

Contents

<i>Preface</i>	<i>xiii</i>
AUGUST	
1. An Apple for Ursula	1
2. In Search of Feral Apples	9
SEPTEMBER	
3. The Venerable Crab	17
OCTOBER	
4. Seeking Celestial Apples	27
5. The Fruiterly	37
6. Ten Thousand Varieties	49
7. The Flow of Energy	59
8. Pulling the Crank	67
NOVEMBER	
9. Wild Horses	81
10. Industrial Fruit	93
DECEMBER AND JANUARY	
11. The Archbishop's Garden	105
FEBRUARY	
12. Community Making	115
MARCH	
13. Mapping the Orchard	123
APRIL	
14. The Generosity of Blossoms	135

MAY

15. Cow Creek Runs Through Paradise 147

JUNE

16. True Wild 159

JULY

17. Love Notes from Nature 165

AUGUST

18. Summer Lake 179

19. The Hidden Rose 187

SEPTEMBER

20. The Songs of Ancient Trees 195

OCTOBER

21. Newtown 207

- Epilogue 221

- Acknowledgments* 225

- Select Sources* 229

- About the Author* 240

Chapter One

An Apple for Ursula

AUGUST



An apple tree near the River Trail. Photo by Priyanka Kumar.

I

My feet quicken as I hike to an apple grove near the Santa Fe River. Walking in the footprints of a black bear who strolled through here last night, I maneuver around copious bear scat, dotted with berries. The trail meanders under a canopy of spindly elms and maternal cottonwoods, and the riverbank is fringed with willows. Creatures skitter away in my path: Skinks with turquoise tails glide over rocks; a bull snake undulates across the trail; water striders dance over the glassy water; and a cricket hovers in the air like a hummingbird. The river belches a grumble; we are in a megadrought, and the water level is perilously low. When I reach a clearing, the late August morning is lustrous and the air shimmers with light. The insistent music of a black-capped chickadee fades away, but my heart thrums as I approach the spot that struck me with the force of a discovery the previous week.

Tall, wild grasses are flattened into a wide circle about the right size for a mature *Ursus americanus*, black bear, to sleep in. The flattened area is tawny and dry, but the surrounding grass retains the bleached green of summer. The size of the circle alone wouldn't be enough to go on if it weren't for the fur in the dirt. Bits of bear fur are scattered on the ground, dark brown with fine white strands. I let out a long breath—I can all but see Ursula the bear curled up and sleeping here in the dark. A fortunate bear who has an orchard for her refuge!

The apple trees in this grove were planted several decades back, and they grace a patch of private land like mellifluous pillars. I walk on to a tall apple tree favored by Ursula, who has marked the circumference around the trunk with her scat. The tree bark is smooth and metallic gray-brown, and the colors shift with the day's light, conjuring Rilke's lines in the *Book of Hours* in which he speaks directly to God: "I want to utter you. I want to portray you not with lapis or gold, but with colors made of apple bark."

Sidestepping Ursula's scat, I gently pull down one of the tree's branches laden with small russet apples. A worm has bored through one apple and I let it fall to the ground—for Ursula. Many of the

apples are strung on high branches, and I imagine the bear up on her hind legs stretching to reach them. Bears and apple trees likely evolved together, like a symphony perfecting itself. In the late Pleistocene, before megafaunal mammals became largely extinct, they played a role in dispersing large fruits in ecosystems around the earth. Archaeobotanist Robert Spengler points out that the apple's small seeds allow the fruit to be more easily dispersed by midsize omnivores and bears, or megafaunal mammals (living or extinct animals who are larger than humans or at least heavier than ninety pounds). Apples played their part to strengthen the mutualism: Early apples or June apples are aromatic, bright, short-lived, and sometimes watery tasting, but they probably evolved to attract young bears, who can more easily climb into a tree's lower boughs. In a separate movement of the evolutionary symphony, the claws of bear species evolved and made it easier to catch fish *and* acted as rakes to harvest fruit.

An adult black bear can stand between five and six feet tall and couldn't reach much of the fruit I am looking at—which is why Ursula sometimes snaps tree branches. An acquaintance, Tim, lives just uphill from this trail. He woke up on a recent morning to find his wire fence partially flattened and two branches of his pear tree broken—the work of a hungry bear.

"I got off easy," Tim told me with a dry smile. He lost several pears but found it exciting to think about the bear wandering through his property. I sense that Tim is a kindred spirit. Ursula, a female bear, could weigh anywhere between ninety and three hundred pounds. So, Tim is understandably stirred that a megafaunal mammal sometimes visits his yard.

In the orchard, I bite into a small red apple—sweet with hints of tartness, like the early fall morning. No wonder Ursula favors this tree. Moments later, phenolic compounds in the apple react with oxygen in the air, and the exposed flesh turns a rust color. This apple has a high level of polyphenol oxidase activity and may be unusually rich in iron. Compared to commercial apples, the ones I forage are likely richer in nutrients since they grow in old orchards, which tend to have biodiverse soil.

During the harvest season, I studiously avoid the supermarket apple.

