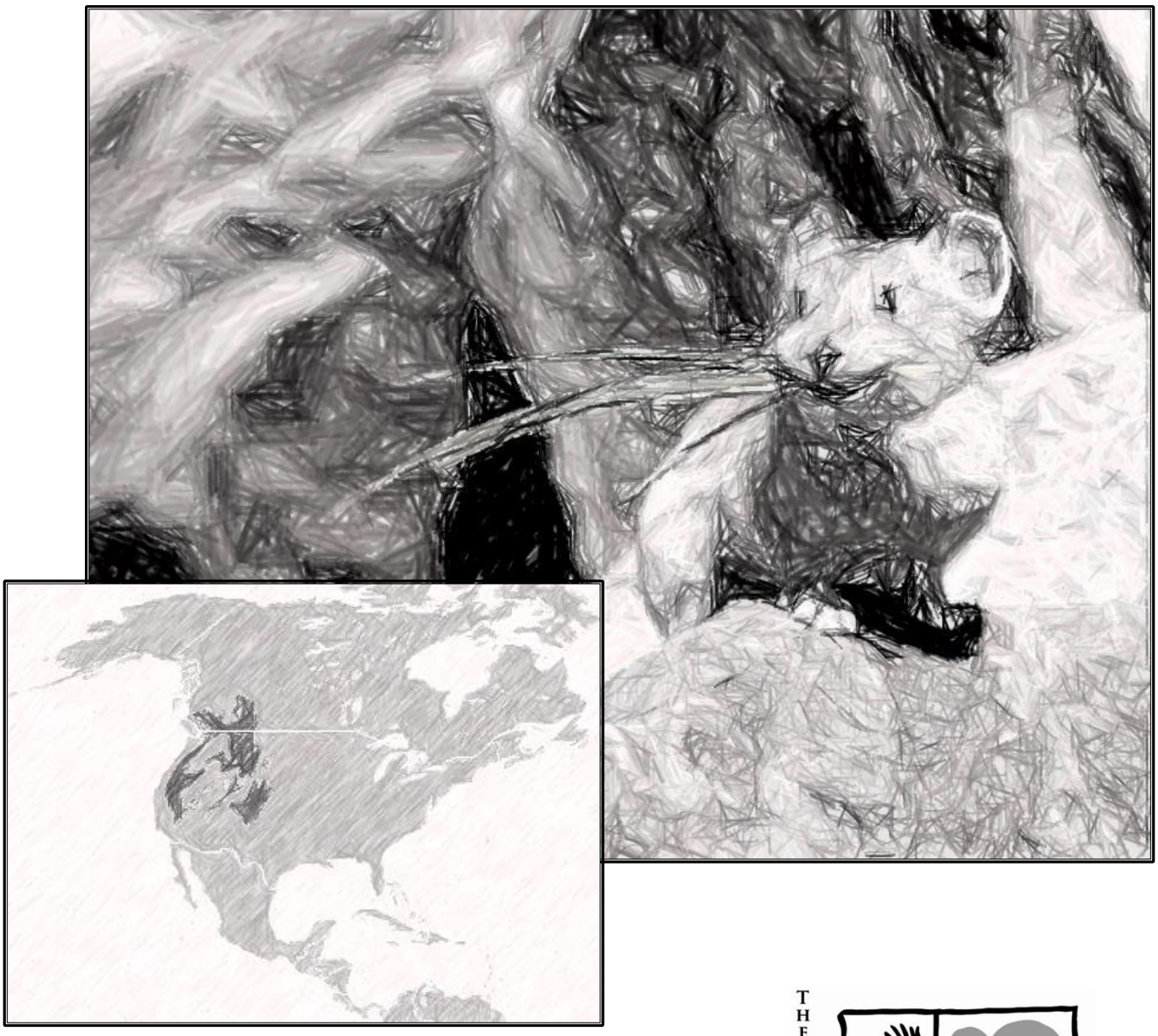
4th Conference of the North American Pika Consortium

POST-Conference Summary Report

February 6-7th, 2017 - Reno, Nevada



In association with the Western Section of
The Wildlife Society

THE WILDLIFE SOCIETY
WESTERN SECTION

4th Conference of the North American Pika Consortium

March 8, 2017

Dear Conference Participant,

Thank you for attending the 4th Conference of the North American Pika Consortium as a Western Section of The Wildlife Society pre-conference symposium at the Peppermill Resort and Casino in Reno during February 6-7th, 2017. We had a great turnout of 54 total participants and 28 presentations plus several posters. Furthermore, we want to thank Dr. Rob Klinger and Dr. Mary Peacock for their wonderful plenaries, Jere Folgert for sharing footage from his fascinating film, "The Adventures of the American Pika", and Candace Renger (and the rest of the TWS Western Section Conference Planning Team) for helping us with planning and logistics for the meeting. Finally, thank you to Beth Pratt from the National Wildlife Federation, for providing copies of the children's book entitled "It's Nice to be a Pika", by Molly Woodward, and to Mimi Matsuda for her generous donation of the beautiful and commemorative pika-art magnets ("Pika Pedals Petals")!

Enclosed in this summary report, you will find the following:

1. Conference schedule
2. Paper and poster abstracts
3. Participant list
4. Notes from the working group discussions (action items for all NAPC members are highlighted in yellow)
5. Conference evaluation summary

We hope the conference helped you build on existing relationships and/or initiate new collaborations among other pika researchers, and we'd like to see that continue. Please keep in mind that Embere Hall (emberehall@gmail.com) is still managing a website for our group. Please check it out at: http://ochotona.wix.com/pikaconsortium and help her with adding new content (e.g. photos, working group updates, etc.).

Are you on Facebook? If so, don't forget to "Like" our page at: https://www.facebook.com/americanpikas, and if you'd like to join our "westernpikas" listserv, please email Janet Foley at peroqueen@gmail.com. Once subscribed, you can send emails to all subscribers at westernpikas@ucdavis.edu.

Furthermore, the Research and Review Working Group has created a pika researcher database available at https://docs.google.com/spreadsheets/d/10jcoqoujsHcHQNAA5BdyhcIzoBVWqESJtj8ZGlXIs0A/edit?usp=sharing. If you have a project you'd like to add, please do so at https://goo.gl/forms/Erq9eWxNaYdF7m4r1. If you are interested in a specific project that was presented and would like access to that PowerPoint or poster, please reach out to the associated PI or presenter via the participant list provided here.

Here are a few more wrap-up items:

1. If you are interested in obtaining one or more snazzy pika shirts or sweatshirts, please contact Erik (ebeever@usgs.gov) for order details. Erik now has the digital file for the design, and can get them made here in the western U.S.

2. Team Pika Headware (hats and headbands) with a pika logo are also available for purchase! Team Pika is an informal group that loves pikas and their mountain habitats, and wants to keep our national system of public lands in public hands and reduce the impacts of climate change. You must order your pika headware by **March 8**, 5 pm MST using this link to access the order form, see prices, and use links to view styles: https://goo.gl/forms/Lzv5s4cetkHzIHoo2 Please email Mary McFadzen (alpinepika@yahoo.com) with questions.

3. Scott has created an online survey via SurveyMonkey focused on selecting a location, date, and planning strategy for the next (5th) pika conference. Please use the following link to access the survey: https://www.surveymonkey.com/r/XPJTX5V

4. The Species Distribution Modeler (Dr. Adam Smith, of the Missouri Botanical Garden) is keenly interested in hearing feedback on which subdivision schemes (beyond the 5 taxonomic lineages, Omernik's Revised ecoregions, and Elevation quintiles) you think should be tested for modeling pika distribution with respect to climate.

5. Erik would like to ask one final time that you send him either a compressed EndNote library, or simply a list of your citations, so that he can finalize and make this bibliographic database available to everyone. Please send either of these to him by **20 March 2017**.

We hope that you enjoyed the conference and we look forward to continued work and collaboration with you.

Sincerely,

-The 2017 NAPC Conference Planning Team (Scott, Erik, John, Kelly, and Mackenzie)

Photo Credit: Chris Ray

4th Conference of the North American Pika Consortium

Peppermill Resort, Reno NV. Main meeting room: Naples 6. Working Group meeting rooms: Naples 6, Capri 2, Capri 3, and Capri 4.

Organizing Committee: Erik Beever, Department of Ecology, Montana State University
Mackenzie Jeffress, Nevada Department of Wildlife
Kelly Klingler, University of Nevada, Reno
Scott Osborn, California Department of Fish and Wildlife
John Perrine, Calif. Polytechnic State University, San Luis Obispo

General Schedule

Monday February 6			
Start Time	**End Time**	**Elapsed Time (H:mm)**	**Event**
7:30 AM	8:30 AM	1:00	Preregistration Check-in, Onsite Registration
8:30 AM	12:15 PM	3:45	Plenary 1, Oral Presentation
12:15 PM	1:45 PM	1:30	Lunch (on your own)
1:45 PM	3:10 PM	3:15	Oral Presentations, Speed Talks
3:25 PM	5:00 PM	1:35	Working Group meetings (Part 1), Film Screening
5:00 PM	7:00 PM	2:00	Break
7:00 PM	9:00 PM	2:00	Poster Session, Social Mixer, Film Screening
Tuesday February 7			
Start Time	**End Time**	**Elapsed Time (H:mm)**	**Event**
7:30 AM	8:00 AM	0:30	Onsite Registration
8:00 AM	11:30 AM	3:30	Oral Presentations, Plenary 2, Film Screening
11:30 AM	12:30 PM	1:00	Lunch (on your own)
12:30 PM	1:45 PM	1:15	NAPC Working Group Meetings (Part 2)
1:45 PM	2:45 PM	1:00	Working Group reports; Discussion
2:45 PM	3:00 PM	0:15	Wrap-up; Adjourn

The organizing committee thanks the conference sponsor, the Western Section of The Wildlife Society.

We also thank conference participants who assisted with review of submitted abstracts: Erik Beever, Lauren Benedict, Kristina Ernest, Mackenzie Jeffress, Aaron Johnston, Scott Osborn, John Perrine, Joseph Stewart, Marie Westover, David Wright.

4th Conference of the North American Pika Consortium

Detailed Schedule

Start Time	Event/Title	Speaker/Session Chair
Monday February 6		
7:30 AM	Pre-registration Check-in; Onsite Registration	
8:30 AM	Welcome and Introductions	Erik Beever
8:40 AM	**Plenary 1.** Niches, heterogeneity, and stability: Moving from single-species perspectives on a faux rabbit to system-level inferences	
	Oral Presentations A: Large scale, regional- or population-level response	**Session Chair: John Perrine**
9:20 AM	State wildlife agency efforts to conserve and monitor the American pika	Kimberly Hersey
9:50 AM	Apparent Climate-Mediated Loss and Fragmentation of Core Habitat of the American Pika in the Northern Sierra Nevada, California, USA	Joseph Stewart
10:10 AM	Lessons from American-pika research in a trailing-edge mainland: 2016 findings from northern New Mexico	Erik Beever
10:30 AM	***BREAK (15 min)***	
10:45 AM	Developing a protocol for long-term population monitoring and habitat projections to track a sentinel of ecosystem change in remote landscapes	Aidan Beers
11:05 AM	Inferring range contraction from apparent cache age in a food-hoarding species	Max Wasser
11:25 AM	Using citizen science data to assess the trend in the distribution of American pika (*Ochotona princeps*) across the Front Range of Colorado	Megan Mueller
11:45 AM	Within-talus temperatures are not limiting for pikas in the northern Sierra Nevada, California	David Wright
12:15 PM	***LUNCH (on your own;)(1 hour, 30)***	
	Oral Presentations A (continued)	**Session Chair: Scott Osborn**
1:45 PM	Do climatic constraints on American-pika distribution vary spatially, and if so, how?: tests of common SDM assumptions, and novel approaches to improve modeling	Erik Beever

4th Conference of the North American Pika Consortium

Detailed Schedule

Start Time	Event/Title	Speaker/Session Chair
	Speed Talks	**Session Chair: Scott Osborn**
2:15 PM	Early Work Report	David Wright
2:20 PM	Increasing pika connectivity across an interstate highway in the Washington Cascades: update of early post-construction monitoring	Kristina Ernest
2:25 PM	Using detection dogs to determine the population status of the American pika (*Ochotona princeps*) in the Bridger Mountains in Montana	April Craighead
2:30 PM	Individual-based analysis of hair corticosterone reveals factors influencing chronic stress in the American pika	Mike Russello
2:35 PM	Pikas reject the low snowfall/high mortality hypothesis	Andrew Smith
2:40 PM	Sub-surface temperature and other environmental effects on the summer surface activity of a microhabitat specialist	Meghan Wiebe
2:45 PM	A multi-scale assessment of newly documented American pika sites in northwestern Nevada	Mackenzie Jeffress
2:50 PM	The importance of long-term monitoring: a case study investigating genetic change within the American pika (*Ochotona princeps*) population in Bodie, CA, USA	Kelly Klingler
2:55 PM	Geomorphic structure of pika habitats defined by airborne LiDAR	Aaron Johnston
3:00 PM	Early Work Report	Aaron Johnston
3:05 PM	Assessing genomic divergence in American pika along elevational transects reveals insights into thermal adaptation	Mike Russello
3:10 PM	***BREAK (15 min)***	
3:25 PM	**NAPC Working Group Meetings (Part 1) (1 hour, 15 min)**	
4:40 PM	Film by Jere Folgert: "*The Adventures of the American Pika, Chapter 1*"	
5:00 PM	***BREAK (2 hrs)***	
7:00–9:00 PM	Poster Session, Social Mixer; Jere Folgert Film: "*The Adventures of the American Pika, Chapter 2*"	

