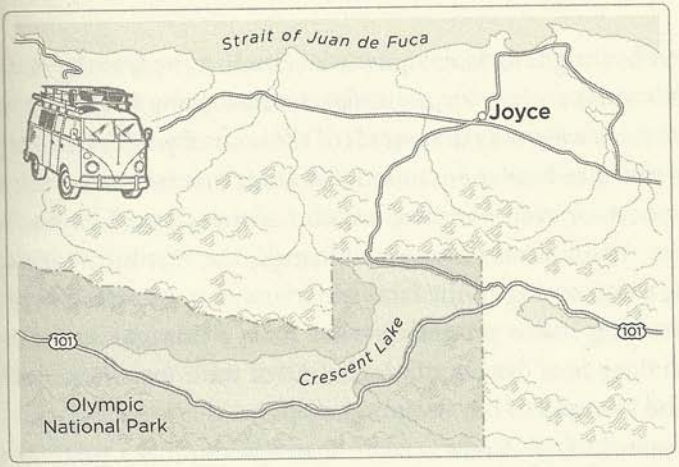
"Interweaves his intriguing and instructive on-the-road adventures with fascinating and rarely addressed facts about sound, health, and environment. Many books help us see the world differently; this one induces us to hear the world clearly."—*Booklist,* Starred Review

ONE SQUARE INCH OF SILENCE

ONE MAN'S QUEST TO PRESERVE QUIET

GORDON HEMPTON

and JOHN GROSSMANN



Prologue

Sounds of Silence

The day will come when man will have to fight noise as inexorably as cholera and the plague." So said the Nobel Prize–winning bacteriologist Robert Koch in 1905. A century later, that day has drawn much nearer. Today silence has become an endangered species. Our cities, our suburbs, our farm communities, even our most expansive and remote national parks are not free from human noise intrusions. Nor is there relief even at the North Pole; continent-hopping jets see to that. Moreover, fighting noise is not the same as preserving silence. Our typical anti-noise strategies—earplugs, noise cancellation headphones, even noise abatement laws—offer no real solution because they do nothing to help us reconnect and listen to the land. And the land is speaking.

We've reached a time in human history when our global environmental crisis requires that we make permanent life-style changes. More than ever before, we need to fall back in love with the land. Silence is our meeting place.

It is our birthright to listen, quietly and undisturbed, to the natural environment and take whatever meanings we may. Long before the noises of mankind, there were only the sounds of the natural world. Our ears evolved perfectly tuned to hear these sounds—sounds that far exceed the range of human speech or even our most ambitious musical performances: a passing breeze that indicates a weather change, the first birdsongs of spring heralding a regreening of the land and a return to growth and prosperity, an approaching storm promising relief from a drought, and the shifting tide reminding us of the celestial ballet. All of these experiences connect us back to the land and to our evolutionary past.

One Square Inch of Silence is more than a book; it is a place in the Hoh Rain Forest, part of Olympic National Park—arguably the quietest place in the United States. But it, too, is endangered, protected only by a policy that is neither practiced by the National Park Service itself nor supported by adequate laws. My hope is that this book will trigger a quiet awakening in all those willing to become true listeners.

Preserving natural silence is as necessary and essential as species preservation, habitat restoration, toxic waste cleanup, and carbon dioxide reduction, to name but a few of the immediate challenges that confront us in this still young century. The good news is that rescuing silence can come much more easily than tackling these other problems. A single law would signal a huge and immediate improvement. That law would prohibit all aircraft from flying over our most pristine national parks.

Silence is not the absence of something but *the presence of everything.* It lives here, profoundly, at One Square Inch in the Hoh Rain Forest. It is the presence of time, undisturbed. It can be felt within the chest. Silence nurtures our nature, our human nature, and lets us know who we are. Left with a more receptive mind and a more attuned ear, we become better listeners not only to nature but to each other. Silence can be carried like embers from a fire. Silence can be found, and silence can find you. Silence can be lost and also recovered. But silence cannot be imagined, although most people think so. To experience the soul-swelling wonder of silence, you must hear it.

