**PROJECT TITLE: Wetland and Forest Change Monitoring**

**I. PROJECT STATEMENT**

We are proposing to develop an automated remote sensing change detection system to efficiently detect wetland and forest cover change on an ongoing basis, which will greatly enhance our ability to respond to natural resource challenges as well as improve our ability to maintain critical natural resource spatial information. The threats to these resources, such as invasive species and extreme weather events, require a more dynamic assessment approach to complement the more detailed wetland and forest resource inventories. This approach will not only enhance our ability to identify emerging threats, but will also improve the effectiveness of our data stewardship for foundational natural resource inventories for both wetlands and forests by targeting updates to areas where change is occurring.

A traditional approach to land cover change detection using photo-interpretation of aerial imagery is sound, but labor-intensive. New methods taking advantage of low-cost (or no-cost) satellite data, including Landsat and Sentinel systems, combined with the computing power of cloud-based systems, such as Google Earth Engine or Amazon Web Services, can augment traditional approaches allowing the state to produce and deliver more dynamic wetland and forest inventory data. Additionally, developing and operating an integrated approach to tracking change for both wetlands and forests is more cost-effective than two separate systems.

This project will develop an automated remote sensing change detection system to identify potential changes in wetland and forest cover that can:

* identify the location and extent of potential wetland and forest changes,
* enable the assessment of the effectiveness of management efforts and state policies for wetlands and forests,
* aid in a rapid response to change events such as floods, blowdown, and invasive species,
* provide information about water level changes over time, and
* help focus updates of more detailed wetland and forest inventory information on those areas showing change.

**II. PROJECT ACTIVITIES AND OUTCOMES**

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| **Activity 1 Title:** *Developing an automated detection procedure for wetland and forest change* | **ENRTF BUDGET:** **$275,000** |
| **Description:**The DNR will work with the University of Minnesota to develop a cost-effective change detection procedure utilizing time series analysis of satellite imagery. This will involve compiling existing field and ancillary data as well as evaluating alternative cloud-based computing platforms, remote sensing data sources, and classification procedures. DNR staff from Ecological and Water Resources as well as Forestry will help define the requirements for the preferred alternative including cost, accuracy, and feasibility. The selected alternative will be developed into a full-scale, statewide procedure. |

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| **Outcome** | **Completion Date** |
| *1. Evaluate cost-effectiveness of various automated change detection alternatives* | *July 2021* |
| *2. Develop, test and implement a full-scale method for the preferred alternative* | *July 2022* |

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| **Activity 2 Title:** *Turnkey training and procedure evaluation* | **ENRTF BUDGET:** **$175,000** |
| **Description:**Subsequent to the completion of activity 1, the University of Minnesota will hand-off the final procedures including documentation and programming code to the DNR. DNR staff will undergo turnkey training to implement this change detection procedure on an ongoing basis. In addition, the DNR will conduct a comparative analysis between the new procedure and existing legacy procedures. |

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| **Outcome** | **Completion Date** |
| *1. Provide turnkey training to DNR data stewards* | *January 2023* |
| *2. Report on comparative analysis between the new change detection procedure and legacy change procedures* | *June 30, 2023* |

**III. PROJECT PARTNERS AND COLLABORATORS:**

The project team includes:

* Steve Kloiber (MNIT@DNR) – Project manager and wetland monitoring and analysis coordinator
* Joe Knight (University of MN) – Principal investigator, procedure development
* Jennifer Corcoran (DNR – Resource Assessment Program) – Turnkey program lead

Project management will be provided through the wetland program of the Division of Ecological and Water Resources. The Resource Assessment Program within the Division of Forestry will serve as the home for the final products. Roles and relationships of the two divisions will be formalized through a service level agreement. Both divisions will serve in an advisory role to the University during the methods development activity. The University will receive $250,000 for their role in this project. The remaining $200,000 will be used to support service level agreements with MNIT@DNR and the DNR Resource Assessment Program.

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

The DNR is committed to ongoing support and data governance for wetland and forest inventory and change monitoring data. This project will help facilitate long-term maintenance of foundational natural resource data needed for effective natural resource protection and management. The long-term operation of the program will be funded from a combination of efficiencies gained and other funding sources.

**V. SEE ADDITIONAL PROPOSAL COMPONENTS:**

**A. Proposal Budget Spreadsheet**

**B. Visual Component or Map**

**C. Project Manager Qualifications and Organization Description**