4th Conference of the North American Pika Consortium

Detailed Schedule

Start Time	Event/Title	Speaker/Session Chair
Tuesday February 7		
7:30 AM	Onsite Registration	
	Oral Presentations B: Small scale or individual response	**Session Chair: Mackenzie Jeffress**
8:00 AM	Dietary variation of the American pika in the Rocky Mountains across a century of climate change	Marie Westover
8:20 AM	Field tests of foraging preferences by haying pikas (*Ochotona princeps*) in the Washington Cascades, with applications to connectivity corridors	Carly Wikhem/Kristina Ernest
8:40 AM	The effects of territory quality, individual variation, and sex on physiological stress in the American pika (*Ochotona princeps*)	Kelly Klingler
9:00 AM	Why is melanism uncommon in the American pika?	April Craighead
9:20 AM	Behavioral ecology of American pikas (*Ochotona princeps*) at Mono Craters, California: Living on the edge	Andrew Smith
9:40 AM	Summer surface activity of a sub-surface microhabitat specialist: surprisingly consistent behavior from dawn to dusk, despite diurnal temperature variation	Lauren Benedict
10:00 AM	***BREAK (15 min)***	
10:20 AM	**Plenary 2**. Pikas in decline: Where do we go from here?	Mary Peacock
11:00 AM	Film by Jere Folgert: "*The Adventures of the American Pika, Chapter 3*"	
11:30 AM	***LUNCH (on your own)(1 hour)***	
12:30 PM	**NAPC Working Group Meetings (Part 2)(1 hour, 15 min)**	
1:45 PM	Informal Working Group reports	Moderated by Kelly Klingler and Mackenzie Jeffress
2:15 PM	Open Discussion on Future Work in Changing Political Climate	Moderated by Mary Peacock and Shaye Wolfe
2:45 PM	Wrap-up	Erik Beever
3:00 PM	Adjourn	

4th Conference of the North American Pika Consortium

Abstracts, in order of presentation

ORAL PRESENTATION ABSTRACTS, Day 1

State wildlife agency efforts to conserve and monitor the American pika.

Kimberly Hersey
Utah Division of Wildlife, 1594 W. N. Temple, Salt Lake City, UT 84116
801-362-0795 kimberlyasmus@utah.gov

The American pika's (*Ochotona princeps*) range within the United States spans 10 states. It is listed as a Species of Greatest Conservation Need in 8 of the 10 State Wildlife Action Plans, and as such, state wildlife agencies are actively engaged in a variety of efforts to conserve pikas. As examples, since 2008, Colorado Parks and Wildlife has been working to assess the status of the species and has implemented a long-term monitoring program. Surveys in Colorado indicate that pika populations are well distributed and habitat is extensive. Connectivity among populations is sufficient to maintain a healthy metapopulation structure allowing populations to persist despite some local declines. Nevada has focused on a statewide inventory including expanding on data for historic ranges, documenting newly discovered populations, and noting areas with only relict sign indicating possible local extirpation. Utah has been monitoring occupancy statewide every three years since 2008. Occupancy rates have been high and stable with metapopulation-related variables best explaining extinction and colonization dynamics. Improved communication among the states and between various academic and citizen science efforts is needed to better integrate our efforts. In general, the states remain committed to pika management and working with diverse partners in conservation.
Co-author(s): Amy Seglund, Mackenzie Jeffress

Apparent Climate-Mediated Loss and Fragmentation of Core Habitat of the American Pika in the Northern Sierra Nevada, California, USA

Joseph A. E. Stewart
University of California, Santa Cruz, 1156 High St, Santa Cruz, CA 95060
831-252-4683 jaes@ucsc.edu

Contemporary climate change has been widely documented as the apparent cause of range contraction at the edge of many species distributions but documentation of climate change as a cause of extirpation and fragmentation of the interior of a species' core habitat has been lacking. Here, we report the extirpation of the American pika (*Ochotona princeps*), a temperature-sensitive small mammal, from a 165-km2 area located within its core habitat in California's Sierra Nevada mountains. While sites surrounding the area still maintain pikas, radiocarbon analysis of pika fecal pellets recovered within this area indicate that former patch occupancy ranges from before atomic bomb testing to ca. 1991. Despite an abundance of suitable rocky habitat, climate warming appears to have precipitated their regional demise. Weather station data reveal a 1.9C° rise in local temperature and a significant decline in

snowpack over the period of record, 1909-2015, pushing pika habitat into increasingly tenuous climate conditions during the period of extirpation. This is among the first accounts of an apparently climate-mediated, modern, regional extirpation of a species from an interior portion of its geographic distribution, resulting in habitat fragmentation.
Co-author(s): Katherine A. Heckman, David H. Wright

Lessons from American-pika research in a trailing-edge mainland: 2016 findings from northern New Mexico

Erik A. Beever
Montana State University, Dept. of Ecology, P.O. Box 173460, Bozeman, MT 59717-3460
530-410-9631 ebeever10@gmail.com

Northern New Mexico presents an uncertain trajectory for trends of American pikas. On one hand, trailing-edge populations of many animal species have suffered disproportionately high losses under contemporary climate change. Conversely, mainland populations have been theorized to exhibit higher persistence; this has been demonstrated repeatedly in several American-pika investigations of persistence from historical records to now. We comprehensively mapped pika-inhabitable patches (felsenmeers) in CalTopo.com across all of the three high-elevation lobes in northern NM, to address various questions, especially recent-past, current, and likely-future pika distributions. In summer 2016, we sampled 87 different patches during June-September for: pika occupancy and density, presence of other unequivocally identifiable mammal and bird species, plant cover by species, microtopography, and microclimate (via sensor deployments). We observed distributional shifts across much of the region, but losses appeared less extensive than in the Great Basin. Several biophysical gradients and changing fire regimes set up a richly nuanced stage to investigate mechanisms underlying species-climate relationships. We present results from more-comprehensive sampling in Bandelier, Valles Caldera, and the Pecos Wilderness Area, as well as initial results of radiocarbon dating of old pellets.
Co-author(s): Marie L Westover, Felisa A Smith

Developing a protocol for long-term population monitoring and habitat projections to track a sentinel of ecosystem change in remote landscapes

Aidan T. Beers
University of Colorado Boulder, 1633 18th St, Apt 5, Boulder, CO 80302
503-544-5369 aidan.beers@colorado.edu

Isolating climate-mediated changes from other processes can lead to advances in understanding the ecological impacts of climate change. Studying ecological change in remote landscapes where climate

change is a dominant process is one promising approach, especially in potential climatic refugia. Species in remote landscapes, such as pikas in national parks, might serve as sentinels of climate-mediated ecological change. Recent results from a uniquely "replicated" study of pikas in eight national parks predicts context-specific responses to climate change during this century, from stable populations to park-level extirpation. These predictions, developed from baseline data on pika habitat occupancy and genetic connectivity in each park, can be tested by monitoring and modeling similar patterns into the future. We used existing predictions of pika vulnerability in Rocky Mountain National Park (ROMO), along with remotely sensed data on habitat features influencing climate exposure and connectivity, to stratify a spatially balanced sample of plots to be monitored long-term by park technicians and volunteers. To encourage similar modeling across parks, our protocol is adapted from the eight-park baseline occupancy and genetic surveys. Similar monitoring at the Niwot Ridge Long Term Ecological Research site will provide a contextual test for the dire predictions of pika loss in ROMO.
Co-author(s): Chris Ray, Paul McLaughlin, Thomas Rodhouse, Donelle Schwalm

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Inferring range contraction from apparent cache age in a food-hoarding species

Max S. Wasser
University of Colorado-Boulder, UCB 450, Boulder, CO 80309-0450
307-460-0997 max.wasser@colorado.edu

Projecting species range dynamics based only on climatic correlates of species presence has been questioned widely. Recent projections for the American pika in the southern Rockies suggest more rapid losses when models include data on habitat connectivity inferred from genetic analysis. Dire projections of pika loss in Rocky Mountain National Park (ROMO) prompted analysis of data from the nearby Niwot Ridge Long Term Ecological Research (NWT) site, where pikas have been studied intermittently since the 1960s. However, variation in the objectives and design of successive NWT pika studies complicates trend analysis. We inferred a temporal trend in habitat occupancy for this territorial, food-hoarding species by assuming the volume of each remnant (unconsumed) cache diminishes over time. On NWT's well-studied West Knoll, we conducted a full census of remnant cache sizes during summer 2015, prior to cache construction, and used independent (trapping) data from 2008-2014 to verify that territories with larger cache remnants were occupied more recently. Results suggest the range of West Knoll pikas has contracted dramatically and uphill, in agreement with projections for ROMO. To validate and extend this inference, we have begun occupancy and connectivity monitoring at NWT using a protocol comparable with planned monitoring at ROMO.
Co-author(s): Chris Ray, Aidan Beers

4th Conference of the North American Pika Consortium

Abstracts, in order of presentation

Using citizen science data to assess the trend in the distribution of American pika (*Ochotona princeps*) across the Front Range of Colorado

Megan Mueller
Rocky Mountain Wild, 1536 Wynkoop Ste 900, Denver, CO 80202
megan@rockymountainwild.org

Understanding the potential impacts of climate change on the distribution and status of American pika in the Southern Rockies may be limited by the availability of long-term datasets. In response to this need, the Front Range Pika Project (FRPP) has engaged citizen science volunteers in collecting data on distribution and habitat associations of pika across the Front Range since 2011. Here, we examine the trend in pika site occupancy patterns and test a suite of habitat and climate metrics as predictors of pika occupancy across the Front Range. Further, we share insights on strengths and weaknesses of a citizen science approach to examining trends in pika site occupancy, and describe how scientists may access our dataset for their research. Lastly, we discuss how participation in the FRPP helps volunteers learn about and engage in conservation efforts in response to climate change.
Co-author(s): Heather Batts

Within-talus temperatures are not limiting for pikas in the northern Sierra Nevada, California

David H. Wright
California Department of Fish and Wildlife, 1701 Nimbus Road, Suite A, Sacramento, CA 95670
916-358-2945 David.Wright@wildlife.ca.gov

The American pika (*Ochotona princeps*) is a temperature-sensitive lagomorph, and is in decline in warm sites in California and the Great Basin, Nevada and Utah. Climate envelope modeling and climate projections suggest the species' distribution will retreat in coming decades – but other studies suggest that pikas' thermal environment is moderated by their ability to take refuge in rocky talus, a common denning habitat in the Sierra Nevada, implying pikas have a thermal refuge from warming ambient temperatures. We investigated the thermal environment of talus habitats in the northern Sierra Nevada between 2010 and 2015, using automated temperature loggers placed approximately 0.5 to 1 m below the surface. We found that temperatures within talus are rarely challenging to pikas – even in taluses well below the inhabited elevational range of pikas. Occurrence of temperature extremes within talus was weakly correlated with elevation, but exhibited substantial variation. Temperatures at depths that we were not able to probe but that pikas can readily reach are certain to be even more stable and less physiologically challenging. We suggest it is likely to be aboveground air and surface temperatures, rather than temperatures within talus, that challenge pika persistence, such as through effects on foraging and dispersal.
Co-author(s): Joseph A. E. Stewart, Stacy Anderson

Do climatic constraints on American-pika distribution vary spatially, and if so, how?: tests of common SDM assumptions, and novel approaches to improve modeling

Erik A. Beever
Montana State University, Dept. of Ecology, P.O. Box 173460, Bozeman, MT 59717
(530) 410-9631 ebeever10@gmail.com

Species distributions reflect a dizzying array of factors that constrain any single species' distribution from its fundamental to its realized niche, including aspects of the predatory, competitive, and physical environments. Because American pikas have been found to respond to variability in climatic conditions at multiple spatial and temporal scales, we are using species distribution modeling (with Maxent, boosted-regression trees, and GAMs) to challenge the assertion that climate constrains distribution across all parts of a species' range. Using data from >75 contributors, we are designing novel ways to rigorously: a) define the 'background' available to individual pika detections; b) compare the predictive ability of several schemes of subdividing the species range into subunits; c) quantify the consequences of correcting for spatial, temporal, and spatio-temporal bias; and d) assess the degree of overlap in importance of climatic predictors, across subunits. Deeper initial investigations into phylogenetically defined niches suggest that evolutionary pathways proposed by Galbreath are not reflected in our analyses, but that the fenisex lineage has a markedly distinct niche from the rest of the species. Fine-scale analyses will seek to identify the locale-specific factors constraining pika distribution and thus identify possible mechanisms to address in any climate-adaptation conservation actions.
Co-author(s): Adam B. Smith, Mimi Kessler, Aaron N. Johnston

POSTER ABSTRACTS

Increasing pika connectivity across an interstate highway in the Washington Cascades: update of early post-construction monitoring

Kristina A. Ernest
Department of Biology, Central Washington University, Ellensburg WA 98926
509-963-2085, ernestk@cwu.edu

The distribution of American pikas in the Cascade Range of Washington is bisected by Interstate-90. Before recent construction efforts in the 25-km stretch of highway east of Snoqualmie Pass, dispersing pikas likely had few options for crossing the highway, and populations north and south of the highway were assumed to have limited connectivity. I conducted occupancy surveys and measured habitat characteristics (including slope, patch size, aspect, rock size) in both natural and anthropogenic rocky patches within approximately 2 km of the highway, and used logistic regression models to analyze the

main variables distinguishing occupied and unoccupied patches. Anthropogenic rocky patches formed or rebuilt during construction were also monitored over several years for pika occupancy. Pikas have rapidly colonized some of these anthropogenic habitats, but not others. Characteristics of re-colonized patches will give important clues about habitat suitability in this zone of critical connectivity for pikas in the Cascade Range and inform restoration efforts along roads, including wildlife crossing structures.

