Introduction to the University of Wyoming's Rogers Research Site

NORTH LARAMIE MOUNTAINS, WYOMING

By Stephen E. Williams and Robert W. Waggener

University of Wyoming
Agriculture Experiment Station

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ROGERS RESEARCH SITE BULLETIN 1: Introduction to the University of Wyoming's Rogers Research Site, north Laramie Mountains, Wyoming

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Layout and design by Tanya Engel

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This is Bulletin 1 in an ongoing series focusing on research, teaching, extension, and other activities at the University of Wyoming's Rogers Research Site (RRS) in the Laramie Mountains, north Albany County, Wyoming. The approximate 320-acre site was bequeathed to UW in 2002 by Colonel William Catesby Rogers.

Colonel Rogers spent much of his retirement time at the mountainous, remote property, which he called the Triple R Ranch. UW renamed the property "Rogers Research Site" in memory of Colonel Rogers, who passed away in 2003 at age 96.

The February 16, 2002, amended living trust of Colonel Rogers states that:

> said ranch be used for the public benefit as a center for studies, a retreat for conducting meetings, conducting conferences, or conducting research in connection with the improvement of wildlife and forestry, or to hold as a natural wooded area in its original state with specific instructions that no part of it be subdivided or sold for residential or private business purposes but held as an entire tract. Said restriction is to continue in perpetuity. If violated, said property shall revert to the ownership of the U.S. Forest Service.

Overseeing management of RRS is the Wyoming Agricultural Experiment Station (WAES), UW College of Agriculture and Natural Resources. RRS is placed administratively under one of the WAES research and extension centers, the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle, Wyoming.

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ON THE COVER

RRS and surrounding lands in the Laramie Mountains were dominated by ponderosa pine (*Pinus ponderosa*) prior to the 2012 Arapaho Fire. The lightning-caused wildfire burned nearly 100,000 acres, consuming the majority of ponderosa on RRS and surrounding lands in the area of Laramie Peak. Both before and following the fire, University of Wyoming faculty, staff, and students initiated a number of research projects at RRS relating to soils and vegetation. This photo shows summer intern James Harkin preparing to plant a ponderosa pine seedling in July 2015 as part of a post-fire restoration study. A number of native grass and forb species established after the fire, including the four species in the foreground: harebells (aka bluebells, *Campanula rotundifolia*, purple flowers); blanketflower (*Gaillardia aristata*, yellow/red flowers); common yarrow (*Achillea millefolium*, white flowers); and sagewort (aka white sagebrush, *Artemisia ludoviciana*, the silvery plants). Noxious weeds also spread, including cheatgrass (*Bromus tectorum*), the reddish-brown grass in the lower right, and Canada thistle (*Cirsium arvense*), the plants in the background with purple seed heads. (Photo by Mollie Herget; cover design by Tanya Engel)

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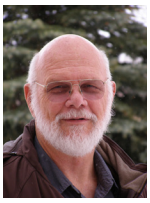


STEPHEN E. WILLIAMS

University of Wyoming Professor Emeritus Steve Williams, of Laramie, Wyoming, has been involved in a variety of research projects at the Rogers Research Site (RRS), both before and after the Arapaho Fire. The lightning-caused wildfire burned nearly 100,000 acres of the Laramie Mountains in 2012, including RRS lands. Though the fire consumed much vegetation in the area around Laramie Peak, it gave Williams and other faculty and staff members, along with undergraduate and graduate students, the opportunity to conduct both pre- and post-fire studies, including ecosystem comparisons manifest mostly in physical, chemical, and biological properties of soils.

Working with graduate students, he has been involved in additional research since the fire, including soil amendment and microbial community recovery after fire, as well as the restoration of ponderosa pine and grasses post-fire. Results from those studies will be presented in upcoming RRS bulletins. During his trips to RRS, Williams took and compiled numerous photographs. Many are included in this bulletin, and additional before- and after-fire photos will appear in future bulletins.

While at UW, a career that spanned from 1976 to 2013, Williams served in various capacities including assistant, associate, and full professor of soil science, head of the then Department of Plant, Soil, and Insect Sciences, dean of the UW Graduate School, director of the Wyoming Reclamation and Restoration Center, and professor of soil biology and biochemistry. During this period, he was on more than 140 graduate committees, and he authored or co-authored approximately 50 peer-reviewed publications and has several hundred other forms of publication and professional presentations. His work includes efforts in Wyoming and the U.S., but also from Australia, Northern China, Mongolia, and, most recently, New Zealand. He was involved heavily in a project that evaluated the ecological consequences of the 1988 Yellowstone fires.

Williams earned a B.S. in biology at New Mexico State University (1970), an M.S. in agronomy from NMSU (1972), and a Ph.D. in soil science from North Carolina State University (1977).

ROBERT W. WAGGENER

Robert Waggener of Laramie, Wyoming, is a part-time editor for the Wyoming Agricultural Experiment Station (WAES). In addition to his work on the Rogers Research Site bulletins, he co-edits the annual WAES *Field Days Bulletin*. Waggener is also part-time copy editor for *Rocky Mountain Geology* journal, published by the UW Department of Geology and Geophysics.

Waggener focuses his freelance editing, writing, and photography work on agriculture and natural resources in Wyoming and the West. Among his other clients are Penton's *Western Farmer-Stockman* magazine, DTN/*The Progressive Farmer* magazine, and Farm Journal Media.

He worked at *The Sheridan Press* and *Buffalo Bulletin* newspapers in northern Wyoming prior to becoming an editor, writer, and photographer for the UW College of Agriculture and Natural Resources/UW Extension in 2004. He then served as editor-in-chief at the Wyoming State Geological Survey before launching his full-time freelance career in 2010.

Waggener earned a B.S. in journalism from the University of Wyoming in 1983, where he also studied sociology and wildlife management. During college, he worked as a biological aide at the Kooskia National Fish Hatchery near Kooskia, Idaho; interned at the *Green River Star* newspaper in Green River, Wyoming; labored in FMC's coal-fired power plant near Green River; and co-taught two summer photography classes at UW. These broad experiences encouraged him to follow a career path that would allow him to blend writing, editing, and photography with his interests in agriculture, natural resources, wildlife, and the great outdoors.

STANDING ON THE COLONEL'S SHOULDERS

By Stephen E. Williams and Robert W. Waggener

"We make a living by what we get. We make a life by what we give."

Those words by Sir Winston Leonard Spencer-Churchill certainly hold true for a World War II veteran named Colonel William Catesby Rogers, who silently accumulated much wealth during his lifetime, and then shared that wealth with many—whether small sums to help pay for the education of young people or very large gifts to benefit cancer research, fine arts, and the tireless efforts of groups trying to end discrimination, hate, and intolerance. Colonel Rogers certainly made a life by what he gave, and we are equally certain that he would be proud watching undergraduate and graduate students, along with their faculty mentors, conducting research on a small tract of Wyoming land that he called home after retiring from the U.S. Army following a distinguished career.

Colonel William C. Rogers put a gift of land into your hands—your challenge is to receive it, use it beneficially, and one day faithfully hand it to the next generation.

It has now been approximately 15 years since the Triple R Ranch in north Albany County's Laramie Mountains was bequeathed to the University of Wyoming by Colonel William Catesby Rogers. UW and many others owe "The Colonel"—as he was known by many—a debt of gratitude for his generosity and foresight in providing this gift. Colonel Rogers died in 2003, at age 96, but a year earlier he provided instructions in his will for how the gift was to be used. Those instructions are broad enough to accommodate a diversity of uses, but specific enough to secure the approximate 320 acres as a unit to address natural resource management issues on the property and surrounding lands near the prominent Laramie Peak, an area known for its rich variety of wildlife and vegetative species.

The Triple R Ranch has since officially become known as the Rogers Research Site (RRS) in honor of The Colonel. RRS has great potential as a research, teaching, and extension site, notably in the areas of forestry and wildlife resources, per the wishes of Colonel Rogers. The legal will provides a broad set of recommendations for use of the property, and it is our hope that future managers and users, including student, faculty, and staff researchers and those involved in extension and other activities, keep in mind the guidelines established by the remarkable Colonel William C. Rogers. During his later years he worked quietly and mostly anonymously as a benefactor of many programs and efforts at UW. Only now, years after his passing, are we realizing the impact of this man. And his impact is having a very positive influence on others, including UW students who have and are conducting a variety of research at the remote, mountainous site—from vegetation mapping using high spatial resolution photography to post-fire ponderosa pine regeneration studies to soil microbial recovery after a high-severity forest fire. Their work, which has been in collaboration with UW faculty and staff members, has truly inspired us, and we hope it inspires others to carry on the wishes of Colonel Rogers, who wanted his beloved land to become a center for studies and a place to conduct research for the improvement of wildlife and forestry resources. "Bill," as he was known by some, also willed money to UW for the establishment of the Colonel William C. Rogers University of Wyoming Excellence Fund, with the purpose to support a variety of programs at UW and across Wyoming, including those that benefit our state's wildlife and forests.

Colonel William C. Rogers bequeathed his 320-acre "Triple R Ranch" in the north Laramie Mountains to the University of Wyoming, in part, for research relating to the improvement of wildlife and forestry resources. Shortly after The Colonel's death in 2003, the property became a component of the Wyoming Agricultural Experiment Station (WAES). The site was renamed the Rogers Research Site (RRS) in honor of Colonel Rogers. Management of RRS is through one of the WAES research stations, the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle, Wyoming. This photo was taken in July 2015. In the background is the prominent Laramie Peak. (Photo by Michael Curran)

This casual (and badly faded) snapshot of Colonel William C. Rogers was taken in 1982. At the time, he would have been about 76 years old and enjoying retirement with friends and strangers alike. His retirement, until the last few years, included both relaxation and hard physical labor on his property in the Laramie Mountains and on a farm in Nebraska. (Photo courtesy Colleen Hogan)

But beyond The Colonel's work—and the work that we do as individuals or teams of individuals—there is a social construct and unwritten contract that we, as members of the group identified taxonomically as *Homo sapiens*, must attend. 'Tis more than curiosity that drives this attendance, although the love and excitement of acquiring new insights and knowledge are close to the heart of these endeavors. With this in mind, there is no summary of our social contract more salient or succinct than the words of Albert Einstein:

> *Bear in mind that the wonderful things you learn in your schools are the work of many generations, produced by enthusiastic effort and infinite labor in every country of the world. All this is put into your hands as your inheritance in order that you may receive it, honor it, add to it, and one day faithfully hand it to your children. Thus, do we mortals achieve immortality in the permanent things which we create in common.*

We would expect that Colonel William Catesby Rogers—the man we now know as The Colonel—would whole-heartedly agree with Mr. Albert Einstein and Sir Winston Churchill. The Colonel made a life by what he gave, and may we honor that gift for generations to come.

TRIBUTE

By Robert W. Waggener

The late Robert "Bob" Means

As research, teaching, and other activities were progressing at the Rogers Research Site (RRS), we learned of the sudden passing of Robert "Bob" Means, who died at his Cheyenne, Wyoming, home on May 26, 2015. He was 61.

Bob was an active participant with the 2011 Wyoming Forestry Best Management Practices Audit Team, which audited several forested sites across Wyoming in an effort to help landowners and managers—both public and private—better manage natural resources on those sites, including forest, wildlife, and water. Among the properties that Bob and his fellow team members toured that year was RRS. Their work at RRS and the subsequent recommendations they made, which are reflected in this bulletin and will be thoroughly discussed in an upcoming bulletin, are helping to pave the way for future management decisions at the remote Laramie Mountains' site that was donated to the University of Wyoming by Colonel William C. Rogers.

Bob was also a member of the 2012 Rogers Research Site Ad Hoc Committee that met in response to the lightning-caused Arapaho Fire, which burned across nearly 100,000 acres of the Laramie Mountains, including RRS lands. Work of that committee is also reflected in RRS Bulletin 1 and will be detailed in an upcoming bulletin.

Bob Means, like many of the people who have been associated with RRS research, extension, and teaching, devoted much of his life to bettering our state and country's natural resources. He worked many jobs with public land management agencies, most recently the U.S. Bureau of Land Management in Cheyenne, where he managed the agency's state forestry program. He was chair of the Society of American Foresters and a member of the Whitebark Pine Ecosystem Foundation.

The attention that Robert 'Bob' Means gave to natural resources was as enormous as his compassion for people

"Bob's attention to natural resources was as enormous as his compassion for people from all walks of life," states his obituary.[1] "His hobbies overlapped with his work, sanding wood rounds, and counting tree rings on his weekends."

We extend our thoughts to Bob's family—wife Maria, daughter Marcela, son Taylor, and brother Rick—as well as his friends, colleagues, and the university students and interns that he mentored. His dedication, talents, compassion, and service are missed.

1 The full obituary for Robert "Bob" Means, 1953–2015, is on the Schrader, Aragon & Jacoby Funeral Home website at www.schradercares.com. We thank the funeral home and employee Mary Pino for kindly sharing the obituary and photo of Bob.

CHAPTER 1

COLONEL WILLIAM CATESBY ROGERS

By Robert W. Waggener[1]

Most stories begin at the beginning. But when telling the story of Colonel William Catesby Rogers, it seems only fitting to begin at the end. That day came in spring 2003, when employees of the Neptune Society of Northern California piloted a small craft into the Pacific Ocean, where they quietly disposed of the ashes of Colonel William C. Rogers. No military detail. No three-gun salute. No Taps. No marble headstone amidst weeping redbud trees and manicured green grass. Just a simple, discreet, direct cremation into the cold, deep waters of the Pacific.

That might seem rather unfitting for someone like William C. Rogers. Here's a decorated colonel who served his country with distinction in the U.S. Army (Fig. 1), a man who was respected and loved across the globe by friends and strangers alike, and a stock investor worth millions of dollars who paid the guys at Neptune exactly $1,275 to carry out their assigned duty as cheaply and efficiently as possible.

As The Colonel's ashes slowly sank into the Pacific that spring day, a young woman from Wyoming named Colleen Hogan learned that she had been willed $10,000 for her advanced education. And a New York woman received word of a $15,000 gift to improve her job skills. And a letter would arrive at the small library in West Point, Nebraska, informing the trustees that $10,000 was on its way for "fundamental and/or classic volumes."

There were many others, too, among them the Memorial Sloan Kettering Cancer Center in New York ($500,000), a pastor doing mission work in Creel, Mexico ($10,000), the Association of Handicapped Artists in Broadway, New York ($25,000), and the Southern Poverty Law Center Endowment Fund in Montgomery, Alabama ($500,000).

Figure 1. This is an official U.S. Army photo (circa 1951) of William Catesby Rogers when he was a lieutenant colonel in the Army. By 1955 he had been promoted to colonel. After retiring, he spent much time on his beloved property in Wyoming's Laramie Mountains as well as in Mexico and on a farm in Nebraska. (U.S. Army photo courtesy Mary Laura Kludy, Preston Library, Virginia Military Institute)

Many people who knew Colonel Rogers had no idea he was a multi-millionaire until after he died at age 96. And that held true for friends who sat around a crackling campfire on The Colonel's isolated property in southeast Wyoming's Laramie Mountains, enjoying a cold beer and salted peanuts with the man they grew fond of in so many ways (Fig. 2). He was a simple man, but at the same time remarkably complex.

People who knew him used words like eccentric, opinionated, powerful, stern, nice, scary, ornery, caring, and kind. Eclectic,

1 Robert Waggener is a Laramie, Wyoming-based freelance editor, writer, and photographer covering agriculture and natural resources in Wyoming and the West. He works part-time for the Wyoming Agricultural Experiment Station, which oversees research, extension, and other activities relating to the property that Colonel William C. Rogers bequeathed to the University of Wyoming. Colonel Rogers called his 320-acre parcel in the Laramie Mountains the Triple R Ranch. UW officially named the property the Rogers Research Site in honor of The Colonel.

Figure 2. Colleen Hogan and many other guests enjoyed sitting around the campfire with The Colonel. On the log just to the right of Colonel Rogers is a can of beer, a jar of salted peanuts, and a salt shaker. "He really liked salty peanuts with his beer," says Colleen, who, with her mother, Levida Hileman, spent a portion of each summer from 1977 to about 2000 visiting The Colonel in the Laramie Mountains. Colleen was 17 or 18 when this photo was taken (circa 1987). (Photo courtesy University of Wyoming American Heritage Center, William C. Rogers Papers)

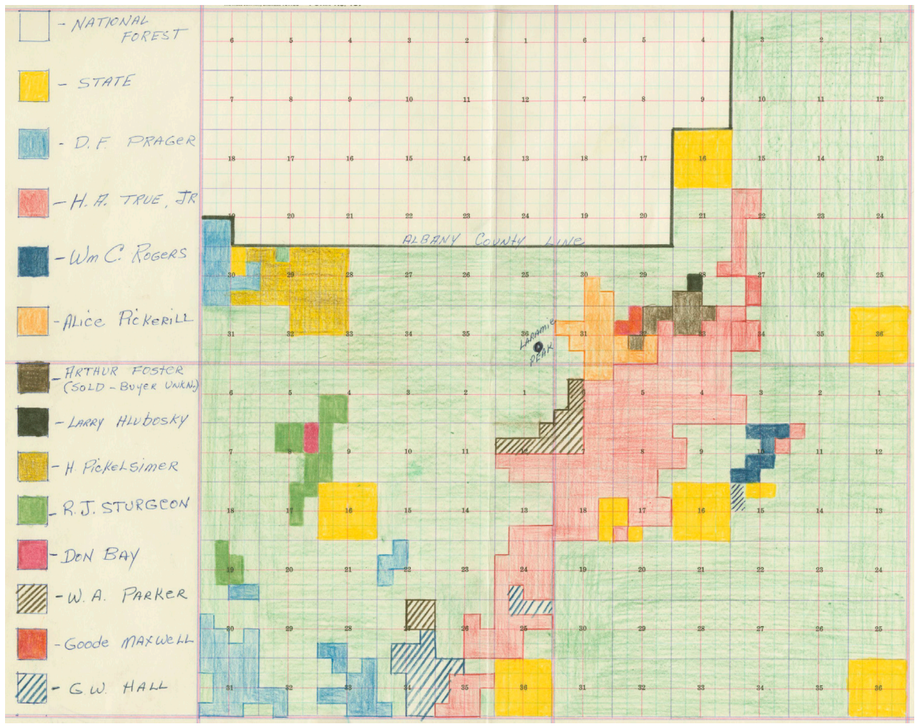


Figure 3. This hand-drawn map shows the general outline of the Rogers' property (dark blue, right center) and surrounding lands in the Laramie Mountains of northeast Albany County. The year the map was created is unknown. It may have been drawn by Colonel Rogers himself since it is in the William C. Rogers Papers at the University of Wyoming's American Heritage Center, but that is also unknown. (Map courtesy University of Wyoming American Heritage Center, William C. Rogers Papers)

exacting, environmentally conscious, outdoorsy, adventurous, independent, and unique. Strict, gentlemanly, well-read, minimalist, thrifty, regimented, respectful, and trustworthy. Well-traveled, though a penny-pincher. Reclusive, but neighborly.

And militaristic, yet hippy-ish.

Yes, militaristic on one hand, hippy-ish on the other. During his career in the U.S. Army, Colonel Rogers toed the military line. But once retired, "Bill" loved to hang out with hippies, and mountain folks, and film festival goers … and well-read scholars, and monks, and missionaries … and Tarahumara Indians living in cliff overhangs … and Zapotec weavers … and liberals bathing nude on isolated beaches in Mexico … and conservatives raising corn in Nebraska or running cattle on high-mountain pastures near his 320-acre chunk of Wyoming real estate that he called the "Triple R Ranch" (Fig. 3).

