Planting Sweetgrass

Sweetgrass is best planted not by seed, but by putting roots directly in the ground. Thus the plant is passed from hand to earth to hand across years and generations. Its favored habitat is sunny, well-watered meadows. It thrives along disturbed edges.

Skywoman Falling

In winter, when the green earth lies resting beneath a blanket of snow, this is the time for storytelling. The storytellers begin by calling upon those who came before who passed the stories down to us, for we are only messengers.

In the beginning there was the Skyworld.

She fell like a maple seed, pirouetting on an autumn breeze.* A column of light streamed from a hole in the Skyworld, marking her path where only darkness had been before. It took her a long time to fall. In fear, or maybe hope, she clutched a bundle tightly in her hand.

Hurtling downward, she saw only dark water below. But in that emptiness there were many eyes gazing up at the sudden shaft of light. They saw there a small object, a mere dust mote in the beam. As it grew closer, they could see that it was a woman, arms outstretched, long black hair billowing behind as she spiraled toward them.

The geese nodded at one another and rose together from the water in a wave of goose music. She felt the beat of their wings as they flew beneath to break her fall. Far from the only home she'd ever known, she caught her breath at the warm embrace of soft feathers as they gently carried her downward. And so it began.

The geese could not hold the woman above the water for much longer, so they called a council to decide what to do. Resting on their wings, she saw them all gather: loons, otters, swans, beavers, fish of all kinds. A great turtle floated in their midst and offered his back for her

* Adapted from oral tradition and Shenandoah and George, 1988.

to rest upon. Gratefully, she stepped from the goose wings onto the dome of his shell. The others understood that she needed land for her home and discussed how they might serve her need. The deep divers among them had heard of mud at the bottom of the water and agreed to go find some.

Loon dove first, but the distance was too far and after a long while he surfaced with nothing to show for his efforts. One by one, the other animals offered to help—Otter, Beaver, Sturgeon—but the depth, the darkness, and the pressures were too great for even the strongest of swimmers. They returned gasping for air with their heads ringing. Some did not return at all. Soon only little Muskrat was left, the weakest diver of all. He volunteered to go while the others looked on doubtfully. His small legs flailed as he worked his way downward and he was gone a very long time.

They waited and waited for him to return, fearing the worst for their relative, and, before long, a stream of bubbles rose with the small, limp body of the muskrat. He had given his life to aid this helpless human. But then the others noticed that his paw was tightly clenched and, when they opened it, there was a small handful of mud. Turtle said, "Here, put it on my back and I will hold it."

Skywoman bent and spread the mud with her hands across the shell of the turtle. Moved by the extraordinary gifts of the animals, she sang in thanksgiving and then began to dance, her feet caressing the earth. The land grew and grew as she danced her thanks, from the dab of mud on Turtle's back until the whole earth was made. Not by Skywoman alone, but from the alchemy of all the animals' gifts coupled with her deep gratitude. Together they formed what we know today as Turtle Island, our home.

Like any good guest, Skywoman had not come empty-handed. The bundle was still clutched in her hand. When she toppled from the hole in the Skyworld she had reached out to grab onto the Tree of Life that grew there. In her grasp were branches—fruits and seeds of all kinds of plants. These she scattered onto the new ground and carefully tended each one until the world turned from brown to green.

Sunlight streamed through the hole from the Skyworld, allowing the seeds to flourish. Wild grasses, flowers, trees, and medicines spread everywhere. And now that the animals, too, had plenty to eat, many came to live with her on Turtle Island.

Our stories say that of all the plants, *wiingaashk,* or sweetgrass, was the very first to grow on the earth, its fragrance a sweet memory of Skywoman's hand. Accordingly, it is honored as one of the four sacred plants of my people. Breathe in its scent and you start to remember things you didn't know you'd forgotten. Our elders say that ceremonies are the way we "remember to remember," and so sweetgrass is a powerful ceremonial plant cherished by many indigenous nations. It is also used to make beautiful baskets. Both medicine and a relative, its value is both material and spiritual.

There is such tenderness in braiding the hair of someone you love. Kindness and something more flow between the braider and the braided, the two connected by the cord of the plait. *Wiingaashk* waves in strands, long and shining like a woman's freshly washed hair. And so we say it is the flowing hair of Mother Earth. When we braid sweetgrass, we are braiding the hair of Mother Earth, showing her our loving attention, our care for her beauty and well-being, in gratitude for all she has given us. Children hearing the Skywoman story from birth know in their bones the responsibility that flows between humans and the earth.

The story of Skywoman's journey is so rich and glittering it feels to me like a deep bowl of celestial blue from which I could drink again and again. It holds our beliefs, our history, our relationships. Looking into that starry bowl, I see images swirling so fluidly that the past and the present become as one. Images of Skywoman speak not just of where we came from, but also of how we can go forward.

I have Bruce King's portrait of Skywoman, *Moment in Flight,* hanging in my lab. Floating to earth with her handful of seeds and flowers, she

looks down on my microscopes and data loggers. It might seem an odd juxtaposition, but to me she belongs there. As a writer, a scientist, and a carrier of Skywoman's story, I sit at the feet of my elder teachers listening for their songs.

On Mondays, Wednesdays, and Fridays at 9:35 a.m., I am usually in a lecture hall at the university, expounding about botany and ecology—trying, in short, to explain to my students how Skywoman's gardens, known by some as "global ecosystems," function. One otherwise unremarkable morning I gave the students in my General Ecology class a survey. Among other things, they were asked to rate their understanding of the negative interactions between humans and the environment. Nearly every one of the two hundred students said confidently that humans and nature are a bad mix. These were third-year students who had selected a career in environmental protection, so the response was, in a way, not very surprising. They were well schooled in the mechanics of climate change, toxins in the land and water, and the crisis of habitat loss. Later in the survey, they were asked to rate their knowledge of positive interactions between people and land. The median response was "none."

