When I began my study of the Finger Rock Canyon drainage, there was no thought of eventually publishing my results. The most important aspect to me was the actual observation. I was above all interested in seeing all that I could see, and that involves a lot more than simply looking around. I was also searching for patterns in the distribution of flora and fauna, flowering sequences, seasonal and responses. My only hypothesis was that there were patterns that could be discerned through methodical observation.

The flora recently published in Desert Plants, “37 Years on a Mountain Trail: Vascular Flora and Flowering Phenology of the Finger Rock Canyon Watershed, Santa Catalina Mountains, Arizona,” was not my first attempt to chronicle my study. After the first ten years of data collecting, I compiled a number of graphs showing how the monthly flowering of life forms and each of the five-mile segments varied. I showed them to several people, but the only one who showed any interest was Richard Felger. He encouraged me to publish my data, but I decided I had only just begun. Perhaps after 20 years of data….

In 2004, following twenty years of data collection and a series of medical mishaps in 2004, I complied a new set of graphs (see Figure 1 below for an example). These graphs, I thought, clearly showed that the flowering patterns on each of the mile segments and of each of the life forms were quite different and that the chief characteristic of the flora was variability. There were, indeed, many interesting patterns. I also realized that this variability was driven by climate. In 2007, I completed my first attempt at describing the first twenty years of my study. Several people agreed to review it, but no one gave it as much attention as Richard Felger. His extensive and highly positive comments were simply invaluable. The second effort which was completed in 2009, and the title had become “Twenty-Five Years on a Mountain Trail: A Floristic Study of an Arizona Canyon.” This version included Richard’s Forward to provide a context for the work and a Preface by me. In his comments, Richard urged me to “put more of your opinion, soul, and observations into the more spectacular parts.” The Preface was intended to show just how deeply I felt about the canyon—the “soul” component. It was nice to have a spiral-bound summary of my work, and I toyed with the idea of getting it published somewhere. But something seemed to be missing, and I had no idea what that was. I still was not ready to publish.

Another version of the flora was prepared in 2015. I was a slimmed-down version of my previous attempts, with few graphs and very few photographs. For several years I had been working with Mike and Theresa Crimmins to analyze the data. At that point I decided that publishing a basic flora would be very useful and that I could dispense with most of the graphs. My hope at that point was getting it published in an on-line journal and realized that the fewer pages and fewer graphs the better.

It wasn’t until the following year that I realized the most important story I had to tell was just how idiosyncratic the many taxa that constitute a flora really are. All along I had been looking at vegetative associations as the basic units of the canyon ecosystem and assumed the components of these associations
responded to climate in much the same way. My eyes were noting the responses of individual taxa, but my mind was lumping a lot of the data together in order to make some sense of it. It seemed to me that only chaos theory could explain the response of individual plants to climate or weather.

While writing the section on Drought for the final version of the flora, now published in *Desert Plants*, I realized that I needed to take a closer look at the “actors” in the incredible drama that was unfolding before me. In 2010, in order to summarize data on the avifauna in the canyon, I had constructed the same kind of graphs I used in the published flora to give me a better idea of where and when I saw particular bird species. It was not until 2016 that I decided graphs like those would be a unique addition to my flora of the canyon. It took me a while to make 1,773 graphs (three for each of 591 taxa), and even longer to develop just the right format for the graphs. I was really pleased with how this came out and was finally committed to getting my flora published. I realized that finding a publisher willing to take on a document with a total of nearly 1,800 graphs and over 100 photographs was going to be difficult if not impossible, but I was not willing to publish the flora without the graphs for each taxa. Jim Verrier suggested I contact *Desert Plants*, and the rest, as they say, is history. I must admit I had no idea how much work would be involved in getting the manuscript into publishable form and am very thankful for a conscientious and capable Editor, Kirsten Lake.

