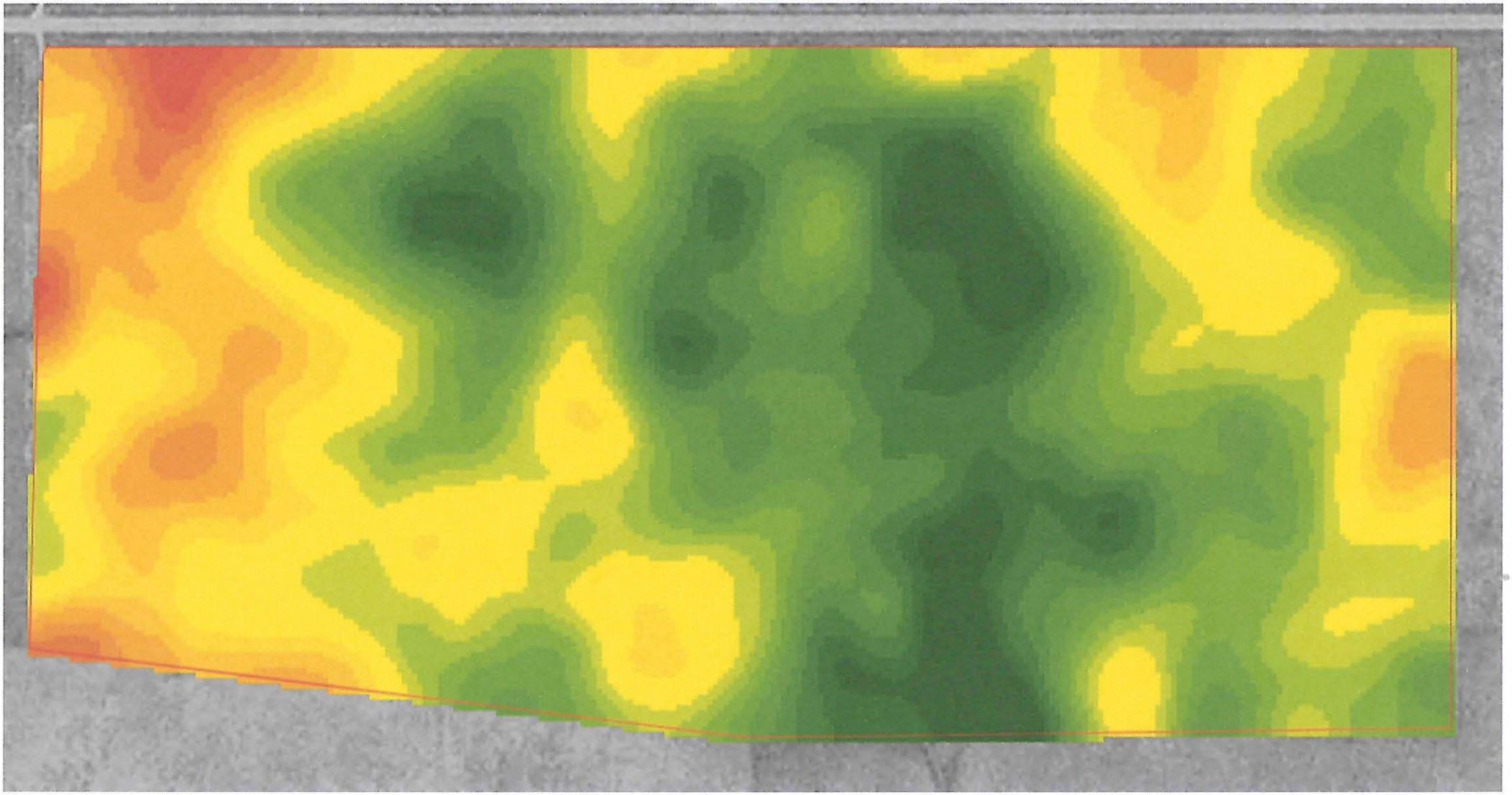


EXHIBIT 1-3
31 JULY 2003
POST TURBINE

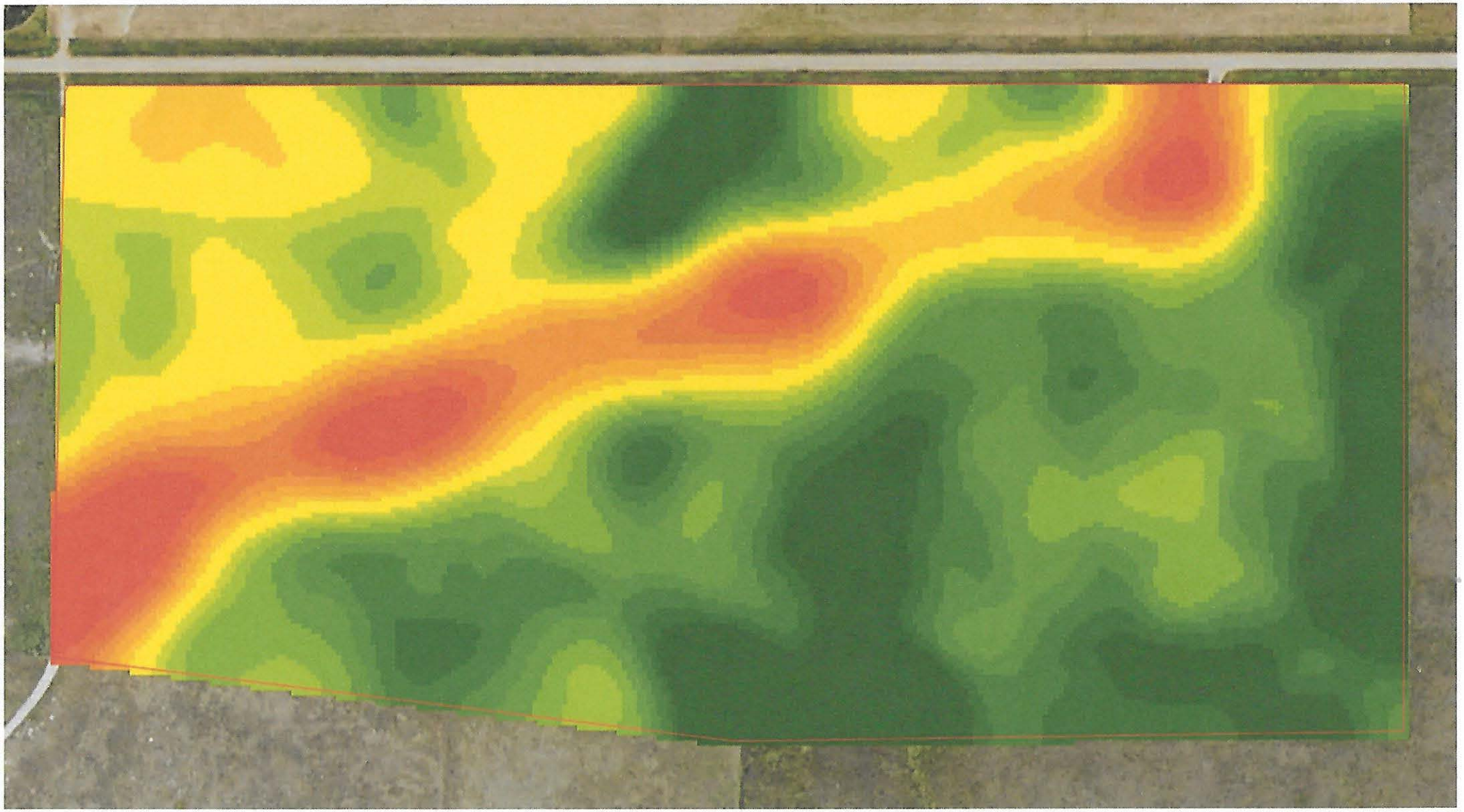


EXHIBIT I-4
5 JULY 2011
POST TURBINE

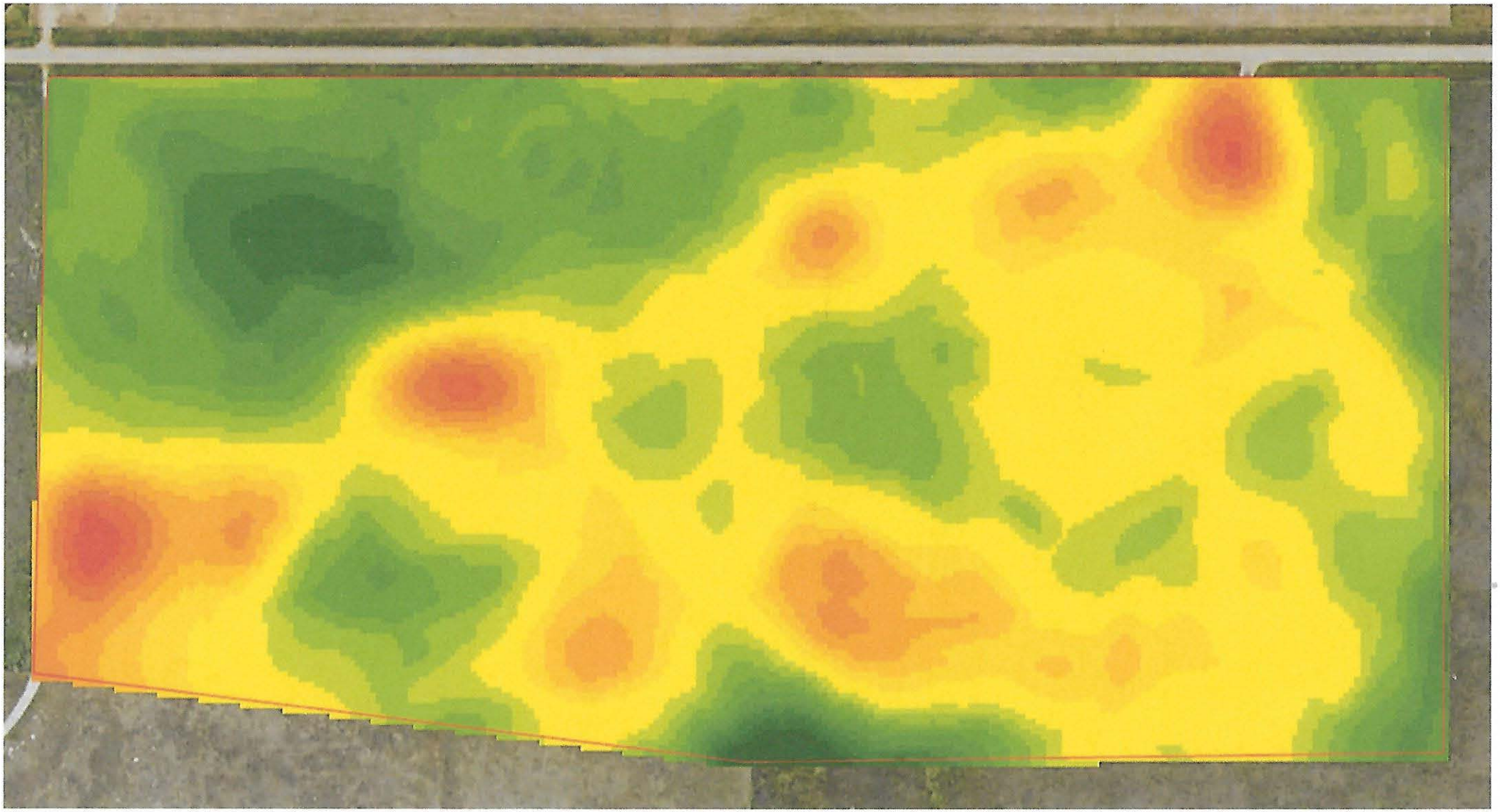


EXHIBIT 1-5
18 JULY 2016
POST TURBINE

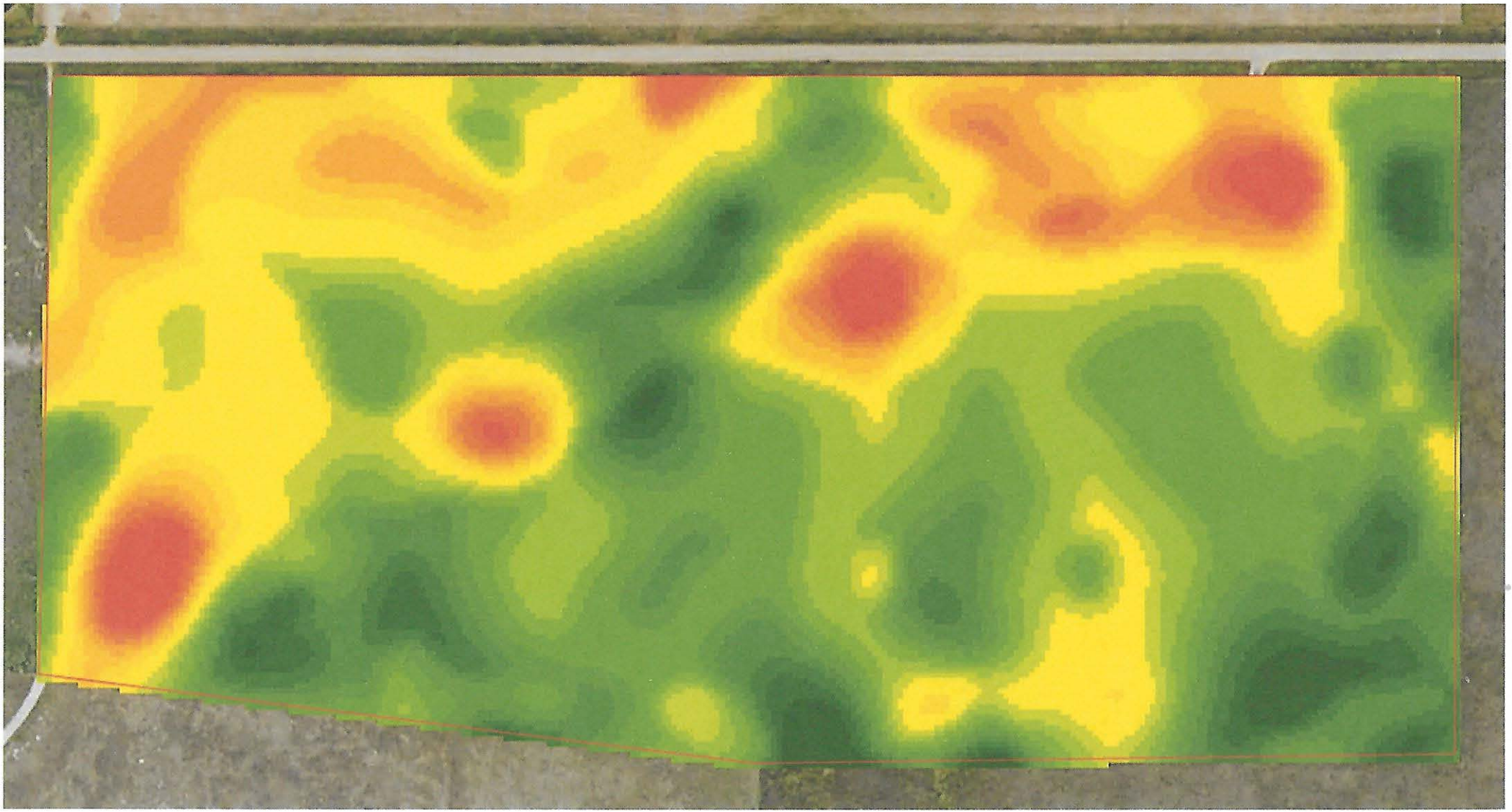


EXHIBIT 2

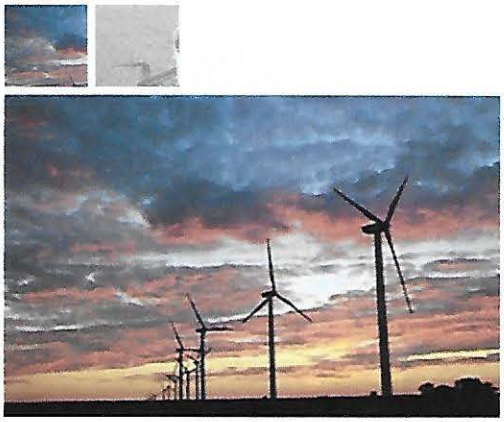
Drone measures effect of wind turbines on farmland

By Patrick C. Miller | September 27, 2017

Embry-Riddle Aeronautics University used a small unmanned aircraft system (UAS) to study the effects of wind turbines on farmland beneath them and found that they can impact soil, crops and livestock.

Farmers can earn extra income by allowing wind turbines to be placed in their fields. Based on data collected from the UAS, researchers discovered that depending on