Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID:**   **116-C**

Strengthening Natural Resources Management with Drone Training

Category: C. Environmental Education

Total Project Budget: $ 132,000

Proposed Project Time Period for the Funding Requested: 2 years, July 2018 to June 2020

Summary:

The goal of this project is to provide training to enable natural resource professionals to effectively use drones in restoring, protecting, and managing natural resources.

Name: Joseph   Knight

Sponsoring Organization: U of MN

Address: 1530 Cleveland Ave N, 115 Green Hall

Saint Paul   MN   55108

Telephone Number: (612) 625-5354

Email jknight@umn.edu

Web Address   rs.umn.edu

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Examples of drone imagery applications

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Strengthening Natural Resources Management with Unmanned Aircraft Systems ("Drones") Training

I. PROJECT STATEMENT

Goal: The goal of this project is to enable natural resource professionals to effectively use Unmanned Aircraft Systems, also known as **drones**, in restoring, protecting, and managing natural resources. The target audience is natural resource professionals who wish to use drones in their work and require training to fully incorporate this rapidly developing technology. This training is needed because:

- Drone operations are in high demand in natural resource applications such as forestry, agriculture, and wildlife management. The on-demand capability of drones allows for frequent, rapid collection of imagery.
- Natural resource professionals may not know how drones can be best used in their work. Projects at MNDNR, MPCA, SWCDs, county land management offices, and others could benefit from drone use.
- Drones are currently being deployed around the state without the necessary training in planning, operations, and compliance. Untrained deployments have a higher risk of failure, injury, damage, and law/rule violations.

The **outcomes** will be:

- Natural resource professionals who have been trained in how drones can be used in their specific work,
- Natural resource professionals who can plan, acquire, and use drone data,
- Web-based assistance for resource managers in using drones,
- Improved restoration, protection, and management of natural resources through proper use of drones.

Background/Justification:

Drone technology and applications have experienced unprecedented growth in recent years. Forest health and inventory, wildlife habitat surveys, precision agriculture, land use mapping, and wetland/water quality monitoring are examples of application areas that are rapidly changing due to the high temporal frequency and on-demand capability of drone data collection. In addition, drones have permeated the popular culture in the U.S. to an extent that would have been unimaginable just a few years ago. The U.S. Federal Aviation Administration (FAA) estimated that one million drones would be sold in the U.S. during the recent holiday season. The FAA's implementation of new regulations governing the integration of Unmanned Aircraft Systems into the National Airspace System has enabled rapid-growth in drone operations.

However, these regulations have specific requirements, including licensing of both the vehicle and the pilot, communications rules, operations notifications, flight procedures, and airspace considerations. Natural resource professionals desiring to use drones must be aware of the regulations and know how to comply with them. In addition, drone operations require specific knowledge of how to: safely plan flight missions, collect and process imagery, use the various hardware and software platforms, and use drones for appropriate applications.

Methods: The project will achieve its goal by:

- Developing training modules for introductory drone information, mission planning, data collection, data processing, applications, and compliance,
- Providing web-based training and reference information,
- Providing hands-on workshops around the state to deliver the training modules to natural resource professionals

1

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Prepare Training Modules and Website   **Budget: $50,000**

Six training modules will be developed for natural resource professionals using drones: 1. Introduction to drones, 2. Mission planning, 3. Data collection, 4. Data processing, 5. Applications, 6. Compliance. Modules will be tested with target audiences and refined for wider delivery. Components of the training modules as well as reference information will be maintained on the web for open use.

Outcome	Completion Date
1. Six training modules ready for delivery in workshops	January, 2019
2. Training and reference information for drones available on the web for all users	June, 2019
3. Natural resource professionals using training and reference information to enable effective use of drones and improved management of natural resources	June, 2020

Activity 2: Deliver Hands-on Training Workshops   **Budget: $82,000**

The six training modules will be delivered through hands-on workshops at locations selected to represent a range of areas and audiences throughout Minnesota. We will deliver each module at a frequency depending on audience demand during the project period. We expect an average of 15 participants per workshop. Pre- and post-workshop surveys of participants will assist in adjustment of training format and content.

Outcome	Completion Date
1. Natural resource managers who have received hands-on training in use of drones for resource management activities	March, 2020
2. Additional resource managers coached by workshop attendees in use of drone data	Jun, 2020

III. PROJECT STRATEGY
A. Funded Project Team
Joseph Knight, University of Minnesota, Project lead, instructor
Dan Heins, University of Minnesota, Drone Coordinator, instructor.
Trent Erickson, University of Minnesota, Information technologist.