Figure 1. High/Low Graphs for Life Forms. Data from 1984-2003. Vertical bars show the highest and lowest number of taxa of each life form in flower in the months indicated. Dot is the mean, and horizontal bars show ± 1 Standard Deviation.
The Forward and Preface were not published in the published flora because *Desert Plants* is a journal, and forwards and prefaces were not consistent with the format. Kirsten felt, however, that it would be worthwhile to include them as an on-line supplement to complement the flora, and so they are reproduced below.
One Man’s Mountain Facing the World

by Richard Stephen Felger
December 21, 2008

I came to Tucson as a freshman at the University of Arizona for much of the same reasons that drew Dave Bertelsen to the desert. I would see the Catalina Mountains jagged on the skyline to the north of town, the constant crestline slicing the sky. Finger Rock stood out (I see it even when not in Tucson), and Mount Kimball too. Eventually I learned there were named trails leading up the south face of the mountain and that one could actually hike up to those mysterious-looking places. And a long time later I met Dave Bertelsen and became fascinated with what he was discovering at that faraway place so close to town.

Dave Bertelsen’s magnum opus crowns a 100-year trilogy of far-reaching ecological research in the Santa Catalina Mountains. The first was the classic study by Forrest Shreve of the south side of the mountain started in 1908 and published in 1915 as the Vegetation of a Desert Mountain Range as Conditioned by Climate Factors. Shreve-worked on the mountain three to nine times per year during that time. He ascended the roadless south slope by mule-train and had fine, tented camps set up for him high in the conifer forest. He had assistants and company. In the summer-fall season of 1962 Robert Whittaker and William Niering rented a cabin at the mountaintop resort of Summerhaven, ascending the mountain on the paved road and setting out numerous vegetation plots. This research resulted in half a dozen scientific articles including their classic Vegetation of the Santa Catalina Mountains, Arizona: a gradient analysis of the south slope in 1965. Dave Bertelsen ascended the mountain on foot, more than twelve-hundred times over two and a half decades, hiking up the steep Finger Rock Trail, eventually producing this book. All these studies are unique landmark works with implications far beyond the local region.

In 1915 the population of Tucson and adjacent areas was about 17,500. By the 1960s it was more than 250,000, and in 2008 more than a million people crowded around the base of the Catalina Mountains and beyond. In Shreve’s time the base of the Catalinas were far out of town, but by the 1960s luxury homes were being built at the foot of Finger Rock Trail. In 2008 urban sprawl extends fully to the lower reaches of the mountain, halted only by the National Forest boundary.

Shreve would be astounded at the changes on the mountain even though the basic vegetation would be familiar. He would see drastic alterations from the devastatingly hot 30,563-acre Bullock Fire in 2002 and the 84,750-acre Aspen Fire in 2003, although the area along the Finger Rock Trail would be spared these fires. Shreve lived to see the road paved to Summerhaven, but he would probably not have noticed much change to places like the Finger Rock Trail except for large patches of invasive buffelgrass. Would the
pioneer of desert ecology have noticed other changes if he had access to details like those amassed by Dave Bertelsen?

Certainly such changes are continuing to occur, but the big question is, why? First you have to document the changes, which is no small task. Only then do you have the luxury of determining, debating, and arguing the cause or causes. In the world of exploding human population, locally and globally, there is little doubt that the hand of humanity is at the root of change that threatens so much too fast. Many studies in different places document changes over the years, but none have chronicled the yearly, seasonal, and even weekly march of plants in an arid region with such precision as Dave’s careful chronicles.

Long-term ecological studies are incredibly powerful tools for understanding local and global trends, but detailed, documented, long-term botanical studies are necessarily difficult to come by—especially in desert and desert-edge places. Funding agencies and career scientists generally need short-term results. Quarter-century follow-through is beyond the realities of most institutional support—unless some pioneer sets the stage. I remember when Dave had just finished a decade of phenological and floristic work on the Finger Rock transects. Along with others, I urged him to publish the results. He was not ready. Charles Darwin was also urged by his friends to publish, but the time was not yet right. The demanding discipline of translating a lifetime passion into publishable form is surely beyond comprehension by most people. The fieldwork, data recording, and ideas would not mean much except to the explorers themselves if it were not for the painstaking follow-up work required to prepare the information for publication and dissemination. Converting two and half decades of detailed recorded observations to a manuscript suitable for publication has surely been as daunting as climbing the mountain more than a thousand times.

