Symposium and Webinar: Vertebrate Responses to Bark Beetles

April 5-6, 2012

Laramie, WY

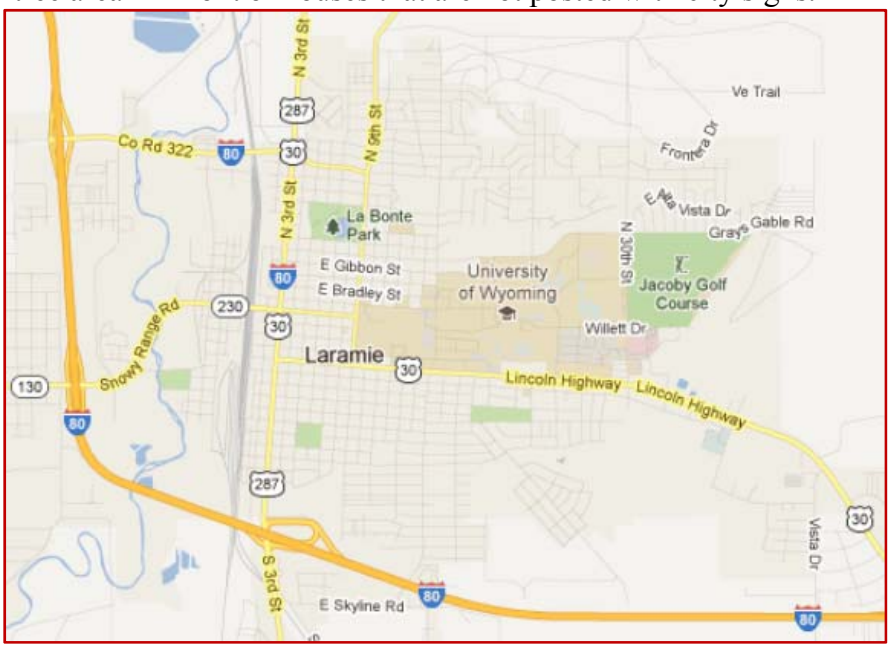
Sponsored by

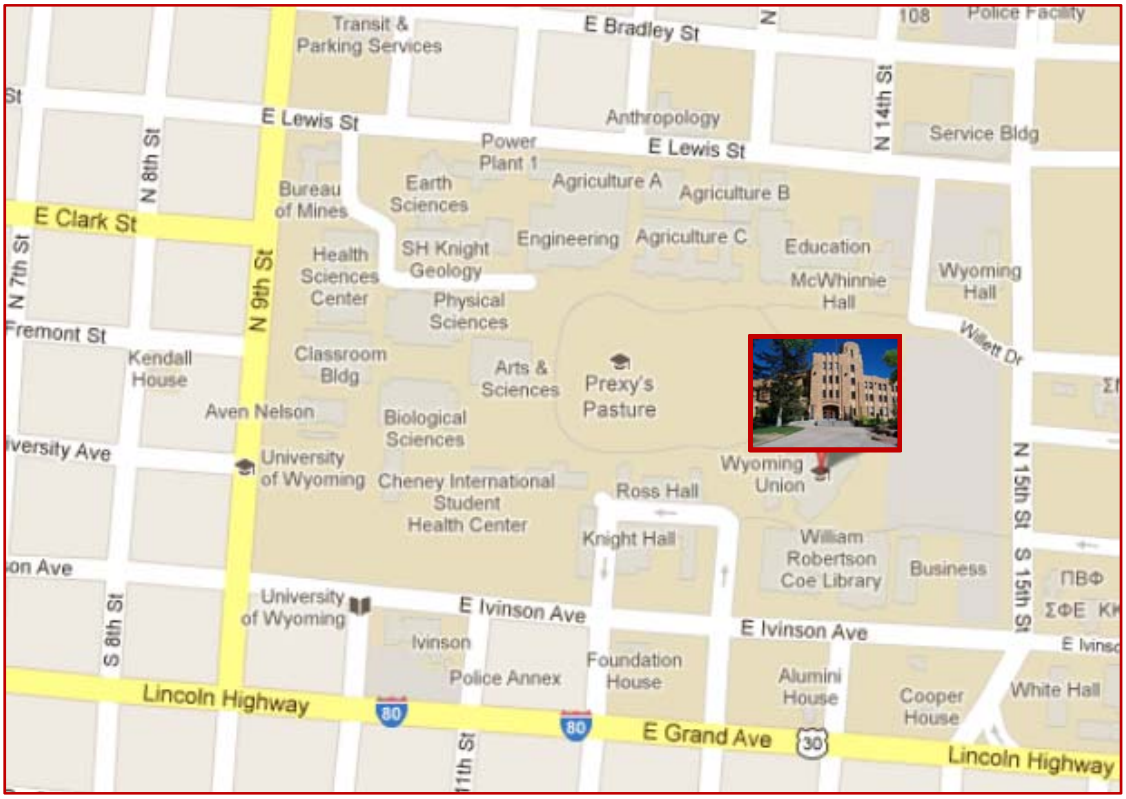
University of Wyoming

U.S.D.A Forest Service, Region 2

LOCATION OF EVENTS:

All events will be held in Laramie, Wyoming at the University of Wyoming Union in the West Yellowstone Ballroom. The Union is easily accessed by heading north onto campus via S. 13th St., and walking northeast from the metered parking area. Additional (free) parking can be found 3 blocks south of campus in the "tree area" in front of houses that are not posted with city signs.





SCHEDULE OF EVENTS: Thursday, April 5, 2012, 9:30 AM – 5:00 PM
Friday, April 6, 2012, 9:00 AM – NOON

Thursday, April 5

Morning Session (9:30AM – 12:05 PM)

Ecology of Bark Beetle Epidemics – Moderator: Rick Truex

9:30-9:40 – *Greetings and Announcements – Rick Truex, USFS Rocky Mountain Region*

9:40-10:05 – *Overview of Bark Beetle Epidemics in the Rocky Mountain Region* – In recent years there have been widespread outbreaks of bark beetles across western North America. Outbreaks of native bark beetles have occurred from the low elevation pinyon-juniper woodlands to the high elevation spruce and subalpine fir forests. Landscape level changes in mature tree cover due to mountain pine beetle and spruce beetle epidemics have occurred in the Rocky Mountain Region since the late 1990's. Beetle biology and the progression of the epidemics in the Region will be discussed. – *Bob Cain and Brian Howell, USFS Rocky Mountain Region*

10:05-10:30 – *Future Forest Conditions* – A paradox of forests is that in order for a forest to grow and develop, trees have to die. The large-scale mortality of lodgepole pine caused by the mountain pine beetle infestation doesn't mean that the forest is dead. Quite the opposite, the new forest is already growing and thriving. Dr. Claudia Regan will discuss what we know so far about what the future forest might look like and how the future forest will affect some important ecosystem services. How will future forest stands and landscapes be different from our lodgepole pine forests before the epidemic? What effects will these differences have on ecosystem functions like wildlife habitat and watersheds? What information do we need to strengthen our predictions about the future forest? – *Claudia Regan, USFS Rocky Mountain Region*

