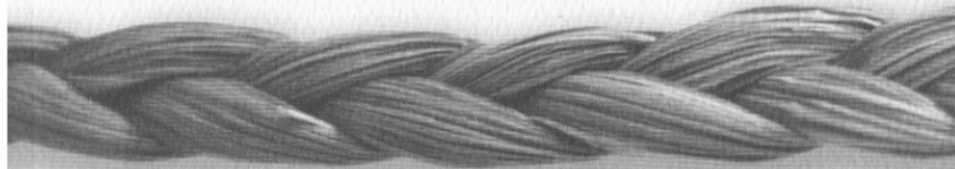


A hymn of love to the world.

—ELIZABETH GILBERT

BRAIDING SWEETGRASS



Indigenous Wisdom, Scientific Knowledge,
and the Teachings of Plants

ROBIN WALL KIMMERER

and I wasn't going to worry about what happened out there on the waste beds."

Philosopher Joanna Macy writes of the oblivion we manufacture for ourselves to keep us from looking environmental problems straight in the eye. She quotes R. J. Clifton, a psychologist studying human response to catastrophe: "Suppression of our natural responses to disaster is part of the disease of our time. The refusal to acknowledge these responses causes a dangerous splitting. It divorces our mental calculations from our intuitive, emotional, and biological embeddedness in the matrix of life. That split allows us passively to acquiesce in the preparations for our own demise."

Waste beds: a new name for an entirely new ecosystem. *Waste*: we use the word as a noun to mean "a leftover residue," "refuse or rubbish," or "a material such as feces which is produced by a living body, but not used." More contemporary uses are "an unwanted product of manufacturing," "an industrial material rejected or thrown away." Wasteland is, therefore, land that has been thrown away. As a verb, *to waste* means "to render the valuable useless," "to diminish, to dissipate, and to squander." I wonder how the public perception of the Solvay waste beds would change if, instead of hiding them, we put up a sign along the highway welcoming people to the lakeshore defined as "squandered land covered in industrial feces."

Ruined land was accepted as the collateral damage of progress. But, back in the 1970s, Professor Norm Richards of the College of Environmental Science and Forestry in Syracuse decided to conduct one of the first studies of the dysfunctional ecology of the waste beds. Frustrated by local officials' lack of concern, "Stormin' Norman" took matters into his own hands. Following the same lane I walked years later, he snuck into the fenced-off lakeshore and unloaded his guerrilla garden equipment, wheeling his backyard lawn seeder out to the long sloping beds that faced the highway. He pushed the load of grass seed and fertilizer back and forth with measured steps. North twenty paces, east ten paces, north again. A few weeks later the word *HELP* appeared, written in grass letters forty feet long on the barren slopes. The scale of the wastelands left room for a longer treatise in fertilized script, but

that single word was the right one. The land had been kidnapped. Bound and gagged, it could not speak for itself.

The waste beds are not unique. The cause and the chemistry vary from my homeland to yours, but each of us can name these wounded places. We hold them in our minds and our hearts. The question is, what do we do in response?

We could take the path of fear and despair. We could document every scary scene of ecological destruction and never run out of material for a Haunted Hayride of environmental disasters, constructing a shocking nightmare tableaux of environmental tragedies, in rooms carved from a monoculture of invasive plants, on the shore of the most chemically contaminated lake in the United States. There could be scenes of oiled pelicans. How about chain saw murders on clear-cut slopes washing into rivers? Corpses of extinct Amazon primates. Prairies paved over for parking lots. Polar bears stranded on melting ice floes.

What could such a vision create other than woe and tears? Joanna Macy writes that until we can grieve for our planet we cannot love it—grieving is a sign of spiritual health. But it is not enough to weep for our lost landscapes; we have to put our hands in the earth to make ourselves whole again. Even a wounded world is feeding us. Even a wounded world holds us, giving us moments of wonder and joy. I choose joy over despair. Not because I have my head in the sand, but because joy is what the earth gives me daily and I must return the gift.