As I was writing this foreword, Dave wrote to me:

“. . . nor do I think I will ever complete what has certainly become a lifetime passion. I’ve always felt, like the WWI song, ‘I don’t know where I’m going but I’m on my way.’ . . . You are right that I didn’t feel I was ready to publish at the end of ten years, and the reason was that I suddenly realized that ten years was simply not enough to discern the patterns within patterns that I was looking at (and for). I remember thinking at that point (after doing my first set of graphs), ‘My God, I’ve only just begun! It will take years and years to make any sense of all of this.’ Then I decided I would continue for at least 20 years or until I saw 600 species. When I broke my leg, the first thing I said out loud after I called 911 was, ‘Well, at least I got my 20 years in.’”

Philosophers and bloggers might question if anything one person does can really matter. What can one headstrong, dedicated individual do and also enjoy doing and without financial support? Read on and you will know the answer. Enjoyable, you ask? Hiking straight up a rugged desert mountain trail? I know that Dave’s hikes sometimes involved danger and hardship, but by and large the fieldwork has been rewarding and spiritually meaningful—each time the learning of something new, the excitement of extending known knowledge of a personal vision quest. Yet I doubt if more than a minute fraction of the world’s population would be able or would even want to complete the Finger Rock Trail, alone and time after time, plus have the skills for botanizing, analyzing, and writing. So many great philosophers expound the virtues of “climbing the mountain” to gain enlightenment. Well, here you have a great work of science
resulting from one man climbing the mountain time and time again. You will see a physically and
mentally strong person who discovers something new every time he hikes his familiar trail.

I offer a plea for the continuation of this astonishing pioneer work. It can never be duplicated, and the
momentum must not be lost. The groundwork and protocols are established, and now a hardy new
generation needs to take on documenting the march of change up and down a desert mountain facing the
rest of a changing world.
Preface for

Twenty-Five Years on a Mountain Trail:
A Floristic Study of an Arizona Canyon
by C. David Bertelsen

Timber wolves still roamed the pastures and forests when our family moved to a farm in the wilds of northwestern Illinois. We had no running water, the telephone was a wooden box with a crank, and electricity had just been brought to the area. My fondest childhood memories are of wandering through the oak and hickory forests and following the creek and river. Nature was not something “out there,” but an intimate friend. I fell in love with the Sonoran Desert of Arizona at about age ten, however, while perusing my grandmother’s Arizona Highways magazines. Some day, I knew, I would live in the desert. After a month-long visit in 1975, I moved to Arizona four years later. I have felt more at home here than anywhere else I have ever been.

On my first hike to Mount Kimball on May 29, 1981, I was captivated by Finger Rock Canyon. The dramatic changes in flora and fauna as I ascended the trail were so intriguing that I felt drawn to the canyon and mountain. After several return trips, I decided to learn as much as I could about this marvelous place. I quickly developed a passion for flowering plants because their incredible variety in the desert and mountains was both surprising and fascinating. At the time I was learning macro photography, and I was continually amazed at the intricate beauty of flowers. Perhaps this was to be expected, for my affinity for flowers dates to a very early age: according to my baby book, the first word I spoke (after “mama” and “dada,” I presume) was “flower.” My mother wrote that the first thing I did when entering a room was to look for flowers. In those days, nearly every home had a flower garden, and flowers were displayed indoors and out from early spring to late fall. This was long before my devotion to native species, and I particularly enjoyed daffodils, tulips, pussy willows, lilacs, sweet peas, forsythias, peonies, lilies, irises, hollyhocks, roses, geraniums, zinnias, marigolds, chrysanthemums, and asters.

