Grant Application

Mackenzie McCoy

OWF

Email : mhopemccoy@gmail.com Application ID : A19MM49 Custom Ref. -

Application Start Date: 2021-10-21 17:34:21 Application Completed Date: 2021-11-05 21:43:22

1	Have you ever applied for an OWF grant before?
	no
2	Have you ever been denied for an OWF grant before?
	no
3	Project Title
	Red Tree Vole Nest Detectability
4	Name of my Organization
	Oregon State University
5	If your organization is not a tax-exempt nonprofit, please list the name of your fiscal sponsor
	If this does not apply to you, write N/A
	National Council for Air and Stream Improvement
6	Project Manager Full Name
	Jason Piasecki
7	Project Manager Mailing Address
	- Please enter full address with city, state & zip
	143 N 8th St., Philomath, OR 97370

9 Project Manager Email Address

jason.piasecki@oregonstate.edu

10 Please provide a brief biographical statement about yourself

Jason Piasecki began his career as a wildlife biologist in 2018 tagging and tracking Chinook salmon for Oregon Department of Fish and Wildlife. After graduating from Oregon State University with a B.S. in Fisheries and Wildlife Science in 2019, Jason continued to work on projects addressing sensitive species in Oregon. He briefly worked on the Oregon Marbled Murrelet Project before moving on to research red tree voles as part of the National Council for Air and Stream Improvement's (NCASI) pilot study in September of 2019. Following his involvement in the development of the project, Jason was retained as the lead field biologist and was instrumental in the progression of survey protocols and project implementation through 2020 and 2021. He continues to manage the red tree vole project for NCASI while pursuing an M.S. in Sustainable Forest Management researching red tree voles in managed forests at Oregon State University.

11

Provide any social media handles you use -Enter social handles or URLs such as instagram, facebook, twitter, youtube, etc. so that we can use to cross promote on our channels - if you do not have any, please place N/A

N/A

12	Please indicate if you are currently following Oregon Wildlife Foundation on our social media channels			
	- None of these channels			
13	Total estimated project cost			
	52634			
14	Funding that you are requesting from OWF - If you're request is for more than \$5,000, please contact Tim Greseth - tim@myowf.org before submitting your application.			
	8000			
15	What type of project are your proposing?			
	Wildlife			
16	Will your project address an Oregon Conservation Strategy habitat or species?			
	yes			
16.1	What habitat or species is addressed?			
	Red Tree Vole			

17	Start date of project- Day/Month/Year
	05-04-2022
18	End date of project
	07-10-2022
19	Location of project
	Central Coast Range
20	Has a local, state or federal biologist reviewed this project?
	yes
20.1	What is their name and contact info?
	Katie Moriarty, kmoriarty@ncasi.org
21	Have you already or will you obtain necessary permits from all requisite agencies as applicable to proposed project?
	yes
22	What will the requested funds be used for?
	Survey equipment and project-related contract personnel for climb training.

23 Provide a brief Project Summary

The red tree vole is an arboreal rodent endemic to Oregon and Northern California. It is currently listed as a Conservation Strategy Species in Oregon. Historical and current population studies maintain that tree voles are closely associated with old growth forests where they nest in the canopy and feed on conifer needles. We are conducting a large-scale study that reveals the presence of vole nests commonly in Douglas fir stands 20-40 years and in stands >80 years, but there are increased challenges surveying old stands. The likelihood for detecting arboreal nests from the ground in older stands (>80 years) can be as low as a 2% probability; therefore it is necessary to climb trees to effectively conduct red tree vole surveys. The development and assessment of a consistent, reliable method that maintains random sampling and improves detectability would benefit any research examining red tree vole density. Our red tree vole research is employing a new but untested method for surveying old growth canopies. We feel this method, the 'vertical climb-plot survey', improves upon previous methods of red tree vole surveying and we anticipate that it reduces sampling bias. Although this method theoretically results in increased detectability, we believe a directed investigation is necessary to assess the efficacy and to compare other survey methods. The importance in quantifying a detectability rate lies in creating a baseline to make surveys in young forest stands more comparable to surveys in old growth. Directly comparing data across stratified age classes without factoring in detection rates presents a risk of underrepresenting nest density in old growth stands where the increased canopy complexity makes detection more difficult. If this data is being used to determine suitable tree vole habitat then it is plausible that the data could portray a false narrative in which tree voles are actually more abundant in young forest stands than in old growth forests. The implications of which could have negative impacts on conservation and management of vole habitat. The purpose of this research is to increase accuracy of tree vole distribution estimates and inferences by providing a reliable detectability rate that can be applied to this and future surveys. If our method is markedly more effective, it could improve surveys for red tree voles and other canopy dwelling species by contributing valuable information to survey data and thus tree vole management.

