

The Black Range Naturalist

A close-up photograph of a green plant stem with several pale yellow flowers and buds. The flowers have a distinct shape with a flared, lobed corolla. The buds are elongated and pointed. The background is a soft-focus mix of a blue sky with light clouds and a brown, textured ground surface.

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In This Issue

Recipe for Homemade Christmas Bird Count by Kathleen Blair

Ever been on a Christmas Bird Count? Ever wonder how it came to be, how and why the area of the count was selected? Dr. Kathleen Blair provides an intriguing account about how she went about establishing the Hillsboro Christmas Bird Count, first held last December. Dr. Blair received her Ph.D. in Ecology, Evolution, Systematics, and Population Biology from Oklahoma State University. She taught at several universities before joining the U. S. Fish and Wildlife Service as an Ecologist. She now resides in Hillsboro.

Proof is in the Pudding - Hillsboro CBC Results by Kathleen Blair

It Came From Inner Space by Patricia M. Woodruff

Patty Woodruff shares here experiences with Giant Vinegaroon, *Mastigoproctus giganteus giganteus*. She is, among other things, the owner of [Aldo's Attic](#), an excellent online bookstore.

Kangaroo Rats and Other Rodents by Walt Whitford

In this article, Walt Whitford discusses several of the rodent species found in our area. Dr. Whitford has extensive experience in the natural history of the American Southwest. He was a Senior Research Ecologist at the U. S. Environmental Protection Agency (1993-2000), a professor at New Mexico State University (NMSU) (1964-1992), an Adjunct Professor in the Department of Fishery and Wildlife Sciences at NMSU (2000-present), and a Collaborator/Research Ecologist at the USDA-ARS-Jornada Experimental Range north of Las Cruces (2000-present). He is widely published, and the second edition of his book *Ecology of Desert System* is in the final stages of preparation. His seminal book, [*Exploring a Desert - Experiences of an Ecologist/ Naturalist in a New Mexico Desert*](#) is available as a free download at this link.

A K-Rat Mound is a Busy Place by Harley Shaw

In this article, Harley Shaw shares a study of a Kangaroo Rat burrow mound near Hillsboro. A graduate of the University of Arizona and the University of Idaho, Harley Shaw spent his professional career with the Arizona Department of Game and Fish. His primary research topics included Wild Turkey and Mountain Lion, although Desert Big Horn Sheep were thrown in for good measure. He is the author of several books, including [Soul Among](#)

[Lions](#) and [Twelve Hundred Miles by Horse and Burro](#). Shaw is the associate editor of this magazine.

On the Shape of a Form - By Harley Shaw

Recently, Harley has been studying the lives and interactions of "bunnies". In this article, he delves into the derivation of the word "form" and describes its function and attributes in the natural history of rabbits and hares.

Red-breasted Sapsucker - Part of a Superspecies - by Bob Barnes

In November of last year, J. R. Absher of the [A-Spear Ranch](#) reported the presence of a Red-breasted Sapsucker on the ranch. Many ventured to the Palomas Creek area to view the bird. In this article, Barnes uses this sighting as the conduit for a discussion of genetic clines, speciation, and hybridization. Barnes describes himself as a videographer who specializes in natural history. His internet presence includes [www.birdtrips.org](#), [www.earlypeople.org](#), [www.airandground.org](#), and [www.blackrange.org](#). His recordings have appeared in various broadcast programs and on non-profit websites in the US, Australia, Canada, and Europe.

Aldo Leopold - His Legacy, Part 3 by Steve Morgan

In this article, Morgan continues his series on the life of Aldo Leopold. Steve is a naturalist, educator, and landscape architect focused on retaining and recreating natural habitat. He has called the wilds of the Southwest his home for 44 years. He has done extensive research on Aldo Leopold and performs as Leopold at a variety of venues. He currently resides in Kingston.

Climate Change and Coronavirus (Covid-19)

A reminder that climate change is the more significant of the two.

Snails, Ferriss, and Pilsbry

In 1915, Ferriss and Pilsbry conducted a snail collecting expedition in the Black Range. At that time, Pilsbry was the leading authority on mollusks. A bit of local-color history is thrown in for good measure.

Cooke's Spring Pass

This article describes some of the human and natural history of the most famous trail in this area.

Cover Photo: Arizona Jewel Flower - *Streptanthus carinatus arizonicus* photographed at the Pony Hills Petroglyph Site. [Other images at this link.](#)

Recipe for Homemade Christmas Bird Count

by Kathleen Blair

History of CBC

In the 1800s (and long before), there was a Christmas tradition called the "Side Hunt". People chose up sides on Christmas Day and went out to shoot anything they could find. Whichever side piled up the biggest body count of feathered and furred by the end of the day, won. I have no idea if this is related to the old song about 4 and 20 blackbirds baked in a pie. Frank M. Chapman, who was with the American Museum of Natural History and the "fledging" Audubon Society (founded in 1895 but went through some modifications until 1905), appalled at the numbers of birds killed at a Christmas party he attended, began a "Christmas Bird Census" as an alternative. Participants counted the living birds they saw that day rather than the dead ones. The Audubon Society took up sponsoring and organizing these events and 1900 is considered the founding date for the first Audubon Christmas Bird Count - better known as the CBC. That first day, 27 counters in 25 counts between Toronto, Canada and Palm Beach, California took to the field and counted 90 species. Today the CBC covers the world with over 2,000 count circles and over 70,000 volunteers. It has become the longest running biological data base in the world -

and it is volunteer, citizen-science based. The data is used extensively in analyzing bird population trends and guiding conservation efforts. It has also generated fabulous maps of the changes in bird distributions and populations over the last 120 years. Check out www.audubon.org someday, or www.ebird.org! It is also fun for folks who like play with birds. So, of course, Hillsboro needed one!

Audubon Process

Before you start this bagunaa at all you need to start talking to people to see how much interest and support you may have from the local birding community. Although there is no min or max of participants required for a circle; each circle is unique as to how many people may be best to cover it well or how many it can stand milling around, still 10-20 is

a nice starting figure. Setting up a circle and nobody comes to play is no fun.

Audubon has a few basic rules to set up a new circle. 1) all circles have a 15- mile diameter (or within 7.5 miles of a fixed center point); 2) circles cannot overlap or abut a pre-existing circle including a historic one - remember this circle is basically permanent as the data associated with each is time specific. The circle is fixed; the birds come and go based on whatever motivates them; 3) the count is a 24-hr. period between Dec 14 and Jan 5. It is best to keep the dates as close to the same as possible each year. You do not get useful data on local or global populations trends, changes in habitats, and species' distributions if you move the circle around in time and space chasing the birds. You may get more birds, but they are not associated with a

measurable way to figure out if or why their numbers may be changing. 4) They want a minimum 5-year commitment to keep the circle going so there will be a good baseline of data that can be reasonably compared to other circles and over time. Those are the basics. You go onto the Audubon website and after wrestling the process around, filling out forms, designating a compiler (who is the contact for Audubon with questions and who must figure out the website data entry input not to mention go round and round with rare bird reports. Lucky person. Not.)

Our Background

Jan Richmond and I have been participating in CBCs

for several years. I started in graduate school in Oklahoma,

then more in Missouri and Texas when I taught a wide variety of natural history related courses at universities. I went to work for the U.S. Fish and Wildlife Service as the ecologist for the Bill Williams River NWR in Arizona and found the position as compiler for that CBC circle came with the filing cabinet. So, I tended that circle for 20 years until I retired to Hillsboro. Jan has been birding for over 20 years keeping records and doing surveys in Canada as well as doing more surveys and helping with the CBC at the Bill Williams River and Havasu National Wildlife Refuges since 2006. We also volunteer for the Caballo count just down the road and have volunteered for others over the years. So, of course, we decided to see if there was interest in starting a CBC here in the Hillsboro area. And there was!



An illustration of the extent of the current CBC effort.

Considerations

There are several considerations which need to go into establishing a CBC circle if you want both useful data and community support. It needs to be designed with a long-term view. It is not quite an exercise in pin-the-tail-on-the donkey. Here are some of the factors that went into choosing the center for the Hillsboro circle in only the vaguest order.

A. As stated before, no overlap of another circle. Our closest circles were Caballo, Ladder Ranch (inactive), and Silver City.

B. Decide your goal - is it to get a bunch of folks to get out and go birding (if so, you need to encircle populated areas and those with easy access)? To maximize the number of species you see (if so, you need to maximize the habitat diversity)? To monitor a species you care about (if so, you need to maximize the amount of that species preferred habitat in the circle)? We decided to go with diversity as the goal, so we started looking for a circle to include the most types of habitats. We went looking for water sources - creeks, stock tanks or springs; and cottonwood-willow-hackberry riparian; grasslands (including the historic or current sacaton cienagas); mesquite grasslands; patches of sotol or ocotillo; riparian terrace shrublands and arroyos; mast producing live oak and pecan groves; pine woodlands including pinyon-juniper and ponderosa; rocky hillside and cliffs; agricultural areas; and bird feeders! And all in one 15-mile diameter circle, of course.

C. Even with GPS, the center is best if it is a conspicuous, long-term stable landmark, preferably on public land, and with as much of the circle on public land as possible. Public land has the best chance of continuing open in the future so more of it in the circle is usually better for access and counting. Current private landowners may be willing to cooperate and permit access but have the right to change their minds for any number of reasons, or ownership itself may change. Trespass on private land without landowner permission is not acceptable.

D. Access can be limited by number and condition of roads and trails especially as winter weather is always unpredictable, so more and better roads and trails are a

good idea. We wanted to stay below the Emory Pass road closure gate for that reason.

E. Talk to local birders to see if there are hotspots you need to try and get in the circle, people you need to contact for access, etc. That brought in the Hillsboro Box, Bloodgood Spring, the Kingston Cemetery, and the Pecan Grove near Lake Valley Ranch.

F. If there is a potential habitat change in the future, try and catch that area to have before and after data if possible. This could be a lake being filled, a mine or residential development going in, a change in land use, etc.

G. Feeders are important so be sure they are covered in residential areas. Not just for the birds they bring in but for folks that love birds and want to contribute but don't feel up to traipsing after them in December.

H. Lots of scouting!

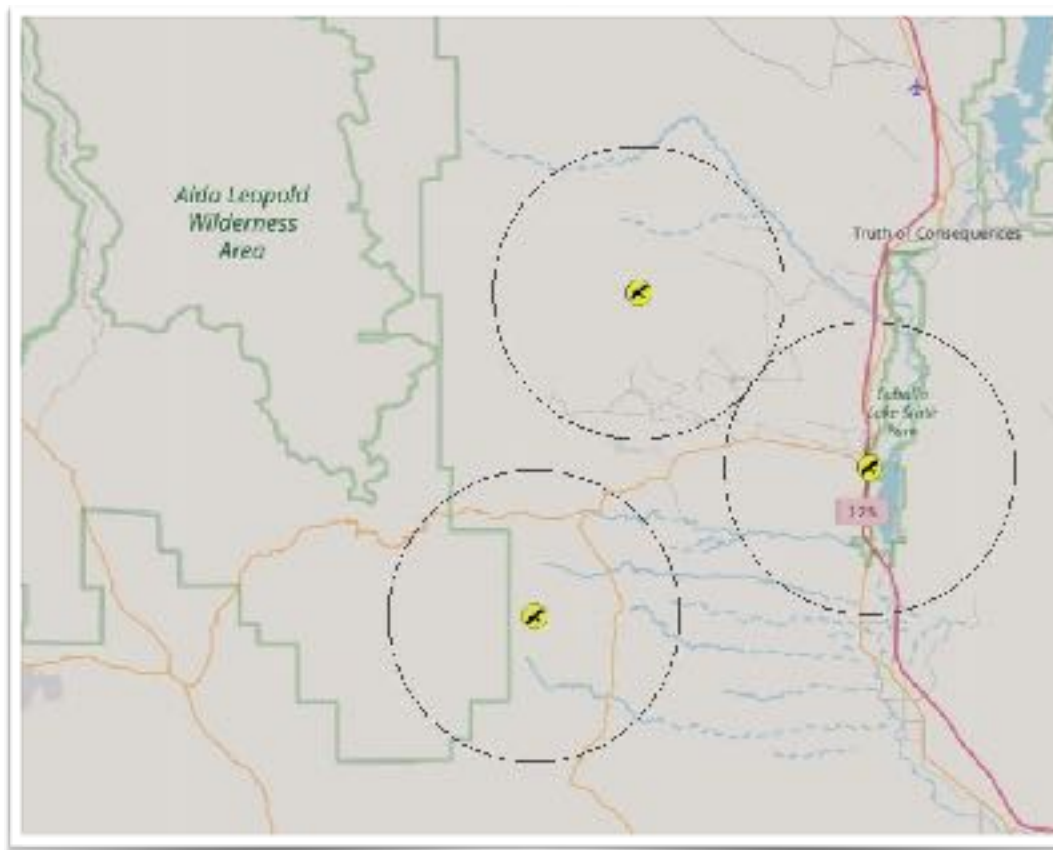
I. Then take the map, a protractor, GPS, and Google Earth and start wiggling your center point until you catch as many of your goals in the hoop as possible before you start to foam at the mouth! Apply wine and/or Wild Turkey, possibly (oh, yeah, maybe that kind of wild turkey, too!) as needed.

J. Community support was important for us. Not only the volunteers, but places in the area where the volunteers could get a meal and hot coffee if needed, maybe lodging if we had out-of-towners. Gets cold and potentially snowy here in the

foothills in December so options to get out of the weather is important. Some CBCs have compilation dinners where folks get together after the count to tell their stories, get an idea of how many birds the circle found, and basically, have fun bird bragging! Wanted one of those, too! It can be someone's home with a covered dish supper, or a local restaurant, or community center. We were so happy when the Black Range Vineyards said they would host a potluck for us.

K. We wanted to minimize carbon footprint by minimizing the driving needed for observers to reach their areas.

L. FINALLY, GET OUTSIDE AND HAVE FUN WITH THE BIRDS!



Existing CBC's in this area: Top - the inactive Ladder Ranch count; Right - the Caballo count; and Bottom - the newly designated Hillsboro count.

It is good to get a basic list of reasonably probable species to start with. Audubon will set you up with a preliminary list, but it will basically be anything that has ever been recorded in any circle in the area, the county, or state maybe. I have no idea. Very unwieldily. Jan and I pulled data from the two closest circles (Ladder Ranch and Caballo) and added eBird data from local birders, and a bit of commonsense as to what was likely in our habitats and got a "most likely" list of about 125 species once we got rid of 2 1/2 pages of Caballo's water birds. This is not limiting, though. Species can always be added if seen. If the species is unexpected (by Audubon at least), Audubon may require a rare bird form be filled out by the observer. The process is rather self-correcting and each year the list becomes more reasonable. Having someone that does not chronically lose files on their computer, like I do, is helpful when you send the list out and wind up with one of mine from Havasu NWR instead.