Individuals and organizations and institutions from all walks of life would discover that their friend Bill—The Colonel—was sending them a gift of appreciation. One of them was the University of Wyoming, which learned before his death that it would be receiving millions of dollars to support the arts, social justice, campus beautification, forestry, and wildlife.[2] And UW would also learn that The Colonel was bequeathing his beloved land to the institution so faculty, staff, students, and others could conduct research on ponderosa pine, quaking aspen, antelope bitterbrush, dwarf mountain ragwort, northern saw-whet owls, Preble's meadow jumping mice, northern long-eared bats, and equally long-eared mule deer. And that's what this bulletin is all about. It's our way of introducing readers to the Rogers Research Site, north Laramie Mountains, Wyoming, and its potential for research, teaching, and extension. We'll cover those latter three things in the coming chapter and Bulletins 2 and 3, but in Chapter 1 we want to tell you about the man named William C. Rogers, for it was his gift of land and money that is helping to pave the way for budding scientists to study the very things that attracted him to Wyoming's rugged Laramie Mountains following his distinguished—but undoubtedly traumatic—career in the military, which took him, among other places, to the Western Front of the European Theatre during World War II.

Born in Newport News, Virginia, in October 1906, William Catesby Rogers was named after Catesby ap[3] Roger Jones (1821–1877), the U.S. Navy officer who commanded the first Confederate ironclad warship, the CSS Virginia, formerly the U.S.S. steam frigate Merrimac. "Our family is directly related to Catesby Jones," says Sarah Stark Serra of Williamsburg, Virginia, a niece of Colonel Rogers.

When she was growing up, Sarah called her uncle "Uncle Catesby," which, unbeknownst to her at the time, was a fitting name for someone destined for the military. "I hate to admit this, but when I was a little girl I was very scared of him. He was a very stern man," she recollects. But Sarah and other members of her family would really never get to know the *real* Colonel whom many others would meet down the long road that he traveled, because, for whatever reason, when he left for the military he left his family behind.

"He lost contact with his entire family by his choice. I don't know why," Sarah says. "My brother doesn't know why. In fact, his nieces and nephews know very little about him. We rarely saw him, and he remains quite a mystery to our family. He did occasionally visit his parents in Newport News, but I don't know where he was living at the time. He had five brothers and sisters and outlived all of them except my mother, who passed away in 2005."

The last time Sarah saw Uncle Catesby was in 1969, when he returned to Newport News to attend the funeral of his mother. "He was cleaning the gutters of his parents' home. I guess he was cleaning the gutters because he wanted to help in some way and wanted to keep busy," she speculates.

2 A full obituary for Colonel Rogers appears in Appendix A. Pertinent information about his trust appears in Appendix B.

3 The "ap" in the name Catesby ap Roger Jones is a Welsh patronymic meaning "son of."

Figure 4. Colonel William C. Rogers, then of Rye, New York, is congratulated in 1955 by the Republic of Korea Minister of Transportation Lee Chong Rin, after receiving the Ulchi Distinguished Military Service Medal in Seoul. Colonel Rogers received the medal—the second highest decoration awarded by the Republic of Korea for military merit—for his service as chief of the Korean Civil Assistance Command's transportation branch. (U.S. Army photo courtesy Mary Laura Kludy, Preston Library, Virginia Military Institute)

By then, a lot had happened in the life of Uncle Catesby, things his family knew virtually nothing about. William Catesby Rogers entered the Virginia Military Institute (VMI) in 1923, at age 16. Rogers, who served as managing editor of the *Cadet* newspaper and was a member of the VMI Dramatic Club, graduated with the Class of 1927 after earning a bachelor's degree in liberal arts. He was called to active duty in 1942 and assigned to the rail branch in the office of the Chief of Engineers. He served as commanding officer of a railway shop battalion in the Persian Gulf Command (Appendix A).

Rogers was in Berlin during the hectic days immediately following the armistice, and it was during this period that he acquired a document signed by Adolph Hitler ordering the German people to cooperate with police. Rogers would later donate the order to the War Memorial Museum of Virginia, which stated in a news release that it is one of the very few authenticated Hitler signatures the museum has in its archives.

People who got to know Bill while visiting around a Wyoming campfire decades later say that they learned little about his military career, even when asking questions. Perhaps The Colonel, like many others who returned home from the war, had buried horrific experiences deep within. "He didn't openly talk about his military service with us and I believe that had to do with us being women, but I'm not sure," recalls Colleen Hogan, who, as girl growing up in Casper, Wyoming, would spend part of each summer on The Colonel's property in the Laramie Mountains with her mother, Levida Hileman. "One day I did ask him about World War II. He didn't tell me a lot, but he did say that he started out in Africa and that the war was horrible. When Hitler surrendered and the American troops made it into Nazi Germany, his troops were the first to go into the Auschwitz concentration camp. I vividly remember one of the things The Colonel told me. 'I will never forget the smell. I will never forget the smell of rotting corpses.'"

Maybe the Laramie Mountains helped Colonel William C. Rogers cope with the wartime memories. There were the fresh scents of late-afternoon summer showers. There were grand ponderosa pines that smelled like vanilla when he peeled the bark back. There were antelope bitterbrush shrubs with fragrant dainty yellow flowers. There were composting layers of quaking aspen leaves on the ground that emitted their distinct earthy smells following early autumn rains. And there were hissing-popping-snapping campfires that gave off musky, mesmerizing wisps of bluish white smoke, smoke that rose to a big Wyoming sky packed full of twinkling stars.

In 1955, Rogers, who by that time had been promoted to colonel, received the Ulchi Distinguished Military Service Medal in Seoul, Korea, for his service as chief of the Korean Civil Assistance Command's transportation branch (Fig. 4). The award, later renamed the Korean Order of Military Merit, Ulchi Class, is the second highest decoration bestowed by the Republic of Korea for military merit. Rogers, who proudly accepted the honor, became a well-traveled man during World War II, serving not only in Korea, but Europe, Africa, and Iran, overseeing such missions as keeping railroad supply lines open to Russia. In 1962, he honorably left one life behind and started another. His travels continued, but this time his destinations were by choice, not by orders from the U.S. Army. Among the lures were the sandy beaches and tree-covered mountains of Mexico.

"He loved Mexico, and he spent a lot of time down there with a woman he adored," says UW Professor Emerita Rebecca Hilliker, who developed a friendship with The Colonel late in his life. "He and this woman, a cultural researcher, took medical supplies to rural people, to Indians. He loved Mexican culture. He loved the indigenous people. And they really wanted to know more about that whole indigenous culture."

The Colonel spent extensive time researching the Tarahumara Indians of northern Mexico, the Union Pacific Railroad, Calamity Jane, and windmills, and his fascination with adventure, travel, and history would eventually take him to the western U.S., where he fell in love with a remote piece of the Laramie Mountains. "He was a very reclusive

Figure 5. Spring 1977 was the first time Levida Hileman and her daughter, Colleen Hogan, traveled to The Colonel's property in the Laramie Mountains. Levida and Colleen, who was only 7 at the time, spent the night in a homemade sauna. That next morning they woke to a heavy spring snow, which blanketed the ponderosa pine and this old sheep wagon. Colonel Rogers hooked up their hatchback Datsun to his Ford Bronco and towed them to the county road, where he wished them goodbye and good luck. It was a good goodbye from a man who respected independent people, and for more than two decades the mother-daughter pair would travel back to the mountains to see their good friend. (Photo courtesy Colleen Hogan)

Figure 6. This old sheep wagon on The Colonel's property (the same wagon as pictured in the snow scene, Fig. 5) was home-away-from-home for more than two decades for Colleen Hogan and her mother, Levida. The mother-daughter pair and others spent much time refurbishing the wagon, as attested by this photo taken in 1999. (Photo courtesy Colleen Hogan)

man. That's why we think he bought that isolated piece of land in Wyoming," speculates The Colonel's niece, Sarah Stark Serra.

As he embraced retirement, Bill would spend winters in Mexico bathing nude on the beaches and researching indigenous people in the mountains, early spring and late fall laboring on a farm in Nebraska, and summers on his Triple R Ranch in north Albany County, Wyoming, where he chopped wood for the fire and collected cow patties to make compost for his strawberry patch. Though he was reclusive, he loved being around people from all walks, and would run ads in *Mother Earth News* welcoming strangers to his little place in the hills. That's how Levida Hileman, a school teacher in Casper, Wyoming, would learn about the man that she and daughter Colleen would grow to admire, respect, and, become forever close friends.

"The ad said there were teepee spaces, cabins, and a sheep wagon for rent in the Wyoming mountains. So I answered that ad. I was a single mother at the time, and it sounded like a neat way to get my kids outdoors," Levida recalls of that early spring day in 1977. Within weeks, she and one of her five children, Colleen, along with a friend loaded into a car and headed to the ponderosa-covered mountains, where they were greeted by a tall, slender, physically fit man sporting thick white hair and ragged, hand-me-down clothes.

"I was 7 years old the first time we went up there," Colleen says. "We spent the night in a homemade sauna, and that next morning we got dumped on by snow. There were about 8 inches of heavy spring snow and it was still snowing, so we figured we better get out of there (Fig. 5). We were in a hatchback Datsun, so Bill towed us to the county road. When we got there, he unhooked the car and said, 'See you later.'"

Colleen starts laughing, before adding: "Bill said 'See you later' in a good way. That was his way of saying, 'I enjoyed seeing you, and you are welcome back.' It wasn't a 'get-off-of-my-property' type of thing. It was a *good* goodbye. Mother had already talked to him about renting his sheep wagon for the summer (Fig. 6), and she got a kick out of the way he said goodbye. She thought that maybe Bill admired independent people. I remember Mother saying, 'Yes, I guess we are on our own. But I want to come back. I feel welcome here.'"

Figure 7. The Colonel enjoys a quiet afternoon visiting with friends Levida and Brock Hileman, along with Colleen Hogan (the picture taker). After Brock married Levida and became Colleen's stepfather, he, too, enjoyed spending time on The Colonel's property, whether it was visiting with Bill and others around a campfire, hiking through high-country meadows, or reading a book while sitting amongst ponderosa pine and Canada jays. (Photo courtesy Colleen Hogan)

Yes, Bill indeed admired independent people, but he also truly made them feel welcome, whether a California hippie on a long, soul-searching road trip, a scholar wanting to talk about the Tarahumara Indians, or a neighboring landowner hired to prune trees. "The Colonel moved in as a stranger, but made himself pretty well welcome," says Duane Walker, a lifelong Laramie Mountains resident who logged, ranched, chased smoke as a firefighter with the U.S. Forest Service, and, along with his wife, Sharon 'Tiny' Walker, helped neighbors, including Colonel Rogers, with whatever they needed help with. "He was real easy to work for. I would explain what I could do, and he would approve it," Duane says. "And then when I got finished, I would ask him: 'Is that what you wanted? Did I get your problem solved?' 'Yes, please come back and do some more.' And when I did do more work for him, he paid me twice as much for doing that work as anybody else around here would have done. He must have thought that I did a pretty dang good job for him."

Another man who helped Colonel Rogers was Bryan Anderson,[4] who, at the time, was an extension forester for UW Cooperative Extension Service.[5] Bryan and others would walk public and private lands, including the small parcel owned by The Colonel, marking trees infested with mountain pine beetle and discussing ways to better manage forest resources. "One fall day a fellow forester and I were in the area marking when we ran into Tiny Walker. She said we were welcome to stop by Hubbard's Mountain Cupboard (the locally famous restaurant, bar, and dance hall) and have supper with everyone," Bryan says. "Tiny told us that The Colonel had bought a couple of turkeys in town, and they were cooking them up at Hubbard's Cupboard and having a community potluck. After a long, hard day in the field, we enjoyed a wonderful meal and some great conversation with Colonel Rogers and his friends. That is one of the memories of The Colonel that still warms my heart."

Those who got to know Bill during his time in the Laramie Mountains spoke of his generosity, whether buying turkeys for a potluck or paying a little extra for a job well done, but following his death in 2003 they were shocked to learn that he was worth many millions. He inherited some money, earned a good salary in the military, lived an incredibly frugal life, and actively traded stocks. "He would go out to the county road and wait for the mailman at 1 p.m. every Monday, Wednesday, and Friday to get his *Wall Street Journal*. He really enjoyed investing. He was a stock market person, and that's why he got the paper," says Brock Hileman, who began spending time at the Triple R Ranch in the early 1980s after developing a relationship with Levida, whom he would soon marry. Brock, like many others, would quickly grow fond of The Colonel (Fig. 7). "We learned later that he had a lot of money, $6 million, $8 million, or $10 million, something like that, but he never spent much of it. He lived in a tiny shack on the property and would get his clothes from The Salvation Army. Sometimes his shirts wouldn't have buttons, but that didn't matter to The Colonel. He would even buy secondhand underwear."

The secondhand underwear story would bring both laughter and tears from Levida and Colleen. The day they learned he wore hand-me-down briefs, which added one more notch to The Colonel's growing list of eccentricities, was the same day that they knew something was seriously wrong with their dear friend.

"One day The Colonel had a severe bleeding attack. I don't remember the year, but it happened in October," Levida says. "Colleen and I went up to the mountains for the weekend and found out he was in a hospital in Cheyenne. He was very special to us so we immediately went down there to see him. He had a bleeding ulcer and had all kinds of tubes

4 Bryan Anderson is now a district forester with the Wyoming State Forestry Division in Casper, Wyoming.

5 In 2011, the UW Board of Trustees voted to change the UW Cooperative Extension Service to University of Wyoming Extension.

Figure 8. Colonel William C. Rogers was a multi-millionaire and could have hired contractors to build a trophy home and guest cabins on his property in the Laramie Mountains. Instead, he chose to stay in this one-room cabin, and his guests had the choice of equally rustic cabins, a sheep wagon, or a teepee. He willed millions of dollars to institutions, organizations, charities, and individuals. (Photo courtesy Colleen Hogan)

in him. He did not want my daughter to see him that way. That's how proud he was."

Levida gets choked up. She's a strong woman. But tears are begging to flow.

She then mentions that Colonel Rogers, who was ordered by his doctors to stay close to medical facilities until he was fit to go back to the mountains, spent a couple of weeks at their home in Casper recovering. There, he depended on the assistance of Levida, Colleen, and others, which, for The Colonel, was not an easy thing to do. Not at all!

There's another pause in the conversation. This time a longer pause.

Levida then says that she must tell the story of Colonel Rogers and the hand-me-down underwear because that story, like many others, begins to reveal, in part, why The Colonel did what he did, and that was living frugally so he could one day help others.

"When we were at the hospital down in Cheyenne, he gave me some money to buy him some clothes so he would have something else to wear when he went back to his ranch. But he didn't want me to go anywhere for those clothes except The Salvation Army. I kind of rebelled when it came to buying him used underwear so I went to a store and bought him some *new* underwear," Levida recalls like it was yesterday. "You could tell that when he saw the package of new underwear, that was not the right thing to do. He wasn't happy that I bought him new underwear."

But that's one of the reasons people like Colleen Hogan, Levida and Brock Hileman, Duane and Tiny Walker, Bryan Anderson, and Rebecca Hilliker liked The Colonel. It was his quirks and his peculiarities and his complexities and the way he lived life that made the colonel *The Colonel*.

"Bill was such a unique individual, and my life is much better for having known him. He always gave me a different perspective at looking at life," Colleen says. "He was very, very special to me and a lot of other people. He taught me the importance of making the most with what you have in life. We had no idea that he was worth millions when looking at how he lived. He was happy enjoying the simple things in life. He could have had a huge, elaborate home built up there in the mountains—a home with running water. But he chose to live in this little one-room cabin (Fig. 8) and carry water from a spring up the hill. He kept that bucket by the wood stove and would go out every day and get water. He enjoyed a simple life, and he enjoyed people."

Figure 9. Colonel Rogers willed his old sheep wagon to Colleen Hogan (pictured in 2015) and her mother, Levida Hileman, who meticulously cared for the antique. After renting a small piece of land near The Colonel's property shortly after his death, they moved the wagon and continue using it to this day. "Spring 2017 marks 40 years of going up there," Colleen says. "Every day I thank the Lord for blessing us. We met a wonderful man, I had a beautiful place to grow up, and I still get to enjoy the mountains and the sheep wagon." (Photo courtesy Colleen Hogan)

The last time Colleen and her mother, Levida, saw The Colonel was in 1999, maybe 2000. By then, the tall, slender, physically fit man they had met more than two decades earlier was riddled with arthritis and had become obsessed with getting older. One could tell he was hurting when he walked. That he was in pain everywhere. The Colonel, a man who served his country with dignity and pride, a man who helped Indians in Mexico, a man who assisted farmers in Nebraska, a man who lent a hand to neighboring ranchers and loggers and cabin owners in the Laramie Mountains, and a man who welcomed strangers to his little piece of heaven in the hills, did not want other people to help him as his health continued to dwindle. But one day, his doctors directed him to move to a much lower elevation, a more hospitable climate. The good military man he was, he obeyed their command and traveled to the coast of California where he would spend his last few years being cared for by friends.

The Colonel still corresponded with many of the people he met over the years, many of the people he had developed lasting friendships with. He would handwrite eight-, 10-, 12-page letters on yellow legal paper—talking about the once towering, but now beetle-sickened ponderosa pine at the Triple R Ranch, campfire gatherings with cold beer and salted peanuts and twinkling stars, the Tarahumara Indians he had helped in northern Mexico, or the book by German novelist Johann Wolfgang von Goethe that he had just finished reading. In one of his last letters to Colleen Hogan, who by now had graduated from college and was helping others as a surgical nurse in Michigan, The Colonel talked about how painful his arthritis was and that he didn't want to end up in a nursing home. He then asked for her permission to send a gift. Within days, *The Alice B. Toklas Cookbook* arrived on her doorstep, along with another hand-written letter, a letter that was barely legible. And then came word that Colleen and her mother, Levida, would be receiving The Colonel's antique sheep wagon that they grew so fond of and cared for during stays on his property (Fig. 9).

Others received gifts, too, like a poor community in Mexico. The Colonel had learned through his correspondence that the community was in desperate need of an ambulance, so he instructed his caretaker in California to buy an ambulance and drive it to that small town across the border. "Him sending that ambulance down to Mexico helps explain who Colonel Rogers was," says Professor Hilliker. "Have you heard of any other individual sending an ambulance down to Mexico to help a community in need? That tells you something about Colonel Rogers."

As people around the United States and Mexico and Japan were learning that they were in the living trust of Colonel William Catesby Rogers, his ashes were slowly sinking in the cold, blue waters somewhere off the coast of Northern California. The man known as "Colonel William C. Rogers," "Uncle

Figure 10. Colonel William C. Rogers spent much time hanging out with friends and strangers, doing manual labor, relaxing, reading, writing, and researching (everything from windmills and the Union Pacific Railroad to Calamity Jane and the Tarahumara Indians) on his beloved land in the Laramie Mountains. This photo was taken in 1995. At the time, The Colonel would have been 89 years old. (Photo courtesy Colleen Hogan)

Catesby," "The Colonel," and "Bill" had traveled around the world—from Newport News on the East Coast, to Iran, Korea, and Africa, to the Western Front of the European Theatre, to the cliffs and beaches of Mexico, to the flat farm fields of Nebraska, to the mountains of Wyoming (Fig. 10), to his final resting place deep in the Pacific. Along that million-mile journey, he made a lasting impact on the lives of many people fortunate enough to cross his path, like that young girl from Casper, Wyoming, named Colleen Hogan.

"I told The Colonel once that he was like the grandfather I never had. He looked at me and shook his head, 'Oh, no, no, we're just really good friends.' I responded, 'OK, I'll take that. I'm glad we're really good friends, but you're still like a grandfather to me.' I then told him that my grandfather passed away before I was born and again told The Colonel that he was like a grandfather to me. But The Colonel didn't want that. He just wanted to be good friends, and that's exactly what we became."

ACKNOWLEDGMENTS

Many thanks go to those who are making these Rogers Research Site (RRS) bulletins possible, including the Wyoming Agricultural Experiment Station (WAES); Bret Hess, director of WAES and associate dean in the UW College of Agriculture and Natural Resources; and John Tanaka, associate director of WAES and director of the James C. Hageman Sustainable Agriculture Research and Extension Center near Lingle, Wyoming. I appreciate Bret and John's votes of confidence to help see these bulletins through to completion so that you can learn about The Colonel, his land that was donated to UW, and the research, extension, and teaching taking place on the site by UW students, faculty, staff, and others.

