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Burns, Bugs, and Bites

The YS Interview with Dr. John F. Burger

DR. JOHN F. BURGER is a zoology professor at the University of New Hampshire who has been coming to Yellowstone since 1956. He specializes in blood-feeding flies, on which he has written two articles for *Yellowstone Science* (issues 3:2 and 4:4). His current research in Yellowstone focuses on using photography to document the natural succession of vegetation following wildfires. Roy Renkin, Vegetation Management Specialist, and Tami Blackford, *Yellowstone Science* Editor, sat down with John on August 7, 2006, during his annual visit to the park.

Becoming an Entomologist

Yellowstone Science (YS): What made you want to be an entomologist?

John Burger (JB): I think the first thing was probably summer camp in Michigan, where one of the activities was making a butterfly collection. That's where a lot of people get interested, even though they may not maintain that interest; collecting butterflies is one of the neat things to do when you're a kid. They encouraged us not only to collect but also to learn how to mount them properly, as well as how to frame them in cotton and put them up on the wall. I did all of that. Unfortunately, I didn't know anything about putting moth crystals in there to keep out the dermestid beetles. After a couple of years,

the bodies of some of my best butterflies were basically dusty powder, and it turned out to be a real mess. But I certainly learned about dermestid beetles—the hard way! Any museum collection has to be concerned about them. When I was down at the Yellowstone Heritage and Research Center, they showed me some of the collections I had done back in the 1960s. I was curious about how they were being housed, and I noticed they were being really careful about museum pests.

The second thing that set me on the entomology path was a college class I took in my junior year, taught by my major professor, Kenneth Christiansen, who is a worldwide specialist with *Collembola*—springtails, small arthropods that live in soil, leaf litter, and caves. He specialized in cave *Collembola*. He was a fantastic teacher; the reason I went into biology was because he taught the general biology course. He triggered my interest in insects; after I graduated I had a long talk with him and decided that was what I wanted to specialize in. I ended up getting both a Master's and PhD in insect biosystematics.

Contracting Yellowstone-itis

YS: How did you get interested in Yellowstone?

JB: That started in 1956 when I was 16. Dale Nuss organized a summer camp called Camp Trails that I attended. We

spent the summer on horseback tracing the Bannock Trail and the Nez Perce route, following the Howard Eaton trail system. We would ride from point A to point B, spend the night, and then go somewhere else the next day—for the entire summer. I guess that was when I was infected by a virulent virus known as Yellowstone-itis. I understand other people have been infected by it. At that age, having an experience like that—spending the whole summer in the wilderness—had a major impact on me.

When I started college I discovered that a lot of students work in national parks in the summer. I applied, and the Yellowstone Park Company hired me. I was assigned to the Fishing Bridge cafeteria as a dishwasher in 1959, the year of the Hebgen Lake earthquake. You got five days on, two days off. It was such a wonderful experience that I came back in 1960 and '61. In 1961 I cooked trout for the people who caught them from Fishing Bridge. Back then, there were wall-to-wall people fishing from the bridge.

I finished my Master's degree at the University of Arizona in 1965 and went on to the University of California–Berkeley. At the time, my major professor was working on insects associated with cattle, and I wondered about the difference between flies that might be on cattle and flies that might be on bison. Bison are native; cattle are not. Were the flies on cattle originally on native animals? My professor thought this was interesting, and I suggested that I go to Yellowstone and do a survey of the insects associated with bison in order to compare them with what was found on cattle. So in 1966 I came to Yellowstone, based out of the Lamar Buffalo Ranch, which is where the research people were then. I spent the whole summer there, working mainly in the Lamar backcountry. I also wanted to know what was on cattle near the park, so I went down to Gardiner and started inquiring about where there might be some cows whose flies I could compare with what was up in the park. They told me a man named Scotty Chapman had some cows at his place on the river, so I went to see him. He found out I was working on insects and got all excited. I spent the summers of 1966 and '67 looking both at flies on cattle at Scotty's place and on bison in the park. I published some papers on that and got the Yellowstone-itis going again.

I had a side study on moose that turned out to be extremely interesting. There is a particular fly that feeds on the blood of moose and nothing else, which is very unusual for a fly. It's related to a fly that feeds on cattle and lays its eggs in cattle excrement, the hornfly. The so-called moosefly does exactly the same thing on moose. The adults stay on the moose, and—I was actually able to observe this with a spotting scope down at Pelican Valley—when the moose poops, some of the females will lay eggs in the moose droppings for about 5 to 10 minutes. After about 10 minutes there are no longer any flies there.

YS: Did you incubate moose droppings?

JB: I'd take them back to Lamar and put them in containers, then wait until the adult flies came out. Nobody had



Arnica cordifolia along the Hoodoo Basin Trail, in a severe burn area, July 1990 (two years after the Clover Mist fire).

ever really done any studies on the biology of this fly, but I spent both summers figuring out its biology and behavior, and published a fairly large paper on it. That got me permanently interested in Yellowstone. Then I got married and had kids, and went away for a long time.

Changes in Post-fire Vegetation

YS: Your current work in the park is in post-fire photography, looking at photographs and interpreting change.

JB: Yes. It wasn't until after the fires of 1988 that I began to think about all the years I'd spent here taking pictures of places all around the park. I had slides from 1959 through 1967. It struck me that it would be interesting to go back and compare the areas post-fire, and thought it would be even more interesting to see how areas exposed to different fire intensities responded over time and what vegetational changes there might be.

Every summer since 1990, I've gone back and re-photographed exactly the same spots either every year or every three years so that I can look at vegetation changes over time. I tried to pick areas that were lightly burned versus those that were completely burned. Now I do it by GPS coordinates, so not only can I go back, but if anybody else wanted to go back, say 50 years from now, they could find the exact spot. I have about 5,000–6,000 slides.

YS: Are you seeing what you expected to see?

JB: I didn't know what I expected to see. I do remember that everything was pretty black in 1990. I wish I'd come back right after the fires, but the idea didn't hit me right away. One of the things that was really impressive after the 1988 fires, as I went into the Lamar backcountry, was the arnica. It was just a sea of yellow. I had never seen that much arnica before. But after two or three years, the flowers were pretty much gone. Arnica must really respond after a fire. It's things like that that really fascinate me. Another thing that really impressed me



Lamar River Trail looking up Cache-Calfee Ridge pre-fire, 1966.



Lamar River Trail looking up Cache-Calfee Ridge, July 1997.

after the East and Grizzly fires in 2003 was that as I was walking the Thorofare Trail from the Nine Mile trailhead, everything looked black, but when I dug down below that black area, I didn't go more than a centimeter or two before I found perfectly unburned soil. I did a little cross-section and took pictures to show where the soot was and where the unburned soil was. I told my students, this looks really awful, but a lot of plants have underground parts. However bad it looks on the surface, underground—unless it was something like the Norris blowdown area, where the fire sat and really cooked everything—there's no problem.