24 Upload pre-project pictures or a video -

By submitting these photos or video I warrant that I am the legal owner of this media and grant the Foundation permission to reproduce, exhibit, or publish them for all general purposes in relation to Oregon Wildlife Foundation's work. If you have questions about photo or video submissions please refer to myowf.org/grants for guidance.

Project Revenue	Cash	In-Kind	Committed / Pending
Oregon Wildlife Foundation Request	8000		Pending
NCASI	44634		Committed
REVENUE	52634.00	0.00	
		TOTAL PROJECT SUPPORT	52634.00
Project Expenses	Cash	In-Kind	Total
Field Tech (2)	39294		39294.00
Work Vehicle	5340		5340.00
Climb Training Contract Personnel	2800		2800.00
Climbing Gear	1850		1850.00
Survey Gear	1650		1650.00
Fuel	1700		1700.00
			0.00
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		TOTAL PROJECT EXPENSES	52634.00
Balanced budget? This cell should read "0"		NET	0.00

Upload your Project Narrative Please make sure your narrative is no more than 7 pages long, single spaced, 12 pt. font (Calibri preferred).

1 Document Uploaded

I understand that I am required to submit a Project Completion Report, copies of any publications or social media posts crediting
 the Foundation's support, and post-project pictures at the completion of my project

yes

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Mackenzie McCoy

Application ID: A19MM49

1 Are the eligible?

No Answer Provided

Red Tree Vole Nest Detectability Project Narrative

Jason Piasecki, Mackenzie McCoy, Katie Moriarty Ph.D Oregon State University College of Forestry 140 Peavy Hall, 3100 SW Jefferson Way Corvallis, OR 97330 jason.piasecki@oregonstate.edu

Introduction

We request funding to evaluate a robust survey technique for monitoring red tree voles (*Arborimus Longicaudus*), an Oregon Conservation Strategy species. The Oregon Conservation Strategy website's red tree vole data gaps include "Develop survey methods for this small, canopy-dwelling species" and "Improve understanding of habitat relationships" (2016). To accomplish the goal of testing techniques, we will leverage our current field staff evaluating tree vole distribution and survival across stands varying in age and distance from old forest. We have confidence these surveys will successfully contribute to future management of this sensitive species and other arboreal nesters by providing a more reliable method of data collection and addressing current data gaps.

Red tree voles have been used as an indicator or focal species for forest management in Oregon, similar to northern spotted owls, marbled murrelets, and sage grouse. Red tree voles are an endemic species to Oregon and coastal northern California and are an extreme specialist; they live in the live canopy of their food source, Douglas-fir trees (Carey 1991). Their diet exists almost exclusively of Douglas fir needles, which also provide free water (Forsman et al. 2011). They very rarely travel to the forest floor (Swingle et al. 2009); thus, all surveys are within the forest canopy. Tree voles often indicate complex forest structure – commonly associated with old-growth forests (Forsman et al. 2016, Marks-Fife 2016). However, it is far more difficult to locate nests in old growth forest than it is in young forest stands. The increase in structural complexity and abundance of moss mats that are typically present in old growth trees provide significant camouflage that in some cases results in nests that are not visible until a climber is in very close range. If the probability of nest detection is not determined, then we run the risk of underrepresenting nest density in old growth forests. This could provide a false narrative that makes it seem as though tree vole nest density is similar in old growth forests as compared to younger forest stands—when in reality the nests are simply easier to detect in younger trees where the entire canopy can be viewed from the ground. As there are currently no reliable estimates of what nest detection rates are for climb-based surveys in old growth trees, this study could provide data that will be very useful for future analyses beyond our project alone. Our proposal directly addresses Oregon Conservation Strategy objectives with the potential to directly inform future management strategies.

