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# Snow-Level Radar Detection of Bird Migration [Project Proposal]

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## PSU Integrated Cluster (IC) Project Funding Process & Proposal Form

**Project Proposal Submittal Process:** All IC projects requesting funding will require the completion and submittal of three (3) forms:

- Project Proposal Form – project scope & outcomes** (*included in this document*)
- Project Guidelines Form – reflective document outlining desirable IC project attributes**
- Project Budget Form – Excel spreadsheet to facilitate budget planning**

### **Instructions for Submitting Project Proposals:**

- ✓ Download the 3 forms to your computer
- ✓ Complete the forms and save them; including the title of your project in the file name
- ✓ Forward the 3 files via email to the IC Project Manager, Ross Humer [rhumer@plymouth.edu](mailto:rhumer@plymouth.edu)
- ✓ Project Proposal will be logged & forwarded to the appropriate IC Guide Team

If not reviewed in advance of the submission, it is important to discuss the Project with the IC Guides to review, refine, and rework (if necessary) to obtain funding approval.

**Project Funding Review Process:** All proposed projects will be reviewed by the Cluster Guide team. Depending on the level of funding amounts being requested, the proposal request will follow the process outlined as follows:

- **Level 1:** Any project with a proposed budget of less than or equal to \$1,000 can be approved by the Cluster without additional review
- **Level 2:** Any project with a proposed budget of \$1,000 but less than \$5,000 can be approved by the IC Project Review Team, which is made up of representatives from each of the 7 Clusters (*see release time exception directly below*)
- **Level 3:** Any project with a proposed budget of \$5,000 or greater **or** requires faculty release time, must be first endorsed by the IC Project Review Team and submitted to the Academic Deans for review and approval

The project funding approvals are limited to one academic year; projects which require additional funding in subsequent years will need to be resubmitted annually for review and approval.

**Deliverables:** At the conclusion of the academic year, a deliverable to the Integrated Cluster Proposal Review Team and Academic Deans is required in order for the project director/coordinator, artist, or author and collaborator(s) to be eligible for future funding. This reporting requirement may be met by numerous means which will be identified as this process matures. It is anticipated that awardees will present their works before a wide public gathering to be scheduled during the upcoming Academic Year.

**Instructions for the PSU Integrated Cluster Project Proposal Form:** Please complete all of the elements of the following form in the spaces provided before saving and then submitting the document.

## **PSU Integrated Cluster Project Proposal Form**

**Title:** Snow-level radar detection of bird migration

**Project Leadership:** (Identify Project Director/Manager or Co-Manager/s: Eric Kelsey and Len Reitsma

**Project Description:** The Plymouth Snow-Level Radar, a vertically-pointing radar on loan by the National Oceanic and Atmospheric Administration (NOAA), is located along High Street just uphill from the PSU Police Department and D&M Hall. Installed in November 2014, the radar is designed to detect the fall speed and intensity of hydrometeors (i.e., rain, snow, sleet, hail), and determine the altitude at which snow is melting to rain during mixed precipitation events. In addition to its intended purpose, the radar unit also senses birds flying over the radar and the last two years of radar data reveal rich details on the timing and patterns of bird migration. Use of radar in learning more about migratory birds is not new, but has not been done with this type of radar. Furthermore, the data on relative abundance and precise timing of migration pulses is tightly coupled with atmospheric patterns that we intend to analyze with the radar bird signals for consistent patterns. Furthermore, the radar unit on PSU's campus is the only one east of the Mississippi River and thus provides valuable information about the eastern migratory flyway. This project involves a collaboration between Drs. Eric Kelsey and Len Reitsma and a team of three undergraduates and one graduate student from three different programs: Atmospheric Science and Chemistry, ES&P and Biology. The student team met weekly and divided tasks that are critical to thoroughly analyzing the data from 2015 and 2016. The meteorology students are principally responsible for analyzing the climate data and the ES&P/Bio part of the student team are leading in the analysis of the bird data. With the advising of the two faculty, the team will integrate their analyses with a focus on the total duration of the migratory period, the timing of the largest pulses of migration and a close examination of how weather patterns may correlate with these pulses. The meteorology team has already presented at the AMS Annual Meeting in Seattle, WA last month. The project will be presented at the Showcase of Excellence but also at a scientific bird meeting in the Spring of 2017, the reason for this funding request.

