



**Wild Sheep Foundation Grant-In-Aid (GIA) Application (FY 2017-2018)**

(Please fill in all applicable fields; failure to do so may result in an application being rejected).

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**Program/Project Overview**

Title:

**Comparative analysis of bighorn sheep movement patterns across subspecies and spatial domains**

Synopsis:

**We seek funding to support a west-wide effort to analyze bighorn sheep movement across a variety of spatial contexts, with the general goal of better understanding spatial patterns of contact and pathogen transmission risk between bighorn and domestic sheep. The planned analyses will additionally add breadth to our knowledge of bighorn movement ecology that may have application for habitat restoration and identification of translocation impacts. Outputs will include site specific movement kernels for all analyzed herds, detailed comparisons of ewe and ram movements, movements of translocated vs. resident animals, and movement variation among the different bighorn subspecies. The project has been pledged support from the national Wild Sheep Foundation and eight regional WSF chapters, as well as the Western Association of Fish and Wildlife Agencies' Wild Sheep Working Group Disease Management Venture.**

\$ Amount Requested from WSF:

**\$ 10,000**

Does this request span more than a single calendar year?

**No**

If so, which years, and how much each year? (If multi-year project, please fill in costs/budget for each year in last table)

**N/A**

Applicant Name(s):

**Kezia Manlove, Tom Besser, Paul Cross**

Agency/Organization(s):

**Washington State University, US Geological Survey**

Does this program/project have support from the WSF Chapter & Affiliate for the jurisdiction where this program/project will occur?

**Yes**

If Yes, letter(s) of support must accompany this application. If No, please explain why:

**At the Chapters and Affiliates meeting in Polson MT, we received pledges of support of \$5,000 each from Montana WSF, Utah FNAWS, Washington WSF, Oregon FNAWS, Iowa FNAWS, Wyoming WSF, RMBS, and Eastern WSF chapters and affiliates, contingent on loss of USDA APHIS support. We are now in the process of contacting these chapters to inform them that USDA APHIS has indicated they will not support this project for a second year, so the support from the chapters will be required for the project to go forward.**

Does this program/project have support from the state/provincial/territorial/tribal/federal/other jurisdictional fish and wildlife management agency(ies) where this program/project will occur?

**Yes**

If Yes, letter(s) of support must accompany this application. (Please provide names of principal agency contacts, as well). If no, please explain why:

**Mike Cox, Nevada Department of Wildlife;  
Brett Wiedmann, North Dakota Game and Fish,**

State/Province/Territory/Jurisdiction/Location of Program/Project:

**At this time, we have data commitments from Nevada and North Dakota, and are working with Nebraska, Idaho, Washington, Oregon, and California to gain additional buy-in.**

Land Status of Project Area: % Public [Click here to enter text.](#) % Private [Click here to enter text.](#)

Majority Land Mgt Agency/Entity [Click here to enter text.](#)

**N/A**

Program/Project Location:

**Pullman WA / Bozeman MT**

UTM or LatLong Coordinates for geographic center of the program/project study area: [Click here to enter text.](#)

**Map: When you submit this application electronically via email, please attach a .jpg map showing program/project location, in relation to known geographic areas. Please limit image file size to less than 2MB.**

## **APPLICANT(S) INFORMATION**

**Applicant Name(s):**

Kezia Manlove

Thomas Besser

Paul Cross

**Position/Title:**

Post-doctoral research associate (Manlove)

Professor and WSU/WSF Rocky Crate Chair for Wild Sheep Disease Research (Besser)

Willife Research Biologist (Cross)

**Agency/Organization(s):**

Washington State University (Besser, Manlove)

US Geologic Survey (Cross)

**Mailing Address(es):**

2917 Oliver Street, Bozeman, MT, 59718 (Manlove)

POBox 647040, Pullman WA 99164 (Besser)

**Email Address(es):**

[kezia.manlove@gmail.com](mailto:kezia.manlove@gmail.com) (Manlove)

[tbesser@vetmed.wsu.edu](mailto:tbesser@vetmed.wsu.edu) (Besser)

**Daytime Phone(s):**

(406) 600-2369 (Manlove)

509-335-6075 (Besser)

Mobile Phone(s):

(406) 600-2369 (Manlove)

(208) 310-6591 (Besser)

Current Member of WSF? **Yes**      WSF Membership #, if known 30159-R (Manlove), not known (Besser)

If not currently a member of WSF, please visit/join: <http://wildsheepfoundation.org/Page.php/cp/Members>

## PROGRAM/PROJECT DETAILS

Program/Project Description: **We seek to analyze bighorn sheep movement across a variety of spatial contexts, with the goal of better understanding spatial patterns of contact and pathogen transmission risk between bighorn and domestic sheep. The planned analyses will add breadth to our knowledge of bighorn movement ecology that may have application for habitat restoration and identification of translocation impacts. Outputs will include site specific movement kernels for all analyzed herds, detailed comparisons of ewe and ram movements, movements of translocated vs. resident animals, and movement variation among the different bighorn subspecies.**

