{4} LOCALLY GROWN

[W]e plant our garden, but it does not grow big. Years ago, before they did any mining in the mountain, when we planted the plants would get very big, such as watermelons and squash. It is the same in Shiprock; the farm produce are small. The melons are small.

Tommy James, Cove, Arizona

In many corners of twenty-first century America, eating locally grown food has become something of a political statement. Those who choose to do so can take advantage of a proliferation of farmers' markets and local produce sections in grocery stores. An abundance of literature exists to guide the aspiring local eater, from how-to guides to philosophical treatises on the culinary and ecological rewards of rediscovering the local foodshed. There are even T-shirts and bumper stickers for the new dietary demographic, sometimes called locavores. The trend has gained so much popularity that the *New American Oxford Dictionary* selected the term "locavore" as its 2007

Word of the Year, honoring the efforts of the group of San Francisco women who coined it and helped galvanize the movement in 2005. "Our food now travels an average of 1,500 miles before ending up on our plates," Jen Maiser and her cofounders note on the Locavores' website. "Because uncounted costs of this long distance journey (air pollution and global warming, the ecological costs of large scale monoculture, the loss of family farms and local community dollars) are not paid for at the checkout counter, many of us do not think about them at all. . . . The distance from which our food comes represents our separation from the knowledge of how and by whom what we consume is produced, processed, and transported."[1]

The idea of a tomato traveling fifteen hundred miles to be diced into our dinner seems counterintuitive when many of our great-grandmothers grew bushels of them in their backyards. How did we get to this point? Since the late 1800s along with every other form of production, food production has been industrialized. As scientists made sense of the natural world, learning the keys to soil fertility, the properties of disease resistance, and the processes of animal reproduction and growth, industry transformed those insights into commercial innovations. Some of these innovations came from unlikely places; for instance, commercial pesticides had their provenance in chemical warfare research. Pesticides, fertilizers, enhanced animal husbandry, and other new techniques enabled farmers to grow more food, faster, with less labor, and in less space. Philosopher Bernard Rollin notes that agricultural productivity doubled between 1820 and 1920 and "continued to double in much shorter and ever-decreasing time periods" thereafter.[2]

As the Bullochs herded their sheep across Nevada in the decades following the Second World War, the country was experiencing one of the most dramatic increases in agricultural productivity in human history. Transportation networks were advancing as well, and interstate highways, global shipping systems, and improved refrigeration technology made it possible to move food across great distances. New

state-of-the-art preservation techniques kept perishable items from spoiling for many months. This highly industrialized system could cheaply market a wide variety of foods to consumers, even if those items were not in season or produced locally; thus shoppers could purchase the Chilean tomato, the Australian beef, the French cheese.[3]

At the dawn of the twentieth century, when one in four Americans lived on a farm, a movement dedicated to eating locally would have been irrelevant. While certainly city dwellers' children might have been unfamiliar with the origin of their milk or eggs, most citizens had some involvement in the production of their food. Even if they did not raise food to sell it, many families kept household gardens and livestock at the turn of the century. The typical farmer would have cultivated "a dozen different species of plants and animals," according to journalist and food activist Michael Pollan. On a farm in Iowa, for example, Pollan notes, "there would have been a fair amount of corn . . . but also fruits and other vegetables, as well as oats, hay, and alfalfa to feed the pigs, cattle, chickens, and horses." While a portion of those crops would have likely been sold and shipped elsewhere, the family and others in their community would have consumed much of this produce.[4]

As the century progressed, mechanization and chemical and technological advances reduced the amount of labor needed to oversee agriculture, leading to bigger operations run by fewer people. "Just before World War II, twenty-four percent of the U.S. population was involved in production agriculture; today the figure is well under two percent," Rollin explains. Today more Americans are in prison (2.3 million) than in farming (less than 2 million), and many of those farmers who remain cannot actually feed themselves or their families with the food they produce. Their crops, predominantly corn and soybeans, are "commodities that must be processed or fed to livestock before they can feed people."[5]

During the atmospheric testing era and the uranium boom of the 1950s, many small towns had not yet been transformed by

industrialized agriculture. In the communities of the downwind region, eating locally produced food was still a way of life rather than a lifestyle choice. Staples such as milk, meat, fruit, grains, and vegetables were still produced and often consumed in the communities that grew them. By keeping gardens, preserving food for the winter, and buying from local farmers, individuals were maintaining a culture of food production they had learned from their parents and grandparents while participating in a community-based economy. While not every individual farmed or ranched, it was difficult to remain ignorant of the path food traveled to reach one's plate and of the labors others had undertaken to produce it.

Mary Dickson, who grew up in Salt Lake City in the 1950s, remembered, "When we were kids, people all had gardens. I mean everybody grew food and you bottled your own pickles. . . . My grandfather up in Morgan did, and we would go up there all the time and eat stuff we picked out of the garden. And he would take us to nearby farms and we would drink milk straight from the cows. They'd grow all their own food." She remembered visiting them and watching her grandmother preserve food. "You would bring home jars of stuff."[6]

With that local knowledge—and that homegrown tomato or jar of neighborhood fruit preserves—came a sense of pride, tradition, and shared ownership. Ecological awareness was still a nascent phenomenon in popular culture in the late 1960s and early 1970s, yet individuals in rural communities were already participating in a generations-old system of knowledge that recognized the interconnectedness of the atmosphere, watershed, flora, and fauna even if at times that knowledge was imperfect or abused. They understood, generally, that contaminating any one of those elements could permeate the other components of their surroundings and eventually reach their own bodies, because they saw much of the process firsthand.

The introduction of radiological pollution into the downwind foodshed was rarely illustrated as dramatically as it was in the sheep

Fig. 3. "Our Soil, Our Strength" graphic from *Iron County (Cedar City UT) Record*, 1 November 1956.

die-off in Cedar City, Utah, yet those who raised their own food were accustomed to paying close attention to environmental conditions and often recognized subtler indications. They watched when streams carried off uranium mine waste during flood season, when the wind picked dust up from uranium tailings piles and scattered it onto their gardens, when fine material drifted onto backyard vegetable plots and alfalfa fields from strangely colored and hazy skies after massive flashes or booms occurred to the west. They paid close attention when animals and crops failed to thrive and actively sought to explain such failures.

Kay Millet, who raised her family near Cedar City during the atmospheric-testing era, remembered one winter when she started tomato plants indoors, intending to plant them later in the spring. "It was February, a nice sunny day, and I thought, 'I'm just going to set these tomato plants out and let them get sun." A short time later, Millet saw the plants had turned "white, crusty-like and laid over, gone for no reason. That same year when we raised the garden we noticed the squash and tomatoes would get this light stuff on them, the leaves would get white and crusty and the squash would be all yucky and the tomatoes did the same thing." Millet observed

the white crust "kind of spread around the garden. We ate them, the ones that were good."[7]

After a few years, most gardeners would be hard-pressed to remember when a specific blight swept through their gardens, but decades later, Kay Millet still remembered when it happened. "That was 1957, or '58, because Sherry [Millet's daughter who succumbed to leukemia at age five] was just a baby then. They were doing tests all the time." Millet lived close enough to the test site to know that around the same time she witnessed the strange phenomenon in her garden, nuclear testing was occurring regularly to the west. For those who did not live in the immediate vicinity of either a test site or a uranium-mining facility, other clues would be necessary to connect crop and livestock problems to radiological exposure.