### **Project Goals and Outcomes:**

- 1. Project Goals – 1) create a multidisciplinary student research pod that accomplishes a specific scientific investigation with the intent of both presenting the findings at PSU and elsewhere and co-authoring a manuscript for publication, 2) foster cross-discipline collaboration that will necessitate exchange of expertise and knowledge between disciplines, and 3) further our understanding of migratory bird behavior and patterns with the hope of having this approach applied to the many identical radar units in western US. No S-L-R data have been used to quantify bird migration to date.**

- 2. Student Learning Outcomes – Outline the expected student learning outcomes** 1) acquire technical expertise in data analysis and programming, 2) demonstrate thorough ability to conduct a literature search, 3) work collaboratively within a team context, 4) present findings as poster and orally, 5) become skilled at writing a scientific paper with the intention of submitting to a peer-reviewed journal.

### **Rationale and Impact:**

Considering the questions below, please write your project rationale and impact statement.

Include how this project will further the Mission and Vision of PSU with respect to 1) fostering collaboration across disciplines; 2) addressing a relevant societal issue, and 3) establishing relationships with community partners, external institutions, companies, non-profits, schools, government agencies, etc. and 4). Making an impact

How does this proposed project advance the Integrated Cluster mission and vision? How does this project facilitate high impact teaching and learning, cross disciplinary collaboration, student engagement and partnership involvement, and real world problem exploration? What are the anticipated impacts of this project?

Is this project an extension of work already in progress, or an entirely new endeavor? Does it integrate with areas that team leaders are already teaching or is it an opportunity to delve into unfamiliar content or a bit of both?

#### **Project Rationale and Impact Statement:**

Rationale: This project by definition is multi-disciplinary. The thorough analyses of the volumes of radar data necessitate expertise in multiple disciplines. This project addresses an area of much needed research given documented declines of most species of migratory Neotropical-Nearctic birds. Understanding the details of migration behavior is both an urgent area of research and a necessary component to conservation efforts of these species. The fact that PSU has the only station in the eastern US makes this a unique opportunity for our students and for the scientific community as a whole.

The approach described above clearly integrates into the cluster mission by bringing students together from multiple disciplines to work in teams to analyze a real dataset, and the analyses have high potential to influence the collective knowledge about bird migration. In particular, linking the climate data with the migratory behavior, and reporting this to all the other stations currently collecting these data may result in many important and new sources of information about the proximate conditions precipitating migration pulses and the timing of these pulses in different flyways (although ours would be the initial analysis that would ideally generate a larger scale effort).

This has been and will continue to be a rich experience for the students to learn and demonstrate skills in analysis, working in a team, integrating disciplinary expertise, and multiple modes of presenting findings. The two faculty mentors have expertise in the two principal fields of study: meteorology and avian ecology, and thus are strategically staged to provide the

needed guidance, but the student team will be expected to execute the analyses, present the findings and write the manuscript. Thus, this project fits the description of what the cluster initiative seeks to transform PSU into: multidisciplinary teams accomplishing real world problems. To date, this team has exhibited exemplary team progress that has culminated in one poster presentation already by the meteorology team. They have laid out their course of action for the second phase of the project, which more specifically quantifies the migration.

Part of the publicity and outreach of the project results will involve developing written content and presentations for Mount Washington Observatory (MWO), of which Dr. Kelsey is jointly-appointed. MWO has a long history of collaborative research and outreach with other partners (e.g., Appalachian Mountain Club) discovering biological responses to weather and climate variability. This project will utilize PSU's existing partnership with MWO to reach a broader audience of stakeholders (e.g., forest, land, and wildlife managers). The targeted meeting for presenting the bird data is the Annual Meeting of the Wilson Ornithological Society in Ft. Myers, FL in March, 2017. Students will also be asked to present their research at the Hubbard Brook Experimental Forest Annual Cooperators Meeting held every July; multiple avian ecologists attend these meetings.

