Project Title: **ENRTF ID:**   **037-AH**

Finding Fawns Based on GPS-Collared Deer Movement

Category: H. Proposals seeking $200,000 or less in funding

Sub-Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 138,540

Proposed Project Time Period for the Funding Requested: June 30, 2021 (2 yrs)

Summary:

Locating deer birth sites is important to understanding fawn survival (key to management), but current methods are inefficient. We will develop a method to find fawns remotely using GPS-collared deer.

Name: William   Severud

Sponsoring Organization: U of MN

Title: Postdoctoral Associate

Department: Fisheries, Wildlife, and Conservation Biology

Address: 2003 Upper Buford Circle, Suite 135

          St. Paul   MN   55108

Telephone Number: (763) 213-2185

Email seve0135@umn.edu

Web Address   https://www.researchgate.net/profile/William_Severud

Location

Region: Central, Northeast

County Name: Cass, St. Louis

City / Township:

Alternate Text for Visual:

Map of movement path from GPS-collared white-tailed deer doe before localizing to give birth. Inset photo of fawn born at the localization. GPS-collared deer movement patterns will facilitate locating newborns.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%
	_____ If under $200,000, waive presentation?		

PROJECT TITLE: Finding fawns based on GPS-collared deer movement

I. PROJECT STATEMENT

Reproductive success (fawn production, survival, and recruitment into the adult population), along with adult survival, are the two major drivers of population growth of white-tailed deer. To best understand the reproductive driver, researchers initially must be able to identify when and where deer give birth. Fawning habitat can have a marked influence on survival of newborns. Current methods to locate birth sites are inefficient; therefore, we will develop a method to find fawns remotely using GPS-collared deer.

Deer mothers must choose birth sites with habitat that affords a balance of safety for young with nutrition to support lactation. Habitat management can improve survival of newborns by enhancing characteristics that increase hiding cover and provide quality nutrition for mothers. Locating fawning sites and newborn deer has traditionally relied on the use of vaginal implant transmitters (VITs) or extensive field searches, both of which are invasive, costly, and effort-intensive.

Many ungulate species make distinctive movements prior to localizing to give birth. Moose, elk, and caribou have all been remotely observed via GPS collars to increase movements before calving. Deer have yet to be evaluated, but do localize once fawns are born. Quantifying the behavior of adult females would enable researchers to identify the timing and location of fawning in a less invasive manner than using VITs, and in a more cost-effective way compared to extensive ground searches. Importantly, this will allow characterization of fawning habitat, and eventually the method could be employed to facilitate study of newborn survival, recruitment, and habitat requirements.

Objectives
1. Evaluate movement behavior of GPS-collared adult female deer to determine timing and location of fawning
2. Identify and characterize habitat of fawning sites to inform management practices

Goal: The Office of the Legislative Auditor's evaluation of MNDNR management of white-tailed deer recommended ongoing research to pursue a better understanding of deer births, deaths, and habitat use at the landscape scale. Fulfilling our study's objectives should be considered a critical first step in a sequence of needed research efforts focused on fawn survival and habitat requirements beginning at birth.   The ultimate goal would be to assess how habitat availability and use influence fawn survival and impact population growth.

Why? Identification and characterization of associated habitat of fawning sites is critical to understanding reproductive success of white-tailed deer. The two drivers of population performance are adult survival and reproductive success (pregnancy rates, fawn production, survival, recruitment).

Specific, direct outcomes
1. Characterization of movement patterns indicative of fawning that may be applied at a broader landscape scale.
2. Measurement of habitat characteristics of fawning sites at fine- and broad-scales.

We will achieve these goals and outcomes by examining movement patterns of GPS-collared adult female deer for 2 fawning seasons (2018, 2019), using statistical movement analyses to identify birth sites. These deer are being collared as part of an existing MNDNR study examining winter habitat requirements. We will then validate patterns during a third field season (2020), ground-truthing adult female movements by locating fawns. Once a doe and fawn(s) depart the birth site, we will measure fine-scale habitat variables on site. We will also characterize fawning habitat at a broad-scale using remote sensing data.

II. PROJECT ACTIVITIES AND OUTCOMES

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Activity 1: Characterization of fawning movement behavior of female deer
Description: We will remotely monitor movement of GPS-collared female deer during fawning to determine where and when they localize for fawning, and whether they make a long-distance movement prior to localizing to give birth.
ENRTF BUDGET: $66,770

Outcome	Completion Date
1. Data acquisition from GPS-collared deer (2 fawning seasons, ~60 deer)	Spring 2018,19
2. Characterize fawning signal in movement data	Fall 2019
3. Validate method with ground-truthing (~60 deer)	Spring 2020
4. Publish manuscripts, present data to partners	Summer 2021

Activity 2: Characterization of fawning habitat
Description: We will measure broad-scale habitat characteristics using remote sensing data (distance to open water, distance to wildlife openings, amount of edge, etc.) and fine-scale habitat characteristics on site (hiding cover, plant species present, etc.). These results will be shared with wildlife management and forestry staff to inform management practices.
ENRTF BUDGET: $71,770

Outcome	Completion Date
1. Plot fawning locations in GIS (from 3 fawning seasons 2018,19,20)	Summer 2020
2. Characterize fawning habitat, fine scale, broad scale	Fall 2020
3. Create management recommendations for protecting or creating fawning habitat	Winter 2020-21
4. Draft manuscripts, present data to partners (MNDNR wildlife and forestry staff)	Spring 2021