One fall, however, my husband Michael got some organic Golden Delicious apples from British Columbia at the Natural Grocers in our hometown, Santa Fe. They turned out to be cardboard-like and so hollow that if you pinched the skin, it gave under your thumb. We composted the whole lot. The legendary scientist Aimak Dzhangaliev, who studied the genetic diversity of Kazakhstan's wild apples, once said: "A widespread cultivar like the Golden Delicious is simply not that good. It does not have good nutritional value nor much disease resistance. . . . We not only have to do better plant genetics work on these apples, but we have to fight against [reiterating] the errors of history." But what are these *errors* of history? Having observed the rhythms of life in forested orchards over several years, I suspect that crowded monoculture orchards are one key error that led us to the corrugated cardboard-textured apple.

I have dived headlong into foraging fruit. I began my foraging career at the age of five, when I wafted like a butterfly through apple trees in the foothills of the Himalayas, but it took the pandemic for my lifelong passion for apples to ripen. During the pandemic years, I discovered more fruit trees than one might expect to find in the high deserts of the American Southwest and the Pacific Northwest—apricots in July, peaches and plums in August, a variety of apples in September and October. As my foraging deepened, I grew aware that fruit trees were connecting me to my past. The act of picking apples is in me; this is how I lived as a child.

In my Himalayan days, I was unselfconscious—a butterfly scarcely thinks of who she is—as I wandered freely in one of the planet's leading biodiversity hot spots. The wildness of this region in Himachal Pradesh has left a deep imprint—I still dream about the state animal, the snow leopard, and chase the state fruit. My recent plunge into fruit trees led me to wonder why my first visit to a Himalayan orchard had been so meaningful. Was it because my father had initiated me into the universe of fruit trees? I lost him to political violence when he was fifty-four—and I was a graduate student. The loss stays in me like a primal ache, but I come closest to transcending it when I engage in the practice of foraging. Picking fruit from trees draws me closer to the

elemental life we shared. After wandering through orchards and the adjacent micro-wild, a wave of aliveness surges in me.

At a time when our community had atrophied to Zoom meetings and real contact with extended family was cut off by the temporary closure of the US-Canada border, my family truly became an island unto ourselves. Yet it wasn't loneliness that drove me to apple trees, but a search for riches, including solitude. I searched for life's essence, which has a different fragrance than the everyday path we hazily walk on. The universe is nearly at our doorstep, and we scarcely know it. I sought the exhilaration that comes from being fully present in the wild. An ancient Indian concept illuminates how the emotional flavors we embrace can set the mood or tenor of our lives. *Rasa* means juice in Sanskrit and suggests the vital essence of an experience, person, or work of art. Seeking fruit straight from trees revitalized me and infused my life with a strain of *rasa*.

How did apple trees offer sustenance and become an anchor at a time when so many of us were feeling unmoored? The answer may have to do with how my apple journeys were taken in empathy with the wild. The wild brings us primal discomforts but also forges kinship with trees and bears and thwacks us to life with heart-stopping surprises. I couldn't have anticipated that my search for wild apple trees and historic orchards would become an exploration not only of biodiversity (how feral apple trees support bears like Ursula) but also of America's love affair with apples. While foraging, I reap the fruit of my father's land ethic, the apple seeds the Spanish and the settlers brought to America in the 1600s, the seeds John Chapman grew into saplings and often gave away, and the young saplings that the French missionary Jean-Baptiste Lamy and others grew into mature trees in the 1800s—scion wood from those trees would later be grafted onto newer rootstock, and the process repeated until were born the trees from which I pick apples today. Americans once lived in real kinship with apples, but that relationship has frayed in modern times. I grew aware of the fragile status of the orchards where I foraged, and it felt urgent to understand the story of apples—how they had evolved, were domesticated, and became beloved—and whether the past could offer insights to prevent us from reiterating the errors of recent apple history.

II

A primal flowering rose evolved on earth under temperate climate conditions some 80 million years ago. How long ago was that? Scientists in China recently discovered the smallest known non-avian dinosaur egg, the size of a small strawberry, which was dated as being 80 million years old. Over thousands of millennia, fruit trees, including apple, cherry, peach, pear, and plum, all evolved from that early rose—and belong to the Rosaceae family. Conveniently, bees already existed on earth before the arrival of flowering plants. Apples are believed to have originated as a cross between an ancient plum and the meadowsweet plant in the genus *Spiraea*, in an area between the Caspian and the Black Seas.

That being said, the origin of fruit trees is one of the biggest unanswered questions in domestication studies. Only recently have genetic studies yielded tantalizing clues about how the wild apple, *Malus sieversii* (named after botanist Johann Sievers, who first described it in the late 1700s), was domesticated. During the Eocene, 56 to 34 million years ago, the Rosaceae family diversified and forged a stronger mutualism with animals, including birds; small fleshy fruit grew prominent, attracting avian seed dispersers. The oldest bee fossil that can unambiguously be placed in an existing family of bees also dates from this period.