Born in 1948, in northern Utah's Duchesne County, Dave Timothy grew up in the dairy industry. He spent his childhood and teenage years working on his father's dairy farm in Altonah at the base of the Uinta Mountains, a steep, massive range east of Salt Lake City. From the age of eight or so, Timothy "milked cows . . . irrigated, plowed, harrowed, disked, leveled, planted, cut the hay, baled it, raked it, hauled it, fed the calves, weeded the garden, [and] mowed the lawn. . . ." His father's "was a Grade A dairy. This was a first-class dairy. [Milk] was taken through pipelines, glass lines, to the tank, where it was immediately cooled, kept at a constant temperature until it was picked up by the milk truck." Timothy's father sold his milk to Hiland Dairy, which in turn distributed it across the region.[8]

After they had finished milking the cows each day, Dave and his father, James, took home two or three gallons for their family's consumption. Between Dave, his two younger sisters, and their parents, "[t]here was very seldom excess milk" left over the following day. "Milk was our produce that we had. So, many of our meals, the basic . . . diet was around things we raised. We raised our own vegetables from our garden and then milk being another basic. Things were planned around and developed from that." The Timothy family

also consumed local beef: "A lot of times . . . [father James Timothy] would get a beef [cow] from one of our neighbors that had fattened it, grain fed, finished it out. We would sell ours or trade for one that was more tasty." Occasionally, Dave recalled, "if you were lucky that year," a hunting trip brought home local deer meat. His mother, LaWanna, "can[ned] a lot of the garden produce so that we would have it through the winter," and the family bought "apricots, apples [and] peaches" from neighbors. Drinking water came from a spring on the property, and crops and gardens were irrigated with snowmelt runoff from the Uinta Mountains watershed.[9]

Ivan Sidney, who was born the year before Dave Timothy, grew up on a farm roughly four hundred miles due south. Sidney lived with his mother and his grandparents at First Mesa, near the town of Polacca, on the Hopi reservation in northern Arizona. When Ivan was five years old, his father, a World War II veteran, had died following an on-the-job accident while working on a Bureau of Indian Affairs road construction crew. Sidney's mother was plagued with rheumatism, so her eldest son Ivan "grew up being her hands." He described a childhood "speaking only Hopi. . . . I grew [up] pretty much in the traditional way." The family lived without electricity, "no phones, and no refrigerators, and we drank mostly from the spring. I remember going with my grandfather to get water. When we wanted the coolest water in the hot summer [we would] go to the spring right at lunch and get some water . . . and much of our food was from the farm, corn, watermelon, beans." In addition to the produce they cultivated, Sidney's grandparents also raised livestock to provide the family with meat. "I was raised on sheep, a lot of us did our own butchering. We don't just eat the meaty part of it—lamb chops and all—our traditional foods even included intestines. Nothing went to waste. There was something called bloodcakes, too, from the blood. What an animal ate, we'd take it too." Sidney labored alongside his grandparents on the farm, hauling water, "clearing sandstones, . . . pulling weeds, things like that."[10]

As children growing up in remote farm communities several hundred miles from the Nevada Test Site, Dave Timothy and Ivan Sidney had no knowledge of the bomb tests as they occurred. Years later, Timothy remembered a number of times "working in the fields . . . when it would be very hazy, just super hazy. It was almost like it had been a real bad windstorm, but there hadn't been. I remember commenting to Dad quite often about different times that it sure was strange to see it that hazy." Timothy remembered the haze being "almost like a smoky color, but it wasn't smoke." On the Hopi reservation, Sidney recalled, "we're so isolated, we didn't know what was going on" at the Nevada Test Site. Several Hopi had battery-operated radios, but "reception was very poor out here; the only reception we had was at night, from Oklahoma. They must have had a powerful transmitter, because I remember it was called KOMA. Everywhere in this village you could hear it just echoing. They played the old-style music. . . . If there was any kind of warning" about nuclear danger, Sidney declared, "we wouldn't [have] hear[d] it."[11]

Of course, few warnings were broadcast, and certainly none from radio stations outside the immediate downwind region. The Atomic Energy Commission occasionally announced a test ahead of time so citizens could view it from Las Vegas or from the rooftops of southern Utah towns, but these messages included no indication of danger beyond cautioning viewers to wear sunglasses to protect their eyes from the brightness of the blast. Families such as the Timothys and the Sidneys would never have heard these broadcasts, as the AEC saw no reason to inform citizens outside the immediate vicinity of the test site. The commission had its hands full simply managing the information it provided to those people who lived close enough to witness the tests.

After the Upshot-Knothole test series of 1953, patriotic press releases were no longer adequate to keep citizens in the immediate vicinity complicit. One test in particular that year bore especially dramatic results. Shot Harry was hardly the largest weapon detonated

in Nevada, but it produced the single-greatest quantity of external gamma ray exposure of any domestic nuclear test. Alarmed the post-blast cloud would cause serious radiation sickness in citizens immediately downwind, the AEC did issue a rare radio warning in St. George, Utah. Later it was reenacted in the 1955 AEC film *Atomic Tests in Nevada* (the same film that erroneously claimed livestock owners received warnings prior to nuclear tests). Filmed in Technicolor and featuring a cast of St. George residents, the film sought to quell the fears of residents in the immediate vicinity of the test site.[12]

It opens with scenes of the early morning streets of St. George. Except for the policeman, the gas station attendant, and the local milkman, "everyone [was] asleep," the narrator intones. "Only our night owls saw it, that great flash on the western sky, an atomic bomb, at the Nevada Test Site, 140 miles to the West. But it is old stuff to St. George. Routine. They've seen a lot of them, ever since 1951. Nothing to get excited about anymore." As the morning progresses, the "thriving community" goes about its business. Women are shown hanging their wash, peeling potatoes, and sending their children off to school while men fill their cars at the service station and patronize local businesses. When the AEC's radio announcement informs them "that due to a change in wind direction, the residue from this morning's atomic detonation is drifting in the direction of St. George," residents calmly vacate the streets, taking cover indoors until their radios notify them the danger had passed.

On the actual day of Shot Harry, few downwind residents actually heard the warning. Many were already at work, away from their radios, and others had no radio at all. Quentin Nisson, mayor of the nearby community of Washington City, Utah, from 1950 to 1964 and proprietor of the Washington Mercantile, received the warning via telephone, as Washington City was still four years away from receiving radio service. The AEC placed a phone call to Nisson at the Mercantile around "10:00 or 10:30" a.m. and asked him to go to the elementary school and order the children to be kept inside during

recess. Nisson walked across the street to pass the warning along to the school. Luckily, he recalled, "recess wasn't till about 11:00, you know, so they did keep them in during recess here. . . . But I remember when I went over [to the school] seeing that there was kind of this yellow-looking stuff . . . [the fallout] was already here."[13]

Even in St. George, the warning did not reach everyone. Frank Butrico, St. George's AEC radiation monitor, recalled, "It wasn't too much of a surprise that not everybody had the word. Cars were still on the road within St. George, people were still walking on the streets, and most distressing, when we passed the grade school, we noticed that the children were still on their morning recess, the teacher having not received the information about taking cover." Butrico received instructions from the AEC to "be sure and discard my clothing, and to be sure and keep showering until I reduced the amount of radiation that was on my body." He asked his superiors "whether we should be doing the same thing in an announcement to the people in the community, and of course the answer was a resounding no, because this would create a panic situation."[14]

