



**REQUEST FOR PROPOSAL**

## **QUINAULT INDIAN NATION**

**Division of Natural Resources**

**PO BOX 189**

**TAHOLAH, WA**

**RELEASE DATE:**

**April 25, 2023**

## **Request for Proposal Wetland Unmanned Aerial System (UAS) Pilot Project**

**Due Date:** May 19, 2023

**May 19, 2023, 5:00 pm PST**

(Late submissions are not considered)

Submission Method: Via email, U.S. Mail, other delivery services or hand delivery.

Submission Address:

ATTN:

Ryan Allen

Procurement & Budget Specialist

*(Janice Martin, Greg Eide, Lauren MacFarland)*

Re: Proposal for Wetland UAS Pilot Project

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### **Who We Are**

The Quinault Indian Nation (QIN) is a federally recognized Indian tribe with a Reservation located along the Pacific Northwest Coast on the Olympic Peninsula. The QIN is a signatory to the Treaty of Olympia (1856) by which it reserved its right to take fish from usual and accustomed fishing areas (U&A), including the Queets, Quinault, Raft, Moclips, and Copalis Rivers, and the entire Chehalis Basin. Also included are many streams draining directly to the Pacific Ocean north of Grays Harbor. Accordingly, the QIN has a keen interest in ensuring its Treaty resources, including fish habitat and access to it, are protected in perpetuity.

### **Quinault Wetland Program Mission**

To manage, preserve, enhance and maintain wetlands and their associated ecological and cultural functions on the Quinault Indian Reservation (QIR) and, when possible, within the Quinault U&A for the benefit of the Quinault Indian Nation now and for generations to come.

### **Description and Introduction**

The QIR is located in the southwest corner of the Olympic Peninsula, approximately 35 miles north of the town of Hoquiam, Washington. The approximately 208,000-acre QIR is roughly triangular shaped. The base of the triangle stretches south to north from approximately the Moclips River to the Queets

River along the coastline of the Pacific Ocean. The apex of this triangle is Lake Quinault, which is within the QIR and held in trust by the United States for the QIN. The western boundary of the Reservation is defined as the low, low tide along the Pacific Coast, starting just north of Moclips, Washington and extending over 25 miles to the Reservation's northwest corner, located about two highway miles north of the Queets River Bridge. Much of the Reservation is within Grays Harbor County, but some northern portions are in Jefferson County. The QIR is largely surrounded by lands managed for timber production or other natural resource extractions. Other surrounding areas include those considered natural undeveloped lands such as the foothills of the Olympic Mountains. Bounded to the east and north by the Olympic National Forest and the Olympic National Park, to the west of the QIR is the Pacific Ocean.

Approximately 8.9% of the QIR is estimated to be composed of wetlands. The QIR wetlands provide essential and irreplaceable habitat for Quinault River Blueback (Sockeye salmon), Roosevelt Elk and numerous species of amphibians and waterfowl. The members and inhabitants of the QIR rely upon the continued health and productivity of these vital wetlands for a variety of traditional uses such as plant collection, fishing and hunting. These wetlands include unique natural landscapes and ecosystems that distinctly embody the beauty and resources of the Pacific Northwest coast. Climate change is an increasing threat to the important natural, economic, cultural, and individual resources on Reservation lands. Land ownership is diverse and therefore management of these valuable resources is paramount to the planning for future generations. Limited by the boundaries of its Reservation, the QIN cannot seek to relocate the village and offices outside of the boundaries, or move for adaptation, if and when the natural environment is threatened by changes.

## **Project Summary**

The Quinault Indian Nation (QIN) is interested in determining a methodology for inventorying, assessing and delineating between the forested wetland edge and the non-forested wetland edge within those areas consisting of intermingled mosaics of these vegetation compositions using Unmanned Aerial Systems (UAS or drones). We propose a hybrid approach to mapping wetlands to accomplish this objective. This approach includes pairing conventional ground-based observations with advanced remote sensing technology and mapping techniques to characterize wetland distribution and characteristics at multiple scales. Wetlands will be mapped using a hybrid approach, which includes QIN wetland documentation, UAS (drone) based remote sensing, and existing LIDAR data. Wetlands will be mapped and classified according to both Cowardin Classification and the QIN FMP as described below under the heading RFP to a degree suitable for the purposes of inventory, future planning and initiatives, and enhancement prioritization. The QIN is interested in determining an alternative and cost effective approach to wetlands mapping in areas difficult to reach.