A strong Wyoming handshake is extended to Steve Williams, the lead author of this and upcoming bulletins; he has been a key player for many years when it comes to research activities at RRS. Steve is now retired after an outstanding career at UW, and taking over RRS oversight are Assistant Professor Linda T. A. van Diepen and Assistant Professor/Rangeland Extension Specialist John Derek Scasta in the UW College of Agriculture and Natural Resources. Many thanks go to Tanya Engel, graphic designer, and Tana Stith, manager and graphic designer, UW Extension Communications and Technology, for their assistance. Tanya Engel oversaw the graphic design of this and upcoming RRS bulletins, and she worked patiently and professionally with us as we worked through the process of creating a scientific looking, yet visually appealing template for the RRS bulletin series. We are confident that Colonel Rogers would be happy with both the content and the look, but, more importantly, that many people, including UW students, faculty, and staff, are involved in research and other activities on the land that he donated to UW.

Thanks go to those who reviewed all or portions of this bulletin: Linda T. A. van Diepen, Derek Scasta, Ryan Amundson, statewide habitat biologist for the Wyoming Game and Fish Department, Bryan Anderson, district forester with the Wyoming State Forestry Division, Sarah Stark Serra, Colleen Hogan, and Levida Hileman. The mother-daughter pair, Levida and Colleen, became very close friends with Colonel Rogers during summer trips to his land—trips that spanned more than two decades. Bryan Anderson and Ryan Amundson both served on the RRS Management Committee, which met in 2010 and 2011 to formulate short- and long-term objectives for the site. The work of the RRS Management Committee, which was directed by Steve Williams, is summarized in this bulletin and will be detailed in an upcoming RRS bulletin.

I greatly appreciate the work of researchers who have co-authored upcoming bulletins in this series, including Steve Williams, Mathew Seymour, Ken Driese, Mollie Herget, Claire Wilkin, Larry Munn, and Michael Urynowicz.

I am indebted to those who personally knew Colonel William C. Rogers and kindly agreed to be interviewed for this bulletin series. They include Colleen Hogan, now of Wheatland, Wyoming; Levida and Brock Hileman, who retired in Truth or Consequences, New Mexico, but who recently moved back to Wyoming; UW Professor Emerita Rebecca Hilliker, who retired on the High Plains between Cheyenne and Laramie; Sarah Stark Serra, of Williamsburg, Virginia; Duane Walker, who lives in the Laramie Mountains; and Bryan Anderson, of Casper. A "click of the shutter" is extended to Colleen Hogan, who provided photos that she and her mother, Levida, took during their trips to The Colonel's Triple R Ranch from 1977 through about 2000. Some of those photos (including Fig. 11, next page) appear in this bulletin, and others will be proudly showcased in the introductions of upcoming RRS bulletins.

Mary Laura Kludy, archives and records management specialist at the Preston Library, Virginia Military Institute, Lexington, Virginia, provided a great deal of material about The Colonel's military career in addition to the two military photos appearing in this

Figure 11. This very rustic, one-room cabin in Wyoming's Laramie Mountains served as a summer retirement home for Colonel William C. Rogers. In the cabin was a large desk covered with volumes of correspondence and an old typewriter, a small pot belly stove, an old double bed, extra clothes rolled up and stuffed into the rafters, and "very little walking room," says long-time friend Levida Hileman. "This had to be a fairly early photo, for in later years he didn't have so much wood stacked around." (Photo courtesy Colleen Hogan)

chapter. The campfire photo (Fig. 2), the hand-drawn map of the Rogers' property and surrounding lands in the Laramie Mountains (Fig. 3), as well as additional information about The Colonel himself, came from the William C. Rogers Papers at the UW American Heritage Center. Another collection at the AHC, the Virginia Scully Papers, added additional insight into this man's life. (If you're not familiar with the AHC, it's that big cone-shaped building across the street from the UW athletic facilities. Known as the "Cone on the Range," the AHC is UW's repository of manuscripts, rare books, and university archives.)

Though Jim Clyde, of Wheatland, Wyoming, didn't meet Colonel Rogers personally, he was hired by The Colonel to perform prescribed thinning on his property. During this time, Jim became familiar with both The Colonel and his land while working with others at the site. After UW received the property following the death of Colonel Rogers, Jim was hired to perform additional prescribed thinning as part of both forest management and research projects at RRS. Those involved in these studies, including lead author Steve Williams, speak highly of Jim and the work he performed.

I thank Greg Dyekman for sharing information relating to Colonel Rogers. Greg, a Cheyenne attorney and UW Foundation emeritus board member, became involved on behalf of the UW Foundation in matters relating to the settling of The Colonel's estate. Toby Marlatt, UW Foundation vice president for marketing and communications, and Tamara Linse, UW Foundation editor, provided additional information about Colonel Rogers.

I offer much thanks and gratitude to my wife, Leslie, who has offered guidance as this and upcoming RRS bulletins have progressed. Leslie has voluntarily proofread copy, shared ideas, and listened to countless stories about a man whom I've never met, but whom I have grown to respect and know so well. I am confident that Leslie feels the same way about Colonel William C. Rogers, as does lead author Steve Williams, and, I would imagine, many others who read this and upcoming bulletins. If you missed the "Standing on the Colonel's Shoulders" column near the beginning of this bulletin that Steve and I co-authored, we encourage you to flip a few pages south to learn why William Rogers, Albert Einstein, and Winston Churchill share something in common. Many others contributed to the development of this and upcoming bulletins in the RRS series, and additional acknowledgments are presented in the upcoming chapter, an acknowledgments section at the back of this bulletin, and the upcoming publications.

Like the people who were fortunate enough to personally meet Colonel William Catesby Rogers, I have gained a deep admiration for the man they called "The Colonel" or, simply, "Bill." For it was this strong, eccentric, unique, remarkably complex man who lived such a simple life so that in the end he could help so many.

CHAPTER 2

AN INTRODUCTION TO THE UNIVERSITY OF WYOMING'S ROGERS RESEARCH SITE, INCLUDING SITE CHARACTERISTICS AND INITIAL PLANNING

By Stephen E. Williams[1–2] and Robert W. Waggener[3]

INTRODUCTION

The Triple R Ranch in southeast Wyoming was bequeathed to the University of Wyoming in the amended will of Colonel William C. Rogers in 2002. The property passed to the UW College of Agriculture and Natural Resources by 2005, and at the time it was covered with dense and sparse stands of ponderosa pine (*Pinus ponderosa)* in various age classes (Fig. 1; Appendix C). The property—which officially became known as the Rogers Research Site (RRS)—is now a component of the research and extension

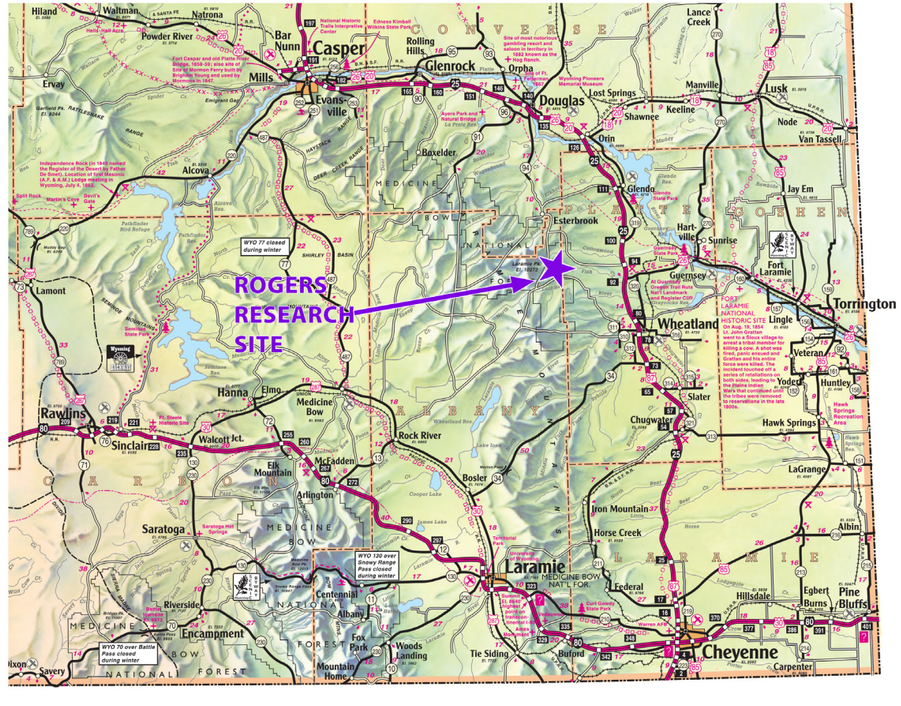
Figure 1. Ponderosa pine (*Pinus ponderosa*) dominated RRS lands and surrounding areas in the Laramie Mountains prior to the 2012 Arapaho Fire. This photo was taken in June 2007. (Photo by Steve Williams)

KEY WORDS
Colonel William C. Rogers, forestry research, Laramie Mountains, planning, ponderosa pine (*Pinus ponderosa*), post-fire restoration, Rogers Research Site, University of Wyoming, wildfire, wildlife research, Wyoming Agricultural Experiment Station

1 For specific questions about this report (along with general questions about RRS research, information about access, driving directions to RRS, etc.) please contact the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) at sarec@uwyo.edu; 307-837-2000; or 2753 State Highway 157, Lingle, WY 82223-8543.

2 Professor emeritus, University of Wyoming Department of Ecosystem Science and Management, Laramie, Wyoming. Specialties include soil biology and biochemistry, disturbed land reclamation, and restoration.

3 Laramie, Wyoming-based freelance editor, writer, and photographer covering agriculture and natural resources in Wyoming and the West. He is a part-time editor for the Wyoming Agricultural Experiment Station.



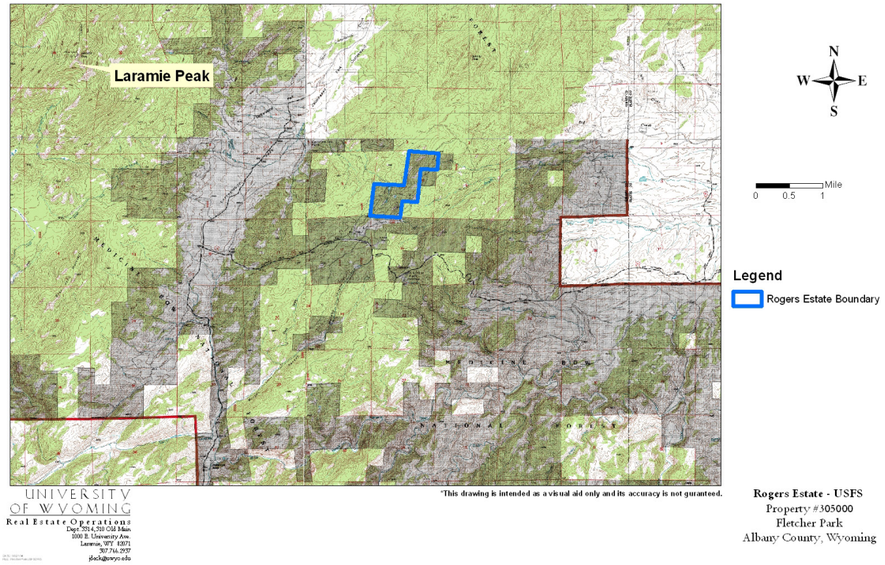


Figure 2. General map of southeast Wyoming showing the location of RRS, northeast Albany County. RRS is located about 25 mi (40 km) northwest of Wheatland, Wyoming. (Official State Highway Map of Wyoming; RRS overlay by Tanya Engel, UW College of Agriculture and Natural Resources/UW Extension)

Figure 3. Rogers Research Site (outlined in blue) is located approximately 5 mi (8 km) southeast of the prominent Laramie Peak (10,272 ft (3,131 m) in the northern reaches of the Laramie Mountains. Elevations at RRS range from about 6,700 to 7,300 ft (2,000–2,200 m). The site is immediately surrounded by U.S. Forest Service lands to the east, north, and west (light green) and state trust and private lands to the south (dark green). (Base map by USFS; RRS mapping by Josh Decker/ UW Real Estate Operations)

centers operated through the college and the Wyoming Agricultural Experiment Station (WAES). Management of RRS is through administrators at the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) located near Lingle, Wyoming (SAREC is one of four R&E centers in the state under WAES). The approximate 320-acre (~129.5-hectare) RRS is on the eastern flank of the Laramie Mountains ~25 miles (40 kilometers) northwest of Wheatland, Wyoming, and ~five mi (eight km) southeast of the prominent Laramie Peak, the highest point in the range at 10,272 feet (3,131 meters) (Figs. 2–5).

Elevations of the Laramie Mountains are highly variable, ranging from ~4,200 to more than 10,000 ft (1,280–3,000 m). The RRS has an average elevation of 7,000 ft (2,100 m), although elevations range from about 6,700 to 7,300 ft (2,000–2,200 m). At the time the land was given to UW, it was mostly forested with ponderosa pine (*Pinus ponderosa* [Figs. 1 and 4; Appendix C]) with a few groves of quaking aspen (*Populus tremuloides* [Fig. 6; Appendix D]). In 2012, a lightning-caused wildfire swept through nearly 100,000 acres of the Laramie Mountains, including RRS and surrounding lands, killing most of the ponderosa pine (Cover; Figs. 4 and 7–8).

The Laramie Mountains provide habitat for hundreds of plant and wildlife species, which helped draw Colonel Rogers to the area. Rogers, in turn, directed UW to use his land, in part, for research relating to wildlife and forestry. Since the 2012 Arapaho Fire, the major focus of efforts by UW, WAES, and the College of Agriculture and Natural Resources has been to develop RRS as a post-fire forestry- and wildlife-focused research site.

The parcel that constitutes the site was renamed by UW from the Triple R Ranch to the Rogers Research Site (RRS) in honor of Colonel William Catesby Rogers. It administratively has been assigned to SAREC and thus falls under the duties of the SAREC director, a position at this writing held by John Tanaka, WAES associate director. The SAREC director reports to the WAES director, who doubles as an associate dean for the College of Agriculture and Natural Resources, a position held by Bret Hess. The WAES director, in turn, answers to the College of Agriculture and Natural Resources dean, a post held by Frank Galey, one of seven academic deans in UW colleges who answer to the UW Office of Academic Affairs and UW Office of the President.

Prior to July 2012—when the Arapaho Fire burned across RRS lands—most of the efforts at the site were centered on describing the land, and making its features and opportunities known to the UW academic community, to the State of Wyoming, to federal agencies, and to the general public. During this time a planning effort was initiated (this is covered below and in upcoming RRS bulletins).

In August 2011, a forestry audit team visited RRS (Figs. 9–10). The audit was requested by this bulletin's lead author and was directed by the Wyoming State Forestry Division. Other members of the team included representatives from the University of Wyoming, Wyoming Game and Fish Department (WGFD), Wyoming Department of Environmental Quality (WDEQ), Colorado State Forest Service, U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), Black Hills Forest Resource Association, and Devils Tower Forest Products. The audit addressed mostly best management practices (BMPs), which were evaluated within the context of: (1) overall planning including soil- and water-resource monitoring and evaluation, sanitary guidelines for construction of temporary camps used by researchers, students, etc., oil and hazardous substance spill contingency, and riparian area protection); (2) permanent and temporary roads, including planning, design, construction, drainage, maintenance, stream crossings and bank protection, tree harvesting/slash treatments, and revegetation; (3) the use of pesticides, herbicides, fertilizers, and other chemicals; and (4) fire management including protection of soil and water from prescribed fires as well as emergency rehabilitation of watersheds impacted by wildfires (Wyoming Forestry Best Management Practices Audit Team, 2012).

Figure 4. The rugged topography of RRS and surrounding lands was covered with sparse and dense stands of ponderosa pine in various age classes when this photo was taken in 2007. Five years later, the Arapaho Fire burned most of the vegetation in the area, including pine. (Photo by S. Williams)

Figure 5. This photo was taken three years after the 2012 Arapaho Fire. It helps to reveal the high tree mortality, but it also shows the many grasses and forbs returning to the area. Also prevalent post-fire were invasive species. The prominent peak in the background is Laramie Peak. (Photo by M. Curran)

Figure 6. University of Wyoming student Michael Curran excavates a soil pit at one of the research plots at RRS. This photo was taken June 22, 2012, during a project to map soils at various locations at RRS. Less than two weeks later, the Arapaho Fire swept across RRS property, burning much of the vegetation. This changed much of the research to post-fire, but some of the earlier studies involving vegetation and soil mapping are providing UW faculty, staff, students, and others with important baseline data. (Photo by Claire Wilkin)

Since the audit was conducted, the major focus of RRS has shifted to post-fire research, including ponderosa pine restoration, largely because of the wildfire (Figs. 11*A–B*). This and upcoming bulletins will provide background information for RRS including natural history, recent human history, an overview of research projects that have either been completed or are in progress, and the status of surrounding lands. Upcoming bulletins will also address current needs at RRS and the potential for further research, extension (outreach), and teaching activities.

CHARACTERISTICS OF THE ROGERS RESEARCH SITE AND SURROUNDING AREA

GEOGRAPHY

RRS and surrounding lands are in the northern reaches of the Laramie Mountains, which extend southerly for ~140 mi (225 km) from Casper Mountain in central Wyoming to northeastern Colorado (Blackstone, 1996). The majority of the range is in Wyoming, where it covers about 3,900 square mi (10,100 square km) (Packer, 2000). This is the famous—and perhaps equally infamous—range between Cheyenne and Laramie, Wyoming, that some four to five million travelers drive over annually as they head either west or east on Interstate 80. At an elevation of 8,640 ft (2,633 m), the "Summit," as it is known locally, is the highest point on the transcontinental interstate (Wyoming Department of Transportation, 2016) as well as the Transcontinental Railroad. Here at the summit is the Lincoln monument, which memorializes the president and his administration that instituted the construction of the railroad in the 1870s.

The Laramie Mountains have served as not only a singular landmark, but also an impediment for 150 or more years to travelers mostly headed west. People on the Oregon Trail in the mid-1800s had their first view of the Rocky Mountains, including the Laramie Mountains and particularly Laramie Peak; however, the Oregon Trail skirted north around the rugged mountains to avoid the terrain in those days impassible and today sometimes nearly so. Scouts searching for a route across the southern Wyoming range

Figure 7. Ponderosa pine trees actively burn during the 2012 Arapaho Fire. (Photo by Shawn Ferron/InciWeb)

Figure 8. The Arapaho Fire killed most of the ponderosa pine and other vegetation at RRS and surrounding lands in the Laramie Mountains. This photo was taken July 18, 2012, just over two weeks after the wildfire swept through RRS. (Photo by S. Williams)

Figure 9. Members of the interdisciplinary team that performed a forest audit at RRS assembled August 8, 2011. Participants discussed a variety of best management practices (BMPs) to be implemented at RRS, ranging from soil- and water-resource monitoring to road management. Among the team members were, from left, Steve Williams, lead author of this paper, blue shirt; Carol Purchase, USFS, green shirt; Bret Hess, WAES director and associate dean in the UW College of Agriculture and Natural Resources, red/white shirt; Bob Means, BLM, gray vest (a tribute to Bob, who passed away suddenly at his Cheyenne, Wyoming, home on May 26, 2015, appears near the front of this bulletin); George Portwood, Laramie Mountains resident, red/blue shirt; Bonnie Parker, Laramie Mountains resident, blue shirt; Mark Stiller, Neiman Enterprises Inc./Devils Tower Forest Products, gray sweatshirt; Mark Conrad, WDEQ, brown shirt; and Colin Tierney, WGFD, red shirt. (Photo by Jim Freeburn)

just after the Civil War discovered the "Gangplank" between Laramie and Cheyenne. This geologic feature, in essence a "ramp," was crucial in establishing a route across the Laramie Mountains. This route would become the Lincoln Highway and eventually Interstate 80, the only paved highway that passes *over* the Laramie Mountains. Another paved road, State Highway 34, passes *through* the range (Sybille Canyon) between Laramie and Wheatland, Wyoming.