Objectives of the Proposed Program/Project, or Problem to be Solved:

**Our objectives are to 1) describe home-range size distributions and overlap, along with sex-specific movement kernels for participating bighorn herds, with the aim of providing stronger local information to characterize the region bighorn sheep occupy and could feasibly encounter domestic sheep; and 2) link these movement and home-range metrics to landscape covariates, in an effort to strengthen inferences about movement potential in other, as-yet unsampled sites.**

Which WSF Objective(s) does your proposal address? (Click all that apply)

- Enhance wild sheep populations and their habitats **X**
- Promote scientific wildlife management **X**
- Educate the public and youth on sustainable use and the conservation benefits of hunting
- Promote the interests of the hunter and all stakeholders **X**

Explain how your proposal addresses WSF objectives and benefits wild sheep conservation/management:

**Pathogen spillover events resulting from direct contact between domestic and bighorn sheep pose a major threat to bighorn sheep populations living on native range. This project directly aids in mitigating that risk for bighorn sheep in study herds by developing movement kernels that describe local movement dynamics. The existing recommendations for separation distance between bighorn and domestic sheep are largely based on movement data from the Hells Canyon regions of Idaho, Washington, and Oregon. It is not clear how well the recommended separation distance can protect bighorn herds living at other population densities, in other habitat settings, and with varying translocation histories. This work, therefore, enhances wild sheep populations and their habitats by clarifying exactly how far that habitat extends in different contexts, refining requisite movement buffers and providing a means to tailor those buffers to other habitat types. These more specific buffer estimates will be of great use to both the management agencies working directly with our study herds, and also to agencies in other states simply by scientifically characterizing the range of variation in bighorn sheep movement structures. We have a unique opportunity to work with data already held by multiple state agencies, which means that our project costs are relatively low. By comparing bighorn movement dynamics in different contexts, our results should provide scientific evidence to help promote the interest of all parties trying to conserve bighorn sheep in their native range. Our research team has a strong track record of work mitigating disease risk for bighorn sheep throughout the western United States.**

Explain how you propose solving problem: **We will use a rich existing dataset aggregated across multiple states to analyze bighorn home ranges in reintroduced and native herds. These estimates will provide a clearer picture of bighorn movements throughout their range. A key question is whether herd movements extend beyond the kernels built using data from Idaho, Washington, and Oregon. We will test whether movements of some bighorn herds consistently exceed movements from the Idaho, Washington, and Oregon herds that underlie the Payette decision and current bighorn-domestic sheep separation recommendations. If we find that movements of some classes of bighorn sheep consistently exceed those assumed under the Payette decision, that finding could provide justification for expanding the high-contact risk areas for some herds, and offer those populations better protection against pathogen invasion.**

Measure(s) of Success (for each pertinent WSF objective):

**The project will succeed in enhancing wild sheep populations and their habitats if we can produce a detailed report of bighorn movements (home range sizes and movement kernels) for each study herds. The project will succeed in promoting scientific wildlife management if our resulting estimates are formatted so that they can be applied in the US Forest Service's Risk of Contact tool, and compared to the estimates provided by O'Brien et al. 2014. The project will succeed in promoting the interests of hunters and all stakeholders if we can add further clarity and nuance to the current bighorn movement analysis underlying the Payette decision. This will be achieved by describing in our final report how movements vary by translocation history, sex, subspecies, habitat type, and population size, and by describing overall variance in movement dynamics across our study herds. Additionally, we will pursue peer-reviewed publications wherever possible, to give our results additional leverage in future discussions of separation distances between bighorn and domestic sheep.**

Timeline (to achieve each pertinent WSF objective):

**Work on the project will begin immediately. We aim to deliver preliminary results in the form of an initial report to WSF by May of 2018 for comment, with a final report deliverable by October 1st of 2018. We will pursue a peer-reviewed publication of our results shortly thereafter, so that the results can contribute to the broader legal and scientific contexts by other agencies and researchers.**

From the **WSF North American Conservation Vision 2020**, which of the following goals does your program/project address? <http://wildsheepfoundation.org/Page.php/cp/Conservation%20Strateg> (Click all that apply)

**WSF Thinhorn Sheep Goals by 2020** (please review **WSF NA CV2020**, to understand detailed goals)

1. Thinhorn Sheep Management Plans
2. Effective Separation Strategies
3. 2017 Thinhorn Sheep Summit II
4. Inclusion of the NW Territories in the WAFWA Wild Sheep Working Group
5. Public Outreach
6. Access for Management of Thinhorn Sheep

**WSF Bighorn Sheep Goals by 2020** (please review **WSF NA CV2020**, to understand detailed goals)

1. Bighorn Sheep Management Plans
2. Effective Separation Strategies
3. Applied Disease Research
4. Agency Leadership Education
5. Public Outreach
6. Domestic Sheep Industry Partnership
7. WAFWA Disease Management Venture Support