Set

Re-contact everyone who has expressed interest in counting and try for confirmation a week or so in advances; send species list, rare bird, and other field forms, tentative team assignments, potluck info, and any other information. Make sure team leaders know the boundaries of their area. Field all the questions that come back and puzzlement as to why they got a list where Abert's towhees are common, but canyon towhees are rare. Like maybe we were in western Arizona or something. Sigh.

Go

Count day! Have a great time! Find many birdies! See you at the potluck at the wine bar!

Aftermath

Now the rest of the compilers job kicks in. Get and compile the teams' lists. Ask for rare bird forms for those you think may need them while memories are fresh. Audubon will no doubt come up with others they want verified but get a start. Find out if a conspicuous species seen in one area might be the same individual seen nearby on another team's area (raptors and other flyovers in particular). Start trying to figure out the convoluted total person hours, party hours, driving and walking miles, driving and walking hours - or whatever - chase down missing rare bird forms. Chase down missing area data. Squabble with Audubon's byzantine decades old website that must have been originally programed in DOS. Double and triple check lists and numbers since they cannot be edited or changed once in Audubon. Apply more wine or wild turkey(s). Helps a lot to have a co-compiler to bounce things off and double, triple check data. And make notes on what to do next year!

Hope to see you then!

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*Ed note: The Hillsboro CBC circle shown here is a hundred yards or so off, it extends somewhat more northwesterly than shown. The issue is being worked on with Audubon.

Proof is in the Pudding - Hillsboro CBC Results by Kathleen Blair

Well, the first ever Hillsboro CBC has come and gone. Thanks to every one of you for all the good effort, work, time, birdseed, and shoe leather! The weather cooperated with mild temps between 20 and 63 degrees and the wind topping out at 6.7 mph and no snow to wade through. Pretty dang pleasant compared to what the Black Range can do in December! We had 15 counters in the field and 7 at feeders for a total of 22! Go, team! Between them the field folk put in an amazing 45 party hours, with 32 miles on foot and 96 by car, while the feeder watchers logged 14 1/2 hours. I know I am pleased with how our community turned out for the birds!

Our grand total was 86 species with 2,348 individuals. The most common species were the 417 Dark-eyed Juncos (all half a dozen or so types of juncos are lumped by Audubon into just the Dark-eyed) with White-winged doves second at 279 individuals. Audubon flagged the hummingbird, vireo, and male Northern Harrier as unusual species although not unusual enough to trigger the need for a dreaded "Rare Bird Form". The hummingbird was a female and could not be identified to species although a female rufous and a female Costa's had been seen around the village feeders over the weeks preceding the official count. The Northern Harrier was unusual as it was a male. The male Harriers are distinctive due to their blue-grey back and white underparts while females are rusty brown on the back and streaky brown below. Both sexes have the distinctive white butt patch and low flying behavior. The males and females do not seem to winter much in the same habitats with the males far more common along the coast and southern plains while the females generally remain more inland. Our choice of habitat diversity was good as we got all 5 available species of wrens, both nuthatches, all 3 species of bluebirds, 3 species of jays, and a nice representation from the woodpecker clan, and both northern cardinals and pyrrhuloxias. There are not many places where you can find both the latter species together. The sparrow clan was well represented especially when count week produced both White-throated and Black-chinned species.

The final report for the first Hillsboro Christmas Bird Count (NMHI) was submitted and accepted by Audubon. The observations from all your good work is now in the data bank for use by all manner of studies. Birders and researchers can now start looking for what is of interest to them. For example, right now there is a lot of excitement

over Northern Cardinals and which group they may belong to - Arizona or Texas.* Now they'll know we're here with a population in an intermediate geographic zone. Winter ranges are altering rapidly for many bird species due to climate change. CBC data contributes to finding these changing patterns and evaluating their success. We're there. Who knows, maybe male Northern Harriers will decide to winter in the foothills rather than the gulf coast? And we'll be there next year with more data points for common, rare, and changing species.

Special thanks go to the Black Range Vineyards Wine Bar for hosting the compilation dinner as well as all the folks that brought lots of really great food! Hillsboro, Queen of the Potluck Towns! From what I could tell, everybody had a dandy time stoking up after a day in the field, bird bragging, and telling stories.

Next year

Well, I am very happy with all the goals we managed to hit this year. This CBC went every bit as well as some that I have known for 20 years, at least from my perspective. However, couple of ideas come to mind. 1) A bigger team. We managed to cover most of the ground and habitats, but several teams were only 1 person. Only so much ground they can cover! I also like folks going a few together in case a vehicle breaks down, bad weather pops up, or some such misadventures. It would be especially good if we can get more counters up into the forest service habitat. Next year we may look at picking a date that is mid-way between those of Caballo and Mesilla Valley in order to draw a few more folks up from the south. This year we overlapped with Mesilla Valley. Another circle to look at as a draw could be Bosque del Apache. There are birders that will work clusters of 2 or 3 CBC circles that are in proximity but have different species - which we have when compared to circles that are on the Rio. That is how they



Both Pyrrhuloxia and Northern Cardinal were seen on the inaugural Hillsboro CBC. Both photos shown here were taken in Hillsboro. See "[*Northern Cardinal Range Expansion*](#)" in the July 2018 issue of this magazine for a full discussion of the Northern Cardinals in our area ([or view as an online magazine](#)).



like to spend Christmas. However, I do want to pick a date that maximizes the local community involvement first. 3) Other folks' ideas and suggestions?

Bug of the Month on the Mimbres Messenger

The Mimbres Messenger is publishing a series called the "Bug of the Month". In December the subject was Harvester Ants, in January it was the "*Western Box Elder Bug*", in February it was "*Tarantula Hawks*", and in March Tarantulas. The Mimbres Messenger [may be viewed at this link](#) or in [our online bookcase](#).



It Came From Inner Space

by Patricia M. Woodruff

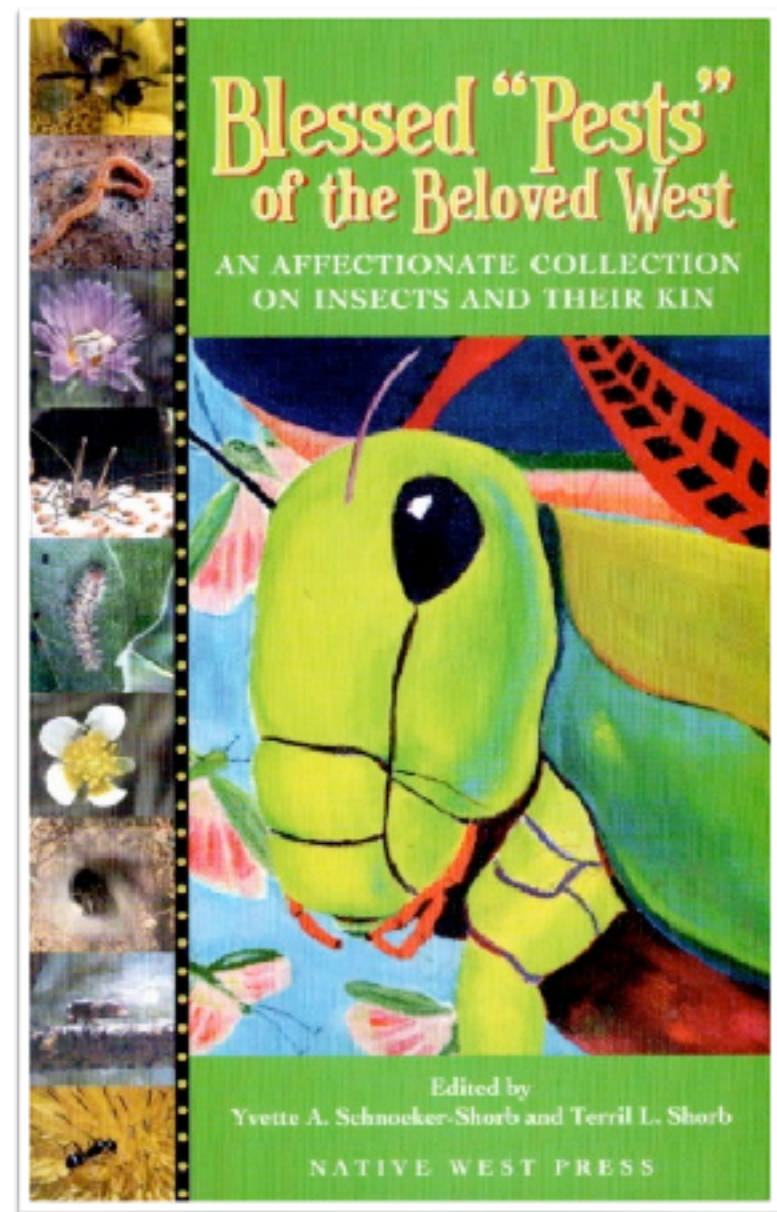
When my family moved from northern Nevada to Oracle, Arizona, in October 1956, our new state was in a “state of siege” by an extreme drought; water was being trucked in to the local households. Climatic history has shown us that this drought was as severe as the 1890 drought in the Southwest. Within a month of our move in October, the skies opened up. In retrospect, this was an El Nino cycle, usually the summer monsoons are absent the next summer. However, the summers of 1957 and 1958 produced wonderful, classic monsoons, and we experienced an explosion of critters. Every day provided a new discovery: tarantulas larger than your hand, scorpions in every corner, “Walapai tigers” lurking and looking for blood at night. huge sun scorpions with monstrous jaws that glistened as they darted about at the speed of light. Enormous bugs and beetles, sounding like B-52 bombers, flew bumbling and crashing into circles of patio lights, and enormous Colorado River toads lumbered out of the dark to snap them up. We had rattlers, ????, king snakes, ring-necked snakes, Sonoran whipsnakes, bull snakes, Gila monsters, flies whose maggots ate live flesh, orange-legged centipedes over a foot long. We marveled at what the earth could produce, and we dutifully identified everything. However, one creature in the books eluded us – the oddly named Vinegaroon.* I often wondered what *they* were.

Almost a half century later, my husband and I moved to Hillsboro, New Mexico, a tiny town on the cusp of the Chihuahuan desert and grassland. Within a month, thunderstorms arrived. One humid evening we were surprised by a creature moving in the shadows – slow and oblivious to us.

I was utterly unprepared for this six-inch critter. It appeared to be made of miniature parts from a scrap metal pile. It was a dull rusty color; it moved deliberately, like a small machine on improbably long legs, and it smelled – like vinegar.

A Vinegaroon! Its head (prosoma) appeared to be a lobster, its abdomen a flattened muffler complete with indentations, slightly bent upward as though carelessly flung into a junk heap; its arm-like pedipalps, when held “engarde,” were pieces of a chainsaw chain with an inside hook at each joint. A small knurled knob on its rear abdomen supported a three-inch, thin, stiff tail (a telson) with tiny hair-like spikes (setae), which, when viewed under a hand lens, looked very much like barbed wire. It moved along on six long, jointed legs, and had another pair in front, at least twice as long as the others. This rather large arachnid is related to spiders and scorpions – all eight-legged critters – but is in a family all its own.

I couldn’t take my eyes off it. When its long front legs delicately tapping and waving, its pedipalps curled into two large knobs at either side of its head, it moved deliberately



This article originally appeared in [“Blessed ‘Pests’ of the Beloved West”](#) (available at [this link](#)).

across the patio to the edge of the house. We placed a large active, predatory beetle in front of it. Those long front legs confused and confined the beetle. The beetle turned away from the tapping legs toward the vinegaroon’s head. In a flash the chainsaw grabbers unfurled and the beetle was imprisoned!

Vinegaroons forage in corners, in leaf refuse, in dark, damp protected areas, the same space used by other arachnids, skunks, and oftentimes, larger animals. It goes about its business, quietly searching for food at dusk or calmly waiting on a wall near a light source after dark. Vinegaroons, when disturbed, have a stance that is both comically fearsome and highly effective. The tail seems to be the trigger for releasing the vinegar odor. I experimented with this idea by crawling around a vinegaroon, pretending to be a predator, smelling it and blowing on the upright tail. The creature took an immediate aggressive stance, vibrating its tail and emitting the highly acidic vinegar odor from its rear. Even a skunk would be taken aback.

Most of a vinegaroon’s life is spent underground, hiding in a humid, sandy substrate. The sand holds the moisture needed for breeding, laying eggs, and especially, molting. A vinegaroon goes through four annual instars, or molts. In order to protect itself during molting, it makes a space in the sand into a protective shelter where its chitinous outer layer can harden during this period of extreme vulnerability.

We had constant visitations from vinegaroons who came in and around our old adobe home. The house had been remodeled, and the new floor had a deep layer of sand upon which brick floors were laid. The house sat on an old meander of Percha Creek, making the perfect habitat - with sand, moisture, and protection - for our new friends. Alas, for the vinegaroons that came *into* our home, the house had been sprayed with pesticides by the previous owner. We often found vinegaroons barely moving or dead in a corner. I couldn't bear to dispose of them, so I packed them gently in cotton and sent them to grandchildren or decorated various posts on our front porch with their brittle, rusty bodies.

Our new Hillsboro neighbors were horrified. "You didn't kill them? They are harmless – and they hunt cockroaches!" As I explained how they had died, I realized we had found the right place to live. We now try to remove all vinegaroons from the house as soon as we find them, hoping they survive the exposure to pesticides long ago applied.

One neighbor, upon seeing our little decorations, shared this story with us. After moving here, she awoke one morning to a slight tickling, like a never twitching on her legs. Upon lifting the bedcovers, she discovered a large vinegaroon using her as a hunting post. She laughed, saying that levitated off the bed. She gathered her wits, grabbed a dustpan, and moved it outside – happy to send it on its way. She said that if this had happened when she visited, she would never have moved here, but that now "I've really grown to love them."

We have learned in many ways from vinegaroons and our other new Hillsboro friends. "We are all neighbors."

The photograph used in the referenced book has not been used in this article. [To view a Giant Vinegaroon digging a burrow across the street from the author's house visit this link.](#) Other photographs of a vinegaroon [may be reviewed at this link.](#)

Kangaroo Rats and Other Rodents by Walt Whitford

When I was a first year grad student, my PhD advisor, Dr. Victor Hutchison, was a new professor at the University of Rhode Island. He had earned his PhD at Duke University and told me to read several papers by one of the professors on his committee, Dr. Knut Schmidt-Neilson. The one paper that really impressed me was his study of Merriam's kangaroo rat, *Dipodomys merriami*. He kept kangaroo rats on a diet of dry millet seeds and demonstrated that they could survive on a diet of dry seeds. His primary interest was in the kidneys of the kangaroo rats because he found

that their urine was almost solid. Not only was the urine very concentrated by the elongated kidneys with loops that protruded deep into the extended kidney. Kangaroo rats also produced dry fecal pellets. They produced their water requirements by their metabolism of the carbohydrates in the millet which were converted to carbon dioxide and water.