weather conditions, the spinning blades can positively or negatively impact crop yields. For example, a wind turbine might inhibit crop disease during wet weather or it could speed moisture loss during a drought.

Kevin Adkins, an assistant professor of aeronautical science and director of Embry-Riddle's Gaetz Aerospace Institute in St. Lucie County, Florida, flew a drone into wind turbine wakes to measure differences in relative humidity levels. He and his colleague Adrian Sescu of Mississippi State University published their research findings in the International Journal of Green Energy.



Using a small UAS to collect data, researchers have found that wind turbines can have an impact on the farmland beneath them.
PHOTO: U.S. DEPARTMENT OF ENERGY

They found that below the hub of a single spinning wind turbine, relative humidity can decrease by as much as 3 percent downwind while humidity increases above the hub. The researchers concluded that this impact is magnified within a broader turbine array. "This occurs as drier air is mixed downward and moister air is mixed upward," they wrote.

The research was conducted at two Midwestern wind farms. An instrument-equipped quadcopter was flown into two different wind-turbine wakes where it hovered at key points to collect upstream and downstream data. The hub of one turbine was 305 feet above a field of winter wheat. The second turbine had a hub height of 262 feet. Baseline meteorological conditions were assessed.

The quadcopter was equipped with GPS and a suite of instruments to capture temperature and relative humidity levels. Following a prescribed flight path over a four-day period, it made a series of sweeps through the wind turbines' wake zone.