We are deluged by information regarding our destruction of the world and hear almost nothing about how to nurture it. It is no surprise then that environmentalism becomes synonymous with dire predictions and powerless feelings. Our natural inclination to do right by the world is stifled, breeding despair when it should be inspiring action. The participatory role of people in the well-being of the land has been lost, our reciprocal relations reduced to a KEEP OUT sign.

When my students learn about the latest environmental threat, they are quick to spread the word. They say, "If people only knew that snow

leopards are going extinct," "If people only knew that rivers are dying." If people only knew . . . then they would, what? Stop? I honor their faith in people, but so far the *if-then* formula isn't working. People *do* know the consequences of our collective damage, they *do* know the wages of an extractive economy, but they don't stop. They get very sad, they get very quiet. So quiet that protection of the environment that enables them to eat and breathe and imagine a future for their children doesn't even make it onto a list of their top ten concerns. The Haunted Hayride of toxic waste dumps, the melting glaciers, the litany of doomsday projections—they move anyone who is still listening only to despair.

Despair is paralysis. It robs us of agency. It blinds us to our own power and the power of the earth. Environmental despair is a poison every bit as destructive as the methylated mercury in the bottom of Onondaga Lake. But how can we submit to despair while the land is saying "Help"? Restoration is a powerful antidote to despair. Restoration offers concrete means by which humans can once again enter into positive, creative relationship with the more-than-human world, meeting responsibilities that are simultaneously material and spiritual. It's not enough to grieve. It's not enough to just stop doing bad things.

We have enjoyed the feast generously laid out for us by Mother Earth, but now the plates are empty and the dining room is a mess. It's time we started doing the dishes in Mother Earth's kitchen. Doing dishes has gotten a bad rap, but everyone who migrates to the kitchen after a meal knows that that's where the laughter happens, the good conversations, the friendships. Doing dishes, like doing restoration, forms relationships.

How we approach restoration of land depends, of course, on what we believe that "land" means. If land is just real estate, then restoration looks very different than if land is the source of a subsistence economy and a spiritual home. Restoring land for production of natural resources is not the same as renewal of land as cultural identity. We have to think about what land means.

This question and more are played out on the Solvay waste beds,

In a sense, the "new" land of the waste beds represents a blank slate on which a whole range of ideas have been written in response to the urgent message of HELP. They are scattered over the waste beds, in scenes every bit as evocative as the tableaux of the Haunted Hayride. A tour of the Onondaga Lake shore captures the scope of what land might mean and what restoration might look like.

Our first stop would have to be the blank slate itself, greasy, white industrial sludge poured over what once was a grassy green lakeshore. In some places, it is as bare as the day it was spewed, a chalky desert. Our diorama should include a figure of a laborer placing the outfall pipe, but behind him would be the man in the suit. The signpost at stop #1 should say: LAND AS CAPITAL. If land is only a means to make money, then these fellows are doing it right.

Norm Richards's HELP appeal started something back in the 1970s. If nutrients and seed were all it took to green the waste beds, the city had a ready answer. Slopping sewage sludge onto the terraces of the waste beds provided both nutrients for plant growth and a disposal solution for the output of the water treatment plant. The result was the nightmare swards of Phragmites, a dense monoculture of invasive reeds, ten feet high, that excludes all other forms of life. Stop #2 on our tour. The sign reads: LAND AS PROPERTY. If land is just private property, a mine of "resources," then you can do whatever you want with it and move on.

Scarcely thirty years ago, covering up your mess passed for responsibility—a kind of land-as-litter-box approach. Policy dictated only that land ruined by mining or industry had to be covered by vegetation. With this AstroTurf strategy, a mining company that destroyed a forest of two hundred species could satisfy its legal responsibilities by planting the tailings to alfalfa under a mist of irrigation and fertilizer. Once federal inspectors checked and signed off, the company could put up a MISSION ACCOMPLISHED banner, turn off the sprinklers, and walk away. The vegetation disappeared almost as quickly as the corporate executives.