## **Project Background**

In tandem with ground-based observations, we propose collecting multispectral imagery using an UAS. Multispectral UAS supports a common arrangement of bands (red, green, blue) which will produce high-resolution orthomosaic imagery of wetland sites. In addition, the UAS-based multispectral sensor supports two additional bands (red edge and near-infrared), which are designed to gather vegetation-

specific information. These bands also uniquely interact with water and saturated surfaces, making it possible to accurately define surface water extents. The image classification process requires training data from ground-based observations and a user background in landscape ecology to accurately interpret and classify plant species and habitat types (feature classification). The proposed classification has three groups: 1) features of a single image, 2) features of an image sequence, 3) semantic features of an observed scene. The first group includes features extracted from a single image. The second group consists of features of any kinds of image sequences. By incorporating the high-resolution multispectral imagery, we can supplement ground-based inventories conducted by QIN staff and comprehensively map habitats and invasive plant species, with seasonality considerations, throughout the Project area.

The benefits of collecting multispectral imagery extend beyond the current scope of work. These data and interpretations will continue to add value for years to come and may serve as baseline imagery for long-term monitoring. Collected information will be used as a planning and design tool, for the QIN.

The scope of services described below will serve to complete a pilot application.

## **Request for Proposals**

The QIN Division of Natural Resources (QDNR) is seeking a qualified firm to provide technical services to create a Wetland UAS Pilot Project (Project).

This Project will comprise several different project tasks including meeting, exchanging information, gathering and analyzing UAS remote sensing information gathered, and working together with QIN Wetland Specialist and other staff to compare results to existing data. Plant species composition, cover, density, biomass and height are structural components of wetland vegetation commonly used to quantify vegetative characteristics and often serve as indicators of wetland condition. Historically, surveys to delineate wetland edges within the QIR have consisted of laborious traversing of wetland landscapes, including time consuming and subjective ocular estimates of species type and cover.

The QIN Forest Management Plan (FMP) determines the line between forested wetland and non-forested wetland with different management protections. The forested wetland is defined as being any portion thereof that has, or if the trees were mature would have a crown closure of >30 percent. The non-forested wetland edge is defined as being any wetland or portion thereof that has or if the trees were mature would have a crown closure of <30 percent.

Cowardin Classification system for wetland types determines the dominant vegetation having a cover class of greater than or equal to 50 percent. There are three vegetation classes that will be used for this Project: 1) emergent, 2) scrub-shrub and 3) forested classifications. The herbaceous (emergent) wetland vegetation class according to Cowardin includes rooted herbaceous (non-woody stemmed) angiosperms, ferns, and fern allies (e.g. Equisetum spp.) that grow in wet soil, stand erect within this area. All water regimes are included except subtidal and irregularly exposed. The scrub-shrub wetland vegetation class includes areas dominated by woody vegetation less than 6 m (20 feet) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes except subtidal are included. The forested wetland vegetation class is characterized by woody vegetation that is 6 m tall or taller. All water regimes are included except subtidal.

For this Project, the forested wetland will consist of a dominant aerial cover of forested wetland defined by Cowardin and the QIN FMP. The non-forested wetland will consist of a dominate aerial cover of either or both emergent and or scrub-shrub as defined by Cowardin and the QIN FMP.

## **Project Area and Design**

A portion of Moses Prairie within the QIR has previously been field delineated along the west edge between the forested wetland and the non-forested wetland edges. The awarded Contractor, in coordination with QIN will draw a grid over a 25-acre portion of this area and take remote sensing imagery of the grid with a UAS at an agreed upon height at agreed upon intervals. Then compare accuracy of this area using the UAS compared to the field delineation area. An added benefit from this study will be the determination of color spectrums expressed, under certain analysis and conditions, within the sampled grid area of:

- obligate dominant wetland vegetation types (occurring within wetlands under natural conditions at an estimated probability > 99%) and
- facultative dominant wetland vegetation types (occurring in wetlands at an estimated probability of 67- 99%).

