



Smart Curtailment for Bats: Testing Efficacy with Multiple Data Streams at Three Wind Energy Facilities

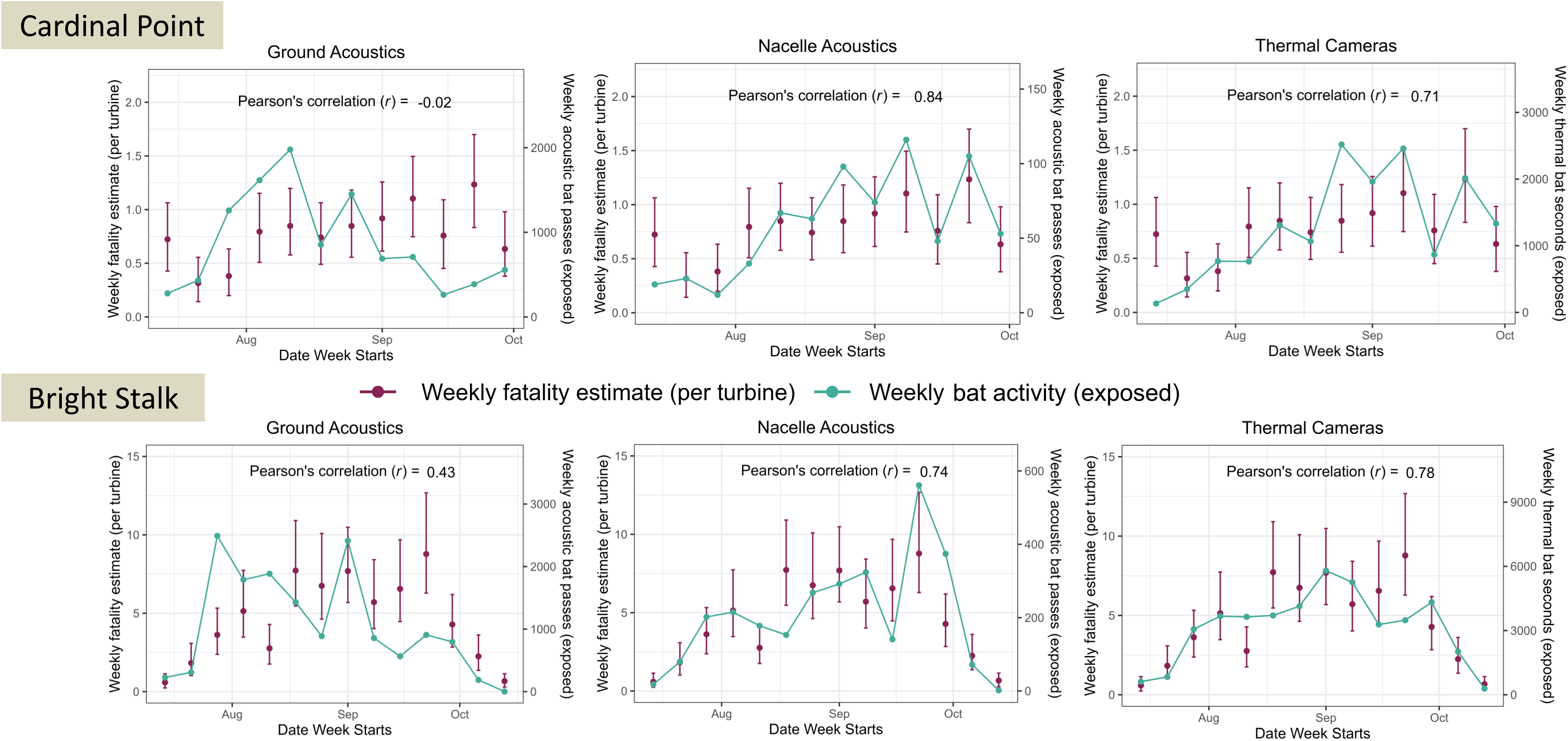
Paul Rabie¹, Amanda Hale¹, Mike True¹, Rhett Good¹, Kevin Heist¹, Brogan Morton², and Jon Ritter² | ¹WEST, Cheyenne, WY and ²Wildlife Imaging Systems, Hinesburg, VT



