Oregon Department of Transportation

Research Stage 1 Problem Statement

Number 26-23 – "UAS for Vegetation Management"

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

Invasive weed management is a significant challenge in natural areas owned by state agencies as traditional methods are labor intensive, and often environmentally damaging. This project aims to explore the use of Unmanned Aerial Systems (UAS) equipped with (1) multi spectral imaging for the identification and quantification of invasive weeds in natural areas owned by the Oregon Department of Transportation. (2) Use of UAS to apply herbicide to noxious weeds within the natural area. These two systems will work in tandem to create a solution that will manage weed population with precision, reduce labor costs for spot spraying, mitigate environmental disturbance to sensitive areas and monitor natural areas for vegetation management.

2. What **final product or information** needs to be produced to enable this research to be implemented?

To enable this research into implementation, there are two objectives that need to be studied and refined. When collecting multispectral imaging hardware on the UAS, post processing to precisely identify vegetation types will need to be refined and validated using a small number of control sites. Growing conditions through the season, varying light and weather during collection will also be considered tested. This method will allow ODOT to evaluate and monitor new sites pre and post weed mitigation.

Programming the spot spraying system to automatically apply herbicides based on real-time weed identification collected by multispectral images will need to be tested for accuracy and ease of use. In addition to effectiveness of spraying the targeted weeds, evaluation of overspray and avoiding non-invasive weeds will need to be done. The overall environmental impact of both traditional and UAS methods should be explored for future decision making. A cost and efficiency assessment will also be conducted and produced in a final report.

3. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

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Allison Cowie	Wetland Specialist – Region 4 Environmental	Allison.Cowie@odot.oregon.gov	541.410.1696
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4. Decision making lenses

Please complete the following three sections. Your answers to these questions will be applied on a programmatic basis to support agency decisions. Answering yes to the questions below is not required. Resolving a narrowly focused technical research problem may meet agency needs without answering yes to any of the following questions. The ODOT Research Section will seek a balanced portfolio some projects will answer yes to one of the three categories below (e.g. climate, equity, and/ or safety) and other projects in a different category.

We are looking for an overall program balance and no one project is expected to balance all categories. Generally, a research problem statement is expected to be able to answer yes with clear and verifiable information in only one of the three categories below, some projects may be able to answer yes in two or even three categories. Some projects (i.e. needs focused on specific elements of infrastructure design), may have no yes answers but may still be high value research need.

Climate

Oregon recognizes the climate crisis and makes systemic changes to reduce emissions caused by travel. Every mile driven in Oregon is powered by a clean source of fuel. We seek research that supports construction and maintenance operations are carbon neutral and investments in mobility that support travel by low and no emission modes. While every research project may not result in a reduction in emissions, transportation investments overall support emission reductions to achieve state goals. Oregon envisions a transportation system that is resilient in the face of seismic and climate events and impacts to the degradation of the natural environment are reduced. Our vision includes a transportation infrastructure is built in a way that avoids impacts on key habitat and results in better environmental conditions for wildlife and native vegetation. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4f. Will addressing the **transportation issue** identified as a need in Question 1 develop, or validate methods for the estimation, measurement, or monitoring of transportation generated greenhouse gasses (GHG)?

☐Yes ☒No ☐Unsure

4g. If climate or GHG is not the focus of this **transportation issue** identified in this problem statement, will the research apply a GHG analysis to transportation infrastructure, planning, operations, maintenance, or materials?

☐Yes ☒No ☐Unsure

4h. Will the addressing the **transportation issue** include development or testing of construction practices, methods, or materials to establish potential reductions in greenhouse gas emissions?

☐Yes ☒No ☐Unsure

4i. Will the solving the **transportation issue** in question 1 study or support the reduction of vehicle miles traveled and single occupancy vehicle travel or support transition to electric vehicles (or other types of zero emission vehicles) or low-carbon alternative fuels?

☒Yes ☐No ☐Unsure

4j. Will the solving the **transportation issue** in question 1 lead to work that will support, measure, monitor, transportation system resilience in response to expected climate events, effects, or natural disasters in general?

