Wind Operational Issue Mitigation (WREN/Tethys & Avian Remote Sensing)

Project ID # M2

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FY17-FY18 Wind Office Project Organization

"Enabling Wind Energy Options Nationwide"

Technology Development	Market Acceleration & Deployment
Atmosphere to Electrons	Stakeholder Engagement, Workforce Development, and Human Use Considerations
Offshore Wind	Environmental Research
Distributed Wind	Grid Integration
Testing Infrastructure	Regulatory and Siting
Standards Support and International Engagement	
Advanced Components, Reliability, and Manufacturing	

Analysis and Modeling (cross-cutting)

Project Overview

M2: Wind Operational Issue Mitigation (WREN/Tethys & Avian Remote Sensing)

Project Summary

- This project works with an international collaborative to share and develop new information on wind energy and wildlife issues (WREN)
- The project also collects, collates, analyzes, and disseminates scientific information to inform and accelerate siting and permitting processes (Tethys).
- This project develops and tests technologies to observe birds and bats around wind farms, to decrease uncertainty of wind energy effects on these animals (Avian Remote Sensing)

Project Objective & Impact

- Potential effects of wind farms on wildlife and habitats continue to concern regulators and stakeholders which complicate and slow permitting. This project brings technology solutions to monitoring wildlife, engages the international community to share solutions to wind and wildlife interactions, and shares existing scientific information broadly to address these concerns.

Project Attributes

Project Principal Investigator(s)

Andrea Copping
Shari Matzner

DOE Lead

Jocelyn Brown-Saracino

Project Partners/Subs

WREN/Tethys:
- 11 WREN nations, IEA Wind.
- NOAA, BOEM

Project Duration

October 2011 – September 2020

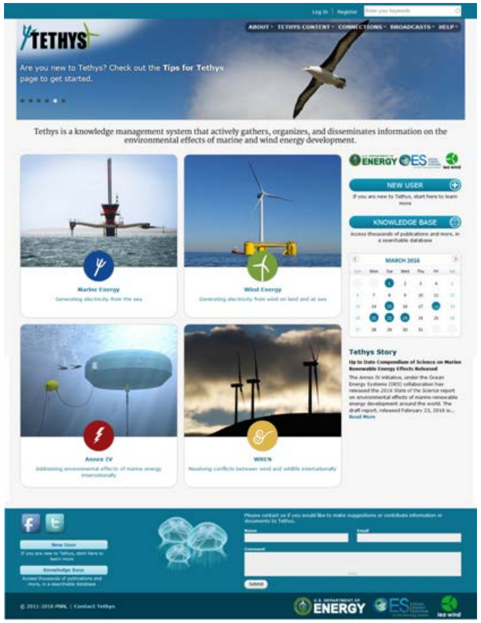
Technical Merit and Relevance

WREN

- Regulators and stakeholders are concerned about potential effects of wind energy development on wildlife and habitats for land-based and offshore wind, which may impede permitting and may foster opposition to wind projects. WREN investigates and analyzes information to address these concerns.

Tethys

- Regulators and other stakeholders may not have access to the best science to support efficient permitting. Using Tethys, scientific papers, reports, and other media are collected, curated, and disseminated to allow a common base of knowledge across the wind community.



Technical Merit and Relevance

Avian Remote Sensing

- **Goal: Advance the science of risk assessment for offshore wind to birds and bats by providing:**
  - Continuous observations of activity, night and day, all weather
  - Timely, accurate information through automated processing
  - Site-specific, species-specific data

Approach and Methodology

WREN

- In cooperation with NREL and WETO, coordinate among 11 nations under IEA Wind
- Understand interactions of wind energy & wildlife to support siting and permitting
- Create and transfer knowledge by developing white papers, webinars, other outreach and engagement materials and processes