Unfunded partner: William Mekeel, Riverland Community College; other community colleges as possible

B. Project Impact and Long-Term Strategy
This project will provide for healthier forests, cleaner water, and better estimates of wildlife habitat/populations by allowing natural resource professionals to safely, properly, and legally use drone vehicles and data in their work. This project will provide needed information through workshops and ongoing web-based content. Training materials from this project will be migrated to a public website for continued use after the project period. New natural resource applications of drone data will continue to be developed in agencies and the private sector. Guides to their use will be posted as they become available.

C. Timeline Requirements
The project will be completed in two years, as follows:
July, 2018 – January, 2019: Training module and web information development.
January, 2019 – March, 2020: Workshop delivery and evaluation, and continued web development.
March – June, 2020: Final evaluation and transition to long term web management.

2018 Detailed Project Budget

Project Title: Strengthening Natural Resources Management with Unmanned Aircraft Systems ("Drones") Training

IV. TOTAL ENRTF REQUEST BUDGET *2* years

| BUDGET ITEM	AMOUNT
Personnel:	
Joseph Knight, Project Manager and Instructor (75% salary, 25% benefits), 12% FTE for 2 years	$ 25,614.00
Dan Heins, Instructor (75% salary, 25% benefits), 50% FTE for 2 years	$ 66,750.00
Trent Erickson, IT Specialist (75% salary, 25% benefits), 25% FTE for 2 years	$ 24,636.00
Professional/Technical/Service Contracts:	N/A
Equipment/Tools/Supplies:	
General operating supplies and services (research consumables, publication costs)	$ 200
Acquisition (Fee Title or Permanent Easements):	N/A
Travel: Travel to/from workshop locations, assumes 12 trips for three days each: hotel, food, POV	$ 12,500
Additional Budget Items:	$ -
Laboratory fees for project personnel (instructor), $1000 per year	$ 2,300
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 132,000

V. OTHER FUNDS

| SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period: N/A	N/A	N/A
Other State $ To Be Applied To Project During Project Period: N/A	N/A	N/A
In-kind Services To Be Applied To Project During Project Period: N/A	N/A	N/A
Past and Current ENRTF Appropriation: N/A	N/A	N/A
Other Funding History: N/A	N/A	N/A

Strengthening Natural Resources Management with Unmanned Aircraft Systems ("Drones") Training