YS: Many resource specialists predicted the Norris blowdown would not support much vegetation of any kind for decades following the 1988 fires because all of the organic material in the soil was consumed by the fire. Contrary to expectations, the area proved to be optimal for lodgepole pine seed germination, and the growth rate of established trees is far greater than adjacent stands that burned but were not affected by the wind storm.

JB: I looked at growth rates in various places, too. I did a series of measurements on tree height and looked at the distance

between the branches. There was one particular tree just south of Norris Junction that I couldn't measure any more because I couldn't get my measuring tool up to the top of the tree. I finally had to give up when it was 22.77 feet tall, and it couldn't have been from before 1988.

I was also looking at onset of reproduction. How old the trees were when they first started to produce cones. I was seeing them as early as seven years post-fire. I've been told that lodgepole has what's called a weedy growth habit. It begins to reproduce very quickly compared to a lot of other conifers.

YS: In your work, do you see successional changes in taxa or insect functional groups similar to those seen by botanists as some plants dominate at one point and then give way to others?

JB: I don't think we really know. I have been asked how the fires in 1988 affected flying insects like horseflies. I honestly don't know. I suppose smoke and fire would have killed some of them, but I have no idea what effect, if any, that's going to have on insect populations over the long term. Obviously, the types of plants that are available after a fire will be utilized by the types of insects that can utilize them. As there are changes in flora over time, I suspect there will be changes maybe not in species, but certainly in populations of insects.

Landscape Changes

YS: After coming here for so long, what are the most significant long-term trends you've noticed?

JB: I wasn't thinking very ecologically when I was working at Fishing Bridge. But I think what's most impressed me about change in the park is the difference between how the forest looks now and how it looked back in the 1950s and 1960s, when almost the entire park was closed canopy lodgepole, particularly down in the interior, and almost nothing was growing on the forest floor.

The other thing that really impressed me was looking at the forest from the air. It was a total revelation—not just the burn mosaic, but also flying over unburned areas and seeing different age classes in stands. You're thinking this is a lodgepole pine forest—and it is—but it's not even-aged forest. It's a whole mosaic of different age groups, and you can see that from the air. You may not be able to determine exactly how old each patch is, but you can tell that one patch over here is much older than another over there. I have some beautiful pictures showing these old, scraggly trees and then there's this big patch of brighter green, younger trees in amongst all the old ones.

YS: There's phenomenal growth in some of these trees. In some areas, the densities are as high as 50,000 trees per acre. They're stacked in like sardines.

JB: They finally put up those signs saying, "naturally reseeded by fire in 1988." In 1990, a lot of people were appalled

because there was almost nothing there at that time. Or they were shaking their heads, saying, how could they let this happen? It's terrible. I don't hear that anymore. The landscape is so different now, even than it was 5 or 10 years ago, that people are beginning to be a little bit more impressed. The other thing that they want to know is how much work it must have been to replant all the trees. You get tired of saying, no we're not the U.S. Forest Service; we're not going in and reseeding.

Biting Flies

YS: We'd like to talk about insects. You've already written two insect articles for *Yellowstone Science*.

JB: I wrote those two on my specialty, biting flies. I was out in Lamar [in summer 2006] talking with ranger Brian Chan and he said they were just awful. [Former Yellowstone biologist] Mary Meagher said that up in Cinnabar Basin she didn't even want to go outside this summer because they were so bad.

YS: They bite people's hands.

JB: Snipe flies like the wrists and between the fingers. Some people call them sticky flies. Some people call them buffalo flies. There's a fellow out at Silvertip Ranch who called them "those little gray bastards."

YS: It was just miserable about the second or third week of July this year.

JB: That's about the time when they seem to be the worst. The second summer I was out in Lamar, 1967, it was a horrible year. I'd go up to Cold Creek, then head up to upper Lamar and run into bands of them. They'd be there, then they'd go away for a while, then they'd come back again further down the trail.

YS: What do we know about their life cycle?

JB: In the immature stages, they're in the soil, but there's not a lot known about exactly what sorts of habitats they prefer. It's really like a black hole as far as the immature stages go. Nobody really knows where the eggs are laid, whether on the ground or in low vegetation. I've seen articles suggesting that they prefer moderately damp soil, often associated with the understory of various trees. For example, out at Lamar, you might find them underneath aspen groves, where there's some moisture. I spent the better part of a week in various areas around the Buffalo Ranch trying to find immature stages. I never found any, but it's like looking for a needle in a haystack. Horseflies are much easier. They like the margins of ponds, so you can dig there and find those with no problem. Snipe flies are terrestrial. The immature stages are predators, feeding on other small invertebrates—as far as we know.

They go through a single generation each year. The adults come out in late spring or early summer. Like most of the so-called lower flies, the males don't bite—only the females. Males probably live only for a week or two. Nobody knows anything about mating behavior, but afterward, the females will search



John Burger collecting black flies.

for blood. They probably feed primarily on the larger mammals—elk, deer, whatever else might be around—bison and people. Deer are just tormented by these things. We have a tail-flicking index. You can tell the severity of biting flies by the number of ear flicks or tail switches per minute. You can drive by an area and, depending on what the tails are doing, you can determine what the situation is out there. At Mammoth, in the evening, sometimes the ears on the elk are just going a mile a minute. That's a good index for activity.

These periodic population irruptions are strange. One or two other people and I have tried to puzzle out what sort of combination of environmental factors might contribute to the occasional really large population. In most years, it seems like they're around but not a problem. People have tried to look for patterns—whether it's "x" number of years in between, for instance. The most important thing, in my opinion, is some combination of environmental features in a particular year. One idea was that the climatic conditions in the previous fall, when the immature stages are developing, might be important: a dry fall followed by a wet spring, or a wet fall followed by a dry spring. The only way to know for sure would be to go back and look really closely at climatic records. But I don't think it's ever really been done.

YS: The years 1967, 1994 (when you wrote the *Yellowstone Science* article), and 2006 were really bad. It seems like once a decade they really catch people's attention.

JB: They're always there. It's when you get the swarms that

everybody seems to notice and complain about it. Is it snow-pack? Moisture in the soil? Who knows? They belong to an insect family called Rhagionidae, almost all of which are non-biting. The only two genera that feed on blood are this one and a genus called *Spaniopsis*, which occurs in South Africa. There's a very large variety of genera in that family. I've seen quite a few in Yellowstone in the past; some of them have an alternating color pattern and some are very colorful, with orange thoraxes or black-and-white abdomens. There are three major species in this area. One is sort of grey, with three yellowish-brown stripes on the thorax. The other one is a darker grey, almost brown. Then there's a black one that you usually find at higher elevations. It's not nearly as abundant. The grayish one with the stripy thorax is found at lower elevations, like Lamar. The greyish-brownish fly tends to occur at higher elevations, like 7,000–8,000 ft. The black one tends to occur, for example, on Parker Peak. I used to see them up on the eastern boundary there, the shiny black ones.

