BUDGET NARRATIVE: Evaluating drone and associated technologies for more efficient monitoring and restoration

The budget in this proposal is based on providing various packages of WWA staff, UWSP academic personnel, and consulting on emote imagery expertise from Stantec. The compositions and relative effort of each of these components of the team will change of the 5 year duration of the program, tailored specifically to the phased objectives described in the project narrative. It assumes two drones will be purchased, with different sensor packages to capture the technical data needed for the three types of purposes on this proposal. Inflation is incorporated at 3.5% per year.

Personnel Costs

WWA staff will manage the contract and provide ground-truth data for each pahse of the project. They will review and revise draft reports and submit to NRCS. They will establish a drone program to meet the objectives in the project narrative.

Personnel costs	Salary	% effort	Funds requested for five year program*
Bruce Ross - Executive Director. Management oversight to ensure project delivers on goals and staff executing efficiently. Estimated at 10 hours / month	$ 62,608	6%	$ 19,369
Peter Ziegler - Project Leader--Weekly oversight to ensure efficient implementation of project and submission of milestone reporting. Estimated at 12 hours/month Note:	$ 62,608	7%	$ 23,243
TBA - project coordinator - Drone pilot - ecologist. 50% effort to manage the prototype development program and work with contractors to meet time, shcedule, performance requirements. Note other 50% of time will be under existing WWA contract with NRCS for CRP and WREP monitoring contract	$ 75,000	38%	$ 154,687
WWA Ecologist Anna Rzchowski - Responsible for site visits and follow-up reporting. Actual effort will be spread out over all WWA ecologists, collectively responsible for .3 FTE of effort.	$ 62,608	10%	$ 32,282
Kelcy Boettcher - Administrative Director - responsible for monthly invoicing, consolidating reporting. Estimated at 8-10 hours per month	$ 62,608	5%	$ 16,787
Total Personnel costs			**$ 246,368**

Notes:

1. Personnel costs include 7.5 % employer SS and state unemployment insurance.

Fringe Benefits

Fringe benefits are estimated at 10% of personnel costs.

b. Fringe Benefits	Funds requested for five year program*
Fringe benefits = 10% of salary	$ 24,636.75

Travel Costs

WWA Budget Narrative: "Evaluating drone and associated technologies for more efficient monitoring and restoration"

Travel will be necessary to meetings for coordination (6 per year), sites for field testing (10 per phase) and conferences (2/year) for remote sensing technology.

c. Travel	Funds requested for five year program*
Travel to sites for beta testing protoype program 20/yr @100 miles	$ 7,132
Conferences (2x year) @ $1500 confernce fee+$1500 travel costs + 3x$166perdiem	$ 29,472
In-person meeting (6x year) @ 150 miles R/T	$ 3,209
TOTAL Travel Costs	**$ 39,814**

Equipment

Two drones are expected to be purchased during this five-year project period, with different sensor payloads. The DJI Matrice Drone is used for cost estimates as it is current state of market drone that can meet the specifications for this project. However, better technology may be available when this project is implemented.

d. Equipment	Funds requested for five year program*
DJI Matrice 350 RTK Agriculture Package + 10% maintenance/year	$ 38,380
DJI Matrice 300 with LIDAR hi-Res payload package	$ 39,716
Software subscriptions to support multi-spectral analysis @$730/year	$ 3,915
Software subscriptions to support multi-spectral analysis @$1500/year	$ 3,154
TOTAL Equipment Costs	**$ 85,165**
Note that Ssoftware has been included as Equipment since it will a package purchase	

Supplies

e. Supplies	Funds requested for five year program*
Laptop computers (2) to support software analysis	$ 6,050
TOTAL Supply Costs	$ 6,050