Project Background

Because of its intentional design, spatial replication across the central Oregon coast range, and diverse landowner involvement, our current work is one of the most extensive climbing surveys to be conducted for red tree voles. We have just finished our 2^{nd} (of 3) season where we surveyed 46 stands and uniquely affixed a tree tag on every tree with a nest. We climbed >700 trees and are monitoring a subset of nests using remote cameras (n = 111 cameras) to model estimated indices of tree vole survival while accounting for nest size and tree age.

A limiting factor in these and other surveys is that red tree voles nest near-exclusively in the live crown and are thus extremely difficult to detect from ground-based surveys. For instance, a 350-year-old Douglas-fir tree may have the live crown beginning >30 meters high, and the average active tree vole nest is only ~42 cm across (Piasecki et al. 2021). In other words, a ground field biologist would be required to consistently identify a highly camouflaged laptopsized object (~16") on or above a 10-story building (~100' tall). Science-based methods suggest ground surveying for nests is ineffective in old forests, nest detectability – or the likelihood of detecting a nest when it's present - was estimated <2% (Marks-Fife 2016). We aim to address this challenge by developing a new survey method, the 'vertical climb-plot survey.' Here, we climb a tree and survey adjacent trees (at the same height as the observer to vertically view across into other canopies) to maximize sampling within a stand. This method could lessen bias in old and tall forests when assessing whether tree voles occupy an unknown stand. To do so, we would like to supplement staff time to climb and completely survey every large tree in a fixed plot (normally 5-8 trees within a fixed radius of 17.8m). This will allow us to quantify nest detection probability using the vertical climb-plot survey method. If effective, then the method could be transferred to other observers with the goal of quantifying arboreal nests, such as land management agency surveys that are required to survey and monitor this sensitive species. As such, our proposal provides us the flexibility to evaluate the effectiveness of a new protocol. We suspect it will be a more accurate assessment of nests and tree vole occupancy.

The Forest Service's Northwest Forest Plan and Bureau of Land Management Resource Management Plans, included two methods of surveying for red tree voles: (1) Modified Line Transect surveys and (2) Individual Tree Examinations, with additional measures provided for "Stands with Large Trees" (trees ≥91cm, 36" diameter) (Huff et al. 2012, modification expected 2022). The Modified Line Transect and Individual Tree Examinations are best suited to young forests (20-50 years) in which the live crown is more visible and can be reasonably surveyed from the ground. The nest detectability rate has been estimated at 9-59% in stands <80 years of age, but in mature and old growth stands the detection rate drops to 2-20% (Table 3.20; Marks-Fife 2016). In older stands where the live crown can easily extend upwards of 60 meters, most nests cannot be seen from the ground (Swingle 2005). Here, it is most valid to employ the "Stands with Large Trees" protocol which dictates that 2 trees with ≥91cm (36") diameter be climbed per every 10 hectares of a stand, with further guidelines if a vole nest is discovered (Huff et al. 2012). Another method for surveying for these elusive creatures was developed by Dunk and Hawley (2009) who employed a plot and transect method. Dunk and Hawley (2009) climbed a stratified-random sample of plots in stands where no nests were detected from the ground and where trees exceeded 61cm diameter. Horizontal and vertical diversification in the canopy, and structural development in Douglas fir forests varies greatly and does not always correlate closely with stand age or standard tree metrics (Van Pelt 2007). To compare occupancy and abundance across stand age, we need surveys to be comparable. We either need to change methods to increase detectability or know how biased surveys are to statistically account for the difference within a model. We believe our 'vertical climb plot survey' method is a logical opportunity to reduce bias in older stands and increase our opportunities to detect nests. We would like to be able to quantify this assumption empirically. We propose to quantify nest detectability rate from a skilled observer, ignorant of the other climber's findings. We will achieve this opportunity by climbing and intensively surveying every tree within a fixed area, replicating within a stand and between stands that vary in age (60-400 years).