YS: The genus is widespread.

JB: It's worldwide, but is primarily in North America.

YS: After the adult females get a blood meal, that helps them complete the reproductive cycle?

JB: Right. After the females of most of these kinds of flies—including mosquitoes, black flies, and horseflies—have mated, the ovaries go through a series of stages, 1–5, with 1 being the initial state of the ovary and stage 5 being the fully formed egg. The ovary is divided into many different sections called ovarioles. Each ovariole eventually will develop an egg. After the ovaries reach a certain point between stages 1 and 2, they arrest—just sit there and do nothing. This triggers all sorts of hormonal mechanisms that in turn trigger the host-seeking behavior. They look for movement. Once they get a complete blood meal, then each of the eggs will begin to go through the various stages. At stage 5, the eggs are ready to be deposited.

YS: Once the female deposits the eggs, does she die?

JB: It depends. Most of the work has been done with mosquitoes, some of which tend to be fairly short-lived. They may go through one or two ovarian cycles. A much lower percentage of females manage to get through three or four cycles. It's a pretty dangerous world out there. Climate, predators, birds, diseases, parasites; all sorts of things can affect their survival. The record number of cycles that I remember seeing for mosquitoes is about five. That's really rare; it'd have to be a darned lucky female. That has not really been studied in snipe flies, so I am not certain whether there is a more finite number of possible ovarian cycles in snipe flies.

Insect Repellent

YS: Is there any form of insect repellent that's effective against these flies? Even DEET doesn't seem to work.

JB: I've actually worked on that a little bit out in Lamar. I have all these herbal, natural compounds that supposedly work

better than DEET. And they're not toxic. DEET is nasty, if only because it's a plasticizer, and if you have it on your hands and touch something that's vinyl or has plastic in it—like the dashboard of a car—you stick to it. One thing I tried in Lamar that actually worked fairly well, but only for a short time, was citronella. There are a number of repellents that have citronella oil in them. I'd sit out behind the residence at Rose Creek, which is a great place for snipe flies, and I'd put DEET on one arm and citronella on the other. The citronella would work really well for half an hour, maybe 45 minutes. After that, they started coming again, but it did work to a point. There are a number of natural repellents that have come on the market in the last 10–15 years, some with oil of peppermint or oil of cloves. They're called aromatic oils, and they appear to have some effectiveness. A new material that's been out in Europe for 5–10 years is called picaridin. It's supposed to be as good as DEET if not better, without the plasticizing effect and unpleasant odor. It's becoming available, but is still hard to find.

YS: Aren't there also health concerns associated with DEET? It seems like most of the supposedly strong repellents these days are only maybe 30–32% DEET.

JB: I used to know of some products that were 95% DEET. They were recommended for people who had to be out in the woods all day long, exposed to high concentrations of whatever biting insects were out there. Those products are extremely unpleasant for a number of reasons. Number one, again, is that if you touch anything, you're going to make a big mess. Second is that I saw some studies indicating that they cause numbness in some people—sensory effects. The other thing is that exposure to mucus membranes—your eyes, mouth, nose—is painful. If you have it on your hands and you rub your eye, it's just absolutely horrible. Twenty-eight percent is about as high as you want to go, and I would recommend even lower concentrations.

Human Health and Wildlife Diseases

YS: Are there any human health concerns associated with any of those biting insects?

JB: A species that's a vector of West Nile Virus occurs in the park, *Culex tarsalis*. But I'm not certain how abundant it is in the park. I did find it in Frying Pan Spring one year. Some of the pools there aren't as hot as some of the others, but I remember thinking, mosquito larvae in Frying Pan Spring? I mean, whoa! But that's what it turned out to be—*Culex tarsalis*. Rocky Mountain Spotted Fever might be another thing, depending on whether ticks are enough of a problem here.

YS: Every now and then you see a deer in hunting season [October] that's really loaded with ticks.

JB: Oh, winter ticks—*Dermacentor albipictus*. That's a really interesting beast because unlike most ticks, which feed and then drop off, that tick actually stays on the animal through all of its life cycle, from larva to adult. Not only that, but the

deer also can go through areas and pick up really large numbers of them. I've seen masses of those things on elk, for example.

YS: Here in the park?

JB: Yeah, in Lamar. Sometimes they get so bad that they actually cause the animal's hair to drop out; it's almost like scabies, really nasty. They can get enormous numbers, and

hang out up on the eastern boundary most of the summer when it was hot down below, and I got several specimens of face fly in 1967. So I knew the fly was at least in Yellowstone. The question was, would it become abundant enough to really become a serious problem, and as far as I know it hasn't.

[O]ften when I'm coming back from hiking in Pelican Valley, people are asking, "did you see any animals?" I say, "lots of animals." "Oh, what did you see?" "Well, butterflies, bees, flies." "Oh. Okay." And they walk off.

I strongly suspect that that may be a real problem in terms of energy drain, particularly in the winter when animals are stressed anyway. There has been some indication that winter stress also may be a factor in the numbers that you find on the animals. Some people have said that animals that are in poor condition tend to move around less. Because they lie around more, they may be more susceptible to getting ticks on them, and so tick numbers sometimes correlate with an animal's condition. So you could say, aha, the animal's in poor condition because of all the ticks! But maybe there are a lot of ticks because the animal's already in poor condition. So we don't really know for sure.

YS: How about wildlife diseases?

JB: There's plague, which of course you get periodic outbreaks of in ground squirrels and prairie dogs. I've never heard of plague up here, but it's possible it could be endemic. It certainly is established in large areas of the West, and every once in a while you hear about occasional human cases that pop up here and there.

One thing I studied while I was here was face flies (*Musca autumnalis*), an introduced fly from Europe that came into eastern North America in the early 1950s and spread across the entire country. They were associated with cattle, initially. The flies gather around the eyes and other mucous membranes, and feed on secretions around the eyes, mouth, and nose. In addition to looking at bison here, I went up to the national bison range in Moiese, Montana, and looked at flies on the bison up there, because that's a captive, or at least fenced, population. They were having severe face fly problems up there; in fact, they actually had bison whose eyeballs were erupting because of the irritation from a fly-transmitted bacterium that infects the eye. The animals go blind. And so I said, okay, I've got to find out if this fly has reached Yellowstone or not. So I started looking for it, and eventually I found it. It was way up on the Cache-Calfee Ridge, up in the Lamar backcountry. There would always be a group of maybe 50 to 75 bison that would

Exotic Insects

YS: Do you think we have a lot of exotic insects here?