☐Yes ☒No ☐Unsure

4k. Will the solving the **transportation issue** in question 1 lead to work that may result in better environmental conditions for wildlife and native vegetation ?

☒Yes ☐No ☐Unsure

4l. If you answered yes to any of the climate questions above or can provide alternative details related to climate, please provide additional information:

This project will reduce the number of visits to a given site as the herbicide application would be done much more efficiently. This method of herbicide application would allow ODOT to evaluate, manage and monitor native vegetation which will be beneficial to local wildlife.

Equity

Equity can have many dimensions and impacts relating to communities, and transportation. It is important that problem statement proposals clearly explain in what capacities are equity dimensions or impacts being examined within problem statements. It is a goal of the OTP to "Improve access to safe and affordable transportation for all, recognizing the unmet mobility needs of people who have been systemically excluded and underserved. Create an equitable and transparent engagement and communications decision-making structure that builds public trust". Proposed research may have the intent of studying elements of this goal or apply analysis to specific transportation topics to ensure the resulting research recommendations is consistent with our equity goals. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan and Oregon Transportation Plan.

4a Is the **transportation issue** identified as a need in Question 1 specifically focused on transportation equity?

☐Yes ☒No ☐Unsure

4b If the **transportation issue** is not focused on transportation equity, will the primary topic be assessed for equity benefits or impacts within the research project?

☐Yes ☒No ☐Unsure

4c Is the implementation of potential findings from this research likely to directly involve participation from an identified group that would benefit from an equitable process or outcome?

☐Yes ☒No ☐Unsure

4d Is the intended final product or information expected to support ODOT's equity efforts (Including but not limited to supporting one of the equity related objectives of the ODOT's Strategic Action Plan or Oregon Transportation Plan) ?

☒Yes ☐No ☐Unsure

4e If you answered yes to any of the equity questions above or can provide alternative details related to equity, please provide additional information:

Vegetation management aligns with the Oregon Transportation Plan as listed in section 6.6. This proposal directly corresponds with Climate Resilience and Sustainability by preserving native vegetation.

Safety
Research outcomes may include interventions and countermeasures to prevent or reduce the frequency of crashes or other causes of transportation-related injury or death; or may include measures to reduce severity of injury (including prevention of death) after a crash or other injurious event. For definitions and details please review the equity vision, goals, and objectives of the ODOT Strategic Action Plan, Oregon Transportation Safety Action Plan and Oregon Transportation Plan.

4m. Will solving the **transportation issue** in question 1 support improving **safety culture** for either transportation workers or the traveling public?

☒Yes ☐No ☐Unsure

4n. Will the solving the **transportation issue** support improving safety through **healthy and livable communities**?

☐Yes ☒No ☐Unsure

4o. Will solving the **transportation issue** support improving safety through using **best available technologies**?

☒Yes ☐No ☐Unsure

4p. Will solving the **transportation issue** support improving safety through **communication and collaboration**?

☒Yes ☐No ☐Unsure

4q. Will the solving the **transportation issue** support improving safety through **investing strategically**?

☐Yes ☒No ☐Unsure

4r. If you answered yes to any of the safety questions above or can provide alternative details related to safety, please provide additional information:

This project is intended to create a safer and more efficient way to spot spray natural areas. This will reduce the human exposure to chemicals when spot spraying as well as reduce necessary labor to access these sites and problematic areas. This project will use the best available technology as UAS use has grown in versatility through the agency. By using multispectral imagery to evaluate and monitor sites,

collaboration and communication of these sites can be done visually, and in real time for decision making.

5. Other comments:

There are few if any contractors in the state of Oregon that are willing to spot spraying due to the labor and time involved. Current staffing at ODOT cannot support the workload necessary to mitigate invasive weeds in our natural areas. With the lack of contractors and internal staffing, a new innovative approach to vegetation management is necessary.

6. Corresponding Submitter's Contact Information:

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