10:30-10:55 – *Resilience in Western Coniferous Forests Following Natural Disturbances* – Currently, forests in the western U.S. are experiencing a bark beetle epidemic that is unprecedented in extent, severity, and duration. While the mountain pine beetle (MPB; *Dendroctonus ponderosae*) often receives much of the attention, there are actually several species of native bark beetle that are currently active. Annual estimates of broad-scale tree mortality do not provide detailed information on stand-level beetle activity and/or tree mortality, nor do they provide any information on the abundance of the surviving understory trees and seedlings, which may be substantial. This "advance forest regeneration" represents the future forests in these regions. This presentation will focus on the resilience of montane forest systems in Wyoming and Colorado, and how they have, and are responding to natural disturbances. – *Daniel Tinker, University of Wyoming*

BREAK (10:55 AM – 11:10 AM)

11:10-11:35 – *Aquatic ecosystems and the bark beetle epidemic* – The bark beetle epidemic is affecting large areas of forest across the Rocky Mountains. This is likely to have substantial effects for forested streams and lakes, and the fish communities which depend on these habitats. Studies on the effects of bark beetle epidemics on aquatic ecosystems are limited but show that affected streams have an increased annual water yield, earlier snowmelt peaks, and an increase in

low flow periods. Thermal regimes are also likely to be affected as decreased forest canopy cover will lead to increased water temperatures. Studies of logging disturbance have found that increases in water temperature can lead to increased primary productivity and fish biomass provided temperatures do not exceed thermal tolerances and there are sufficient resources to support increased fish metabolic demands. At least initially, epidemics could also cause an increase in large woody debris in streams creating high quality fish habitat, but these positive effects may be negated by increased sedimentation and streambank erosion. Further research is needed to understand how bark beetle epidemic effects on streamflow, temperature, habitat quality, and biotic interactions will affect fish communities in forested aquatic ecosystems. – *Annika Walters, University of Wyoming and USGSWyoming Cooperative Fish & Wildlife Research Unit*