The forested understory is difficult to interpret during the summer and leafed-out portions of the year. Therefore, three separate sampling timelines will be incorporated within the Project. The pattern will be flown by the UAS and remote sensing data collected three times in the same year, in order to capture the extent and cover of different vegetative species as follows:

- Summer 2023 (July 1st through August 2nd) and
- Fall 2023 (October 1st through October 31st).
- Spring 2024 (April 1st through May 2nd);

The awarded Contractor will be determined based on their understanding, knowledge and ability to classify fine spatial resolution images using Object-Based Image Analysis (OBIA) techniques, which has proven more valuable for classifying fine spatial resolution images in wetlands than purely pixel-based mapping techniques (e.g., Pande-Chhetri et al. 2017; Zhang et al. 2018); and/or Structure-from-Motion (SfM) photogrammetry to create the orthomosaic image displayed in a color-infrared composite.

GIS datasets to be used by Contractor (either provided by QIN or to be found in the public domain):

1. One-foot-pixel-resolution, 4-band, and 2019 NAIP imagery. In addition, if requested, we can provide the high resolution, one-foot-pixel-resolution, 4-band version of the 2017 NAIP Imagery;
2. Field verification data [i.e., geotagged photos and United States Army Corps of Engineers (USACOE) wetland determination data forms] if available for the Project location grid.
3. Two soil surveys (i.e., Weyerhaeuser contracted in 1976 and the United States Department of Agriculture/Natural Resources Conservation Service, 2013).
4. LiDAR data for the pilot grid location, including Digital Elevation Model (DEM) derived hill shades, and canopy height model, including a hydrologically-enforced, DEM-derived, synthetic stream network.
5. United States Topographical maps in digital format, 2013; and
6. QIR Watershed information including Basin and Sub-basin information in digital format (USGS HUC watershed dataset).

## **Scope of Services**

### **Tasks and proposed workflow:**

**Task 1 – Project Management & Coordination:** The project team (QIN & the awarded Contractor) will meet to outline goals and objectives for this Project.

#### **Outcomes:**

- A collective understanding of intended data uses and suitable applications of our proposed outputs.
- Understanding of data acquisition and processing limitations.

**Task 2 – Desktop Analysis:** The awarded Contractor will conduct a desktop review of the existing wetland observations collected by QIN staff and perform a desktop analysis to recommend the 25-acre UAS grid layout location within the previously field delineated area of Moses Prairie.

#### **Outcomes:**

- Review the QIN field delineated area within the grid location.
- Identify potential wetland areas and compare to QIN known wetland locations to assess UAS grid location.
- Determination of the 25-acre grid layout for this Project will occur.

**Task 3 - Remote Sensing:** The awarded Contractor will acquire UAS imagery within the identified grid location within Moses Prairie and fly the grid with a UAS at an agreed upon height at agreed upon intervals as identified through the desktop analysis during the three identified periods in 2023.

#### **Outcomes:**

- High-resolution multispectral imagery of the selected sites.
- Classify wetland areas by HGM/Cowardin classes and QIN FMP as defined.
- Determine the percent cover of different vegetation communities, including invasive cover, and compare to QIN known wetland locations to assess accuracy.

**Task 4 – Reporting & Mapping:** The awarded Contractor will prepare a report and webmap which describes the methods and results of this Project. The Project team will also meet to review and comment on the desktop and remote sensing analysis.

#### **Outcomes:**

- Draft wetland inventory methods and discussion report as a Microsoft Word document (.doc)
- Final wetland inventory methods and discussion report cover form as an Adobe document (.pdf)

- GIS data for all mapped features

### **References:**

Adam E, Mutanga O, Rugege D (2010) Multispectral and hyperspectral remote sensing for identification and mapping of wetland vegetation: a review. *Wetlands Ecology and Management* 18:281–296

Durgan, S.D., Zhang, C., Duecaster, A. et al. Unmanned Aircraft System Photogrammetry for Mapping Diverse Vegetation Species in a Heterogeneous Coastal Wetland. *Wetlands* 40, 2621–2633 (2020). <https://doi.org/10.1007/s13157-020-01373-7>

Roshan Pande-Chhetri, Amr Abd-Elrahman, Tao Liu, Jon Morton & Victor L. Wilhelm (2017) Object-based classification of wetland vegetation using very high-resolution unmanned air system imagery, *European Journal of Remote Sensing*, 50:1, 564-576, DOI:10.1080/22797254.2017.1373602

Wei, Y., Zhu, X., Li, C., Guo, X., Yu, X., Chang, C. and Sun, H. (2017) Applications of Hyperspectral Remote Sensing in Ground Object Identification and Classification. *Advances in Remote Sensing*, 6, 201-211. doi: 10.4236/ars.2017.63015.