Though the I-80 Summit, which is ~70 mi (113 km) due south of RRS, boasts an impressive elevation, a number of peaks in the range are higher, including the aforementioned Laramie Peak located near RRS. Among other named peaks in the range are Warbonnet Peak (9,414 ft/2,869 m); North (8,306 ft/2,532 m), Middle (8,502 ft/2,591 m), and South (8,723 ft/2,659 m) Sawtooth mountains; Eagle Peak (9,167 ft/2,794 m); Bear Head Mountain (8,380 ft/2,554 m); Collins Peak (7,915 ft/2,412 m); Red Mountain (6,589 ft/2,008 m); Baldy Mountain (8,607 ft/2,623 m); Sherman Hill (8,492 ft/2,588 m); Pilot Hill (8,859 ft/2,700 m); and Mound Mountain (7,891 ft/2,405 m), the latter of which is just north of the Wyoming-Colorado border in extreme southeast Albany County (U.S. Forest Service, 1994; U.S. Forest Service, 1998; Google Chrome, 2014). The northernmost peak in the range, Casper Mountain, which overlooks the city of Casper, Wyoming, has an elevation of 8,130 ft (2,478 m).

The Laramie Mountains northwest of Laramie Peak are interspersed with deep canyons, such as Deer Creek, Box Elder, La Prele, LaBonte, and Horseshoe canyons. Deep canyons are also present south of Laramie Peak. The deepest in the area is the one cut by the North Laramie River (Fig. 2), and in places this canyon is up to 1,000 ft (300 m) deep. To the south is another deep canyon cut by the Laramie River, and further south are the Sybille Creek and Crow Creek canyons. The majority of the water courses run southwest to northeast in the northern sector of the Laramie Mountains and west to east in the southern sector (U.S. Forest Service, 1994; U.S. Forest Service, 1998).

Some of the water courses (Sybille and Crow creeks) originate in the Laramie Mountains themselves. The Laramie River, however, rises in northern Colorado, flows into Wyoming along the east side of the Medicine Bow Mountains, and then through the city of Laramie (Fig. 2). The Little Laramie River, which originates in Wyoming's Medicine Bow Mountains west of Laramie, meets the Laramie River in the Laramie Plains north of the city. The combined river then continues north through the plains and through the Laramie Mountains, eventually meeting the North Laramie River near Wheatland, Wyoming (Fig. 2). The main rivers and streams passing through the Laramie Mountains are tributaries to the North Platte River, which skirts the northern end of the range near Casper before heading in a southeasterly direction toward the Wyoming-Nebraska state line. The extreme southern reach of the Laramie Mountains drains into the South Platte River drainage in Colorado (Marston and Brosz, 1990).

RRS and surrounding lands, including Laramie Peak, are in a remote section of the Laramie Mountains. In good weather, it is an approximate 4½-hour roundtrip drive from the main UW campus in Laramie, Wyoming, a 3-hour roundtrip drive from SAREC, and a 1½-hour roundtrip drive from Wheatland, Wyoming. During bad weather, unnecessary travel to this remote section of the Laramie Mountains is ill-advised.

Figure 10. Following the introductory meeting during the 2011 forest audit at RRS, participants broke up into small groups to discuss specific BMPs and how to implement them. Among the participants were, from left, Carol Purchase, USFS; Steve Williams, lead author of this paper; Dennis Oberlie, WGFD, now retired, Lander; Mark Conrad, WDEQ; and Jay Hein, Wyoming State Forestry Division. (Photo by Jim Freeburn)

GEOLOGY

The RRS is chiefly underlain by intrusive igneous rocks, including the widespread Laramie Peak granite of Archean age (approximately 2.6 billion years ago [~2.6 Ga]). Other igneous rocks in the area are intrusive mafic dikes, which are part of a Paleoproterozoic (~2.01 Ga) mafic dike swarm (Cox et al., 2000). South and east of RRS is an exposed segment of the Laramie Peak shear zone, a belt of highly strained rocks consisting of mylonitic gneiss and intercalated highly deformed mafic dikes (Chamberlain et al., 1993; Resor and Snoke, 2005). The Laramie Peak shear zone is dated at ~1.76 Ga and is within the age range of the Cheyenne belt exposed in the Medicine Bow Mountains to the southwest and west of the Laramie Mountains (Resor et al., 1996). The geology of this area is documented in detail by Snyder et al. (1995) and other authors. The Laramie Mountains contain many spectacular exposures of granitic rocks, which form the

core of the mountains. The range was uplifted along Laramide-age reverse faults, which occur along its eastern flank (Blackstone, 1996).

SOILS

Soils of the range are mostly embryonic (recently formed soils exhibiting only early states of formation), low-nutrient status, shallow, and erodible. They are generally low in pH and salt content. Along water courses, soils are generally much deeper with higher organic matter, and they often have buried horizons. Erosion events can alter these soils periodically during periods of high rainfall—especially post-fire (Reckner, 1998; this study). In flat regions, soils are more developed and have an organic matter content in surface horizons that is characteristic of grasslands. Where precipitation is low, soils exhibiting usually only the early stages of weathering persist. Often the vegetation cover here is sagebrush (*Artemisia tridentata*), and the soils are generally alkaline (high pH). Calcium salts dominate, while sodium salts are also present (Reckner, 1998; this study).

Soil Orders of the Laramie Mountains and RRS

Of the 12 orders of soil taxonomy, five orders are found in the Laramie Mountains: Alfisols, Aridisols, Entisols, Inceptisols, and Mollisols (Young and Singleton, 1977; Packer, 2000). Descriptions of these five orders follow: (1) Alfisols are in semiarid to moist areas; they formed primarily under forest or mixed vegetative cover and are productive for most vegetation; (2) Aridisols are soils located in arid climates; they are too dry for the growth of mesophytic plants; (3) Entisols have little, if any, horizon development, and form in such locations as dunes, steep slopes, and flood plains; (4) Inceptisols are the beginning of horizon development; they occur in a wide variety of climates, from semiarid to humid; and (5) Mollisols have a dark-colored surface horizon relatively high in organic matter; they characteristically formed under grasslands (U.S. Department of Agriculture, Natural Resources Conservation Service, 2017).

Soils at RRS are Entisols, Inceptisols, and Mollisols (L. Munn,[4] personal communication, 2017). On forested slopes, the soils are moderately developed Inceptisols and shallow Entisols because of the low inherent fertility, low water-holding capacity due to coarse texture, and erosive nature of the soils. They developed from granitic substrates. Soils found under quaking aspen and herbaceous vegetation along springs and other wet areas are Mollisols and Inceptisols. These soils are deeper, are finer textured, and contain more organic matter than the soils on the forested slopes (L. Munn, personal communication, 2017). (Detailed information about soils at RRS, including pre- and post-fire soil comparisons, will be presented in an upcoming RRS bulletin.)

Figure 11. In 2015, three years after the Arapaho Fire, ponderosa pine seedlings were planted at RRS as part of a long-term restoration study. *A*, Summer intern James Harkin prepares to plant a pine seedling on July 21 at one of the study plots. *B*, Prior to planting, seedlings were fitted with slip-on tags to distinguish them from any naturally regenerated *P. ponderosa*. Brightly colored flags were placed next to each tree to help future researchers easily find each planting site. (Photos by Mollie Herget [*A*] and S. Williams [*B*])

4 Larry Munn is a professor emeritus of soil science in the UW Department of Ecosystem Science and Management.

CLIMATE

The climate in the Laramie Mountains is semiarid with snowfall during at least half of the year. The growing season (temperatures above 32°F [0°C]) is 100 days or less. Annual precipitation varies from around 12 inches (30 centimeters) in the foothills to as much as 40 in (100 cm) in the mountainous band that stretches from Laramie Peak to Casper Mountain. The balance of the Laramie Mountains lies between these extremes, with probably 16–20 in (41–51 cm) being the most common (Reider et al., 1990).

The number of weather stations in the Laramie Mountains has always been few, and most are now discontinued. One station near Esterbrook (elevation 6,251 ft/1,905 m) operated from 1954 to 1957 and recorded only precipitation. Despite the short time of operation, the station demonstrated the variability of precipitation from year to year (as well as across the same months, although that data are not shown here). From the four-year period, Esterbrook averaged 21.5 in (55 cm) of melted precipitation and 159 in (403 cm) of snow, although variations from these means were as high as 25% (National Oceanic and Atmospheric Administration, 2014a).

The most complete weather records in the vicinity were kept by the Double Four Ranch (elevation 6,119 ft/1,865 m), about four miles (6.5 km) southwest of RRS. Weather data were recorded at the ranch for 50 years, from 1955 to 2005, after which the station was discontinued. Those records show an annual average precipitation of 15.4 in (39.2 cm) and a mean annual temperature of 47.5°F (8.4°C) (National Oceanic and Atmospheric Administration, 2014b; Tables 1 and 2).

The weather at RRS is probably somewhat colder and wetter than at the lower-elevation Double Four Ranch. To establish better weather records for RRS, a weather station with remote access was installed in 2013 (discussed below and in upcoming RRS bulletins).

BIOTA—VEGETATION

A variety of habitat types are found in the Laramie Mountains. They include (1) cottonwood floodplains; (2) foothill grasslands (cool- and warm-season species); (3) foothill shrub lands, e.g., antelope bitterbrush (*Purshia tridentata*) (Fig. 12; Appendix E), juniper stands (*Juniperus* species), mountain mahogany (*Cercocarpus montanus*), and sagebrush-steppe (*Artemisia tridentata* and other species); (4) mountain meadows, which include a variety of grass and shrub species, among them sagebrush; (5) stands of quaking aspen (Fig. 6; Appendix D) and willow (*Salix* spp.); (6) ponderosa pine forests; (7) mixed pine, spruce, and fir woodlands; and (8) boulder outcrops and rocky peaks (Packer, 2000; T. Byer,[5] personal communication, 2017; M. Hicks,[6] personal communication, 2017). Found throughout the range, from the lowest to highest elevations, are numerous species of forbs (see below). Water system habitats include a wide variety of riparian areas, wetlands, springs, creeks, rivers, ponds, lakes, and reservoirs.

When Colonel Rogers donated his land to UW, the major habitat type in the site was ponderosa pine forest (Figs. 1 and 4; Appendix C). But there were other macro-vegetative components including quaking aspen (Fig. 6), willow, and a small number of alder (*Alnus* spp.). The understory was occupied by various rosaceous and rhamnaceous shrubs,

5 Tim Byer is district wildlife biologist for the U.S. Forest Service's Douglas Ranger District.

6 Martin Hicks is a wildlife biologist for the Wyoming Game and Fish Department.

Table 1. Precipitation records from the Double Four Ranch (lat 41.179° N, long 105.402° W) from 2005.

Month	Melted Precipitation (in/cm)	
	Total	Departure from Average
1	0.41/1.04	0.00/0.00
2	0.11/0.28	-0.43/-1.09
3	0.68/1.73	-0.26/-0.66
4	1.49/3.78	-0.51/-1.29
5	3.67/9.32	+0.81/+2.06
6	1.91/4.85	-0.16/-0.41
7	1.50/3.81	-0.22/-0.56
8	1.27/3.23	-0.14/-0.36
9	0.22/0.56	-0.97/-2.46
10	0.76/1.93	-0.20/-0.51
11	0.59/1.50	-0.16/-0.41
12	0.23/0.58	-0.35/-0.89
2005 Total and Departure	12.84/32.61	-2.59/-6.58
Average Total from 1955 to 2005	15.43/39.19	

Table 2. Temperature records from the Double Four Ranch (lat 41.179° N, long 105.402° W) from 2005.

Month	Temperature (°F/°C)			
	Mean max.	Mean min.	Monthly Mean	Departure from Average
1	39.5/4.2	18.8/-7.3	29.2/-1.6	5.6/3.1
2	42.8/6.0	19.0/-7.2	30.9/-0.6	3.9/2.2
3	46.7/8.2	23.2/-4.9	35.0/1.7	1.3/0.7
4	55.5/13.1	26.2/-3.2	40.9/4.9	0.4/0.2
5	62.8/17.1	33.7/0.9	48.3/9.1	-0.9/-0.5
6	73.9/23.3	41.6/5.3	57.8/14.3	-0.4/-0.2
7	88.2/31.2	47.7/8.7	68.0/20.0	3.7/2.1
8	79.9/26.6	43.8/6.6	61.9/16.6	-1.1/-0.6
9	77.2/25.1	36.9/2.7	57.1/13.9	3.2/1.8
10	63.7/17.6	30.7/-0.7	47.2/8.4	3.5/1.9
11	48.9/9.4	29.0/-1.7	39.0/3.9	6.9/3.8
12	34.0/1.1	13.9/-10.1	24.0/-4.4	-0.8/-0.4
2005 Average and Departure			44.9/7.2	2.1/1.2
Average from 1955 to 2005			47.1/8.4	

including sagebrush, antelope bitterbrush (Fig. 12), two buckbrush species (*Ceanothus velutinus* and *C. fendleri*), mountain mahogany (*Cercocarpus montanus*), and buffaloberry (*Shepherdia canadensis*). There were numerous legumes in the understory including lupine (*Lupinus argenteus*), milkvetch (*Astragalus* spp.), locoweed (*Oxytropis* spp.), and clovers (*Trifolium* spp.). Other forbs in the understory included thistles (*Cirsium* spp.) and bighead pygmycudweed, aka rabbit tobacco (*Evax prolifera* [syn. *Filago prolifera*]). Riparian areas often have coniferous and deciduous species intermixed and are largely dominated by aspen. Among the other plants that have been observed on the property include Rocky Mountain iris (*Iris missouriensis*), chokecherry (*Prunus virginiana*), gooseberry (*Ribes* spp.), and raspberry (*Rubus* spp.) (L. Hileman,[7] personal communication, 2017).

The Arapaho Fire burned through several of the aspen groves at RRS, but aspen began

Figure 12. Antelope bitterbrush (*Purshia tridentata*) is an important shrub species for many wildlife species in the Laramie Mountains. It is an essential dietary component of mule deer and bighorn sheep, particularly in fall, winter, and spring. It also provides browse for elk, pronghorn antelope, and domestic livestock, and it's an important shrub—food and/or cover—for a host of small animals and birds (R. Amundson, personal communication, 2016). This photo, taken in July 2015, shows antelope bitterbrush re-sprouting following a low-intensity prescribed fire in the Laramie Mountains. Following the 2012 Arapaho Fire, however, there was very little regrowth of bitterbrush from original plants at RRS and surrounding lands because of the intensity of the fire. Instead, regeneration is from the native seedbank. (Photo by Ryan Amundson, WGFD)

Figure 13. Quaking aspen quickly regenerated after the 2012 Arapaho Fire. This photo was taken in 2013. (Photo by S. Williams)

7 Levida Hileman spent many weeks during the summers from 1977 to about 2000 visiting Colonel William C. Rogers with her daughter, Colleen Hogan, and later her husband, Brock Hileman (their trips to the land continued until approximately 2005, when they removed their belongings from the property). During this time, she was a school teacher in Casper, Wyoming. She and Brock are now retired, and in spring 2017 moved back to Wyoming after spending their early retirement years in Truth or Consequences, New Mexico.

Figure 14. Following the 2012 wildfire, grasses and forbs quickly regenerated at RRS. This photo was taken in 2014. (Photo by S. Williams)

actively regenerating within a couple of years (Fig. 13). In the immediate years following the fire and through 2016, dominant vegetation included grasses, among them bluebunch wheatgrass (*Elymus spicatus*), forbs, and shrubs (Figs. 14–15), which is typical of post-fire vegetation in this region. Among the many forbs that reestablished include blanketflower (*Gaillardia aristata* [Fig. 16]), cutleaf daisy (*Erigeron compositus*), dwarf mountain ragwort (*Senecio fremontii*), beardtongue (*Penstemon* spp.), spreading dogbane (*Apocynum androsaemifolium*), New Jersey tea (*Ceanothus velutinus*), common yarrow (*Achillea millefolium*), harebells (*Campanula rotundifolia*), and sagewort (*Artemisia ludoviciana*).

Graminoids on RRS include rough bentgrass (aka winter bent) (*Agrostis scabra*;

Figure 15. This photo, taken in 2015 (three years after the Arapaho Fire), shows fire response of lupine (*Lupinus* spp., plant with blue blossoms in foreground) and other forbs and grasses. A member of the Wyoming Conservation Corps strings a plot boundary as part of a post-fire ponderosa pine regeneration study. (Photo by S. Williams)

identified by J. Daniel Rodgers[8] and John Derek Scasta[9] [personal communication, 2015]). This species is common in mountains and has proliferated at RRS since the 2012 fire. Another grass that has spread rapidly since the 2012 fire is the highly invasive downy brome (Fig. 17, reddish-purplish plants in middle), commonly referred to as cheatgrass (*Bromus tectorum*). Canada thistle (*Cirsium arvense*) is another invasive plant that was present at RRS prior to the 2012 fire, but in low numbers. There are areas within RRS, however, where this plant has established in dense patches since the fire (Fig. 17, green plants in foreground/some of which have purple heads, and Fig. 18). Future research projects and management efforts at RRS should include weeds (discussed below).

Detailed pre-fire vegetation categories at RRS are presented in an upcoming RRS bulletin titled *Vegetation mapping of Rogers Research Site, north Laramie Mountains, Wyoming, using high spatial resolution photography and heads-up digitizing.*

BIOTA—NON-PATHOGENIC (BENEFICIAL) FUNGI

A category of non-pathogenic fungi has been recorded at RRS—macro-fungi. These were observed abundantly prior to the 2012 fire and included a number of organisms that likely formed mycorrhizal associations with trees, especially ponderosa pine. These mycorrhizal fungi enhance tree growth and reproduction; in fact, many trees cannot survive to maturity without these fungal associations (Bellgard and Williams, 2011). The mycorrhizal associations aid the host trees in nutrient uptake, provide growth hormones, provide antibiotics that protect the trees

8 J. Daniel Rodgers was an associate professor of rangeland ecology and watershed management in the UW Department of Ecosystem Science and Management and a rangeland management specialist with UW Extension. He retired in 2017 and was awarded 'emeritus' status.

9 John Derek Scasta is an assistant professor of rangeland management in the UW Department of Ecosystem Science and Management and a rangeland management specialist with UW Extension.

Figure 16. Blanketflower (*Gaillardia aristata* Pursh) was among the many forbs that reestablished after the 2012 Arapaho Fire. This photo was taken July 23, 2015, just over three years after the wildfire swept through RRS. (Photo by M. Curran)

Figure 17. Highly invasive weeds—including cheatgrass (the reddish-purple plants in the center) and Canada thistle (the green plants in the foreground and background)—quickly spread in some areas after the 2012 Arapaho Fire. This photo was taken in 2014. (Photo by S. Williams)

Figure 18. Canada thistle was present in low numbers at RRS before the 2012 wildfire, but several large patches began establishing following the fire. This photo was taken in 2014. (Photos by S. Williams)

against pathogens, and protect sensitive root tips from adverse soil characteristics.

Among the macro-fungi observed are the king bolete (*Boletus edulis*) (Fig. 19), slippery jack (*Suillus luteus*), stubby-stalk (*Suillus brevipes*), and aspen scaber stalk (*Leccinum aurantiacum*), as well as several hedgehog mushrooms (*Hydnum* spp.). Other genera observed include the brittlegills (*Russula* spp.), shaggy mane (*Coprinus* spp. including *C. commatus*), field mushrooms (*Agaricus* spp.), occasionally fly agaric, also known as fly amanita (*Amanita muscaria*), among others (personal observations by S. Williams, 2005–2015).

BIOTA—ANIMALS

Wyoming is well-known for its wildlife, with more than 600 species of birds, mammals, amphibians, and reptiles (Orabona et al., 2016). Though we are not aware of a specific species list for the Laramie Mountains, the range is home to a rich array of resident and migratory wildlife—along with an equally rich array of resident and migratory insects and a variety of fish species. Collectively, they depend on a great diversity of plants and habitats. Packer (2000) conducted an extensive floristic study of the Laramie Mountains between 1997 and 1998 and identified 929 taxa (1,061 when including historical collections) inhabiting floodplains, grasslands, shrub lands, riparian areas, forests, boulder outcrops, and rocky summits.