Contractual

- UWSP will provide consulting services based on the current work in evaluating drone-captured imagery on wetlands and upland areas. At least two professor researchers will be engaged at various times to bring both vegetative and soil expertise, to design and guide the evaluations, and to supervise research assistants that will be supporting the effort and collecting field data.
- A deeply experienced remote sensing and analysis company will be

f. Contractual	Funds requested for five year program*
UWSP - Professor (possibly two different professors at different times in the project) acting as the research coordinator; They would develop the methodology and tools to interpret the data captured by the drones in each phase of the project, and guide research assistants. They would develop the evaluation methodology and overee the data collection, analysis and evaluation reporting ($120,000 fully loaded for 1000 hours)	$ 71,000
UWSP - Grad student assistant. Under the guidnce of the research director these research assistants would develop practices and guidleines for each pahse, collect ground truth data and draft reports for reveiw (2000 hours at $25 /hour over 4.5 years).	$ 57,500
Stantec Consultant team- drone pilot program development; Working with WWA, develop a knowledge transfer program (documentation plus actual hands-on training) for drone piloting training and certification preparation ($85000 / year for 9 months, then available for on call consulting at $4000 per year	$ 74,500
Stantec Consultants - Remote sensing hyperspectral consultants (2). Working with the Research director and WWA, provide insights and experience to shape the development of the drone programs outlined in the project narrative for CRP and WREP monitoring- ($130000 fully loaded salary for 15 months over two-1/2 years)	$ 162,500
Stantec Consultants - Remote sensing wetland restoration consultant - Working with the Research director and WWA, provide insights and experience to shape the development of the drone programs outlined in the project narrative for wetland restoration - ($140,000 fully loaded salary for 14 months spread over 2-1/2 years)	$ 163,500
TOTAL Contractual	$ 529,000

selected to work with WWA to identify and transfer the technology. Stantec was approached to support this initiative and would be a valuable partner with deep and broad experience in remote sensing technology an analysis. However, contractual agreement would need to be reached to bring them aboard this program—they have not been pre-selected. The selected company will provide consulting services for bringing their pre-existing remote sensing expertise to this project and knowledge transfer of that expertise to develop an ongoing program for NRCS. Three distinct roles are envisioned: Consulting on the development of hyperspectral imaging to evaluate CRP and WREP properties; Consulting on remote sensing elevation technologies (LIDAR, etc.) to establish a wetland restoration approach using drones; and drone piloting training and program development. Prices are high for such a service as the company is essentially transferring the knowledge to reduce their possible future market share.

Construction

No construction expenses are anticipated.

Other direct charges

- Insurance (General Liability insurance increment, and worker's compensation) is expected to be $3500 per year.
- High speed Internet service - $50 / month for ecologist's home office plus
- MS Office suite at $100 / year annual subscription and miscellaneous software required to support the analytical component of the project at $423 per year
- Phone service - $75 / month.

h. Other Direct expenses	Funds requested for five year program*
Insurance (General Liability insurance increment, and worker's compensation) is expected to be $1500 per year.	$ 18,769
Miscellaneous office suite and analytical software subscriptions	$ 1,003
Phone service - $100 / month and Highs speed internet	$ 11,261
TOTAL Direct Costs	$ 31,033

Indirect charges

WWA will charge a de minimus indirect cost rate of 10%. This is based on the modified direct total cost method where contractual costs for the purpose of calculating indirect costs is limited to $25,000/sub-award.

h. Indirect calculation (MTDC)	Total direct costs	Modified TDC
WWA Salaries and Wages (including fringe)	$ 310,818	$ 310,818
Materials and supplies	0	$ -
Equipment	$ 85,165	$ 85,165
Subaward - Contractual - UWSP	$ 128,500	$ 25,000
Subaward - Contractual - Stantec	$ 400,500	$ 25,000
Total Indirect costs		$ 44,598

TOTAL PROGRAM COSTS

Total NRCS investment for the five-year program would be $1,002,000

WWA Budget Narrative: "Evaluating drone and associated technologies for more efficient monitoring and restoration"

Appendix A: Resumes

Bruce Ross, WWA Executive Director
After retiring from active-duty senior military officer service to live in Wisconsin, Bruce held program management and executive positions in the avionics and insurance industries in the southeast corner of the state. He has been with WWA for the past 5 years.