Introduction

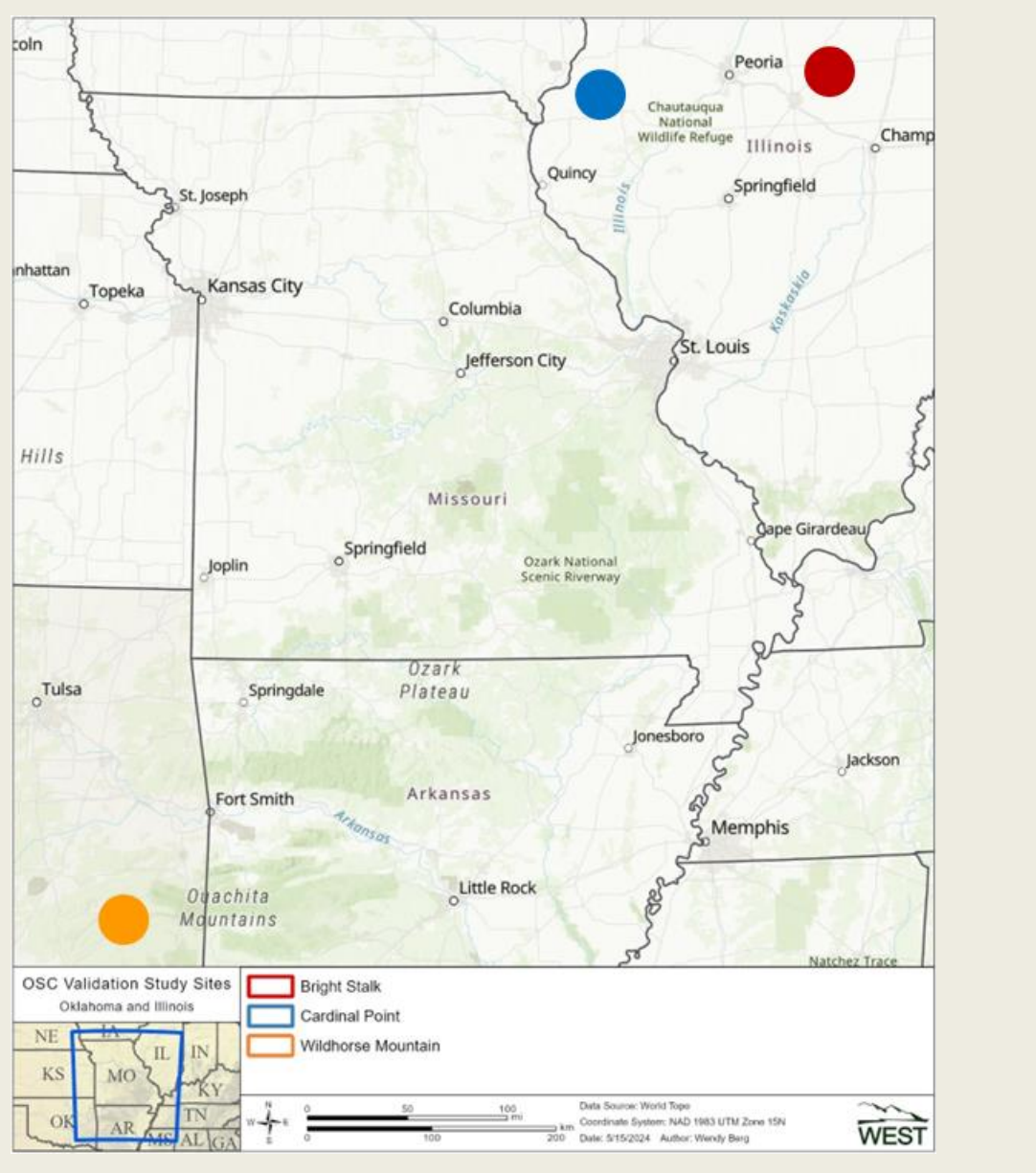
Around the globe, wind turbine-related bat mortality is a conservation challenge for wildlife managers and the wind energy industry. These mortalities are an important issue because bats have low reproductive potential and require high adult survivorship to avoid population declines. Given the increasing demand for wind energy to help meet decarbonization goals, coupled with increasing evidence that bats are attracted to wind turbines, developing cost-effective and practical impact minimization strategies is imperative. “Smart curtailment” strategies incorporate site-specific information to identify high-risk periods for bats, with the potential to provide more conservation value for less power loss compared to traditional blanket curtailment methods. Optimized Smart Curtailment™ (OSC)™, developed by WEST, reduces bat fatalities while maximizing power production by curtailing wind turbines when a Bayesian decision tree model indicates higher risk conditions for bats and lower energy production potential.