Using detection dogs to determine the population status of the American pika (*Ochotona princeps*) in the Bridger Mountains in Montana

April C. Craighead
Craighead Institute, 201 South Wallace Ave., Suite B2D, Bozeman, MT 59715
406-585-8705 april@craigheadresearch.org

The Bridger Mountains comprise a long, narrow, isolated, mountain range near Bozeman in southwestern Montana. The Bridgers contain adequate talus at higher elevations to support pika populations, and anecdotal evidence exists that pikas have resided there, but no historical records confirm this. Surveys were conducted in 2012, 2013 and 2015 using established research protocols and aerial photography to determine if pika populations are extant. Data were collected from a total of 147 random survey points and 55% of the potential talus habitat was surveyed. Sites were searched on foot by teams of observers to find visual evidence (haypiles or scat) or auditory evidence. However, no pika sign was detected. To further investigate if pikas resided in the Bridger Mountains, a specially trained detection dog was enlisted in 2015 to resurvey specific sites. Detection dogs are trained to find various species by detecting species-specific scat in the environment. Pika scat can remain in the environment for many decades making it feasible for scat to be detected after many years. Four of the best talus sites were investigated by the dog; however no pika sign was detected. This sort of alternative search method could prove cost-effective for finding pikas in remote landscapes.
Co-author(s): Megan Parker

Individual-based analysis of hair corticosterone reveals factors influencing chronic stress in the American pika

Matthew Waterhouse (presented by Michael Russello)
Department of Biology, University of British Columbia, 3427 University Way, Kelowna, BC V1V 1V7, Canada

Glucocorticoids are often measured in wildlife to assess physiological responses to environmental or ecological stress. Here, we report the first use of hair samples to measure long-term corticosterone levels in the climate-sensitive American pika (*Ochotona princeps*). We initially validated an

immunoassay-based measurement of corticosterone extracted from hair samples, and compared corticosterone estimates obtained from plasma, hair, and fecal samples of nine pikas. We further investigated relationships between hair corticosterone, microclimate, body size and sex in 49 pikas sampled over two elevational gradients to assess whether hair samples can provide direct insights related to climate-mediated stress responses. Corticosterone was measured accurately in pika hair after correcting for the influence of extraction efficiency. Hair- and plasma-based estimates of corticosterone were weakly correlated. The best-supported linear, mixed-effects model suggested corticosterone was lower in larger, male pikas, and at locations with higher ambient summer temperatures. Our results are consistent with a general negative relationship between body mass and glucocorticoid concentration observed across mammals, attributed to the higher mass-specific metabolic rates of smaller bodied animals. Overall, this work establishes direct physiological evidence for thermal stress in the American pika adding to recent studies demonstrating negative effects of chronic cold stress in this species.
Co-author(s): Bryson Sjodin, Chris Ray, Liesl Erb, Jennifer Wilkening, and Michael Russello

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Pikas reject the low snowfall/high mortality hypothesis

Andrew T. Smith
Arizona State University, School of Life Sciences, Tempe, AZ 85282
480-965-4024 a.smith@asu.edu

In 1978 one of us (ATS) formulated a hypothesis which has gained considerable traction in the pika literature, particularly with regard to climate change extrapolations and conditions that may lead to extinction of pikas throughout part of their geographic range, namely that there could be high density-independent mortality in years of low or early snowmelt. Intuitively, absence of an insulative layer of snow to shield pikas from cold could force pikas to excessively increase their metabolism overwinter to thermoregulate, and they may run out of energy reserves before the onset of spring and emergence of fresh vegetation. Many researchers have invoked this hypothesis, and many have even stated it as fact. In winter 2014-2015 the Sierra Nevada experienced its lowest snowfall in recorded history. Water content of snow on 1 April 2015 was only 5% of average. There was essentially no snow. What better year to clarify and test this hypothesis? In summer 2015 there were healthy populations of pikas at every locality where we observed pikas the previous summer. There was no evidence that the nearly total lack of snow caused unusual overwinter mortality in Sierra pikas. The pikas rejected the low snowfall/high mortality hypothesis.
Co-author(s): Constance I Millar

Sub-surface temperature and other environmental effects on the summer surface activity of a microhabitat specialist

Meghan R. Wiebe
University of Colorado at Boulder, UCB 450, Boulder, CO 80309-0450
303-579-3692 meghan.wiebe@colorado.edu

Microhabitats often harbor microclimates, and microclimatic conditions might be the proximal determinant of geographic range for many microhabitat specialists. The relatively moderate sub-surface temperatures in rocky microhabitats exploited by the American pika should allow for behavioral thermoregulation, extending the range of this otherwise thermally constrained species. This long-standing hypothesis was tested in recent studies of the American pika in the northern half of its range. Here, we extend results with an ongoing (2012-2016) study in the southern Rockies of Colorado. Focal-animal behavioral observations (n = 159) were paired with environmental conditions, including surface and sub-surface temperatures, to model durations of surface activity. Surface activity declined with increasing surface and sub-surface temperature and in windy conditions, but increased with increasing cloud cover. After controlling for site, observer, month and year, our best supported model of surface activity based on surface temperature was improved dramatically by including sub-surface temperature as a predictor variable. Recent models of pika distribution have focused on potential surface activity, estimated from surface climate and pika physiology, as a relatively mechanistic predictor of pika presence. Our results suggest that distribution models might be improved further by incorporating sub-surface temperature in this case, and relevant microclimates in general.
Co-author(s): Maxwell Plichta, Heather Batts, Lauren Benedict, Chris Ray

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Factors influencing American Pika (*Ochotona princeps*) in the Beartooth Mountains and implications under a warming climate

Kaitlyn E. Hanley
Clemson University Dept. of Biological Sciences, 123 Long Hall, Clemson University, Clemson, SC 29678
561-568-7756 kehanle@g.clemson.edu

Temperatures in the Greater Yellowstone Region are expected to increase by 1- 4 °C over the next century, threatening species such as American pika (*Ochotona princeps*) that are found in cooler microclimates there. If their distribution is limited by microclimate, then they may disappear from lower, warmer southwest-facing sites first, and find refuge in cooler, higher elevation northeast-facing sites. However, if their distributions are limited by food availability or the presence of large, connected areas of talus, then the effects of warming may be reduced. We explored these possibilities for pika populations in the Beartooth Mountains of Montana. We surveyed 30 populations across southwest- and northeast-facing elevational gradients (2200-3500m), and asked whether pika densities varied with elevation, food availability or aspect, all related to temperatures, or with talus area and connectivity,

which are not. There was no difference in pika density, measured by latrine densities, between the two gradients; in both gradients, they ranged from 14.6 to 167.5/ha, and declined slightly with elevation. There was also no difference in plant cover, which varied from x to y%, and it did not vary with elevation. Future analyzes with included the effects of talus area and connectivity, and temperatures within the talus.

Co-author(s): David Tonkyn, Katie Quakenbush

A multi-scale assessment of newly documented American pika sites in northwestern Nevada

Mackenzie R. Jeffress
Nevada Department of Wildlife, 60 Youth Center Rd., Elko, NV 89801
775-777-2307 mrjeffress@ndow.org

Although the American pika (*Ochotona princeps*) continues to receive attention due to documented declines and range retractions, particularly in the Great Basin, thorough range inventories have yet to be completed in much of the region. We report discoveries of 238 new locations ("sites") in northwestern Nevada with evidence of past or current occupancy by pikas that cluster into 31 locales in 15 distinct mountain ranges or geographic areas. We documented twice as many relict sites as currently occupied sites, supporting previous observations of local range retraction and site losses within the pika's range. Median elevation and water year precipitation were higher and minimum and maximum July temperatures were lower for occupied sites respective to relict sites. Occupied sites were more likely to be found between a lower and upper limit of water year precipitation, in cooler climates, and on more mesic facing aspects, but many of these environmental descriptors also describe relict sites. Since pikas were known from only a handful of early 20th century records in the area, these surveys greatly expand our understanding of both current and historic pika distribution in the northwestern Great Basin.

Co-author(s): K. Jane Van Gunst, Constance I. Millar

The importance of long-term monitoring: a case study investigating genetic change within the American pika (*Ochotona princeps*) population in Bodie, CA, USA

Kelly B. Klingler
University of Nevada, Reno, 1664 N. Virginia St, Reno, NV 89557
585-721-8470 kbklingler@unr.edu

Monitoring intraspecific genetic variation at both local and regional scales may shed light on the capacity of populations to respond to environmental disturbance such as climate change. Here, we compare genetic data from museum specimens' collected mid-20th century, to samples collected late 20th century, and from the contemporary population of American pikas inhabiting mine tailings at Bodie State Historic Park, Mono County, CA, in order to quantify the genetic impacts of long-term population

decline. These temporal data indicate that significant shifts in allelic distribution and frequency have occurred over the last 65 years. In fact, it is clear that a significantly greater number of alleles have been lost within the last 25 years compared to the 40 years that preceded it. In addition to losses in allelic diversity (LOA), there is also evidence for reduction in novel allelic variants across all sampled loci and a highly reduced effective population size for the contemporary population. Genetic bottlenecks were detected at each time period, a possible signature of metapopulation dynamics and genetic coalescence. Finally, the genetic data indicate that the extant Bodie pika population is genetically distinct from surveyed populations in the Bodie Hills and beyond and thus of conservation significance.
Co-author(s): Mary Peacock, Lyle Nichols, V. Kirchoff

Geomorphic Structure of Pika Habitats Defined by Airborne LiDAR

Aaron N. Johnston
US Geological Survey, 2327 University Way, STE 2, Bozeman, MT 59715
406-994-7158 ajohnston@usgs.gov

American pikas (*Ochotona princeps*) are most often found in taluses with rock diameters 0.2-1 m, but most aerial imagery cannot resolve talus characteristics important to pikas. Airborne light detection and ranging (LiDAR) can penetrate forests and should describe microtopography in sufficient detail to identify taluses suitable for pikas. We surveyed pikas within a LiDAR acquisition (9 pts/m2) in Montana and measured rock sizes at 134 plots centered on either haypiles or areas unoccupied by pikas. We measured the relationship strength between rock sizes and LiDAR metrics for surface roughness to determine whether LiDAR can discriminate geomorphic features important to pikas. We then used LiDAR metrics and logistic regression to discriminate areas around 206 haypiles from areas of talus unoccupied by pikas. Mean rock size was positively correlated with the standard deviation of LiDAR return heights ($R2 = 0.40$, $P < 0.001$). As expected, the probability of use by pikas had a significant quadratic relationship with the standard deviation of LiDAR return heights, such that highest use corresponded to mean rock size of 0.96 m. Results indicate that LiDAR can describe taluses at resolutions meaningful to pikas, and this method should improve habitat mapping and hypothesis testing for this species.
Co-author(s): Erik A Beever, Thomas Millette

Assessing genomic divergence in American pika along elevational transects reveals insights into thermal adaptation

Matthew Waterhouse (presented by Michael Russello)
Dept of Biology, University of British Columbia Okanagan Campus, 3427 University Way, Kelowna, BC V1V 1V7, Canada

Climate change has been implicated in recent extirpations of American pika (*Ochotona princeps*) populations suggesting local adaptation to thermal stress may play an increasingly important role in maintaining the species' viability. Here, we investigatied patterns of neutral and adaptive genetic divergence in American pikas across rapidly changing environments along elevational transects in North Cascades National Park, Washington, USA. Pikas were live-trapped at four sites along each of two transects and microclimate was measured at each site using ambient and talus temperature sensors. Restriction site-associated DNA sequencing was used to genotype 59 samples at approximately 42,000 loci, 229 of which were identified as high confidence F_{st} outliers and candidates for divergent selection. Sampling sites exhibited a unique genetic identity at outlier loci only, indicating an elevational pattern in putatively adaptive, but not neutral genomic divergence. Additionally, six of these outlier loci showed correlations with enviornmental parameters, one of which was successfully annotated to a gene involved in fat metabolism. Our results highlight the potential importance of climate in shaping patterns of adaptive genetic variation in American pikas and the possible role of fat metabolism in responding to climate-mediated stress, although further validation is required.