Spengler, the archaeobotanist, suggests that in the late Miocene, 23 to 5 million years ago, apples grew even larger, and megafaunal mammals began to eat them and disperse seeds. During the late Pliocene, some 2.6 million years back, vast temperate forests flourished in central Asia. Scientists have speculated that the ancestors of fruit-eating birds such as the azure-winged magpie flew through these forests, which ranged from western Europe to eastern Asia in the late Tertiary and early Quaternary. These ancestral birds would have gorged on a wilder version of a bird-dispersed apple we know today as *Malus baccata*. On the River Trail where I seek apples, I have run-ins with black-billed magpies, building or defending a nest or chattering away with spirited river or rock. Over millennia, apples have seduced all creatures, from magpies to bears. And humans.

In time, ancient temperate forests graded into foothills, steppe, and desert. One key region, the Tian Shan, now in Kazakhstan, remained temperate and became girdled by harsh deserts. Discrete boundaries are considered to be a critical ingredient in the evolution of species—so it was that propitious conditions arose for wild apples to perfect themselves in the Tian Shan, the Celestial Mountains. Unlike some fruit, apple trees are less likely to grow from rotting apples fallen on the ground; so, apples need allies such as birds and mammals to disperse their seeds. In addition, local humans played a role in dispersing apples. At a village site in the Tian Shan in Kazakhstan, archaeologists discovered an apple seed that was dated to the end of the first millennium BCE. In the twentieth century, in this very area, scientists would discover apple forests growing wild in the Tian Shan range.

In America, when I seek wild apple trees, I use the term “wild” in a cultural rather than a scientific sense—in the way that Henry David Thoreau called those apple trees wild that were self-seeded or ungrafted and irregularly planted. Biting into such feral apples is intoxicating. Standing under a tree, enveloped in crisp bluish air, when I taste an apple, all I’m doing is tasting an apple. While savoring a foraged apple, I become aware of the grass under my feet and the reddish globes hanging enticingly from trees of wildly diverse shapes and sizes. A flicker might fly past and a chickadee sing. This is enough; this is *rasa*, a hidden spring of joy. Having experienced dizzying changes in life, chiefly migration and mortality, I yearn for this at least to stay the same. I grow exultant at the thought of discovering “wild apples”—and recall how Thoreau had raved about them.

When Thoreau trekked beyond his neighborhood on longer hikes, he sometimes turned to wild apples (*agrestia poma*, as he called them) for refreshment. He relished the tart fruit while admitting that it tasted good only in fresh air. In the mid-1800s, Thoreau saw that wild apple trees were already on their way out. “The rows of grafted fruit will never tempt me to wander amid them like these,” he wrote. “But I now, alas, speak rather from memory than from any recent experience, such ravages have been made!”

In the industrial age, land in Concord, across America, and around

the world became highly monetized, a process that has speeded up a thousandfold in our day. Since 1970, the human population has doubled whereas wildlife populations have declined by roughly 70 percent. Scientists have zeroed in on habitat loss as the primary driver of biodiversity loss—that includes the loss of thousands of apple varieties. We have erected countless structures where the glories of the living earth once lay. It is no surprise that we are surrounded by what can only be called scraps of ecosystems. It grows ever harder to chance upon wild fruit trees, but it is an invigorating and essential pursuit—like knocking on the door of the universe. Wondering if the tree that Ursula favors had a wild cousin nearby, a self-seeded tree, I began my search.

Chapter Two

In Search of Feral Apples

AUGUST



The River Trail. Photo by Priyanka Kumar.

I

I have been hiking the River Trail since early in the pandemic, when Michael and I started bringing our two children here. Pika, then four and a half, showed us the trail, proving that children can be our best teachers. We had stopped by to take a last look at the tree-rich playground of Pika's preschool, which had recently shut down along with everything else, when she literally tugged at our sleeves to take us to "the bridge." She led us to a trail that her class sometimes took to the river, where they would sit on the riverbank to eat lunch. Pika showed us a single-log bridge, which we gleefully crossed, then Michael and I kept walking, trailed by Pika and her older sister, Mia. The trail turned out to be longer than Pika had imagined. When at last she hotly declared that she couldn't walk anymore—"My legs are tired!"—Michael ended up carrying her back. In the coming weeks, in this rare riparian habitat, we found isolated stands of apricot and apple trees. I had encountered a scattered wealth of mature apricot trees elsewhere in the city, and a sprinkling of plum and peach trees in unexpected nooks, sidewalks, and gardens. Sometimes I would stumble upon a lone surviving diehard from what may have once been a thriving grove. But a development spree is causing habitat to dwindle even for the fruit trees that have endured.

I feel a surge of desire to protect historic fruit trees, for they are a living connection to history and science, and the wild. Since my childhood, I have sought food that is close to the soil. When I couldn't pick fruit or herbs, I ate flowers. My body sensed that food taken from nature's arms nourishes deeply, though it can also sicken us if we are foolish and ignorant. I marvel at land that supports us even after we've thrown it out of balance. In the forests of Assam, in the eastern foothills of the Himalayas, I lived in the land of wild bananas, or wild *kol*, where unusual varieties such as the hairy or pink banana and the petite *kaskol* were also grown. Indigenous communities relished feasts on banana leaves and used the flower and root of this herbaceous plant, in the genus *Musa*, in traditional dishes. As a child, I saw these Indigenous peoples as being highly intelligent—for they preferred eating

outdoors, as I did, and afterward we could easily compost our leafy plates. In our Haflong bungalow we had a fruit storage room where I routinely cradled a branch laden with a hundred petite bananas. This narrow room with its sulfurous odor (from the powder sprinkled to ripen the green bananas) was my favorite place to read and to think about snakes and other wild animals I'd encountered. The narrow and long fruit storage room was the first space I had to myself—it was my first study. Strangely, the room presaged where I find myself now: a naturalist intrigued by the place of fruit in nature and in our lives. Perhaps this is another reason why a hidden spring of *rasa* began to flow when I discovered the covert stands of fruit trees in Santa Fe.