Happily, scientists like Norm Richards and a host of others had a

better idea. When I was at the University of Wisconsin in the early 1980s, on summer evenings I would walk with a young Bill Jordan through the trails of the arboretum, where a collection of natural ecosystems had been put in place on abandoned farmland, homage to Aldo Leopold's advice that "the first step to intelligent tinkering is to save all the pieces." At a time when the toll taken by places like the Solvay waste beds was finally being understood, Bill envisioned a whole science of restoration ecology, in which ecologists would turn their skills and philosophy to healing land, not by imposing an industrial blanket of vegetation, but by recreating natural landscapes. He didn't submit to despair. He didn't let his idea sit on the shelf. He was the catalyst for and a cofounder of the Society for Ecological Restoration.

As a result of efforts like his, new laws and policy demanded evolution in the concept of restoration: restored sites would have to not only look like nature, but have functional integrity as well. The National Research Council defined ecological restoration thus:

The return of an ecosystem to a close approximation of its condition prior to disturbance. In restoration, ecological damage to the resource is repaired. Both the structure and the function of the ecosystem are recreated. Merely recreating form without the function, or the function in an artificial configuration bearing little resemblance to a natural resource does not constitute restoration. The goal is to emulate nature.

If we got back on the hayride wagon, it would take us to a restoration experiment at Stop #3, another version of what this land might be, what it might mean. It's visible from way off, in big quilted blocks of vivid green against the chalky white. Moving like a field of grass, you can hear the sound of the wind in the willows. This scene might be titled *LAND AS MACHINE* and be peopled with mannequins of engineers and foresters who are in charge of the machine. They stand before the ravenous jaws of a brush hog and an unending plantation of shrub willows, as thick as the Phragmites and not much more diverse. Their goal is to reestablish structure, and especially function, to a very specific purpose.

Here the intention is to utilize the plants as an engineering solution to water pollution. When rainwater leaches through the waste beds, it picks up high concentrations of salt, alkali, and a host of other compounds that it carries right to the lake. Willows are champions of absorbing water, which they transpire to the atmosphere. The idea is to use the willows as a green sponge, a living machine to intercept the rain before it gets down into the sludge. As an added benefit, the willows can be mown down periodically and used as woody feedstock for biomass fuel digesters. Use of plants in phytoremediation schemes holds promise, but an industrial monoculture of willow, however well-meaning, does not quite meet the standard for true restoration.

This kind of fix is at the core of the mechanistic view of nature, in which land is a machine and humans are the drivers. In this reductionist, materialist paradigm an imposed engineering solution makes sense. But what if we took the indigenous worldview? The ecosystem is not a machine, but a community of sovereign beings, subjects rather than objects. What if those beings were the drivers?

We can clamber back on the hay wagon to travel to the next display, only this one is not well marked. It sprawls across the oldest lakeside section of the beds into a scruffy patchwork of vegetation. The restoration ecologists here at Stop #4 are not university scientists or corporate engineers, but the oldest and most effective of land healers. They are the plants themselves, representing the design firm of Mother Nature and Father Time, LLC.

After that momentous Halloween excursion years ago, I felt completely at ease on the waste beds and enjoyed rambling there to watch restoration in action. I never encountered another dead body. But that is part of the problem. It is, of course, dead bodies that build soil, that perpetuate the nutrient cycle that propels the living. The "soil" here is white emptiness.

Here on the waste beds there are expanses without a living thing, but there are also teachers of healing and their names are Birch and Alder, Aster and Plantain, Cattail, Moss, and Switchgrass. On the most

barren ground, on the wounds we have inflicted, the plants have not turned their backs on us; instead, they have come.

A few brave trees have become established, mostly cottonwoods and aspens that can tolerate the soil. There are clumps of shrubs, some patches of asters and goldenrod, but mostly a thin scraggly collection of the common roadside weeds. Dandelions, ragweed, chicory, and Queen Anne's lace blown to this spot have made a go of it. Nitrogen-fixing legumes in abundance, and clovers of all kinds, have also come to do their work. That struggling field of green is, to me, a form of peacemaking. Plants are the first restoration ecologists. They are using their gifts for healing the land, showing us the way.