During my first summer as a grad student, I completed a study of the respective roles of the moist skin and lungs of a local spotted salamander. My major professor insisted that I present my findings at an American Association for the Advancement of Science meeting in Philadelphia. When we entered the room where I was to present, Vic introduced me to the man sitting behind me: Dr. Knut Schmidt-Neilson. Needless to say, with the world-famous physiological ecologist sitting behind me, I was a nervous wreck when I went to the podium to make my presentation. Schmidt-Neilson was very gracious and congratulated me on my research. At the time, I did not expect to be working in a desert and had no idea that I would study desert mammals when I completed my degree.

When I first arrived at New Mexico State University, I began a study of tiger salamanders at several cattle stock tanks that were kept full of water by windmills. The salamanders reached adult size with all of their larval characteristics: external gills, broad tail, and lack of dark skin and tiger stripes. A small fraction of the larvae transform into air breathing adults with dark markings and greenish-black skin. Adult salamanders that retain larval characteristics are called axolotls. I spent several years studying salamanders. During those years, I had graduate students who worked on grasshopper mice and kangaroo rats. The big emphasis on desert rodent communities came with the International Biological Programme - Chihuahuan Desert Program that provided Sherman Live Traps in order to study desert rodent communities. We continued to study desert rodents for the remainder of my career at NMSU, and when I moved to the Environmental Protection Agency we continued to study desert rodents.

One of the things that we soon came to realize was that Merriam's kangaroo rats can survive on dry seeds but need green vegetation to support the animal's need for water and minerals. The most expensive part of the life cycle for water and nutrients is during the reproductive cycle. These are needed to allow for development of fetuses and to produce female lactation, the most energy and nutrient expensive part of their life cycle. Although it is the females that require green vegetation, we have evidence that both males and females utilize green plants in addition to seeds.

Kangaroo rats and pocket mice belong to the family Heteromyidae. These rodents share many traits: most are bipedal (hop on hind legs), have reduced forelimbs that are used primarily to collect seeds, and have external cheek pouches. These rodents typically filter feed, using their forelimbs and toenails to sift through sand and collect seeds which are then stuffed into their pouches. When

heteromyid rodents forage, they use the forelimbs to push seeds into the external cheek pouches. When seeds are abundant, the heteromyid rodents look like they have mumps, with the cheek pouches stuffed full of seeds. Cheek pouches allow the rodents to take advantage of large seed rains plus minimize the time spent out of the burrow where they are subject to a whole list of predators including owls, snakes, coyotes, and badgers. Heteromyids store some seeds in their burrow system but also "scatter hoard" - that is, they bury the contents of the cheek pouches in excavated caches near the main burrow system. Since the rodents do not always remember where caches are located, they serve to generate species of plants that are preferred seeds. The most desirable seeds are of the annual grama grasses that complete their life cycle in six weeks and therefore are called six-week gramas. When the annual gramas are in fruit and seeds are falling from the plants, heteromyids forage almost exclusively on the six-week grama seeds.

When we were funded by the International Biological Programme, I had two graduate students who were deep into their

research. As a consequence, I hired an undergraduate student to assist with trapping, and one who was a good entomologist. Since we were working on a watershed dominated by creosotebush, I gave the students a choice of the sloping bajada (piedmont) or the trap grids at the base of the watershed: a dry lake. Needless to say, I opted for the bajada while most students chose the dry lake. The students quickly learned about cold air drainage. Cold air is denser than warm and quickly settles on the dry lake. After conferring with the other students, we settled on a compromise: dry lake one night and bajada the next night.

One of the undergrads, who later worked for the Texas game department, had lost his leg in a motorcycle accident. Once when setting traps on the dry lake, he stepped into a crack in the clay and twisted his foot pointing to the rear. He continued to set traps with one foot forward and the other to the back. The other students thought this was great because it offered a bit of humor for them.

Kangaroo rats vary greatly in size and type of burrow system that they utilize. There are two species of kangaroo rats that are nearly the same size: Merriam's Kangaroo Rat ¹

and Ord's Kangaroo Rat (approximately 30 grams each or eleven or twelve ounces). Before the cattle industry reduced the perennial grasslands to patches, there was little overlap between Merriam's Kangaroo Rats and Ord's Kangaroo Rats. Merriam's seemed to prefer the open shrub-dominated areas while Ord's preferred grassy habitats. In an experiment where we killed shrubs with a herbicide, there was a rapid expansion of grasses, especially the grama grasses, bush muhly, and tobosa grass. Initially the Ord's Kangaroo Rats were most abundant, but during a series of drought years, Merriam's Kangaroo Rats became dominant. Our initial assessment that the Ord's Kangaroo Rats benefitted from the increase in grass cover was not substantiated by the results of the more than 10-year study of the treated area in comparison to untreated shrubland.



A banner-tail kangaroo rat - body mass 48 ounces. Note the white terminus of the tail which gives the rodent the common name of banner-tail (photo by Dr. David Lightfoot).

When cleaning and baiting traps, we occasionally noted locations of pack-rat middens and made certain that we would capture the resident. As I tried to extricate a rat from the trap, it bit my index finger to the fascia and tendons. That caused me to dance around trying to staunch the blood, and I

am confident that the students working the dry lake heard me and I heard lots of laughter. The next night the students insured that I would cover the bajada. When they baited the traps, they placed a rock weighing approximately 200 grams in the trap near the midden. When I picked up the trap and felt the weight, I was convinced that the resident was a very large pack rat. I started yelling (XX##%%&&@) I heard gales of laughter from the students, who had really convinced the professor that there was a large vicious rat in the trap.

One visual that I will never forget was a Merriam's kangaroo rat that I released from the trap. The kangaroo rat took three hops to get under a creosotebush and into the jaws of a Western Diamondback Rattlesnake. The snake struck the rodent, who took 3-4 hops before dropping and quivering. The rattlesnake used its Jacobson's organ in its mouth to locate the prey. The snake slowly made its way to the carcass, and swallowed the rat head first.

Merriam's and Ord's Kangaroo Rats maintain fairly stable populations, with recruitment dependent upon the production of annual grasses. The two species were

separated into grassland habitats for Ord's and shrub-dominated habitat for Merriam's. When the livestock industry took over, much of the western U. S. grasslands were rapidly converted to shrub and small tree savannas. Populations of both medium-size kangaroo rats increase with good summer monsoon rains, but when the summer is dry, as it was last year, reproduction of the kangaroo rats is curtailed and population numbers decline. Since rodents are an important food base for a variety of predators other species are affected as well.

The Banner-tail Kangaroo Rat² behaves differently from the other two species, includes a variety of plants in the diet, and stores seeds and hay in the burrow system. In the study to examine the effects of rodents on grasses (drop-seeds, black grama, several other grasses, and several forbs [herbaceous plants]), we utilized a one-hectare plot that had not been grazed by cattle in more than 30 years. The enclosure was a four-strand barbed wire fence with a chicken wire mesh barrier fastened to the barbed wire. The chicken wire kept jackrabbits and desert cottontails from accessing the grasses. The holes in the chicken wire allowed kangaroo rats and pocket mice to enter the enclosure. Within one month after establishing the plot, we found tillers that had been cut by rodents. By the end of the growing season (August) up to 35% of the grass and other green foliage had been consumed. The August peak coincides with the reproductive peak and therefore the rats may be obtaining critical nutrients from the grasses. In addition to nutrients and some preformed water, kangaroo rats may be obtaining 6-MBOA, which is an estrogenic phytochemical that occurs in new growth grasses. This chemical has been found to boost reproductive activity in Ord's Kangaroo Rat.

Spotted ground squirrels are the only rodents that are active during daylight hours. Spotted ground squirrels may be found in desert grasslands and in mesquite-

grasslands. They are more abundant in areas with large mesquite than in grasslands with few or no shrubs. Spotted ground squirrels feed on green vegetation, seeds, and insects. Mesquite seed pods are an attractive food source for these squirrels. Spotted ground squirrels are not found in creosotebush communities, probably because of the paucity of suitable foods.



A large Banner-tail Kangaroo Rat mound that is approximately 6 feet in diameter and elevated more than one foot above the surrounding vegetation (photo by Vic Crane).



A pocket mouse (photo by Dr. David Lightfoot)

Cactus Mice are most abundant in the rocky foothills of desert mountains. They occur in lower numbers in creosotebush habitats on bajadas and may expand their range into basin shrublands during periods of successive wet years. These small, nocturnal mice eat seeds, fruits, flowers, green vegetation

and insects. During dry periods, many of the foods needed by these mice for reproduction and lactation are not available. Cactus Mice populations decline rapidly during dry years and gradually increase in numbers during years with average or above average rainfall. Populations of Cactus Mice track year-to-year weather patterns, which results in large fluctuations in numbers of mice per unit area.

For the Western Harvest Mouse, the northern Chihuahuan Desert provides few suitable habitats because this mouse prefers thick grass or shrub cover for foraging

and nesting. In the last century or more, thick grass habitats are widely scattered and mostly consist of tobosa grass swales (low areas that receive overland flow in some large rains) and margins of dry lakes. Published studies of rodent populations in the Chihuahuan Desert report Western Harvest Mice from thick tobosa grass areas and from areas where Lehman's love grass filled in spaces between grama grass tussocks. Western Harvest Mice are good climbers and are known to climb into low shrubs to obtain food. These mice are omnivorous. They eat seeds, insects, fruit, and green vegetation. Population numbers of this species increase during wet periods and drop to exceedingly low numbers during dry periods.

The northern Chihuahuan Desert is marginal habitat for Hispid Cotton Rats. Cotton rats need moderate to dense grass cover for nest building and rearing young. Reduced grasslands with increased shrub cover and dependence of grasses on adequate summer rainfall have combined to make cotton rats a rarity in most of the Chihuahuan Desert. Cotton rat nests are constructed of grass which is formed into a cup or hollow ball where the females give birth and suckle the young. Weather conditions that produce good grass growth seem to be necessary for populations of Hispid Cotton Rats. Cotton rats are known for explosive increases in population numbers and equally rapid decreases in numbers. Studies in the northern Chihuahuan Desert report increases from no Hispid Cotton Rats in dry years to more than twenty rats per acre during a wet year. The explosive nature of cotton rat populations is related to their reproductive characteristics. Litter sizes vary between one and fifteen young depending upon the quality and quantity of food. Males are sexually mature in sixty days and females are receptive thirty to forty days after birth. Females mate within one day of giving birth. Adult Hispid Cotton Rat's diet consists mostly of stems, foliage, and seeds, but insects and other small animals are occasional parts of the diet. Water is obtained from green vegetation.

The Southern Grasshopper Mouse is the only predatory rodent that lives in the desert. These mice obtain their water from their prey. Grasshopper mice are efficient predators not only on grasshoppers and crickets but also take scorpions, centipedes, beetles, snakes, and other mice. Southern Grasshopper Mice have the intriguing behavior of "howling" to defend their territory. That behavior has been caught on film along with the successful hunts of scorpions and centipedes and is favorite footage

on TV and computer outlets. Southern Grasshopper Mice are found in most habitats in the northern Chihuahuan Desert. Grasshopper mice will also take "stink beetles" that stand on their head when threatened and exude a drop of liquid containing quines plus other nasty chemicals. Grasshopper mice grasp the beetle with forelimbs and push the beetles' rear-end into the ground and proceed to eat the beetle like a sno-cone.



Above: Chihuahuan Pocket Mouse - *Chaetodipus eremicus*

Below Right: Rock Pocket-Mouse - *Chaetopidus intermedius*

Below Left: Hispid Cotton Rat - *Sigmodon hispidus*

All from Broad Canyon Ranch, North of Las Cruces, New Mexico



North American Deer Mice occur in low numbers in Chihuahuan Desert grasslands and shrublands. Deer mice eat a variety of foods and change their diet depending upon immediate past weather conditions, rainfall, and plant production. In the Chihuahuan Desert deer mice eat seeds, green vegetation, fruits, and arthropods. Deer mice population numbers increase during successive wet years. During extended wet periods, deer mice move into marginal habitats but disappear from those habitats when dry conditions return. The White-footed Deer Mouse can be found in some of the same habitats as the North American Deer Mouse but usually at lower numbers per unit area.

One observation led to several studies of kangaroo rats. We noted that many grass tillers were severed at the base with the whitish base consumed by the rodents while the tiller terminus was still with seeds. Obviously the kangaroo rats were not consuming the flowering heads or seeds. We then set up some burrow systems with a single grass plant in the plastic tub. Excess seeds in the form of cracked milo provided the control. We studied both Merriam's and Ord's Kangaroo Rats, and in every case the grass tillers were cut



A microcosm with a dropseed plant and scattered milo seeds. Note that most of the tillers have been severed.

and the milo left untouched.

Dr. James Brown and his students established a series of plots in an ecotone between mesquite shrubs and some grasses. Their long-term results showed that grasses increase when rodents are excluded from plots. We initially thought that granivory (eating seeds) and soil disturbances contributed to the increase in desertification (producing more desert-like conditions). When we visited Dr. Brown's plots we found that where rodents were allowed to establish, there were severed tillers on the ground at the base of all but a few grass tussocks. In addition his plots were dominated by Lehmann's Lovegrass, which is a native of South Africa. Lehmann's Lovegrass is currently spreading and may soon dominate many of the sandy-loam grassy areas. Because we had no way of tracking kangaroo rats, we have no way of knowing if the cutting of grass tillers is limited to Banner-tail Kangaroo Rats or if other kangaroo rats and rodents also cut stems from the grass tussocks. All

of this indicates that this is a fruitful area for future research.

1. The editor chooses to capitalize the English Common Names of species. This is non-standard usage. If this is a matter of concern to you please take your ire out on the editor, rather than the author(s), they know better.
2. Banner-tail Kangaroo Rat, Bannertail Kangaroo Rat, and Bannertailed Kangaroo Rat are all names which may be found in the literature.