The AEC screened *Atomic Tests in Nevada* for the St. George Chamber of Commerce in April 1955. Member Sheldon Johnson recalled chamber members felt a "kind of pride" at this depiction of their participation in the work of national security. "We were recognized as somebody. . . . And up till [then], St. George wasn't anything." The film subsequently played for local residents, who found it exciting to see their streets and neighbors on-screen. Years later, St. George's Technicolor debut gained darker significance in downwinders' memories. Hardware store proprietor Elmer Pickett, who was shown in the documentary listening to the radio in his store, noted that many of the other film participants later succumbed to cancer. "Remember the milkman and the police? They had a housewife and a sheriff . . . out of the bunch that was in that film, two-thirds of them died with cancer."[15]

The film had been produced as part of the AEC's new campaign of

"zone management," which sought, in Frederick Schoemehl's words, to "reshape the political and cultural geographies of the region." Subsequent to the sheep die-off and the call for citizens to go indoors after the Harry test, the AEC "declared 'complete acceptance' of atomic testing as its goal. . . . A process of public 'indoctrination' began with a view that the off-site region was a network of zones that the AEC would manage." Within two years of Shot Harry, test site officials had become "obsessed with local matters, a recognition that on- and off-site activities were, in reality, inseparable." The zone management campaign institutionalized the sort of condescension and disrespect AEC officials involved in the sheep death investigation directed at the ranchers. Schoemehl argues the zone management program "embraced an institutional arrogance and authority. Common people—the ranchers, miners, and rural residents who occupied the region—remained subjects of management and manipulation." A key technique of the zone management program was the AEC's wooing of local leaders, who could then "carry [the AEC's] message to the bulk of the local population," a strategy that Schoemehl observes was "not dissimilar from colonial systems of governance."[16]

Flattered by their participation in the great work of national security, as depicted by zealous AEC officials and *Atomic Tests in Nevada*, many local leaders (though not all) enthusiastically endorsed the AEC's messages and placated worried citizens. The AEC recruited radiation monitors from the Public Health Service and assigned them to various communities and regions downwind of the test site, where they distributed badges to measure radiation, shared pamphlets and films with locals, and "educated" physicians about radiation-related health problems. The 3 March 1955 *Washington County (St. George UT) News* advised concerned citizens that AEC representatives were stationed locally, and readers could easily contact them with questions by dialing "724, at the Rugged West," a motel located in the center of downtown St. George, across from the popular Big Hand Cafe and the new J. C. Penney store.[17]

The AEC set out to "manage" downwind perceptions of the test site in Tonopah, Nevada; St. George; and other towns because their residents were already well aware of the ongoing testing. The townspeople regularly heard the sound of the blasts, felt the shock waves, and saw the bright flashes of light and the distinctively shaped mushroom clouds. By the time these clouds passed over distant communities such as Altonah and Polacca, they had dispersed enough to resemble ordinary clouds and gave no outward indication of their toxic content other than their occasional strange coloring. At that distance, no one saw or heard the initial blasts. If a radiation monitor did cross paths with a citizen in these communities while measuring for radioactivity, he would have little need to explain himself. Regional newspapers such as Salt Lake City's *Deseret News* did discuss test site activities periodically, but people outside of the immediate downwind area had little knowledge of bomb detonations, precisely as the AEC intended.

Unaware of the explosions to the west, the Timothys and the Sidneys and other families went on with their lives. Their parents and grandparents continued to run their farms, and both young men set out into the world. Ivan Sidney went off to a BIA boarding school in Phoenix for high school, and he allayed his homesickness by learning guitar, a passion that would sustain him through many difficult periods to come. After graduating, he enrolled at the newly formed U.S. Indian Police Academy in Roswell, New Mexico, and several years later was chosen as the chief of police for the Hopi Tribe. In 1981, Sidney became the youngest person ever elected as the tribe's chairman.

In 1996 Sidney began to experience severe flu-like symptoms while working as the tribal liaison for the president of Northern Arizona University. "I went to the local Indian Health [Service (IHS)], and they would diagnose it as the flu, and give me medication for that. And I'd be okay for a little while, but it became more frequent." Sidney's job at the university had enabled him to acquire health insurance, which he credits with saving his life, by offering him access to cutting-edge diagnosis and treatment technology off the reservation. "If I didn't

have my own insurance, and being just a ward of the government, having services available from IHS, I'd be dead right now. And that's how I'm afraid a lot of our Indian people are dead today because they don't have any insurance." Diagnosed with non-Hodgkins lymphoma, Sidney underwent eighteen months of chemotherapy and a blood stem cell transplant. He attributed much of his recovery to his wife, who prepared him "mostly Hopi foods, foods that my mother and grandmother cooked. They were just common things." Thus nourished, Sidney "started comin' through it." It was not until he began to recover that Sidney asked his doctor what might have caused his disease. "His first question he asked me, 'Let me ask you, have you ever been exposed to radiation?' And I said, 'All the x-rays you gave me.' And he said, 'Noooo. Do you remember anything?' Then he said, 'I want to have the nurse give you some material.' That's when I heard about this compensation."

The materials the nurse provided informed Sidney that his family's home lay downwind of the Nevada Test Site and in a region so heavily contaminated that Sidney could qualify for a compensation payment of $50,000 from the federal government if he could legally demonstrate he had resided there during the atmospheric-testing era. Reeling, Sidney began to piece together how his body might have absorbed that contamination. "I drank from local springs. This was our primary source of water. We drank that, not knowing that there was some of the fallout." He considered that the vast majority of the food he and his family consumed was grown locally, in an area he now knew had been heavily contaminated.

Sidney then began to tally those in his immediate family who had also been stricken by cancer: "[M]y mother died from breast cancer, she refused to take chemo. She went on chemo after her breast was removed, but after a short while, she refused to get more, and she just died from cancer." Subsequent to his own cancer battle, Sidney reflected, "I know why she didn't want to take it. I used to say, why did she leave us? If she took chemo maybe we would have enjoyed

our mother a little longer, because that [she] was the only thing I had. I forgive her now, because, boy, having chemo, it hurts. And she died." In addition, his mother's "younger sister, who is dead now, also had cancer, but she lived longer. Her other sister, my aunt, just passed away this past August from cancer. My uncle died from prostate cancer. And I, being too busy, I didn't realize I was part of it."

Dave Timothy discovered he too was part of a pattern of strange health problems, only much earlier in life than Ivan Sidney did. In 1967, at age nineteen, Timothy left his parent's farm in Altonah and moved to St. George to attend Dixie State College. Partway through his first quarter, Timothy noticed himself becoming "extremely hyper" and simultaneously very tired. After discovering a lump in his throat, he went to the college library, researched his symptoms, then took himself to the doctor. Shortly thereafter, diagnosed with advanced thyroid cancer, Timothy underwent a radical thyroidectomy on 17 December and radical dissections on the left and right sides of his neck in January. A series of cobalt treatments—a form of radiation therapy—followed. His operations left him without the "muscles in the front of [his] neck that it takes to keep the vertebrae lined up properly," diminished much of the feeling in his shoulders and head, and limited his lifting ability. He continued to battle cancer for many years.[18]

Other members of Timothy's family from northern Utah also struggled with health problems. Among others, his mother discovered frequent lumps under her skin, his sister experienced symptoms of a damaged thyroid, and his aunt June Carrell had her thyroid removed. He recalled, "Many [blood relatives] died from cancer . . . they were most of them farmers at that particular time in that area. They most of them lived out in the Uintah Basin. . . . Uncle Charlie [Timothy] died . . . I believe he had stomach cancer. Vaughn Timothy, . . . Presley Timothy died of leukemia, . . . Pink Timothy . . . prostate cancer, and cancer of the liver. . . . My Aunt Mary, Mary Murray . . . she had lupus, erythematosis, blood cancer."[19]