Walking among the fruit trees of the River Trail, the carefree Assamese days returned to fortify my butterfly self. I wanted to realign myself with the land and its animals and embrace a way of being that resists the fragmented lives we live, sundered from nature. It is true that I was walking in the scrap of a riparian ecosystem when my heart lay in exploring relatively intact ecosystems. But wilderness areas aren't always within reach. The forests around us are battered by drought and wildfires, and they can no longer absorb a quarter of the carbon emissions from the atmosphere each year as they once did. I would have to make do with what was at hand.

Land literacy can fuel a radical life, and I was soon writing to the city's mayor about conserving our micro-wild and ecosystem scraps. I got back blandly polite responses, however, and felt bewildered. Meanwhile, more land—pristine swaths of desert—was being devoured, sometimes when the state auctioned off treasures in its trust to the highest-bidding developer. Glorious small orchards have similarly been abandoned or decimated across the country. Even relatively quiet communities have experienced development spikes. It seems that no amount of land devoured is finally enough.

While mentally composing yet another letter to the city council, I found myself growing dispirited, and I paused. First, I needed to deepen my practice of connecting to the wild and answer my questions about the origins of the apple trees I saw. I also wanted to experience more fully the fruit trees that remained so that I could articulate why they should be valued.

Is it worthwhile to experience a scrap of an ecosystem? I would try and find out. My own neighborhood, where I walked daily, was experiencing a serious loss of biodiversity; some cues were an uncanny silence of plant life and a relentless ebb of insect and bird song. Birds I had counted on for over a decade had stopped coming to the area. I gazed at each clay-colored hill that hadn't been razed flat (most have been). When I stumbled upon a grove of trees left intact, it felt like a discovery. "This grove must be where the bushtits roost," I told myself. "That hill must be a refuge for the coyotes, or perhaps a bobcat." One evening, I nearly stepped on a juvenile snake and a nighthawk flew over me, encouraging my faith in the micro-wild. Such remnants of the wild are rare, however, and feel almost sacred.

When I experienced that wild scraps could move my spirit, trailing the river on weekends became an essential part of my practice. I couldn't have anticipated that the months from July to October would come to mean a luscious and tart procession of fruits, beginning with apricots and peaches in mid-summer and climaxing in bluish-purple plums and dazzling apples. While picking apples, I follow Thoreau's dictum: "Surely the apple is the noblest of fruits. Let the most beautiful or the swiftest have it. That should be the 'going' price of apples."

II

All children stomp and whine about hiking, but the gurgling river helped entice ours, and the paths that led to the fruit trees became the yellow brick roads they grew to savor. While Ursula the bear roams this trail when humans are out of sight and a deer skeleton signals a mountain lion's hunger, the animals we've befriended here range from line and bull snakes to downy and hairy woodpeckers in episcopal caps, pecking hypnotically at tree barks. The fruit we forage is eaten on the spot or ripened on a windowsill. The apples tend to be wormy around the core and the clean parts must be sliced off. We stew the slices and sprinkle in cinnamon, cardamom, and cloves, for a healing Ayurvedic breakfast.

The primal pleasures of picking feral apples may be forgotten today, but the evangelist of apple love remains a staple of our classrooms. Pika

would learn in first grade about Johnny Appleseed and the tall tales that Americans tell about him: No, Johnny's skin wasn't so thick that a snake couldn't bite through, nor did he play with bear cubs. It's more likely that Appleseed, or John Chapman, was vegetarian and went out of his way not to harm animals. In a coffee-sack shirt and wide-brim felt hat, he tended to wander away from his crowded childhood home until, finally, in late 1805 or early 1806, at the age of thirty, he stuffed apple seeds into leather pouches and steered his canoe upstream on the Muskingum and Licking Rivers.

While picking apples near the Santa Fe River, I experience a fellow feeling with Ursula: I follow her tracks and, the next day, she'll follow mine. Bears and apple trees are braided together, and Ursula is a lynchpin of the riparian community I am observing. My practice is to let the material world fade and instead tune in to nature's throbbing connections. As a megadrought rages in the Southwest, acorns are expected to wane in abundance and apples will become more vital for bears, who must fatten up before going into torpor or deep sleep at the end of October. Leaving a few apples under a tree for Ursula is my way of respecting a fellow sentient.

In my neighborhood, a woman drove straight into a female bear and killed her. Two cubs were accompanying their mother. One ran away, but a couple of hours later, Animal Services located the cub squatting on a low tree branch; the second cub's whereabouts are unknown. The captured cub was taken to a wildlife center with the intention of releasing him in a forest in January. I don't know how or why this woman drove her car into a bear; presumably, it was an accident. The act may have sealed the fate of the remaining cub, however. The New Mexico Department of Game and Fish cautions that killing a mother with cubs often means that the cubs will die too.