The diversity of both animal and plant species across the Laramie Mountains is largely due to (1) wide ranging climatic variation, including mean annual precipitation from rain and snowmelt (~5–40 in [13–100

Figure 19. Among the macro-fungi observed at RRS are the king bolete (*Boletus edulis*). The out-of-focus plant in the background is arnica (*Arnica* spp.) This photo was taken in July 2009. (Photo by S. Williams)

Figure 20. Rocky Mountain elk are among the common big game inhabitants of public and private lands in the Laramie Mountains near Laramie Peak. This bull elk, pictured on April 9, 2016, is moving through an area that was burned by the 2012 Arapaho Fire. (Photo by Martin Hicks, WGFD)

Figure 21. The charismatic bighorn sheep is common in portions of the Laramie Mountains, including the area around Laramie Peak. WGFD estimates a population of 250 to 300 sheep, and that it is a healthy herd producing mature rams (R. Hicks, personal communication, 2016). A portion of occupied sheep habitat on private and public lands was within the 2012 Arapaho Fire. The fire will have long-term benefits for bighorn sheep and other wildlife, but initially there was a flush of noxious weeds (notably cheatgrass and Canada thistle) that land managers need to continue addressing. (Photo by Ryan Amundson, WGFD).

cm] annually); (2) soil (five different orders); (3) elevations (~4,200–10,200 ft. [~1,280–3,110 m]); (4) vegetation; (5) habitats; and (6) water systems (Packer, 2000; L. Munn, personal communication, 2017; this report).

Variety of Wildlife Inhabit RRS and Surrounding Lands

WGFD, USFS, and others recognize RRS and neighboring lands in the Laramie Mountains as important habitat for many economically important wildlife species (Kearns, 2005) including Rocky Mountain elk (*Cervus canadensis nelsoni* [syn. *C. elaphus nelsoni*]) (Fig. 20), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*) (Fig. 21), and wild turkey (*Meleagris gallopavo*).

Additionally, RRS and surrounding areas provide important habitat for other resident and migratory wildlife, including bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), American black bear (*Ursus americanus*), blue grouse (aka dusky grouse, *Dendragapus obscurus*), ruffed grouse (*Bonasa umbellus*), cottontail rabbits (probably mountain cottontails, *Sylvilagus nuttallii*), mice, including deer mice (*Peromyscus maniculatus*), and coyotes (*Canis latrans*) (Kearns, 2005; personal observations by S. Williams, 2005–2015; Orabona et al., 2016; R. Amundson,[10] personal communication, 2017; T. Byer, personal communication, 2017; M. Hicks, personal communication, 2017).

A northern saw-whet owl (*Aegolius acadicus*) was photographed in an aspen grove in the northern portion of RRS in 2013 (Fig. 22). This owl, although listed as occurring in Wyoming, is uncommon in the state. The northern saw-whet along with other raptors in Wyoming are listed as "species of concern" by the U.S. Fish and Wildlife Service (Wyoming Ecological Services Office, 2016). Turkey vultures (*Cathartes aura*) have been seen in the air over RRS and seem to have nested on the high point near the southern end of the site. Golden eagles (*Aquila chyrsaetos*), bald eagles (*Haliaeetus leucocephalus*), and other raptors have been seen in the area, as well as a diversity of smaller birds including songbirds, among them the mountain bluebird (*Sialia currucoides*), western tanager (*Piranga ludoviciana*), and common nighthawk (*Chordeiles minor*) (personal observations by L. Hileman and S. Williams).

Among the reptiles and amphibians that have been observed at RRS and nearby lands is the prairie rattlesnake (*Crotalus viridis*) (personal observations by L. Hileman).

Threatened Species Inhabit Area

The Preble's meadow jumping mouse (*Zapus hudsonius preblei*)—listed as "threatened" under the federal Endangered Species Act—is known to inhabit lands around RRS, including the Cottonwood Park and Albany Peak areas (Fig. 23). The most recent detection in this area was in 2014 by the WGFD statewide nongame mammal biologist, Nichole Bjornlie (T. Byer, personal communication, 2017). In 2015, WGFD detected Preble's along Friend Creek, about seven miles west of RRS (N. Bjornlie, personal communication, 2017). Another threatened species, the northern long-eared bat (*Myotis septentrionalis*), may also occur within the Laramie Mountains as a resident, but more information is needed. USFS currently has only one confirmed sighting, and it was on the western side of the USFS Douglas Ranger District (RRS is on the eastern side of the district) (T. Byer, personal communication, 2017).

LAND STATUS

The Laramie Mountains cover approximately 2.5 million ac (1 million ha) in southeast Wyoming, which equates to ~3,900 square mi (10,100 square km). The land status is relatively heterogeneous when compared to most other mountainous areas

Figure 22. Wildlife is abundant at RRS and surrounding areas in the Laramie Mountains. This northern saw-whet owl—though an uncommon visitor to Wyoming—was photographed in an RRS aspen grove a year after the 2012 Arapaho Fire. (Photo by S. Williams)

10 Ryan Amundson is statewide habitat biologist for the Wyoming Game and Fish Department.

Figure 23. The Preble's meadow jumping mouse—listed as "threatened" under the federal Endangered Species Act—is known to inhabit lands in the immediate vicinity of RRS, including the Cottonwood Park and Albany Peak areas. This particular Preble's was captured in 2015 along Friend Creek, about seven miles west of RRS. Once data was recorded, the male mouse was released unharmed back to the wild. (Photo by Nichole Bjornlie, WGFD)

in the state where land status tends to be homogeneous. Unlike some of those ranges, the Laramie Mountains are a patchwork of federal, state, and private lands. The lands in private ownership—mostly working cattle and recreation ranches—comprise approximately 70% of the range, or roughly 1,792,000 ac (725,000 ha). However, the single largest landowner in the range, which mirrors the state of Wyoming as a whole, is the federal government. The U.S. Department of Agriculture's USFS manages approximately 237,000 ac (96,000 ha) in the Laramie Mountains north of the Wyoming-Colorado border. Of this, nearly 180,000 ac (73,000 ha) are in the northern parts (under Douglas Ranger District jurisdiction), while about 57,000 ac (23,000 ha) are in the southern stretches (Pole Mountain Unit of the Laramie Ranger District). All of these USFS lands are in the Medicine Bow-Routt National Forests and are comprehensively administered out of the supervisor's office in Laramie and the Douglas Ranger District office in Douglas, Wyoming.

BLM and the Wyoming Office of State Lands and Investments each oversee approximately 235,000 ac (95,100 ha) of federal and state lands, respectively, in the Laramie Mountains of Wyoming. Each of these totals is nearly the same amount of land managed by USFS.

Characteristically, ownership types are often mixed over fairly small areas within the Laramie Mountains. These mountains accommodate 108 townships, of which not a single one has contiguous land ownership across all of the 36 square miles (93 square km) that constitute a township. Many townships have state, BLM, and USFS lands mixed with privately owned parcels, and those private lands may have four or five separate owners. There are some large private holdings (e.g., the Double Four Ranch and Warren Livestock holdings), while numerous landowners own smaller tracts of private land. Many of these are used as summer and vacation homes largely because of the recreational activities that the forest affords.

RRS is, for all practical purposes, embedded in USFS lands of the Laramie Peak Unit (Douglas Ranger District) of the Medicine Bow-Routt National Forests (Fig. 24/light blue). This contiguous parcel of USFS land, which surrounds RRS on all sides except its southern boundary,

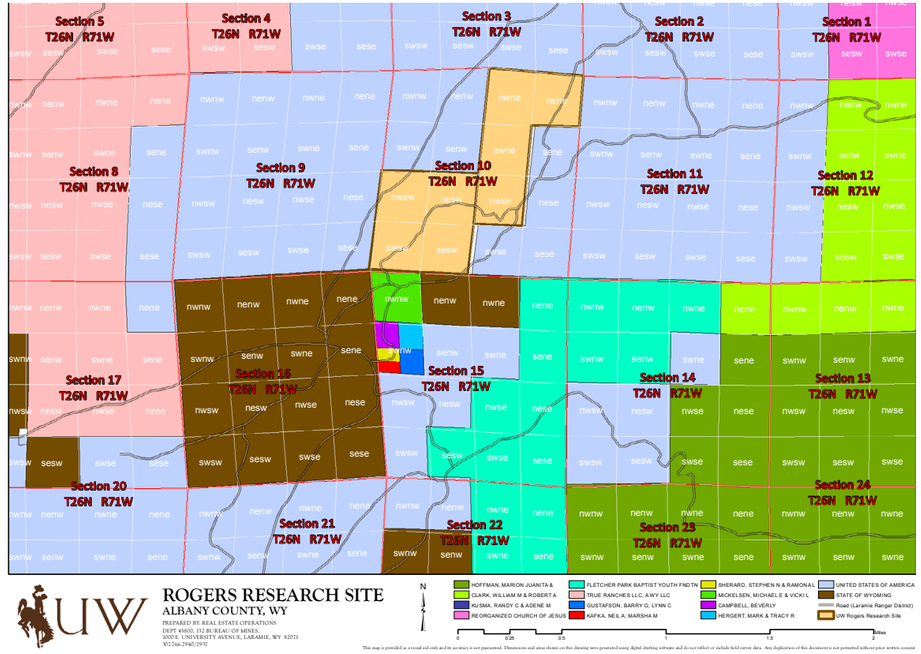


Figure 24. Land status of RRS and lands within the vicinity. The tannish-colored area in the upper center is RRS property. The blue areas surrounding RRS are USFS lands, while the brown areas to the south and southwest are State of Wyoming trust lands. Other colors represent private lands. (Map courtesy J. Decker/UW Real Estate Operations)

encompasses approximately 7,685 ac (3,110 ha). (Immediately contiguous to RRS on the south is one section of private land and one section of Wyoming state trust land [Fig. 24].)

To the south of RRS (but not contiguous) is a separate parcel of USFS land containing 3,843 ac (1,555 ha). Approximately five miles (6.5 km) west-northwest of RRS is one of the largest contiguous parcels of USFS land in the Laramie Peak Unit; it is ~60 sections (38,400 ac/15,550 ha) in size and contains the high point in the unit, Laramie Peak.

The salient point here is that RRS is embedded in lands that are mostly managed by USFS. Within a 5-mi (8-km) radius of RRS, there are roughly 3,842 ac (1,555 ha) of state land and 27,528 ac (11,140 ha) of private land. The remainder, about 19,212 ac (7,775 ha), is USFS land concentrated in the vicinity of RRS (Fig. 24).

HISTORY AND PLANNING AT ROGERS RESEARCH SITE

HISTORY

In September 1984, Colonel William C. Rogers and the University of Wyoming signed an agreement that the Triple R Ranch, owned by The Colonel, as he was known by friends, would transfer to the university. This transfer was made clearer in a trust amendment dated February 16, 2002, in which Rogers indicated that all of his interest in the Triple R Ranch would be transferred to UW at the time of his death, stating…

> *Prior to the termination of the Trust, I direct that my Successor Trustee convey any interest I retain at my death in Triple R Ranch in the amount of 320 acres located in Township 26 North, Range 71 West, of Albany County, Wyoming, to the University of Wyoming with the requirement that said ranch be used for the public benefit as a center for studies, a retreat for conducting meetings, conducting conferences, or conducting research in connection with the improvement of wildlife and forestry, or to hold as a natural wooded area in its original state with specific instructions that no part of it be subdivided or sold for residential or private business purposes but held as an entire tract. Said restriction is to continue in perpetuity. If violated, said property shall revert to*

Figure 25. Participants in the May 2005 open house at RRS walk across the dam that Colonel Rogers had constructed to hold back spring water and natural precipitation. The reservoir was stocked with trout, but many fish and other aquatic life died both during the 2012 Arapaho Fire, and after, when a large precipitation event carried silt downhill and into the spring channels and reservoir. (Photo by Jim Freeburn)

the ownership of the U.S. Forest Service (Rogers, 2002).

Additionally, Colonel Rogers made a large gift to UW to create the Colonel William C. Rogers University of Wyoming Excellence Fund (Rogers, 2002; Appendix B). Funds from this program could tie directly into research, education, outreach, and other activities at and related to RRS. Among the areas that the fund is to support are: (1) forestry programs at UW that help to reforest cleared areas and maintain the health of these forested areas; and (2) wildlife management programs at UW that benefit wildlife in the state.

PLANNING

The Triple R Ranch, now known as the Rogers Research Site (RRS), has been under control of UW for more than a decade. During the last 10 years, WAES and the UW College of Agriculture and Natural Resources have been organizing the property as a forestry and wildlife research station. Part of this decision hinged on opinions of those attending an open house at the Rogers property in 2005 (Fig. 25). Nearly 70 people attended the field day (Kearns, 2005), and 50 visitors filled out a survey that identified forestry research as the primary desired activity at RRS (this will be covered in detail in an upcoming RRS bulletin). The same group also identified wildlife and wildlife habitat as a principle area of focus as well as student education. Other suggested areas of focus that were identified by at least 50% of the survey participants were water and watershed research, weed control and research, and adult outdoor education.

Another field day took place in 2009; this event attracted participants from a variety of UW departments, the Laramie Peak Fire Zone, WGFD, among others (Fig. 26). Input from this event and other meetings at RRS were compiled by the authors, and these suggestions were incorporated into early planning documents (these will be covered in detail in upcoming RRS bulletins).

Rogers Research Site Management Committee

The Rogers Research Site Management Committee was created and charged May 14, 2010, by WAES Director Bret Hess. The committee submitted its final report in early 2011 (this report, along with updates, will be detailed in an upcoming bulletin). The following are summaries of charges made to the committee by Director Hess:

1. Provide input and recommendations on management practices planned to be implemented in the very near future. These include aspen treatments and land acquisition.

2. Develop a management plan (short-term and long-range) for the property, including a protocol for planning and implementing management practices. These include fire management and coordination with the Medicine Bow-Routt National Forests, Wyoming Office of State Lands and Investments, and other federal, state, and local entities.

3. Provide recommendations on how to encourage research, teaching, and outreach at the site.

4. Develop a protocol for how requests to utilize the property should be handled.

5. Provide recommendations for (1) the committee's role into the future; (2) future committee members' limits to time in office; (3) selection of committee representatives; and (4) whatever else may be pertinent to the committee's purview.

There are two clear mandates that must be accommodated at RRS, just as they must be accommodated at any research center managed by UW. The first is that management of RRS should be accomplished such that natural features of the site and activities therein do not pose a risk to users of the facility nor represent risks to landowners in the immediate area (this being said, there is always risk. The intent here is to remove as much risk as possible so as to minimize risk). Second, research, teaching, and outreach activities conducted at RRS should be consistent with the mission of UW as a whole, the College of Agriculture and Natural Resources, WAES, SAREC, UW Extension, and the needs of the citizens of Wyoming and beyond.

Figure 26. The 2009 field day at RRS attracted participants from a variety of institutions and agencies. Among the attendees were, from left, John Ritten, assistant professor in the UW Department of Agricultural and Applied Economics; Stephen Miller, former director of the Wyoming Agricultural Experiment Station (now retired); Randy Anderson, UW Extension (now retired); Bob Shoemaker, superintendent of the Platte County Weed and Pest Control District (now retired) and warden of the Laramie Peak Fire Zone fire department; Jim Freeburn, former SAREC director (now with Western Sustainable Agriculture Research and Education); Steve Paisley, UW Extension beef cattle specialist; Ryan Amundson, WGFD habitat biologist; Martin Hicks, WGFD wildlife biologist; Ginny Alm, UW Department of Plant Sciences (now retired); and Dana Rowland, former summer research assistant at SAREC. (Photo by Kelly Greenwald)

Forest Fires Complicate Land Management

There is considerable concern regarding forest fires throughout the western United States. Numerous private and public structures have been—or have the potential to be—threatened by fire because they are embedded in, or are adjacent to, forest lands, an area known as the wildland-urban interface.

Although the mixture of land-ownership and land-use types in the Laramie Mountains makes comprehensive land management problematic, this mixture also provides an opportunity to manage complex ecosystems that are currently under a diversity of management strategies and philosophies, some of which are conflicting. This has been exacerbated by the long-held federal policy to extinguish nearly all forest fires. This policy has led to forests that are overstocked with flammable fuels, and many are decadent and diseased. Land management, including the potential for prescribed fire, becomes even more difficult in places like RRS and surrounding lands because of the increased rural growth in these lands, which has resulted in construction of cabins (Fig. 27), summer and year-round homes, and some

Figure 27. Steve Paisley, UW Extension beef cattle specialist, left, and John Ritten, assistant professor in the UW Department of Agricultural and Applied Economics, visit during the 2009 field day at RRS. In the background is one of the rustic cabins that would burn down during the 2012 Arapaho Fire. Colonel Rogers had a name for all of his cabins—this one was called the "Ever House" (L. Hileman, personal communication, 2017). Jim O'Brien, longtime caretaker of the property when it was owned by Colonel Rogers, lived in this cabin until it was destroyed by the fire. (Photo by Kelly Greenwald)

privately owned camps including a church-sponsored camp near RRS, Camp Grace. This problematic admixture of land ownerships and ecosystem types was tested during the 2012 Arapaho Fire. The lightning-caused wildfire burned ~98,000 ac (39,659 ha) of the Laramie Mountains before being contained in late August. Fire does not respect or recognize political boundaries. The 2012 fire consumed virtually all vegetation at RRS, destroyed rustic cabins (Fig. 28) and several outbuildings, and burned several vehicles (more photos will be presented in upcoming RRS bulletins). A small storage shed was spared, and, miraculously, so was The Colonel's old sheep wagon, which, by then, had been moved to nearby property and is still being used by the mother and daughter it was willed to [C. Hogan,[11] personal communication, 2016]). The fire was unusually hot (temperatures reached approximately 900°F (500°C), putatively due to high winds and high fuel loads. Even metal fence posts melted. Down slope from RRS, most of the structures at Camp Grace burned including cabins and an auditorium.

The problems associated with managing forests partially inhabited by multiple land users is a national problem. At RRS and surrounding areas these problems are magnified because of the fire-prone nature of the vegetation as well as the fire dependency of some of the plant species present. Such policies as "let it burn" versus "no burn," timber management versus wilderness management, wildlife management versus livestock management, etc. (see Christensen et al., 1989, for an example of some of these conundrums) have the potential to be addressed at least in part at RRS.

More saliently, however, is that fire control on RRS will be a function of fire control on surrounding, mostly USFS, lands. Fire control must be part of short-term as well as long-term planning. Fire and fire control could, and likely should, be a theme in research, teaching, and outreach at RRS. This became abundantly clear during 2012 when the Arapaho Fire burned through RRS on July 2 and 3. Most of the trees (and tree species) at RRS burned in this conflagration, which covered 95% of the property. Lightning started the fire on June 27, and it wasn't contained until late August. This was one of the largest wildland fires in the region that year, and at its peak about 1,050 firefighters and support crews were assigned to the event (InciWeb, 2012).

There were fire mitigations and fencing activities on RRS prior to the July 2012 fire. Activities also included removal of unsafe buildings and clean-up of materials left by former human visitors, including old tires, spent barbed wire, cans, glass, etc. The Arapaho Fire burned several rustic cabins and outbuildings at RRS and significantly damaged most of the fence posts, while ensuing rains washed out cattle guards and roads, and dumped a considerable amount of silt into the small reservoir on the property.