In the years following Dave Timothy's first bout with cancer, the health problems and fallout exposure of southern Utahns began to be written about in the Salt Lake City newspapers. Naturally inquisitive and still struggling with his health, Timothy sorted through his memories. He recalled the hazy skies he saw over his family's farm as a boy and remembered that around the same time, between 1957 and 1962, "there was a lot of talk about our milk possibly being too hot to sell . . . if the milk was too hot, that's the way it was referred to, if it was too hot that it might have to be dumped. And people were saying, 'If we should have to dump this milk . . . who is going to buy it?'" He remembered school bus conversations with neighbor Susan Fisher, who told him that men were visiting her father's farm and "taking fish from the ponds and that they were taking samples of deer and calves." When he contacted Fisher as an adult, she confirmed his memories and told him that she and other residents of the farms underwent scientific tests in Salt Lake. These tests were intended to measure the presence of radiation in the farm residents' bodies, although many of the subjects probably did not know the full significance of the tests.[20]

Returning home to Altonah, Dave Timothy sought out Carl Carrell, George Fisher, and Ross Munson, dairy farmers of his father's generation who operated their dairy herds within a few miles of the Timothy farm. They told him Dr. Robert Pendleton, a scientist from the University of Utah, had monitored their milk, their farms, and some of their family members, including Susan, George Fisher's daughter, and it was Pendleton who had warned them their milk could be "hot." Hoping for answers, Timothy tracked down radiation ecologist Pendleton at the university. In a 2005 interview, Timothy recalled that when he told Pendleton he had grown up on a northern Utah dairy farm and revealed why he had come, Pendleton, "a big strapping man, started to cry."[21]

Prior to joining the university's faculty, Pendleton had spent most of the 1950s studying environmental contamination and radiation

measurement in the employ of the U.S. Army Chemical Corps and Hanford Laboratory in Washington State. During that time, he became interested in the process by which the radioactive element Cesium-137 (Cs-137) became integrated into plant systems. In 1961, after moving to Utah, Pendleton took his research a step further, setting up a network of Utah dairy farmers in order to study the uptake of Cs-137 into the milk supply after dairy cows consumed plants bearing the element. Prompted by scientific curiosity rather than a perceived overt threat to human health, Pendleton's cesium study did not raise any alarms initially.[22]

On 7 July 1962, the radiation ecologist took a group of University of Utah students into Big Cottonwood Canyon, twenty miles southeast of Salt Lake City, seeking to "measure the small quantities of radioactivity that are associated with the disintegration of granites, [and] various kinds of rocks." Pendleton was aware at the time that nuclear testing was under way in Nevada, and when the group's instruments "went completely nuts," indicating the presence of far more radioactivity than disintegrating granites could produce, he surmised they were "in the fallout track" of a recent test. Upon returning to the university, Pendleton noticed a "big rather reddish brown colored cloud" hovering over the mountains to the south. "The following morning," he remembered, "we could find [radioactivity] all over—we counted on our lawns out here." Shot Sedan, a 110-kiloton bomb, had been detonated in Nevada the previous day as part of the Operation Plowshare test series, dedicated to exploring the use of atomic bombs for nonmilitary purposes such as excavating for mines and dams. Maps assembled later showed the trajectory of the fallout cloud passed directly over northern Utah, then arced over the Midwest, and eventually deposited heavy fallout in Iowa.[23]

Unnerved by the high radiation levels present in the Salt Lake City area, Pendleton collected milk samples from several of the farms in his cesium study. Tests revealed the milk to be "highly contaminated" by the radioactive element iodine-131, which posed a

significant risk to human health. On 16 July, Pendleton "notified the Utah State Department of Health of this situation and suggested that highly contaminated milk be diverted to the production of cheese, powdered milk, or condensed milk to reduce unnecessary exposure to the population." I-131 has a short half-life of only eight days, and it was hoped that diverting the milk would enable the element to decay beyond a point of extreme danger. There is no evidence that such a diversion occurred.[24]

Pendleton did receive funding to "delineate the extent and degree of contamination by I-131." Using the network of dairy farms he'd set up for his cesium study, Pendleton and several other researchers from University of Utah began to study I-131 accumulation. They found dangerous levels of I-131 throughout the milk supply in northern Utah. The data they gathered led to a startling discovery: The degree of radiation exposure received by populations downwind hinged more on local factors, such as elevation, moisture, and livestock feeding practices, than on the size or characteristics of the bomb or even on the proximity of the downwind population to the test site. Such local variations "caused differences in [the amount of radiation intake] ranging from 2 to 450 fold." The scientists concluded, "It is obvious that evaluation of the hazards from local fallout should be made on the basis of local, intensive monitoring of milk and people, rather than on fission yield, aerosol trajectories, or estimates based on air monitoring." Their research found the most severe contamination "in milk and people from farms where cattle were fed freshly-cut green alfalfa or were grazing on wet meadows. . . . Highest I-131 levels occurred in farms at high altitudes."[25]

Anyone who has lived at the base of a mountain range has seen the rain shadow effect in action. Clouds traveling in the lower atmosphere are pushed upward when they drift against the slopes of mountains, causing their temperature to drop and airborne moisture to condense into precipitation. Since the AEC only conducted nuclear tests when the wind was forecasted to blow east, fallout-bearing clouds were

repeatedly swept into the Wasatch and Uintah Mountains, massive ranges in northeastern Utah that butt up against the Rockies to form the eastern wall of the Great Basin. The Wasatch Range, which runs north–south, averages ten thousand feet in elevation. The Uintah Range, running west–east, tops out between eleven thousand and thirteen thousand feet. Trapped by these high peaks, clouds from the test site were transformed into snow and rain, which bore their radioactive content to earth, contaminating watersheds. Farmers in the basins below funneled the watersheds into well-developed irrigation systems that the early LDS settlers had designed and maintained thereafter to capture as much water for agriculture as possible.[26]

"Radioactivity was not raining down on a wilderness," Frederick Schoemehl writes. "It was entering a landscape previously transformed by a century of human reengineering." The problem was more complex than irrigation systems funneling radioactive rain into the food supply. Since I-131 decays relatively rapidly, some of its toxicity likely was lost by the time it reached crops and livestock via irrigation systems. However, even if the I-131 in irrigation water had decayed beyond the point of danger, those irrigation systems still distributed other longer-lasting radioisotopes. Most important, irrigation created a presence of moisture in cultivated fields, primarily alfalfa, that Pendleton and his colleagues found magnified the uptake of airborne I-131 into crops. In northern Utah, farmers living near the mountain watersheds tended to irrigate their fields far more heavily than their southern Utah counterparts did. Cattle fed fresh-cut, moist alfalfa, known as green crop, consumed significant amounts of the isotope, which transferred into their milk. Thus began the process known as bioaccumulation.[27]

"Bioaccumulation means that a blade of grass may contain a tiny amount of dioxin, or some herbicide or pesticide chemical," writer Chip Ward explains. "A cow, however, can eat a lot of grass. So the cow more or less gathers the dioxin or pesticide that is spread out in the pasture's grass and concentrates it in her milk, especially in

the fatty cream. A dairy producer then collects the cream from many dioxin-gathering cows, and further concentrates it" immediately prior to human consumption. Ward notes, "Being at the top of the food chain has its price."[28]