Imagine the surprise of the infant plants who emerged from their seed coats to find a waste bed habitat no one in their long botanical lineage had ever experienced. Most died of drought, of salt or exposure, or starved from lack of nutrients, but a select few survived and did their best to carry on. Especially the grasses. When I dig my trowel under a grass patch, the soil is different. The waste below is no longer pure white and slippery, but dark gray and crumbly between my fingers. There are roots all through it. The darkening of the soil is humus mixed in; the waste is being changed. True, a few inches down it is still dense and white, but the surface layer holds promise. The plants are doing their work, rebuilding the nutrient cycle.

If you get down on your knees, you'll see anthills, no bigger than a quarter. The granulated soil the ants have mounded around the hole is as white as snow. Grain by grain, in their tiny mandibles, they are carrying up waste from below and carrying seeds and bits of leaves down into the soil. Shuttling back and forth. The grasses feed the ants with seeds and the ants feed the grasses with soil. They hand off life to one another. They understand their interconnections; they understand that the life of one is dependent on the life of all. Leaf by leaf, root by root, the trees, the berries, the grasses are joining forces, and so there are birds and deer and bugs that have come to join them. And so the world is made.

Gray birches dot the top of the waste bed, arriving on the wind,

no doubt, and lodging fortuitously against a gelatinous clot of *Nostoc* algae bubbling in a puddle. Protected in the selfless scum of *Nostoc*, the birch can grow and thrive on its nitrogen inputs. They are now the biggest trees here, but they are not alone. Directly beneath almost every birch are small shrubs. Not just any shrubs, but those that make juicy fruits: pin cherry, honeysuckle, buckthorn, blackberry. These shrubs are largely absent from the bare expanse between birches. This apron of fruit bearers speaks of the birds who passed over the waste beds and stopped to perch on the trees to defecate their load of seeds into the shade of the birch. More fruit drew more birds, who dropped more seeds, who fed the ants, and so it goes. That same pattern of reciprocity is written all over the landscape. That's one of the things I honor about this place. Here you can see beginnings, the small incremental processes by which an ecological community is built.

The beds are greening over. The land knows what to do when we do not. I hope that the waste beds do not disappear entirely, though—we need them to remind us what we are capable of. We have an opportunity to learn from them, to understand ourselves as students of nature, not the masters. The very best scientists are humble enough to listen.

We could name this tableau LAND AS TEACHER, LAND AS HEALER. With plants and natural processes in sole command, the role of land as a renewable source of knowledge and ecological insight becomes apparent. Human damage has created novel ecosystems, and the plants are slowly adapting and showing us the way toward healing the wounds. This is a testament to the ingenuity and wisdom of plants more than to any action of people. I hope we'll have the wisdom to let them continue their work. Restoration is an opportunity for a partnership, for us to help. Our part of the work is not complete.

In just the last few years, the lake has offered signs of hope. As factories have closed and citizens of the watershed build better sewage treatment plants, the waters have responded to that care. The natural resilience of the lake is making its presence known in tiny increments of dissolved oxygen and returning fish. Hydrogeologists have redirected the energies of the mudboils so that their load is lightened.

Engineers, scientists, and activists have all applied the gift of human ingenuity on behalf of the water. The water, too, has done its part. With lessened inputs, the lakes and streams seem to be cleaning themselves as the water moves through. In some places, plants are starting to inhabit the bottom. Trout were found once again in the lake and when water quality took an upward turn it was front-page news. A pair of eagles have been spotted on the north shore. The waters have not forgotten their responsibility. The waters are reminding the people that they can use their healing gifts when we will use ours.

The cleansing potential of the water itself is a powerful force, which gives even greater weight to the work that lies ahead. The presence of eagles seems a sign of their faith in the people, too, and yet what will become of them, as they fish from the wounded waters?