Activities, Research Take Place at RRS Post-Fire

Some of the original charges addressed by the Rogers Research Site Management Committee were obviated by the 2012 fire; however, several efforts are ongoing. Although the fence was destroyed during the fire, new fencing is complete, but in need of repair because of damage caused by falling dead trees and large animals, most likely elk. Electrical service to RRS was completely restored after the fire. A forest pathogen inventory was conducted in fall 2014; this included brief surveys for fungal-like pathogens. Soil and vegetation studies have and are taking place. But some proposals have stalled, including monitoring of and improvements to aspen stands. Though meetings have taken place in the past with stakeholders as well as officials with the Medicine Bow-Routt National Forests and Wyoming State Forestry Division, such communications need to be continued. It is our recommendation that talks resume and that both short- and long-term management plans be developed and carried out. (NOTE: co-author R. Waggener interviewed or corresponded by email with more than 50 people to gather information for this and upcoming RRS bulletins. Among them were residents of the Laramie Peak area; employees with the USFS, WGFD, Wyoming State Forestry Division, and Wyoming Office of State Lands and Investments; the warden of the Laramie Peak Fire Zone; current and former UW faculty and staff members; former UW undergraduate and graduate students who conducted research at the site; and people who personally knew Colonel Rogers. But these discussions and correspondence were strictly informal and held well after management plans had been instituted. Consequently, they are not part of the various RRS management plans; however, they do provide key updates to the research focuses, management activities, short- and long-term objectives at RRS, etc., that are identified in the plans, which will be

Figure 28. Pictured are remains of the rustic cabin shown in Figure 27. The cabin and many other structures in the Laramie Mountains burned during the 2012 wildfire. This photo was taken a year after the fire. (Photo by S. Williams)

11 Colleen Hogan and her mother, Levida Hileman, visited Colonel Rogers and his property for more than two decades starting in 1977. Colleen, who now lives in Wheatland, Wyoming, is a health facility surveyor for the Wyoming Department of Health, and she still calls the sheep wagon that was willed to her by The Colonel her home-away-from-home. When UW was granted ownership of Colonel Rogers' property, Colleen and Levida moved the sheep wagon to nearby property that they rent in the Laramie Mountains. The wagon miraculously survived the 2012 Arapaho Fire.

discussed in detail in upcoming RRS bulletins. Additionally, the persons contacted and the information they shared provide important platforms for future collaboration and decision-making.)

A weather station with remote accessibility was constructed at RRS in 2013 by a former faculty member of the UW Department of Plant Sciences, Assistant Professor Axel Garcia y Garcia, and his graduate student (Fig. 29). The station, however, was heavily damaged by mice (Fig. 30), and it is our hope that repairs are made in 2017 to bring the station back online. This planned effort is being led by Assistant Professor Vivek Sharma in the UW Department of Plant Sciences (more details about the station will be presented in an upcoming bulletin; V. Sharma, personal communication, 2017). In addition to repairing wires and electronic equipment, steps should also be taken to prevent mice and other like creatures from entering the box. It is our recommendation, too, that the UW College of Agriculture and Natural Resources, WAES, and SAREC work with the National Weather Service (NWS) to make this weather station an official cooperative weather station. This could happen through the NWS Cooperative Observer Program.

Figure 29. Data from this weather station, which was installed at RRS in 2013, was designed to be downloaded remotely. Axel Garcia y Garcia (white hat) and his graduate student, Marcello Abritta, constructed the station. (Photo by S. Williams)

Figure 30. During winter 2013–2014, mice gained access through an opening in the bottom of the weather station, causing extensive damage. The station needs to be repaired and returned to functionality, and steps need to be taken to avoid future damage by mice and other animals (work on the station was planned for summer 2017). (Photo by S. Williams)

To better track trends in weather, it is our recommendation that the long-term weather records from existing (e.g., Sybille) and discontinued (e.g., Double Four Ranch, Esterbrook) weather stations be comprehensively summarized in an upcoming RRS bulletin to provide future researchers and other users easy access to this information.

A soils map for RRS needs to be completed, and UW Professor Emeritus Larry Munn has agreed to complete this project for a chapter in an upcoming bulletin (L. Munn, personal communication, 2017). The RRS Management Committee also stressed that a marketing plan for the site, including potential to users, also needs to be done. The development of this and upcoming RRS bulletins in conjunction with news releases to promote the bulletins and field days at RRS are major steps in showcasing this facility to the public in general and to potential users at UW and other like institutions. A field day is being planned at RRS for either 2017 (late summer or fall) or 2018 (J. Tanaka, personal communication, 2017).

RRS Ad Hoc Committee

Helping to guide early decision-making in addition to on-site management at RRS was not only the Rogers Research Site Management Committee (discussed above and detailed in an upcoming bulletin), but a committee that met in response to the Arapaho Fire. This committee became informally known as the Rogers Research Site Ad Hoc Committee, and its recommendations for post-fire management and research will also be detailed in an upcoming bulletin.

It is clear that RRS has and can provide an opportunity for pre- and post-fire teaching, research, and outreach. Several UW undergraduate classes have visited RRS both before and after the Arapaho Fire (Fig. 31), and several monitoring and research activities are progressing (Cover; Figs. 6, 11*A–B*, 15, 29, 32–35). In addition to research summarized in this bulletin, other studies relating to vegetation and soils will be detailed in upcoming bulletins.

WILDFIRE CHANGES RESEARCH OPPORTUNITIES AT RRS

As comes in many walks of life, fortune and serendipity play a large part in the success (and failure) of *Homo sapiens*. That has certainly held true at RRS, where the 2012 Arapaho Fire burned stands of ponderosa pine and aspen and also obliterated some of the early research. But the wildfire also provided tremendous opportunities to study pre- and post-fire changes in soils and vegetation since much research had, fortuitously, already taken place.

In 2006, Mathew Seymour, then an undergraduate student at UW, mapped vegetation at RRS using high spatial resolution photography. The work by Seymour and his co-authors, which will be detailed in an upcoming bulletin, provides pre-fire *baseline* vegetation data that could prove to be invaluable for future research at RRS and surrounding lands.

And shortly before the Arapaho Fire, a monitoring effort on RRS was initiated. Eight 50-m × 50-m plots (164-ft by 164-ft) were established at random locations around RRS on principle vegetation and soil types (the fire swept across the Laramie Mountains and RRS before a planned ninth plot had been established). Figure 15 shows a member of the Wyoming Conservation Corps stringing the boundaries of a plot. Vegetation on all eight plots was photographed and informally mapped. Soil samples were taken

Figure 31. Several University of Wyoming classes, including these students in a forest and range soils course taught by lead author Steve Williams, have participated in field studies at RRS both before and after the 2012 Arapaho Fire. This photo was taken in late September 2012, just shy of three months after fire burned through RRS. The students examined post-fire vegetation, sampled soils, and participated in other fieldwork. (Photo by S. Williams)

from the center point of each plot to help determine chemical, physical, and biological characteristics of the site; soil horizons were identified as well. These samplings and analyses were finished by mid-June 2012. On July 2 and 3, the wildfire swept across RRS. During the ensuing weeks, soils were re-sampled at the same eight locations, permanent sites were photographed again, and vegetation mapping initiated (although this was largely an exercise in mapping ash and blackened ponderosa pine trunks (Fig. 8). Although these data sets, both pre- and post-fire, are not unique, they are still the kind of comparative data sets that are hard to come by. They have provided the basis, at least in part, for further experimentation. As discussed in more detail in an upcoming bulletin, the reestablishment of nitrogen-fixing plants at RRS post-fire would be an appropriate project currently and in the future.

Figure 32. University of Wyoming students taking the lead author's 2012 forest and range soils course examine soil properties at RRS approximately three months after the Arapaho Fire burned through the site. Their examination included soil texture (determined by hand), pH, electrical conductivity, and depth of soil horizons. This is a different group of students than the one pictured in Figure 31. (Photo by S. Williams)

Weeds Take Hold Post-Fire

Because cheatgrass, Canada thistle, and other noxious weeds are now common in the area, weed and weed control will most likely continue to be an issue at RRS and adjacent lands. A more complete weed survey is recommended at RRS and, if possible, other lands in the area; it is our recommendation that UW collaborate with neighboring landowners, both private and public, as well as the weed and pest control districts from Albany and Platte counties to develop and carry out a management plan to control weeds in the area. During the 2017 growing season, UW master's degree student Stephanie Winters, working under the direction of Assistant Professor Linda T. A. van Diepen, plans to study the invasive weeds to help determine if earlier erosion control treatments with grass, for example, reduce the occurrence of weeds (L. van Diepen, personal communication, 2017). Opportunities for future research and management are detailed in an upcoming bulletin.

Cheatgrass is on the State of Wyoming, Albany County, and Platte County lists of designated noxious weeds (Wyoming Weed and Pest Council, 2016a, 2016b), while Canada thistle is on the state list (Wyoming Weed and Pest Council, 2016a). These designations mean that these two weeds and the others on the lists "are considered detrimental, destructive, injurious, or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within the state (Wyoming Weed and Pest Council, 2016c)." Such a listing provides statewide mandate and legal authority to regulate and manage the weeds so listed.

Figure 33. On July 18, 2012—just over two weeks after Arapaho Fire swept through RRS and surrounding lands—the lead author (S. E. Williams) collects soil samples as part of a study examining fungi both pre- and post-fire at RRS that will be detailed in an upcoming bulletin. Because of the fire's intensity, the majority of RRS and surrounding lands had nothing but ash and dead trees remaining. Williams was conducting this research with Stanley Bellgard, a visiting scientist from New Zealand who helped with soil sampling and who assisted with microbial surveys several years later. (Photo by Stanley Bellgard)

LOOKING TO THE FUTURE

Much groundwork has been laid at RRS in terms of planning, on-site management, and scientific studies. Now, it is our hope that UW leaders, faculty and staff members, and students continue to collaborate with others on research projects, outreach activities, outdoor classroom teaching at the mountainous site and neighboring public and private lands, and indoor classroom teaching relating to RRS research. And this should all be done in accordance with the will of Colonel William C. Rogers, who loved sharing his land, and all it offered, with friends and visitors. Per his wishes, the land is now to be used as a center for studies, as a place to hold meetings and retreats, and as a site to conduct research that will improve wildlife and forestry resources not only on this property, but across the Laramie Mountains, Wyoming, and hopefully beyond.

Figure 34. Lead author Steve Williams surveys one of the research plots at Rogers Research Site, which ranges in elevation from ~6,700 to 7,300 feet (2,000–2,200 meters). In the background is the prominent Laramie Peak, the tallest peak in the Laramie Mountains at 10,272 ft (3,131 m). This photo was taken on October 28, 2015. (Photo by Linda T. A. van Diepen)

ACKNOWLEDGMENTS

Bret Hess, director of the Wyoming Agricultural Experiment Station (WAES) and associate dean in the University of Wyoming College of Agriculture and Natural Resources, has been instrumental in providing the backing and leadership for early and ongoing Rogers Research Site (RRS) planning and management; research projects at and relating to RRS; and support for this and upcoming bulletins that are detailing RRS management activities, planning, research, outreach, and teaching. Overseeing RRS is John Tanaka, director of the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC), one of four R&E centers in the state that are under WAES. Both Bret and John have provided valuable input and direction as the development of this and upcoming RRS bulletins have progressed. Also helping in this endeavor are Joanne Newcomb in the state WAES office and Kelly Greenwald, SAREC administrative associate. Appreciation is extended to those entities that helped fund projects at RRS, including the USDA McIntire-Stennis program.

Many thanks go to Tanya Engel of UW Extension Communications and Technology for graphic design work on this and upcoming bulletins. Jim Freeburn, former SAREC director, and Kelly Greenwald spent much time gathering photos from early activities at RRS, in addition to providing valuable information for photo captions. Maps and map work are courtesy of Josh Decker, manager of UW Real Estate Operations, and his staff.

Appreciation is extended to those who reviewed all or portions of this bulletin (see Chapter 1). We also thank those who reviewed the geology and soil sections in this chapter and provided additional insight: Art Snoke, co-editor of *Rocky Mountain Geology* journal and professor emeritus of structural geology and tectonics in the UW Department of Geology and Geophysics; and Larry Munn, professor emeritus of soil science in the UW Department of Ecosystem Science and Management.

Vivek Sharma, assistant professor of agronomy and irrigation with the UW Department of Plant Sciences/Powell R&E Center, gave an update on the RRS weather station, which will be discussed in more detail in upcoming bulletins. Providing valued input on plants were Bonnie Heidel, lead botanist with the Wyoming Natural Diversity Database on the UW campus; Ernie Nelson, curator of the Rocky Mountain Herbarium; Dorothy Tuthill, associate director of the UW Biodiversity Institute and Berry Biodiversity Conservation Center; J. Daniel Rodgers, associate professor emeritus of rangeland ecology and watershed management in the UW Department of Ecosystem Science and Management; and Derek Scasta, assistant professor of rangeland management in the Department of Ecosystem Science and Management. Sharing information about wildlife were Tim Beyer, district wildlife biologist for the Medicine Bow-Routt National Forests and Thunder Basin National Grassland; Martin Hicks, wildlife biologist for the Wyoming Game and Fish Department (WGFD); Ryan Amundson, WGFD statewide habitat biologist; and Nichole Bjornlie, WGFD statewide nongame mammal biologist.

Klayton 'Shay' Rogge, assistant fire management officer with the Medicine Bow-Routt National Forests and Thunder Basin National Grassland, rounded up several pictures from the Arapaho Fire through InciWeb, and he, too, provided important caption information for fire photos that will appear in this and upcoming bulletins. The InciWeb picture appearing in this bulletin was taken by Shawn Ferron. Ryan Amundson, Martin Hicks, and Nichole Bjornlie shared photos of wildlife. Nichole was lucky enough to snap a nice picture of the threatened Preble's meadow jumping mouse. "They are pretty squirmy so hopefully this picture will work," she wrote to us. Also providing photos were Mollie Herget and Claire Wilkin, former UW graduate students who are co-authoring upcoming RRS bulletins on post-fire ponderosa pine restoration and post-fire soils, respectively; UW Assistant Professor Linda T. A. van Diepen, who is now co-leading research efforts at RRS with Derek Scasta (Fig. 35); Stephanie Winters, a UW master's degree student in soil science; and Stanley Bellgard, a visiting scientist from New Zealand who helped the lead author with soil sampling and microbial surveys at RRS. Linda van Diepen, too, has provided updates on ongoing research that is taking place at RRS.

Michael Curran, a Ph.D. student in the UW Program in Ecology and one of the many students who volunteered research time at RRS, provided caption information about his work as well as photos that appear in this and upcoming bulletins. Thanks go to Missy Samp and Jane Wolfinbarger, both with UW Institutional Communications, for excavating the UW archives to find the 2005 news release about the RRS open house (the entire release will run in an upcoming bulletin that focuses on early planning at the site). Kathleen Bertoncelj, Josh Decker, Jamie Hageman-Phipps, Bret Hess, and Steve Paisley provided information about the photos from the open house. Carol Purchase, Mark Conrad, Melissa Dempsey, Rich Edwards, Colin Tierney, Jay Hein, Dennis Oberlie, Carson Engelskirger, Mark Stiller, George Portwood, Bonnie Parker, and Martie Jo Dunlap helped to identify the 2011 RRS forestry audit participants who appeared in photos in this chapter and an upcoming bulletin. Summer intern Noah Snider provided information on research and helped to identify students who assisted with studies at RRS. And Linda Waggener, senior library assistant at UW Libraries, shared information on how to access the Laramie Mountains floristic study paper by Barbara Packer (see the Packer reference).

Finally, we owe a great deal of gratitude to Colonel William Catesby Rogers, for it was his gift that is providing many opportunities for UW students, faculty, staff, and others to conduct research on his beloved land in Wyoming's Laramie Mountains.

Figure 35. Matt King, left, and Emily Bean, right, University of Wyoming master's degree students in soil science, along with UW assistant professors Linda T. A. van Diepen and John Derek Scasta, pose for a picture before surveying ponderosa pine restoration plots at the Rogers Research Site on September 30, 2016. (Photo by Elizabeth Traver)

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APPENDIX A. COLONEL WILLIAM CATESBY ROGERS, 1906–2003.

Editor's note: The following obituary appeared in the fall 2003 issue of the *Alumni Review*, published by the Virginia Military Institute (VMI), Lexington, Virginia. William Catesby Rogers graduated with VMI's Class of 1927 (his official date of graduation was January 11, 1928). His obituary was provided by Mary Laura Kludy, archives and records management specialist at VMI's Preston Library. Sarah Stark Serra, a niece of Colonel Rogers, provided additional information about survivors.

WILLIAM C. ROGERS '27

William Catesby Rogers '27 of Carmel, California, died on April 30, 2003. He was 96.

Rogers matriculated from Newport News, Virginia, and attended VMI for three and one-half years. He held a bachelor of arts degree in liberal arts from VMI, where he was managing editor of the *Cadet* newspaper and a member of the Dramatic Club during his first class year.

A veteran of World War II, he was called to active duty in 1942 and assigned to the rail branch in the office of the Chief of Engineers, the Corps of Engineers. He later served in the headquarters of Gen. Carl Gray, who at the time was director general of the Military Railway Service. He served overseas during the war as commanding officer of a railway shop battalion in the Persian Gulf Command. In 1951 he was assigned as chief of the Rail Operations Branch, the Transportation Research and Development Station, at the Army's Transportation Center, Fort Eustis, Virginia.

In 1955, Rogers, who by that time had been promoted to colonel, received the Ulchi Distinguished Military Service Medal in Seoul, Korea, for his service as chief of the Korean Civil Assistance Command's transportation branch.

Among his survivors are a sister, Anne Rogers Stark[1] of Newport News, Virginia; two nieces, Sarah Stark Serra and Anne Burrell Williams; and two nephews, John Walker Carter Stark and Ernest Rogers Williams.[2] Ernest Williams is collecting material for a biography of Rogers and would like to hear from anyone who knew of or worked with Rogers. Williams may be reached at 52 St. Leonards Road, Bexhill-on-Sea, East Sussex TN40 1JB, Great Britain.

1 Anne Rogers Stark, 82, died on December 4, 2005, in Newport News, Virginia.

2 Ernest Rogers Williams, of Great Britain, died at age 72.

APPENDIX B. COLONEL ROGERS' TRUST BENEFITS A VARIETY OF PROGRAMS AND RESEARCH AT UW, INCLUDING STUDIES RELATING TO FORESTRY AND WILDLIFE.

Editor's note: The Colonel William C. Rogers University of Wyoming Excellence Fund was established in fiscal year 2010 by the Colonel William C. Rogers Trust. The purpose of the fund is to stimulate creative and innovative activities at UW. The following article—titled "Who is anonymous"—appeared in the fall 2009 *UWYO* magazine.

By Tamara Linse
Editor, University of Wyoming Foundation

He was not a professional day trader and was untrained in the world of stocks and bonds, but every day he would go to his local library and read the *Wall Street Journal*.[1]

He followed the work of investor Warren Buffett, and at one time his fortune grew to $130 million.

For the past 20 years, this individual gave part of what he made to the University of Wyoming, and only a handful of people knew his identity. The many students and faculty who benefited from his almost $4 million in gifts knew him only as "anonymous."

Anonymous turns out to be the extremely private and charismatic Colonel William C. Rogers, who died in Carmel, California, in 2003, at age 96.

"The Colonel wanted to create something that would be lasting for humanity and for the university, two things that he loved. He was a very unique character," says Chuck Graves,[2] his friend and lawyer for almost 30 years.

In 2009, his estate will provide an estimated $1.2 million to programs at UW, but his generosity has benefited UW since 1991. That's when Colonel Rogers gave UW

Figure 1. Colonel William C. Rogers (Ret.) at the throttle of a high horsepower, high speed Union Pacific freight locomotive in Cheyenne, Wyoming, testing and preparing for a full tonnage run west, August 1965. (Photo courtesy William C. Rogers Papers, American Heritage Center, University of Wyoming)

1 We have since learned that Colonel Rogers had the *Wall Street Journal* delivered to his mailbox in the Laramie Mountains.

2 Attorney Charles E. (Chuck) Graves, of Sheridan, Wyoming, passed away on August 22, 2011. He was 80.

$109,000 for the Half Price Revolving Trust, a loan fund to help students.

In 1997, he contributed $87,000 to establish the Gladys Crane Mountain Plains Film Festival. In 1998, he donated $1.6 million for the Crane Studio, a 4,000-square-foot, state-of-the-art rehearsal hall and studio theater in the UW Fine Arts Building. In 2001, he supported the Matthew Shepard Symposium on Social Justice with $1 million, which was matched with $1 million from the state.