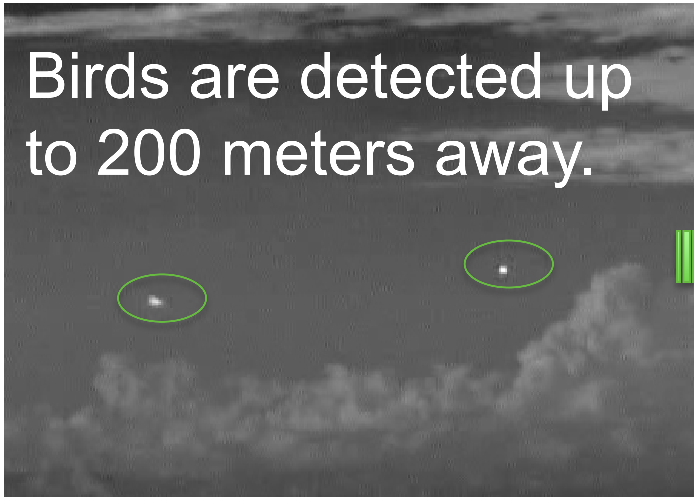
Tethys

- *Tethys* knowledge base used to collect, curate, and disseminate documents for land-based and offshore wind.
- *Tethys* platform used to promote engagement among users

Approach and Methodology

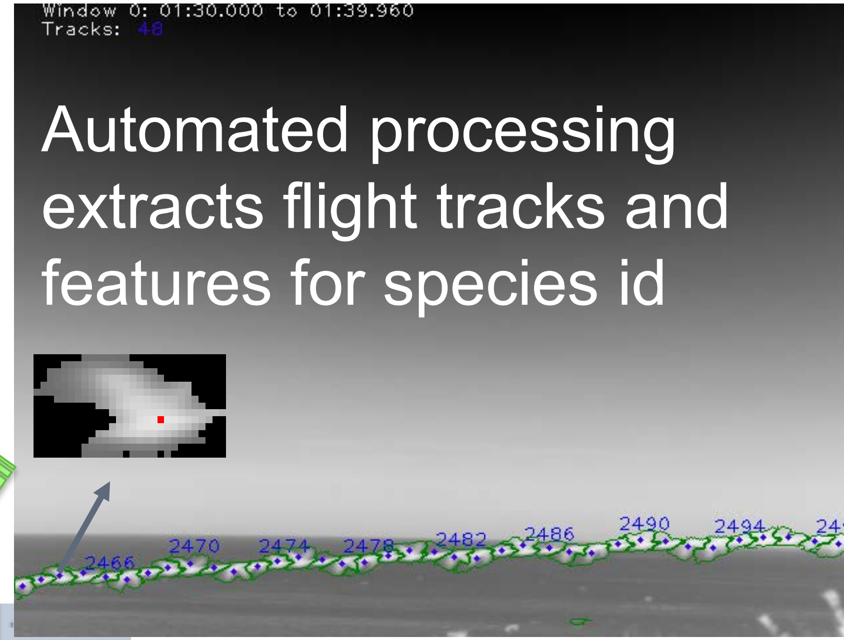
Avian Remote Sensing

Raw thermal image.