I was stunned. How is it possible that in twenty years of education they cannot think of any beneficial relationships between people and the environment? Perhaps the negative examples they see every day—brownfields, factory farms, suburban sprawl—truncated their ability to see some good between humans and the earth. As the land becomes impoverished, so too does the scope of their vision. When we talked about this after class, I realized that they could not even imagine what beneficial relations between their species and others might look like. How can we begin to move toward ecological and cultural sustainability if we cannot even imagine what the path feels like? If we can't imagine the generosity of geese? These students were not raised on the story of Skywoman.

On one side of the world were people whose relationship with the living world was shaped by Skywoman, who created a garden for the

well-being of all. On the other side was another woman with a garden and a tree. But for tasting its fruit, she was banished from the garden and the gates clanged shut behind her. That mother of men was made to wander in the wilderness and earn her bread by the sweat of her brow, not by filling her mouth with the sweet juicy fruits that bend the branches low. In order to eat, she was instructed to subdue the wilderness into which she was cast.

Same species, same earth, different stories. Like Creation stories everywhere, cosmologies are a source of identity and orientation to the world. They tell us who we are. We are inevitably shaped by them no matter how distant they may be from our consciousness. One story leads to the generous embrace of the living world, the other to banishment. One woman is our ancestral gardener, a cocreator of the good green world that would be the home of her descendants. The other was an exile, just passing through an alien world on a rough road to her real home in heaven.

And then they met—the offspring of Skywoman and the children of Eve—and the land around us bears the scars of that meeting, the echoes of our stories. They say that hell hath no fury like a woman scorned, and I can only imagine the conversation between Eve and Skywoman: "Sister, you got the short end of the stick . . ."

The Skywoman story, shared by the original peoples throughout the Great Lakes, is a constant star in the constellation of teachings we call the Original Instructions. These are not "instructions" like commandments, though, or rules; rather, they are like a compass: they provide an orientation but not a map. The work of living is creating that map for yourself. How to follow the Original Instructions will be different for each of us and different for every era.

In their time, Skywoman's first people lived by their understanding of the Original Instructions, with ethical prescriptions for respectful hunting, family life, ceremonies that made sense for their world. Those measures for caring might not seem to fit in today's urban world, where "green" means an advertising slogan, not a meadow. The

buffalo are gone and the world has moved on. I can't return salmon to the river, and my neighbors would raise the alarm if I set fire to my yard to produce pasture for elk.

The earth was new then, when it welcomed the first human. It's old now, and some suspect that we have worn out our welcome by casting the Original Instructions aside. From the very beginning of the world, the other species were a lifeboat for the people. Now, we must be theirs. But the stories that might guide us, if they are told at all, grow dim in the memory. What meaning would they have today? How can we translate from the stories at the world's beginning to this hour so much closer to its end? The landscape has changed, but the story remains. And as I turn it over again and again, Skywoman seems to look me in the eye and ask, in return for this gift of a world on Turtle's back, what will I give in return?

It is good to remember that the original woman was herself an immigrant. She fell a long way from her home in the Skyworld, leaving behind all who knew her and who held her dear. She could never go back. Since 1492, most here are immigrants as well, perhaps arriving on Ellis Island without even knowing that Turtle Island rested beneath their feet. Some of my ancestors are Skywoman's people, and I belong to them. Some of my ancestors were the newer kind of immigrants, too: a French fur trader, an Irish carpenter, a Welsh farmer. And here we all are, on Turtle Island, trying to make a home. Their stories, of arrivals with empty pockets and nothing but hope, resonate with Skywoman's. She came here with nothing but a handful of seeds and the slimmest of instructions to "use your gifts and dreams for good," the same instructions we all carry. She accepted the gifts from the other beings with open hands and used them honorably. She shared the gifts she brought from Skyworld as she set herself about the business of flourishing, of making a home.

Perhaps the Skywoman story endures because we too are always falling. Our lives, both personal and collective, share her trajectory. Whether we jump or are pushed, or the edge of the known world just crumbles at our feet, we fall, spinning into someplace new and

unexpected. Despite our fears of falling, the gifts of the world stand by to catch us.

As we consider these instructions, it is also good to recall that, when Skywoman arrived here, she did not come alone. She was pregnant. Knowing her grandchildren would inherit the world she left behind, she did not work for flourishing in her time only. It was through her actions of reciprocity, the give and take with the land, that the original immigrant became indigenous. For all of us, becoming indigenous to a place means living as if your children's future mattered, to take care of the land as if our lives, both material and spiritual, depended on it.

In the public arena, I've heard the Skywoman story told as a bauble of colorful "folklore." But, even when it is misunderstood, there is power in the telling. Most of my students have never heard the origin story of this land where they were born, but when I tell them, something begins to kindle behind their eyes. Can they, can we all, understand the Skywoman story not as an artifact from the past but as instructions for the future? Can a nation of immigrants once again follow her example to become native, to make a home?

Look at the legacy of poor Eve's exile from Eden: the land shows the bruises of an abusive relationship. It's not just land that is broken, but more importantly, our relationship to land. As Gary Nabhan has written, we can't meaningfully proceed with healing, with restoration, without "re-story-ation." In other words, our relationship with land cannot heal until we hear its stories. But who will tell them?