Relationships between Fatality Estimates and Bat Activity



Objective

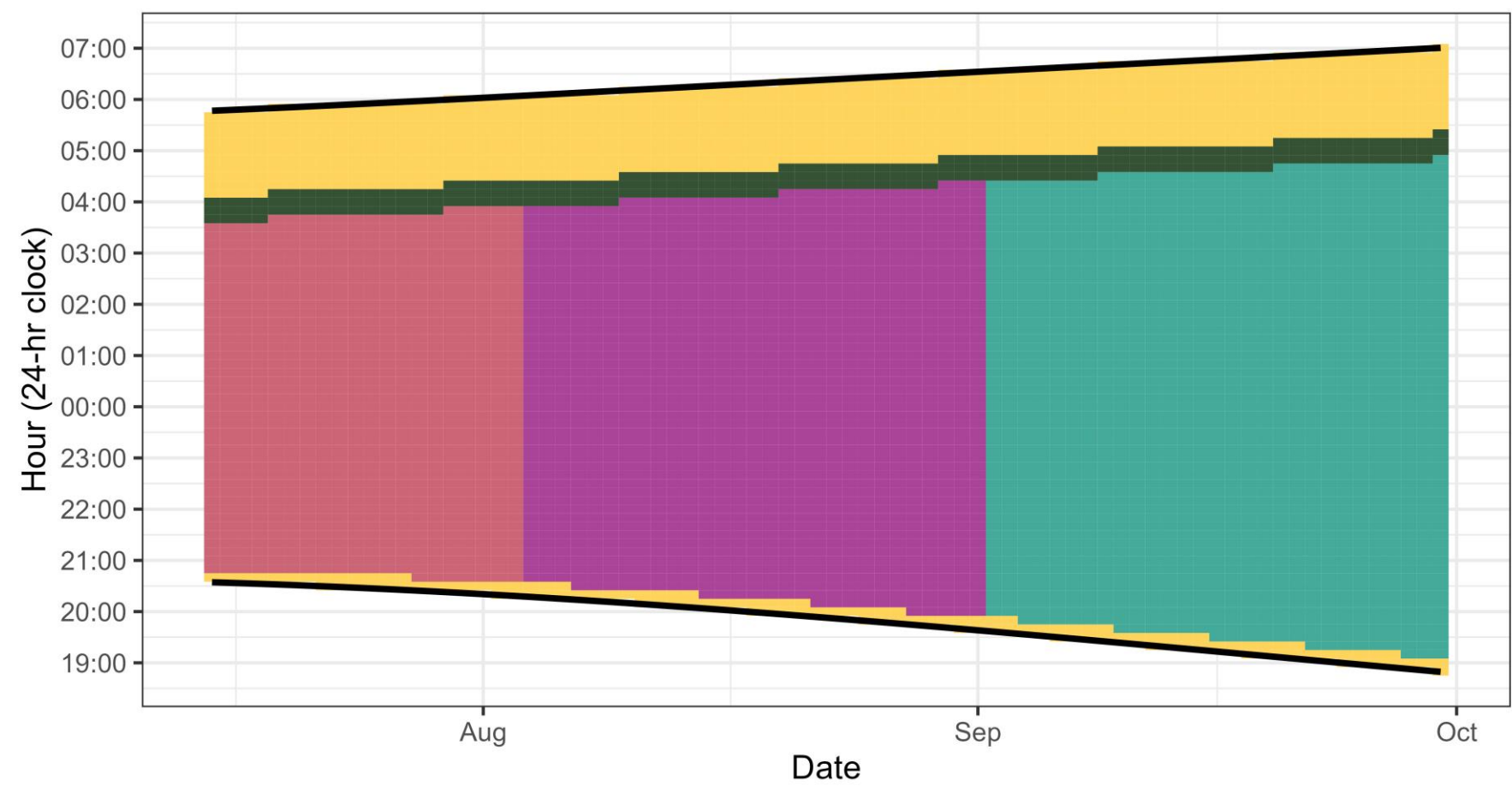
Validate OSC at 3 operational wind energy facilities in the US in a multi-year study.