The slowly accreting community of weedy species can be a partner in restoration. They are developing ecosystem structure and function, beginning ever so slowly to create ecosystem services such as nutrient cycling, biodiversity, and soil formation. In a natural system, of course, there is no goal other than proliferation of life. In contrast, professional restoration ecologists design their work to move toward the "reference ecosystem," or the predamage, native condition.

The volunteer successional community creating itself on the waste beds is "naturalized," but it is not native. It is unlikely to lead to a plant community that the Onondaga Nation would recognize from their ancestral past. The outcome will not be a native landscape peopled with the plants who lived here when Allied Chemical was only a gleam in the eye of a smokestack. Given the drastic changes produced by industrial contamination, it is probably not possible to recreate cedar swamps and beds of wild rice without some help. We can trust the plants to do their work, but except for windblown volunteers, new species can't get here across highways and acres of industry. Mother Nature and Father Time could use someone to push a wheelbarrow, and a few intrepid beings have volunteered.

The plant communities that will thrive in this environment are the ones that are tolerant of salt and the sodden "soil." It's tough to

imagine a reference ecosystem of native species that could survive. But, in presettlement times, there were salt springs around the lake, and they supported one of the rarest of native plant communities, an inland salt marsh. Professor Don Leopold and his students have brought in wheelbarrows full of these missing native plants and conducted planting trials, watching their survival and growth with hopes of playing midwife to the recreation of a salt marsh. I went out to visit with the students, to hear their story and look at the plants. Some were dead, some were hanging on, and some were flourishing.

I headed to where the green seemed the strongest; I caught a whiff of a fragrance that haunts my memory, and then it was gone. I must have imagined it. I stopped to admire a thriving stand of seaside goldenrod and some asters. To witness the regenerative power of the land tells us that there is resilience here, signs of possibility that arise from partnership between the plants and the people. Don's work fulfills the scientific definition of restoration: working toward ecosystem structure, function, and the delivery of ecosystem services. We should make this nascent native meadow the next stop on the hayride, Stop #5, with a sign that says LAND AS RESPONSIBILITY. This work raises the bar for what restoration can mean, to create habitat for our nonhuman relatives.

As hopeful as this tableau of restored vegetation might become, it doesn't feel quite whole. When I visited with the students with shovels in their hands, their pride in the planting was evident. I asked what motivated them in their work, and I heard about "getting adequate data" and "devising a solution" and a "feasible dissertation." No one mentioned love. Maybe they were afraid. I've sat on too many dissertation committees where students were ridiculed for describing the plants they've worked with for five years with so unscientific a term as *beautiful*. The word *love* is unlikely to make an appearance, but I know that it is there.

That familiar fragrance was tugging at my sleeve again. I raised my eyes to meet the brightest green in the place, shiny blades gleaming in the sun, smiling up at me like a long lost friend. There she was—sweetgrass—growing in one of the last places I might ever have

expected. But I should have known better. Tentatively sending out rhizomes through the sludge, slender tillers marching bravely away, sweetgrass is a teacher of healing, a symbol of kindness and compassion. She reminded me that it is not the land that has been broken, but our relationship to it.

Restoration is imperative for healing the earth, but reciprocity is imperative for long-lasting, successful restoration. Like other mindful practices, ecological restoration can be viewed as an act of reciprocity in which humans exercise their caregiving responsibility for the ecosystems that sustain them. We restore the land, and the land restores us. As writer Freeman House cautions, "We will continue to need the insights and methodologies of science, but if we allow the practice of restoration to become the exclusive domain of science, we will have lost its greatest promise, which is nothing less than a redefinition of human culture."

We may not be able to restore the Onondaga watershed to its pre-industrial condition. The land, plants, animals, and their allies among the human people are making small steps, but ultimately it is the earth that will restore the structure and function, the ecosystem services. We might debate the authenticity of the desired reference ecosystem, but she will decide. We're not in control. What we *are* in control of is our relationship to the earth. Nature herself is a moving target, especially in an era of rapid climate change. Species composition may change, but relationship endures. It is the most authentic facet of the restoration. Here is where our most challenging and most rewarding work lies, in restoring a relationship of respect, responsibility, and reciprocity. And love.