III. PROJECT PARTNERS:
A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
William Severud	**Postdoctoral Associate**	**University of Minnesota**	**Project Manager**

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Joseph Bump	**Associate Professor**	**University of Minnesota**	**Advise field sampling and analysis**
Glenn DelGiudice	**Deer/Moose Project Leader**	**MNDNR**	**Provide GPS locations of female deer and equipment for habitat measurement, advise analysis**

IV. LONG-TERM- IMPLEMENTATION AND FUNDING:
This project will build off a current deer study in northcentral and northeastern Minnesota examining winter habitat requirements to inform forestry management. Results of our proposed research can be used by deer managers across the state to better understand deer births, deaths, and habitat use.

V. TIME LINE REQUIREMENTS:
Two years of support are required. Retroactive monitoring of existing and planned collared female deer in 2018 and 2019 will be used to investigate movement patterns once funding begins in July 2019. Collared deer in 2020 will be used to validate the patterns via ground-truthing (searching for fawns). Those fawning sites will also be measured for fine-scale habitat covariates. Broad-scale habitat measurements will then be conducted using remote sensing data after fawning sites are confirmed and mapped in GIS.

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2019 Proposal Budget Spreadsheet

Project Title: Finding fawns based on GPS-collared deer movement

IV. TOTAL ENRTF REQUEST BUDGET 2 years

BUDGET ITEM (See "Guidance on Allowable Expenses")	AMOUNT	
Personnel: William Severud, postdoctoral associate, project management, 100% FTE for 2 years (82.37% salary, 17.63% benefits)	$	133,540
Professional/Technical/Service Contracts:	$	-
Equipment/Tools/Supplies:	$	-
Acquisition (Fee Title or Permanent Easements):	$	-
Travel: mileage, lodging, for in-state travel by project personnel to and from field sites for one season (~1 month). All travel willl adhere to the commissioner's plan. (1) Vehicle Rental for 1 month = $ 912 (Spring 2020) (2) Vehicle mileage = $608 (3) Campsite rentals = $ 690 (4) per diem $2,790	$	5,000
Additional Budget Items:	$	-
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$	138,540

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period:	N/A	*N/A*
Other State $ To Be Applied To Project During Project Period: Money from existing MNDNR deer winter habitat use study	$ 303,600	*secured*
In-kind Services To Be Applied To Project During Project Period: Forgone organized research indirect costs associated with this project (54%)	$ 74,812	*secured*
Past and Current ENRTF Appropriation: M.L. 2014, Chp. 226, Sec. 2, Subd. 5m, Moose Decline and Air Temperatures in Northeastern Minnesota. Severud as graduate student on project. DelGiudice as lead investigator.	$ 600,000	*secured*
Other Funding History:	N/A	*N/A*

Where are fawns born?

- **Locating deer birth sites is needed to understand fawn survival and critical habitat.**
- **Understanding fawn survival is key to deer population management.**
- **Current methods to find fawns are costly and invasive.**
- **We will develop a cutting edge method to find fawns remotely using GPS-collared deer.**
- **This new method will facilitate statewide deer population assessment and management.**

PROJECT TITLE:
Finding fawns based on GPS-collared deer movement
Severud, Bump, DelGiudice

Photo Credit: Minnesota Conservation Volunteer

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Finding fawns based on GPS-collared deer movement

PROJECT MANAGER QUALIFICATIONS:
Dr. William J. Severud is a postdoctoral associate in the lab of Dr. Joseph K. Bump in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Severud's expertise is in wildlife ecology, management, and conservation, with a focus on ungulates. He has intensively studied movement of GPS-collared moose in relation to calving and calf survival. His dissertation and associated research has resulted in at least 8 peer-reviewed publications and numerous presentations. His current research involves an investigation of deer winter habitat requirements, moose calving phenology, and nutritional restriction of moose through winter. Severud is an active member of The Wildlife Society at the state, section, and national level, including acting as a regional representative and student relations committee member. Dr. Severud's postdoctoral advisor, Dr. Bump, has 15 years of experience working with ungulate ecology in the Upper Great Lakes Region.

Professional preparation
University of Minnesota, Ph.D., Natural Resources and Management - Wildlife Ecology and Management, Glenn D. DelGiudice, 2017
Northern Michigan University, M.S., Biology, John G. Bruggink, 2011
Carleton College, B.A., Biology, Mark J. McKone, 2002

Journal peer review
Alces, Behavioral Ecology and Sociobiology, Canadian Journal of Zoology, Human-Wildlife Interactions, Journal of Mammalogy, Journal of Wildlife Management and Wildlife Monographs, Mammalian Biology, PLOS ONE, internal reviewer for USGS

PROJECT MANAGER RESPONSIBILITIES:
Dr. William J. Severud and Dr. Bump will provide co-leadership, coordination, and oversight for this project. Dr. Severud will be responsible for study design, data collection, analysis, manuscript writing, and presentation of results.

ORGANIZATION DESCRIPTION:
The Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota Twin Cities provides world-class training and expertise to contribute to the management, conservation, and sustainable use of fisheries and wildlife resources. Our goal is to use innovative teaching, research, and outreach to respond to societal needs for information and education pertaining to natural resources.