JB: You certainly do have some, because some of these insects are adaptable to different kinds of animals, ungulates particularly—you have cervids as well as bovids. The introduced insects probably came in back in the 1800s, but they're probably not of any real concern. I don't know if you have houseflies here, but that's an introduced species.

YS: What about ladybugs?

JB: I wouldn't be surprised. A lot of ladybugs were introduced intentionally in various areas and spread all around.

YS: There's been talk about introducing exotic insects for exotic weed control; do you have any thoughts on that?

JB: Well, okay, let's say you don't like thistle. You've got these nasty old thistles growing all over the place because horses have pooped all along the trails for however many years. We have this wonderful insect that really controls thistle well. Well, that's nice except what are you going to do when it goes from the introduced thistle to the native thistle? That is, once it



Burger at Lower Miller Creek cabin.

runs out of one thing to eat, what's it going to do? Is it going to die out, or is it going to move to something else? And quite frankly, sometimes we don't really know. Sometimes unintended consequences are very painful. There is an example in the east—I don't know if you've heard of the Halloween lady beetle (*Harmonia*) or not, but it is a species of lady beetle that was introduced to control aphids on various kinds of crops. They tried a number of times to get it to establish and apparently couldn't, but then finally, all of the sudden, it started appearing in larger and larger numbers until now the numbers are huge. And they have this tendency to go into people's houses in the wintertime by the thousands. And so you've got people calling up and saying, we've got thousands of these lady beetles in the house—what do we do? How do we get rid of



Fritillary (*Nymphalidae* family) on aster.

them? And apparently they have adversely affected some of the native lady beetle species in terms of competition. And so again, you've got a situation where, number one, they're actually a pest in terms of humans in some cases, and in others they are apparently decimating the native lady beetle populations. So we've solved our problem with pea aphids—sure, okay. Now what?

Insect Inventory and Monitoring

YS: Here in Yellowstone, there's been lots of work done in relation to the larger mammals, but less on insects, especially given their numbers and diversity. Can you address what it is we think we know or, more importantly, what we don't know about insects in this part of the world?

JB: I've thought about that a lot. When you come to Yellowstone you think elk, bison, bears, wolves. This happens very frequently—often when I'm coming back from hiking in Pelican Valley, people are asking, "did you see any animals?" I say, "lots of animals." "Oh, what did you see?" "Well, butterflies, bees, flies." "Oh. Okay." And they walk off. I think most people who come here just visiting have heard about the charismatic megafauna, and that's what almost all people focus on. But if you look at ecosystems, you start thinking about how many insects there are in Yellowstone relative to other animals. We probably don't know even within an order of magnitude how many there are. If you were to ask me for a number, I would say many thousands, but that would just be a guess. I

usually try to be fairly observant when I'm out hiking, particularly when there are lots of flowers out, because there's all sorts of insect activity. Black horseflies circling around. Stuff flying around and landing on flowers. Snapping grasshoppers. Somebody asked me the other day why they make that noise. I get asked that fairly frequently. I said, you know, I'm not sure anybody

knows whether it's an alarm or whether it's something else. I've heard a couple of explanations. In some years you get huge numbers of Mormon crickets. Like a lot of other insect populations, they sort of fluctuate over time.

I sometimes wonder if it's possible to get any reasonable estimate of diversity here. I suppose you could, but it would be a big, big job. You'd almost need a group of people to do a "bioblitz" [a rapid assessment of as many species from as many taxo-

mic groups living in a particular area at a given point in time as possible, often conducted over a 24-hour period by scientists and volunteer members of the public] to try to catalog numbers in a particular geographic area. Those are becoming more and more popular. Acadia National Park has had a number of those over the years. Each year they'll pick a certain order of insects, whether it's beetles or flies or bees and wasps, and they'll get as many specialists as they can to come in and spend about five days intensively looking at everything. It's similar to a Christmas Bird Count, but much more challenging.

YS: Are there key insect species that you think we should be monitoring, so that in 10 years we don't look back and say, gosh, we wish we had some data on that?

JB: It would have to be something that is relatively sensitive to whatever changes are of concern here.

YS: Having an inventory might be a first good step.

JB: There was a fellow from England, Adrian Pont, who came to Yellowstone and the Tetons one summer and was so enamored that he came back for several summers. He happens to specialize in muscid flies, which are not very well known or well studied, and he gave me a list that's about 25 pages long of all the species that he found in both parks.

YS: Great Smoky Mountains National Park recently started an all-taxa biological inventory.

JB: I've been involved in it. I've done all the horseflies. Here in Yellowstone, there are representatives of all the species I've collected down in the HRC collection. In fact, they even put my name on one of the drawers. But I have all the

mosquito species, all the horseflies, deerflies, and snipe flies.

YS: How many mosquito species did you collect?

JB: There are more than 30 species known in the park; I probably collected two-thirds of them at one time or another. Or they collected me! I collected larvae, too, when I got here early enough in the spring. They're actually easier to identify than the adults are.

Simple Answers

YS: You mentioned grasshoppers. Given the rich history of grazing issues about how many elk the northern range can support, it's mind-boggling to think about the biomass of grasshoppers out

certain kinds of plants. In most cases that I'm aware of, at least a few insects manage to somehow circumvent that plant defense. In fact, one of the ideas involving what people sometimes call co-evolution is that there is a sort of arms race going on with insects evading a particular response from a specific plant. The plant responds either by producing more or different compounds that make it unpalatable. Then the insects somehow evade or detoxify the materials. It's a little bit like insecticide resistance. In terms of large herbivores, the underground parts of the plant are often adapted to grazing and, in fact, grazing actually stimulates plant growth.

All these people who say the northern range is overgrazed, what does that

People want to try to reduce things to simple factors, and I'm a process person. I'm always wary of what I call simple answers to questions that may not be so simple.

there and how much plant matter they consume.

JB: It's huge. All you have to do to realize it is walk along for five minutes and count the number of grasshoppers that are only on the trail. Never mind how many are out there that you don't see. I saw some speculation about the amount of plant material consumed by grasshoppers relative to elk or bison. And they're not taking a huge volume, but it's the numbers that add up. What if you heard somebody say, "There's too many grasshoppers; we're going to have to cull the grasshopper population"?

YS: Plants obviously can't get up and run away from an herbivore, but they can do some really unique things. What have we learned about how plants respond or react to insects by creating chemical defenses against herbivory?