In the Western tradition there is a recognized hierarchy of beings, with, of course, the human being on top—the pinnacle of evolution, the darling of Creation—and the plants at the bottom. But in Native ways of knowing, human people are often referred to as "the younger brothers of Creation." We say that humans have the least experience with how to live and thus the most to learn—we must look to our teachers among the other species for guidance. Their wisdom is apparent in the way that they live. They teach us by example. They've been on the earth far longer than we have been, and have had time to figure things out. They live both above and below ground, joining Skyworld

to the earth. Plants know how to make food and medicine from light and water, and then they give it away.

I like to imagine that when Skywoman scattered her handful of seeds across Turtle Island, she was sowing sustenance for the body and also for the mind, emotion, and spirit: she was leaving us teachers. The plants can tell us her story; we need to learn to listen.

The Council of Pecans

Heat waves shimmer above the grasses, the air heavy and white and ringing with the buzz of cicadas. They've been shoeless all summer long, but even so the dry September stubble of 1895 pricks their feet as they trot across the sunburned prairie, lifting their heels like grass dancers. Just young willow whips in faded dungarees and nothing else, their ribs showing beneath narrow brown chests as they run. They veer off toward the shady grove where the grass is soft and cool underfoot, flopping in the tall grass with the loose-limbed abandon of boys. They rest for a few moments in the shade and then spring to their feet, palming grasshoppers for bait.

The fishing poles are right where they left them, leaning up against an old cottonwood. They hook the grasshoppers through the back and throw out a line while the silt of the creek bottom oozes up cool between their toes. But the water hardly moves in the paltry channel left by drought. Nothing's biting but a few mosquitoes. After a bit, the prospect of a fish dinner seem as thin as their bellies, beneath faded denim pants held up with twine. Looks like nothing but biscuits and redeye gravy for supper tonight. Again. They hate to go home empty-handed and disappoint Mama, but even a dry biscuit fills the belly.

The land here, along the Canadian River, smack in the middle of Indian Territory, is a rolling savanna of grass with groves of trees in the bottomlands. Much of it has never been plow broke, as no one has a plow. The boys follow the stream from grove to grove back up toward the home place on the allotment, hoping for a deep pool somewhere,

finding nothing. Until one boy stubs his toe on something hard and round hidden in the long grass.

There's one and then another, and then another—so many he can hardly walk. He takes up a hard green ball from the ground and whips it through the trees at his brother like a fastball as he yells, "*Piganek!* Let's bring 'em home!" The nuts have just begun to ripen and fall and blanket the grass. The boys fill their pockets in no time and then pile up a great heap more. Pecans are good eating but hard to carry, like trying to carry a bushel of tennis balls: the more you pick up, the more end up on the ground. They hate to go home empty-handed, and Mama would be glad for these—but you can't carry more than a handful . . .

The heat eases a little as the sun sinks low and evening air settles in the bottomland, cool enough for them to run home for supper. Mama hollers for them and the boys come running, their skinny legs pumping and their underpants flashing white in the fading light. It looks like they're each carrying a big forked log, hung like a yoke over their shoulders. They throw them down at her feet with grins of triumph: two pairs of worn-out pants, tied shut with twine at the ankles and bulging with nuts.

One of those skinny little boys was my grandpa, hungry enough to gather up food whenever he found it, living in a shanty on the Oklahoma prairie when it was still "Indian Territory," just before it all blew away. As unpredictable as life may be, we have even less control over the stories they tell about us after we're gone. He'd laugh so hard to hear that his great-grandchildren know him not as a decorated World War I veteran, not as a skilled mechanic for newfangled automobiles, but as a barefoot boy on the reservation running home in his underwear with his pants stuffed with pecans.

The word *pecan*—the fruit of the tree known as the pecan hickory *(Carya illinoensis)*—comes to English from indigenous languages. *Pigan* is a nut, any nut. The hickories, black walnuts, and butternuts of our northern homelands have their own specific names. But those trees, like the homelands, were lost to my people. Our lands around

Lake Michigan were wanted by settlers, so in long lines, surrounded by soldiers, we were marched at gunpoint along what became known as the Trail of Death. They took us to a new place, far from our lakes and forests. But someone wanted that land too, so the bedrolls were packed again, thinner this time. In the span of a single generation my ancestors were "removed" three times—Wisconsin to Kansas, points in between, and then to Oklahoma. I wonder if they looked back for a last glimpse of the lakes, glimmering like a mirage. Did they touch the trees in remembrance as they became fewer and fewer, until there was only grass?

So much was scattered and left along that trail. Graves of half the people. Language. Knowledge. Names. My great-grandmother Sha-note, "wind blowing through," was renamed Charlotte. Names the soldiers or the missionaries could not pronounce were not permitted.

When they got to Kansas they must have been relieved to find groves of nut trees along the rivers—a type unknown to them, but delicious and plentiful. Without a name for this new food they just called them nuts—*pigan*—which became *pecan* in English.

I only make pecan pie at Thanksgiving, when there are plenty around to eat it all. I don't even like it especially, but I want to honor that tree. Feeding guests its fruit around the big table recalls the trees' welcome to our ancestors when they were lonesome and tired and so far from home.

The boys may have come home fishless, but they brought back nearly as much protein as if they'd had a stringer of catfish. Nuts are like the pan fish of the forest, full of protein and especially fat—"poor man's meat," and they were poor. Today we eat them daintily, shelled and toasted, but in the old times they'd boil them up in a porridge. The fat floated to the top like a chicken soup and they skimmed it and stored it as nut butter: good winter food. High in calories and vitamins—everything you needed to sustain life. After all, that's the whole point of nuts: to provide the embryo with all that is needed to start a new life.

. . . .