Co-author(s): Liesl Erb, Erik Beever, Michael Russello

ORAL PRESENTATION ABSTRACTS, Day 2

Dietary variation of the American pika in the Rocky Mountains across a century of climate change

Marie L. Westover

University of New Mexico, MSC03 2020 1 University of New Mexico, Albuquerque, NM 87131
mariewestover@gmail.com

While climate change is driving shifts in the range boundaries of taxa globally, it may also alter the life history traits or ecology of many species. One small alpine mammal, the American pika *(Ochotona princeps)* is an indicator species for animal responses to climate change. Shifts in forage availability and quality may be a driver influencing *O. princeps* abundance, persistence, and body size. We utilize carbon (13C) and nitrogen (15N) stable isotope analysis of fur and bone to characterize the dietary niche of *O. princeps* across Rocky Mountain populations spanning a latitudinal gradient (n=9) and a century of climate change (n=4). The questions we address are 1) How much individual O. princeps and population dietary niches vary across their range in the Rocky Mountains? 2) Have *O. princeps* altered their diet over the past century of climate change? We sampled seasonal molts and bone collagen from each individual to assess variation between individuals and populations. We find pika diets tend to exhibit little variation throughout the southern Rocky Mountains, with higher rates of seasonal variation in diet within individuals than in populations over decades. Pika isotopic dietary niche appears not to be affected by climate change or latitude.

Co-author(s): Felisa A Smith

Field tests of foraging preferences by haying pikas (*Ochotona princeps*) in the Washington Cascades, with applications to connectivity corridors

Carly S. Wickhem (presented by Kristina Ernest)
Central Washington University, Department of Biological Sciences, 400 E University Way, Ellensburg, WA 98926
carly.wickhem@cwu.edu

Pikas are dietary generalists, consuming a wide variety of plant species. Diet choices may vary geographically and even within populations if individuals show differences in plant selection. We conducted field experiments to test plant selection on the eastern slopes of Washington's Cascade Range as pikas were collecting food for their winter haypiles. Cafeteria-style trials allowed pikas to selectively forage from five to six locally-common plant species at a time. Jacobs' selectivity index, Hotelling's T2 tests, and one-sample t-tests were used to evaluate which species were preferred by pikas. Levels of nutritional components and secondary metabolites from samples of each plant species were analyzed with linear regression. Douglas fir (Pseudotsuga menziesii), Sitka alder (Alnus viridis), willow (Salix spp.), and black cottonwood (Populus balsamifera trichocarpa) were the species pikas selected most. Despite being common haypile components in the study area, bracken fern (Pteridium aquilinum) and fireweed (Chamerion angustifolium) were not selected for by pikas. Pikas selected plants that contained either alkaloids or high levels of tannins but not both. The preferred forage species are recommended for planting to encourage pika use of wildlife crossing structures currently being built into Interstate-90 near Snoqualmie Pass.
Co-author(s): Kristina A. Ernest, Lisa A. Shipley

The effects of territory quality, individual variation, and sex on physiological stress in the American pika (*Ochotona princeps*)

Kelly B. Klingler
University of Nevada, Reno, 1664 N. Virginia St, Reno, NV 89557
585-721-8470 kbklingler@unr.edu

Non-invasive approaches to studying the response of a sensitive species like the American pika (*Ochotona princeps*) to environmental disturbance can be particularly informative. Within a talus habitat, there are a finite number of territories suitable for pikas and we hypothesize that they may differ in relative "quality" as a function of both distance to the talus-vegetation interface, and inherent thermal buffering capacity. Recent research validated the use of a corticosterone enzyme immunoassay for measuring glucocorticoid metabolites (GCMs) in pika feces as a proxy for chronic stress. Here, we explore the utility of a multi-variate toolkit for assessing fine-scale population health. Fresh fecal

samples were repeatedly collected at occupied territories within a pika population located in the Sierra Nevada of eastern California to compare the variation in relative GCM concentrations: (i) among individuals; (ii) between sexes; and (iii) across territories. Average GCM concentrations varied among individuals but did not differ significantly between sexes or when compared within and across seasons. Most powerful is the evidence that GCM concentrations are significantly correlated with maximum summer temperature. Ultimately, these data may help to assess the relative influence of sub-surface temperature, individual variation, and stress on site-specific pika survival.
Co-author(s): Mary Peacock, Cynthia J. Downs

Why is melanism uncommon in the American pika?

April C. Craighead
Craighead Institute, 201 S. Wallace Avenue, Suite B2D, Bozeman, MT 59715
406-585-8705 april@craigheadinstitute.org

Melanism in ectotherms is often studied as an adaptation for raising body temperature. In endotherms, thermal outcomes of melanism are more complex. Melanism is common in some Asian pikas, but extremely rare in the American pika, perhaps because the American pika is operating near thermal maximum during the summer. We hypothesized that melanistic American pikas would be more stressed and less surface-active than non-melanistic neighbors during the summer, and tested these hypotheses using data from a melanistic pika discovered in Montana in 2012. In 2013, fecal and blood samples were collected from the melanistic pika, its immediate neighbors and other pikas at similar elevation. Focal-animal behavioral observations (each 45 minutes long) were conducted in 2013-2015, focusing on the melanistic pika (N =12 observations) and seven uniquely tagged neighbors (N = 24 observations). Results indicated that GCM levels were significantly higher in the melanistic pika than other pikas at the same elevation. We discuss this result in the context of behavioral patterns observed. While our results derive from a sample size of one, they are in agreement with the hypothesis that melanism could cause pikas to operate at higher body temperature during the summer, increasing GCM levels and potentially lowering survivorship.
Co-author(s): Chris Ray, Jennifer Wilkening

4th Conference of the North American Pika Consortium

Abstracts, in order of presentation

Behavioral ecology of American Pikas (*Ochotona princeps*) at Mono Craters, California: Living on the edge

Andrew T. Smith
Arizona State University, School of Life Sciences, Tempe, AZ 85282
480-965-4024 a.smith@asu.edu

American pika behavioral ecology was investigated at a hot south-facing low-elevation site at Mono Craters, California, a habitat quite different from the upper montane regions typically inhabited by pikas where most prior investigations have been conducted. The behavioral profile of Mono Craters pikas contrasted significantly with that of pikas found in upper montane regions. Mono Craters pikas were less surface active than montane pikas, although their short call vocalization rate was similar. Mono Craters pikas did not exhibit typical foraging behavior: they were observed to feed and collect hay infrequently, and they did not construct central place haypiles. Social interactions were comparatively infrequent. The Mono Craters site is one of the warmest localities in which pikas have been investigated. Talus surface temperatures consistently exceeded 30oC, and temperatures >40oC were recorded. Talus matrix temperatures were consistently cooler, and the apparent insulating effect of talus was most pronounced on the hottest days. Pika activity was most frequent in early morning, late afternoon, and at night. Data on populations of pikas which inhabit marginal sites can help us understand how pikas and other montane animals might respond to climate change, so that we may more effectively plan for their conservation.
Co-author(s): John D. Nagy, Constance I. Millar

Summer surface activity of a sub-surface microhabitat specialist: surprisingly consistent behavior from dawn to dusk, despite diurnal temperature variation

Lauren M. Benedict
Whitman College, 345 Boyer Avenue, Walla Walla, WA 99362
303-709-1782 benedilm@whitman.edu

In response to climate change, heat-sensitive species might shift certain activities to cooler times of day. The American pika, which sheds heat by accessing sub-surface microclimates, could be a good model for temporal shifts in behavior as a response to increased heat stress. Recent research on this question was conducted on Niwot Ridge in the Colorado Front Range, where logistical constraints often limit behavioral observations to midday hours. To extend inference to crepuscular activity, we conducted paired dawn and dusk observations of N=11 unique pikas at two sites on Niwot Ridge, for a total of 60, 45-minute observations during the summer of 2016. No significant difference was found in the average percent of time pikas were surface active at dawn (38%), dusk (53%), or midday (33%). Except for preening, which was more prevalent at one site at dusk, specific activity frequencies did not differ significantly between dawn and dusk, and were consistent with previous baseline data for midday

behavior. Sub-surface temperatures, recorded during each observation, were significantly cooler at dawn than at dusk at both sites. Together, these results suggest that summer temperatures on Niwot Ridge currently do not disrupt the consistency of pika surface activity from dawn through dusk.
Co-author(s): Chris Ray

PLENARY

Pikas in Decline: Where do we go from here?

Mary M. Peacock
Department of Biology, Ecology, Evolution and Conservation Biology Graduate Program, University of Nevada, Reno, Reno, Nevada 89557
775-784-1958 mpeacock@unr.edu

Beginning with the Beever et al. (2003) publication, which documented extirpations of known populations in the Great Basin during the 20th century, there has been an increasing interest in exploring potential pika population declines range wide. Using historical records researchers began by asking primarily 3 questions: (1) have there been population extirpations throughout the range of pika, (2) has there been an upslope/elevational range shift in pika distribution, and (3) has climate change played a role in population losses and elevational shifts? The answer to all of these questions has been a resounding yes. From British Columbia to Colorado, the Sierra Nevada and Great Basin not only are we losing pika populations but the role of global climate change – increasing temperatures and changes in precipitation regimes – is apparent. The challenge of mitigating global climate change as a successful conservation action remains formidable as countries worldwide need to agree and implement reductions in greenhouse gases primarily through reduction of fossil fuel use. Herding cats anyone? So where do we go from here? We focus on refugia. We need to refine our knowledge of talus site characteristics where pikas now persist. There has been a huge effort to instrument sites with temperature loggers to better characterize talus locally over the past few years. Such data will allow us to refine our predictions about suitable habitat. In addition, we may be able identify sites that become suitable with increasing temperatures *sensu* Jeffries et al. 2013. Characterization of stress hormone profiles in pika populations in different habitats and elevations may also shed light on extirpation risk. Finally, new advances in genomics not only allow us to access more of the genome resulting in greater power to characterize population genetic parameters, but also to begin characterization of adaptive differences among populations by identification of adaptive trait loci, as seen in Mike Russello's recent work.

4th Conference of the North American Pika Consortium

Plenary Speaker: Mary M. Peacock, Ph.D.

Mary Peacock is an Associate Professor in the Department of Biology and a member of the Ecology, Evolution and Conservation Biology graduate program at the University of Nevada, Reno. Dr. Peacock received a BA in Biological Sciences from the University of California at Davis, a MS in Biology from the University of Nevada, Reno and a PhD in Zoology from Arizona State University. Mary is a conservation geneticist whose research program focuses on the impact that habitat fragmentation has on the probability of long term population persistence. Mary and her students use molecular genetic tools to assess maintenance of genetic variation – and therefore evolutionary potential – as well as to estimate gene flow and effective population size for populations found in anthropogenic altered habitats. Recently we have begun to work on adaptive trait loci for multiple species. Mary has worked on the conservation genetics of a wide variety of taxa including many ESA listed species, among them the Lahontan cutthroat trout, Moapa dace, Desert Dace, Utah prairie dog, Coqui frog, and not the least of which the North American pika. Mary's dissertation research used newly developed highly variable genetic markers (DNA fingerprinting) to elucidate movement, mating patterns and test metapopulation theory in the Bodie pika population. She was one of the first to use highly variable markers to empirically test metapopulation dynamics and the first for the pika. Conservation genetics has become an important tool over the past 20 years in conservation biology. Throughout her career Mary has sat at the table and worked with the state and federal land and species management agency biologists to develop and implement conservation actions based upon sound science.

TWS Certification, Recertification and Professional Development

For initial certification as a Certified Wildlife Biologist (CWB) or Associate Wildlife Biologist (AWB), the "Fourth Conference of the North American Pika Consortium" included 8 hours of content (the working group break-out meetings are not creditable), or 0.6 equivalent semester units. Request 0.6 units, either in Section 1b; or place 0.3 units in Section 1b and 0.3 units in Section 6 (Policy, Administration and Law). In the course description, be sure to mention this was a TWS Western Section-sponsored symposium.

For CWB recertification or in support of obtaining a Professional Development Certificate, request 15 hours in Category A (the working group break-out meetings and the poster session would count here).

Questions? Contact the TWS Western Section Professional Development Committee.