JB: Insects can stimulate plant defenses—for example, the production of certain types of toxic molecules that prevent most insects from feeding on

mean, exactly? What criteria do you use? Some people say, well, there aren't as many willows as there used to be. You go down to Pelican Creek where it goes into the lake, and there are no willows at all. I have pictures, taken in 1960, of two great big moose feeding on these enormous willows growing all along Pelican Creek. What happened to the willows? Overgrazing? It turns out that the caldera is tilting, and the water levels are going up in some areas and down in others. The water levels and the flow there are completely different than they were in 1960. Looks to me like the willows have simply been drowned out. No willows, no moose.

YS: It seems like more and more people are beginning to recognize that landscape changes are often the result of things like hydrological, climatic, or geological shifts, instead of more obvious, visible drivers like elk grazing—that identifying the reasons for landscape change is more complex than simply



John Burger on Parker Peak, his favorite spot in the park.

comparing a couple of photos.

JB: Wolves are the other visible driver that people like to point to. We're seeing more willows now. Why is that? A simple explanation is that elk never had anything to worry about in terms of predators, but now they have to worry about wolves, so they're not spending as much time grazing the willows as they used to. So the wolves are responsible for the new willow growth that we're seeing. People want to try to reduce things to simple factors, and I'm a process person. I'm always wary of what I call simple answers to questions that may not be so simple. It's interesting to think that those things might be happening, but I'm always a little wary about saying, "that's the answer."

YS: Is there anything else we should know about insects in Yellowstone?

JB: One thing I've always been intrigued by is that you're not allowed to kill animals in the park; does that include mosquitoes? Does it include snipe flies? Horseflies?

YS: Do you plan to continue coming back to the park?

JB: As long as I can get around! It's going to be pretty hard to keep me away from here as long as I can walk on two legs.

YS

Trailing Theodore Roosevelt Through Yellowstone

The Written and Visual Records of Roosevelt's 1903 Yellowstone Visit

Jeremy Johnston



THE PRESIDENT, MR. BURROUGHS AND "BILLY" HOFER ON THE TRAIL FROM HELL ROARING TO STERN CREEK.
Copyright, 1903, by *The Illustrated Sporting News*.

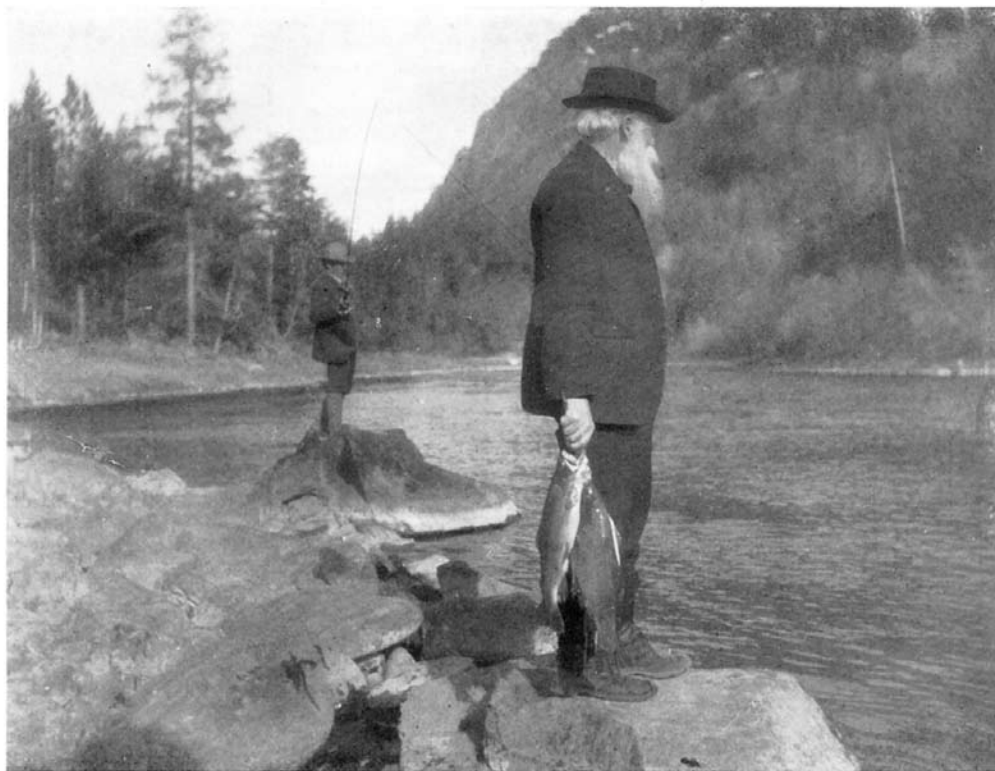
Theodore Roosevelt, John Burroughs, and Elwood "Billy" Hofer near Hellroaring Creek. This image appeared in *The Illustrated Sporting News* in an article by Lindsay Denison.

THEODORE ROOSEVELT'S VISIT to Yellowstone National Park in 1903 marked the most extensive presidential visit to the region, yet only four detailed primary narratives and very few visual images recount Roosevelt's extended visit within the park boundaries. A number of photos and press accounts covered Roosevelt's arrival and the famous dedication of what would become known as the Roosevelt Arch; however, due to Roosevelt's desire to escape the public's prying eyes while he camped within Yellowstone, Major John Pitcher and the soldiers under his command greatly limited any public access to Roosevelt's campsites. As a result, no newspaper reporters or bystanders managed to witness Roosevelt enjoying his private camping trip through the park. Roosevelt and his companions, who included John Burroughs, Elwood Hofer, and Major John Pitcher, did write first-hand accounts of their visit, and a number of these have been reprinted in various formats, all of which offer a good literary narrative of the visit. Yet surprisingly, very few photos were taken of Roosevelt and his colleagues camping in the park, and only a minute number of these images have been circulated to a wide audience.

In 1906, John Burroughs, a famed naturalist writer, published his first-hand account, "Camping with Roosevelt," for *The Atlantic Monthly*. In 1907, Burroughs published this same narrative with an additional account of his other encounters with Roosevelt in the book, *Camping and Tramping with Roosevelt*. Both John Pitcher and Elwood Hofer, who previously guided Roosevelt through the Yellowstone region in 1891, wrote very brief accounts of the president's visit. Hofer's account, "The President's Park Trip," appeared in *Forest and Stream* on June 13, 1903. Pitcher kept a diary of the trip and allowed it to be published in an article for the *Avant Courier* on May 8, 1903. Pitcher's diary of the trip was again published in 1910 in a book by Addison C. Thomas, *Roosevelt Among the People*, which covered Roosevelt's entire 1903 nationwide trip. In 1904, The Boone and Crockett Club first published Roosevelt's account of his visit to Yellowstone, "The Wilderness Reserves." This article appeared in *American Big Game In its Haunts*, a collection of various hunting narratives written by Boone and Crockett Club members. The periodical, *Forestry and Irrigation*, reprinted Roosevelt's story in June 1904 and it appeared in print again with Roosevelt's book, *Outdoor*



PRESIDENT ROOSEVELT AND MAJOR PITCHER.