After analyzing the data, Adkins and Sescu found that the descending blades were delivering drier air downward, while the ascending blades were displacing moister air upward—away from the surface of crop fields. They believe this could have significant implications for crops, soil and livestock.

"For farmers, reduced relative humidity over fields could have an impact on their crop productivity," Adkins said. "It's my hope that farmers will take this new information and utilize it, leveraging their specialized knowledge."

Most prior investigations of wind-turbine impacts on near-surface meteorology have been based on computer modeling, Adkins said. "The implementation of the unmanned aerial system provides proof of concept for a platform that can also be used for the measurement of other atmospheric parameters with high spatial resolution," the researchers wrote.

Related Articles


Drone maker Delair earns award shared with Google, Airbnb


Smaller than a dime, MIT's new chip powers honeybee size drones


General Atomics selects Pratt & Whitney engine for MQ-25

New York plans to move ahead with UAS program


Navy to outfit drones with fuel cell systems

What drone operators need to know at start of hurricane season

Another Reason to Reject Wind Farms

Paper Reviewed

Tang, B., Wu, D., Zhao, X., Zhou, T., Zhao, W. and Wei, H. 2017. The observed impacts of wind farms on local vegetation growth in northern China. *Remote Sensing* **9**: 332, doi:10.3390/rs9040332.