Kelcy Boettcher, WWA Director of Administration
Kelcy has worked for WWA for 21 years, taking on the role of Director of Administrative Services over 18 years ago. She manages the organization's books and administers federal and state-level grants and cooperative agreements for WWA.

Peter Ziegler, Director of Habitat for Wisconsin Waterfowl Association.
Peter has over 20 years working in the habitat restoration field across the upper Midwest. He completes property analysis, technical work, permitting, contracting and cost share associated with habitat restoration projects across the state for private landowners, non-profits, governmental agencies and commercial businesses. He has designed restoration plans for small to large wetlands, stream realignments, and associated floodplain wetlands. Peter holds a BA from Luther College and has completed the following professional training related to this work: Wisconsin Wetland Restoration Workshop Conservation Delivery, 2011. Wetland Training Institute; 2009-US Army Corps of Engineers Wetland Delineation Certification and Lakeshore Habitat Restoration Training for Professionals, 2014.

Anna Rzchowski - Anna fills WWA's full-time Public Land Ecologist role, and works alongside Peter Ziegler in both of our public and private land restoration programs. Her focus is on identifying restoration candidates on DNR properties, then planning and overseeing the restoration itself. Anna also coordinates a new WWA initiative to provide monitoring and maintenance planning for private land wetland easements and CRP alongside the Natural Resource Conservation Service.

University of Wisconsin- Stevens Point

Benjamin Sedinger - Assistant Professor, University of Wisconsin-Stevens Point (July 2019-Present)
Ben Sedinger grew up in Fairbanks, Alaska, where he developed a passion for wildlife and the outdoors. He honed this passion into a career during his university studies in Reno, Nevada, and while working on ecological research projects around North America. Ben is especially

interested in waterfowl ecology and using quantitative tools to advance the conservation of wildlife and the habitats they rely on.
Research Interests: Wildlife population ecology; Harvest dynamics; Life-history evolution; Quantitative ecology.

Bryant Scharenbroch - Associate Professor - Soil and Waste Resources
University of Wisconsin-Stevens Point
Ph.D. Soil Science - University of Wisconsin-Madison
M.S. Plant Science - University of Idaho
B.S. Urban Forestry and Forest Management - University of Wisconsin-Stevens Point

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Stantec (by way of validating proof of concept)

In building this proposal, WWA discussed the state of technology to support this effort with environmental consulting company Stantec. It was important to understand where the realm of the possible and relative costs associated with bringing this idea to life. WWA is not considering sole-sourcing Stantec but wanted to ensure the project is feasible. It is possible.

Stantec is a world leader in advancing remote sensing technology. They have over 150 drone pilots, scores of remote s experts and ecologists, and dozens of technologies from synthetic aperture radar to LIDAR and multispectral image capture payloads. Their remote sensing and environmental specialists have developed an approach to combining high-resolution image datasets with object-based image analysis for more accurate and efficient monitoring. These include determination of vegetation encroachment of power lines, and monitoring construction effects to wetland soils and vegetation otherwise not possible to provide a reliable and complete picture of wetland hydrology across the landscape.

A relevant example: Stantec's Carbon WATCH technology calculates carbon stocks in carbon dioxide equivalents (CO_2e) contained within plants and soils using earth observation datasets that include high resolution imagery and multibeam LiDAR elevation data to classify individual species types such as trees, shrubs, and herbaceous communities. Such
imagery and data collected by unmanned aerial vehicles (UAVs) can be analyzed using ObjectBased Image Analysis (OBIA). OBIA is a form of artificial intelligence that breaks down images into objects using color, texture, shape, size, and proximity charact eristics. Project-

specific features are then identified and defined that have either been previously ground truthed or can serve as a basis for focused field verification. This helps identify native and nonnative vegetation species for environmental assessments.