11:35-12:00 – *Terrestrial wildlife responses to bark beetle outbreaks: assessing the state of knowledge* – Our current knowledge is limited, even more so if we constrain our frame of reference to the Rocky Mountains between Colorado and the Canadian border, and to *Dendroctonus ponderosae*. We describe a few studies relevant to the problem of terrestrial vertebrate responses, and characterize the large number of sources of uncertainty in predicting future conditions. Uncertainty has played an increasingly important role in community and ecosystem ecology through time, and this is even more the case for the system that includes many vertebrate species, interactive and cascading effects, multiple insect pests and tree hosts, varying outbreak intensities, and chronosequences of post-outbreak change. — *Steven Buskirk, University of Wyoming; Tracey Johnson, University of Wyoming; and Rick Truex, USFS Rocky Mountain Region*

12:00-12:15 – *What's killing all those trees and why don't you stop it*! – In the early days of the outbreak, the USDA Forest Service approached managing the MPB outbreak as one would, thinking that this would be a "normal" outbreak that may last for 2-3 years or so and then be curtailed by a cold weather event as ones in the past had. Our initial response was to thin stands of trees, spray trees in recreation sites with chemicals, and try to "get ahead" of the expanding event. As the public began to notice something was going on with all the red trees, the agency joined with community leaders to create a forum that would enable a joint response to the emerging epidemic focused on public education, consistent messaging, and collaborative planning of prevention and suppression. As the years went on and so did the epidemic, now impacting over 4 million acres in all our pine types, our efforts are now focused on Safety, Recovery, and Resiliency. **–** *Susan Gray, USFS Rocky Mountain Region*

Break for lunch (12:15 – 1:45)

Afternoon Session (1:45 PM – 5:00 PM)

Current Research and Monitoring – Moderator: Tracey Johnson

1:45-2:05 – *An assessment of spatiotemporal refugia for wildlife during the mountain pine beetle epidemic* – Major habitat changes will occur at a range of spatial scales as a result of the current mountain pine beetle epidemic, with largely unknown implications for forest wildlife species. An important question is which alternative stand types may best support forest-dependent wildlife prior to mature lodgepole regeneration. Our specific study objective was to examine the relative abundance of focal avian and small mammal species and species diversity across a gradient of patch sizes of spruce-fir and previously logged (young) lodgepole stands within a

matrix of beetle-killed lodgepole forest. During 2010-2011 we conducted diurnal rodent/avian point counts and small mammal live-trapping with PIT-tagging in each potential refugia type across a gradient of patch sizes. Species assemblages differed significantly between stand types and among patch sizes. Habitat specialists and semi-rare species were most abundant in the largest patches of spruce-fir. These stands also had the highest species richness and diversity. Generalists and species that thrive in open canopy or drier environments were more abundant in young lodgepole stands. Our results provide a foundation for managers evaluating management actions influencing the size and distribution of forest stands in post-bark beetle landscapes. *Joslin Heyward, University of Wyoming and USGS Wyoming Cooperative Fish & Wildlife Research Unit ;Anna Chalfoun, University of Wyoming and USGS Wyoming Cooperative Fish & Wildlife Research Unit; and Greg Hayward, USFS Alaska Region*

2:05-2:25 – *Black-backed woodpecker home range size and resource selection in habitat created by mountain pine beetle infestations in the Black Hills of South Dakota* – Black-backed woodpeckers (*Picoides arcticus*) are a disturbance dependent species that rely on habitat created by wildfire and mountain pine beetle (MPB) infestations. These disturbances reduce timber value, and salvage logging is often employed to mitigate the economic impact. Because of their rarity and potential habitat loss from salvage logging, black-backed woodpeckers are considered a Sensitive Species in Region 2 of the U.S. Forest Service. Management actions that promote both economic development and habitat conservation require knowledge of how woodpeckers respond to MPB infestations. Our research thus seeks to understand spatial requirements and resource selection of black-backed woodpeckers occupying MPB infested forests. Since 2008, we captured 75 woodpeckers in habitat created by MPB infestations. We located radio-marked birds 2-3 times weekly, recording spatial coordinates, vegetation characteristics, and foraging behavior. Average home range size was 896 acres (range = [167 - 2,876], n = 27). Woodpeckers demonstrated strong selection for MPB-killed trees in general and moderate selection for recently infested trees (infestation <1 year) in particular. Woodpeckers also demonstrated slightly greater foraging success on recently infested trees relative to older infestations and undisturbed trees. Our results demonstrate that localized MPB infestations may be important for maintaining regional black-backed woodpecker populations. – *Christopher Rota, University of Missouri; Dylan Kesler, University of Missouri; Chad Lehman, South Dakota Dept. of Game Fish and Parks; Mark Rumble,UFS Rocky Mountain Research Station; and Joshua Millspaugh, University of Missouri*

