ML 2018 Project Abstract
For the Period Ending June 30, 2023

PROJECT TITLE: Detecting and Monitoring Invasive Phragmites
PROJECT MANAGER: Joe Knight
AFFILIATION: Forest Resources, College of Food, Agriculture, and Natural Resource Sciences
MAILING ADDRESS: 115 Green Hall, 1850 Cleveland Ave
CITY/STATE/ZIP: St Paul, MN 55108
E-MAIL: jknight@umn.edu
WEBSITE: https://mitppc.umn.edu/research/research-projects/detection-and-monitoring-invasive-phragmites
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 2018, Ch 214, Art 4, Sec 2, Subd 6a

APPROPRIATION AMOUNT: $203,781
AMOUNT SPENT: $203,781
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

Through this project, we determined that Uncrewed Aircraft Systems (UAS; "drones") can be used to map invasive Phragmites stands with high accuracy and that the potential exists to identify previously unknown Phragmites patches, and to monitor known patches, using widely available remotely sensed data such as aerial imagery and lidar.

Overall Project Outcome and Results

European common reed grass (*Phragmites australis* subsp. *australis*) is an invasive wetland grass that forms dense stands of up to 15 feet tall. It reduces habitat quality for native fish, insects, plants and birds; decreases biodiversity; and can alter water chemistry and topography. Both the invasive and a native subspecies of *P. australis* occur in Minnesota. Future management of non-native *Phragmites* will depend upon knowing where it is in the landscape. Monitoring large, remote areas of the state can be difficult and expensive. Remote sensing technology offers a new opportunity for monitoring populations more easily over time.

This project took advantage of state-of-the-art, high-resolution satellite imaging to remotely detect non-native *Phragmites* in the Minnesota landscape. Researchers found that drones and machine learning can be used to accurately map invasive *Phragmites* stands. It is possible to identify previously unknown *Phragmites* patches and to monitor known patches. Drones are able to capture the structural differences between *Phragmites* and other species at specific times of the year.

The team used widely available aerial imagery and LiDAR to develop a state-of-the-art workflow using a combination of Object-Based Image Analysis (OBIA) and machine learning (ML) algorithms that led to highly accurate detection of *Phragmites*. For land managers, the process of mapping an area for *Phragmites* could take place in a day or less with the appropriate technology and imagery. This makes detecting and monitoring the invasive species in difficult terrain much more accessible than it was previously.

Project Results Use and Dissemination

Four peer reviewed publications have derived from this research project. All peer reviewed publications are permanently archived. Multiple public presentations were made through the UMN Extension program, as well as industry events, and academic conferences. A full listing may be found on the MITPPC webpage dedicated to this research project.