With all the emphasis on the out-of-doors, very few people take time to get to know a place, any place, really well. Friends who are birders and amateur herpetologists tend to have a narrow focus and seem more interested in the number of different birds or reptiles they see, with greatest emphasis on the unusual or exotic, not on habitat or even animal behavior. All too frequently they see neither the forest nor the trees. Most hikers I know are usually intent on going from here to there, and seeing how many different trails they can traverse, how many peaks they can “bag.” Trail runners I meet try to make record time, taking pride on traversing a steep and rugged trail; they claim to love being in the mountains but, like most hikers, see little of what makes it so unique. The sights of most people who enjoy “the great outdoors” are set on such grand vistas that they completely miss the miracle of the details that surround them, the intricate web of life. They never see the trees for the forest, let alone tiny flowers. I am continually surprised at how very few people are really aware of, let alone interested in, flora. Animal life is directly or indirectly dependent upon the plant kingdom, but most people seem to feel little or no connection to the multitude of plants all around. Even flowers receive little attention unless there are great
displays of poppies or owl clover covering the landscape. Many times I have told other hikers that I had seen 50 or 100 different species in bloom that day and was met with a blank stare and apparent disbelief. Only through great attention to a wide variety of detail can one feel the pulse of a place. It is difficult to explain, but I really feel I belong in this canyon, that I am truly a part of it. The data reported herein can give only a vague idea of the knowledge I have gathered and the wonders I have seen. I experience the canyon with all my physical senses, and that takes both time and a conscious effort. I can give only a hint of the awe I experience when seeing the delicate beauty of an Ayenia flower, a peregrine snatching a white-throated swift out of the sky, a collared lizard in breeding colors, snow piled high on yucca leaves, a Sonoran spotted whiptail lizard eating a centipede nearly as long as its body, the play of light and shadow on sheer cliffs, or canyon tree frogs almost invisible on water-polished rock. Insects, too, are a constant visual delight: gold beetles on canyon ragweed, yellow crab spiders on goldeneye flowers, nearly invisible lime green lynx spiders, black and yellow horse lubber grasshoppers with scarlet inner wings, orange dragonflies and inky black botflies on the mountaintop, purple pleasing fungus beetles on rotted logs, or red ladybugs massed on the peak. Mere words are totally inadequate to describe the joy I feel when hearing the bark of a fox, the alarm chirp of a vigilant coati to its troop shuffling through the leaves in search of food, the sharp hiss of a Gila monster, the melodious songs of curve-billed thrashers and Scott’s orioles, the scream of a red-tailed hawk a thousand feet overhead, the buzz of a rattlesnake poised and ready to strike, the kecking of a peregrine falcon from the aerie, the wind whispering through saguaro spines or oak leaves, or the sound of water rushing down the canyon. Many times I have enjoyed a light breeze or the sting of sleet on my face, felt the rough bark of alligator juniper and the smooth bark of manzanita, stroked a lizard or a snake, felt the sandpapery leaves of Thurber Acourtia and the softness of cottontop grass, caressed the glassy smoothness of water-worn rock, and let icy snowmelt cascade over my hand. The earthy smell of wet oak leaves, the heavenly aroma of desert thornapple or shindagger flowers carrying far into the night, the pungent odor of a skunk, the indescribable scent of rain in the desert, even the rank odor of carrion as vultures circle overhead—all are commonplace but memorable none the less. I often enjoy the delightful crispness of miner’s lettuce and purslane leaves, the bitterness of buckthorn and silk tassel berries, the leaves and flowers of wild onion, the sweet stems of thistle, bitter-sweet wolfberries, the cantaloupe-like taste of hackberries, the tang of wood sorrel flowers and fruits, the sweetness of the fruit of saguaro and spineless pricklypear, the banana-like fruits of Schott yucca after a hard freeze, and the tartness of barrel cactus and Engelmann pricklypear fruit.

I have ascended Finger Rock Trail to Mount Kimball over 1180 times, experiencing something new on each and every trip. Few people understand how this is possible and most think I should have become bored with the trail many years ago. For me, it is the journey, not the destination, that is important, and each and every hike is part of a single experience that has lasted more than 20 years, a journey of nearly 12,000 miles. Since coming to Arizona, I have lived in Tucson, a very large city to a country boy like me, and from 1984 to 2005, I worked full-time in the field of criminal justice. My love of Finger Rock Canyon became a passion, and because of my frequent visits I was able to tolerate living in a city and to deal more effectively with people caught up in the legal system. I have continued these hikes because of the endless variety I experience, and the great tranquility I feel, every time I make the trek. Each journey is a physical effort but always an intellectual and a spiritual delight. I have also hiked extensively in the Rincon, Santa Rita, and Tucson Mountains and visited many other incredible places in Arizona, but always I return to “my” canyon. The mountains of the Sonoran Desert are places of particular wonder to me, and life is far
too short to experience more than a fraction of what even one range has to offer. The more I know about the canyon and the mountain, the more I realize how little I really know. I am most thankful for having the opportunity to explore and to experience this incredible place. I did not set out to engage in a grand study of flowering plants, I simply set out to see what I could see. I have seen so very much, so on and on I go, experiencing wonder and joy with every step.