2:25-2:45 – *Mountain pine beetle and white pine blister rust in whitebark pine (Pinus abicaulis) ecosystems: cone production decline impacts seed dispersal by nutcrackers* – Whitebark pine (*Pinus albicaulis*) is obligately dependent on Clark's nutcracker (*Nucifraga Columbiana*) for seed dispersal and thus tree regeneration. *Cronartium ribicola*, which causes white pine blister rust, has spread nearly range-wide in whitebark pine. Recent mountain pine beetle (*Dendroctonus ponderosae*) outbreaks have achieved unprecedented whitebark pine mortality. Whitebark pine damage and mortality lead to cone production declines and reduced likelihood of seed dispersal. We review the findings of three studies in the Central and Northern Rocky Mountains, which examined the relationship between whitebark pine stand structure, tree health, and cone production declines. McKinney et al. (2009) determined that a threshold level of ~1000 cones/ha leads to a high probability (≥.7) of seed dispersal by nutcrackers, but Barringer et al. (MS) determined that lower cone production would result in similar probabilities of nutcracker visitation. Both data sets were combined by Barringer et al. into a single predictive model that outperformed both original models. This model may be used to help managers prioritize whitebark pine stands for restoration. – *Diana Tomback, University of Colorado Denver;*

Michael Wunder, University of Colorado Denver; Shawn McKinney, USGS and University of Maine; and Lauren Barringer, University of Colorado Denver

2:45-3:05 –*Responses of least chipmunk to the recent bark beetle irruption in the Laramie Range, Wyoming*– Mountain pine bark beetle (*Dendroctonus ponderosae*) populations have irrupted in recent years in the northern Rocky Mountains due to a measurable reduction in winter severity. Such irruptions substantially altered the conifer forest ecosystems in the region. In contrast with forest specialists, which are expected to decline as tree mortality progresses, the responses of other ecosystem components are less clear. Since 2006, we have been studying the dynamics of least chipmunk (*Tamias minimus*) populations in forest and sagebrush habitats in the Laramie Range, southeast Wyoming. We used capture-recapture data to estimate population size and survival, described the associated habitat features, and determined the diet of these small mammals using stable isotope analyses. Our data suggest that chipmunk density is annually variable with values ranging from 0.19 to 3.91 animals per hectare. Similarly, apparent survival ranged from 0.027 to 0.37. In most years and locations, chipmunk density was higher in forested habitats than in sagebrush, and chipmunk captures were associated with conifers even in that habitat. Nonetheless, in 2010, abundance in of chipmunks was twice as high in sagebrush as in forest habitats in all other years. There was little isotopic evidence that chipmunks were consuming bark beetles, despite a high correlation between chipmunk abundance and beetle infestation rate. Together our findings suggest that chipmunk demography at the landscape scale may be influenced by bark beetle infestations although the relationship between the two may be compounded by other factors. We emphasize the need for continuous, long-term monitoring of least chipmunk populations in relation to bark beetle irruptions. – *Merav Ben-David and Elizabeth Flaherty, University of Wyoming.*

BREAK (3:05 PM – 3:25 PM)