Objectives

- Quantify detection probability for vertical climb plot survey method within plots in a stand and between stands that differ in age

- Create plot maps with photographs and tree metrics (size, branch density) to depict stand composition and structure

Methods

Grant authors Moriarty and Piasecki (National Council for Air and Stream Improvement) developed a method for canopy research to quantify nest occurrence in forests >60 years called the Vertical Climb Plot protocol.

Within all stands of interest, we created fixed plots at random locations with a density of 1 per hectare, which is approximately one plot every 100-m. Each fixed plot has a radius of 17.8m (1,000m²), the tallest or most deformed safely climbable tree is chosen to maximize canopy detectability within the plot and likelihood of finding nest structures, similar to what is suggested within the Northwest Forest Plan protocol for large trees (Huff et al. 2012). An individual on the field team climbs the large tree and carefully examines other trees in the plot using 10x binoculars. We focus on other trees with >95% visibility, which becomes the new inference – the number of visible trees. If nests were observed, the adjacent tree would also be climbed to investigate whether or not the nest was used by a red tree vole. We uniquely mark and record measurements at every tree and nest regardless of tree vole status (e.g., not a tree vole nest, was formerly occupied, actively occupied).

This study proposes to quantify and assess the validity of this new survey method in the 2022 field season. We intend to employ up to three field biologists to carry out a detection

probability study in no less than three old growth stands. In each stand we will survey no less than three randomly selected plots that have not been surveyed in previous years to avoid any detection bias. The plots will be surveyed following the above methods, climbing the plot center tree and then clearing surrounding trees. Following this step, every single plot tree will be climbed and a thorough search for nesting structures performed. This will determine if there are nests that were not visible from the plot-center tree, as well as investigate and confirm potential nests that were spotted. Comparing nests detected during the initial vertical climb plot surveys to nests detected in this detectability study will provide a detection rate that can be applied to this and future surveys.

Relevance

As one of the only mammals that can persist almost exclusively on a diet of conifer needles, and being endemic to Oregon and Northern California, the tree vole is one of Oregon's more sensitive and unique species. Red tree voles can be a considerable portion of northern spotted owls' diet (10.3% of diet biomass) in Douglas-fir and western hemlock dominant forests of Oregon (Forsman et al. 1984). In a landscape where high severity fires, drought limiting water in the canopy, and forest conversion, management using science-based information can inform risk and opportunities for red tree voles and other forest dwelling species. We aim to collect the most accurate information we can, while addressing uncertainty. Thus, testing and improving survey methods are the foundation for increased data accuracy to estimate nest occurrence. This funding will provide an opportunity for us to evaluate and test methodology, for this study and for others interested in collecting accurate information for an elusive species.

References

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November 3rd, 2021

Oregon Wildlife Foundation

901 SE Oak St, Suite 103

Portland, OR 97214

Dear Oregon Wildlife Foundation Project Committee,

I am writing in support of Jason Piasecki's "Red Tree Vole Nest Detectability" study. The study may provide validation for a novel tree vole nest survey method that will be useful to future research endeavors involving this cryptic arboreal species. As a wildlife biologist who has conducted extensive tree vole research, I can attest to the challenges of detecting tree vole nests, especially in the complex bole and branch structures of old-growth trees. The current red tree vole nest survey protocol is currently being updated to include surveys of individual trees by tree climbers because data suggests that many tree vole nests cannot be seen from the ground. I believe that this nest detectability study can contribute valuable information to tree vole nest surveys and thus tree vole management.

I am familiar with the broader aspects of the 3-year survey project Jason is conducting through Oregon State University in partnership with the National Council for Air and Stream improvement. Having mentored Jason in various aspects of this study over the past two years, I am confident in his leadership abilities and the caliber of work he is committed to. I fully support his work and believe that expanding the research to encompass this nest detectability study will provide valuable information which will contribute to future conservation efforts concerning the red tree vole. The intentions behind his research directly align with the Oregon Wildlife Foundation's mission to contribute to the lasting conservation of wildlife in our state.

Sincerely, Jimmy Swingle Wildlife Biologist, Pacific Northwest Research Station, USDA Forest Service 3200 SW Jefferson Way, Corvallis, OR 97331 james.swingle@usda.gov 541-680-1903

