“OOM JOHN.”

The pictures above appeared in *American Big Game In Its Haunts*. Top: Roosevelt in camp with Major John Pitcher. Above: John Burroughs with a fishing companion. Roosevelt affectionately referred to Burroughs as “Oom John” (oom is Dutch for “uncle”).

Pastimes of an American Hunter, published in 1905.

Due to the Major John Pitcher's efforts to fulfill Roosevelt's request of being isolated from the public and the press during his visit, only a few images of Roosevelt's visit to the park exist and very few of these images have been reprinted. It appears that Major John Pitcher was the only photographer during Roosevelt's private trip through Yellowstone. According to a letter written by B. E. Parke to the Roosevelt Memorial Association, he "was told that each of the party received prints [of Pitcher's photos] after which the negative was destroyed" (Theodore Roosevelt Collection, Harvard University).

A number of Pitcher's photographic images were first printed in an article by reporter Lindsay Denison, "The President in Yellowstone Park," which appeared in the short-lived sporting magazine *The Illustrated Sporting News*, which remained in print only from the year 1903 to 1906. According to Denison's article, Pitcher gave permission to reprint the images appearing in the article solely to *The Illustrated Sporting News*. Due to the short run of this magazine and its limited audience, Denison's article containing Pitcher's photos remained relatively unknown to researchers. Today, only a few original copies of this article exist in archival repositories. Both Roosevelt's and Burroughs' accounts also contained a few more of Pitcher's photographic images detailing Roosevelt's trip, including some of the same photos that were printed in *The Illustrated Sporting News*. Another small



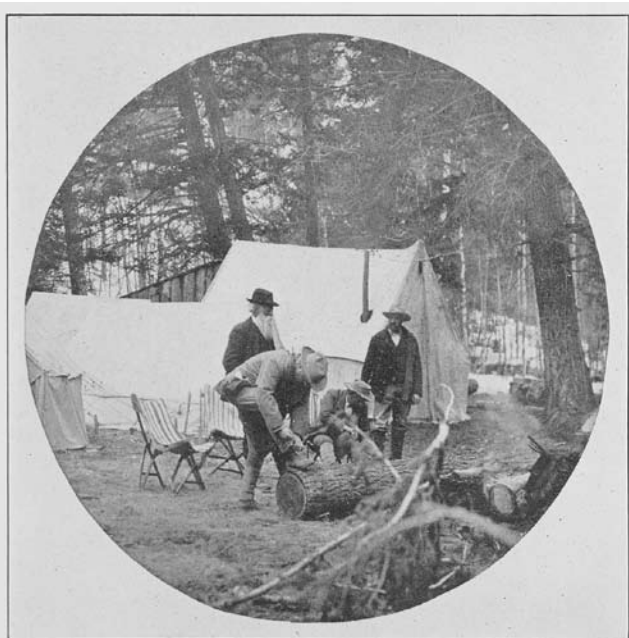
A HARD TRIP THROUGH THE SNOW.

Copyright, 1903, by *The Illustrated Sporting News*.

Roosevelt (at the front with the sleigh driver), John Burroughs, and H. W. Child (at the back of the sleigh). During the sleigh ride, Roosevelt bolted from the sled and captured a mouse under his hat, believing it to be an unknown species.

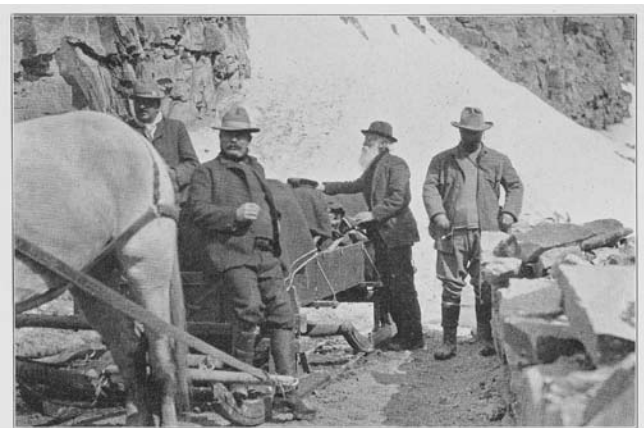
group of Pitcher's photos are housed in the Theodore Roosevelt Collection at Harvard University and many of these images have never been published.

Another collection of photos from Roosevelt's trip were published by Doris Whithorn in her book, *Twice Told on the Upper Yellowstone*, volume I. Whithorn writes, "contrary to orders, an enlisted man accompanying the presidential party to the camp near Tower Falls, carried a camera and used it. The negatives were entrusted to the Mammoth storekeeper, Ole



THE PRESIDENT PREPARING FOR A TRAMP IN THE WOODS.

Copyright, 1903, by *The Illustrated Sporting News*.



PASSING THROUGH THE GOLDEN GATE.

Copyright, 1903, by *The Illustrated Sporting News*.

Left: Roosevelt hiked many miles to view wildlife during this 1903 trip. On one occasion, he hiked 18 miles solo, causing Pitcher much worry. Above: The group walks a dry segment of road in the Golden Gate area. The images on this page first appeared in *The Illustrated Sporting News*.



THEODORE ROOSEVELT COLLECTION, HARVARD COLLEGE LIBRARY

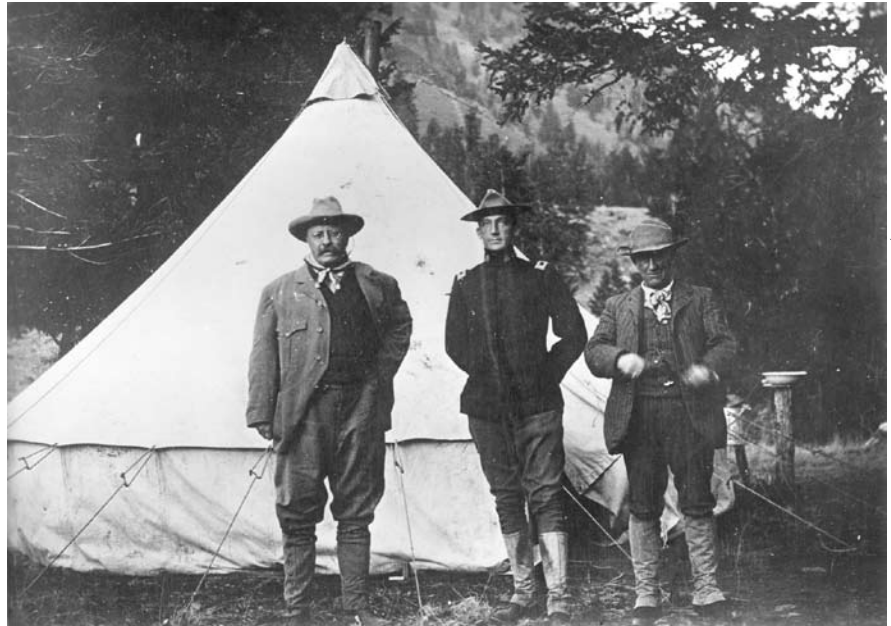
Roosevelt, dressed for a hiking trip.