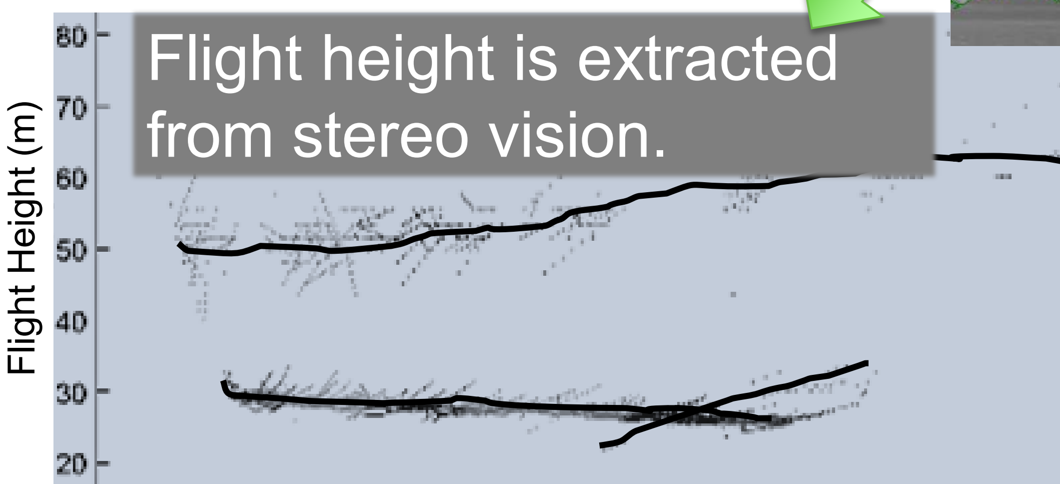


Birds are detected up to 200 meters away.

ThermalTracker output image.



Automated processing extracts flight tracks and features for species id



Flight height is extracted from stereo vision.

Commercial-off-the-shelf hardware is reliable and cost-effective.

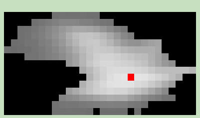
Flir A65 thermal cameras

Accomplishments and Progress

WREN/Tethys/Avian FY17 Milestones

FY17	Q1	Q2	Q3	Q4
Avian	Field Study Plan	Detection Field Demo	Stereo-optic Data Collection	Report & Draft Field Study Plan
WREN/Tethys	AM SSS; NWCC	Outreach & Engagement Plan	Tethys Peer Review	Annual Tethys Assessment

FY 17 Go/No-Go Decisions



Avian Remote Sensing

- 9/30/2017: Real-time detection algorithm has been validated to meet benchmarks → GO

WREN/Tethys

- 12/30/2016: IEA Wind Committee must agree to a 2^{nd} phase of WREN in order for the initiative to continue → GO

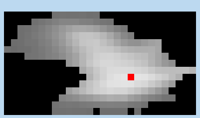
Accomplishments and Progress

WREN/Tethys/Avian FY18 Milestones

FY18	Q1	Q2	Q3	Q4
Avian	Algorithm Validation	NA	NA	Manuscript Submitted
WREN/ Tethys	NA	Draft RBM Paper	Tethys Peer Review	NA

= slipped milestone

FY 18 Go/No-Go Decisions



Avian Remote Sensing

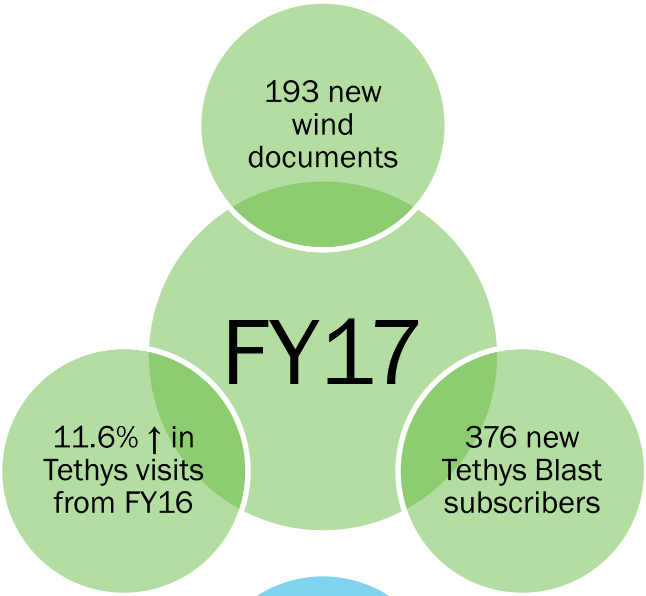
- 9/30/2018: Classifiers can recognize a detected target as a bird & Land-Based Wind Demo successfully completed → GO