A K-Rat Mound is a Busy Place **by Harley Shaw**

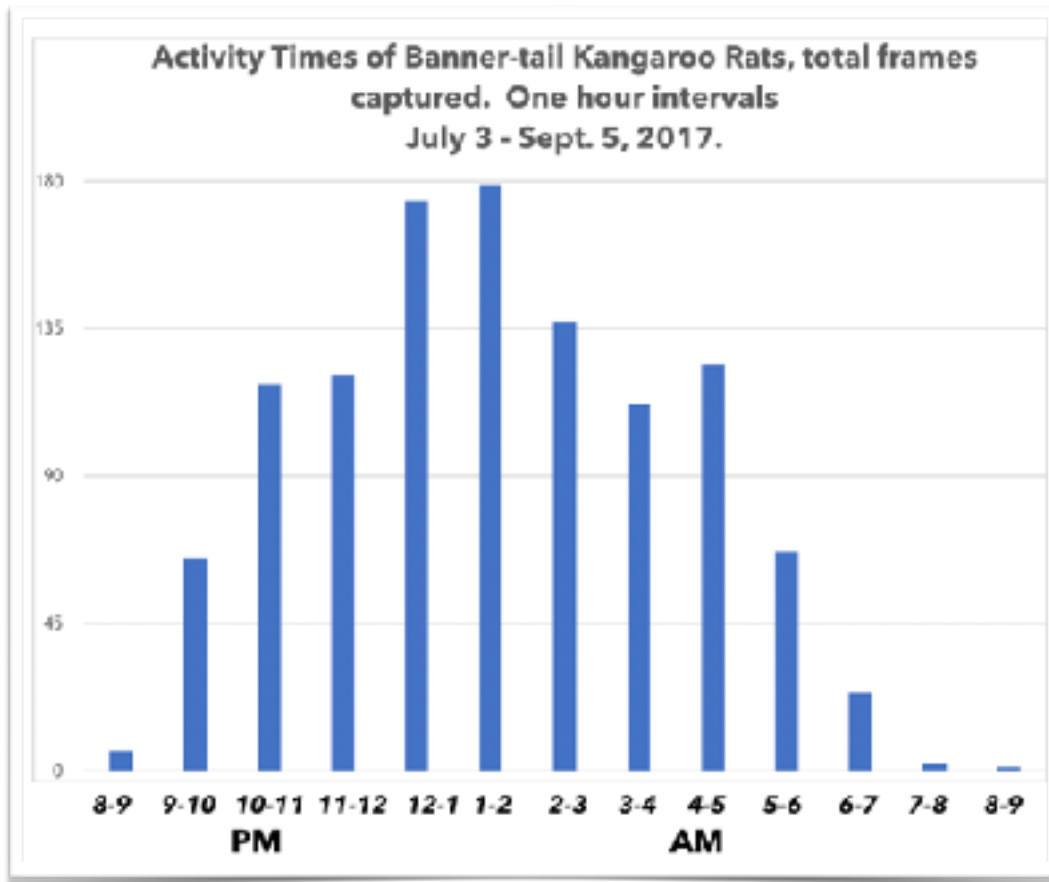
A couple of years ago, I set a trail camera on a Banner-tail Kangaroo Rat (see footnote "1" above) mound, hoping to capture a photo or two of its occupant (photo below). This was on an acreage we own at the west edge of Hillsboro. It was hardly a wilderness setting, but was on a portion of our property not used for horses and seldom visited by us or other humans. I initially set the camera up on July 17; its final night of operation was September 6. Time of use amounted to 35 camera nights, on the last three of which the camera had fallen on its side but continued to record k-rat activity on the mound.



Instead of capturing a few isolated shots of the resident rat, I learned how busy the little creatures are after dark. I also learned that the k-rat mound was a popular place with other wild and domestic species. I haven't attempted further photos of k-rats houses, having been distracted by other wild creatures. Nonetheless, perhaps the outcome of my brief experiment is worth disclosure. There's a lot more going on around town in the dark than we diurnal mammals realize.

First, as to the owner of the mound, who goes by the scientific name of *Dipodomys spectabilis*.

During 35 camera nights, the camera recorded 1130 images



of this busy creature, all after dark. The graph above shows its activity pattern. Nearly all of these images were of the resident rat, although a second, smaller k-rat showed up on three separate evenings.

While the intense activity of the resident rat was a surprise, even more unexpected was the number of other species using the mound, mostly in the daytime. Eleven additional species were identified and two more unidentified animals visited the site. Some obviously came to hang around. Such visitors included woodrats (3 visits), rock squirrel (1 visit), cottontail (6 visits), neighbor's house cat (1 visit), Mule Deer (1 visit), Javelina (1 visit), Canyon Towhee (2 visits), Bobcat - photo below- (3 visits), Gambel's Quail (6 visits), Greater Roadrunner - photo below - (2 visits), unidentified bird (1 visit), and unidentified mammal (3 visits). Cottontails (photo below) and quail, especially, hung around.



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On the Shape of a Form

By Harley Shaw

Cottontails sit a lot. They are built for sitting. Their oversized haunch provides a pedestal. Once plumped down, no balance is needed to stay erect. Cottontails can hunker with their ears lowered, displaying a profile that resembles an oblong, gray stone. Or they can sit alert, head up, ears erect and rotating to catch every faint sound. Their eyes scan an arc of 200 degrees of their surroundings. Sitting is a good strategy for bunnies, since many of their neighbors would have them for dinner.

Some people call the places bunnies sit “forms”-- shallow depressions created by excavation and continued reuse for daylight resting and hiding. I suggest that definition of the word, as applied to cottontails, has, over long usage, become diffused, and that American wildlife biologists use it more loosely than their English predecessors.

“Form” may be misused and outdated, but it frequently appears in popular and technical rabbit literature. In old English, it referred to the daytime lair of the European hare, located to provide views of approaching predators, including humans and their hounds, along with protection from the elements. The word appeared in writing as early as AD 1290, spelled variously as forme, fourme, fourm, and foorme (Table 1, following page)¹. Other nouns applied to the same phenomenon included hide, couch, squat, seat, and sit. “Form” also found use as a verb, describing the act of going to cover to hide, ergo, to take its form, to seat, but the Oxford English Dictionary defines a form simply as, “The nest or lair in which a hare crouches. Also rarely of a deer.”

I have long assumed, with no particular justification that I can remember, that the term described a depression created by the animal by lying in a particular position, thereby imprinting its “form.” That is, the form reflected the shape and size of the animal using the spot for a bed. I assumed this would apply more accurately to hares than to rabbits, because the larger animals would lie down more, instead of sitting.

In *Lagomorphs-Pikas, Rabbits, and Hares of the World*², the latest word in worldwide rabbit biology and taxonomy, “form” does not appear in the index, although, in a chapter within this book on antelope jackrabbits of Arizona’s Sonoran Desert, Brown et al.³ note that

“During the day, individuals rest in shallow depressions known as forms, typically under the cover of a mesquite or other shade-providing plants. These forms, which range from 8 to 15 cm wide and 28 to 46 cm long, are typically free of rocks and sticks; these are temporary structures that may be used repeatedly or only occasionally. Here the hare may be seen resting on its haunches or laid out like a dog with feet resting fore and aft. The ears may be erect or laid back, depending on alertness of the animal.”

Also in the same book, Nielson and Berkman⁴ note, regarding swamp rabbits, that, *“During the day they rest in and on forms such as dense tangles of vines, heaps of logs, or logs.”* For the eastern cottontail, Nielson and Berkman note,⁵ *“Forms (depressions) are commonly found in the densest vegetation available; these areas provide ample thermal cover and protection from predators.”*

In *Rabbits—the animal answer guide*,⁶ the authors include nest sites, stating, *“Rabbits are born in a nest of fur and grass in a burrow or special depression on the ground, called a “form” (p. 6).* They note later, *“... black-tailed jackrabbits spent most of the daylight hours resting in a shallow form, or lair, under the shade of a shrub and did not move from that position. But on very hot summer days, they became restless in the early afternoon and ... moved to find a form with better shade or moved to burrows. . . .” (p. 95).* *“... antelope jackrabbit digs out a form that is only deep enough for his haunches to fit into (p. 96).” “In winter, the arctic hare’s form may be no more than a depression in the snow or in gravel on ridges and slopes... (p. 99).”* On page 116, the authors provide a photo of a young rabbit in a nest and equate this to a form.

*The Hound and the Hawk*⁷ says *“... the hare ... could be hunted in the morning after it had returned to its form. . . .” (pp. 22-23).*

The authors of *The Leaping Hare*,⁸ writing of European hares, note, *“Its mother gives birth ... in an open nest called a form” (P. 22).* Later, they equate the sites where mother hares disperse their young to separate forms. On page 35: *“The mountain hare’s form, whether made in snow or not, is usually deeper than the brown hare’s. . . . Like all hares, she*

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1. Oxford English Dictionary, oed.com.
 2. Smith, A. T., Chalotte H. Johnston, Paulo C. Alves, and Kaus Hacklander, editors. Johns Hopkins University Press. 2018.
 3. Brown, D. E., C. Lorenzo, and Maria Altemus. Above book. P. 161 under Behavior.
 4. Nielson, C. K. and L. K. Berkman. Above book. P. 119. Behavior.
 5. Nielson and Berkman. Above book. P. 139 Habitat and Diet.
 6. Lumpkin, S. and J. Seidensticker. 2011. Johns Hopkins Press. Page 6.
 7. Cummins, J. 1988. The Phoenix Press, p. 113. Also n. 113.
 8. E. E. George and D. Thomson. 1974 Faber and Faber. P. 22-23

lies with her back to the weather, sheltered by the best wall she can find or make.... Most likely heather lined...Hares do not so much dig a form as shape it and press it into shape with their bodies." On page 44: "The shape of the form is round like a football, first, and it's narrow where he goes in." Page 52. . ."They'll dig a little hole, so they're level with the land Seat we call it." Page 62. "They never have a hole like a rabbit. Just a seat." Or a form.

Robert T. Orr, in his book, *The Rabbits of California*, (California Academy of Sciences Publ. XIX, 1940), discusses forms, burrows, and trails of desert cottontails.

" In certain instances . . . individuals of this species may be found in forms even where they are living away from brushy cover. These forms often resemble those of jack rabbits in that they merely consist in cleared spaces, situated in tall grass, which are of sufficient size to harbor single individuals.

None of the forms examined gave evidence of having the earth excavated even to a slight extent. In nearly every instance the bottom of the form contained some matted down grass and a few droppings. Short but definite trails appeared to lead out a few feet from these structures. These forms were found both in open stands of tall grass and in grass beneath small trees."

Orr minimizes the importance of forms for the desert cottontails in his study area and provides a detailed description of the species' use of burrows, a subject I'll address in a later article. This is interesting in that, although the cottontails in Sierra County, New Mexico are considered to be the same species as Orr's California rabbits, they more commonly spend their idle hours sitting in above-ground

depressions, under cover, that fit the descriptions of "forms."

Dr. Walt Whitford⁹ of New Mexico State University describes jackrabbit forms at the Jornada Research Station thusly:

"During the summer, jackrabbits dig shallow depressions or "forms" under shrubs with dense canopies that produce

deep shade. A jackrabbit will typically dig three forms under a suitable shrub, one on the east side, one on the north side, and one on the west side. The jackrabbit will spend the morning hours lying in the form on the west side, then move to the form on the north side during the middle of the day and finally

to the form on the east side in the mid-afternoon. Using this behavior, the animal reduces the heat load from direct solar radiation by maximizing the shading from the shrub canopy and can unload heat by conduction from its belly to the cool soil of the form. During the hottest days of summer, it is possible to walk within 2-3 meters (6 to nine feet) of a jackrabbit hunkered down in its form. If forced to move when conditions are hot, a jackrabbit will only move a few meters and return to its form as soon as the intruder moves away."

c1290	etc. in <i>Middle Eng. Dict.</i>
a1300	<i>Fragm. Pop. Sc.</i> (Wright) 318 I-buyd as an hare Whan he in forme lyth.
c1386G.	Chaucer <i>Shipman's Tale</i> 104 As in a fourme sitteth a very hare.
c1440	<i>Promptorium Parvulorum</i> 172/1 Foorme of an hare, or oþer lyke, <i>lustrum</i> .
1575	Gascoigne <i>Noble Arte Venerie</i> lviii. 161 When a Hare ryseth out of the forme.
1600	R. Surflet tr. C. Estienne & J. Liébault <i>Maison Rustique</i> vii. xxxiii. 859 The first point..for the killing of the hare, consisteth in finding out her forme.
1735	W. Somervile <i>Chace</i> ii. 38 In the dry crumbling Bank Their Forms they delve.
1799	J. Robertson <i>Gen. View Agric. Perth</i> 329 The young [deer] keep close to their form, until the dam return to raise them.
1845	C. Darwin <i>Jrnl.</i> (ed. 2) iii. 46 The Indians catch the Varying Hare by walking spirally round and round it, when on its form.
1916	E. Blunden <i>Harbingers</i> 63 Strange streams Flow flagging in the undescribed deep fourms Of creatures born the first of all.
<i>intransitive.</i> Of a hare: To take to her form; to seat.	
1575	G. Gascoigne <i>Noble Arte Venerie</i> lviii. 162 To looke about hir, & to choose out a place to forme in.
1612	M. Drayton <i>Poly-olbion</i> ii. 28 The melancholie Hare is form'd in brakes and briers.
a1637	B. Jonson <i>Sad Shepherd</i> ii. viii. 4 in <i>Wks.</i> (1640) III First, think which way shee fourmeth, on what wind: Or North, or South.
1725	J. Coats <i>New Dict. Heraldry</i> (rev. ed.) <i>Seateth</i> or <i>Formeth</i> are the Terms that note where the Hare has its resting Place.
1801	J. Strutt <i>Glig-gamena Angel-ðeod</i> i. i. 17 A hare [was said to be] formed, a rabbit set.

Table 1. Early usages of the term "form" as applied to leporid resting or hiding places. Oxford English Dictionary online. 2019.

9. Unpublished ms.

The above references provide at least three different kinds of form. In one, forms are depressions under protective brushy canopy, where rabbits or hares spend the daylight hours. These forms are reused by their occupants. Resting places in the open may also be called a form, and the term has been used for places cottontails birth their young. I suggest the latter is a misuse of the term and "nest" would be more accurate. Finally, R. M. Lockley, in *Private Life of the Rabbit*,¹⁰ describes the highly social European rabbits laying out in "... 'forms' or 'squats' in the long grass. Two additional local terms, "seat" and "squat" reflect the leporid tendency to sit still for hours in a frequently used depression. Harrison, cited below, notes the term "couch."

In the case of our desert cottontails and hares, two studies of forms have perhaps narrowed the definition of the term. Brown and Krausman,¹¹ working in the Sonoran Desert north of Tucson, initially define forms used by cottontails and black-tailed and antelope jackrabbits as "above-ground resting sites." Driving desert roads between 4:30 a.m. and 11:30 a.m., these workers classified leporids observed as sitting, foraging, or in forms. Blacktailed jackrabbits created forms under mesquite trees and creosote bush (>73%,). Desert cottontail predominantly used palo verde, triangle-leaf bursage, and prickly pear (63%) as cover for forms. Jackrabbit forms were in more open habitat, with visibility distance averaging three times greater than visibility distance around cottontail forms. Cottontails avoided use of creosote bush as cover for forms. In the Sonoran Desert during summer, cottontails and jackrabbits selected microsites that were different in some respects: cottontails used dense vegetation that was closer to the ground more often than did jackrabbits. Average distance from the ground to base of the canopy for jackrabbits averaged 1.75 times that for cottontails. These differences result from the smaller size of cottontails compared with jackrabbits, as well as differences in escape behavior.

More recently, Robert L. Harrison¹² studied diurnal resting places of black-tailed jackrabbits and desert cottontails in Chihuahuan Desert on New Mexico's *Jornada del Muerto*. He describes forms as shallow excavations under cover. He

introduces the alternative term "couch", thereby adding another term to the rabbit resting place lexicon. Harrison used radio-marked animals to locate their forms. In addition to measuring cover characteristics at and around the form sites, he measured and described the individual depressions used by the species. His detailed assessment of forms for the two species appears in the publication footnoted below. It reports, in the typical matter-of-fact manner of scientific papers, an incredible amount of detail regarding form characteristics and rabbit behavior

associated with forms.