Test of OSC vs Blanket Curtailment in 2024

Cardinal Point Wind Energy Facility

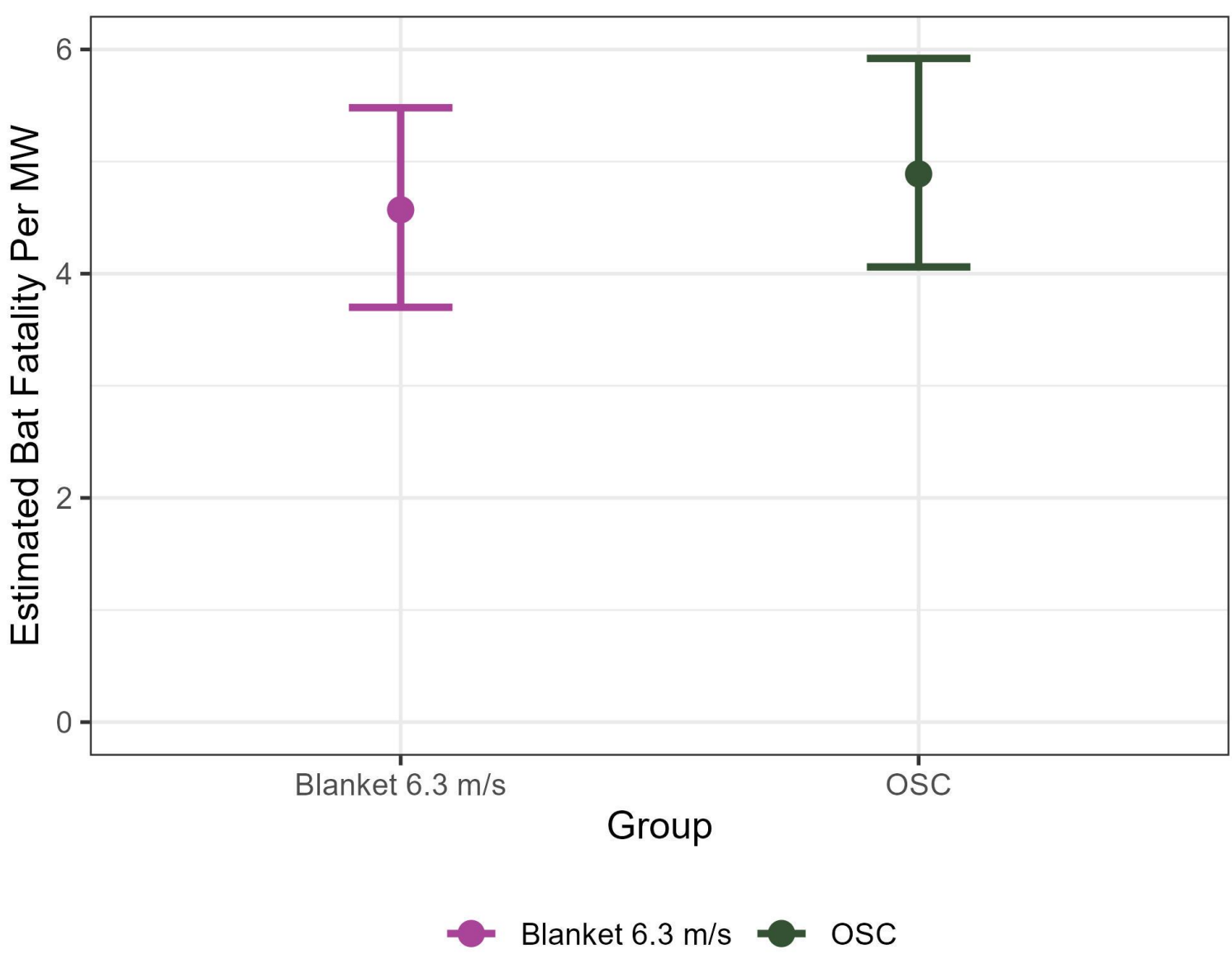
- OSC developed using acoustic data from July – Oct in 2022 and 2023
- Designed to provide $\geq 60\%$ risk reduction across the entire bat-active season



Curtailment rule:

- Cut-in speed = 3.0 m/s
- Cut-in speed = 4.2 m/s
- Cut-in speed = 5.1 m/s
- Cut-in speed = 6.5 m/s
- Cut-in speed = 6.8 m/s

Test of OSC vs Blanket Curtailment in 2024



Next Steps

2025/2026: Implement OSC and blanket curtailment (subject to change). Collect PCM, acoustic and thermal activity, and power production data to validate OSC. The blanket curtailment column in each table below reflects the conservation goal of each facility.

Cardinal Point 15 July – 30 Sept	OSC	6.4 m/s Blanket Curtailment
Predicted Acoustic Coverage	69%	69%
Predicted Thermal Coverage	71%	72%
Predicted Power Recovery	25%	---

Bright Stalk 15 July – 15 Oct	OSC	5.0 m/s Blanket Curtailment
Predicted Acoustic Coverage	55%	52%
Predicted Thermal Coverage	46%	47%
Predicted Power Recovery	17%	---

Wildhorse Mountain 01 July – 30 Sept	OSC	5.0 m/s Blanket Curtailment
Predicted Acoustic Coverage	27%	24%
Predicted Thermal Coverage	36%	30%
Predicted Power Recovery	18%	---



RENEWABLE ENERGY
WILDLIFE
RESEARCH FUND

- Project Goal: Reduce power losses while maintaining bat conservation objectives
- Project Results: 46% reduction in power losses with equivalent bat conservation
- Fatality rates did not differ between the two groups
- Estimates of activity “covered” by curtailment were similar in the two groups



- Implemented July 15 – September 30
- 30 OSC turbines
- 30 6.3 m/s blanket curtailment turbines