NPS

In *Twice Told on the Upper Yellowstone*, by Doris Whithorn, Major Pitcher (left) was mistakenly identified as Theodore Roosevelt. It's likely this photo was taken with Pitcher's camera, not by an enlisted man, as Whithorn suggested.

Anderson, but were never reclaimed. Ole's son gave them to Clarence Scoyen, and he loaned them to Bill Whithorn for producing the first prints in 1975." (Whithorn, page 37). It is the opinion of this researcher that Whithorn's images were also taken by Major Pitcher's camera and not that of an enlisted man's, especially since Pitcher, who is mistakenly identified by Whithorn as Roosevelt, appears in one of the photos. Due to the strict nature of the isolation provided to Roosevelt by Pitcher, it is unlikely that any secret camera was used by a soldier to take an unauthorized photo, especially of the commanding officer who issued the restrictions. For some unknown reason, Pitcher must have left these images with Anderson who then passed them on to his son. Since many of these photos included



THEODORE ROOSEVELT COLLECTION, HARVARD COLLEGE LIBRARY

Left to right: Theodore Roosevelt, Lieutenant Dorsey H. Cullen, and Elwood Hofer. Lt. Cullen served during the Spanish American War and fought in the Philippine Insurrection, and was honored to accompany Roosevelt in Yellowstone.

Roosevelt's companions posed with elk antlers and a bear skin rug, Roosevelt and Burroughs would not have wished to use them to illustrate their narratives. Both men cautiously avoided any slight suggestion that Roosevelt hunted any wildlife in the park in his isolation due to the president's advisors worrying about any possible public outcry that would taint Roosevelt's visit.

Reprinted here are the photographic images taken by Major John Pitcher that first appeared in the article by Lindsay Denison and in Burroughs' and Roosevelt's accounts. Also included are the previously unpublished photos from the Theodore Roosevelt Collection located at the Houghton Library at Harvard University. Many of these images have not been seen by the general public since they appeared in their original publications. The combined collection of these images offers the most complete presentation of Pitcher's photos documenting Roosevelt's visit to Yellowstone. Together, they offer a rare and intimate perspective of Roosevelt and his fellow companions relaxing in Yellowstone National Park.

Acknowledgments

The author extends his appreciation to Wallace Fine Dailey, the curator of the Theodore Roosevelt Collection at Harvard University, and George Rugg, the Curator of Special Collections at the University of Notre Dame, for providing many of the images reprinted here.



Jeremy M. Johnston was born and raised in Powell, Wyoming. He received his BA and MA from the University of Wyoming. His master's thesis is entitled, "Presidential Preservation: Theodore Roosevelt and Yellowstone National Park." Jeremy teaches Wyoming and Western history, including a college level course on the history of Yellowstone National Park, at Northwest College. His writings have been published in *Readings in Wyoming History*, *The George Wright Forum*, *Yellowstone Science*, *Points West*, and various regional newspapers.

YS

BOOK REVIEW

A Ride to the Infernal Regions: Yellowstone's First Tourists

by Calvin C. Clawson,
Edited by Lee Silliman

Tamsen Emerson Hert

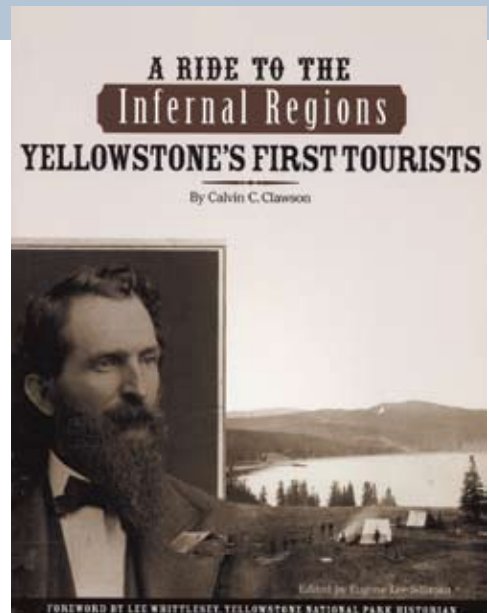
(Helena, MT: Riverbend Publishing, 2003. 136 pages, 13 photos, 1 map. ISBN 1-931832-18-8.)

THE ASTONISHING FEATURES of what was to become Yellowstone National Park were described by such men as Jim Bridger and John Colter. Their stories of the Yellowstone, considered “tall tales,” were finally verified by scientific explorations in 1869, 1870, and 1871. In 1871, Calvin C. Clawson of Deer Lodge, Montana, and five of his associates decided to see the wonders for themselves. This group of six unwittingly became the first tourists in the world's first national park.

Members of the party included C. C. Clawson of Deer Lodge, Montana, and editor of the town newspaper; Rossiter W. Raymond, editor of the *Engineering and Mining Journal* and U.S. Commissioner of Mines and Mineral Statistics; Frederic A. Eilers, Deputy Mining Commissioner; Josiah S. Daugherty of Wabash, Indiana; Gilman Sawtell, resident of the north shore of Henry's Lake, Idaho (15 miles from the present boundary of Yellowstone National Park), and the guide for the group; and Augustus F. Thrasher of Deer Lodge, Montana, photographer.

As stated in the introduction “...their avowed goal was to see the ‘Spouting Geysers...the lake, canyon, cataracts, and hot-springs of the Yellowstone’ that others before them had amply described—rather than explore new territory or further establish the veracity of the their predecessors...” With the Hayden Expedition still in the park at the time of the group's departure, there were no maps available to show them the way. No map is mentioned in their accounts. They did have a description of the Upper Geyser Basin from Nathaniel Langford's articles published in *Scribner's Monthly*.