Participant List:

Name	Affiliation	Email
Erik Beever	Montana State University, Dept. of Ecology	EBeever10@gmail.com
Lauren Benedict	Whitman College	benedilm@whitman.edu
Peter Billman	USGS NOROCK	peterbillman@ymail.com
Ali Chaney	Nevada Natural Heritage Program	achaney@heritage.nv.gov
Lehong Chow		lehongc@yahoo.com
Brendan Cohen	Michael Baker International	bcohen@mbakerintl.com
Evan Cole	University of San Francisco	ejcole2@dons.usfca.edu
April Craighead	Craighead Institute	april@craigheadinstitute.org
Kristina Ernest	Central Washington University	kristina.ernest@cwu.edu
Jere Folgert		jfolgert@gmail.com
Jere Folgert	Folgert Studio	candace.renger@gmail.com
Ken Goehring	College of the Siskiyous	kengoehring@gmail.com
Kaitlyn Hanley	Clemson University	kehanle@g.clemson.edu
Kristine Harman		keharman05@gmail.com
Kimberly Hersey	Utah Division of Wildlife	kimberlyasmus@utah.gov
Kristina Hopkins	USDA Forest Service, Plumas NF	thopkins@fs.fed.us
Lauren Hoyle	USFS Tanoe National Forest	l.hoyle2@gmail.com
Mackenzie Jeffress	Nevada Department of Wildlife	mrjeffress@ndow.org
Aaron Johnston	US Geological Survey	ajohnston@usgs.gov
Kelly Klingler	University of Nevada, Reno	kbklingler@unr.edu
Patricia Krueger	USDA Forest Service	pkrueger@fs.fed.us
Rory Lamp	Nevada Department of Wildife	rlamp@ndow.org
Hayley Lanier	University of Wyoming	hlanier@uwyo.edu
Philip Leitner	California State University, Stanislaus	pleitner@pacbell.net
Michael Magnuson	Lassen Volcanic National Park	michael_magnuson@nps.gov
Tina Mark	USDA Forest Service - Tahoe National Forest	tmark@fs.fed.us
Kari McClanahan		k.a.mcclanahan@gmail.com
Connie Millar	USDA Forest Service Pacific SW Research Station	cmillar@fs.fed.us
Megan Mueller	Rocky Mountain Wild	megan@rockymountainwild.org
Karen Oakden	Humboldt State University	keo154@humboldt.edu
Scott Osborn	Calif. Dept. Fish and Wildlife	scott.osborn@wildlife.ca.gov
Mary Peacock	University of Nevada, Reno	mpeacock@unr.edu
John Perrine	Cal Poly, SLO	jperrine@calpoly.edu

Maxwell Plichta	University of Colorado Boulder	MaxPlichta@Gmail.com
Beth Pratt-Bergstrom	National Wildlife Federation	prattb@nwf.org
Katie Quakenbush	Clemson University	katieq@g.clemson.edu
Chris Ray	Institute for Bird Populations	cray@birdpop.org
Tom Rickman	Lassen National Forest	trickman@fs.fed.us
Jennifer Rippert	University of Nevada, Reno	jenrippert@gmail.com
Justin Rozich	U.S.D.A. Forest Service	justinrozich@fs.fed.us
Michael Russello	University of British Columbia	michael.russello@ubc.ca
Matt Shinderman	Oregon State University-Cascades	matt.shinderman@osucascades.edu
Andrew Smith	Arizona State University	a.smith@asu.edu
Joseph Stewart		joaaelst@gmail.com
Kristin Van Gunst	Nevada Department of Wildlife	jvangunst@ndow.org
Kyra Walton Reid	USFS	kireid@fs.fed.us
Max Wasser	University of Colorado Boulder	max.wasser@colorado.edu
Michael West	US Forest Service	mowest@fs.fed.us
Bob Westfall	USDA Forest Service Pacific SW Research Station	bwestfall@fs.fed.us
Daryl Whitmore	U.S. Forest Service	dwhitmore@fs.fed.us
Meghan Wiebe		mewi9853@colorado.edu
Jennifer Wilkening	USFWS	jennifer_wilkening@fws.gov
Shaye Wolf	Center for Biological Diversity	swolf@biologicaldiversity.org
David Wright	Ex-CA Dept F&W	david.wright@wildlife.ca.gov

WORKING GROUP DESCRIPTIONS:

POPULATION GENETICS AND POPULATION GENOMICS WORKING GROUP

This working group focuses on topics related to the genetics/genomics of the two North American pika spp. (American and Collared) including phylogeography, conservation/population genetics, and sampling methodologies/protocol standardization at both fine-scale and range-wide levels. Group goals for these two species include the generation of genomic resources/data, a comprehensive review of the genetic literature, standardization of collection protocols, and creation of genetic kits for agencies and citizen science efforts. We are also interested in weighing in on transplant projects if/when proposed, and addressing how genetics information can help pika conservation.

HEALTH AND PHYSIOLOGY WORKING GROUP

This working group is interested in understanding the effects of physiological stress, disease ecology, and population health on persistence of pikas in the Intermountain West. In particular, this group hopes to inform conservation efforts through greater documentation of how physiology, diet, and disease relates to pika survival, and through easily implemented field metrics of population health that can be routinely sampled over the long-term. In addition, this group recognizes the need for standardization of physiological and disease field collection as well as protocols for trapping and necropsies.

FIELD METHODS WORKING GROUP

The field methods group is working on compiling and standardizing protocols, many of which overlap with other working groups. These protocols include occupancy surveys, trapping/handling, data logger deployment, behavioral observations and more.

CLIMATE WORKING GROUP

The climate working group is focused on understanding how climate and climate change are affecting pika populations and how to best collect and analyze climate data. This includes microclimate data collected with temperature sensors and GIS and remotely-sensed data.

EDUCATION, OUTREACH & CITIZEN SCIENCE WORKING GROUP

This group connects existing pika citizen-science initiatives and supports the development of new outreach programs. It is also exploring options for standardizing data collection between citizen-science projects, creating a shared central repository for pika citizen-science data, and developing protocols for evaluating the effects of citizen-science participation on volunteers. Furthermore, the group is working to support researchers in integrating education, citizen-science and outreach activities as integral parts of future funding proposals.

DISTRIBUTION AND HABITAT WORKING GROUP

This group is working to understand key habitat components for pikas, and their spatial scales. The group would like to better quantify how pikas use the landscape and how to improve modeling efforts. Goals include summarizing habitat types where pikas have been found, contributing protocols for delineating patches, and providing recommendations for how best to measure pika habitat.

RESEARCH AND REVIEW WORKING GROUP

The research and review group is tasked with keeping track of various research projects and being available for pika information requests. To this end, the group was interested in creating a database of pika studies, past and current.

4rd North American Pika Conference

Notes from the Working Group Discussions

FEBRUARY 6-7, 2017 ● PEPPERMILL RESORT AND CASINO ● RENO, NEVADA

Following are the notes from the various working group sessions. Action items for the large NAPC membership are highlighted in yellow.

Please contact the working group lead if you would like to be added to or removed from a particular working group.

EDUCATION, OUTREACH & CITIZEN SCIENCE WORKING GROUP

LEAD: April Craighead (april@craigheadinstitute.org) *RECORDER: Megan Mueller*

Working Group Member	Affiliation	Email
Max Plichta	University of Colorado	MaxPlichta@gmail.com
Shaye Wolf	Center for Biological Diversity	swolf@biologicaldiversity.org
Karen Oakden	Humboldt State University	Keo154@humboldt.edu
Katie Quakenbush	Clemson University	katieq@g.clemson.edu
Kaitlan Hanley	Clemson University	kehanle@g.clemson.edu
Megan Mueller	Rocky Mountain Wild	megan@rockymountainwild.org
Lehong Chow	Independent Biologist	lehong@yahoo.com
April Craighead	Craighead Institute	april@craigheadinstitute.org

Other members who are still interested in this subcommittee but couldn't be at conference this year:

Johanna Varner (Colorado Mesa University johannavarner@gmail.com), Liesl Petersen-Erb (Warren Wilson College, Peteson.liesl@gmail.com), Erica Garroutte (Denver Zoo, egarroutte@denverzoo.org)

Other past members or individuals currently running CitSci projects who may be interested in this subcommittee:

Nifer Wilkening, Lucas Moyer-Horner, Embere Hall, Leslie Rodman, Marci Demmy-Bidwell/Amanda Kuenzi (Mountain Studies Institute, marci@mountainstudies.org, amanda@mountainstudies.org), Shiloh Halsey (Cascades Forest Watch, shiloh@cascadeforest.org), Other people on the list of past attendees?

Review and Update Goals and Role of Working Group:

This year the group was made up primarily of people new to the idea of citizen science with an interest in citizen science, rather than people directly involved in pika citizen science projects, and didn't include anyone present at the previous session at NAPC except for April. Due to the makeup of the group – we spent a proportion of the time having a very general discussion about citizen science and education and outreach around pika (history, value, challenges, benefits etc.). We didn't review and update the general goals (and the notes from the previous meeting didn't include general goals.

Group Progress/New Data to discuss since 2015 Meeting:

April mapped all of the citizen science projects – this map needs to be updated as some projects are no longer active and there are new projects planned.

Johanna et al. presented a poster on the CitSci efforts around pika.

There was an e-mail list and some conference calls – this hasn't been active in a while.

Knowledge Gaps:

- Areas with a high density of citizen science projects are located in places with lots of willing volunteers (e.g. Bozeman, Denver, Portland) and not necessarily in areas with highest conservation priority (e.g. southern Utah, New Mexico, or Great Basin).
- K-12 engagement is often limited by issues of liability and timing during the school year. This also requires a teacher to be a "champion" to help address logistics and maintain enthusiasm in the classroom.
- It can be challenging to connect to audiences that don't already engage with science and nature – how to we reach out to underserved audiences in science? Is this feasible given the geographical and technical challenges of pika research?
- There are challenges inherent in engaging volunteers in pika research: e.g. study sites can be difficult to access, need to set realistic expectations for volunteers.

Updated Needs & Objectives / Identify Challenges

- FUNDING is a big need – most researchers think of citizen science as "free data", but resources are required to orchestrate and maintain these programs.
  - Coordination capacity is often limited
- Volunteer dropout rates can be high. How can we maintain volunteer commitment to collecting data, following a training event?

- We need to create a sense of community among volunteers (via Facebook, blog sites, or sharing of stories)
- We need to improve and maintain connections between staff and volunteers via follow-up messages and planned events.

- Citizen science generated data can be difficult to analyze
  - Absence observations are often of lower confidence with citizens
  - Quantifying spatial survey effort can be a challenge
  - Collection protocols vary across projects giving rise to data compatibility issues.

Short-Term Goals/Tasks (3 months to 1 year):
This includes the tasks from the previous conference as well, as we aren't certain they were completed.

Short Term Goals / Quick Wins	Next Steps	Leader and Collaborators
1. Update the list of all current projects with contact info and the map of all current projects		April Craighead
2. Compile list of potential crowdfunding platforms		Johanna Varner (she has already put together an initial list)
3. Conduct a brief survey of agency and university researchers to determine needs/help ensure CitSci data is useful.	Elements of Survey: What are key research questions currently being addressed/research needs Will they share data protocols they use to answer these questions Where would they like to see additional CitSci involvement/what data would be useful to them etc.	Megan Mueller
4. Develop a brief media fact sheet on pika with local contacts for each region – so everyone has a resource to provide to the media when contacted with a brief summary of the key facts re pika and climate change.		April Craighead
5. Collect CitSci Protocols and provide them to the Max Plichta (see notes from research methods working group)		Megan Mueller and Max Plichta

6. Broader impacts examples and templates: Provide other pika researchgers with information to include citizen science coordination and staff resources as budget line items in future grant proposals.	This is a goal from the last conference: Unclear if any progress has been made on this – if not – keep as a short term goal for this time around.	
7. Establish and communication option or a group for citizen science coordinators to share stories and lessons learned or to pose questions	This is a goal from the last conference: Unclear if any progress has been made on this – if not – keep as a short term goal for this time around.	
8. Collect data on cit-sci programs that did not work. This could be added as a misc. category under protocols		April Craighead and Cathryn Wild provided notes on the Seventh Generation Institute Program

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. Since it seems like many of the leaders of CitSci/Education and Outreach Projects don't make it to NAPC each year, we may need to make a bigger effort to make sure they all get contacted and invited, and also to organize the working group session to facilitate remote participation (via conference call or skype), and schedule that at a time when the folks not at the conference can join.

2. There is a lot of discussion in all of the working groups about the need for a good system for storing shared documents and other resources and communicating. We do need a better system for this working group as well. Can we just build off what the other groups/larger group decides on in terms of a system? Since this is a need for all of the working groups – would it make sense for someone to take the lead on figuring out the ideal system and setting it up for all the groups? There was a discussion about whether it would be useful to have a separate facebook page for outreach – might be nice in the future – but may not be realistic/necessary now.

Specific funding agencies/opportunities for collaboration:

There was a general discussion of the lack of grant opportunities and difficulty getting grant funding, particularly for small CitSci groups (though it's also an issue generally for citizen science). We discussed crowdfunding as a potential way to tap into funding.

1. See goal 2 under short term goals.

Long-Term Goals/Tasks (1 + years):

We ran out of time before getting to discuss long-term goals. The long-term goals below are the goals from the previous conference.

Long Term Goals	Next Steps	Leader / Collaborators
1. Develop an IRB protocol for evaluating the effects of citizen science participation on volunteers themselves.		
2. Interface with environmental educators to develop assessment tools/instruments that can be used to compare across projects.		