Butternuts, black walnuts, hickories, and pecans are all closely related members of the same family *(Juglandaceae)*. Our people carried them wherever they migrated, more often in baskets than in pants, though. Pecans today trace the rivers through the prairies, populating fertile bottomlands where people settled. My Haudenosaunee neighbors say that their ancestors were so fond of butternuts that they are a good marker of old village sites today. Sure enough, there is a grove of butternuts, uncommon in "wild" forests, on the hill above the spring at my house. I clear the weeds around the young ones every year and slosh a bucket of water on them when the rains are late. Remembering.

The old family home place on the allotment in Oklahoma has a pecan tree shading what remains of the house. I imagine Grammy pouring nuts out to prepare them and one rolling away to a welcoming spot at the edge of the dooryard. Or maybe she paid her debt to the trees by planting a handful in her garden right then and there.

Thinking back to that old story again, it strikes me that the boys in the pecan grove were very wise to carry home all that they could: nut trees don't make a crop every year, but rather produce at unpredictable intervals. Some years a feast, most years a famine, a boom and bust cycle known as mast fruiting. Unlike juicy fruits and berries, which invite you to eat them right away before they spoil, nuts protect themselves with a hard, almost stony shell and a green, leathery husk. The tree does not mean for you to eat them right away with juice dripping down your chin. They are designed to be food for winter, when you need fat and protein, heavy calories to keep you warm. They are safety for hard times, the embryo of survival. So rich is the reward that the contents are protected in a vault, double locked, a box inside a box. This protects the embryo within and its food supply, but it also virtually guarantees that the nut will be squirreled away someplace safe.

The only way through the shell is a lot of work, and a squirrel would be unwise to sit gnawing it in the open where a hawk would gladly take advantage of its preoccupation. Nuts are designed to be brought inside, to save for later in a chipmunk's cache, or in the root cellar of an Oklahoma cabin. In the way of all hoards, some will surely be forgotten—and then a tree is born.

For mast fruiting to succeed in generating new forests, each tree has to make lots and lots of nuts—so many that it overwhelms the would-be seed predators. If a tree just plodded along making a few nuts every year, they'd all get eaten and there would be no next generation of pecans. But given the high caloric value of nuts, the trees can't afford this outpouring every year—they have to save up for it, as a family saves up for a special event. Mast-fruiting trees spend years making sugar, and rather than spending it little by little, they stick it under the proverbial mattress, banking calories as starch in their roots. When the account has a surplus, only then could my Grandpa bring home pounds of nuts.

This boom and bust cycle remains a playground of hypotheses for tree physiologists and evolutionary biologists. Forest ecologists hypothesize that mast fruiting is the simple outcome of this energetic equation: make fruit only when you can afford it. That makes sense. But trees grow and accumulate calories at different rates depending on their habitats. So, like the settlers who got the fertile farmland, the fortunate ones would get rich quickly and fruit often, while their shaded neighbors would struggle and only rarely have an abundance, waiting for years to reproduce. If this were true, each tree would fruit on its own schedule, predictable by the size of its reserves of stored starch. But they don't. If one tree fruits, they all fruit—there are no soloists. Not one tree in a grove, but the whole grove; not one grove in the forest, but every grove; all across the county and all across the state. The trees act not as individuals, but somehow as a collective. Exactly how they do this, we don't yet know. But what we see is the power of unity. What happens to one happens to us all. We can starve together or feast together. All flourishing is mutual.

In the summer of 1895, the root cellars throughout Indian Territory were full of pecans, and so were the bellies of boys and squirrels. For people, the pulse of abundance felt like a gift, a profusion of food to be simply picked up from the ground. That is, if you got there before the squirrels. And if you didn't, at least there would be lots of squirrel stew that winter. The pecan groves give, and give again. Such communal generosity might seem incompatible with the process of evolution, which

invokes the imperative of individual survival. But we make a grave error if we try to separate individual well-being from the health of the whole. The gift of abundance from pecans is also a gift to themselves. By sating squirrels and people, the trees are ensuring their own survival. The genes that translate to mast fruiting flow on evolutionary currents into the next generations, while those that lack the ability to participate will be eaten and reach an evolutionary dead end. Just so, people who know how to read the land for nuts and carry them home to safety will survive the February blizzards and pass on that behavior to their progeny, not by genetic transmission but by cultural practice.

Forest scientists describe the generosity of mast fruiting with the predator-satiation hypothesis. The story seems to go like this: When the trees produce more than the squirrels can eat, some nuts escape predation. Likewise, when the squirrel larders are packed with nuts, the plump pregnant mamas have more babies in each litter and the squirrel population skyrockets. Which means that the hawk mamas have more babies, and fox dens are full too. But when the next fall comes, the happy days are over, because the trees have shut off nut production. There's little to fill the squirrels' larders now—they come home empty-handed—so they go out looking, harder and harder, exposing themselves to the increased population of watchful hawks and hungry foxes. The predator-prey ratio is not in their favor, and through starvation and predation the squirrel population plummets and the woods grow quiet without their chattering. You can imagine the trees whispering to each other at this point, "There are just a few squirrels left. Wouldn't this be a good time to make some nuts?" All across the landscape, out come the pecan flowers poised to become a bumper crop again. Together, the trees survive, and thrive.

The federal government's Indian Removal policies wrenched many Native peoples from our homelands. It separated us from our traditional knowledge and lifeways, the bones of our ancestors, our sustaining plants—but even this did not extinguish identity. So the government

tried a new tool, separating children from their families and cultures, sending them far away to school, long enough, they hoped, to make them forget who they were.