I don't mean to romanticize Ursula, nor am I eager to once again hear a bear's growl or her otherworldly snorting. After an encounter with five bears several years back in Northern California, I learned to be wary. I understood then that backing away from a bear is a far better strategy than running away and that bears are considered to be a threat only when they are surprised or protecting their cubs. Years later, now that I have children, I find myself appreciating the connection we

share with bears: Fueled by protective instincts, mother bears stay with their cubs and raise them for relatively long durations—from eighteen to thirty months.

III

As a forager I keep a lookout for wild fruit, but I also observe what fruit other animals—big and small—eat. In August, I stayed for a month in a century-old cabin in northern New Mexico, which forester Aldo Leopold designed and lived in with his young wife, Estella. In the mornings, I would climb up the rocks behind the cabin to an immense boulder from where I could peer into a ponderosa pine glade. Early one morning, I saw a chipmunk approach a prickly pear cactus and turn away on seeing no fruit on it. The week before, five-year-old Pika had climbed a boulder near the cabin and seen fruit on a prickly pear.

The next day, the reddish-yellow fruit had already rolled down the massive boulder.

The day after, the fruit intriguingly vanished.

Pika asked about it. Now I could tell her that a chipmunk had accepted the gift of the cactus and consumed the fruit, seeds and all. The chipmunk doesn't waste. At dawn, chestnut fur glowing, the chipmunk would devour the feathery-pink flowers of the native Apache plume. Black-and-white stripes along the face and back set off a delicate russet beauty. The chipmunk consumed the pink, flowery strands while the rose strands in the sky resolved into a glaucous daybreak. In the Gambel oak thickets that skirted the cabin, chipmunks relished the yellow-orange cushiony gall that grows on the pale underside of oak leaves. From atop the trees, they let out terrifically loud *psstt-psstt* calls and, on a boulder, a chipmunk tail flicked in beat to the call.

Like chipmunks, Ursula favors wild fruit, especially apples and berries. Berry seeds pass through her gut unbroken and, on the ground, her scat acts as a fertilizer in which the seeds can germinate. Ursula eats far more berries than birds do, and disperses significantly more viable seeds. So, she plays an extraordinary role in revitalizing plant communities. A single pile of bear scat planted in a Rocky Mountain National Park greenhouse yielded twelve hundred berry bush

seedlings—one-third were chokecherry, a difficult plant to grow from seed, and the rest were Oregon grape. Scientists and researchers such as Taal Levi at Oregon State University acknowledge that bears are like farmers—by planting seeds everywhere, they promote a vegetation community that goes on to feed them. It follows that a decline in bear density adversely impacts plant and animal communities that rely on wild fruit. When humans disrupt nature's finely tuned balance by fragmenting more land or taking out an errant bear who has eaten *our apples*, the disturbance reverberates throughout the forest.

The grove I hike to near the Santa Fe River has over a dozen apple trees. We return to this place almost weekly. With development pressures picking up, I hear and see two large houses go up as I walk the beloved trail. This riparian zone, an ecological strip, is suffering more rips; at what point will the micro-wild crumple? The question nags me because the vast majority of riparian ecosystems—biodiversity heroes—have collapsed across the country. Just as apple varieties such as the dappled yellow-red Champion have become functionally extinct—they are no longer known or grown in meaningful numbers and according to the Montezuma Orchard Restoration Project, “their unique characteristics are at risk of being lost forever”—species who rely on at-risk ecosystems, such as *Empidonax traillii*, willow flycatcher, have also become threatened or endangered with the precipitous loss of streamside habitat. The National Park Service estimates that riparian zones in the Southwestern United States make up less than 2 percent of the land area but support the highest density and abundance of plants and animals compared to any other habitat type.

I divert my eye from the construction by taking note of the skip in Pika's step. With each hike, she walks farther, and we rarely carry her now. She calls the flattened circle with Ursula's fur “the place where the bear lives.” Studying the area one morning, I noted that a little trail connects Ursula's circle to the apple tree she favors. After exploring this grove, we walk along the river until “No Trespassing” signs force us to turn around.

One fall morning, half a mile from the apple grove, I unexpectedly came upon a lone apple tree. I paused, surprised: In front of me grew a tree that a bear might well have planted. Tucked into a corner of the

trail, flanked by a willow and an elm, the tree I had stumbled upon was almost hidden but for its telltale fruit. It grew high, for there was little space to grow wide. Most of its apples were unreachable, but I wedged myself into the thick vegetation to see if I might be able to grasp a branch. I returned to the trail with some honest scrapes and a handful of apples. The apples were smaller and redder, with deeper flavor than the apples from the grove. Surprisingly, none of these apples had worms. Maybe codling moths hadn't found this loner or else the tree had exceptional resilience.

Thoreau's regard for wild apple trees shimmers when he writes: "Here on this rugged and woody hill-side has grown an apple-tree, not planted by man, no relic of a former orchard, but a natural growth, like the pines and oaks."