"Colonel Rogers is the most significant donor the UW Department of Theatre and Dance has ever had," says Dr. Rebecca Hilliker,[3] department head.

Adds Graves: "The Colonel was a brilliant man who thought with the right approach and enough money he could bring UW into the league with the finest liberal arts schools in the country."

Rogers was born in 1906 in Newport News, Virginia, and earned a degree in mechanical engineering from Virginia Military Institute. During World War II, he served in Iran with the American Transportation Corps to help keep railroad supply lines open to Russia. He also served in Europe and Korea until 1962.

With his varied interests, Rogers was an intellectual who read and researched voraciously. That was his connection to UW—he spent time doing research in the archives of the American Heritage Center.

He researched and published work on Calamity Jane, the Union Pacific Railroad (Fig. 1), Mexico, windmills, and the Tarahumara Indians of northern Mexico.

His interest in UW soon broadened to include film, dance, social justice, forestry, wildlife, and campus beautification.[4] Rogers also believed in tolerance, and he was deeply affected by what happened to Matthew Shepard.[5]

"For someone who came from a straight-laced Virginia family, he was very moderate. He was very liberal," says Graves.

3 Professor Emerita Rebecca Hilliker retired from the UW Department of Theatre and Dance in 2014. She and her husband, Rich Nelson, live between Laramie and Cheyenne, Wyoming.

4 Colonel Rogers bequeathed approximately 320 acres (129.5 hectares) in southeastern Wyoming's Laramie Mountains to UW for the purpose of conducting research in connection with the improvement of forestry and wildlife resources and for a place to conduct meetings and conferences. Additionally, funds from the Colonel Rogers trust are to support a variety of programs at UW and in the state, including forestry programs that help maintain the health of forested areas and wildlife programs that benefit Wyoming's wildlife.

5 Matthew Shepard, an openly gay student at UW, was beaten and left to die in the outskirts of Laramie, Wyoming, in October 1998.

APPENDIX C. PONDEROSA PINE (*PINUS PONDEROSA*) PLANT GUIDE.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Guide

PONDEROSA PINE

Pinus ponderosa P. & C. Lawson

Plant Symbol = PIPO

Contributed by: USDA NRCS National Plants Data Center

Banner, R. 2002.
Utah State University Extension.

Alternate Names
Big heavy, black jack, bull pine, ponderosa white pine, Sierra brown bark pine, silver pine, western pitch pine, western red pine, western yellow pine, yellow pine, Yosemite pine.

Uses
Erosion control: Ponderosa pine is a rapid growing tree with the ability to firmly anchor into most soil types. For this reason, it is suitable for use as a windbreak species. It can also be used with other natives to provide cover and erosion control on rehabilitated sites.

Ethnobotanic: Native Americans used various parts of ponderosa pine for medicinal, building and household, food, and ceremonial purposes. Needles were used as dermatological and gynecological aids.

They were also used to reduce coughs and fevers. The pitch was used as an ointment for sores and scabby skin, backaches, rheumatism, earaches, inflamed eyes, and as a sleeping agent for infants.

The boughs of the plant were used in sweat lodges for muscular pain, as decoctions for internal hemorrhaging, and as infusions for pediatric treatments.

The roots of ponderosa pine were used to make blue dye and needles were used as insulation for underground storage pits. The wood was used extensively for fence posts, boards for general construction, and to fabricate snowshoes. Single logs were used to make dugout canoes. Bark was used to cover houses.

Most parts of the plant were used for food, including the pitch, seeds, cones, bark, buds, and cambium. The pollen and needles were used in healing ceremonies.

Ornamental value: Ponderosa pine has a lush green color and pleasant odor that makes it popular for ornamental plantings. It has been planted, sometimes out of its natural range, because of its aesthetic qualities. Ponderosa pine is used as borders of forested highways, but is not planted within the right-of-way. The large stature of the tree limits its use to open spaces.

Wildlife: Red-winged blackbirds, chickadees, mourning doves, finches, evening grosbeak, jays, Clark's nutcracker, nuthatches, rufous-sided towhee, turkeys, chipmunks and squirrels consume the seeds of ponderosa pine. Blue and spruce grouse use ponderosa pine needles for nesting material. Mice, porcupines, and other rodents use the bark for nesting material. The trees are also important to various birds for cover, roosting and nesting sites.

Wood production: Ponderosa pine is one of the most important timber species in the western United States. The annual production of ponderosa pine is ranked third behind Douglas fir and hem-fir. Approximately 1.3 billion board feet of ponderosa pine lumber is produced annually out of Oregon, the largest supplier in the United States. It is popularly used for the construction of buildings.

Description
General: Pine Family (Pinaceae). Ponderosa pine is a large tree that lives 300 to 600 years and reaches heights of 30 to 50 m tall and 0.6 to 1.3 m in diameter. The oldest trees can exceed 70 m in height and 2 m in diameter. The bottom one-half of the

straight trunk is typically without branches. The crown of ponderosa pine is broadly conical to round-shaped. The bark is characteristically orange-brown with a scaly plate-like appearance. Twigs are stout, up to 2 cm think, orange-brown, and rough. Needles are 12 to 28 cm long, thin and pointed with toothed edges, occur in bundles of three, and give a tufted appearance to the twig. Buds are up to 2 cm long, 1 cm wide, red-brown with white-fringed scale margins. Male cones are orange or yellow and are located in small clusters near the tips of the branches. The female cone is oval, woody, 8 to 15 cm long, with a small prickle at the tip of each scale. Flowering occurs from April to June of the first year, and cones mature and shed winged seeds in August and September of the second year.

Distribution: Ponderosa pine is distributed from southern British Columbia through Washington, Oregon, and California, and east to the western portions of Texas, Oklahoma, Nebraska, North Dakota, and South Dakota. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site (http://plants.usda.gov).

Habitat: Ponderosa pine trees occur as pure stands or in mixed conifer forests in the mountains. It is an important component of the Interior Ponderosa Pine, Pacific Ponderosa Pine-Douglas fir, and Pacific Ponderosa Pine forest cover types.

In the northwest, it is typically associated with Rocky Mountain Douglas fir, lodgepole pine, grand fir, and western larch. In California it is associated with California white fir, incense cedar, Jeffrey pine, sugar pine, coast Douglas fir, California black oak, and western juniper. In the Rocky Mountains and Utah, it is associated with Rocky Mountain Douglas fir, blue spruce, lodgepole pine, limber pine, and quaking aspen. In the Black Hills, it is associated with quaking aspen, white spruce, and paper birch. In Arizona and New Mexico, it is associated with white fir, Rocky Mountain Douglas fir, blue spruce, quaking aspen, gambel oak, and southwestern white pine at higher elevations and Rocky Mountain juniper, alligator juniper, and Utah juniper at lower elevations (Oliver & Riker 1990).

Shrubs and grasses typically associated with ponderosa pine within its range include ceanothus, sagebrush, oak, snowberry, bluestem, fescue, and polargrass.

Adaptation
The USDA hardiness zones for ponderosa pine range from 3 to 7. It grows on a variety of soils from shallow to deep, and from gravelly sands to sandy clay loam. It is found growing on bare rock with its roots in the cracks and crevices. It has a low tolerance to alkalinity, preferring soils with a pH of 6.0 to 7.0. It grows best in zones with 30 to 60 cm average annual precipitation on well-drained soils. Once established it also survives hot and dry conditions, exhibiting medium to good drought tolerance. Fifty percent shade reduces the growth rate significantly. It withstands very cold winters.

Ponderosa pine is a climax species at the lower elevations of the coniferous forest and a mid-successional species at higher elevations where more competitive conifers are capable of growing. It generally grows at elevations between sea level and 3,000 m. The populations at higher elevations usually occur within the southern part of its range (Oliver & Riker 1990).

Establishment
Site preparation is needed to control competition, which compromises seedling survival and growth. Seeds are sown in late March to early April. The seed is sown for an initial density of 237 seedlings/m^2 (22 seedlings/ft^2). Transplant stock should be one or two years old, with less than 2 prior transplantings, and 15 to 30 cm in height. Space the plants 1 to 3 m apart depending on the site.

Initial seedling survival is reduced under moisture stress. Older seedlings can tolerate limited moisture. Competition from other vegetation should be controlled for the first three to six years until the trees become well established.

Management
Ponderosa pine can be over-irrigated in poorly drained soils, or drowned out on high water table sites.

It responds well to thinning, which should be done as stands become older to develop larger crowns, resulting in heavier seed crops for wildlife. More forage for deer and elk become available from associated plants by opening the canopy. The use of repellents or other control measures may be necessary to prevent overuse of the trees by rodents.

Ponderosa pine is resistant to fire due to its thick bark. Low intensity surface fires control competitive species like scrub oak and shade-tolerant conifers. Ponderosa pine seedlings can also survive low intensity burns.

Pests and Potential Problems
Approximately 200 insect species affect ponderosa pine from its cone stage to maturity. Pine cone beetles cause tree death by transmitting blue stain fungus to the tree. Their larvae also consume the phloem, restricting the flow of nutrients to the top of the tree.

Western pine beetle is a common cause of death for older trees, drought stressed trees, and even healthy, vigorous trees during epidemics.

Bark beetles are naturally present in all stands. Harvesting methods that leave large amounts of logging slash can allow bark beetle populations to explode and kill vigorous trees up to 0.5 m in diameter.

The ponderosa pine budworm, also known as the sugar-pine tortrix, eats new needles on trees in New Mexico and Colorado. Several years' worth of damage will affect the health of the tree. Early research suggests that some insecticides may help to control infestations.

Dwarf mistletoe is the most widespread parasite that causes branch and stem deformation. It germinates on ponderosa pine branches and forces its roots into the phloem of the host branch, creating stem cankers that leave the wood weak and unsuitable for use as lumber. This weakens the tree and leaves it susceptible to fungal infections and insect attacks. Root diseases, rusts, trunk decays, and needle and twig blights also cause significant damage.

Seeds and Plant Production
Ponderosa pine is propagated by seed. Cones are ready for collection in October and November when they turn reddish brown. Mature seed is firm and brown in color. Cones should be dried on canvas tarp in a well-ventilated area immediately after they have been collected. The seeds will drop from the cones as they dry.

Several germination methods for ponderosa pine have been utilized, each with their own variations. In general, seeds undergo an imbibition treatment before stratification. Seeds are placed in mesh bags and soaked in cold running water for 48 hours. One variation is to soak the seeds in a 40% bleach solution for 10 minutes with hand agitation prior to placing them under running water. The mesh bags are placed in plastic bags and stored at 1°C for 2 to 8 weeks. They should be checked daily for mold. Seeds are sown into containers and covered with media. The media should be kept moist throughout germination. Germination will occur at an average greenhouse temperature of 20°C. Alternating greenhouse temperatures of 21-25°C during the day and 16-18°C at night are an appropriate environment for germinating seeds. Germination will occur in approximately 15 days.

Seedlings are thinned and watered daily throughout the establishment phase. They should not be moved outdoors until after the last frost of the year.

Seeds can be dried to between 5 and 8% moisture and placed in airtight plastic bags, then stored for long periods of time in freezers set at –15°C.

Cultivars, Improved and Selected Materials (and area of origin)
Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

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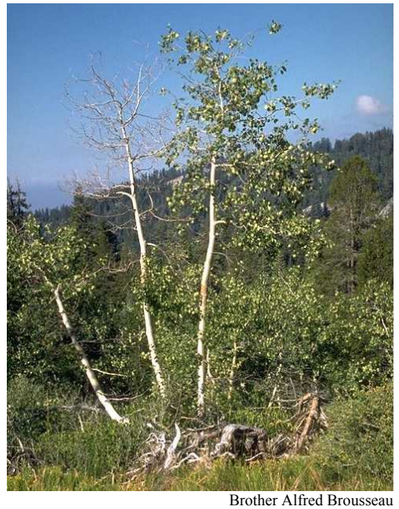
For more information about this and other plants, please contact your local NRCS field office or Conservation District, and visit the PLANTS Web site<http://plants.usda.gov> or the Plant Materials Program Web site <http://Plant-Materials.nrcs.usda.gov>

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Guide

QUAKING ASPEN
Populus tremuloides Michx.
Plant Symbol = POTR5

Contributed by: USDA NRCS National Plant Data Center & the Biota of North America Program



Brother Alfred Brousseau
© St Mary's College
@ CalPhotos

Alternate Names
Trembling aspen, golden aspen, mountain aspen, trembling poplar, white poplar, popple, aspen

Uses
Industry: Quaking aspen is an important fiber source, especially for pulp, flake-board, and other composite products. The wood is light and soft with little shrinkage (see Wheeler 2000) and is used for pallets, boxes, veneer, and plywood. Higher grades are used for other solid wood products, such as paneling, furniture components, and flooring. The wood characteristics make it useful in miscellaneous products, including excelsior, animal bedding, matchsticks, toys, beehives, tongue depressors, spoons, and ice cream sticks. It makes good playground structures because the surface does not splinter, although the wood warps and is susceptible to decay.

Conservation: Quaking aspen is valued for its white bark and brilliant fall color, especially when clustered. The species has been widely used in landscaping but is best in sites away from structures that might be damaged by the aggressive roots. The trees provide good visual screening and noise abatement.

Aspen stands are good firebreaks, often dropping crown fires in conifer stands to the ground when they reach aspens and even sometimes extinguishing the fire because of the small amount of flammable accumulation. They allow more ground water recharge than do conifer forests and they also play a significant role in protecting against soil erosion. They have been used in restoration of riparian habitats.

Wildlife: Young quaking aspen provide food and habitat for a variety of wildlife: black bear, deer, beaver, porcupine, elk, moose, ruffed grouse and many smaller birds and animals, including small mammals such as mice, voles, shrews, chipmunks, and rabbits. Bark, buds, new sprouts, twigs from the tops of fallen or logged trees, and fallen leaves all are wildlife foods.

Ethnobotanic: Native Americans used *Populus* bark (including aspen) as a food source. They cut the inner bark into strips, dried and ground it into meal to be mixed with other starches for bread or mush. Catkins were eaten raw, and the cambium was eaten raw or in a soup.

Status
Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status, such as, state noxious status and wetland indicator values.

Description
General: Willow Family (Salicaceae): This is a native tree 5-30 m high, typically less than 15 m, with a rounded crown; lateral roots may extend over 30 meters and vertical sinker roots from the laterals may extend downward for nearly 3 m; bark is typically smooth, greenish-white to gray-white, often thin and peeling, becoming thicker and furrowed with age, especially toward the base. Leaves are simple, deciduous, broadly ovate to nearly round, 4–6 cm long, with small, rounded teeth on the margins, on a

Plant Materials <http://plant-materials.nrcs.usda.gov/>
Plant Fact Sheet/Guide Coordination Page <http://plant-materials.nrcs.usda.gov/intranet/pfs.html>
National Plant Data Center <http://npdc.usda.gov>

slender, flattened petiole, dark green and shiny above, pale green below, turning bright yellow, yellow-orange, gold, or reddish after the first frosts. The male (staminate) and female (pistillate) flowers are on separate trees (the species dioecious – or 'polygamodioecious,' because bisexual flowers may be produced at low frequencies on staminate and pistillate trees), each type of flower borne in pendent catkins. The fruits are narrowly ovoid to flask-shaped capsules 5-7 mm long, splitting to release the seeds; seeds ca.2 mm long, each with a tuft of long, white, silky hairs, easily blown by the wind. The common name is in reference to the shaking of the leaves in light wind.

Variation within the species: Considerable genetic and morphological variation exists over the range of quaking aspen. A number of species and varieties have been described but none are currently recognized. Entire stands are often produced as a single clone from root sprouts – this sometimes easily observable on a single mountainside in different timing in leaf appearance or in different hues and timing of fall coloration. Distinctively large triploid trees are sometimes found.

Quaking aspen hybridizes naturally with bigtooth aspen (*Populus grandidentata*), narrowleaf cottonwood (*P. angustifolia*), curly poplar (*P. canescens*), balsam poplar (*P. balsamifera*), eastern cottonwood (*P. deltoides*), and white poplar (*Populus alba*, a naturalized European species), and hybrids with black cottonwood (*P. trichocarpa*) occur rarely in Alaska. Quaking aspen, bigtooth aspen, European aspen (*P. tremula*), and three Asian species are closely related and sometimes classed together as a single, circumglobal superspecies (see Peterson and Peterson 1992).

Distribution
Quaking aspen is the most widely distributed tree species in North America. It grows from Alaska across the Northwest Territories to Quebec and Newfoundland, south to West Virginia and Virginia, and in all of the western North America US states (except Oklahoma and Kansas) -- in all Canadian provinces and all but 13 US states (absent from the Southeast). It occurs in both the eastern and western sierras of Mexico, into the south-central part of the country. Outside of the main range, it is represented by a huge number of disjunct populations. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Adaptation
Quaking aspen occurs in a wide variety of habitats (including soil type and moisture conditions) and at a great range of elevation, matching its extensive geographic range. It characteristically forms pure stands or mixed stands with bigtooth aspen, but it occurs with scrub oaks and sagebrush at lower elevations and as a prostrate form above timberline and exists as a dominant species in many communities at mid elevations. It is a shade-intolerant, disturbed site species and is quickly replaced in succession by more tolerant species.

Some trees are self-pruning, dropping numerous small twigs with excess fall foliage and returning nutrients to the soil. Leaves decay relatively rapidly, and a characteristic "aspen soil," with a higher pH than on conifer-dominated soils, develops on sites that have supported aspen for a number of generations.

Flowering occurs March–April (East) or May–June (West), before the leaves appear and fruiting in May–June (–July), often before the leaves are fully expanded. Temperatures above 12° C for about 6 days apparently trigger flowering. Female trees generally flower and leaf out before male trees.

Establishment
Quaking aspen commonly establishes from seed in Alaska, northern Canada, and eastern North America. Seedling establishment is less common in the West but occurs there in moist sites such as kettles and other topographic depressions, seeps, springs, lake margins, and burnt-out riparian zones. Drought stress kills seedlings, as does standing water.

Young trees first flower at 2-3 years but production of large seed crops begins at about 10-20 years; maximum seed production occurs at 50-70 years. Heavy seed crops are produced at 4-5-year intervals. Seeds are wind-dispersed for distances of 500 meters to several kilometers.

Germination generally begins nearly immediately after moisture is received and can occur across a broad temperature range, with optimal germination at 15-25° C. Surface placement or a very shallow depth of burial on exposed mineral soil (such as burned or scarified sites) apparently provide the best environment for germination. Continuous moisture is required.

Asexual reproduction and clones
Reproduction of quaking aspen is primarily by root sprouts, and extensive clones of root-interconnected trees are characteristic of the species. Most root sprouts develop within 10 meters of the parent stem, although some are produced at 30 meters or more. They develop from roots within 2-10 centimeters of the surface. Growth in primordia and buds is suppressed by apical dominance but resumes after stems are top-killed by fire, harvest or wind-breakage, or after defoliation and many thousands of sprouts per acre may be produced. Removal of the above-ground plant portion in June or July after maximum auxin production (the chemical agent of apical dominance) results in fewer suckers than top-removal during the dormant season. Sprouts produced in a closed stand usually die unless in a canopy gap. Saplings may begin producing root sprouts at 1 year of age.

Stands of quaking aspen may consist of a single clone or represent a mosaic of different clones. Even in a small area, wide variation in genetic traits exists between clones – differences may be seen in leaf shape and size, bark colour and texture, branching habit, resistance to disease and insect attack, sexual expression, growth rate, and phenology. The most conspicuous differences may be in the timing of spring leaf flush and in autumn leaf coloration.

The staminate-pistillate ratio of clones is 1:1 in most localities, but in the eastern US staminate trees may outnumber pistillate ones by 3:1. Some clones alternate between staminate and pistillate forms in different years or produce combinations of perfect, staminate, and pistillate flowers.