Irrigation systems were not the only piece of agricultural reengineering funneling radiation toward the food supply; the alfalfa crop was also to blame. Confronted with a largely arid climate, early LDS settlers had sought out a crop that could produce well in dry conditions to augment the native plants, which could support only so many dairy cattle. "Alfalfa supplied the link," Schoemehl notes, "provid[ing] a way to feed ever-larger herds, thereby circumventing limits that otherwise would have been imposed by native plants." With alfalfa crops spread out over the countryside, farmers had sizable herds of dairy cattle, which consumed prodigious quantities of fallout material and thereby compromised a large regional dairy industry.[29]

The highest levels of I-131 contamination discovered in Pendleton's research were not in milk from St. George or Cedar City, close to the test site. They were found in the milk supplies of Cache County, bordering Idaho. Duchesne County, home to the Timothy farm, was not far behind. Pendleton stated a "considerable amount of radioactive material came down in the water from the Uintah [Mountains]." Owing to the proximity of the dairy industry to most of their communities, residents of the Great Basin region tended to consume milk soon after it was procured from the animals. Consequently, children consumed the contaminated milk while it still bore high levels of I-131, which traveled directly past their developing thyroid glands as they swallowed. Milk was not the only contaminated food source. Pendleton's samples of local produce, beef, wild game, and water collected in the region in the 1960s revealed that radioactive byproducts of nuclear testing had contaminated all avenues of the Timothy family's food supply.[30]

Pendleton's attempts to warn the public via the Public Health Service and other government agencies failed. Testifying on behalf

of Dave Timothy, who sued the federal government for damages in 1981, Pendleton recalled, "The argument was, 'Don't say anything of this kind. It's going to panic all the people, and they will do something that is going to be hard for them to live with later. They might drink too little milk and depress their calcium intake.'" Concerned over the public health risk that I-131 posed, particularly to children, Pendleton and his wife "spent a couple of nights driving all over most of northern Utah going to station after station after station . . . talk[ing] them into taking their people off radioactive milk and using powdered milk or canned milk." By "station" Pendleton meant the dairy farms where his monitoring equipment was located. When Dave Timothy found him in his office years later, Pendleton told him he had suffered nightmares about the fate of the children from the dairy farms he monitored as children were being urged to drink more cow's milk than ever before.[31]

During the atmospheric-testing era of the 1950s, dairy products came to symbolize Utah's agricultural bounty, corresponding with a nationwide upsurge in dairy consumption and marketing. In 1946, President Truman signed into law the National School Lunch Act, "as a measure of national security, to safeguard the health and well-being of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities and other food." The House Committee on Agriculture intoned, "Not only is the child taught what a good diet consists of, but his parents and family likewise are indirectly instructed." The central tenet of that dietary education was to encourage regular dairy consumption; indeed the act dictated that children's lunches were to include a half pint to two pints of whole milk every day. It also stipulated that federal money would not flow to schools that failed to include milk in the required amounts: "Reimbursement rates for lunches served without milk were reduced by two cents, but this was permitted only if an adequate supply of milk meeting state and local standards as to butterfat and sanitation was not available; otherwise, meals without milk were not reimbursable."

Nutritionists did not develop these standards alone. Journalist Barry Yeoman points out the program was "designed to subsidize agribusiness, shoring up demand for beef and milk." The program has changed little in the decades since it was launched. Yeoman quotes nutritionist Jennifer Raymond, who sums up the school lunch program as "a welfare program for suppliers of commodities. It's a price support program for agricultural producers, and the schools are simply a way to get rid of the items that have been purchased." It was a sign of the times that in the School Lunch Act, Truman linked nutrition with national security. Well-fed, strong Americans were often invoked as a defense against communism, and purchasing American commodities was considered just as crucial, if not more so.[32]

Milk producers were more than ready to hop on the dairy promotion bandwagon, and they appreciated the parallel being drawn between milk consumption and patriotism as it was good for business. Midway through the 1953 Upshot-Knothole nuclear test series, and around the same time of the catastrophic Cedar City sheep die-off, the newly formed Utah Milk Foundation initiated an extensive advertising campaign to boost milk and dairy product consumption. Playing on local pride and patriotism, the foundation claimed "membership drawn from nearly all of the state's 2,500 grade A milk producers." Not only did milk taste "extra good in Utah," consumers were reminded, but "America would be an even stronger nation in terms of economic and human health if Americans consumed more milk." Foundation president and dairy farmer Eugene Pace reminded consumers that the GIs serving overseas in Korea that year "voted milk as their favorite food." The campaign not-so-subtly suggested that drinking milk not only would strengthen consumers' bodies but also would fortify the health of the nation, which was embroiled in fear over perceived threats from communist enemies.[33]

The foundation designated June 1953 as Dairy Month and kicked off events with the coronation of "a milk-drinking queen—Utah's Dairy Darling." University of Utah co-ed Lu Ann Richards professed

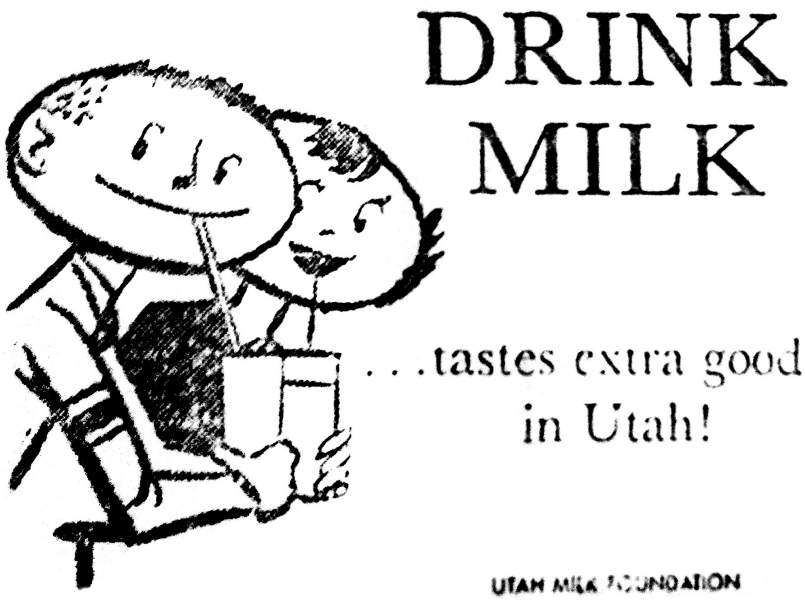

Fig. 4. "Drink Milk . . . tastes extra good in Utah," Utah Milk Foundation advertisement from *Iron County (Cedar City UT) Record*, 12 May 1955.

to drink "a quart of milk a day, and 'love[d] nippy Swiss cheese and ice cream with nuts in it.'" The Safeway grocery store chain offered a Studebaker Champion four-door sedan as the grand prize in a statewide essay contest on "the reasons why Dairy Month deserves the support of every Utah citizen." Local dairies sponsored milk carton drives in their communities' schools. In Cedar City four-year-old Marsha Lewis gathered 6,074 milk cartons to win a bicycle from Arden-Sunfreeze Creamery.[34]