Zweig CL, Burgess MA, Percival HF, Kitchens WM (2015) Use of unmanned aircraft systems to delineate fine-scale wetland vegetation communities. *Wetlands* 35(2):303–309. <https://doi.org/10.1007/s13157-014-0612-4>

### **Additional Considerations:**

The goal of this solicitation is to select the best-fit provider of this service at a reasonable cost (not just at the least cost).

### **Instructions for Preparation of Proposal**

#### **1. General**

All consultants responding to this RFP shall provide sufficient information to fully aid a complete evaluation of the proposal.

#### **1. Required Information**

Consultant must present satisfactory evidence to the Nation indicating their ability to meet the scope of services:

##### **Section 1 –Firm Qualifications**

Provide an overview and history of the firm. Provide recent experience demonstrating current capacity, familiarity and expertise in providing the service requested of facilitating a process and developing a draft Plan. If you have written a prior management plan that relates to this project, please supply the plan with the application if publicly available.

##### **Section 2 – Qualifications of Staff**

Provide a summary of staff qualifications and experience. Provide resumes for the key project staff likely to be utilized in performing the scope of Services. The submittal shall include notice of any investigations or disciplinary action taken or pending by national or state regulatory bodies against the firm or individuals employed by the firm. Please include experience working in regionally relevant locations, working with Pacific Northwest wetlands, working with suitable drone equipment and multispectral sensors, possessing a current Part 107 drone pilot certification and suitable liability insurance, working with SfM and OBIA capable software, and climate change adaptation plans.

#### Section 3 – Familiarity/History

Provide a list of all relevant engagements the firm completed and key staff at the firm who worked on these engagements, for tribal or local government entities within the last ten (10) years. Illustrate how previous experience may be of benefit in the execution of the present scope of services. Please state if the firm has worked with wetland delineation in field and with UAS.

#### Section 4 – Proposal and Cost Estimate

Provide a general description of the consultant’s approach to assisting QIN with the scope of services requested. Describe the firm’s technical capabilities and the ability to comply with timelines, which include three seasonal UAS flights of the identified grid area and outcomes to be reviewed by QIN staff.

Provide a fee schedule for 2023 and 2024 for relevant services. Provide estimated timeline for proposed Project.

#### Section 5 – References

Provide a complete list of clients under contract for the last two (2) years. Provide at least three (3) references for which the firm has performed services within the past five (5) years that are similar to the requirements in the Scope of Services. At least one of the references should be from tribal or other government entities for work performed that is similar to that specified in this RFP. Provide the reference contact name, address, e-mail address, telephone numbers and a summary and date of the services provided.

### **Evaluation Criteria**

All responses will be evaluated with respect to the completeness of the information provided, relevancy to the scope of services, familiarity with both wetland and upland vegetation and experience delineating wetlands in the field. The following criteria will be utilized in the evaluation of the consultant’s proposal, in no order of no importance:

1. Project understanding and approach. Experience with similar projects involving tribal, local government and/or other governmental agencies.
2. Experience and capability of key staff assigned to this Project.
3. Ability to complete services in an appropriate time frame.
4. Submitted examples of experience with prior similar projects.
5. Reports from references
6. Cost of Project



## 7. Timeline for Project

### **Submittal Review**

An evaluation committee will initially review and score all written submittals based upon the evaluation criteria above. The QIN will contact and evaluate the Submitter references.

### **Ex Parte Communications**

Submitters should not communicate with the Quinault Business Committee or any QIN staff about this RFP, except with Lauren MacFarland (Environmental Protection Department Manager) in the event of need for clarification.

### **Miscellaneous**

The QIN's Indian Preference Policy applies (attached). The successful submitter will sign the attached Agreement with the QIN, obtain a QIN business license, provide a W-9, and submit certifications of required insurance coverage.

This RFP does not commit QIN to award a contract, to pay any costs incurred in preparation of a response to this invitation, or to procure or contract for services or supplies. Respondents will not offer any gratuities, favors or anything of monetary value to any employee, officer, or agent of the QIN for the purpose of influencing favorable disposition toward either their proposal or any other proposal submitted as a result of this RFP. The QIN reserves the right to accept or reject all or part of the proposal, or to decline the whole proposal, and to negotiate with the respondents to ensure QIN receives the appropriate deliverables within the required timeframe. Submissions become the property of the QIN and will not be returned.