Harrison expended 25 trap nights of effort for each animal caught. Once they were collared, locating the animals on their forms must have been time-consuming, requiring considerable care to prevent spooking them when still out of visual range. Mesquite has many thorns and pushing through it can become painful. Even

thornless species such as little leaf sumac have dense foliage that can damage one's clothes or hide. And the Jornada is known for its rattlesnakes. Form hunting during the warmer months had to be fraught with risk for someone crawling into thick foliage.

Harrison noted forms used throughout daylight hours and differentiated form positions under shrubs relative to time of day. He found that the average length of cottontail forms was 10.3 inches; average width, 4.4 inches and that the length of adult cottontails was about 15 inches.

10. 1964. McMillan Press. 1973 edition by Equinox Books/Avon. This is the amazing study that later formed the basis for Richard Adams' classic *Watership Down*.

11. Brown, C. E. and P. F. Krausman 2003. Habitat characteristics of 3 leporid species in southeastern Arizona. *J. Wildl. Mgmt.* 67(1): 83-89.

12. Harrison, R. L. 2019. A comparison of diurnal resting sites used by *Sylvilagus audubonii* and *Lepus californicus* in the Chihuahuan Desert. *Western North American Naturalist* 79(2):170-184.



Black-tailed Jackrabbit, Lepus californicus

Harrison found that the average width and volume of male cottontail forms were slightly larger than those of female cottontails, in spite of the fact that adult females are larger than the males. Cottontail forms tended to be deeper during hot months.

Jackrabbit forms were larger than cottontail forms, with an average length of a little over 18 inches and width of about 6 inches. There was no difference between forms of males and females. Average length of jackrabbits was 25 inches.

Cottontail forms were located primarily in the centers of dense shrubs, while jackrabbits used forms nearer the edges and moved with the sun. Both species returned to previously used forms. With few exceptions, only one rabbit used a particular form, and the two species didn't share forms.

Both of the above studies attempted detailed quantitative description of forms, and they narrowed the definition of forms from past usages. Based upon their observations, forms of both jackrabbits and cottontails always had overhead cover. Compared with cottontails, jackrabbits, being more inclined to outrun their predators, used forms that were located in more open habitats, and plant species selected for cover came less close to the ground and provided greater visibility of the surrounding environment. In the Sonoran desert, primary plant species above jackrabbit forms were mesquite trees, creosote bush, palo verde, cholla, and triangle leaf bursage, with mesquite and creosote bush receiving most usage. Cottontails used a wider range of species, including mesquite trees, creosote bush, palo verde, cholla, prickly pear, saguaro, and triangle leaf bursage. However, cottontail usage of mesquite and creosote bush was minimal, the growth form of these species being better suited to sight and flight escape behavior preferred by jackrabbits. Cottontails more often chose palo verde, prickly pear, and triangle leaf bursage.

In the Chihuahuan Desert, jackrabbits used creosote bush, mesquite, little leaf sumac, Mormon tea, four-winged saltbush, *Flourensia*, and grasses, with highest usage of creosote bush, little leaf sumac, mesquite, and *Flourensia*. Cottontails used all of the above species in the following descending order: mesquite, grasses, four-winged saltbush, creosote bush, *Flourensia*, little leaf sumac, and Mormon tea. Mesquite on the Chihuahuan desert takes on a short tree or shrubby growth form, hence is more suitable as cottontail habitat than is the taller tree shape of the plant in the Sonoran desert. Harrison doesn't identify the grasses used by cottontails, but in the area where Toasty the Beagle and I trail rabbits near Hillsboro, bush muhly assumes a dense, shrub-like shape, growing within the canopy of more open shrubs. We often jump cottontails from clumps of this grass.

Based upon these studies, plants are selected on the basis of growth shape of the cover plant and its surroundings in a particular area, rather than species. Jackrabbit forms occur under taller and more open plants than those used by

cottontails and are close to open terrain where the hare can flee predators. Cottontail forms are under denser shrubs and surrounded by good escape cover.

But leporids can be creative, when it comes to forms. The most unique form I've observed existed through a full summer in the yard of our neighbors in Hillsboro. This couple spends summers in Minnesota and returns here when weather turns cold. During one summer, they left a Ford sedan parked in their driveway. Their lot encompasses perhaps a quarter acre and has a woven wire fence surrounding it, which might exclude coyotes, foxes, and bobcats, as well as domestic carnivores. One of these could no doubt dig into the yard, but with ample prey outside they probably do not have the incentive. The "shrub" above the daily-used form in this case was the Ford. I regularly saw a rabbit sitting centered under the parked car throughout the entire summer, and I assume it was the same rabbit. In this case, the rabbit was highly visible horizontally from all sides, but had solid protection above. I wondered if the rabbit understood that the fence was serving as a substitute for horizontal plant cover.

Compared to jackrabbits, cottontails more often sit, poised to survive. Those catapult-like hind legs can project a bunny several times its length in any direction. Or they can scramble, driving forward, a ball of fur weaving through brush at 15 miles per hour. A rabbit can move fast, but sitting is its primary tool of survival--sitting very still, in or out of cover, but always with cover nearby.

In the low brush of the Chihuahuan Desert Grassland, where I spend most of my mornings, at least eight of a rabbit's neighbors would willingly be uninvited dinner guests. These neighbors aren't strangers; they know Rabbit's sitting places, and they drop by regularly to test its hospitality. Unfortunately for Rabbit, hospitality can be fatal, because said uninvited guests see the host as the main course. The best strategy is to pretend to not be home; should that not work, then skilled evasion is employed. With so many neighbors eyeing the menu, the rabbit must constantly test the visitors's resolve; a resolve perhaps directly proportional to time since their last meal. Most of the potential dinnertime guests snooze during daytime, sitting time for the rabbit. Dusk, nighttime, dawn are the times Rabbit moves about to dine, hence these are the appropriate times to visit and see if Rabbit might be ready to serve (as) a meal. Midday danger for Rabbit probably comes more often from above—a large hawk, eagle, even a raven, can kill or injure it with a dive. So, it sits on its mighty butt, beneath a shrub, staying invisible to airborne hopefuls.

Perhaps a lesser threat, but also present, are reptiles. Only the largest of diamondbacks or gopher snakes might consume an adult rabbit. Both of these can stalk or ambush. Regular use of familiar "forms" protects Rabbit against ambush. It will spot, hear, or smell anything new, no matter how immobile or how well camouflaged, within attack distance of its butt pad. And that butt pad is "formed" to fit

those cocked legs, allowing instant departure along a pre-planned trajectory should a stalking serpent or other unwanted guest approach.

However, fleeing may not be the chosen strategy for dealing with a serpent, especially one that has no venom. An adult rabbit might instead employ aversive conditioning on such an invader, especially if the rabbit is a mom with kits nearby. Those small front legs, relative to hind legs, may resemble the atrophied limbs of a thalidomide birth, but they end in razor sharp claws, as do the rear toes. A leap, a kick with those hind legs and the extended claws can penetrate the scaly hide of the snake. And the long front incisors can unsheathe and grip or puncture hide. If the serpent retreats, a quick bite holds it briefly while both front and hind claws run in place, leaving bloody scratches that can disable or infect. For a predator, even minor injuries might debilitate and initiate a long, slow process of infection, decreasing competence and increasing hunger that can convert it to carrion or prey.

In the case of a stalking rattler, or one lying in ambush, a rabbit may let the serpent know it has been detected, rather than assume immediate flight. A mature rabbit has confidence in the quickness and power of those rear legs and knows it can instantly be out of reach if a snake telegraphs intent to strike. Confronting the predator at hand, monitoring its position and intent, perhaps harassing it until it leaves, may be a better strategy than forced flight in the open that could make Rabbit vulnerable to an opportunistic redtail or coyote.

Any rabbit that survives to adulthood has ample opportunity to hone its anti-predator strategies and refine its judgement. It becomes a known member of a desert community, and it knows that the wannabe guests will check regularly to see if dinner might be available. Maintaining an acquaintance with those guests and assessing their intent is critical to Rabbit's survival.

Probably the largest predators consistently worrisome to an adult cottontail are coyotes or bobcats. While rabbits would seem to be natural coyote fare, coyotes might be a lesser threat in the desert. They relish a cottontail for dinner if the

opportunity arises; no doubt they catch inexperienced young. But coyote hunting style probably renders them less effective on a creature so attentive as an adult cottontail is to its surroundings and so skilled at using cover. Coyotes may gang up to relay a running jackrabbit, trying to wear it down by prolonged chases. For mice or woodrats, coyotes often hunt singly and adopt a stalk and pounce strategy, relying on extremely sensitive ears to locate prey in undergrowth. Neither approach is likely to consistently catch adult cottontails.



Trailcam photo by Harley Shaw.

A rabbit's avoidance behavior is especially resistant to stalk and pounce hunting.

In addition to its catapult-like legs, a rabbit has an advanced surveillance system. Most often it sits in its form, well back under a bush, protected on all sides. A coyote-sized predator would be hard pressed to slip through the brush unheard, and it could not approach in the open unseen. And rabbits hear, smell, and see quite well.

Those large ears detect any faint sound that might not be normal for the area; the eyes, placed on each side of the head, observe some 200 degrees of arc. Sneaking up on a rabbit is challenging for the most patient stalkers, and coyotes aren't much known for patience. They may use a freeze and creep strategy, moving only when attention of the prey is diverted. If the strategy allows a near approach on any prey, a sudden rush may succeed.

But the rabbit has its own counter strategy. It starts by sitting perfectly still hoping to remain undetected. If the coyote develops a "natural pointer" demeanor—intermittently creeping forward, then freezing, focused on the prey, thereby notifying Rabbit that it has been detected, Rabbit remains cool. It watches intently, perhaps hoping that the coyote, realizing its plans are known, might shrug and move on without wasting energy. Should Coyote persist in its stalk, Rabbit waits for it to commit. If Coyote rushes, a short but fast run puts Rabbit in cover. The coyote may give pursuit. However, ground cover is usually too tall for Coyote to retain sight of the fleeing rabbit, which, all the while, is using a preplanned escape route. Body scent may give coyote a brief inkling of direction, but airborne scent dissipates quickly and drifts with any breeze. It soon becomes a false trail that will lead coyote astray. Coyote's nose is undoubtedly sensitive enough to trail the rabbit

scent on the ground, but, as Toasty daily demonstrates, ground trailing a jumped bunny is a losing game, especially on dry desert soils. Rabbit will move ahead on an erratic course that slows a trailing predator and gives rabbit ample time to increase its lead. And once out of sight, it can now accomplish this at a leisurely pace, going from shrub to shrub, all the while watching for other sources of danger. Coyote, being practical, probably decides to seek less wary prey. It sniffs the cottontail's track, perhaps whimpers or yaps its frustration, then moves on. It will visit again on its next pass in the vicinity. Who knows, the day may come when a moment of distraction will render Rabbit vulnerable, hence dinner.

But Rabbit cannot let down its guard, for guests better adapted to penetrating its hideout will visit. Gray fox and bobcats know how to reduce Rabbit to a meal. They are stalking masters, who use scent rather than sight to locate prey. Like the coyote, they know where the rabbit lives and feeds, and in their rounds, circle downwind from the spot they expect the bunny to hide. Their strategy is to approach unseen, and catch the cottontail with a single, short charge. They waste little effort on pursuit. For either of these predators, unless the rabbit shows some sign of weakness, a 10-yard chase would be a long one. The most successful hunt involves no chase at all, with Rabbit in their grasp before it knows it has been detected.

Leporids use other hiding and resting places than the narrowly-defined forms. Where substrate is suitable, desert cottontails dig burrows. Burrows were common in Orr's California study area. I'm not sure that cottontails dig many burrows in the hard, rocky ground of either the Sonoran or Chihuahuan deserts. I've found only one burrow that tracks indicated had been recently dug by a cottontail. I've watched rabbits use available holes, going into cracks and small crevices in steep rocky banks of the larger washes. Where we walk, these are a conglomerate made up of sediments and small to mid-sized rocks deposited between 78,000 and 23 million years ago. Local cottontails have had ample time to evolve their usage. Known as the Santa Fe geological formation, these low bluffs provide rocky outcrops and soils with more dense shrubs than some of the surrounding Pleistocene and Holocene outwash, thereby being particularly attractive to cottontails. I once watched a cottontail slip into a large hole in a kangaroo rat mound. Such holes in softer ground, holes of prairie dogs or banner-tailed kangaroo rats, are easily excavated by a canid and may be a less secure hideout.

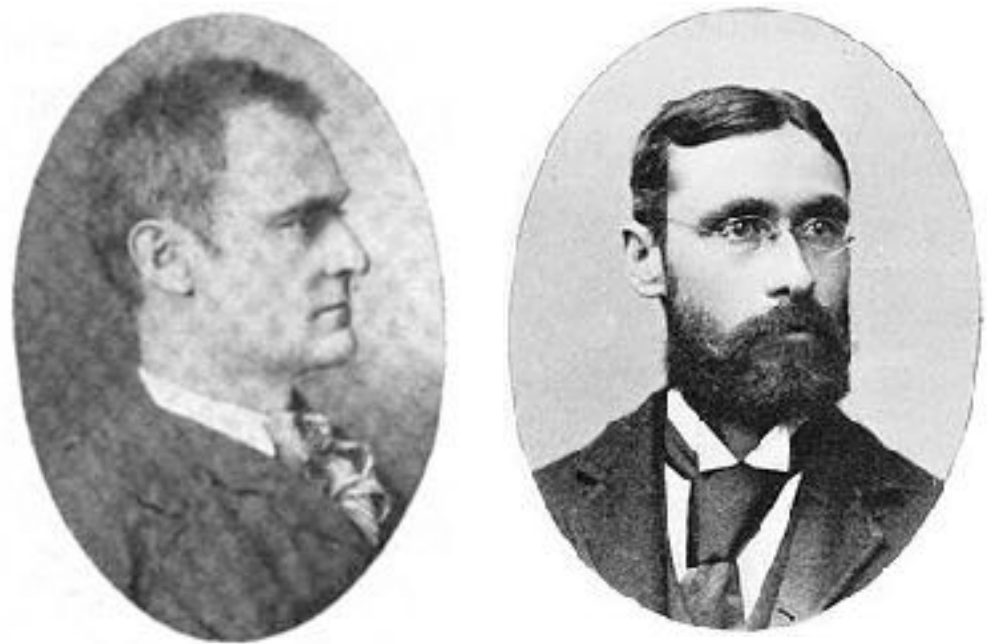
The narrower definition of forms as developed from the descriptions in the two desert cottontail studies noted above, excludes other places leporids may sit. Cottontails drift away from shrubby cover during evening hours. We encounter them often scattered along dirt streets in Hillsboro, and I've seen them sitting in the worn tire tracks on back roads in the local desert. In doing so, they create shallow depressions that are also reused, ergo forms with no overhead cover. These depressions may hold remains of mesquite or acacia bean pods or stems of grasses or half

shrubs, apparently carried to the site by the rabbit. The values of such sites, in the presence of potential mammalian and avian predation, is hard to conceive. Maybe rabbits just get claustrophobic now and then.

