**REQUEST FOR STATEMENTS OF INTEREST**

**Pacific Northwest Cooperative Ecosystems Studies Unit (PNW CESU)**

**SOI W912HZ-17-0006**

**PROJECT TO BE INITIATED IN 2017**

**Project Title:** Understanding avian flocks near and entering civil infrastructure for species of concern

Responses to this Request for Statements of Interest will be used to identify potential investigators for a project to be funded by the U.S. Army Engineer Research and Development Center (ERDC). Estimated funding for the first, 1-yr period is $48,000. Option year funding could be available for three additional years for a total project funding of $457,000 and a total period of performance of 5 years.

**Background:**

Habitat loss and fragmentation due to urban development is widely recognized as major cause of species decline worldwide. Changes in the ability of species to use the landscape and move through urban civil infrastructure can have profound impacts on native species communities. In urban environments as well as DoD lands, there are examples where civil infrastructure facilitates species dynamics in lieu of the prior, natural features of the landscape that are no longer present and cannot be fully recovered. The configuration of civil infrastructure can impact the mobility and predator-prey balance of species of concern. The DoD has been, and continues to be, interested in understanding avian dynamics near infrastructure. As part of this broad interest, the ERDC-EL is working with local partners to understand the behavior and dynamics that underlie bird collective motion ecology preceding roosting each night in a piece of infrastructure. The ERDC-EL hopes to use this information at civil infrastructure to inform potential, future conservation practices for species recovery in urban and DoD environments.

Despite extensive theoretical work, very little empirical data exists on the detailed movements, characteristics, decisions, and time-varying dynamics of bird flocks as they gather near and enter infrastructure for roosting, especially within the United States. One reason is that measuring the detailed, 4-D movements of individual birds constituting a flock is not straightforward. The trajectories of small, fast-moving individual birds can be hard to measure in 3-D and time (4-D). Further, birds may or may not be present during available field monitoring periods. Therefore, our understanding of bird movement, characteristics, decisions, and time-varying dynamics in these contexts is still very poor.

**Brief Description of Anticipated Work:**

The purpose of this research is to understand how flocks of Vaux’s Swifts, one of the fastest small birds in North America and a species of concern due to their range-wide population decline, organize and avoid predators and other stressors as they gather each evening for their entry into infrastructure for roosting, i.e., a chimney in this case. The study will use a location where the birds are present every day at twilight for approximately 3-4 weeks every September. The annual appearance of Vaux’s Swifts at known chimneys and dates in the Pacific NW provide a rare opportunity to measure flocks in their transition to roosting that would otherwise be far more difficult to execute successfully at unpredictable and ephemeral sites. Hypotheses will be generated based on how the measured bird flocks organize themselves and move into the chimney at the site. Such understanding could inform future management decisions involving infrastructure configurations in both urban and DoD installations such as Joint Base Lewis-McChord that is one of four Vaux’s Swifts roosts in the State of Washington designated as an official Important Bird Area (IBA), as this DoD property is a significant roosting site for migrating swifts. The initial agreement will be for 1 year, but additional years of effort are anticipated.

**Objectives:**

* **Objective 1:** Participate locally and collaboratively with researchers and assist with initiating and maintaining contact and communication with local, interested collaborators, sponsors, and other parties such as the USFWS, Audobon Society, city, county, and state government representatives, and the local school and school district whose property may be part of the study.
* **Objective 2:** Participate in developing the plan and all details (e.g., permits, public outreach, communication) necessary to initiate and execute the fieldwork to measure and reconstruct the detailed, individual 4-D movement trajectories of thousands of these fast-moving, small birds in collective motion (flocks) during their transition from daily flight aloft (daytime foraging) to roosting (in a chimney) in twilight light conditions. Predators such as hawks and falcons sometimes occupy the study site, and field equipment and work should identify and track the detailed 4-D trajectories of these predatory birds when present as well as their effect on the flock.
* **Objective 3:** Perform two or more of the following analyses for characterizing the movements, decisions, and time-varying dynamics of the measured flocks: (1) statistical/empirical analysis as part of a ‘top-down’ approach; (2) develop and apply models and/or relevant sub-models for analysis of individual-based collective behavior as part of a ‘bottom-up’ or ‘mechanistic/modeling’ approach; (3) approach based on network theory; (4) approach based on meta-heuristics; or (5) approach based on another field of science that may prove valuable in elucidating hidden, underlying properties of measured Vaux’s Swifts flocks.
* **Objective 4:** While the focus is on fast small birds, to reach a more general understanding of observed animal collective motion dynamics and behaviors, the findings stemming from the analyses of the Vaux’s Swifts should be integrated with findings from data on other 4-D flocks and swarms (e.g., Starlings, midges) as well as fish schools (i.e., often 2-D, time in nature), if possible.
* **Objective 5:** Perform dissemination of the project’s findings, to include presentations at conferences, public meetings, as well as the preparation and submission of peer-review science journal articles related to findings of this study.