Milk was such an integral part of daily life in the 1950s that fifty years later baby boomers in the downwind region could still recall where their family's milk came from. Cedar City resident Claudia Peterson's milk came from "neighbors down the street." Gwendolyn Nisson of Washington City fed her children milk from her father's dairy farm. Even people who grew up in urban areas can still name

the dairy that bottled their milk. In Salt Lake, Janet Seegmiller's family bought milk from a Cache Valley dairy, while Mary Dickson drank the milk from Salt Lake's Winder Dairy, which, along with many local dairies, delivered fresh milk to customer's homes every morning. Michelle Thomas remembered drinking raw milk from the dairy of St. George farmer Rulon "Boots" Cox until her mother became concerned by rumors of deformed calves being born to local dairy herds. She switched her family to milk from northern Utah's Hiland Dairy—the very dairy the Timothy family in Altonah was supplying—hoping it might be safer.[35]

Government agencies responsible for public health had indications that radioactive contaminants had entered the food supply, making the fervent promotion of milk drinking all the more unnerving. In addition to measuring local radiation levels and noting local sentiments about testing, the AEC's Public Health Service monitors also gathered milk samples from southern Utah dairies all while using "extreme care . . . and diplomacy in order to avoid arousing unwarranted doubts in the minds of the dairy farmers concerned." St. George dairy farmer Boots Cox supplied samples of milk, feed, manure, and the occasional cow to the AEC. Years later, he told Carole Gallagher, "I didn't know what it meant, or nothing. . . . I asked them a lot of times, and they told me that they would tell me if they ever found any traces of radiation. The only time they ever did tell me was when China let off their first explosion, and they told me then that they got a slight trace." Despite the economic blow it would have dealt him, Cox told Gallagher he would have been willing to dump contaminated milk had he been told it was dangerous. "I asked quite a few times, but they always said no. I didn't know enough about it to know whether to suspect anything. . . . Knowing what I know now and read and everything, I don't see how they could have helped but know that there was fallout in it."[36]

While the data that zone monitors gathered on milk contamination in the 1950s was never made public, Frederick Schoemehl argues

the installation of a federal milk-monitoring system demonstrates the AEC's knowledge of the incursion of radioactivity into the food supply. It is difficult to draw conclusions about the complexity of that knowledge. Scientists were still learning to identify both all of the radioactive by-products of atomic detonations and their associated effects. In the 1950s, strontium-90 was considered the primary threat to human health, largely because of the efforts of chemist Willard Libby, who was considered a leading authority on fallout. Formerly with the Manhattan Project, Libby was appointed to the AEC in 1954 and oversaw the commission's fallout-monitoring program, reassuringly named Project Sunshine. Strontium-90 was the primary research focus of the program, which took contamination of the food chain into account but failed to reflect completely or accurately the extent of that contamination. At a 1957 congressional hearing on radiation safety, AEC health physicist Forrest Western suggested the dairy cow was "actually a protection," the theory being the body of the dairy cow "shielded" the public from danger by filtering out strontium-90 before it entered the milk supply.[37]

The AEC's admission that strontium-90 had entered the food chain did motivate inquiries into the safety of the food supply. The March 1959 edition of *Consumer Reports* offered readers "a study—the most thorough of its type yet undertaken—of the effects of fallout on 'The Milk We Drink' [b]ased on laboratory tests of samples collected from 50 cities across the United States and Canada." The report provided rudimentary information on radiation filtering into the food supply and the body and concluded that "there is incontrovertible evidence that the strontium-90 content of milk has been increasing since 1954." The report ended by admitting its authors had no "clear recommendation. None exists. . . . We can surmise that we still are not heavily dosed, but we can also be sure that there have been unattributed individual tragedies caused to persons by fallout."[38]

Public reporting on the incursion of radioactivity into the food supply helped bring about an agreement between the United States

and the Soviet Union to enact a temporary moratorium on nuclear testing. Despite the moratorium, the news about milk contamination spurred citizens to action. Horrified that a staple they fed their children might contain radioactive poisons, mothers across the country joined antinuclear organizing efforts. To protest the resumption of testing in 1961, "on November 1, seemingly out of nowhere, an estimated 50,000 women in more than sixty cities walked out of their kitchens in a one-day strike." Organizers of the strike announced the action "through female networks: the PTA [Parent Teacher Association], the League of Women Voters, the Women's International League for Peace and Freedom. They even used Christmas card lists," journalist Ruth Rosen wrote. "After a decade of containment and the Cold War, with citizen dissent silenced . . . Women Strike for Peace [WSP] stunned the nation." At the heart of their campaign was the threat that the nuclear buildup posed to their children. The WSP "activists carried placards demanding such modest goals as 'Pure Milk, Not Poison,' and 'Let the Children Grow.'" On 12 July 1962 WSP protesters picketed with those messages at the AEC office in Las Vegas. Three days later, forty-four WSP women picketed at the entrance to the test site itself.[39]

The *Consumer Reports*' study and WSP's pickets seem to have provoked little corresponding outcry in the immediate downwind region, likely because the AEC's zone management program was effective and residents adopted the LDS church's unfavorable attitude toward public protest. If downwind residents did read the *Consumer Reports*' study, they might have actually been reassured: the figures offered for the strontium-90 content of milk produced in the Intermountain West were some of the lowest in the nation. For the purposes of comparison, the strontium-90 content of milk sampled in Salt Lake City was half that of Seattle's and one-third of that found in New Orleans. The presence of strontium-90 in the milk supplies of cities distant from the Nevada Test Site illustrates just how little control the AEC had over the dispersal of radiation. Wind currents

regularly carried debris from the Nevada tests beyond the immediate downwind region, and periodic changes in wind direction made predicting where that debris would end up difficult. Nuclear tests conducted elsewhere in the world at that time—for example, in Australia, the Pacific, Kazakhstan—also contributed to the presence of radioactivity in global air currents and international food supplies.[40]

Those residents in the downwind area who did discern contamination in their food supply did so largely on their own time and via their own observations. There were other indications about the presence of radioactivity aside from the AEC's monitoring or Pendleton's warnings. When Dave Timothy returned to Duchesne County in the late 1970s to talk to the dairy farmers, he also spoke with former uranium prospectors Jimmy Bird, Don Birch, Max Birch, Junior Hicks, and William Durfey. They related how, in the early 1950s, many of them filed mining claims, "thinking they had vast deposits of uranium," only to find out their Geiger counters had picked up "background radiation . . . because of 'the bomb,' as they referred to it." Government officials in charge of authenticating uranium finds for the AEC were the ones who dashed the prospectors' hopes. It occurred frequently enough, the prospectors told Timothy, that "word got out, 'Prospectors, hey, the cloud is coming over. So, forget it this week." Junior Hicks told Timothy, "If you had a vacuum cleaner . . . you could have made money" simply by picking up the radioactive dust covering the ground after tests.[41]

The stories the Duchesne prospectors related to Timothy were common across the Great Basin. As tales spread about uranium prospectors striking it rich, general usage of Geiger counters increased, giving downwind citizens access to the necessary tools to gain a rudimentary sense of the radiation levels surrounding them. Agatha Mannering of Ivins, Utah, "became interested in the uranium boom of the day. We purchased a very expensive nucleometer and a geiger [*sic*] counter, and we went out prospecting constantly." She remembered "when this fallout came, we monitored that fallout every day,