All in all, I wonder at the continued utility of the word, form, as we learn more about leporid behavior. It seems to refer specifically to resting places for hares or rabbits, but usage varies in literature. In most cases, it seems to have become a "token" word, thrown into text by authors simply to show they are aware of its existence. For most other species, such as deer or peccary, such resting places are called beds or bedsites. If the term originally referred to depressions where European hares lay midday, some current usages are perhaps misguided. For cottontails, the term "seat" might be more appropriate. This, of course, is nitpicking on my part; no doubt, over time, the term "form", as applied to leporids, will assume more shapes in the shifting realm of language. Or perhaps it will gradually disappear, replaced by more common and less ambiguous words.

Snails, Ferriss, and Pilsbry

In the category of never heard of them and probably don't care to hear about them fall [James Henry Ferriss](#) and [Henry Augustus Pilsbry](#). In 1915, they were prowling around the Black Range. If they were rustlers or bank robbers their story would be legend. But they were not, they were snail collectors. In particular, landshell collectors.



James Ferris (left) in 1904 and Henry Pilsbry in 1914

Of the two, Pilsbry was the most renowned, being described as a "dominant presence in many fields of invertebrate taxonomy for the better part of a century" (from link above). In 1917, they published "Mollusea of the Southwestern States, VIII: The Black Range, New Mexico" ([.pdf](#) or [online magazine](#)) in the Proceedings of the Academy of Natural Sciences of Philadelphia (pp. 83-107 with four additional plates). In the article, they described a collecting trip in the Black Range during the

summer of 1915. Annotated excerpts follow (spelling and punctuation as in the original - "sic" is not used here).

"Approaching from the west, by way of the Mimbres Valley and up Gallina Canyon, we reached the crest above the head of Silver Creek. Subsequent camps were made at intervals from Sawyer Peak, the southern end of the range, to Reed's Ranch on Black Canyon, our route being along the crest trail, with numerous short trips down the slopes, and a two-day trip to Kingston . . . travel was by pack train." (p. 83)

Note the reference to a well-established crest trail with reference points we are very familiar with today; Sawyer Peak, Black Canyon, and Reed's Ranch. Maps are at pages 84 and 85 and show a road across the Black Range south of Sawyer Peak, Wright's Cabin, and the McKnight Fire Cabin, among other things.

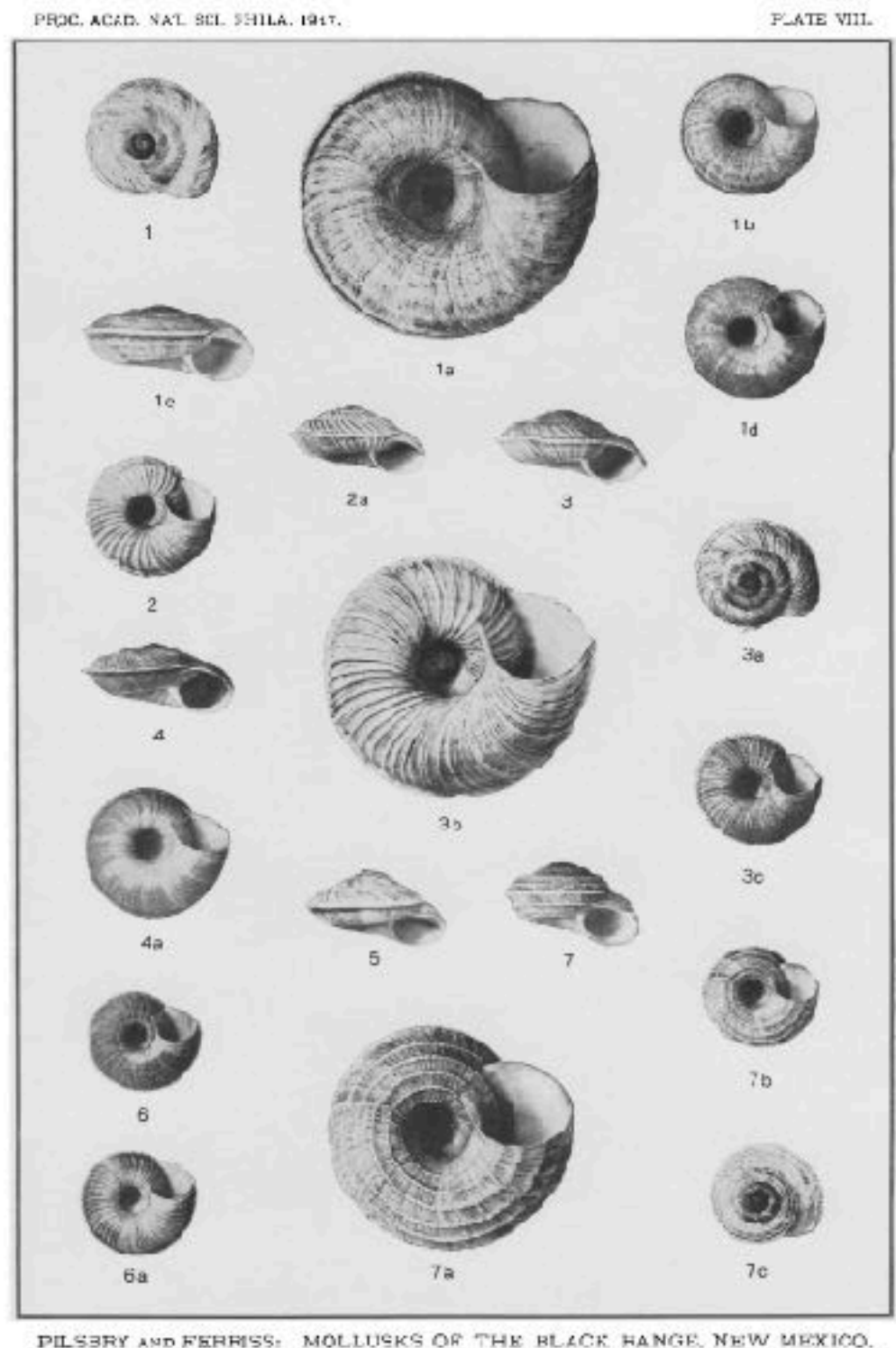
"Fine forest extends down nearly to the 7,000-foot contour. It has been well protected against fire and its remoteness has deterred the lumberman. The yellow pine, spruce and quaking asp are large and the ground well covered with forest mold." (p. 83)

See [Volume 2, Number 1](#) (January 2019) for an excellent discussion of the fire history of the Black Range by Larry Cosper.

"A good crest trail is maintained by the Forestry Service, and several cabins along it are occupied by forest rangers during the dry season . . . Deer, bear and wild turkeys are abundant. There are no rattlesnakes in the forest zone, though occasionally seen up to about 6,000 feet." (p. 86)

Most of the article is, as would be anticipated, a scientific discussion of the snail species collected, scientific descriptions, listings of collecting sites etc. In addition to the discussion of the subject species, the article provides excellent insight into how natural history was done in the Black Range in 1915. Plate VIII from the article is shown below.

Ferris later wrote an account of the collecting trip entitled "A Shell Hunt in the Black Range" ([.pdf version](#) or [online magazine](#)). It was published in the January 1917 issue of *The Nautilus*, Henry Pilsbry editor and publisher. Before you jump to the conclusion that there was collusion, let me point out two things: 1) probably; and 2) Pilsbry was probably the leading authority on mollusk in North America at this time. It was that standing that made him the obvious choice of Editor for *The Nautilus - A Monthly Journal Devoted to the Interests of Conchologists*. And, the format of the publication included a mix of science and the adventure which is sometimes a part of science. For instance, the previous issue (December 1916) included articles like "The Anatomy of the Náyad Hyriopsis Myersiana" and "Shell Collecting in the Sierra Nevadas".



Whereas "Mollusea of the..." was heavy on descriptions and scientific keys "A Shell Hunt..." was written in a different vein. For instance,

"... the work continued for another month by way of Black Canyon, Diamond Creek (where we were detained briefly by enormous speckled trout) . . . It was our highest and wildest range to date. The cattle, wild and keen of scent, are trapped for slaughter in corrals with swinging gates, something like monster turkey-traps. Black and silver-tipped bears, and mountain lions were plentiful (p. 100) . . . Again when alone, and my thoughts were far away, just at dusk, a robust mountaineer from the Great Smokies came into camp to show me the mummied right hand of the last man who climbed the trail to take him back to Tennessee. As a stranger, and a little timid, it was my part to show that I had no particular interest in the specimen; but those mountaineers possess keen insight into the minds of the tender-feet and I presume the camp site is marked also. However, the dwellers of the high and lonesome will never find the spot where I lay out the rest of the night watching to see if that uncanny naturalist was coming back with any more fragments of his specimen (p. 101) . . ."

I grew up bounding across the taiga bogs near Fairbanks, Alaska; waiting patiently in large tide pools in Puerto Rico; "surveying" Mourning Dove nests near Dexter, New

Mexico; hiking the Anza-Borrego and Mojave Deserts; tromping through the woods of the eastern United States looking for wildflowers; and worrying about people wanting to take me back to Tennessee. When not living my own life I was absorbing those of Bates, Wallace, Darwin, Cook, and Humboldt. Such a wonderful mix of science and adventure. Now, as I creak about my home in southwest New Mexico, I discover that hard science and adventure occurred here in the Black Range in the early 1900's. Good stuff.

If, by chance, you are a snail person you may also be interested in "Land Snails of New Mexico", Bulletin 10 of the New Mexico Museum of Natural History and Science (available as [.pdf](#) or [online magazine](#)).

More on early naturalist: [River of Spirits - A Natural History of New Mexico's Las Animas Creek](#) (esp. chapters 15 & 16) by Harley Shaw and [Early American Naturalist - Exploring the American West, 1804 - 1900](#) by John Moring.

Aldo Leopold - His Legacy Part 3 by Steve Morgan

When Aldo Leopold stood on the porch of Mia Casita and gazed contently out over the great valley of the upper Rio Grande, he had no idea his life and world were about to completely change. He was basking in the glow of accomplishment, the first Supervisor from his class and his newly pregnant, love of his life by his side.

The attack of acute nephritis took a man who was extremely active and forced him into being a cautious invalid. It was sixteen and a half months before his life righted course when he was reinstated by the Forest Service, but Leopold

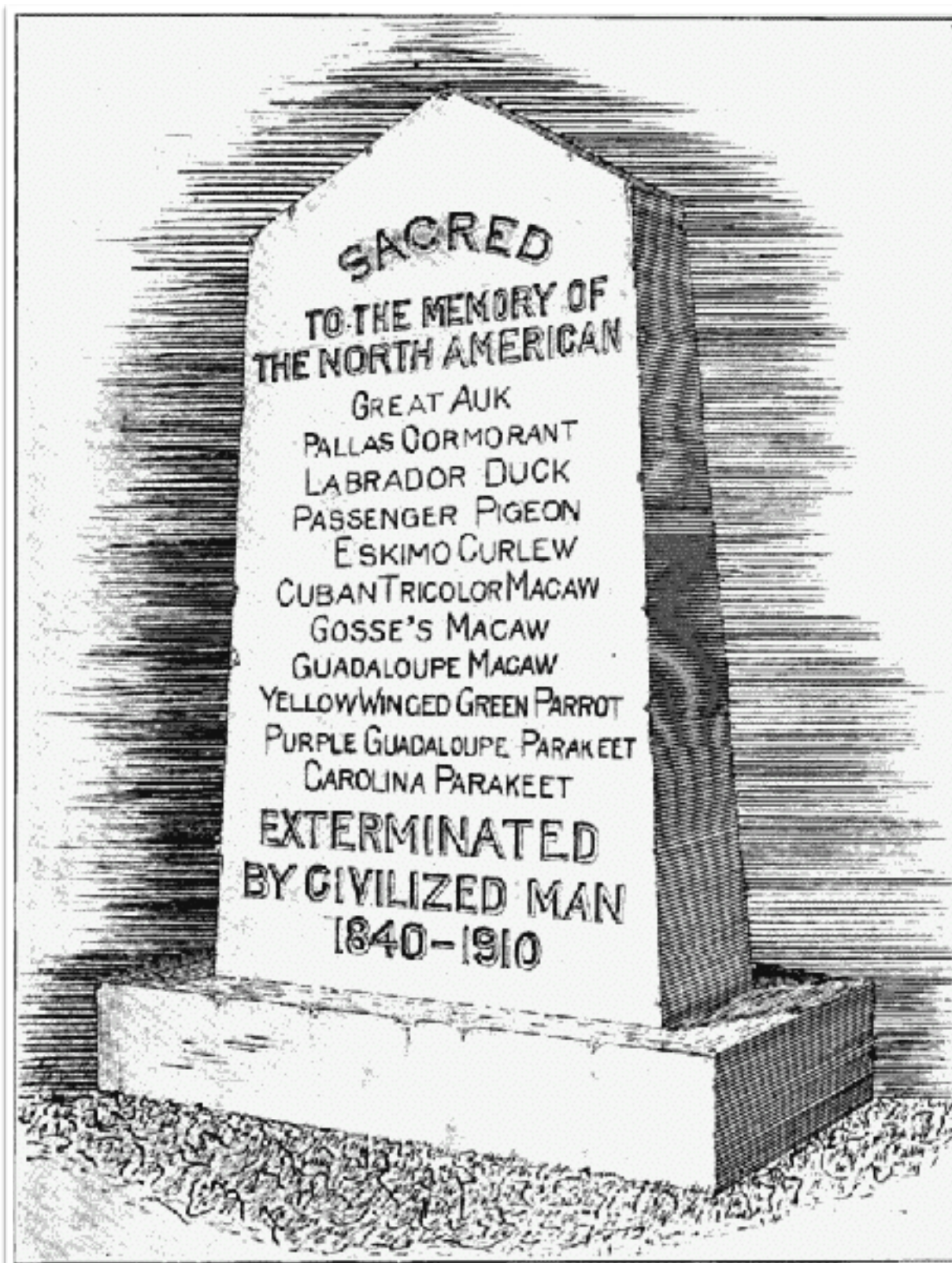
was never one to be idle. He read voraciously during that time and began the practice with Estella of reading to each other.

One of the books that had the greatest impact on Leopold during that time was *Our Vanishing Wildlife* by [William Temple Hornaday](#). It was among the first books wholly devoted to the conditions endangering the wild game populations. The book focused Leopold's thinking on the importance of game protection, a topic that would be forefront in his thinking for the next several decades.

With all of his imposed invalid time, he managed to write and edit the Pine Cone Newsletter and a few pieces on his thoughts about the qualities of a Forest Service employee. He wrote, "We are entrusted with the protection and development, through wise use and constructive study, of the timber, water, forage, farm, recreative, game, fish and aesthetic resources of the areas under our jurisdiction. I will call those resources, for short, "The Forest". Our agencies for this development are: first, the Forest Users; the second,

our own energies, labor and example; and third, the funds placed at our disposal. It follows quite simply, that our sole task is to increase the efficiency of these three agencies. And it also follows that the sole measure of our success is the effect which they have on the Forest. In plainer English, our job is to sharpen our tools, and make them cut the right way."