3:25-3:45 – *Red squirrel (Tamiasciurus hudsonicus) responses to beetle-induced tree mortality in south-central Wyoming* – Bark beetle outbreaks may have important effects on the abundance or distribution of forest wildlife by influencing resource availability or habitat selection. For species like the red squirrel (*Tamiasciurus hudsonicus*), which is typically associated with dense canopy cover and relies on mature lodgepole pine (*Pinus contorta*) as an important source of food, broad-scale tree mortality caused by the current mountain pine beetle (*Dendroctonus ponderosae*; MPB) epidemic may negatively affect populations. Given the red squirrel's important role as prey and predator in forest ecosystems, understanding population-level responses of red squirrels to the MPB epidemic will be critical to effective management of wildlife communities in post-epidemic forests. We are currently evaluating changes in red squirrel occupancy and midden density in beetle-killed subalpine forest in the Sierra Madre Range in south-central Wyoming. We compare data collected across two watersheds during 1985-96 (pre-epidemic) to data collected in 2011 (post-epidemic), and identify changes in habitat characteristics that may influence red squirrel site occupancy. We present preliminary results and implications for conservation and management of red squirrels. – *Tracey Johnson, University of Wyoming; Steve Buskirk, University of Wyoming; Martin Raphael, USFS Pacific Northwest Research Station; and Greg Hayward, USFS Alaska Region*

3:45-4:05 – *Elk and hunter responses to bark beetle infestations* – Gathering information for resource managers in relation to how hunters and elk utilize the forest before, during and after the bark beetle epidemic will be an integral part in protecting forest ecosystem health and maintaining viable wildlife habitat throughout the beetle kill epidemic. Currently no information

is available on how beetle kill or the management of beetle kill will impact elk or elk hunters. Downfall created by beetle kill has the potential to decrease the ability of hunters to harvest elk which may lead to an overpopulation of elk and overgrazing on summer and winter ranges. Elk may also shift their use patterns to focus on areas of management or downfall which may decrease the regeneration potential of the impacted forest. This study will use GPS technology to document use patterns of both elk and elk hunters as the beetle kill progresses through the Sierra Madre Mountain range in South-central Wyoming. Data collected during this study will give wildlife and forest managers information that will allow them to make decisions to maintain a healthy forest ecosystem during and after the beetle kill epidemic. – *Tony Mong, Wyoming Game and Fish Department*

4:05-4:30 – *Integrated monitoring in Bird Conservation Regions: an initial look at bird population responses to mountain pine beetle* -Recent efforts have increased interest in assuring that bird monitoring programs are integrated, well designed, target priority species and are responsive to management issues. We developed a scalable grid-based, generalized random tessellation design based on unchanging features to address these issues. The design ensures a spatially balanced sample even with annually fluctuating funding that affects sample size. Numerous monitoring approaches can be incorporated with this sampling design. We utilized a point-transect sampling approach with collection of vegetation and environmental attribute data to allow for post-stratification, direct hypothesis testing and evaluation of causes of population trends. For abundant species, distance analysis is utilized, whereas for less common species, occupancy and removal and models are effective alternatives. We integrated large-scale monitoring programs across the Rocky Mountains and Great Plains including all land ownerships in BCR 17, Colorado, Montana, and Wyoming. This approach demonstrates increased scientific defensibility, improved spatial relevance, and more flexibility for partner participation. The result is an integrated monitoring strategy for priority bird species across landownership boundaries. As an example, we will present an overview of the program, and the preliminary results of a post-stratification analysis evaluating the response of bird populations to bark beetle epidemic. – *Robert Skorkowsky, USFS Avian Program Coordinator; Paul Lukacs, University of Montana; Jennifer Blakesley, Rocky Mountain Bird Observatory; David Pavlacky, Rocky Mountain Bird Observatory; David Klute, Colorado Division of Parks and Wildlife; and David Hanni, Rocky Mountain Bird Observatory*

4:30-5:00 – *Wrap-up and information regarding Friday session*

Friday, April 6

Morning Session (9:00 AM – NOON)