Offering this fruit of "a natural growth" to Pika, and biting into one myself, I decided that these sweetly tart apples were fine refreshment on a sunbaked hike. She agreed, delighted to rest with a fruit she hadn't expected in this part of the trail. I felt strangely buoyant. I had found a wild cousin of Ursula's tree. What was more exhilarating was the discovery that life stirs in this fragmented riparian strip in ways that mirror an actual riparian ecosystem. The taste of wild apples had hope mingled in it.

Chapter Three

The Venerable Crab

SEPTEMBER



Pockets swollen with apples. Photo by Priyanka Kumar.

I

An unseasonably warm September has grazed the state's record maximum temperatures for the month. I wake up as the day's light spills like milk into the indigo sky. The temperatures don't spell autumn, but I keep a lookout for jewellike migrants. A small yellow bird with beady black eyes, and a shapely black cap on sunny head, flits among the junipers. *Cardellina pusilla*, the Wilson's warbler, pauses in my garden each year on his way south to Mexico or Costa Rica. This shy warbler, yellow-bodied and olive-backed, breeds in New Mexico and winters across the coasts of Mexico and Central America and from the Caribbean lowlands to the cloud forests of the continental divide. Seeing the warbler searching for insects and berries in my garden all but transports me to a cloud forest. The presence of migrants signals that autumn is here, but it has been terribly warm and the hummingbirds haven't left—they go on sipping from the *Salvia* “raspberry delight” in the rose bed. Aware that warming has disrupted the migration patterns of monarch butterflies, I find myself talking to the hummingbirds, urging them to leave before it's too late.

Walking through the garden, I note with relief that the morning air is tinged with coolness. This is my sylvan hour, before the morning exhales hurry and heat. *Malus ioensis*, a prairie crabapple tree, was once the centerpiece of the garden, but it didn't sprout a single leaf this spring. Yet the tree comes to life when *Thryomanes bewickii*, the Bewick's wren, screeches with a tart musicality; the short, shrill calls serve as my summons to be present. During the sylvan hour, the world can and must wait. Standing at the edge of a world that is shackled with industrial and digital busyness, I devote the early morning to avian and arboreal friends. The wren shuffles along the ground in search of beetles as I walk over to the crabapple. A favored perch of many birds, the prairie crabapple is native to the central US. The tree's near-demise depresses me, and I shift my gaze to the walking onions. They are sprouting from bulbs I foraged and put into the ground a little late this year. Planted near the base of a young plum tree, the onions drink from the water we give the plum, and their scent can deter deer. Such

symbiotic connections are what I seek to restore among the plants. Long ago, I dreamed about making a garden that would be quivering and humming, buzzing, shrilling, and flowering.

What hurts is that the prairie crab has stopped being alive in any of those ways.

The name crabapple originates from the Nordic word *skrabba*, “fruit of the wild apple tree,” and also the Celtic word *crab*, which means sour; in old English, it translates as “bitter” or “sharp-tasting.” Sour or not, children pick fruit so long as they can reach it. Later that morning, an hour north at the Los Luceros Historic Site, while watching Mia gather peach-colored crabapples, I accidentally step on a path that *Pogonomyrmex barbatus*, harvester ants, take to their anthill. A local couple standing ten feet away warn me about the ants. I step back, but large red ants are already swarming up my foot. Shaking them off, I ask the couple, “What do people do with crabapples?”

“The only thing I’ve heard of is they make jelly from it,” the man says.

I nod. European settlers routinely made preserves and vinegars with this small, fleshy fruit while Native Americans stored it underground until spring to let it sweeten. Generous trees, crabapples make rich clustering blooms, pinkish-white clouds that attract a bevy of pollinators. Those bees and wasps then go on to nearby apple trees, which cannot self-pollinate and benefit immensely from proximity to crabapple trees. My prairie crabapple’s crown once served as resting and foraging grounds for an army of bees, edgy black-chinned hummingbirds, squeaking goldfinches, curve-billed thrashers, chattering evening grosbeaks, and even a stately roadrunner. Over the last fourteen years, the venerable crab has gone from erupting into a magnificent fuchsia canopy each April—I could set a calendar by how the tree bursts into bloom in mid-April—to producing a lone flower last spring. It is yet another victim of our prolonged drought. The forlorn birds are all but begging me for another crabapple or two. I also find myself dreaming about getting some varieties of cultivar apples to go with the new crabapples. Planting a diverse variety of fruit trees would increase the odds that some will survive the vagaries of a changing climate.

II

Crabapples have turned out to be more important in the origin story of apples than almost anyone could have anticipated. My prairie crabapple is one of four crabapple species that are native to the United States. It's the wild European crabapple, *Malus sylvestris*, however, that is generating buzz in scientific circles. Sylvan means "of the woods," and I think of *Malus sylvestris* as the woodland crabapple, which prefers the "wet edge of the forest" and began to expand across Europe at the end of the last ice age. It is believed that Europeans relished crabapples long before they tasted a cultivar apple. A large number of wild crabapple remains have been found in European archeological sites dating back to the Neolithic era (7500–4500 BCE).