He also felt strongly that the details of administration and policy details often took precedence over the real work in the Forest itself. He thought that the person in the best position to gauge the success of the Forest was not the Forester in Washington, nor the District Forester in Albuquerque, nor even the forest supervisor, but the individual forest ranger, the man on the ground. As scattered as our National Forests



An image from [Our Vanishing Wild Life](#), a copy of which has been added to the History section of our [online bookcase](#).

were throughout the United States, he felt the person with the best view of life on the forest was the ranger who worked the land every day and didn't spend their time in the confines of an office. Only their best judgement and input could ensure success in a broad-scale conservation effort.

One other topic that is seen throughout Leopold's early thinking is the need to manage the land well. But his main goal here was not the preservation of every cog and wheel, that thinking came later, but that of game management. He still pushed the need for predator elimination, and it was only in the early 1930's that he started to shift his thinking and realized that predators played an important part in the natural world. One of his "Pine Cone" commentaries from January 1914 commented on a story the newsletter carried about Ranger Elliot Barker killing four bobcats and four mountain lions over a few days.

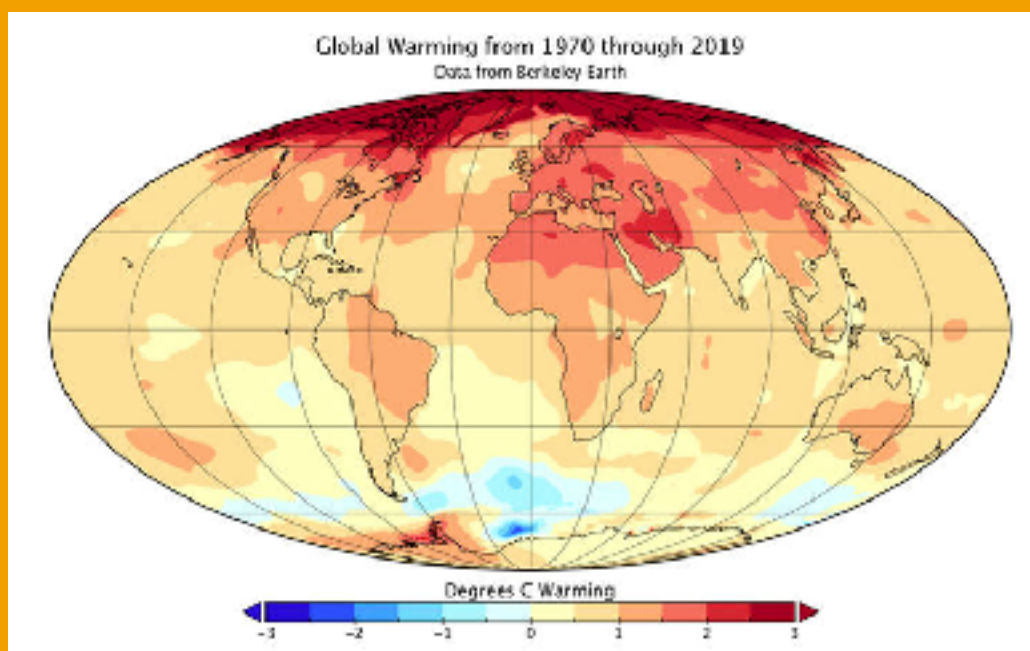


Estella Bergere and Aldo Leopold - December 7, 1910. (Courtesy of the [U.S. Forest Service](#) under provision of this [Creative Commons License](#).)

Leopold's comment was, "some shooting".

It was during this hiatus in Leopold's career that an event occurred causing great joy in both families: on October 22, 1913, Estella gave birth to their first child, Aldo Starker Leopold. It was still another four months before the doctor would allow Leopold to travel back to New Mexico. He wrote to Regional Forester Ringland that his health was improving but was "slow as all get out."

On September 14, 1914, Leopold was finally reinstated back with the Forest Service. In the sixteen and a half months of being on medical leave, his world had shifted from contentment on the porch at Mia Casita overlooking the broad upper Rio Grande valley and being the Carson Forest Supervisor to a more sedate role as Assistant Director in Region 3's Office of Grazing. But his chaffing at idleness was over. He was back to work.



Science, Dec. 4, 2019 - "[Even 50-Year-Old Climate Models Correctly Predicted Global Warming](#)"

Climate Change and Coronavirus (Covid-19)

Oh no, he isn't going to blame the Covid-19 pandemic on climate change is he? Nope.

Of the two issues, climate change is the more complex and devastating, but Covid-19 is more immediate and direct - and thus resonates viscerally with many more. But the

differences and similarities between the two are instructive from a systems perspective.

The biology of a virus and its hosts is much more direct and easy to understand than are the global systems which are changed because of the massive addition of CO₂ and other gases, by humans, into the atmosphere. The changes to ocean oscillation, and the dramatic changes to weather patterns that creates, is just one of myriad "grand-scale relationships" that we, and all other species, will have to deal with over the next decades and generations.

Climate change and Covid-19 both have their deniers, notably in high places. Unluckily the deniers are not the people who will bear the brunt of these events. In a world without justice it is those who have no power who suffer the most.

Covid-19 will adversely (harshly in some cases) affect segments of our generation, but climate change will affect the planet for the rest of time. And "a planet for the rest of time" is more significant than "segments of one generation of a singular species".



All Red-breasted Sapsucker (see discussion below) photographs in this article are by J. R. Absher at the [A-Spear Ranch](#). Photographed in early November 2019.

Red-breasted Sapsucker - Part of a Superspecies

by Bob Barnes

In early November 2019, a Red-breasted Sapsucker, *Sphyrapicus ruber*, was found at the A-Spear Ranch on the east slopes of the Black Range. It was seen and photographed by many. The photographs shown here are by J. R. Absher, who lives at the ranch and is a significant asset for the birding community here.

There are two subspecies of Red-breasted Sapsucker. *S. r. daggetti* is the bird of California and Nevada. *S. r. ruber*, which I have had years of experience with, is found (primarily) from southern Oregon along the coastal areas to the southern boundary of the Yukon. The two subspecies intergrade in southern Oregon. When two subspecies cross, they produce an intergrade. Except for the intergrades, which can be confusing, the two subspecies are fairly easy to distinguish from each other.

S. r. ruber is not known to wander widely; *S. r. daggetti* is found as far south as northern Baja and, at a disjunct location in Arizona, during migration.

When two species interbreed they produce a hybrid. Both subspecies of Red-breasted Sapsucker interbreed with Red-naped Sapsucker (*S. nuchalis*), which is monotypic and is the common sapsucker of our area. The

species limits are considered stable for these two species, meaning that viable hybrid populations do not exist.¹

In personal correspondence of February 17, 2020, Dr. John Hubbard notes:

I agree it does not appear to show any plumage or other external characteristics that suggest it might be an intergrade of any sort either with the Yellow-bellied or Red-naped forms! On the other hand, the rather extensive rows of whitish spotting on the dorsum of this bird are more characteristic of daggetti than the typically smaller ones of ruber, whereas the reddish coloration extending farther down the breast suggests to me just the opposite in terms of the taxonomic name for this particular sapsucker!





"[Sphyrapicus Anxiety, Identifying Hybrid Sapsuckers](#)" by Stephen A. Skunk, *Birding*, May/June 2005, pp. 288 - 298, provides a definitive discussion of hybridization within the *Sphyrapicus*. (Note in particular the discussion and top image at page 292.)

At one time the Red-breasted, Red-naped, and Yellow-bellied Sapsucker species were treated as one species. The Yellow-bellied Sapsucker is found in the eastern US (winter) and Canada (summer). These three species now form a superspecies. (The individual species of a superspecies are called allospecies.) This group separated from the Williamson's Sapsucker lineage about 3.5 million years ago (mya) at some time between 3.0 and 3.7 mya. There are hybridization zones between all three species (including between the Red-naped and both subspecies of Red-breasted).

With these species (*S. ruber* and *S. nuchalis*), hybrids apparently show little intermingling of characteristics, generally looking like one or the other parent. There are two reported observations of *S. ruber* x *S. nuchalis* hybrids from our general area - one from Silver City (2009) and one from Dona Ana (2010).

John Hubbard, in the communication referenced above, notes:

I have just made a quick (review) of the published records of the Red-breasted Sapsucker complex from our state by the New Mexico Ornithological Society in its Field Notes as issued both in print and in an online database that anyone can use! On the cover of [Vol. 51, No. 4, Autumn 2012](#) is a photograph identified as that of a "juvenile [=immature] daggetti, which was present 5 km north of Ramah Lake" in the Zuni Mountains of McKinley Co., NM from 19 Oct-4 Nov [2012]." As best I can tell, this is the only record that has so far been verified among five other of single "red-breasted" sapsuckers that have previously been reported from New Mexico between 1968 and 1996. Consequently, the Hillsboro photos would presumably confirm only the second verified record of this taxonomic complex in our state!

The July 1, 2019, version of the official [New Mexico checklist](#) issued by the NM Bird Records Committee lists the Red-breasted Sapsucker as an accepted species within the state, based on the sighting referenced by John Hubbard, above, by Matthew J. Baumann. The [bird on the cover](#) looks very similar to the one pictured in J. R. Absher's photographs shown in this article.

The report in Vol. 51, No. 4, states: "*– Providing New Mexico's first confirmed record, a juv. of the daggetti subspecies was in McKinley 5 km north of Ramah L. 19 Oct-4 Nov (R. Hammond**, JEP*, JRO**, WFWi**, CLA**, NDP*, MJB**, JPB**).* The numerous photographs were circulated

to persons familiar with the species, including its molt sequence; Peter Pyle compared the photos with numerous specimens and concluded the New Mexico bird was consistent with juv. daggetti, a view shared by Kimball L. Garrett and others."

In our general area, there are two previous records of possible *S. ruber* observations which were not accepted by the Rare Bird Committee. One from [Water Canyon in Socorro County](#) from March 1996 ("yellow-bellied sapsucker with brilliant red head and breast with wing stripe") and one from [Clanton Canyon in Hidalgo County](#) from January 1996 ("1 possible in Clanton Canyon in the Peloncillo Mts. 1/17 . . . Analysis of photographs indicates hybrid origin."). Given the geographic proximity of this location to the Arizona population of *S. r. daggetti*, it

is likely that the hybrid was of that subspecies. Links are to issues of the *New Mexico Ornithological Society Field Notes* which contain the listings.

It is a pretty bird and we are lucky to have had it in this part of New Mexico. All of the above, however, is just a prelude to a discussion of superspecies, which follows.

In 2003, I found myself standing at the top of a 30 meter tower in the southern Amazon, looking out across the Amazon canopy, marveling at the flowering trees dispersed throughout the jungle. On this particular morning, Richard Tkachuck (PhD Biology, UCLA) joined Jon, my son, and me as we recorded beautiful bird species only meters away.

New Mexico Ornithological Society Field Notes



Volume 51, Number 4, Autumn 2012

Richard, his wife Cindy, Jorge Lopes, and I were helping Jon [video a Rufous-necked Puffbird](#) at its nest (first documentation of this species at its nest), an effort conducted from dusk to dawn. But this was in the day and we were recording from the tower and Richard was continuing with his crash course in speciation, explaining the diversity of the Amazon, and all those flowering trees, in a manner that created a lasting fascination.

In the last issue, Harley Shaw commented that *"Contrary to nature shows, not much in nature happens fast or often. You have to be out there a lot and endure days of monotonous, ongoing, sameness before you'll get to experience anything extraordinary. Extraordinary, I mean, in the sense that you feel frightened, enlightened, or changed, when the event is over."* Writing about the puffbird video (link above), at the time I commented that it *"captures the tedium and the excitement, the boat rides, the walks through the dark jungle, and the joy."*

Superspecies? Sorry, I can not separate my fascination with the topic from the experiences of that particular trip into the Amazon.

Speciation, a rather particular field of biology, has spawned (oblique pun intended) a dictionary of terminology, some of which appears here.² The term "superspecies" was coined to help with myriad issues which have developed in speciation questions during the last hundred years. In general, it is defined as a group of largely allopatric species which are closely related but considered separate species - that is, they are not considered subspecies of a singular species. Ernst Mayr (1931) first proposed the English term "superspecies" based on the German *Artenkreis* developed by Bernhard Rensch (1929). There are about 53 +/- superspecies in the US and Canada. The processes of speciation and the factors that affect the process are complex and sometimes argued about; precision is sometimes arbitrary (should I say capricious as well?)

Here I wish only to discuss the concept of species geographic distribution and the margins between individual species (sometimes called a hybrid zone or the primary area of intergradation).

Difficulties generally occur when the groups of birds under consideration are disjunct geographically, meeting - if at all - only along narrow geographic bands, generally sharply delineated on range maps. When the groups of birds are found in the same geographic area, traditional speciation determinations are made - if they cross do they produce viable hybrids? Yes, lump them into a singular species. No, split them into two or more species. You might ask, "What is the standard for determining 'viable hybrids'?" Numbers of individuals, numbers of individuals per encounter, relative fertility of the offspring (with one or both of the parent groups)? Etc. You got it! Lots of papers on these issues.

Writing for [Stanford University](#), Paul R. Ehrlich, David S. Dobkin, and Darryl Wheye (1988) put it this way. *"Geographic variation -- birds showing different characteristics in different areas -- is inevitable among the populations of all species with extensive breeding distributions. It is largely the result of populations responding to different pressures of natural selection in different habitats. If populations of a single bird species become geographically isolated, those different selection pressures may, given enough time, cause the populations to differentiate sufficiently to prevent interbreeding if contact is reestablished. In nature, degrees of differentiation and of abilities to hybridize fall along a continuum, so one finds what is expected in an evolving avifauna -- some populations intermediate between subspecies and species, populations (members of superspecies) that have differentiated to the point where they will not hybridize but have not yet regained full contact, and populations so distinct that they can be recognized as full species whether or not they occur together."*

Or, as I would say, there are no distinct clear lines, the spaces where species come into contact or where a distinction is made between recognized subspecies populations which abut each other should be indicated by bands of grey, not by narrow lines of black.

And the bird at A-Spear? I suspect that it is *S. ruber daggetti*, but that determination will have to be made, finally, by others with more expertise than I.

1. Information in the opening paragraphs was gathered from personal experience and from [Woodpeckers, An Identification Guide to the Woodpeckers of the World](#). Hans Winkler, David A. Christie, and David Nurney. Houghton Mifflin Company, Boston, 1995. pp. 220 - 224 and plate 16. Evolution, 3 September 2012.
2. ["The Language of Speciation"](#), Richard G. Harrison, Evolution, 3 September 2012.