Throughout Indian Territory there are records of Indian agents being paid a bounty for rounding up kids to ship to the government boarding schools. Later, in a pretense of choice, the parents had to sign papers to let their children go "legally." Parents who refused could go to jail. Some may have hoped it would give their children a better future than a dust-bowl farm. Sometimes federal rations—weevilly flour and rancid lard that were supposed to replace the buffalo—would be withheld until the children were signed over. Maybe it was a good pecan year that staved off the agents for one more season. The threat of being sent away would surely make a small boy run home half naked, his pants stuffed with food. Maybe it was a low year for pecans when the Indian agent came again, looking for skinny brown kids who had no prospect of supper—maybe that was the year Grammy signed the papers.

Children, language, lands: almost everything was stripped away, stolen when you weren't looking because you were trying to stay alive. In the face of such loss, one thing our people could not surrender was the meaning of land. In the settler mind, land was property, real estate, capital, or natural resources. But to our people, it was everything: identity, the connection to our ancestors, the home of our nonhuman kinfolk, our pharmacy, our library, the source of all that sustained us. Our lands were where our responsibility to the world was enacted, sacred ground. It belonged to itself; it was a gift, not a commodity, so it could never be bought or sold. These are the meanings people took with them when they were forced from their ancient homelands to new places. Whether it was their homeland or the new land forced upon them, land held in common gave people strength; it gave them something to fight for. And so—in the eyes of the federal government—that belief was a threat.

So after thousands of miles of forced moves and loss and finally settling us in Kansas, the federal government came once again to my people and offered another move, this time to a place that would be

theirs forever, a move to end all moves. And what's more, the people were offered a chance to become United States citizens, to be part of the great country that surrounded them and to be protected by its power. Our leaders, my grandpa's grandpa among them, studied and counciled and sent delegations to Washington to consult. The U.S. Constitution apparently had no power to protect the homelands of indigenous peoples. Removal had made that abundantly clear. But the Constitution did explicitly protect the land rights of citizens who were individual property owners. Perhaps that was the route to a permanent home for the people.

The leaders were offered the American Dream, the right to own their own property as individuals, inviolate from the vagaries of shifting Indian policy. They'd never be forced off their lands again. There would be no more graves along a dusty road. All they had to do was agree to surrender their allegiance to land held in common and agree to private property. With heavy hearts, they sat in council all summer, struggling to decide and weighing the options, which were few. Families were divided against families. Stay in Kansas on communal land and run the risk of losing it all, or go to Indian Territory as individual landowners with a legal guarantee. This historic council met all that hot summer in a shady place that came to be known as the Pecan Grove.

We have always known that the plants and animals have their own councils, and a common language. The trees, especially, we recognize as our teachers. But it seems no one listened that summer when the Pecans counseled: Stick together, act as one. We Pecans have learned that there is strength in unity, that the lone individual can be picked off as easily as the tree that has fruited out of season. The teachings of Pecans were not heard, or heeded.

And so our families packed the wagon one more time and moved west to Indian Territory, to the promised land, to become the Citizen Potawatomi. Tired and dusty but hopeful for their future, they found an old friend their first night on the new lands: a pecan grove. They rolled their wagons beneath the shelter of its branches and began again. Every tribal member, even my grandpa, a baby in arms, was given title

to an allotment of land the federal government deemed sufficient for making a living as a farmer. By accepting citizenship, they ensured that their allotments could not be taken from them. Unless, of course, a citizen could not pay his taxes. Or a rancher offered a keg of whiskey and a lot of money, "fair and square." Any unallocated parcels were snapped up by non-Indian settlers just as hungry squirrels snap up pecans. During the allotment era, more than two-thirds of the reservation lands were lost. Barely a generation after land was "guaranteed" through the sacrifice of common land converted to private property, most of it was gone.

The pecan trees and their kin show a capacity for concerted action, for unity of purpose that transcends the individual trees. They ensure somehow that all stand together and thus survive. How they do so is still elusive. There is some evidence that certain cues from the environment may trigger fruiting, like a particularly wet spring or a long growing season. These favorable physical conditions help all the trees achieve an energy surplus that they can spend on nuts. But, given the individual differences in habitat, it seems unlikely that environment alone could be the key to synchrony.

In the old times, our elders say, the trees talked to each other. They'd stand in their own council and craft a plan. But scientists decided long ago that plants were deaf and mute, locked in isolation without communication. The possibility of conversation was summarily dismissed. Science pretends to be purely rational, completely neutral, a system of knowledge-making in which the observation is independent of the observer. And yet the conclusion was drawn that plants cannot communicate because they lack the mechanisms that *animals* use to speak. The potentials for plants were seen purely through the lens of animal capacity. Until quite recently no one seriously explored the possibility that plants might "speak" to one another. But pollen has been carried reliably on the wind for eons, communicated by males to receptive females to make those very nuts. If the wind can be trusted with that fecund responsibility, why not with messages?

There is now compelling evidence that our elders were right—the

trees *are* talking to one another. They communicate via pheromones, hormonelike compounds that are wafted on the breeze, laden with meaning. Scientists have identified specific compounds that one tree will release when it is under the stress of insect attack—gypsy moths gorging on its leaves or bark beetles under its skin. The tree sends out a distress call: "Hey, you guys over there? I'm under attack here. You might want to raise the drawbridge and arm yourselves for what is coming your way." The downwind trees catch the drift, sensing those few molecules of alarm, the whiff of danger. This gives them time to manufacture defensive chemicals. Forewarned is forearmed. The trees warn each other and the invaders are repelled. The individual benefits, and so does the entire grove. Trees appear to be talking about mutual defense. Could they also communicate to synchronize masting? There is so much we cannot yet sense with our limited human capacity. Tree conversations are still far above our heads.