- 8. Risk Assessment
- 9. Access for Management of Bighorn Sheep
- 10. BLM Feral Horse & Burro Appropriate Management Levels
- 11. Population Management/Ewe Harvest
- 12. Hunting Opportunity
- 13. Youth Outreach
- 14. 2018 Bighorn Sheep Summit I
- 15. Mexico Desert Bighorn Sheep Management
- 16. Inclusion of 6 States in Mexico + SEMARNAT in the WAFWA Wild Sheep Working Group

### PROGRAM/PROJECT BUDGET DETAILS

Amount Requested from WSF: \$ **10,000**

Use of WSF \$ (Describe specifically how WSF grant \$ would be utilized):

**We would use the WSF national chapter money, along with the 8 pledging chapters, to support personnel costs for all analyses. Specifically, these funds will cover Manlove’s WSU salary and benefits**

Is Auction Tag \$ from state/provincial/territorial/tribal agency where your program/project will take place being sought from that jurisdiction? Yes  No

If Yes, how much \$ has been requested/granted:

If No, please explain why:

**We generally haven’t sought auction tag money for this project, as we generally believe those funds are best invested in local population restoration and management efforts. While this project will have direct implications on our study populations, we are not manipulating any populations per se with this study and our broader questions are continental in scale. Note: We have requested funding from North Dakota to conduct a test-remove experiment that would complement our analyses by letting us examine how that strategy might alter movement dynamics (as has been documented for other host systems).**

If your application is eligible to be matched 3:1 via Pittman-Robertson matching funds, please describe how and when P-R match will be obtained.

**Our state partners are are seeking P-R funds to compliment this project, but we are not seeking them directly for this work.**

Complete the budget form below. Remember, program/project salaries are not typically allowed. Contracted services and equipment costs must be listed in detail, and may be explained more fully in narrative on this page. Separately, in the narrative section, please describe “hard \$” and/or in-kind contributions sought vs. those already committed to this program/project. Also remember that program/project costs prior to completion/execution of the WSF Grant Agreement may be included as matching/donated \$.

Narrative [max 5 pages, ≥12 pt font...] (to accompany/explain budget details and further information):

**The funding is intended to cover analyst salary. We have commitments from eight WSF chapters, which along with the requested National WSF funds would cover one year of analyst salary. We anticipate that this will be sufficient time to complete the proposed work.**



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<b>Totals:</b> Click here to enter text.	10,000	50,000	Click here to enter text.	Click here to enter text.	62,000

August 1st, 2017

To whom it may concern,

I am writing in my capacity as chair of the Western Association of Fish and Wildlife Agencies' Wild Sheep Working Group in support of Kezia Manlove and Tom Besser's proposed work on space use and movement of bighorn sheep in North Dakota and Nebraska.

Kezia, Tom, and I have worked together to design a multi-state project integrating data from a variety of western states to build comparative knowledge on how bighorn sheep move through different habitat types. This work is fundamental to bighorn sheep conservation, since it will refine movement kernels and separation distance recommendations for bighorn and domestic sheep in a variety of habitat types.

Including analysis of bighorn movements in the Northern Plains is crucial for several reasons. First, the Northern Plains are a unique habitat type, and it is unclear whether bighorn movements in this setting will echo those of other areas. Second, these herds have varied substantially in number over the last decade, giving us an opportunity to investigate how changes in population density might alter movement patterns. Understanding the relationship between movement and population density is key, since some states currently manage on the assumption that small populations exhibit less movement, and are thus at lower risk of disease introduction than their larger counterparts. This assumption is currently untested, but nevertheless forms the basis for current management strategies to keep herds small.

I look forward to working with Kezia, Tom, the biologists from North Dakota and Nebraska, and our collaborators on this project going forward.

Thank you for your consideration.

Mike Cox

Chair, Western Association of Fish and Wildlife Agencies' Wild Sheep Working Group



August 1st, 2017

To the Members of the Midwest Chapter of the Wild Sheep Foundation,

I am writing to state my support for Kezia Manlove and Tom Besser's proposed work on space use and movement of bighorn sheep in North Dakota and Nebraska.

Kezia and Tom have reached out to me as the bighorn sheep biologist for North Dakota, and our plan to analyze bighorn sheep movement in North Dakota will be of use to the state for wildlife planning purposes. In the broader context, this project will place a heavier emphasis on movement by the young rams that are thought to be important for connectivity.

This work is being carried out in conjunction with a larger project funded by North Dakota Department of Game and Fish to study bighorn sheep and run test-remove projects in several sub-herds.

I think this project is important for understanding pathogen spillover risk and management in North Dakota, and hope the WSF will support our efforts.

Sincerely,

Brett Wiedmann

Big Game Biologist, North Dakota Department of Game and Fish