Elsewhere, though, in the Jordan Valley and Anatolia, locals were eating apples around 6500 BCE. A significant archaeobotanical discovery all but holds us by the hand and walks us back to antiquity: Remains of some kind of apples were found in the royal tomb of Queen Pu-abu near the ancient city of Ur in Mesopotamia, dating to the late third millennium BCE. Found on a saucer, "one of the most intriguing finds were the perforated halves of small dried apples," scientists explain. "It appears that they were cut transversely in half when fresh and threaded on a string and dried before being deposited in the tomb." The fruit was "very small and wrinkled in appearance." Because it is too arid and warm in Mesopotamia for crabapples to grow wild, scientists came to believe that these apples were likely cultivated. The discovery solved a mystery from the same time period concerning cuneiform writings that describe small fruit on strings: "The sometimes disputed translation of 'haihuru'" is not apricot, but apple.

Mesopotamians seem to have been apple lovers, and some scholars argue that grafting—a key tool of apple propagation—was invented either there or in ancient Persia. A significant clue is a fragment of a Sumerian cuneiform tablet, and a theory about how grafting technology may have developed. The tablet, from roughly 1800 BCE, describes the movement and replanting of grapevine shoots. Barrie Juniper and David Mabberley interpret this record to refer to grafting, though they acknowledge the difficulty of Sumerian translations and the tentativeness

of their interpretation. Their fascinating theory suggests that grafting originated in Mesopotamia as a response to a gradual salinization of the soils and consequential decline in their grape yields. Farmers would have selected for grape rootstock that is tolerant of salty soils and grafted salt-intolerant grape scions onto hardy rootstock. However, other scholars contend that this tablet could be referring to the vegetative propagation of grapes through cuttings, and the original translation of the Sumerian script into English makes no mention of grafting.

Apples of some size were certainly present in Mesopotamia by the time that Alexander the Great traveled near Babylon in 323 BCE. His records describe him ordering his boat crews to practice their battle readiness by pelting each other with apples! One can only speculate on what kind of apples these may have been, how they got there, and whether grafting was involved. Where and when grafting was invented is at best speculative, though most scholars agree that it was outside of the Mediterranean region. Grafting may also have had an independent origin in China, around 2000 BCE, through the development of silk and the dependency of silkworms on white and black mulberry leaves.

From roughly 130 BCE to 1450 CE, the Silk Route vitally connected China in the east to central Asia before radiating west to Europe. *Malus domestica* (think of it as the domestic apple, the one we eat), the cultivar apple, was a popular traveler along the 4,000-mile ribbonlike trading paths known collectively as the Silk Route. When apple-eating traders traveled eastward and westward from Kazakhstan, they did the work of birds and bears by spreading apple seeds in both directions. Spengler, the archaeobotanist, writes that “by the time of the Roman Empire, the apple was revered from one end of the Silk Road to another.”

We may know how the apple traveled to us, but botanists have heatedly debated the origins of the domesticated apple since the eighteenth century. The Swedish botanist Carl Linnaeus went as far as to argue that the domesticated apple be placed under *Pyrus*, the genus containing the pear. Earlier botanists strongly disagreed—as did British horticulturalist Philip Miller. The first to furnish a taxonomic description of the genus *Malus*, Miller argued that the apple should be placed within *Malus*, based on the different qualities of the pome—a technical term

that refers to fruit with small seeds at the core, encased by fleshy mass and a thick membrane. Miller, however, didn't suggest which *Malus* species the apple should be assigned to.

In 1803, the German botanist Moritz Borkhausen provided the first positively defined description of the apple and named it *Malus domestica* (the name suggests a domesticated or cultivated apple).

Then Borkhausen threw a bomb: He conjectured that the apple was domesticated from the wild European crabapple, *Malus sylvestris*.

Scientists have passionately debated the conjecture ever since.

What complicated matters is that over a century later, in September 1929, geneticist Nikolai Vavilov traveled to Kazakhstan and had an epiphany when he encountered wild apple forests outside the city of Almaty. A founder of the Plant Institute, he surveyed the unusual apples—knobby yellow, green, and varying shades of red—assisted by a local teenager who would go on to become the apple scientist Aimak Dzhangaliev. Both Vavilov and Dzhangaliev noticed that there is considerable morphological or phenotype variation in *Malus sieversii*, the true wild apple. Some *Malus sieversii* trees even have thorns! On the whole, Vavilov was struck by the diversity of fruit size, shape, and color of the wild apples nestled in the Tian Shan mountains. Based on visual similarities between the fruits of *Malus sieversii* and the cultivar apple, Vavilov guessed that the genome of the cultivar apple was somehow linked to the wild apples he was seeing and theorized that this region near Almaty was the birthplace of the apple we eat today. Based on his observations, Vavilov came up with a compelling equation:

$$\text{Centers of origin} = \text{Centers of diversity}$$

“Centers of origin” refers to the geographical region where a fruit may have originated, and “centers of diversity” refers to where fruit variation has evolved over time. The theory was criticized as being overly simplistic, but genetic science would later prove that Vavilov was at least on the right track.

Reflecting on the Kazakh fruit forests, I find it thrilling to consider that the origin of the wild apple was not some anemic, barely-made-it event; instead, the diversity in wild apples points to the abundant

creativity within nature. Interestingly, this diversity is also reflected in the structure of the wild apple trees, with trunks ranging from one-stemmed to five-stemmed to outright bushy, and crown structures varying from round to vase-formed to pyramidal.