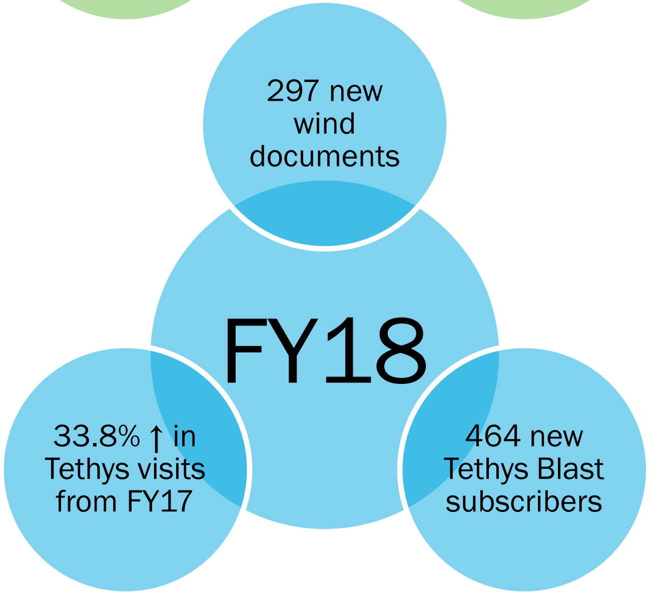
WREN/Tethys

- 6/30/2018: Evaluation of whether there has been a significant increase in Tethys wind users and collection as a result of focused outreach efforts during the first 3 quarters of FY18 → GO