A 1994 statement from the Indigenous Environmental Network puts it best:

Western science and technology, while appropriate to the present scale of degradation, is a limited conceptual and methodological tool—it is the "head and hands" of restoration implementation. Native spirituality is the 'heart' that guides the head and hands . . . Cultural survival depends on

healthy land and a healthy, responsible relationship between humans and the land. The traditional care-giving responsibilities which maintained healthy land need to be expanded to include restoration. Ecological restoration is inseparable from cultural and spiritual restoration, and is inseparable from the spiritual responsibilities of care-giving and world-renewal.

What if we could fashion a restoration plan that grew from understanding multiple meanings of land? Land as sustainer. Land as identity. Land as grocery store and pharmacy. Land as connection to our ancestors. Land as moral obligation. Land as sacred. Land as self.

When I first came to Syracuse as a student, I had a first—and only—date with a local fellow. We were going on a drive and I asked if we could go to fabled Onondaga Lake, which I had never seen. He reluctantly agreed, joking about the city's famous landmark. But when we got there he wouldn't get out of the car. "It stinks too much" he said, as ashamed as if he himself were the source of the foul odor. I'd never met anyone who hated his home before. My friend Catherine grew up here. She tells me that her weekly ride to Sunday school took the family along the lakeshore, past Crucible Steel and Allied Chemical, where even on the Lord's day, black smoke filled the sky and pools of sludge lay on either side of the road. When the preacher talked of fire and brimstone and the sulfurous vents of hell, she was sure he meant Solvay. She thought she drove to church each week through the Valley of Death.

Fear and loathing, our internal Haunted Hayride—the worst parts of our nature are all here on the lakeshore. Despair made people turn away, made them write off Onondaga Lake as a lost cause.

It's true that when you walk on the waste beds you can see the hand of destruction, but you can also see hope in the way a seed lands in a tiny crack and puts down a root and begins to build the soil again. The plants remind me of our neighbors at Onondaga Nation, Native people faced with daunting odds, great hostility, and an environment much changed from the rich land that first sustained them. But the

plants and the people survive. Plant people and human people are still here and are still meeting their responsibilities.

Despite numerous legal setbacks, the Onondaga have not turned their backs on the lake; rather, they are the authors of a new approach to healing it, put forward in their "Onondaga Nation Vision for a Clean Onondaga Lake." This dream of restoration follows the ancient teachings of the Thanksgiving Address. Greeting in turn each element of Creation, the declaration offers vision and support for returning the lake to health and with it a mutual healing of lake and people. It is an exemplar of a new holistic approach, called biocultural or reciprocal restoration.

In the indigenous worldview, a healthy landscape is understood to be whole and generous enough to be able to sustain its partners. It engages land not as a machine but as a community of respected non-human persons to whom we humans have a responsibility. Restoration requires renewing the capacity not only for "ecosystem services" but for "cultural services" as well. Renewal of relationships includes water that you can swim in and not be afraid to touch. Restoring relationship means that when the eagles return, it will be safe for them to eat the fish. People want that for themselves, too. Biocultural restoration raises the bar for environmental quality of the reference ecosystem, so that as we care for the land, it can once again care for us.

Restoring land without restoring relationship is an empty exercise. It is relationship that will endure and relationship that will sustain the restored land. Therefore, reconnecting people and the landscape is as essential as reestablishing proper hydrology or cleaning up contaminants. It is medicine for the earth.

One day in late September, while earth-moving machinery dredged contaminated soils on the western shore of Onondaga Lake, another group of earth movers worked on the eastern shore—dancing. I watched their feet as they moved in a circle led by the water drum. Beaded moccasins, tassel-tie loafers, high-top sneakers, flip-flops, and