POPULATION GENETICS AND POPULATION GENOMICS WORKING GROUP

(N. American pikas—*O. princeps & O. collaris*)

LEAD: Dr. Mike Russello (Michael.russello@ubc.ca) *RECORDER: Kelly Klingler*

Working Group Member	Affiliation	Email
Ken Goehring	None	kengoehring@gmail.com
Jere Folgert	None	Jfolgert@gmail.com
Jane Van Gunst	Nevada Dept. of Wildlife	jvangunst@ndow.org
Jen Rippert	University of Nevada, Reno	jenrippert@gmail.com
Rory Lamp	Nevada Dept. of Wildlife	rlamp1437@gmail.com
Scott Appleby	University of Nevada, Reno	sappleby@unr.edu
Peter Billman	USGS NOROCK	peterbillman@ymail.com
Mary Peacock	University of Nevada, Reno	mpeacock@unr.edu
Brendan Cohen	Michael Baker Intl.	bcohen@mbakerintl.com
Hayley Lanier	University of Wyoming	hlanier@uwyo.edu
Mike Russello	University of British Columbia	michael.russello@ubc.ca
Kelly Klingler	University of Nevada, Reno	kbrieklingler@gmail.com

Review and Update Goals and Role of Working Group:

1. To standardize genetic/genomic protocols being used across pika research labs to improve comparative power, and enable collaboration

2. To inform conservation efforts with an understanding of the genomic patterns within populations, between regions, and across the range of the American and Collared pika spp.

3. To provide state and local agencies as well as outreach/citizen science groups with the protocols and materials necessary for effective genetic sample collection

Group Progress/New Data to discuss since 2015 Meeting:

- Klingler and Peacock: generation of Genotyping-by-Sequencing data for populations in Nevada (Rubies and E. Humboldts), Montana (Emerald Lake), Colorado (West Knoll), and California (Pipet Tarn, Bodie State Historic Park)
- Waterhouse and Russello: Genomic divergence in the American pika along elevational transects reveals insights into thermal adaptations
- Schwalm et al. 2016: use of functional connectivity metric to inform SDMs
    - Measure of genetic neighborhood distance (distance across which gene flow occurs within a given population)
    - Reflects the cumulative effects of multiple and successful dispersal events
- Castillo et al. 2016: use of a landscape genetics approach to assess resistance to gene flow across 8 national parks
    - Determine how landscape and climate-related variables influence gene flow
    - Barriers to dispersal include south-facing aspects, areas with a high degree of topographic relief
    - Dispersal distances increased with habitat fragmentation (up to a point)

Knowledge Gaps:

Updated Needs & Objectives

- Individual and Site- Level
    - Still need an understanding of pika mating systems and prevalence of inbreeding
    - Relatedness levels and genetic predisposition for different traits
    - Offspring success---nearest-territory dispersal
        - How does it change over space and time?
        - What is the average long-term gene flow distance between sites?
        - Under GCC, are populations becoming more isolated?
- Range-wide
    - How do Galbreath units hold up with genomic data?
    - Viscosity of movement on the landscape

Identify Challenges

- Different DNA extraction protocols for ddRADseq protocols (e.g. restriction enzymes, etc.)
- Gaps in the reference genome of the American pika—limits adaptive inferences

Short-Term Goals/Tasks (3 months to 1 year):

Short Term Goals / Quick Wins	Next Steps / Timeline	Leader / Collaborators
Shared Google spreadsheet/collaborative database of available genetic samples, lat/longs, PIs, freezer locations, and folder of relevant literature	May 2017 (early stages of platform)	Pika accession samples (fecal pellets and/or extracted DNA) in need of an archival location may be able to be placed under the care of the Sam Noble Museum in OK with Dr. Hayley Lanier. Restrictions on use may also be possible.
Genetic monitoring/ non-invasive scat collection kits and protocols provided to state and local agencies as well as citizen science efforts	June 2017 (hopefully, protocols and materials list uploaded and available for 2017 field season)	Kelly Klingler (provide scat collection protocols and list of materials)
Interactive map with sample size, years, and number of marker loci to identify gaps in genetic sampling across the range, and available in museums (e.g. Arctos)	December 2017	Jane Van Gunst (NDOW)
Need a list of state lead contacts for genetic research projects, and some funding to create genetic kits and banking of genetic samples (lab freezers)	May 2017	

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. Shared Google folder/ spreadsheet with link available on NAPC Wix website

2. Interactive map of pika genetic sampling linked to NAPC website

Specific funding agencies/opportunities for collaboration:

1. Eppley Foundation, Parks Canada (?) matching funds for whole-genome sequencing

2. State agencies have match funding (perhaps for long-term genetic monitoring studies)

Long-Term Goals/Tasks (1 + years):

Long Term Goals	Next Steps / Timeline	Leader / Collaborators
Whole-genome sequencing project for the American pika and Collared pika species in order to provide an improved reference genome on GenBank-decent scaffaolds for reference assembly already available to help with SNP calling/gbs	2018-2019	Mike Russello, Hayley Lanier, Kelly Klingler, and Mary Peacock Initial planning underway as of Feb 2017
Lagomorph Genomics Group (LaGoMics)—starting to think about interacting and communicating with these folks to standardize protocols for lagomorph genomics projects (international framework for sequencing extinct and extant lagomorphs)	World Lagomorph Society met in July 2016 and will meet again in 2020 (WLS6)	Recently, a perspective paper was published: Fontanesi, L et al. 2016. LaGomiCs—Lagomorph Genomics Consortium: An International Collaborative Effort for Sequencing the Genomes of an Entire Mammalian Order. *Journal of Heredity*, *107*(4), pp.295-308.
Parsing out the regional subtleties of neutral and adaptive genomic variation within each of the 5 subspp./mitochondrial lineages, using HyRAD (hybridization capture approaches) for museum and non-invasive samples	Late 2017-2019	Jen Rippert (PhD student with Mike Russello) is pursuing this using RADseq data and the original Galbreath samples (8 lanes of HiSeq data collected to date) *****lots of opportunity for collaboration using museum specimens/additional targeted sampling**** Danielle Schmidt (MSc student working with Mike Russello) is experimenting with HyRAD to collect genome-wide data from non-invasively collected samples (and museum specimens)
Estimating finer-scale dispersal distances for pikas through non-invasive sampling and minimum viability size necessary to maintain a viable population		E. Beever has a student conducting non-invasive sampling between mountain ranges to determine dispersal distances across isolated patches in Montana

HEALTH AND PHYSIOLOGY WORKING GROUP

LEAD: Dr. Nifer Wilkening (Jennifer.Wilkening@colorado.edu) *RECORDER: Kelly Klingler*

Working Group Member	Affiliation	Email
Nifer Wilkening	USFWS	Jennifer.Wilkening@colorado.edu
Max Wasser	CU Boulder	Max.wasser@colorado.edu
Kelly Klingler	UNR	kbrieklingler@gmail.com
Meghan Wiebe	CU Boulder	meghan.wiebe@colorado.edu
Kristina Earnest	Central Washing University	Kristina.ernest@cwu.edu

Review and Update Goals and Role of Working Group:

1. To standardize the current protocols used to measure stress physiology, disease ecology, and population health in American pika populations in the Intermountain west.

2. To generate a bank of baseline stress data (GCM and GC) for relative comparisons among populations within an eco-region and regional lineages, and to understand how stress physiology relates to estimates of survival and population persistence.

3. To inform conservation efforts by identifying populations at risk of extirpation due to disease or chronic stress.

Group Progress/New Data to discuss since 2015 Meeting:

- Wilkening, J.L., Ray, C. and Varner, J., 2015. Relating sub-surface ice features to physiological stress in a climate sensitive mammal, the American pika (*Ochotona princeps*). *PloS one*, *10*(3), p.e0119327.
- Wilkening, J.L., Ray, C., Ramsay, N. and Klingler, K., 2015. Alpine biodiversity and assisted migration: the case of the American pika (*Ochotona princeps*). *Biodiversity*, *16*(4), pp.224-236.
- Wilkening, J.L., Ray, C. and Varner, J., 2016. When can we measure stress noninvasively? Postdeposition effects on a fecal stress metric confound a multiregional assessment. *Ecology and evolution*, *6*(2), pp.502-513.
- Wilkening, J.L. and Ray, C., 2016. Characterizing predictors of survival in the American pika (Ochotona princeps). *Journal of Mammalogy*, p.gyw097.
- Marie Westover presented a talk at the 2017 IV NAPC entitled, "Dietary variation of the American pika in the Rocky Mountains across a century of climate change":
    - Shifts in forage availability and quality may influence persistence of *O. princeps*
    - Conducted stable isotope analysis (13C and 15N) of fur (seasonal molts) and bone collagen to characterize the dietary niche of *O. princeps*

    - Used 9 Rocky Mountain populations to assess the patterns of dietary niche across the latitudinal gradient and over a century of climate change
    - Found little variation among populations, but greater rates of seasonal variation in diet within individuals than in population over decades
    - Pika isotopic dietary niche does not appear to be affected by climate change or latitude in this population
- Unknown number of winter physiology studies
    - Aiden Beers [long-range pit readers, radio collars], and perhaps, Embere Hall?
- Plague vaccination pilot study of 40 pikas in CO and MT [C. Ray, M. Wasser]
    - CDC sends 6 doses at a time
    - Every other pika receives a placebo

Knowledge Gaps:

Updated Needs & Objectives

- Winter physiology still remains a black box for pikas---biggest gap in our understanding of pika health
    - Collar-based data loggers, camera or acoustic traps may be helpful?
- Genetic predispositions related to health and physiology
    - Is there any evidence to suggest a genetic predisposition to higher stress (i.e. heritability/ genetics of the stress response)?

Identify Challenges

- Winter physiology studies require relatively easy access to field sites, as well as collection of fecal pellets not saturated by ice and snow.
    - Potential for camera-trapping techniques especially through citizen science project on Zooniverse
    - Kris Ernest has known field sites that are accessible by skiing
- Not enough researchers are trapping and marking pikas so there are limited opportunities to collect parasites, GC samples, or acquire survival estimates through mark-recapture
    - May be able to account for this with genetic mark-recapture supplemented with a subset of the population being trapped each year
    - Also, the only way to collect fleas, earmites, or blood (which would enable tracking of disease such as Hanta Virus or plage)

Short-Term Goals/Tasks (3 months to 1 year):

Short Term Goals / Quick Wins	Next Steps / Timeline	Leader / Collaborators
Strategize stress collection both at fine-scale and at regional scales with coordinated, paired genetic sampling [citizen science efforts could be utilized here]	2017 field season	
Greater integration of diet and GCM---using hair samples to isolate stable isotopes of C, N, and O perhaps combined with fecal DNA and GCM estimates	2017 field season	
Create a repository for GCM sampling and analysis protocol, SOP for disposition of dead pikas (IACUC protocols), GC sampling and analysis protocol, and draft trapping protocol	March-May 2017	Nifer and Kelly (submit protocols to website and Google dropbox)

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. Dropbox shared folder linked to the NAPC wix website for easy access to general protocols

Specific funding agencies/opportunities for collaboration:

1. INSWE (International Society of Wildlife Endocrinology) offers ~20% discount plus there may be student travel/grant awards available

Long-Term Goals/Tasks (1 + years):

Long Term Goals	Next Steps / Timeline	Leader / Collaborators
Still need a synthesis paper on physiological study methods and frontiers		
Need a paper that collates what is known regarding pika studies that have involved captivity [Denver Zoo published two notes, PhD theses of JH Severeid (1955), H Robert Krear (1965) and Denise Dearing (1995), Preston Somers should be interviewed, MacArthur and Wang (1973, 1974)	Late 2017-2018	Kelly Klingler is interested in pursuing this

Need individual and population-level estimates of the effects of stress on survival (What are the fitness costs to higher stress? Does it vary individually?)—most useful may be a multi-regional stress, climate and survival paper	Late 2017-2018	Nifer and Kelly
Broad-based initiative to collect fleas and earmites—bank samples for general study. Also, important to collect ceacal and fecal pellets and store in RNAlater for investigation of gut microbes		Should talk to museums/labs interested in serving as an archival repository for these samples

DISTRIBUTION AND HABITAT WORKING GROUP

LEAD: Kris Ernest (Kristina.ernest@cwu.edu) *RECORDER: Jane Van Gunst*

Working Group Member	Affiliation	Email
Kris Ernest	Central Washington University	Kristina.ernest@cwu.edu
Jere Folgert	None	jflogert@gmail.com
Kim Hersey	Utah Division of Wildlife	kimberlyasmus@utah.gov
Evan Cole	University of San Francisco	Ejcole2@dons.usfca.edu
Brandan Cohen		
Aaron Johnston	USGS	ajohnston@usgs.gov
Jane Van Gunst	Nevada Dept of Wildlife	jvangunst@ndow.org
Mackenzie Jeffress	Nevada Dept of Wildlife	mrjeffress@ndow.org
Rory Lamp	Nevada Dept of Wildlife	rlamp@ndow.org (now retired)
Krissy Harmon	Tahoe National Forest	keharmon05@gmail.com
Lauren Hoyle	Tahoe National Forest	lehoyle@fs.fed.us
John Perrine	CalPoly	jperrine@calpoly.edu

Review and Update Goals and Role of Working Group:

1. Identify appropriate climate metrics at different scales
2. Improved quantification of how pikas use the landscape
3. Improve/standardize modeling, including use of presence/absence and best predictor variables

Group Progress/New Data to discuss since 2015 Meeting:

Progress from previous meeting is unknown

Knowledge Gaps:

Updated Needs & Objectives

There is a need to gather and summarize data on methods used to delineate patches and habitat surrounding those patches. There is a need to begin examining the importance of various habitat variables in promoting and hindering connectivity among patches across the landscape.