There are a number of legitimate reasons for opposing wind farms; (1) they kill birds, bats and other animals, (2) they create undesirable ambient noise, (3) they blight the landscape and (4) the power they generate is far more costly per kilowatt hour than that obtained from conventional fossil fuels. Now, however, thanks to the studious research of six Chinese scientists (Tang *et al.*, 2017), we can add a fifth reason for avoiding wind farms -- *they reduce the productivity of surrounding vegetation.*

In reaching this conclusion, Tang *et al.* used remotely-sensed imaging data, including leaf area index (LAI), normalized difference vegetation index (NDVI), an enhanced vegetation index (EVI), gross primary production (GPP) and net primary production (NPP), coupled with other climate-related data (temperature, soil moisture, evapotranspiration, albedo and wind) over the period 2003-2014, to analyze the effects of a recently built wind farm on summer (Jun-Aug) vegetative growth in the Bashang region of northern China. Located in the Hebei province, the Bashang study area (40.9-41.5°N, 113.9-114.7°E) witnessed a total of 1747 wind turbines constructed between the period 2005 and 2011. Land cover in Bashang primarily consists of grassland and crops, which account for 53.4 and 44.7 percent, respectively, of the total cover. Thus, using the remotely-sensed and climate data described above, Tang *et al.* set out to determine whether the wind farm construction in Bashang exerted any influence on the growth and productivity of the region's summer vegetation.

And what did their analysis reveal?

In describing their findings, Tang *et al.* report that construction of the wind turbines elevated both day (by 0.45-0.65°C) and night (by 0.15-0.18°C) temperatures, which increase, they say, "suppressed soil moisture and enhanced water stress in the study area." As a result, local vegetative growth and productivity decreased (see Figure 1). More specifically, they calculated an approximate 14.5, 14.8 and 8.9 percent decrease in LAI, EVI and NDVI over the period of study, as well as "an inhibiting [wind farm] effect of 8.9% on summer GPP and 4.0% on annual NPP." Consequently, these several findings led Tang *et al.* to conclude that their research "provides significant observational evidence that wind farms can inhibit the growth and productivity of the underlying vegetation." And thus we have yet another reason to question the wisdom of policy makers who are seemingly rushing to install more and more of these bird-killing, noise-polluting, eyesore-viewing, cost-prohibiting and vegetative-decreasing low power producing energy sources. It doesn't make any sense, does it?

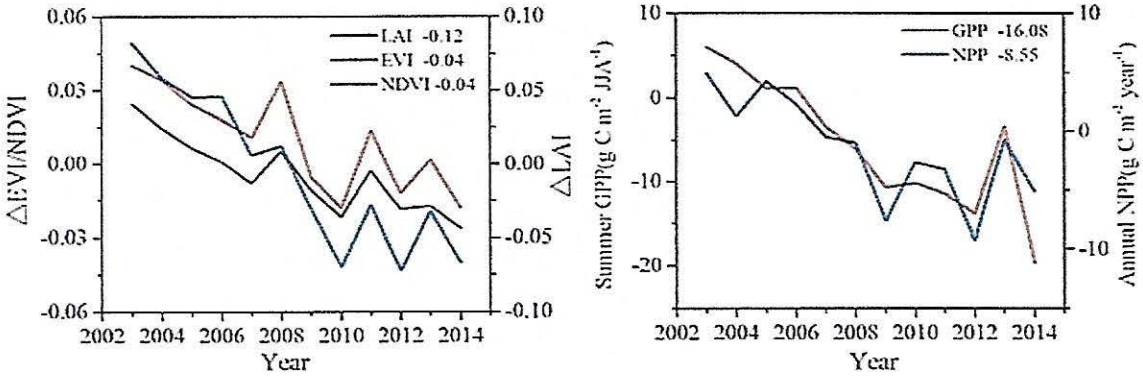


Figure 1. *Inter-annual variations of area mean vegetation index differences (left panel) and GPP and NPP (right panel) differences between wind farm pixels and nearby non-wind farm pixels for the period 2003-2014. The insert numbers are the area mean VI, GPP, and NPP differences between the post- and pre-turbine construction periods (2012-2014 minus 2003-2005). Source: Tang et al. (2017).*

Posted 29 August 2017

Printer Friendly Version