Some studies of mast fruiting have suggested that the mechanism for synchrony comes not through the air, but underground. The trees in a forest are often interconnected by subterranean networks of mycorrhizae, fungal strands that inhabit tree roots. The mycorrhizal symbiosis enables the fungi to forage for mineral nutrients in the soil and deliver them to the tree in exchange for carbohydrates. The mycorrhizae may form fungal bridges between individual trees, so that all the trees in a forest are connected. These fungal networks appear to redistribute the wealth of carbohydrates from tree to tree. A kind of Robin Hood, they take from the rich and give to the poor so that all the trees arrive at the same carbon surplus at the same time. They weave a web of reciprocity, of giving and taking. In this way, the trees all act as one because the fungi have connected them. Through unity, survival. All flourishing is mutual. Soil, fungus, tree, squirrel, boy—all are the beneficiaries of reciprocity.

How generously they shower us with food, literally giving themselves so that we can live. But in the giving their lives are also ensured. Our taking returns benefit to them in the circle of life making life, the chain of reciprocity. Living by the precepts of the Honorable Harvest—to

take only what is given, to use it well, to be grateful for the gift, and to reciprocate the gift—is easy in a pecan grove. We reciprocate the gift by taking care of the grove, protecting it from harm, planting seeds so that new groves will shade the prairie and feed the squirrels.

Now, two generations later, after removal, after allotment, after the boarding schools, after diaspora, my family returns to Oklahoma, to what is left of my grandfather's allotment. From the hilltop you can still see pecan groves along the river. At night we dance on the old powwow grounds. The ancient ceremonies greet the sunrise. The smell of corn soup and the sound of drums fill the air as the nine bands of Potawatomi, scattered across the country by this history of removal, come together again for a few days each year in a search for belonging. The Potawatomi Gathering of Nations reunites the people, an antidote to the divide-and-conquer strategy that was used to separate our people from each other and from our homelands. The synchrony of our Gathering is determined by our leaders, but more importantly, there is something like a mycorrhizal network that unites us, an unseen connection of history and family and responsibility to both our ancestors and our children. As a nation, we are beginning to follow the guidance of our elders the pecans by standing together for the benefit of all. We are remembering what they said, that all flourishing is mutual.

This is a mast year for my family; we are all here at the Gathering, thick on the ground, like seeds for the future. Like an embryo provisioned and protected inside layers of stony shell, we have survived the lean years and flower together. I go walking in the pecan grove, perhaps the very place where my grandfather stuffed his pant legs full. He would be surprised to find us all here, dancing the circle, remembering pecans.

Asters and Goldenrod

The girl in the picture holds a slate with her name and "class of '75" chalked in, a girl the color of deerskin with long dark hair and inky unreadable eyes that meet yours and won't look away. I remember that day. I was wearing the new plaid shirt that my parents had given me, an outfit I thought to be the hallmark of all foresters. When I looked back at the photo later in life, it was a puzzle to me. I recall being elated to be going to college, but there is no trace of that in the girl's face.

Even before I arrived at school, I had all of my answers prepared for the freshman intake interview. I wanted to make a good first impression. There were hardly any women at the forestry school in those days and certainly none who looked like me. The adviser peered at me over his glasses and said, "So, why do you want to major in botany?" His pencil was poised over the registrar's form.

How could I answer, how could I tell him that I was born a botanist, that I had shoeboxes of seeds and piles of pressed leaves under my bed, that I'd stop my bike along the road to identify a new species, that plants colored my dreams, that the plants had chosen me? So I told him the truth. I was proud of my well-planned answer, its freshman sophistication apparent to anyone, the way it showed that I already knew some plants and their habitats, that I had thought deeply about their nature and was clearly well prepared for college work. I told him that I chose botany because I wanted to learn about why asters and goldenrod looked so beautiful together. I'm sure I was smiling then, in my red plaid shirt.

But he was not. He laid down his pencil as if there was no need to record what I had said. "Miss Wall," he said, fixing me with a disappointed smile, "I must tell you that *that* is not science. That is not at all the sort of thing with which botanists concern themselves." But he promised to put me right. "I'll enroll you in General Botany so you can learn what it is." And so it began.

I like to imagine that they were the first flowers I saw, over my mother's shoulder, as the pink blanket slipped away from my face and their colors flooded my consciousness. I've heard that early experience can attune the brain to certain stimuli, so that they are processed with greater speed and certainty, so that they can be used again and again, so that we remember. Love at first sight. Through cloudy newborn eyes their radiance formed the first botanical synapses in my wide-awake, newborn brain, which until then had encountered only the blurry gentleness of pink faces. I'm guessing all eyes were on me, a little round baby all swaddled in bunting, but mine were on Goldenrod and Asters. I was born to these flowers and they came back for my birthday every year, weaving me into our mutual celebration.

People flock to our hills for the fiery suite of October but they often miss the sublime prelude of September fields. As if harvest time were not enough—peaches, grapes, sweet corn, squash—the fields are also embroidered with drifts of golden yellow and pools of deepest purple, a masterpiece.

If a fountain could jet bouquets of chrome yellow in dazzling arches of chrysanthemum fireworks, that would be Canada Goldenrod. Each three-foot stem is a geyser of tiny gold daisies, ladylike in miniature, exuberant en masse. Where the soil is damp enough, they stand side by side with their perfect counterpart, New England Asters. Not the pale domesticates of the perennial border, the weak sauce of lavender or sky blue, but full-on royal purple that would make a violet shrink. The daisylike fringe of purple petals surrounds a disc as bright as the sun at high noon, a golden-orange pool, just a tantalizing shade

darker than the surrounding goldenrod. Alone, each is a botanical superlative. Together, the visual effect is stunning. Purple and gold, the heraldic colors of the king and queen of the meadow, a regal procession in complementary colors. I just wanted to know why.