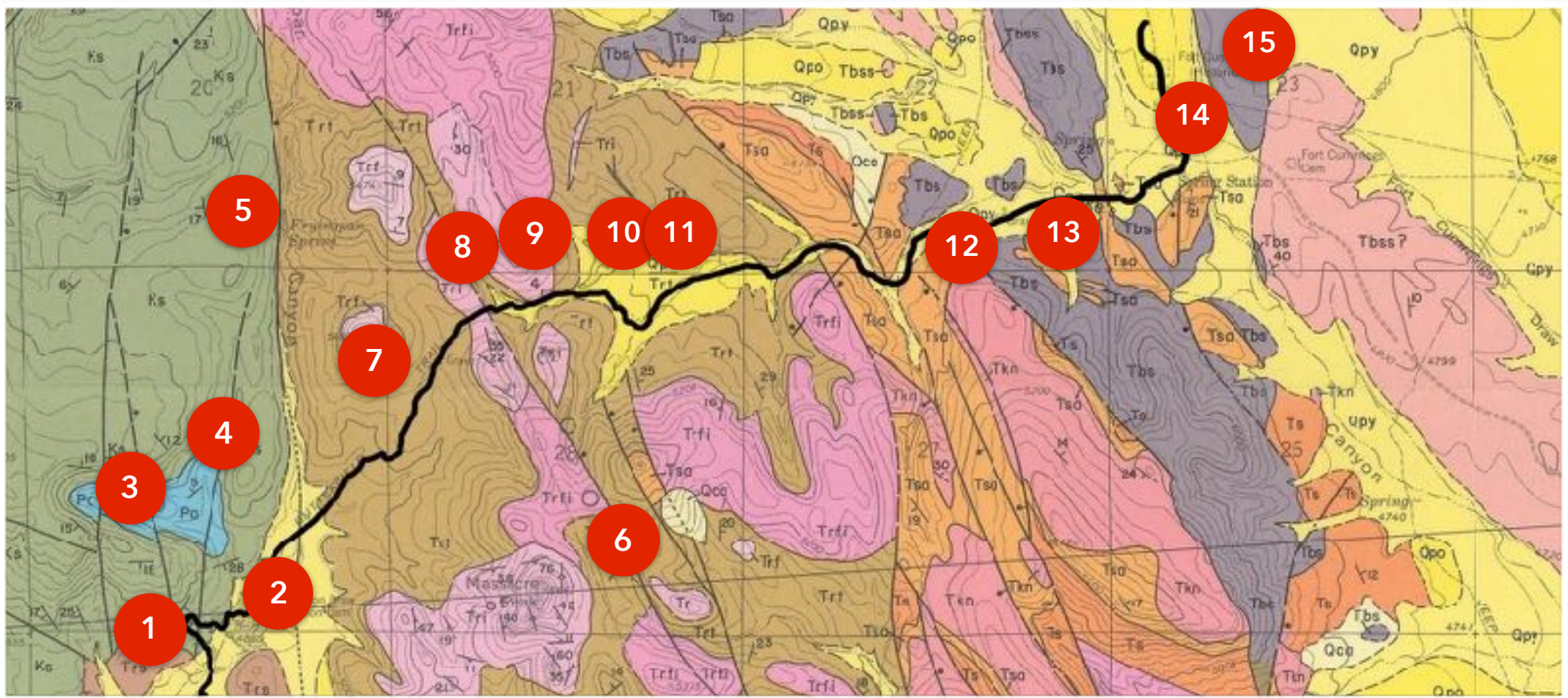
Spring really is here, as attested by this Rufous-crowned Sparrow singing merrily just east of Hillsboro on March 15.

Cooke's Spring Pass

What do you call this trail? It has been called many things by the Anglos, many more by the Spaniards, and even more by the various native peoples. During the Anglo period it was part of the Gila River Train and Wagon Road, or the Butterfield Stage Route, or Whatever you call it, the route from the west side of the range starts at the Starvation Draw Detention Dam No. 4 (Number 1 on the map below). It terminates on the east side at the ruins of Fort Cummings ("15" on the map below). The route is shown in black below. This route is steeped in [cultural history](#). See the link for an extended discussion. The number protocol is consistent throughout this article and repeats on the map at the end of the article.

from the Tertiary. The Tbs formation on the east side of the map is Tertiary (Miocene era rock). The Ks rock to the west is from the Lower Cretaceous and the Pa unit is from the Lower Permian. ([Download the Massacre Peak Geology Map](#))

- 1. There is a series of detention dams in Starvation Draw. This route starts at Detention Dam 4. The range land of Starvation Draw begins to change at the dam. Just to the west of the dam there are nice Cane Cholla, *Cylindropuntia spinosior*. (Photo top of next page.)**
- 2. The area behind the dam to the northeast is rich in sediment and plants benefit from the greater amount of water in the soil. In this area there are numerous Desert**



Geologically this route passes over Tertiary and Quaternary era Rock (alluvium). Most of the Tertiary rock is identified as the Rubio Peak Formation. The surrounding rock is also



***Chilopsis linearis* - Desert Willow - Frying
Pan Canyon, Photographed on May 21, 2018.**

Willow trees (photo below left) and very old Mesquite.

- 3. A population of *Echinocereus chloranthus* subsp. *rhyolithensis* - or if you wish ***E. rhyolithensis***, a newly described species - is found on the slopes in this area and is pictured below. Information is in short supply.**





There is more relief (elevation change) along the "B" transect than along the route discussed here (which follows the pass).

7. Generally the area to the north of this route is in a Wilderness Study Area where the use of motor vehicles is prohibited. My experience in this area is limited so I am not able to access the degree to which these regulations are adhered to. On February 7 of this year we shared the route with a pair of ATV's which seemed to be compliant.

8. Near the crest of the pass, there is a road which forks off of the Butterfield Trail and heads northwest to Frying Pan Spring. Although I knew the location of the spring, and the old stage route, I had

never really understood what the route was like for groups like the Mormon Battalion when they came through this area. After leaving Cooke's Spring they crossed the pass on this route and camped near the detention dam, after getting water at Frying Pan spring. I had always assumed that they must have made camp and then headed up the wash to the spring. It is more likely that they took this cut-off and went directly to the spring, making camp near-by or near the detention dam (which is a large flat area). Makes sense when you walk it . . .

9. Photo below: Looking east along the route from the high point of the pass. ATV's referenced above are center left.

10. The view of Massacre Peak is striking from this point on the route.

11. Photo top of next page: Stream cuts in the area often show dramatic geological strata. In the case of this photo, tuff (Rubio Peak Formation Trt) over other layers.

12. Middle photo next page: Mormon Tea, *Ephedra trifurca*, is found along the route at this point.

13. Bottom photo next page: We found this Spiny Cliff Brake, *Pellaea truncata*, beneath a juniper which provide some shade for a water break. This species is found in the American southwest and northern Mexico. The type specimen of this species was collected in the Mule Mountains of Arizona in August 1911 by Leslie N. Goodding. Goodding was considered a leading expert on the flora of the Southwestern United States. See www.blackrange.org for a more extensive discussion and an image of the type specimen of this species.



The route shown on the map on the inside back cover is roughly 3.6 miles each way. I say roughly because the battery of my trail plotter became exhausted at the black dot on the right side of the map. At that point, it had registered 3.2 miles. We continued from the point where it ceased to record to the saddle of the ridge we had climbed to view the country to the east. This part of the walk was the most strenuous, a walk up a steep ranch road. After reaching the saddle, Rebecca explored more upslope then we turned northeast and headed down slope to the old Butterfield Stage corral site where we had a late lunch ("14" on the maps). This part of the route is shown by the red arrows. After lunch we made our return trip via the route shown by the blue-green arrow, this northern route skirts the ridge we had climbed for the view and is basically flat.



The view from the top of the ridge impressed me greatly. The valley south of Lake Valley spreads out both north and south of where we were. These are the Nutt Grasslands, the northern edge of the Chihuahuan Desert in our area. I was also impressed with how difficult it was to pick out the ruins of Fort Cummings, even though I knew where they would be - I might not have found them except for the fact that the roof of the spring house at Cooke's Spring was more-or-less visible.



We plotted the trail (inside back cover) on February 7 and it proved to be a good time for a hike. There is little shade along the route, except for the occasional juniper. During the heat of the summer there are more flowers in bloom, more reptiles to be seen, and in general more to see from a natural history perspective - but there will be a price if you go at this time of year.

On our walk during February several things became more clear to me. I had long considered the pass to be simply a question of getting from one water source to the next. To fully understand how important this consideration was to the peoples of the southwest prior to the modern age please read [Wood Plenty, Grass Good, Water None](#) by Harley Shaw. But I had never considered how easy this pass is. Although there are a lot of cobbles on the road and you can easily twist an ankle that may be the least of your worries (unless you travel it in summer).



Secondly, the pass had a deadly reputation in the late 1800's when stages, riders, and cattle drives had to deal with attacks from the Apaches and robberies from Anglos and Mexicans. A lot of people died along this route. There are many ambush sites along the way, if you are thinking in that vein it becomes painfully clear why this was a dangerous place.

And lastly, this is a short route. Three and a half miles gets you through the pass, from Cooke's Spring to Starvation Draw and on your way to the Mimbres river. And you have the option of a stop at Frying Pan Spring if you wish (note that on our visit to the Spring two years ago it was dry).

14. Among the possible reptile species you can encounter is the **Long-nosed Leopard Lizard**. It can grow to 10 inches in length and is capable of jumping up to two feet when catching prey (and I assume at other times). "A seasonal breeding coloration develops in adult females: orange to red pigment emerges on the sides of the head, flanks, thighs, and the ventral surface of the tail." (*Lizards of the American Southwest, A Photographic Field Guide*, Lawrence L. C. Jones and Robert E. Lovich editors, specific article by Bradford D. Hollingsworth, Rio Nuevo Publishers, p. 124.) The bottom photo shows this coloration - and we heartily endorse the reference cited above.

15. Some of the ruins of Ft. Cummings are shown to the right. From the height of the ridge above they were easy to overlook but easy enough to discern when you were able to pick out where they were in the scrub and grasslands below. These walls are of adobe and will dissolve into the earth if it continues to rain in our area, all thirteen inches a year.



Long-nosed Leopard Lizard, Gambelia wislizenii, Cooke's Spring (above) and female at Frying Pan Canyon (below). Both in May.





1. Massacre Peak from the detention dam, the dotted black arrow on the map to the right shows the angle of view. Massacre Peak is named for, you guessed it, the massacre of anglos by indians at the base of the peak. The location of massacres of indians by anglos are rarely referenced on maps.

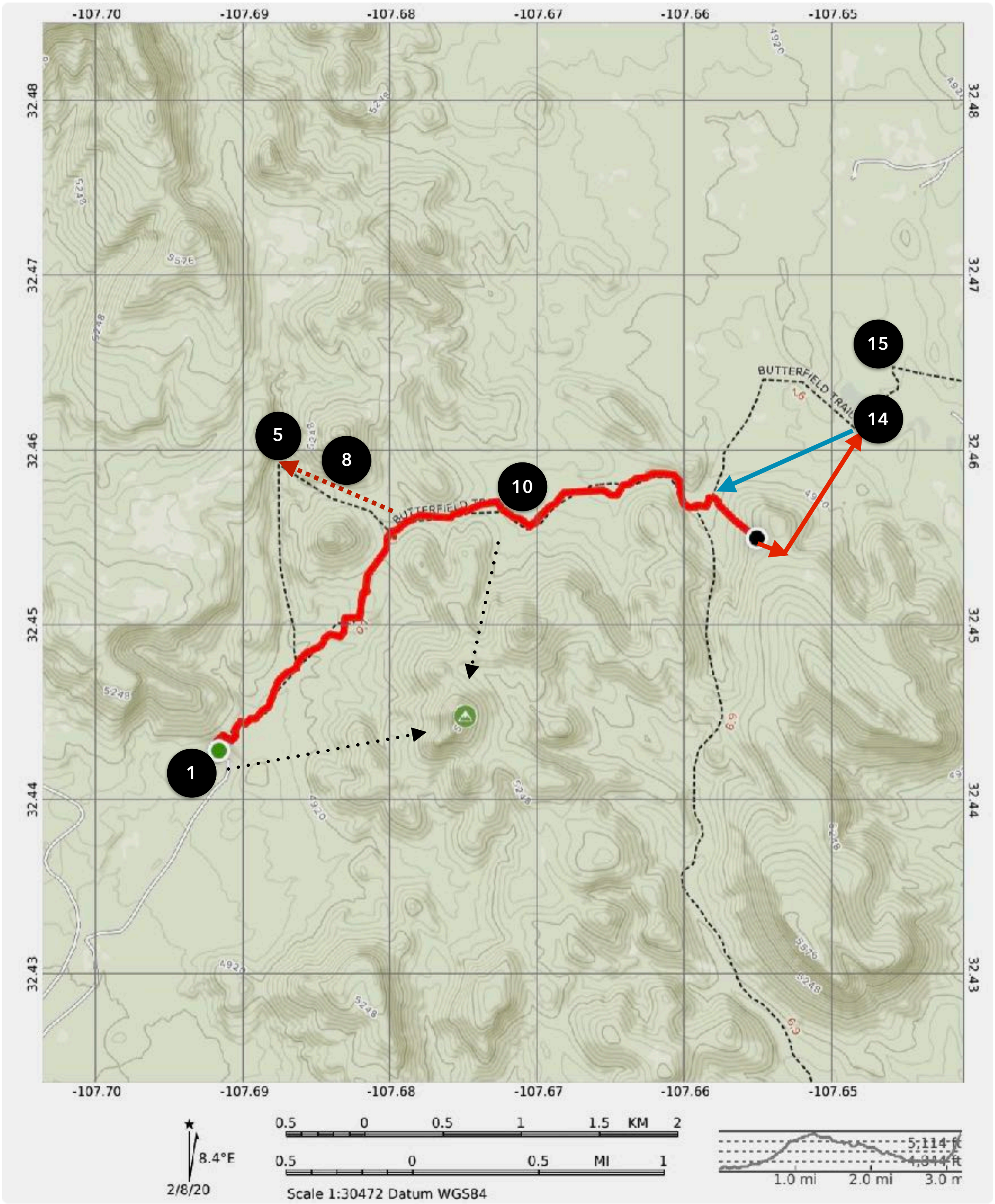


10. Massacre Peak has a dramatically different aspect when viewed from about the half-way point on the trail. For this spot it is a distinctive landmark. Again, the dotted black arrow shows the direction of the photographic shot.

Cooke's Spring is a lesson in the natural history of our area. In 1851 it was described as **"a pool, some 50 feet across, surrounded by rushes. The water is a little brackish, but the grass in the vicinity is excellent."** Later, after the sheep and cattle drives, after the wagon trains, after - well you get the picture - after people it was little more than a mud hole. But there was water. In 1881, the AT & SF Railroad built the spring house shown (from 1882) to the right and piped the water to the Florida Station on their railway. By that time the use of the pass as a transportation corridor had ceased to

exist. Now it is used by ranchers, hikers, hunters, and ATV owners. There are no longer any big trees at the site.







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