Individual trees of quaking aspen are short-lived (maximum age in the Great Lakes states is 50–60 years, up to 150 years in the West). Stands may be even-aged (after a single top-kill event) or only broadly even-aged (from sprouting of a gradually deteriorating stand). The clones are much older: many in the Rocky Mountain and Great Basin regions are at least 8000 years old, persisting since the last glacial retreat. A male clone in the Wasatch Mountains of Utah occupies 17.2 acres (43 ha) and has more than 47,000 stems – this clone is estimated to be 1 million years old and may be the world's most massive known organism. Clones east of the Rocky Mountains usually cover no more than a few acres.

Management
The thin, soft bark of quaking aspen makes it susceptible to many diseases and insect infestations as well as mechanical and fire damage. Fires may kill trees or cause basal scars that serve as entry points for wood-rotting fungi, which are common in older stands. The wood decays easily. Fires may also kill surface roots that could reduce sucker regeneration.

The poplar borer beetle, one of the most common wood borers of aspen, weakens trees by boring galleries in the trunk near the lower portion of the crown. Outbreaks of forest tent caterpillar may last 4-5 years and result in serious defoliation -- cold weather in the spring shortly after the eggs hatch and above-average fall temperatures can cause a rapid decline in caterpillar populations by killing eggs and larvae. Overgrazing by livestock or big-game animals disturbs roots and compacts soil, limiting sucker formation. Heavy grazing of young sucker stands by cattle for three years in a row may destroy them.

Quaking aspen can be propagated by seed, following cold stratification. Germination of fresh seed may be 80-95%, but viability lasts only 2-4 weeks under favorable natural conditions (low temperature and humidity). Seeds dried for 3 days and stored at cool temperatures may retain good viability for up to a year.

The species roots poorly from woody stem cuttings, but newly initiated (softwood) shoots can usually be induced to root by dipping in IBA (indolebutyric acid) or other commercially available rooting powders. A more preferred method uses root sprouts. Collect dormant lateral roots in early spring -- plant root cuttings 1-2 in diameter and 3-5 centimeters long in vermiculite and place in the greenhouse for 6 weeks. Excise the young sucker shoots and root in perlite/vermiculite (2-3 weeks, using IBA), misting frequently. Transplant the developing plants to peat/vermiculite mix and grow at 15-25º C. Or, the root cuttings may be planted directly into the perlite mix, with the top of the cutting just below the media surface.

Cultivars, Improved and Selected Materials (and area of origin)
Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

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USDA NRCS

Plant Guide

ANTELOPE BITTERBRUSH

Purshia tridentata (Pursh) DC.

Plant Symbol = PUTR2

Contributed by: USDA NRCS California State Office and Lockeford Plant Materials Center, California Upper Colorado Environmental Plant Center, Colorado

Steve Parr, UCEPC, Meeker, Colorado

Alternate Names
Antelopebrush, buckbrush, quininebrush, bitterbrush, antelope-brush, quinine brush, deer-brush, black sage

Uses
Antelope bitterbrush is one of the most important palatable native shrubs in the western United States. It provides high quality, important spring and winter browse for domestic livestock, antelope, deer, and elk. Its seed is an important source of food for small animals and the plant provides cover for small animals and birds. It is considered medium quality coverage for sage-grouse. The shrub is also used for reclamation and erosion control of mined areas and has the potential for use as a living snow fence, roadside beautification, and xeriscape plantings.

Historic Native American Uses: Western Indian groups used leaf poultice or wash for itches, rashes, insect bites, chickenpox, and measles. Leaf tea was used as a general tonic and for colds, pneumonia, liver disease, to expel worms, and as an emetic and laxative for stomach ache and constipation. Twigs, leaves, and berries were used as a laxative. Root teas were used for coughs, lung and bronchial infections, fever, and to facilitate delivery of placenta.

Status
Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

Description
General: Antelope bitterbrush is a slow growing shrub that is moderate to very deep rooted with wide ecotypic variations. It is normally 2 to 6 feet in height and up to 8 feet in width with wedge shaped, three lobed leaves (some are persistent in winter). Leaves can vary in color from grey green to bright green. Some plants have branches near the soil that layer (branches that touch the soil develop roots) providing additional rooting for the plant.

Flowering occurs in late spring to early summer. The spindle-shaped seed shatters easily at maturity. Flowers are small, varying from white to yellow, and produced profusely along each leader. The seeds are large for the species—15,500 per pound. They are about one-fourth inch long and obovate. Seeds, stems, and leaves are nontoxic.

Individual bitterbrush plants exhibit considerable variation for growth form. Bitterbrush's growth forms vary from a uniform, erect growth habit to more decumbent, layering forms. Users are encouraged to consider the various forms of bitterbrush in choosing a strain best suited to their needs.

Distribution: Antelope bitterbrush is an important native browse shrub in the intermountain western United States. It occurs from New Mexico north to Colorado, Wyoming, Montana, and British Columbia, west to Idaho, and Washington, south to Oregon, California, and Nevada. For current distribution, please consult the Plant Profile page for

Plant Materials <http://plant-materials.nrcs.usda.gov/>
Plant Fact Sheet/Guide Coordination Page <http://plant-materials.nrcs.usda.gov/intranet/pfs.html>
National Plant Data Center <http://npdc.usda.gov>

this species on the PLANTS Web site.

Habitat: Antelope bitterbrush occurs most often as part of a mixed shrub community, but occasionally is found in nearly pure stands. It is associated with a variety of understory grasses and forbs. It can also be an understory plant in association with taller growing trees.

Adaptation
Antelope bitterbrush is adapted to a wide range of soils with 8 to 34 inches of annual precipitation. It is normally found at elevations of 4000 to 8500 feet, but has been noted at 11,000 feet in California. The shrub has good tolerance to drought and cold.

In California, bitterbrush is associated with big sagebrush (*Artemisia tridentata*) and rabbitbrush (*Chrysothamnus* sp.). It occurs naturally on dry lake beds, alluvial fans or terraces, and low foothills. It occurs in soils that are deep, gravelly, loamy coarse sands derived from granite, with pH ranging from 6.0 to 7.0. Tests have shown that bitterbrush has high potential for use on deep, coarse, well-drained, neutral to slightly acidic soils in areas that have 12-24 inches of annual precipitation.

Establishment
Natural establishment of antelope bitterbrush occurs in years with good seed production when rodents cache seed and do not use all of the caches. Moisture is necessary the first few years of seedling growth for establishment. Late fall or winter seeding is recommended and competition can be a problem for establishment. Seeds should be drilled about 1 inch deep at a rate of 1/2 to 2 (3) pounds per acre. Rates are doubled if broadcasting and seeds do need to be covered. In California, pretreatment with hydrogen peroxide is required to break dormancy for spring seeding and seedlings are susceptible to late frosts.

Bitterbrush seedlings are often transplanted on critical sites. In such cases, moisture must be adequate to ensure survival in the first year. One-year-old bare-root or containerized seedling stock, 6 to 24 inches tall, is recommended.

Plants should not be used for the first four years and seedlings need protection until they are 8 to 10 inches tall. Rodents normally cache seeds within 50 to 75 feet of an existing seed source. Suitable environmental conditions may allow natural revegetation in only one out of 20 years. Antelope bitterbrush can also be established with tubling plants. These should be planted in the spring or early summer. Establishment can be slow; however, stands tend to be long-lived.

Several insects and diseases are known to damage the foliage, seed, and seedlings of bitterbrush, and are more or less susceptible than other species. High-density populations of grasshoppers can destroy seedlings.

Management
Since antelope bitterbrush is a very palatable shrub for big game and livestock, its use should be controlled or it can be easily eliminated by overuse. The shrub is most often used by big game in the fall, winter, or early spring when other plants are still covered by snow. Livestock tend to use the shrub during the growing season when use is more detrimental to vigor. Stands of bitterbrush can become decadent with no use and mature plants should be browsed for good forage production and vigor. However, no more than 50 to 60 percent of current annual growth should be removed. The literature indicates that bitterbrush is not a fire resistant shrub, but is fire dependent and light to moderate fires may enhance stands.

Pests and Potential Problems
Many species of insects and mites inhabit antelope bitterbrush, several of these are beneficial. It should be noted that bitterbrush is insect pollinated. Insects that cause problems include defoliators such as mountain mahogany loper and western tussock moth. Some of the noted seed insects are bitterbrush seed midge, Say's stinkbug, dark bitterbrush leaf tier, and flower thrips. Large numbers of seedlings and small plants have been destroyed by cutworms and false wireworms. Diseases associated with bitterbrush include root rot, root and stem wilt, and root-stem canker. Seedlings have been damaged by damping off (a disease caused by fungi). A beneficial organism associated with antelope bitterbrush is the nitrogen-fixing endophyte *Frankia purshiae*.

Environmental Concerns
There are no known environmental concerns associated with antelope bitterbrush.

Seeds and Plant Production
In Colorado, seed may not be produced in wildland stands for 8 to 20 years depending on existing conditions. Browsing should be reduced to 30 percent or less to obtain good seed production. Seed may not be produced from mature plants when stressed from drought or late freezes. Seed can be collected by hand by shaking branches and allowing the seed to fall in hand held collectors. Seeds vary in size from 15,000 to 33,000 per pound and germination normally ranges from 85 to 95 percent. A cold moist stratification period of up to six weeks may be required to obtain good germination. Tublings can be grown in a greenhouse for planting in a period of six months to one year.

In California, mature seed must be harvested within 3 to 10 days of ripening because it shatters quickly after reaching maturity. Seed may be harvested into canvas hoppers or aluminum seed collection trays positioned under the shrubs prior to seed fall. Seed collection and orchard maintenance are simplified by the upright growth form.

A 3.6 to 3.6 m to 4.9 x 4.9 m (12 x12 ft to 16 x 16 ft) spacing is recommended for antelope bitterbrush seed orchards. Plants in wildland stands reach full seed production in 8 to 20 years. With appropriate cultural practices, this period may be reduced to about 5 years for seed orchards. Nine-year old shrubs grown at 2.4 m (8 ft) spacings without irrigation or other cultural treatments at the Boise Shrub Garden, produced 118 g (0.26 lbs) of seed per shrub or 199 kg/ha (177 lbs/acre).

Seed is easily cleaned to a purity of 95 percent using a two-screen fanning mill and a barley debearder. Shriveled black seed is nonviable and should be separated with the chaff. Seeds of bitterbrush are relatively large, averaging 34,507 seeds/kg (15,685 seeds/lb) for cleaned seed, with germination averaging about 84 percent. Seeds of bitterbrush remain viable for 15 years or more in open storage.

On rangeland sites antelope bitterbrush is normally seeded in late fall or winter to permit field stratification of the seed. Pretreatment with hydrogen peroxide is required to break dormancy for spring seeding. Seedlings are susceptible to late frosts. Plants develop very slowly and must be protected from competition during the first two seasons. Recommended seeding rates are 1.2 to 3.3 kg/ha (1 to 3 lbs/acre). Bitterbrush may be established on critical sites by transplanting.

Cultivars, Improved, and Selected Materials (and area of origin)
'Lassen' is a cultivar of antelope bitterbrush released in 1984 by USDA Forest Service, Shrub Sciences Laboratory, Provo, Utah, Soil Conservation Service, and Utah Division of Wildlife Resources, Ephraim Utah. Seven other agencies in California, Idaho, Nevada, and Oregon cooperated. Its origin is near Janesville in Lassen County, California.

Fountain Green germplasm is a source identified release of antelope bitterbrush. It was released in 1990 by the USDA Forest Service, Shrub Sciences Laboratory, Provo, Utah, and the Utah Division of Wildlife Resources, Ephraim, Utah. Its origin is north of Fountain Green, Utah.

Maybell germplasm was released in 1997 as a selected class release by Upper Colorado Environmental Plant Center. Five other agencies participated in the release. Maybell's origin is Moffat County in northwest Colorado, near the town of Maybell.

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Release information for 'Lassen' and Maybell Select Class.

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A NOTE OF THANKS

RRS has great potential as a research, teaching, and extension site, and we owe a great deal of appreciation to The Colonel and many others

By Stephen E. Williams

We owe a great deal of gratitude to Colonel William C. Rogers for donating his land in the Laramie Mountains to the University of Wyoming for research, teaching, and extension. In turn, we owe a great deal of gratitude to the many people who have been instrumental in early development of the Triple R Ranch into what has been renamed the Rogers Research Site (RRS) in memory of The Colonel.

Stephen Horn and Frank Galey, the former and current deans of the UW College of Agriculture and Natural Resources, have provided incentive to develop RRS during their respective administrative times. The former associate deans and directors of the Wyoming Agricultural Experiment Station (WAES), Jim Jacobs and Stephen Miller, and the current associate dean/director, Bret Hess, have also provided direction and resources to continue this development under their respective administrative tenures. During the last seven years especially, Bret Hess, with strong approval and support from Frank Galey and others, has provided resources to bring the development of RRS to function as a research, outreach, and teaching location.

Administratively RRS has been placed under the direction of one of the four WAES research and extension (R&E) centers, the James C. Hageman Sustainable Agriculture R&E Center (SAREC) near Lingle, Wyoming. Jim Freeburn was the director of SAREC during the early development of RRS. He had a strong hand in the planning effort and has directed many resources toward RRS. There has been a continuation of that effort under the new SAREC director, John Tanaka.

Prior to 2017 a host of people worked on research at RRS or had a strong influence in planning, implementation, or sample analysis. As apparent elsewhere in this bulletin, two *ad hoc* planning committees, attendees of field days and an open house, and members of a team that conducted an on-site forestry audit have paved the way for current and future research, extension, and teaching at RRS, in addition to on-site management.

Claire Wilkin, a former UW graduate student (co-advised by this author and Professor Michael Urynowicz [UW Civil and Architectural Engineering]), was at the center of much of this early work, and results from her studies focusing on soils will be presented in an upcoming paper in the RRS bulletin series. In her thesis Claire thanked Caley Gasch, Leann Naughton, and Rachana Giri Paudel for their help in sample analysis. Claire also made a point to particularly thank Kelli Belden for her expertise in soil analysis and her always sage advice. During the time that Claire was conducting her thesis work, several persons were instrumental in helping with various field operations. These include Christine Sednek, Dave Rider, Michael Curran, and Jesse Hahm (Claire's husband). David Legg, statistician in the Department of Ecosystem Science and Management, helped with the statistical design. Brian Mealor, faculty member in the Department of Plant Sciences who now directs the Sheridan R&E Center, helped to lay out the study conceptually.

Mollie Herget worked on RRS projects during 2015, when much on-site activity occurred. She was crew boss during much of the tree cutting operations, and she oversaw all of the erosion control seeding treatments, seeding of ponderosa pine, and plantings of ponderosa pine seedlings. Her work under less than ideal weather conditions and under changing personnel situations was nothing short of heroic. Prior to her paid work at RRS, Mollie completed a master's degree at UW under the guidance of Kristina Hufford, a faculty member in the Department of Ecosystem Science and Management. Mollie's

research focused on the implications of seed origin for ecological restoration success. Herget, like Wilkin, will co-author an upcoming paper in the RRS bulletin series.

Others have had a strong presence at RRS. One of Hufford's former students, Patricia McIlvenna, conducted line-transect surveys of vegetation both before and after the 2012 Arapaho Fire, which burned nearly 100,000 acres in the Laramie Mountains, including the RRS property. Larry Munn, professor emeritus in the same department, conducted important soil survey work at RRS prior to retiring. And Stan Bellgard, a plant pathologist from Landcare Inc. in New Zealand, helped with soil sampling in 2012 and worked closely with the lead author of this bulletin in 2014 in conducting a pathogen survey. We anticipate that results from all of these studies will also be presented in upcoming bulletins.

Contributing to the research efforts, especially layout of plots and planting of ponderosa pine, were Noah Snider, James Harkin, and Tunsisa Hurisso, who provided technical assistance both in the field and greenhouse. Bret Hess generously granted access to his personal all-terrain vehicles for use at the field site. Brian Mealor and his lab crew—Will Rose, Julia Workman, Tevyn Baldwin, and BJ Bender—volunteered hours of their time to establish and plant study plots at RRS. From the Wyoming State Forestry Division, Travis Pardue donated help, time, and equipment to assist in seeding plant species at RRS. Mick Mickelson proved to be the finest of neighbors in times of need at the remote research site. Josh Decker at UW Real Estate Operations has provided assistance throughout the development of this and upcoming RRS bulletins.

Particular thanks and gratitude is extended to Jim Clyde, who went above and beyond his function as contract forester. He assisted in many aspects of research-related work at RRS, but particularly in cutting and removing fire-killed ponderosa pine in accordance with the overall research plan. Mr. Clyde also provided heavy equipment to extract UW vehicles from bog holes and off of impassible roads during problematic weather events. He also provided emergency communications with UW field personnel when normal means of communications failed. A special thanks and tribute is extended to Jim O'Brien, who was the caretaker of the Triple R Ranch prior to its transfer to UW. In a lease agreement signed by Colonel Rogers, Mr. O'Brien was given the right to stay on the property for 20 years following the death of The Colonel. Jim lived at RRS until the 2012 Arapaho Fire consumed the majority of trees on the site as well as the rustic cabin he called home. During the time that UW has had the property, he has been a helpful resource for historical, management, and ecological information and perspective. His input has been greatly appreciated.

Future researchers studying vegetation and related topics at RRS and surrounding lands will be grateful for the work of Mathew Seymour, who, as an undergraduate student at UW in 2006, conducted a vegetation mapping project at RRS using high spatial resolution photography. His study became particularly relevant just six years later when the lightning-caused Arapaho wildfire burned the majority of vegetation at RRS. Thus, as Mat and his co-authors state, future work could examine if vegetation is transitioning back to pre-fire states or trending to new ecological states. Assisting Seymour in his paper, which is complete and will be published shortly after the release of this bulletin, was Ken Driese and Robert Waggener. Thanks are extended to Bret Hess for hiring Robert to assist with the RRS bulletin series. Robert has provided editing, writing, research, collaboration, and project management, which is bringing these peer-reviewed bulletins to completion. Part of his effort has involved pulling together vital material from more than 100 sources, including personal interviews and written materials, both published and unpublished. He has also assembled hundreds of photographs and reached out to potential reviewers. A note of thanks goes to those who accepted his invitation and then took the time to read the papers and offer constructive comments. A big thank you goes to UW Extension graphic designer Tanya Engel and the many others who have assisted with these bulletins.

A PERSONAL STATEMENT FROM STEVE WILLIAMS

This and upcoming RRS bulletins that I co-authored with Claire Wilkin, Mollie Herget, and Robert Waggener are part of my post-retirement efforts at RRS. These have been done after the close of the contract (ending in spring 2016) that I had with UW, the College of Agriculture and Natural Resources, and the Wyoming Agricultural Experiment Station. I have been involved with RRS and its evolution for nearly 15 years. In fact, it began soon after I stepped down as dean of the UW Graduate School in 2003, and it continued through my stint as director of the Wyoming Reclamation and Restoration Center and until my retirement in 2013. Since that time and until spring 2016, I continued to work as a contractor on research and other activities related to RRS (Fig. 1). Now there are two relatively new faculty members in the Department of Ecosystem Science and Management taking over that role—Linda T. A. van Diepen (soil microbiologist) and Derek Scasta (Extension rangeland specialist).

RRS has great potential as a research, teaching, and extension site, and I am happy to have had a minor part in early activities at the site. I am now equally happy to pass the torch to Linda and Derek. The legal will of Colonel Rogers provides a set of guidelines for the use of the former Triple R Ranch, now known as the Rogers Research Site. It is my hope that as Linda, Derek, and others use RRS and surrounding lands to advance research, extension, and teaching, that they keep in mind the guidelines established by the remarkable Colonel William C. Rogers.

Figure 1. University of Wyoming Professor Emeritus Steve Williams relaxes after spending a day conducting fieldwork at the Rogers Research Site in June 2015. (Photo by Mollie Herget)

A rainbow is cast over the Rogers Research Site during an afternoon thunderstorm on July 15, 2015, when University of Wyoming researchers were working on a post-fire ponderosa pine regeneration study. (Photo by Mollie Herget)

University of Wyoming
Agriculture Experiment Station

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