Interestingly, the group missed the Upper Geyser Basin, viewing only the Lower Geyser Basin before heading across country to Yellowstone Lake and then on to the Grand Canyon of the Yellowstone. Along the route they did encounter Gustavus Doane of the Hayden Expedition who directed them to the Upper Geyser Basin, which they visited on their return to Virginia City. Another interesting note is that A. F. Thrasher was the photographer; yet the volume is not illustrated with any

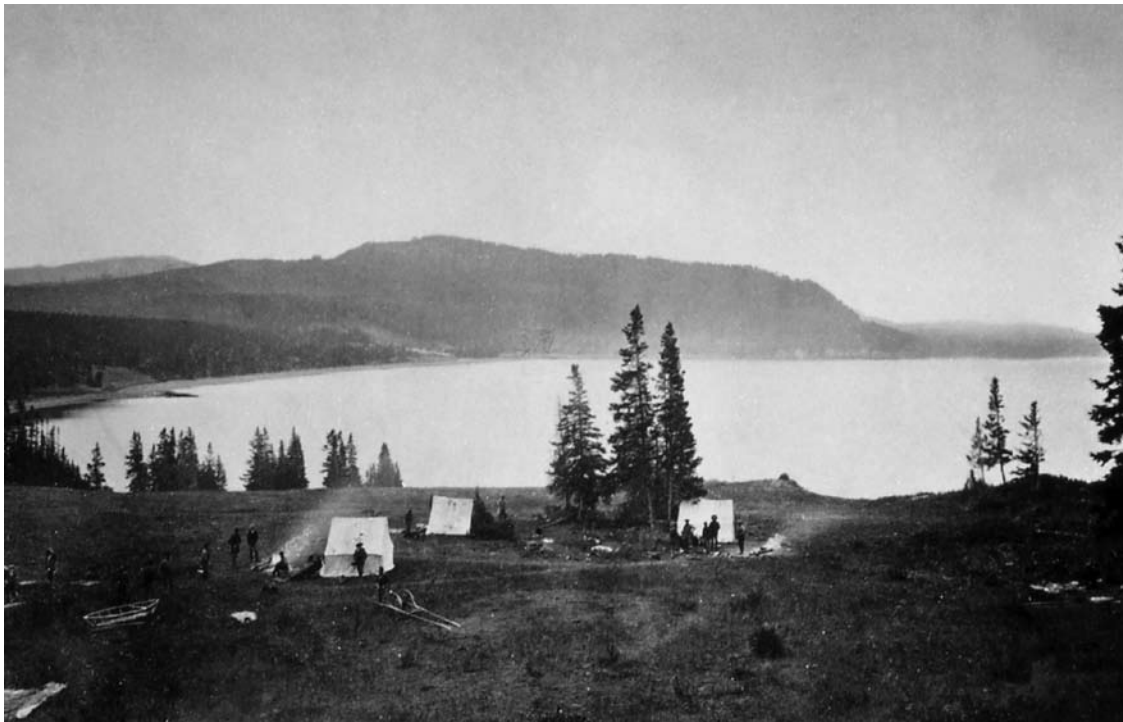


of his photographs. In fact, none have been found, or it is likely that his early images of the Yellowstone would be comparable to those of William Henry Jackson, whose photographs are used to illustrate this work.

Lee Silliman discovered a gem when he unearthed the account of this 1871 visit in the Deer Lodge, Montana, *New North West* newspaper. This rare account of the journey has not been republished since its original appearance in seventeen installments between September 9, 1871, and June 1, 1872. The reprinting of the installments here attempts to reflect the original newspaper format.

More than the simple reprinting of a series of newspaper articles, Mr. Silliman enhances the value of this account with his annotations and supplemental material. The lengthy introduction gives the reader background on the trip; biographical material on the six travelers; details about the route; and describes the party's encounters with wildlife as well as their thoughts about Native Americans.

The text itself is divided into the



Hayden survey in “earthquake camp” on the east side of Yellowstone Lake. On the night of August 19, 1871, slight tremors were felt. Photo by William Henry Jackson.

installments as they originally appeared under four separate titles: “Notes on the Way to Wonderland: A Ride to the Infernal Regions”; “In the Region of the Wonderful Lake”; “In Wonderland: The Region of the Wonderful Lake”; and “In Wonderland: The Region of the Enchanted Lake.” Throughout the text Silliman provides valuable information through the use of footnotes. Unlike the typical format, where footnotes are printed at the bottom of the page, here the footnotes are printed in a column which parallels the text. This makes it exceptionally easy to check the footnote and not lose your place—very easy to read!

The reader will learn a great deal about the early days of Yellowstone as Clawson describes the travel, geography, thermal features, and more. In many instances the text is clarified or enhanced by the comments in the notes. For example, in using “Wonderland” in the title of the installments, the reader learns from Silliman that this is the first public use of that term in describing the Yellowstone region. It is equally interesting to read Clawson’s comments on the commercial value he

sees in some of the thermal features—a topic that is being discussed in present day.

But this is more than Clawson’s account of the trip. Silliman included additional material in five appendices that are accounts by other trip members, Rossiter W. Raymond and A. F. Thrasher, as well as an editorial presumed to be written by Clawson in support of the bill proposing the establishment of Yellowstone as a national park. This additional commentary fills in some of the gaps in Clawson’s text.

The only criticism I have for the work is the lack of one additional map. It would have been nice to have a map of the route from Virginia City to Henry’s Lake to the Madison River. I pulled out a Montana highway map to locate Deer Lodge and the approximate route to the park. Finally, in the bibliography there are a couple of errors. One is the repeated entry of one citation, and the other is that some of the sources cited in the footnotes were not listed in the bibliography.

This is an excellent read for anyone with an interest in Yellowstone. Historians as well as geyser gazers and every-

one in between will be intrigued by the descriptions provided here. So, follow Lee Whittlesey’s recommendation in the foreword, “...curl up somewhere in a warm place, pretend it is 1871 and enjoy C. C. Clawson’s fascinating tale of pre-stagecoach Yellowstone.”

YS



Tamsen Emerson Hert is the Wyoming Bibliographer at the University of Wyoming Libraries. Her article, *Luxury in the Wilderness, Yellowstone’s Grand Canyon Hotel, 1911–1960*, which appeared in *Yellowstone Science* 13(3), won the Wyoming State Historical Society award for best article.

FROM THE ARCHIVES



THE PRESIDENT AND MR. BURROUGHS NEAR A GEYSER.
Copyright, 1903, by The Illustrated Sporting News.

Theodore Roosevelt with naturalist John Burroughs observing a geyser. This image appeared with Lindsay Denison's article for *The Illustrated Sporting News*.



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Theodore Roosevelt's Camping Trip
Yellowstone's First Tourists



Arnica cordifolia one year after a mid-1970s fire.

Coming this spring, *Yellowstone Science* explores wildlife diseases in the Greater Yellowstone area.

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