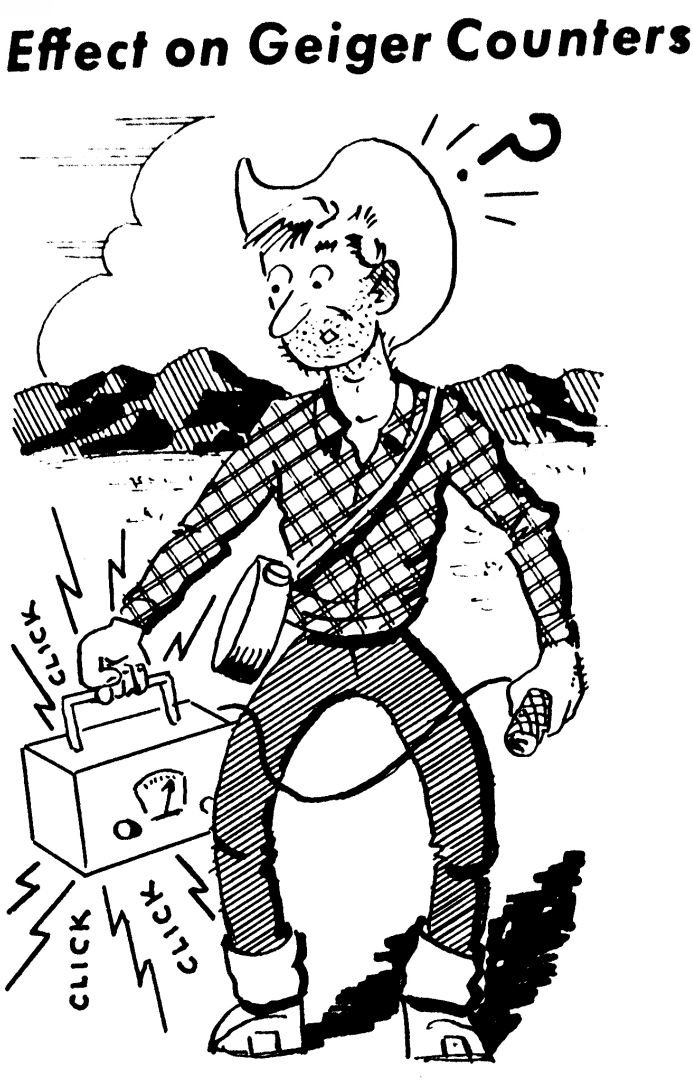

Fig. 5. "Effect on Geiger Counters" illustration from the *Atomic Tests in Nevada* pamphlet published by the Atomic Energy Commission (March 1957) and distributed in the downwind region. From the collection of Preston Jay Truman.

sometimes two or three times a day, because we were anxious to get out and prospect. You cannot prospect with the high background radiation that was there at the time." She described to Carole Gallagher how "right on our doorstep, right on the threshold, on the nucleometer it would kick over on the second scale. And out in our garden area, it would almost take in the third scale. . . . This would last for days and days. . . . We were told not to worry and not to be afraid of it."[42]

Growing up near St. George, Diane Nielson remembered her father "had a Geiger counter that he would go and check things with. He would come in and be really upset because it was reading radioactive. Verbally upset. I remember my dad several times going outside and walking around with that thing and having it go ratta-tat-tat. We would tag along with him and watch it—it would go up. I do remember the dial going up and down and hearing it click-click-click." Her father told the children, "Clean off, don't get it on you, wash up good. Don't play in [the dust]." Years later, Diane Nielson recalled, "Of course, kids are going to go and do the opposite. We'd sneak out in it and dig in it and have a good time."[43]

While at the time they had no way of knowing what sort of danger the levels might imply, many other people also became concerned by the high readings, a concern the AEC's zone management program hastily sought to diffuse. When, in the spring of 1955, Cedar City residents "with Geiger counters . . . expressed . . . the belief that an extensive fallout had occurred," the AEC assured residents the amounts were "not enough to worry about." Several months earlier, the AEC had reminded uranium prospectors in southern Utah that "tests this year again will likely result in increased radiation readings" and prove "misleading in . . . prospecting activity." That increased radiation, the AEC assured, was "*not expected to be hazardous to humans or livestock or to have any effect on crops*" (emphasis added). In a 1957 version of its pamphlet "Atomic Tests in Nevada," the AEC printed a cartoon of a bowlegged, Geiger counter–toting cowboy, replete with

checkered shirt, cowboy hat, canteen, and stubble. Staring wide eyed and with mouth agape at his clicking Geiger counter, the cowboy had a question mark over his head. Next to the graphic, the AEC used calm text to reassure readers who had experienced similar concern: "We can expect many reports that 'Geiger counters were going crazy here today.' Reports like this may worry people unnecessarily. Don't let them bother you."[44]

The cartoon did not set all minds at ease. Many citizens felt the government had been less than forthright in its explanation of recent livestock deaths, and the AEC's casual dismissal of high Geiger counter readings struck many as disingenuous. Official explanations for changes in the downwind region were proving inadequate for many citizens, who were insulted by what they perceived as the AEC's condescension, typified in the cartoon of the bowlegged cowboy gaping at his clicking Geiger counter. Cracks had appeared in the AEC's authority, and citizens increasingly turned to each other for information. The stories they shared—about strange headaches after a day in the fields or dust that withered vegetable plants—could now be shored up by the Geiger counter readings they either had heard rumors of or had witnessed themselves. Gradually downwind citizens were constructing their own narrative account of the effects of radiation exposure, an account that increasingly privileged local observations and knowledge over that of more educated and powerful outsiders.

The AEC was unconcerned with zone management in those areas where uranium was actively being extracted, even though numerous communities were in the path of severe contamination, often from both the uranium industry and the Nevada Test Site. These communities tended to be economically depressed and their inhabitants, people who were often indigenous or otherwise not white, lacked significant political power. "Managing" their perceptions of the uranium industry and nuclear weapons testing was irrelevant to AEC officials, because these people could not interfere with the AEC's activities.

The pattern of locating nuclear activities near poor, rural, and nonwhite communities was not limited to the United States. Russia established the Semipalatinsk site in rural Kazakhstan after test site planners, overlooking hundreds of thousands of residents and farms, falsely claimed the region was uninhabited. When Great Britain entered the arms race, its scientists opted to test their weapons in southern Australia's Maralinga region, which was populated by the indigenous Maralinga Tjarutja people. Uranium industries outside the United States likewise have tended to be located in arid regions, such as the Rössing Uranium Ltd. Mine in Namibia, that are inhabited primarily by indigenous peoples and farmers and ranchers. When sicknesses and deaths occurred in these communities, the government could easily overlook or dismiss them, because the affected people had little access to publicity or political or legal support. Many even lacked access to health care. This pattern has played out in numerous industries around the world, and in a 1978 lawsuit it gained a name—environmental discrimination. Time and again, researchers have concluded that communities populated by poor people of color are disproportionately likely to host toxic industry or waste.

Environmental discrimination is connected to a larger system called colonialism. *Colonialism* is the expansion of a nation's land, resource, and labor bases through the appropriation of the land, resources, and labor of the less powerful. The powerful do not want nuclear weapons tested in their backyards, so they have tested them in colonized, undervalued areas far from their nations' centers of power. Great Britain tested its bombs in what was then its colony of Australia. The United States needed uranium to build its bombs (and later to fuel its power plants) so it extracted the ore from the lands of sovereign Indian nations, nations that had been colonized by the U.S. government. Scholar Valerie Kuletz documents how "the uranium industry exploited the low visibility and lack of political power of the semi-sovereign Indian nations (reservations) to bypass [federal]

environmental protection standards and job safety regulations . . . to ensure a high profit margin in the extraction, processing, and sale of uranium ore to the . . . scientific-military complex."[45]

Most of these rural and indigenous residents were familiar with the process of mining; yet in the more remote communities, particularly on reservations, they had very little knowledge of radiation or how it might result from the uranium industry. Residents were not blind to the intrusion of visible mine wastes into their surroundings. They noticed it particularly when it occurred via water, a precious resource in the arid region and one they could ill afford to ignore. As time passed, changes began to manifest in their crops and in the bodies of their livestock and the wild animals they hunted, allowing those people living downwind and downstream from the uranium industry to begin piecing together cause and effect.