Identify Challenges

Mapping talus is difficult! Spatial data is often too coarse or expensive for use in smaller studies and understanding vegetation around patches is complicated by these variables as well as patch delineation. CalTopo is helpful in identifying talus patches.

- Do we understand the geologic and morphology underpinnings of pika habitat?
- Does Landfire do a better job of talus classification than SWReGap?
- Is there a TNC product from the ecoregional assessment mapping that is useful for mapping potential talus habitat?

Short-Term Goals/Tasks (3 months to 1 year):

Short Term Goals / Quick Wins	Next Steps	Leader / Collaborators
List of available remote sensing and imagery products to help identify and map potential talus habitat & pros, cons, and uses of imagery and index.		*Aaron Johnston (USGS)*
Collect and summarize different protocols for delineating patches.	Literature Review & Solicitation	

Collect and summarize different protocols for delineating vegetation surrounding patch or amount and type of vegetation used by pika within a patch.	Literature Review & Solicitation	
Summarize (white paper?) habitats where pika are found (e.g. talus, lava flows, anthropogenic, rocky outcrops). Identify repositories of both spatial information for habitat mapping as well as pika occurrence data in each state & investigate role of heritage programs in each state as potential repositories of this information.	Literature Review, including Connie's paper on non-traditional habitats	

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. None identified

Specific funding agencies/opportunities for collaboration:

1. Heritage programs in each state.

Long-Term Goals/Tasks (1 + years):

Long Term Goals	Next Steps	Leader / Collaborators
Identify what habitat & environmental setting variables may be important to larger-scale pika connectivity.		

CLIMATE WORKING GROUP

LEAD: Erik Beever *RECORDER: Marie Westover*

WG Member	Affiliation	Email
Erik Beever	Montana State University, Dept. of Ecology	EBeever10@gmail.com
Evan Cole	University of San Francisco	ejcole2@dons.usfca.edu
Kaitlyn Hanley	Clemson University	kehanle@g.clemson.edu
Aaron Johnston	USGS N. Rocky Mtn. Science Center	Ajohnston@usgs.gov
Patricia Krueger	USDA Forest Service	pkrueger@fs.fed.us
Philip Leitner	California State University, Stanislaus	pleitner@pacbell.net
Connie Millar	USDA Forest Service Pacific SW Res. Station	cmillar@fs.fed.us

Beth Pratt-Bergstrom	National Wildlife Federation	prattb@nwf.org
Katie Quakenbush	Clemson University	katieq@g.clemson.edu
Chris Ray	Institute for Bird Populations	cray@birdpop.org
Joseph Stewart	U.C. Santa Cruz; CA Dept. of Fish & Wildlife	joaaelst@gmail.com
Kyra Walton-Reid	USFS	kireid@fs.fed.us
Bob Westfall	USDA Forest Service Pacific SW Res. Station	bwestfall@fs.fed.us
Marie Westover	Univ. of NM	MarieWestover@gmail.com
Meghan Wiebe	Univ. of Colorado	mewi9853@colorado.edu
Jennifer Wilkening	USFWS	jennifer_wilkening@fws.gov
Shaye Wolf	Center for Biological Diversity	swolf@biologicaldiversity.org

Review and Update Goals and Role of Working Group:

Rob Klinger: Are we hoping to produce products for pika researchers? What's the point of our working group?

EABeever response: Raise the bar on types of data, make our work more defensible and to have application beyond just pikas. Think critically about what an effort's objectives are, and we should have common-ground understanding of where sensors should be placed, given a certain objective (though it seems that different temperatures may be important in different parts of the species' range). iButtons have been placed on woodrats in Death Valley to track the thermal environments that they're sampling (by F.A. Smith at UNM), but there are problems with that: the heat signal from a homeotherm's body heat confounds what one is trying to measure. Also, tracking pikas underneath the talus is not an easy thing.

RK: What are the strategies to achieve that?

We have a list of 9 knowledge gaps from the 2015 mtg, some of which are already being addressed in studies. E.g., how acute does a climatic stress have to be to illicit an behavioral or fitness response in pikas? E.g2., can populations disperse, given particular temperatures? What kinds of climate data are needed to answer that? Where we have pikas, how far is it to the next habitable location? Need to know when they disperse. during certain seasons? at night? Literature on this is lacking, though we've assumed in cooler periods. We actually need more observations on this, but they are VERY hard to achieve. Fluorescent dies to track them (Connie suggestion)? Chris Ray has tried move pikas to a new location, to see how they do, but results have been limited without tracking data. Someone suggested performing a Circuitscape analysis, to quantify resistance to dispersal at different times of the day and year.

We acknowledged that we need more than simply mean annual temp, as that reflects several different mechanisms by which pikas may be affected by climate (and thus mixes apples and oranges). Folks have found evidence (pellets) suggesting that pikas may overwinter in poor

habitats, then disperse further in the spring. For example, if stopover places are getting warmer, this could be limiting dispersal. Chris Ray suggested that we have no good evidence of recolonizations at population-level scale, though Erik B. stated that individual *patches* across the Great Basin have blipped on and off.

Group Progress/New Data to discuss since 2015 Meeting:

Aaron Johnston now has year-round talus sensors at various heights, and habitats: in forest, talus (subsurface, surface, 2 m above surface), and riparian areas, to develop a high-resolution (30-m) surface-temperature model across an entire watershed, *sensu* Holden et al. 200(8 or 9?). Goal is to relate it to LiDAR imagery. These are in the Sapphire Mountains, western MT, at 5000-9000 ft elev. He'll be relating the network to weather stations nearby. Zach H. suggested to Aaron that 20 or more surface sensors in an area is good to characterize 20,000 hectares, but Aaron has put out 10x that density.

Chris Ray has continuous data since 2000 of pika survival history (*EAB thinks that it's 25 years of data*), with paired sensors in the haypile for each of these tagged individuals, in Hyalite Canyon, near Bozeman, MT.

Knowledge Gaps:

What would the most valuable information be, for synthesizing studies, so as to be conceptually unified?
What proximate events lead to climate-induced mortality? E.g., WRT heat stress, cold stress, water stress, predation, disease, starvation, or surviving but not reproducing. For these types of things, we really need tagged individuals.

One research need is a more-explicit understanding of mechanisms of climate influence on pikas. E.g. physiological response (e.g., TNZ) of pikas in metabolic chambers project (Otto et al. 2016). The study had some problems (e.g., 8 days of data from sensors, some results are difficult to interpret). Pikas have variable coat thickness, so data are not always interchangeable.

We would also like to know survival of dispersers. Could this be achieved with cameras? It IS possible to distinguish juveniles from adults, or use ear clips. It's important to train the camera on the active haypile, because that's where you can tell whether turnover has occurred. However, there are also issues with cameras.

Could acoustic biology help us? The data generated are of enormous value, but expensive and expansive.
Can genotype individuals, with fur on tape. This only provides DNA microsatellite data, but they can at least tell individuals apart.

What about pit tagging individuals to determine when individuals disperse? Chris Ray purchased 50-foot-long readers, and placed them in the field. She had hoped to quantify microhabitat use, but the set up did not work, because the cord had to be doubled back on itself to work. It *could* tell you when the animal quits crossing the cable to the haypile, but it was too expensive to extend it to be long enough, to be able to employ it much.

Can satellite imagery tell you what surface temp is? MODIS is 250-m resolution. Landsat (30-m resolution)…? Maybe, eventually. LiDAR gives great resolution, but does not provide temp data.

Is there an upper temperature threshold that is constraining pikas, in terms of survivorship, fecundity, or behavior? Can individuals or populations adapt? If so, how quickly? Does current mortality lead to evolution in populations, across time?

Is translocation of pikas a solution? Logistically and pragmatically, it's hard to do. Chris Ray noted that every time it's been tried (not related to climate; just moving animals out of the field), there's been more mortality than survival (of individuals), in each case. She said that there may be a fair amount of selection in the translocation process, which may or may not be beneficial for establishing animals at the recipient site. Chris doesn't have quantitative data to back this up (right?), but suspects that handling stress has been increasing over the years. She reported that pikas are happier to be trapped in cooler temps. It's unknown whether this reflects seasonal behavior or is instead climate-related?

Joseph Stewart asked whether it was possible to pick up on acoustic signal before the population winks out? based on how many calls there are? Pika calls are distinctive, and it's possible to use software to detect the species. Problematically, it still is time-intensive and expensive to do this. Acoustic Recording Units, such as SongMeters, are an exmple. In seabirds, overall volume was good measure. Several of us have found (and Beever et al. 2016 published) that at least in some cases, low population density in pikas can translate into calls being made only infrequently. However, some populations may just call less, due to geographic variation unrelated to climate.

There is also geographic variation (at several resolutions!) in haypile behavior. Maybe depends on winter vegetation, and access to forage (see Dearing and Varner papers).

Vegetation as a mechanism of climatic influence: metrics of long-term climate and vegetation have repeatedly proven to be predictive of pika losses, but (see Ray et al. 2016, *Ecosphere*) not clear whether vegetation is influencing pikas through nutrition, or it is correspondingly being affected by climate and microclimate, just like pikas are.

Aspect typically has lower importance in model selection (better to move it into solar insolation, with slope), but we *have* seen lower abundance/occupancy and higher losses on south-facing slopes near the rear (southern) edge of the distribution, but lower pika densities at the northern edge (Glacier NP) on north-facing slopes.

Do regional climate dynamics play any part in pika responses? Valuable (perhaps?) to re-investigate whether climate status (baseline) vs magnitude of change is more important to populations, *sensu* Beever et al. (2010).

Long-Term Goals/Tasks (1 + years):

We sought to figure out how we might be able to increase our strength of inference about the influence of climate, & move beyond simply correlative studies, to understand mechanism. Some possibilities include:

a) feasible experiments:

a. snow fences to induce more snowpack on one side, and reduce snowpack on the other side, to see whether snowpack affects pikas (has to be done in a way that is relevant to pikas, though, given their dispersal capabilities and territory size)
b. Creation of artificial talus – *not sure of the connection to climate, here*?
c. Addition or removal of vegetation.
d. adding black stuff to snow to try and reduce snowpack (due to altered albedo), but the wind blows the snow back over the area.
e. We can't realistically add a shade feature. Instead, could we look at tree-shaded talus (Joseph suggestion)? One would compare behavior at sites in shade vs sun. EABeever has quantified this in the Columbia River Gorge, and is still in the midst of analyzing those data.

FIELD METHODS WORKING GROUP

LEAD: Max Plichta (maxplichta@gmail.com) *RECORDER: Mackenzie Jeffress*

Working Group Member	Affiliation	Email
Karen Oakden*	Humboldt State	keol54@humboldt.edu
Lauren Benedict*	Whitman College	benedict.lauren@gmail.com
Kris Ernest*	Central Washington University	kristina.ernest@cwu.edu
Andrew Smith*	Arizona State University	a.smith@asu.edu
Lehong Chow*	Independent	lehongc@yahoo.com
Krissy (Kristine) Harman*	USFS Tahoe NF	keharman05@gmail.com
Lauren Hoyle*	USFS Tahoe NF	lehoyle@fs.fed.us
Megan Mueller*	Rocky Mountain Wild/FRPP	megan@rockmountainwild.org
April Craighead*	Craighead Institute	april@craigheadinstitute.org

Kimberly Hersey*	Utah Division of Wildlife	kimberlyasmus@utah.gov
Max Wasser*	CU Boulder	max.wasser@colorado.edu
Max Plichta*	CU Boulder	maxplichta@gmail.com
Mackenzie Jeffress*	Nevada Department of Wildlife	mrjeffress@ndow.org
Heather Batts	Miami University of Ohio	battshk@miamioh.edu
Rod Schorr	Colorado Natural Heritage Program/Colorado State University	Robert.schorr@colostate.edu
Cheryl Blair	Thompson Rivers University	squrrl@hotmail.com
Todd Stefanic	NPS - Craters of the Moon	todd.stefanic@nps.gov
Amy Seglund	Colorado Parks and Wildlife	amy.seglund@state.co.us
Aaron Johnston	USGS	ajohnston@usgs.gov
Rhiannon Jakopat	University of Wyoming	rjakopak@uwyo.edu
Brian Fauver	Colorado State University	

** Working group members present for 2/6/2017 meeting*

Field methods working group membership list managed as a google sheet at: https://docs.google.com/spreadsheets/d/1OnIeHfbK_L-GGLfIdHiDR_QrCdtCgrMrNtFVaqOoi9c/edit?usp=sharing

Review and Update Goals and Role of Working Group:

Many of the goals for this group remain the same as previous meetings: compiling and making available protocols for various aspects of pika research and monitoring.

Group Progress/New Data to discuss since 2015 Meeting:

A Dropbox folder was created and some protocols were added shortly after the 2015 meeting. Not much else for progress.