Vavilov's theory would not become widely known until after the collapse of communism. A man of integrity and a brilliant scientist who corresponded with his Western peers, Vavilov soon grew out of favor with Stalin's regime. Cruelly persecuted for his independent mind, he would die of starvation in 1943 in a Leningrad prison. In time, his student Dzhangaliev would document the impressive diversity of *Malus sieversii* trees and fruit in their immunity to disease, biochemistry of the fruit, winter hardiness, quality and quantity of the fruit, ripening times, flowering period, and variation in tree canopy.

While many scientists came to believe that *Malus sieversii*, the wild apple that still grows along the flanks of Kazakhstan's Tian Shan mountains, is the primary ancestor of our cultivar apple, unanswered questions persisted. For starters, how did humans arrive at *Malus domestica*, the cultivated apple with roughly ten thousand varieties, simply from *Malus sieversii*?

The balance of morphological studies, which are based on physical features and traits such as flowering times, pointed to *Malus sieversii* as being the sole progenitor of the apples. But some scientists continued to wonder if *Malus sylvestris*, the wild European crabapple, might be a forgotten ancestral link between the wild central Asian apple and *Malus domestica*. Genetic evidence from the last twenty years has brought us closer to settling the issue. Newer and more sensitive genetic markers at last swung open the door for the debate to play out. Did other wild apple varieties contribute to the genome of *Malus domestica*? Could the flow of genes from crabapple trees actually have impacted the evolution of *Malus domestica*?

III

As I dove into the science of apple trees, I naturally craved to grow my own. Still, Michael and I were up against the impossibility of growing

fruit at a time when the Southwest's megadrought, a significant indicator of a warming climate, had caused our clayey soil to become bone dry. It stung to recall the fruit trees we had acquired a decade back with enthusiasm from orchardist Gordon Tooley, who specializes in fruit trees that survive in our high desert environment. Historically, a variety of trees including apples, peaches, and apricots have thrived in our region. In our garden, Tooley's trees had received a royal welcome. Michael dug generous holes for the three hawthorns and a handful of fruit trees. That May, I was pregnant with Mia and my younger brother was visiting from Toronto. One afternoon, my brother and I watched through a glass door as Michael, swathed in bright sunlight, jabbed his shovel relentlessly against the unyielding ground. Turning to me, my brother remarked with satisfaction: "I am a city boy."

Despite the work Michael poured into transplanting and caring for the new trees, most of them remained stunted or even died. I still wonder if watering the trees more might have dodged failure. In an era of water scarcity, we use recycled kitchen water to supplement drip irrigation for edible plants. The Southwest is our home, and we save each bucket of water we can. Ironically, thinkers like William deBuys caution that saving water can also fuel the false notion that we have enough water to justify even more development; for when aridification really sets in, there will be no cushion as water conservation would already have hardened. In this scenario, agriculture, the highest water user in the Southwest, would be forced to cut back water use.

Whether or not there is water to support it, the drumbeat of development grows ever shriller. At a time when we can hear nature groaning, the country as a whole has seen a surge in development: Over roughly the last two decades, new development devoured 10 percent of America's land, mostly forests, equaling five times the size of Delaware. As nature bleeds away, a procession of birds, from beloved grassland species such as meadowlarks and northern bobwhites to common species such as warblers, finches, and blackbirds, decline precipitously. Which is not to say that we lack sensitivity toward birds—we adore birds, and so many of us love apples—but our sense of urgency remains blunted. The biodiversity crisis feels remote and unconnected to our lives. The word *crisis* itself is overused. How can we respond to anything seriously

when so many places and people—our planet herself—are in crisis?

In a time of daunting upheavals, it is critical to *see* biodiversity loss, for truly seeing and experiencing can spur us to pivot and adapt to new climate realities. As a naturalist, I experience many upheavals in the natural world, and I make hard decisions about which ones to train my attention on. At the moment, the desiccated soil in my garden didn't look as though it could support the diverse variety of apple trees I was dreaming about.

Faced with a nearly dead crabapple, and long dead peach and nectarine trees, why did I dream about more crabapples, and even adding apple trees to the mix? An orchard is a space where I can taste and scent my childhood, for one thing. But growing the present is as important as the *rasa* of the past. On a quest to foster my connection to the wild, I know that crabapple trees, sour though their fruit might be, would be at home in our unruly garden. Biting into ripe apricots and apples straight from trees are among my juiciest memories from pandemic summers, a tangible connection to the biodiversity around us. Every state has its share of harvest festivals, but this way of being—with wild foods integrated into our everyday lives—is uncommon now. When my children offered freshly picked apricots to family friends visiting from a big city, the grown-ups stiffened and said, “Thank you,” but didn't eat the juicy apricots.

At our local Audubon center, a seven-year-old boy mimicked Mia and climbed an apple tree. Mia has been scaling apple trees since she was five, and it is her fervent climbing that got us to notice the apple trees at the Audubon center. The boy, following her lead, also picked an apple. Then he raced over to his parents, excitedly showing them the apple and wanting to eat it.

His parents seized the fruit. “We have to think about it,” they said. It's almost as though we forget where the apple comes from.

(continued...)