Research Needs and Management Implications

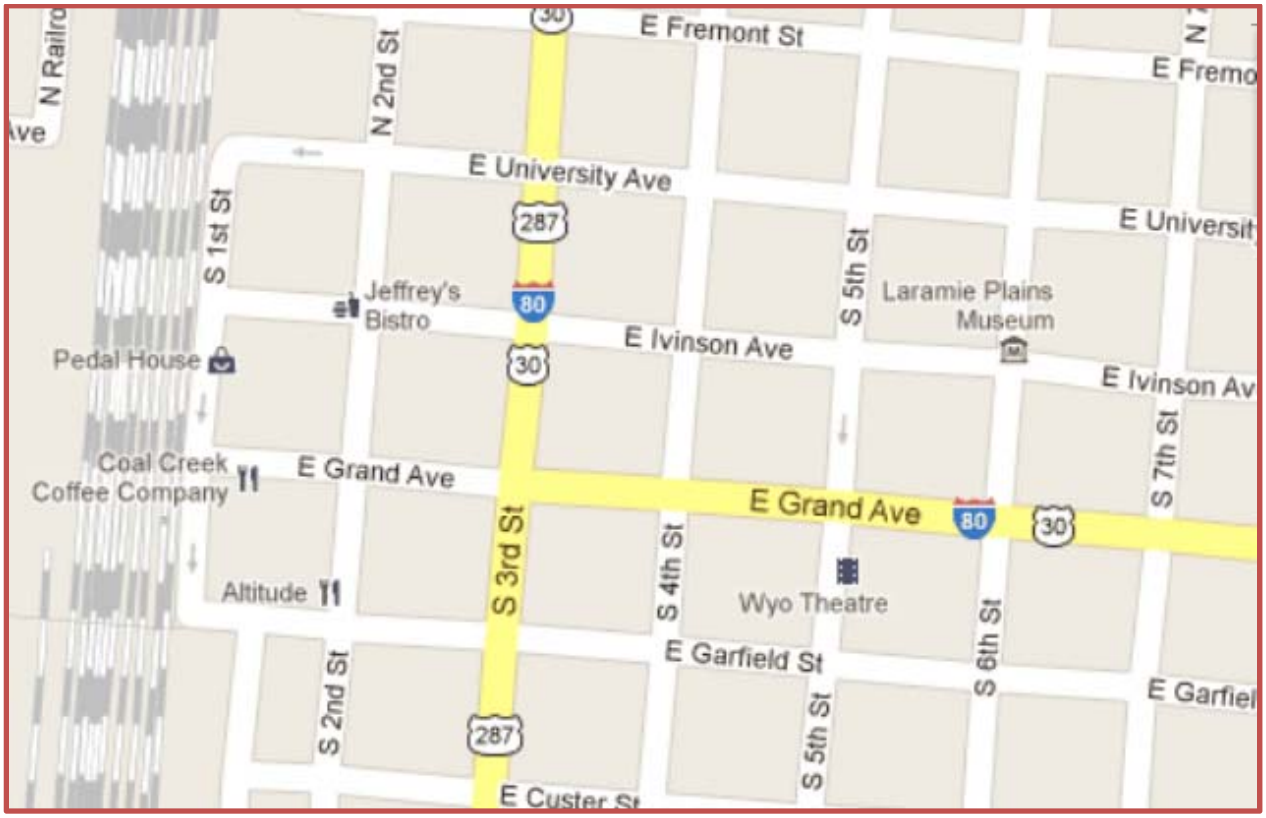
9:00-9:45 – Overview of previous day's information and introduction of session objectives and target questions. – *Tracey Johnson, University of Wyoming*

Break (9:45 AM – 10:00 AM)

10:00-11:00 – Small group brainstorming sessions to identify key information needs and knowledge gaps, as well as wildlife considerations related to management opportunities, project and landscape design considerations, and products and tools needed by management community.

11:00-11:30 – Reports from group discussions.

11:30-NOON – Assimilate key points as one large group; group discussion of next steps and how best to continue communicating.



Dining locations in downtown Laramie:

- Altitude Chophouse & Brewery: 320 S 2nd St.
- Grand Avenue Pizza: 301 E. Grand Ave.
- Jeffrey's Bistro: 123 E. Ivinson St.
- Prairie Rose Café: 410 S. 2nd St.
- Lovejoy's Bar & Grill: 101 E. Grand Ave.
- Anong's Thai Cuisine: 101 E. Ivinson St.
- El Zarape Mexican Foods: 204 S. 3rd St.
- Sweet Melissa's and Front Street Tavern: 213 S. 1st St.
- Tommy Jack's: 221 E. Grand Ave.
- Coal Creek Coffee - 2 locations: 110 E. Grand Ave, 2317 Grand Ave.
- Mizu Sushi: 307 S. 3rd St.
- Luciano's Italian Restaurant: 100 E. Ivinson St.

Lodging in Laramie near UW campus:

- Hilton Garden Inn, 2229 E. Grand Ave., 307-745-5500
- The Mad Carpenter Inn, 353 N. 8th St., 307-742-0870
- Hampton Inn, 3715 E. Grand Ave., 307-742-0125
- Comfort Inn, 3420 E. Grand Ave., 307-721-8856
- AmericInn Lodge & Suites, 4712 E. Grand Ave., 307-745-0777
- Holiday Inn, 204 S. 30th, 307-721-9000
- Travelodge, 165 N. 3rd, 307-742-6671