Why do they stand beside each other when they could grow alone? Why this particular pair? There are plenty of pinks and whites and blues dotting the fields, so is it only happenstance that the magnificence of purple and gold end up side by side? Einstein himself said that "God doesn't play dice with the universe." What is the source of this pattern? Why is the world so beautiful? It could so easily be otherwise: flowers could be ugly to us and still fulfill their own purpose. But they're not. It seemed like a good question to me.

But my adviser said, "It's not science," not what botany was about. I wanted to know why certain stems bent easily for baskets and some would break, why the biggest berries grew in the shade and why they made us medicines, which plants are edible, why those little pink orchids only grow under pines. "Not science," he said, and he ought to know, sitting in his laboratory, a learned professor of botany. "And if you want to study beauty, you should go to art school." He reminded me of my deliberations over choosing a college, when I had vacillated between training as a botanist or as a poet. Since everyone told me I couldn't do both, I'd chosen plants. He told me that science was not about beauty, not about the embrace between plants and humans.

I had no rejoinder; I had made a mistake. There was no fight in me, only embarrassment at my error. I did not have the words for resistance. He signed me up for my classes and I was dismissed to go get my photo taken for registration. I didn't think about it at the time, but it was happening all over again, an echo of my grandfather's first day at school, when he was ordered to leave everything—language, culture, family—behind. The professor made me doubt where I came from, what I knew, and claimed that his was the *right* way to think. Only he didn't cut my hair off.

In moving from a childhood in the woods to the university I had unknowingly shifted between worldviews, from a natural history of

experience, in which I knew plants as teachers and companions to whom I was linked with mutual responsibility, into the realm of science. The questions scientists raised were not "Who are you?" but "What is it?" No one asked plants, "What can you tell us?" The primary question was "How does it work?" The botany I was taught was reductionist, mechanistic, and strictly objective. Plants were reduced to objects; they were not subjects. The way botany was conceived and taught didn't seem to leave much room for a person who thought the way I did. The only way I could make sense of it was to conclude that the things I had always believed about plants must not be true after all.

That first plant science class was a disaster. I barely scraped by with a C and could not muster much enthusiasm for memorizing the concentrations of essential plant nutrients. There were times when I wanted to quit, but the more I learned, the more fascinated I became with the intricate structures that made up a leaf and the alchemy of photosynthesis. Companionship between asters and goldenrod was never mentioned, but I memorized botanical Latin as if it was poetry, eagerly tossing aside the name "goldenrod" for *Solidago canadensis*. I was mesmerized by plant ecology, evolution, taxonomy, physiology, soils, and fungi. All around me were my good teachers, the plants. I found good mentors, too, warm and kind professors who were doing heart-driven science, whether they could admit it or not. They too were my teachers. And yet there was always something tapping at my shoulder, willing me to turn around. When I did, I did not know how to recognize what stood behind me.

My natural inclination was to see relationships, to seek the threads that connect the world, to join instead of divide. But science is rigorous in separating the observer from the observed, and the observed from the observer. Why two flowers are beautiful together would violate the division necessary for objectivity.

I scarcely doubted the primacy of scientific thought. Following the path of science trained me to separate, to distinguish perception from

physical reality, to atomize complexity into its smallest components, to honor the chain of evidence and logic, to discern one thing from another, to savor the pleasure of precision. The more I did this, the better I got at it, and I was accepted to do graduate work in one of the world's finest botany programs, no doubt on the strength of the letter of recommendation from my adviser, which read, "She's done remarkably well for an Indian girl."

A master's degree, a PhD, and a faculty position followed. I am grateful for the knowledge that was shared with me and deeply privileged to carry the powerful tools of science as a way of engaging the world. It took me to other plant communities, far from the asters and goldenrod. I remember feeling, as a new faculty member, as if I finally understood plants. I too began to teach the mechanics of botany, emulating the approach that I had been taught.

It reminds me of a story told by my friend Holly Youngbear Tibbetts. A plant scientist, armed with his notebooks and equipment, is exploring the rainforests for new botanical discoveries, and he has hired an indigenous guide to lead him. Knowing the scientist's interests, the young guide takes care to point out the interesting species. The botanist looks at him appraisingly, surprised by his capacity. "Well, well, young man, you certainly know the names of a lot of these plants." The guide nods and replies with downcast eyes. "Yes, I have learned the names of all the bushes, but I have yet to learn their songs."

I was teaching the names and ignoring the songs.

When I was in graduate school in Wisconsin, my then husband and I had the good fortune to land jobs as caretakers at the university arboretum. In return for a little house at the edge of the prairie, we had only to make the nighttime rounds, checking that doors and gates were secure before we left the darkness to the crickets. There was just one time that a light was left burning, a door left ajar, in the horticulture garage. There was no mischief, but as my husband checked around, I stood and idly scanned the bulletin board. There was a news

clipping there with a photo of a magnificent American elm, which had just been named the champion for its species, the largest of its kind. It had a name: The Louis Vieux Elm.

My heart began to pound and I knew my world was about to change, for I'd known the name Louis Vieux all my life and here was his face looking at me from a news clipping. He was our Potawatomi grandfather, one who had walked all the way from the Wisconsin forests to the Kansas prairie with my grandma Sha-note. He was a leader, one who took care of the people in their hardship. That garage door was left ajar, that light was left burning, and it shone on the path back home for me. It was the beginning of a long, slow journey back to my people, called out to me by the tree that stood above their bones.