**Site Location:**

The intended study site is in Portland, Oregon. There is high public interest in the Vaux’s Swifts roost spectacle. An average of 1,145 people watch the swifts every night, with nightly crowd maximums around 3,400. Due to the intense public interest and involvement, the contractor would ideally have at least one team member work from downtown Portland, Oregon to engage year-round with the public and city, county, and state government representatives as well as the local school and school district whose properties may be involved in this study.

**Methods:**

In collaboration with ERDC-EL, investigators will use all available resources and contacts to achieve the stated objectives. Investigators will coordinate frequently with the ERDC-EL in all objectives to ensure ongoing coordination, communication, and execution of the project (Objective 1). As planning progresses, identification of potential new technologies that could be suitable for the fieldwork will be done in close coordination with the ERDC-EL as will the fieldwork itself, which will be co-led by ERDC-EL staff (Objective 2). As the project progresses to analysis, methods chosen and deployed will be done in close coordination with the ERDC-EL (Objective 3). Integration of findings with prior works will be led by the contractor but involve the ERDC-EL (Objective 4). Finally, investigators will work closely with the ERDC-EL to disseminate the findings of this project (Objective 5) and work with the ERDC-EL to prepare new and emerging partnering opportunities.

**Requirements:**

Successful applicants should have expert knowledge and extensive past, published experience in measuring detailed, 4-D movement trajectories of individual birds in moving flocks and, preferably also, experience measuring 4-D movement trajectories of predators attacking bird flocks. Ideally, applicants would have at least one team member stationed year-round in downtown Portland, Oregon to engage local collaborators and involved parties such as the Audubon Society of Portland, the USFWS Portland office, and city, county, and state government representatives as well as local schools whose properties may be involved in the study. The investigator must be willing to collaborate with the government in acquiring all approvals, permits, and reviews needed, such as from an accredited Institutional Animal Care and Use Committee.

**Public Benefits:**

The public is very interested in how the Vaux’s Swifts accomplish their many geometric shapes that they display each night during their annual September spectacle (aerial flocking). This work will investigate the mechanisms that underlie the birds’ ability to accomplish their many geometric shapes, and provide the results of the analysis to the public through educational events with the Audubon Society of Portland as well as through publication of the results in scientific journals. The public has a long-running interest in the Vaux’s Swifts spectacle, evident through the many thousands of citizens (10,000+) across the month of September that come to watch these birds in Portland, Oregon. Publicizing the results of this work into how Vaux’s Swifts display their varied aerial shapes will be of significant interest and value to the regional community as public questions related to how Vaux’s Swifts accomplish such geometric feats are commonplace during the aerial flocking events in September. The events are of such interest to the public that declining numbers are the subject of TV news coverage (www.kgw.com/news/vauxs-swifts-struggle-for-shelter-as-chimneys-torn-down/327433250) and a cover story in the region’s primary newspaper, the *Oregonian*. Vaux’s Swifts are affected by urban development in the Pacific NW and, most specifically, a reduction in viable chimneys for roosting. Roost locations near Portland, Oregon are a critical resource in the southward migration of Vaux’s Swifts. In addition to illuminating the underlying mechanisms for how Vaux’s Swifts accomplish their geometric feats, this study will also improve the public’s understanding of this relatively little-studied spectacle that, in turn, could help preserve this community event in the face of declining population numbers and preserve this public ecosystem good and service for future generations of citizens.

**Government Furnished Property and Services:**

The Government will work cooperatively with the contractor to identify and acquire the use of resources needed for the project, including camera and other field equipment, training, supercomputing (https://www.erdc.hpc.mil/hardware/index.html), and other materials and assist the contractor in all phases of this work. The Government may provide workspace and equipment.

**Government Participation:**

The government will participate in all aspects of this project study, including site selection, plan design, securing permits and review approvals for the field investigations, field data collection, data analysis, new and emergent theoretical developments, and publication of any peer-review journal publications that stem from this work.

**Materials Requested for Statement of Interest/Qualifications:**

Please provide the following via e-mail attachment to: *CT Representative TBD*

(Maximum length: 2 pages, single-spaced 12 pt. font).

1. Name, Organization and Contact Information.
2. Brief Statement of Qualifications, including:
   1. Biographical Sketch,
   2. Relevant past projects and clients with brief descriptions of these projects,
   3. Staff, faculty or students available to work on this project and their areas of expertise,
   4. A brief description of capabilities to successfully complete the project. You may wish to add, e.g., existing unique and custom software and data appropriate for this investigation, equipment, laboratory facilities, field facilities, etc.

**Note:** A proposed budget is NOT requested at this time.

**Review of Statements Received:** Based on a review of the Statements of Interest (SOI) received, an investigator or investigators will be invited to prepare a full study proposal. Statements will be evaluated based on the investigator’s specific experience and capabilities in areas related to the study requirements. Additionally, the evaluation method and selection criteria for research and development awards must be: (1) The Technical merits of the proposed research and development; and (2) Potential relationship of the proposed research and development to the Department of Defense missions.

**Please send responses or direct questions to:**

*Amanda Andrews*

U.S. Army Engineer Research and Development Center (ERDC)

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**Timeline for Review of Statements of Interest:** Review of Statements of Interest will begin after the SOI has been posted on the CESU website for 10 working days.