Accomplishments and Progress

WREN/Tethys

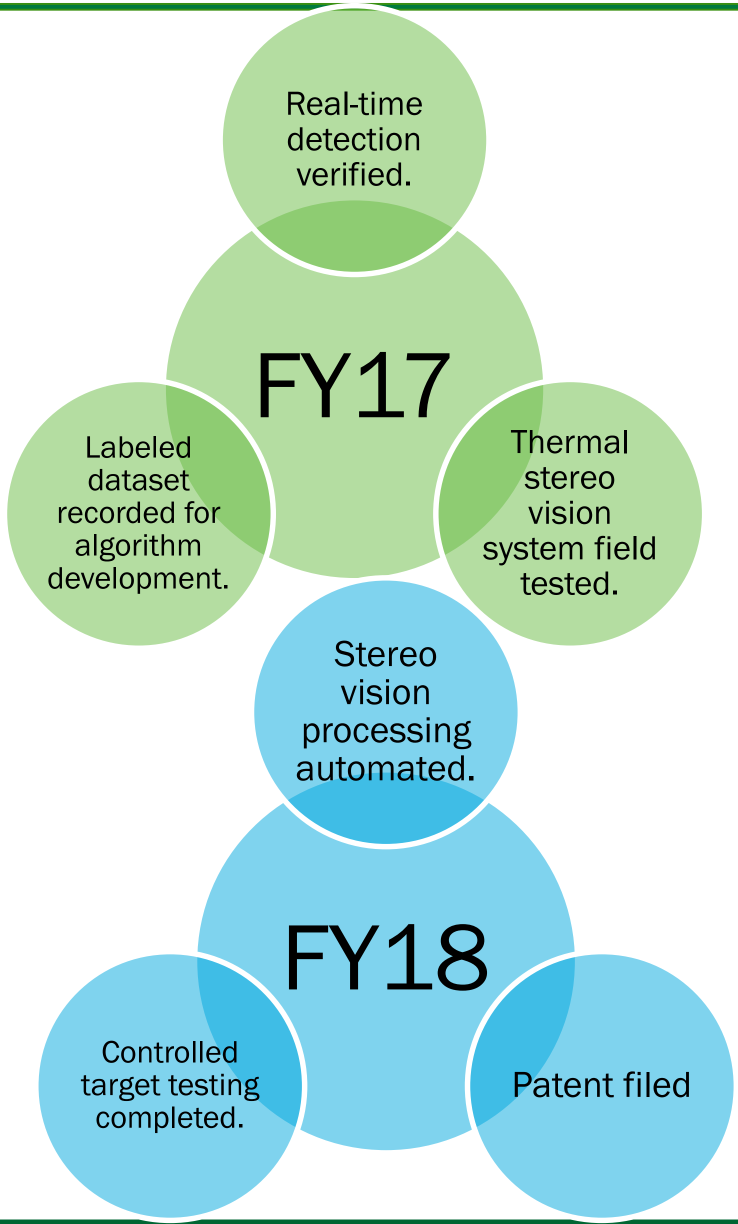




Accomplishments and Progress

- **Avian Remote Sensing**

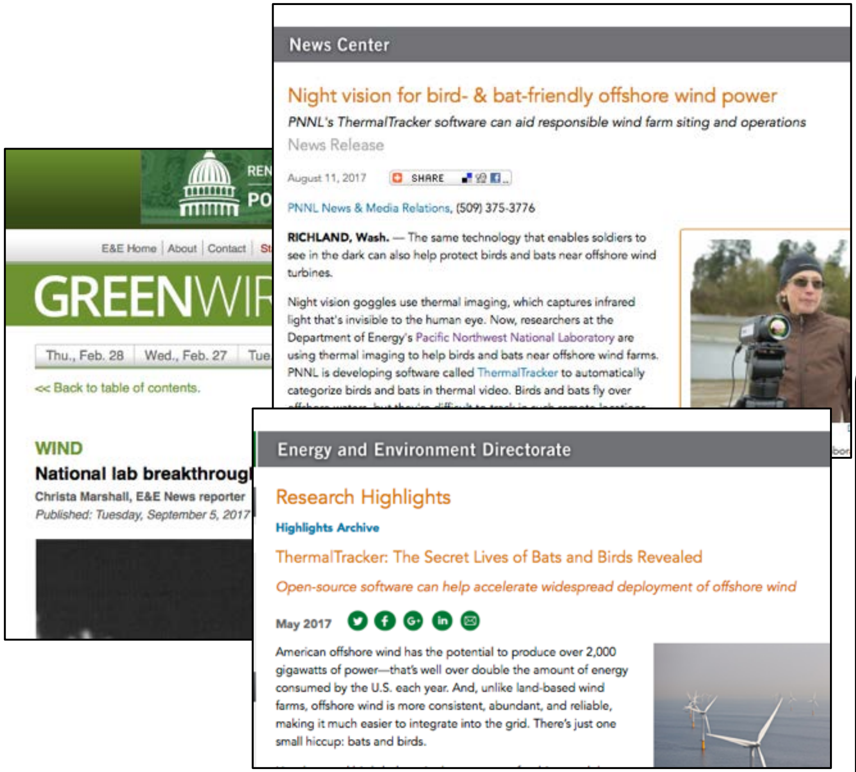
Prototype system field tested

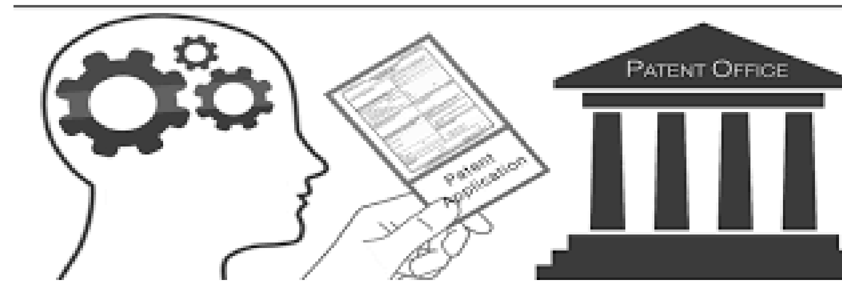


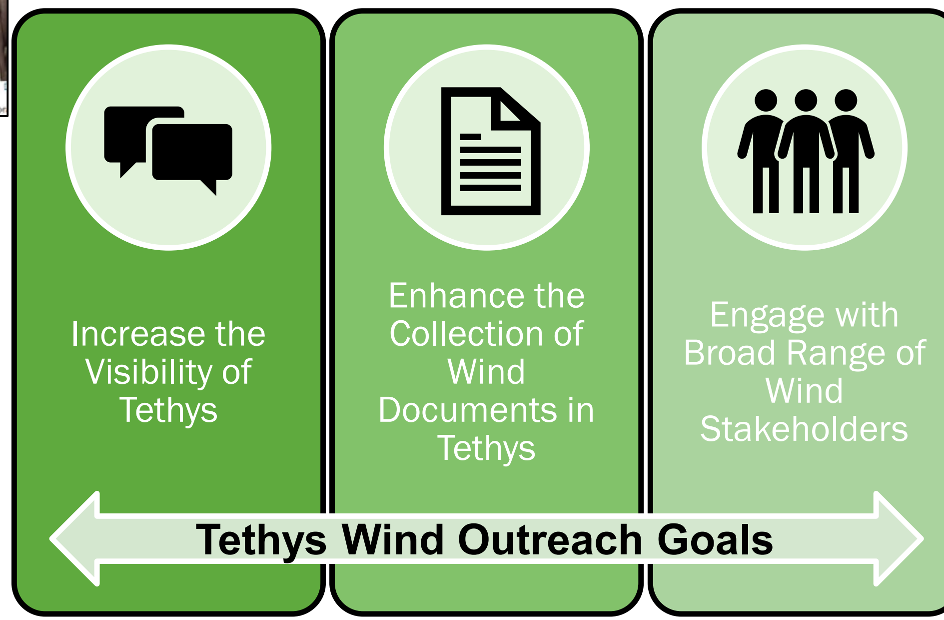
Automated stereo processing accuracy verified

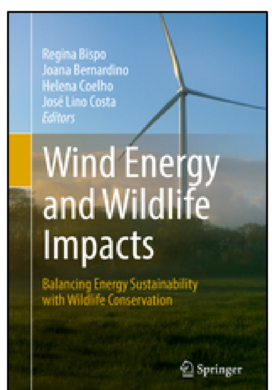
Controlled Target Test	Human-matched distance (m)	Algorithm-matched distance (m)	Difference (m)
1	28.43	28.55	**0.12**
2	31.96	32.15	**0.19**

Communication, Coordination, and Commercialization









NWCC WIND WILDLIFE RESEARCH MEETING

Conference on Wind energy and Wildlife impacts

Upcoming Project Activities

WREN

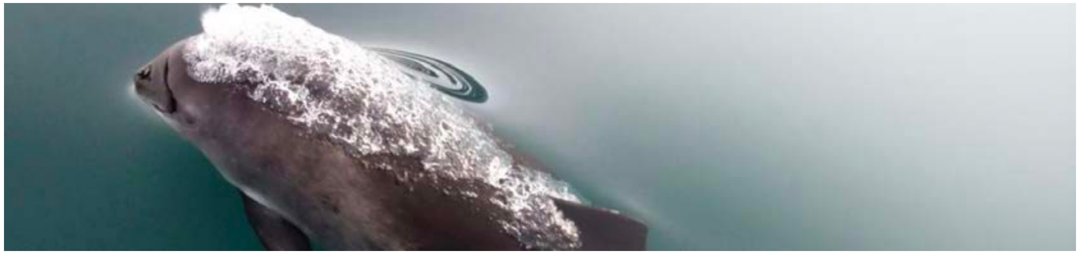
During FY19 we expect to:

- Publish WREN white paper on risk-based management
- Work on two other white papers on cumulative effects and “green versus green”
- Addition of Belgium as 12 WREN Member

- Second phase of WREN ends in 2020; expect to request a 3rd phase from IEA Wind

Tethys

- Tethys collection, curation, and dissemination of literature will continue
- Moving Tethys to a new platform (Drupal 8) for increased functionality
- Continue to support WREN, in collaboration with NREL



Upcoming Project Activities

Avian Remote Sensing

- Species classification from features using stereo vision
  - estimate wingspan, body length
  - flight speed, height

- Field testing at NREL's National Wind Technology Center
  - validate 3D tracking with drone
  - endurance test of system reliability