Current Dropbox folder structure:

- Field Methods Protocols, Data Forms, and Videos
- Meetings and Conference Call Notes
- Trapping and Handling Examples

Knowledge Gaps:

Updated Needs & Objectives/ Identify Challenges

Didn't spend a lot of time discussing. There was continued interest in an inventory survey protocol that could be used for management purposes (e.g., baseline surveys by consultants for the NEPA process).

Challenges still include making protocols available, finding the right protocol for the objective(s), understanding the pros and cons of various protocols and standardizing where possible.

Short-Term Goals/Tasks (3 months to 1 year):

Short Term Goals	Next Steps	Leader / Collaborators
Request was made to move from Dropbox to Google Drive for file sharing.	Max P. offered to do this. He'll also look into making the folder available via a link (possibly password protected?) on the website.	Max P.
Add more content to the share drive regarding protocols, data sheets, citizen science efforts, management advice, and tips and tricks from the community.	Point people were identified for each general category (see right). These people will seek out information, including by contacting associated working group leads and then place them on the share drive. Please send us your protocols, data forms, etc. We're also open to other category suggestions that people find helpful to have access to and if anyone is interested in managing that collection.	Andrew Smith (Behavioral); Kris Ernest (Trapping); Lauren Boyles and Mackenzie Jeffress (Occupancy and Management); Meghan Mueller (Citizen Science); and Lauren Benedict (Camera Traps)
Tips and Tricks: We all have learned things from trial and error in the field or discovered new tricks that work well when trapping, observing, or finding pikas. Creating a place or a collection of these tips would be a great resource for new and old pika researchers to share and learn what tips and tricks work well in the pika community.	Index cards were handed out at the meeting and meeting participants were encouraged to write their name and email address with a tip or trick. If you didn't submit one of these and have a tip or trick to share, please email that to Max.	Max P.

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. Currently using DropBox but Max P. will look into moving us to Google Drive. He'll also reach out to various working group leads to see if we can all start using Google Drive to share documents since many of our tasks overlap.
2. Discussed creating a Facebook page or group specifically for the field methods working group. No decision was made on whether or not to do that.

3. Also discussed using the westernpikas listserv (although these might be becoming outdating since most of the <30 year old members had no idea what a listserv was!) for communication. This is a resource already available.

Specific funding agencies/opportunities for collaboration:

We quickly discussed funding opportunities, particularly when it comes to organizing the various working groups and website maintenance. It was recognized that NAPC is not a recognized organization capable of managing money, which makes this more difficult. The current mode will continue to be member volunteer efforts.

Long-Term Goals/Tasks (1 + years):

Long Term Goals	Next Steps	Leader / Collaborators
Update and manage a website where protocol, datasheets, data, citizen science work, and locations of research can be available for everyone to access.	Do the best with what we currently have for a website and free services, like Google Drive, that are available. Encourage working group member involvement to accomplish tasks, and continue to pursue opportunities for more dedicated help as they arise.	
Fundraising (see funding above).		
Explore opportunities for in person trainings on protocols? Maybe as part of NAPC conferences?		
Reviewing protocol collection and condensing into a single general protocol that the NAPC could endorse. Also creating simple effective protocols for management to use and follow.	Decide if there is a certain protocol that we feel we could do this with and how that process might work.	

RESEARCH AND REVIEW WORKING GROUP

LEAD: Chris Ray (cray@colorado.edu) *RECORDER: **Hayley Lanier***

Working Group Member	Affiliation	Email
Peter Billman	USGS NOROCK	peterbillman@ymail.com
Hayley Lanier	University of Wyoming	hlanier@uwyo.edu
Mary Peacock	University of Nevada	mpeacock@unr.edu
Chris Ray	CU-Boulder	cray@colorado.edu

Review and Update Goals and Role of Working Group:

1. Identify ongoing research projects and sensor data collections

2. Identify and promote research opportunities/gaps

3. Consider meta-analysis of occupancy and/or trend projections

Group Progress/New Data to discuss since 2015 Meeting:

While quite a lot of new data have been published since the 2015 meeting, few of the goals from the group have been achieved. We discussed general trends from the literature and ways in which this committee might help to further a synthetic understanding of ongoing research progress and gaps in our knowledge.

Knowledge Gaps:

Updated Needs & Objectives

1. Coordinate information on different pika projects (who is working where, what are they working on, what type of data are they collecting)
2. Identify different groups collecting pika-specific temperature sensor data, and possibly to look at bringing some of those data together in a future framework
3. Identify ways to bring together information/questions across projects to create more synthesis of information (e.g., occupancy, population trends)

Short-Term Goals/Tasks (3 months to 1 year):

Short Term Goals/ Quick Wins	Next Steps	Leader/ collaborators
1. Online database of projects on NA pikas	Use NA pika research spreadsheet Chris compiled to create a new Google Form and associated spreadsheet; publicize on NAPC sites and via email	Hayley Lanier Chris Ray
2. Endnote DB to disseminate or morph into more easily updatable shared resource	Either post Erik's database and/or transfer to an open source option	Erik Beever
3. Promote collection of similar data and protocols		This goal largely overlaps with other NAPC working groups, and may be best achieved through those channels.

Communication Strategies (shared DropBox folder, Google doc, etc.):

1. Google Docs and Google Surveys for data collection/dissemination

Specific funding agencies/opportunities for collaboration:

1. Small grant for survey data collection (perhaps undergraduate funds at UNR)

Long-Term Goals/Tasks (1 + years):

Long Term Goals	Next Steps	Leader/ collaborators
1. Website-based list of research opportunities (gaps & available data)	Create list; disseminate or host through NAPC website and/or Google Sheets	Mary Peacock Chris Ray
2. Sensor data database	Compile existing data on temperature loggers/sensors Identify longer-term methods/options for data storage and archival Consider consortium to explore in-talus temperature trends across range	Mary Peacock Chris Ray
3. Metaanalysis paper on occupancy and/or trend projections across range	Identify ways to combine data/ projections among regions to understand range-wide trends	Chris Ray Mary Peacock Hayley Lanier

4th Conference of the North American Pika Consortium - Evaluation Summary

	1 (Poor)	2 (Fair)	3 (Good)	4 (Very Good)	5 (Excellent)
ORGANIZATION AND COORDINATION					
Conference information (website, email invitations, etc.)		1	5	11	6
Registration and correspondence			5	7	8
Organization of the conference			1	8	12
Time of conference (month/days)		1		14	6
Length of conference				8	13
Length of sessions			1	10	8
TOPICS AND SPEAKERS					
Presentation topics				8	13
Speakers				8	13
Keynote presentation			2	6	13
Poster session			5	10	6
Working group session		2	1	8	6
PERSONAL VALUE					
Informal conversations with others			2	4	14
Relevance to your current research or job	2		4	3	8
Registration fees (5 = Too High, 1 = Too Low		1	13	3	3
FACILITIES and SNACKS					
Meeting rooms			2	9	10
Refreshment breaks		2	3	8	8

How did you find out about the conference?	
www.tws-west.org	8
Employer	
E-mail list	3
Other (friends in NAPC)	4

Additional Comments on Page 1 Topics
ORGANIZATION AND COORDINATION
"Maybe post where working groups going or inform before break so people know where to go."
"Organization was excellent. Things seemed to run fairly smoothly."
"Lots of new information. Two days seems like a good time frame for the consortium."
"Mid-week is hard, but M/T is better than W/Th/F."
"Knowing the end time of the conference earlier would have been nice to know fo make flight arrangements."
"Website is hard to find, especially well before the conference."
"Good length of talks and informative. Good use of [illegible] to mix up talks. Talks can be improved [illegible] on less quantitative information 1st."
"Need to be better at time management, sticking to the time schedule."
"Not loving speed talks, but okay"
"I love it being informal. 1st day felt too packed, but ok"
"The only tine issue I had was that I wasn't participating in a working group, but I wanted to watch the video, so I ended up having a long break and coming back for just a few minutes, then having another break. Maybe I'm the only one, but if others aren't in a group it may be awkward timing."
"For all the driving, it may be easier road condition-wise to move it later in the spring.
"The variety of talks were excellent. The combination of short and longer talks was a good idea."
TOPICS AND SPEAKERS
"I really liked the 5-min speed talks, gave insight into posters/research before the poster session."
"Really enjoyed the poster sessions, especially as new professional with minimal experience with pikas. Very informative. I wish it was longer."
"More posters. I liked the speed talks."
"It would be great to encourage more posters and perhaps have a more open (easier to navigate/mingle) display set-up for posters."
"more concrete tasks for groups"
"Seemed to be a good mix of research presentations"
"how to get more pika researchers to come?"
"I would've liked 10-minute speed presentations -- so 8 min presentations and 2 minutes for questions."
"It may be nice to have a 'merry-go-round' approach to working group sessions, so we could ba part of 2 or more."

PERSONAL VALUE
"Would be nice to see a lower cost to students or early professionals to make it more accessibile."
"Liked all the breaks and opportunities to talk with different people."
"For students and early professionals, $80 is steep. It would be nice to have a different fee for us. I think it would increase attendance amongst newer professionals."
"Thank you for keeping this at a reasonable price!!"
"I appreciated the student/early professional price!"
"not real relevance to my field but highly informative and helpful"
"Difficult to read slides due to low position of screen"
"$100 would be okay for 2 days"
"I'm not currently working with the N. American Pika, but I did learn a lot."
FACILITIES and SNACKS
"Snacks?"
"Breaks are good. I think the spacing was about right."
"Ridiculous carpet"
"Coffee = hugely helpful"
"mtg room size good (a little cold and noisy). Great job w/ coffee, tea, snacks. Peppermill food too expensive, esp. for students"
"Peppermill was smokey :(and noisy :("
"Add another one or two breaks that are short."
PAGE 2 COMMENTS
What portion(s) of the conference were most valuable? Least valuable?
"Keynote was excellent. Provided a big picture view of the subject. The variety of talks were diverse and appreciated. Movie was awesome -- Wow!"
"Genetics information"
"Excellent speaker presentations. So interesting to hear and see what all are doing."
"For me I just liked the chance to hear about all the pika research that's going on and to talk with the researchers about it."
"Catching up/networking -- learning about methods -- love this group, so supportive"
"talks and speed talks most helpful and informative"
"Working groups and breaks (networking!) were incredibly valuable"
"I really loved th eworking groups."
"Talks and mixer were very helpful"
"The poster session was the most valuable. To meet, greet, and to really become familiar with the current research as a new professional."
"All talks were great!"

"I thought they were all great and had a purpose -- from speed talks to working groups and meet/greet."
"Some of 20 minute talks were really interesting/relevant but I wish there was a longer chance to ask questions. I liked the movie but I wish it had just been during breaks so people had the options to stat and watch or go and network."
PLEASE LIST ANY SUGGESTIONS FOR IMPROVEMENT:
"More innovated talks other than inventory of pika."
"No complaints! Possibly further communication and materials before the conference, but I joined late and may have missed."
"I would like option of coordinated lunches/dinners -- small groups that eat together and talk informally -- e.g., moderators could say after morning session, 'Anyone interested in small group lunch meet in this corner of room.'"
"Keep to schedule and don't switch things around."
"[illegible] talks and more hands-on approaches"
"Have work time after working group debriefs so the leads of each group could have computers out so they can start working on goals/databases/collecting contact info."
"Maybe make the working groups be larger. It might be better to each conference take on few groups to have more people in each. For example having 2/day might add some richness to the talks. Or possibly have a panel-like ask an expert session where 3 people get up and talk about a major them like vegetation. Then the audience could have a chance to ask questions surrounding the topic."
What post conference materials would you find valuable? What format do you find most effective (website, listserv, etc.) in accessing this information?
"Website, Google Docs"
"I would appreciate all of the above -- any way to stay connected and maintain communication between this research community."
"I would just like to be ble to access the powerpoints."
"Email addresses of attendees, having powerpoints (pdfs) and posters would be great if presenters are willing"
"Papers from presenters and/or copies of powerpoints"
"original source materials, sharepoint working documents, opportunities for funding, outreach"
"Access to website and working group websites/listservs/documents, and maintaining up to date info on gatherings and research, would be very helpful!"
"Abstracts and working group goals -- listserv: how to join? -- list of all the point people to send protocols to!"
"Updates and requests from the working groups -- website or listserv"
"website"
"Email list of participants -- Identify who to send particular protocols to"
"Google Drive -- I would love to be on the list"

Other comments and suggestions:
"Thanks to organizers!"
"Work on funding for internships that would help organize databases, websites, standard protocols, communications, etc."
"Films were great"
"Really enjoyed my time, thought it was a very educational and interesting chance to hear about advances in pika research but also the research gaps."
"Ideas for next NAPC: 1. Group photo on first day before everyone leaves. 2. short workshops for methods (have an expert describe a technique, show pics/videos, explain a protocol, etc.). 3. Time at end of meeting to actually do some of the working group goals (e.g., add all names and emails into someone's laptop, email each other protocols) -- it's hard to get to some of these things once we get home. 4. Panel discussions to help standardize methods (e.g., temperature loggers).