## **Project Team**

**PSU Project Participants** (essential core team participants including faculty and staff)

Name	Position/ Title	Project Role	Discipline/ Specialty	Email
Eric Kelsey	Research Asst. Professor of Atmospheric Science & MWO Director of Research	Co-advisor	Meteorology	ekelsey2@plymouth.edu
Len Reitsma	Professor of Ecology	Co-advisor	Ecology	leonr@plymouth.edu

**Non-PSU Project Participants** (stakeholders; partners; academic institution; etc.)

Name	Organization	Project Role	Discipline/ Specialty	Email
Kyle Horton	University of OK	consultant	Aeroecology Lab	ky.g.horton@gmail.com

**Student Participant Profile** (Identify the student population/s to be engaged in the project.

Identify if this has been or is planned to be incorporated into curricula)

Class/ Student Organization/ Individuals	Role in Project	Academic Level (Undergraduate or Graduate)	Academic Discipline	Total Student Population
Jesse Carlson	Senior ES&P	Student team	Envtl Science	jdcarlson@plymouth.edu
Parker Bradley	Senior Envtl	Student team	Envtl Biology	prb1001@plymouth.edu

	<b>Bio</b>			
<b>CareyAnne Howlett</b>	<b>Study atmospheric patterns</b>	<b>Undergraduate</b>	<b>Atmospheric Science</b>	
<b>Andrea LaRocca</b>	<b>Study atmospheric patterns</b>	<b>Graduate</b>	<b>Applied Meteorology</b>	

## **IRB (Institutional Review Board) Compliance**

IRB Compliance: <http://www.plymouth.edu/office/institutional-review-board/>

- This project DOES NOT require IRB compliance  
 This project DOES require IRB compliance (*complete below*)

IRB Approval Status:

IRB Approval Date:

Any funding approvals of IRB-required projects are contingent on obtaining IRB approval.

## **Project Management: Timeline and Milestones**

Identify the timeline for the project including start, completion, and major project milestones. A closing report will be required as a part of the project funding process.

**Project Start Date:** 9/1/2016

**Project Complete Date:** 6/30/2017

<b>Project Milestone</b>	<b>Milestone Description</b>	<b>Target Completion Date</b>
<b>Data analysis (Fall 2015, Spring 2016, and Fall 2016)</b>	<b>Separate analyses of the climate and bird migration data and then integration and correlation.</b>	<b>12/16/2016</b>
<b>Draft of manuscript</b>	<b>Full draft in scientific format</b>	<b>3/10/2017</b>

<b>Final draft of manuscript</b>	<b>Submission-ready manuscript for Wilson Journal of Ornithology or similar journal</b>	<b>5/1/2017</b>
<b>Presentations at showcase (poster)</b>	<b>Poster(s) at Showcase of Excellence</b>	<b>4/21/2017</b>
<b>Poster presentations at scientific meetings</b>	<b>American Meteorological Society, January 2017 (already presented)</b> <b>Annual Meeting of the Wilson Ornithological Society, March 2017</b>	<b>3/8/2017</b>
<b>Oral presentation at MWO and/or USFS Hubbard Brook Annual Meeting</b>	<b>Oral presentation(s)</b>	<b>Summer 2017</b>

Please identify any pre-project education or training for students, faculty, and staff that would be helpful for your project team to have in advance to begin work on a strong footing (e.g., skill training, concepts), and identify any training and education that you are willing to help provide during the preparatory period for the project team before team work formally begins.

**Some basic training on how to read and interpret the snow-level radar data was given by Dr. Kelsey to all students at the commencement of the project. Kyle Horton has already provided valuable peer-reviewed literature to begin the literature search for radar detection of bird migration and verified that this approach to quantifying bird migration is unprecedented.**

Student Education/ Training Requirements: The students will work closely with the two faculty to develop and master the skills needed to accomplish each phase of the project from analyses through writing and presentation. No pre-project training will be necessary despite the detailed nature of this exhaustive dataset. Andrea LaRocca has been a particularly strategic player to date by organizing the weekly meetings and directing the research. She will be steering the bird sub-team through further analyses, some of which will necessitate programming.