Importance of Drone Data and Training

Drone imagery and derived products are increasingly important for natural resource applications such as those below. Users must be properly trained before undertaking drone operations.
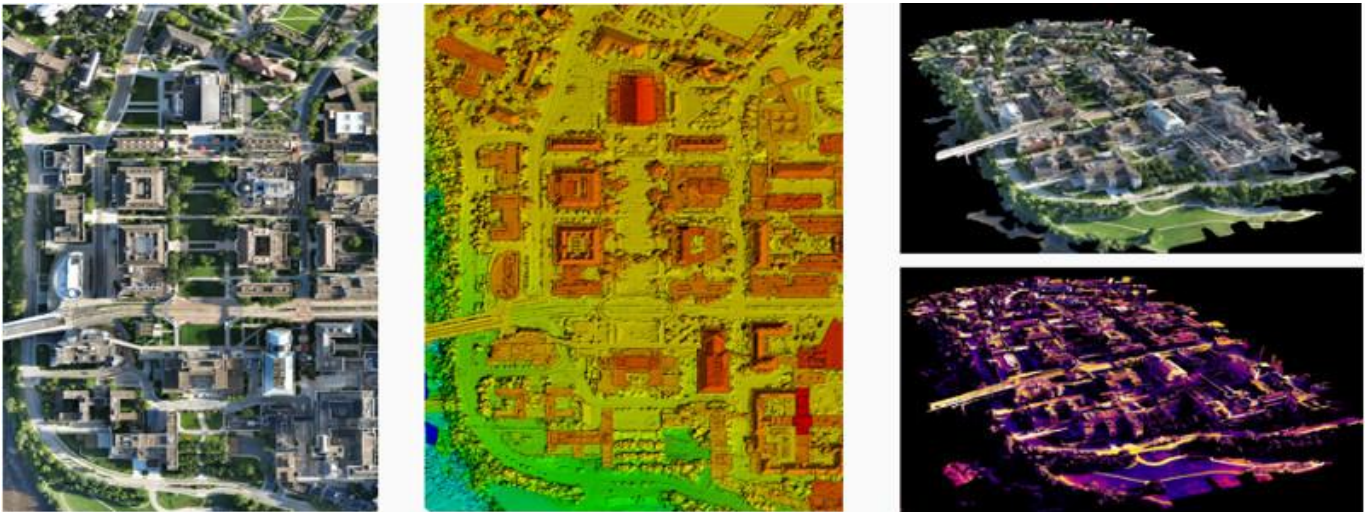
Drone imagery of the University of Minnesota's Twin Cities Campus. These images are being used for urban planning, greenspace management, urban forestry, and infrastructure planning.
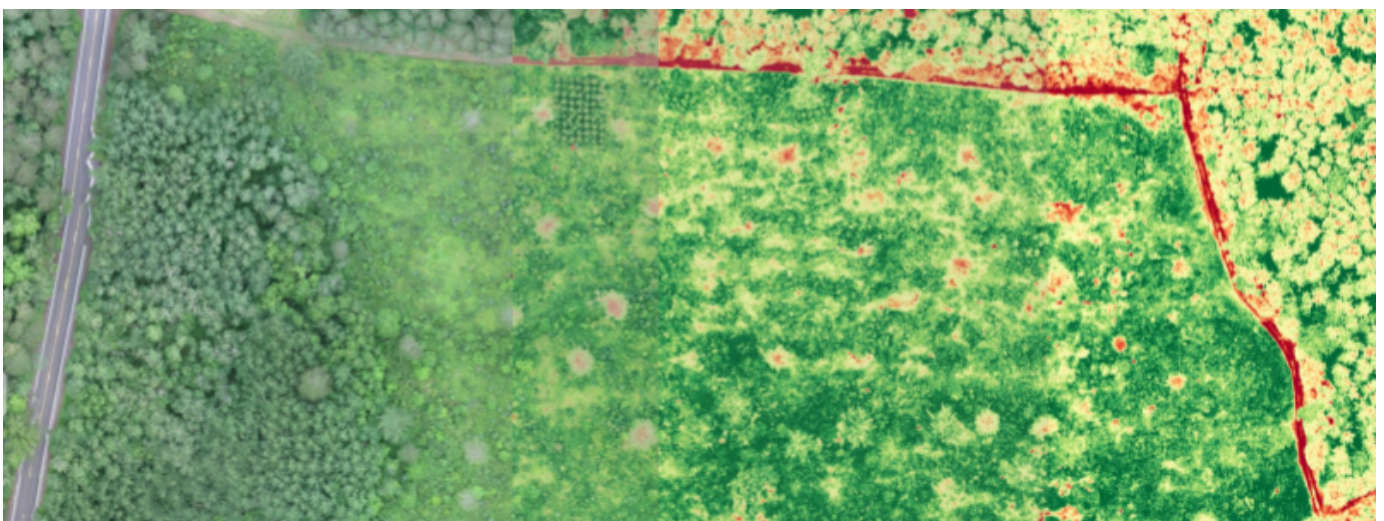
Drone imagery of a forested area, transformed to show tree health. These images are being used for forestry applications including harvest management, inventory, and stand treatments.

PROJECT TITLE: Strengthening Natural Resources Management with Unmanned Aircraft Systems ("Drones") Training

Institution Description

The flagship University of Minnesota Twin Cities is the state's land-grant university and one of the most prestigious public research universities in the nation.

- Our 3,800 faculty include members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, plus the American Academy of Arts and Sciences, among other bodies.
- Current and former faculty have won Guggenheim Fellowships, MacArthur Fellowships ("genius grants"), Nobel Prizes, and other significant honors.
- While nationwide the average time spent with an employer is four years, employees stay at the U of M for an average of eight years. They stay because they know their work matters.

Research: We seek new knowledge that can change how we all work and live. At the University of Minnesota, students do research alongside top professors in all majors.

Education: We prepare students to meet the great challenges facing our state, our nation, and our world. U of M students engage with your professors and fellow students from the very beginning, and develop strengths with beyond-the-classroom experiences.

Outreach: We apply our expertise to meet the needs of Minnesota, our nation, and the world. We partner with communities across Minnesota to engage our students, faculty, and staff in addressing society's most pressing issues.

Remote Sensing and Geospatial Analysis Laboratory
The facilities of the Remote Sensing and Geospatial Analysis Lab (RSGAL) include up to date hardware and the relevant software for image processing and geospatial analysis, as well as a wide array of ancillary and supporting equipment. Lab hardware includes: Twelve workstation class computers, servers, GPS receivers, spectroradiometers, and a SenseFly eBee UAV. A suite of applications software provides state-of-the-art capabilities for image processing, mapping, modeling, statistical analysis, and visualization.

Project Leader Qualifications

Joseph Knight is an Associate Professor of Remote Sensing in the Department of Forest Resources at the University of Minnesota, Twin Cities. Dr. Knight studies how changing land use affects both natural resources and humans. He uses geospatial science methods such as remote sensing, image processing, and geographic information systems (GIS) in applications such as: identifying and characterizing natural and anthropogenic landscape change to assess impacts on natural resources, wetlands mapping and characterization, describing landscape-human interactions that lead to exposure to infectious diseases, and thematic accuracy assessment methods development.