To walk the science path I had stepped off the path of indigenous knowledge. But the world has a way of guiding your steps. Seemingly out of the blue came an invitation to a small gathering of Native elders, to talk about traditional knowledge of plants. One I will never forget—a Navajo woman without a day of university botany training in her life—spoke for hours and I hung on every word. One by one, name by name, she told of the plants in her valley. Where each one lived, when it bloomed, who it liked to live near and all its relationships, who ate it, who lined their nests with its fibers, what kind of medicine it offered. She also shared the stories held by those plants, their origin myths, how they got their names, and what they have to tell us. She spoke of beauty.

Her words were like smelling salts waking me to what I had known back when I was picking strawberries. I realized how shallow my understanding was. Her knowledge was so much deeper and wider and engaged all the human ways of understanding. She could have explained asters and goldenrod. To a new PhD, this was humbling. It was the beginning of my reclaiming that other way of knowing that I had helplessly let science supplant. I felt like a malnourished refugee invited to a feast, the dishes scented with the herbs of home.

I circled right back to where I had begun, to the question of beauty. Back to the questions that science does not ask, not because they aren't

important, but because science as a way of knowing is too narrow for the task. Had my adviser been a better scholar, he would have celebrated my questions, not dismissed them. He offered me only the cliché that beauty is in the eye of the beholder, and since science separates the observer and the observed, by definition beauty could not be a valid scientific question. I should have been told that my questions were bigger than science could touch.

He *was* right about beauty being in the eye of the beholder, especially when it comes to purple and yellow. Color perception in humans relies on banks of specialized receptor cells, the rods and cones in the retina. The job of the cone cells is to absorb light of different wavelengths and pass it on to the brain's visual cortex, where it can be interpreted. The visible light spectrum, the rainbow of colors, is broad, so the most effective means of discerning color is not one generalized jack-of-all-trades cone cell, but rather an array of specialists, each perfectly tuned to absorb certain wavelengths. The human eye has three kinds. One type excels at detecting red and associated wavelengths. One is tuned to blue. The other optimally perceives light of two colors: purple and yellow.

The human eye is superbly equipped to detect these colors and send a signal pulsing to the brain. This doesn't explain why I perceive them as beautiful, but it does explain why that combination gets my undivided attention. I asked my artist buddies about the power of purple and gold, and they sent me right to the color wheel: these two are complementary colors, as different in nature as could be. In composing a palette, putting them together makes each more vivid; just a touch of one will bring out the other. In an 1890 treatise on color perception, Goethe, who was both a scientist and a poet, wrote that "the colors diametrically opposed to each other . . . are those which *reciprocally* evoke each other in the eye." Purple and yellow are a reciprocal pair.

Our eyes are so sensitive to these wavelengths that the cones can get oversaturated and the stimulus pours over onto the other cells. A printmaker I know showed me that if you stare for a long time at a block of

yellow and then shift your gaze to a white sheet of paper, you will see it, for a moment, as violet. This phenomenon—the colored afterimage—occurs because there is energetic reciprocity between purple and yellow pigments, which goldenrod and asters knew well before we did.

If my adviser was correct, the visual effect that so delights a human like me may be irrelevant to the flowers. The real beholder whose eye they hope to catch is a bee bent on pollination. Bees perceive many flowers differently than humans do due to their perception of additional spectra such as ultraviolet radiation. As it turns out, though, goldenrod and asters appear very similarly to bee eyes and human eyes. We both think they're beautiful. Their striking contrast when they grow together makes them the most attractive target in the whole meadow, a beacon for bees. Growing together, both receive more pollinator visits than they would if they were growing alone. It's a testable hypothesis; it's a question of science, a question of art, and a question of beauty.

Why are they beautiful together? It is a phenomenon simultaneously material and spiritual, for which we need all wavelengths, for which we need depth perception. When I stare too long at the world with science eyes, I see an afterimage of traditional knowledge. Might science and traditional knowledge be purple and yellow to one another, might they be goldenrod and asters? We see the world more fully when we use both.

The question of goldenrod and asters was of course just emblematic of what I really wanted to know. It was an architecture of relationships, of connections that I yearned to understand. I wanted to see the shimmering threads that hold it all together. And I wanted to know why we love the world, why the most ordinary scrap of meadow can rock us back on our heels in awe.

When botanists go walking the forests and fields looking for plants, we say we are going on a *foray.* When writers do the same, we should call it a *metaphoray,* and the land is rich in both. We need them both; scientist and poet Jeffrey Burton Russell writes that "as the sign of a deeper truth, metaphor was close to sacrament. Because the vastness

and richness of reality cannot be expressed by the overt sense of a statement alone."

Native scholar Greg Cajete has written that in indigenous ways of knowing, we understand a thing only when we understand it with all four aspects of our being: mind, body, emotion, and spirit. I came to understand quite sharply when I began my training as a scientist that science privileges only one, possibly two, of those ways of knowing: mind and body. As a young person wanting to know everything about plants, I did not question this. But it is a whole human being who finds the beautiful path.

There was a time when I teetered precariously with an awkward foot in each of two worlds—the scientific and the indigenous. But then I learned to fly. Or at least try. It was the bees that showed me how to move between different flowers—to drink the nectar and gather pollen from both. It is this dance of cross-pollination that can produce a new species of knowledge, a new way of being in the world. After all, there aren't two worlds, there is just this one good green earth.

That September pairing of purple and gold is lived reciprocity; its wisdom is that the beauty of one is illuminated by the radiance of the other. Science and art, matter and spirit, indigenous knowledge and Western science—can they be goldenrod and asters for each other? When I am in their presence, their beauty asks me for reciprocity, to be the complementary color, to make something beautiful in response.