In December 1995, Tommy James succinctly described the path of uranium contamination to Phil Harrison: "The waste was dumped over there. The water runs right through the waste, and we use the water. That is the same stream that was used for drilling in the mines. That is the same water the people drink, too. That is how it is with us today. And we plant our garden, but it does not grow big." James remembered how "years ago, before they did any mining in the mountain, when we planted the plants would get very big, such as watermelons and squash. It is the same in Shiprock; the farm produce are small [now]. The melons are small." Timothy Benally recounted a similar scenario: "The Navajo people say the [mine] operators went up into the mountains and pushed a lot of the dirt that contained some radiation or uranium off the side of the mountains and they were just scattered down below. When it rains and when it thaws in the springtime, a lot of the water washes into the riverbed and flows down into the stream and eventually comes out on the farms." Manny Pino described how at the open-pit Jackpile Mine in Laguna Pueblo, "there's two rivers, or streambeds, that flow directly through the mine. The Rio Paguate, and then . . . there was another

tributary called the Rio Moquino, and they met in the center of the mine, and then they exit. . . . These two tributaries [flowed] downstream into another tributary called the Rio San Jose, which flowed into the Rio Puerco, which eventually flowed into the Rio Grande, the lifeblood of New Mexico."[46]

As essayist Joan Didion once observed, "Water is important to people who do not have it." Average rainfall in the Colorado Plateau lowlands is less than ten inches annually, and local residents make full use of that small amount. Visible contamination of the water supply by any process, be it erosion or the dumping or flowing of mine wastes, could not occur without attracting the local people's attention. As those who labored in the uranium industry began falling ill in the 1960s and, with alarming frequency, dying young in the early 1970s, some began to connect the sick miners to the poor crop yields in fields that had been irrigated with water contaminated by the mines. Activists such as Harry Tome and Manny Pino began the uphill struggle of educating their communities on radiation, a concept for which there was no word in their native languages. Memories of mine wastes entering the water supply and then the food supply became integrated with this new knowledge. "It's like a chain reaction," Timothy Benally explained years later. "The food you raise may have some radiation, and you eat it."[47]

Explaining that by-products of the uranium industry were radioactive did not always induce people to make the changes necessary to protect their health. As Manny Pino discovered, established practices could not be abandoned overnight, and in communities struggling to maintain their cultural identity and continuity of traditions, many were loath to alter their foodways. In 2005, Pino visited the Spokane reservation in eastern Washington, site of the open-pit Midnight Uranium Mine. He recalled, "The people were already being told, 'Don't eat the salmon from the Spokane River, because they're not fit for human consumption.' What do the people still do? Eat the salmon." He paralleled the experience of the Spokane to that of his

own community. "It's like telling these people at Paguate, 'Don't grow corn, you know, because there's radioactive dust blowing.' Or 'don't dry your fruit in the open air, don't dry your meat out there.' This is a traditional lifeway, you know? These are traditional foods that people aren't going to give up that easy."

Awareness of the intrusion of radiation into the local foodshed came about unevenly in the downwind region. For most downwinders and uranium-affected people, catastrophic illnesses and deaths prompted questions about the causes, which led the questioners to reconstruct the contamination of the food chain and thereby identify the potential cause of illness. For some, such as Dave Timothy and the widows of many uranium workers, these illnesses occurred in the late 1960s and early 1970s and coincided with the emergence of new information about the potential health effects of radiation exposure, giving some of those who survived reason to ask questions in that early period. For others, such as Ivan Sidney, illnesses in their community and their family were simply isolated and inexplicable tragedies until new information or a new medical diagnosis put a pattern into focus for them, inevitably prompting questions about how radiation might have reached their bodies.

On a fundamental level, stories about the infiltration of radiation into local water and agriculture were simply variations on an old theme. For generations, the survival, comfort, and success of rural people in the American West have depended on their ability to function cooperatively, to share information as well as labor and culture. Knowledge about environmental factors, including the safety and abundance of local water, was integral to agricultural success and was thus shared with others in the community through story telling. Water folklore abounds in every region of the West, from such place names as Poison Creek and Clearwater to jokes about the control of sparse water supplies and folk prescriptions for provoking or anticipating rain. Wallace Stegner once noted "how often Shoshonean place names contain the syllable *-pah*: Tonopah, Ivanpah, Pahrump,

Paria. In the Shoshonean language, *-pah* means water, or water hole. The Pah-Utes [Paiutes] are the Water Utes, taking their name from their rarest and most precious resource."[48]

Such folklore does more than entertain or express the identity of a community; for generations, it has served as a spoken library of local knowledge, a narrative tradition that enables its users to live and raise food successfully in the region. In the words of essayist and farmer Wendell Berry, "Such a culture contains, and conveys to succeeding generations, the history of the use of the place and the knowledge of how the place may be lived in and used." This spoken history is a dynamic creation, as its relevance depends on constant retelling and updating when new information becomes available or environmental changes are observed.[49]

During the atmospheric-testing era and the first uranium boom, citizens in the downwind region had virtually no knowledge about the effects of radiation on plants and animals, and many were not even aware radiation existed. Expertise on the local environment and the process of raising food abounded, however. Rural residents knew that changes in their environment would affect their crops, so they paid attention to those changes. Years prior to learning the dangers of radiation, individuals living near uranium mines noted the intrusion of mine wastes into local water supplies. They filed their observations away in their library of local knowledge, and when their crops failed to thrive, they revisited the stories of water contamination by the mines. The Cedar City sheep ranchers took the same steps to deduce the cause of their losses. When all of their experiential ranching knowledge failed to explain the deaths and illnesses among their sheep, they concluded that the new contaminant they had observed in the region—dust from the test site—was to blame. Struggling to make sense of their cancer diagnoses, Dave Timothy, Ivan Sidney, and others relied upon their local knowledge to pinpoint the way contamination had reached them. No matter when individuals in the downwind region began to question the safety of the uranium

industry or the test site, their participation in the local culture of food production aided their inquiry. Their membership in this culture invested their stories with emotional weight and rhetorical currency for other members of the culture who recognized the places, agricultural practices, and other cultural markers in the stories.

Even as this culture enabled its members to identify some of the changes being advanced by the atomic age, it was already beginning to erode. Agriculture alone was no longer enough to sustain many families economically, and young people were leaving their home communities in greater numbers to seek work and education elsewhere, creating a gap in the transmission of local knowledge to subsequent generations. Farmland and rangeland changed hands, and large commercial ranching and farming enterprises became the dominant producers of food and agricultural products. For these rural communities, as Wendell Berry observed, the fraying of local culture was both "a practical loss and an economic one." This loss, which was occurring regardless of nuclear activities, gained a new dimension when individuals considered it in the light of the nuclear contamination they learned about in later years. Not only was their way of life no longer economically sustainable, it had become poisoned—and by government negligence—rendering the loss of the local agricultural tradition and their loved ones that much more difficult to bear.[50]