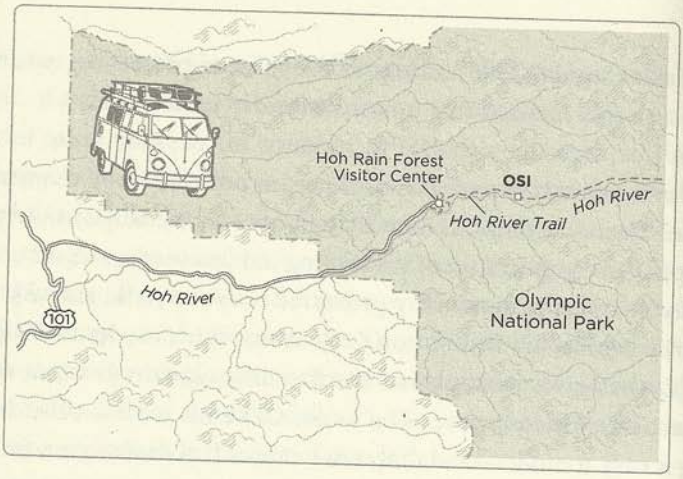
Silence is a sound, many, many sounds. I've heard more than I can count. Silence is the moonlit song of the coyote signing the air, and the answer of its mate. It is the falling whisper of snow that will later melt with an

astonishing reggae rhythm so crisp that you will want to dance to it. It is the sound of pollinating winged insects vibrating soft tunes as they defensively dart in and out of the pine boughs to temporarily escape the breeze, a mix of insect hum and pine sigh that will stick with you all day. Silence is the passing flock of chestnut-backed chickadees and red-breasted nuthatches, chirping and fluttering, reminding you of your own curiosity.

Have you heard the rain lately? America's great northwest rain forest, no surprise, is an excellent place to listen. Here's what I've heard at One Square Inch of Silence. The first of the rainy season is not wet at all. Initially, countless seeds fall from the towering trees. This is soon followed by the soft applause of fluttering maple leaves, which settle oh so quietly as a winter blanket for the seeds. But this quiet concert is merely a prelude. When the first of many great rainstorms arrives, unleashing its mighty anthem, each species of tree makes its own sound in the wind and rain. Even the largest of the raindrops may never strike the ground. Nearly 300 feet overhead, high in the forest canopy, the leaves and bark absorb much of the moisture . . . until this aerial sponge becomes saturated and drops re-form and descend farther . . . striking lower branches and cascading onto sound-absorbing moss drapes . . . tapping on epiphytic ferns . . . faintly plopping on huckleberry bushes . . . and whacking the hard, firm salal leaves . . . before, finally, the drops inaudibly bend the delicate clover-like leaves of the wood sorrel and drip to leak into the ground. Heard day or night, this liquid ballet will continue for more than an hour after the actual rain ceases.

Recalling the warning of Robert Koch, developer of the scientific method that identifies the causes of disease, I believe the unchecked loss of silence is a canary in a coal mine—a global one. If we cannot make a stand here, if we turn a deaf ear to the issue of vanishing natural quiet, how can we expect to fare better with more complex environmental crises?

Gordon Hempton
—Snowed in at Joyce, Washington



2 The Quiet Path

> See how nature—trees, flowers, grass—grows in silence; see the stars, the moon and the sun—how they move in silence. . . . We need silence to be able to touch souls.
>
> —Mother Teresa

Good things come from a quiet place: study, prayer, music, transformation, worship, communion. The words *peace* and *quiet* are all but synonymous, and are often spoken in the same breath. A quiet place is the think tank of the soul, the spawning ground of truth and beauty.

A quiet place outdoors has no physical borders or limits to perception. One can commonly hear for miles and listen even farther. A quiet place affords a sanctuary for the soul, where the difference between right and wrong becomes more readily apparent. It is a place to feel the love that connects all things, large and small, human and not; a place where the presence of a tree can be heard. A quiet place is a place to open up all your senses and come alive.

Sadly, though, as big as it is, our planet offers fewer and fewer quiet havens. This is especially true in developed nations, where the high con-

sumption of fossil fuels translates into noise pollution. It's come to this: there is likely no place on earth untouched by modern noise. Even far from paved roads in the Amazon rain forest you can still hear the drone of distant outboard motors on dugout canoes and from the wrist of a native guide the hourly beep of a digital watch. The question is no longer whether noise will be present, but how often it will intrude and for how long. The interval between noise encroachments (measured in minutes) is the measure of quiet these days. In my experience, a silence longer than 15 minutes is now extremely rare in the United States and long gone in Europe. Most places do not have quiet at all; instead, one or more noise sources prevail around the clock. Even in wilderness areas and our national parks, the average noise-free interval has shrunk to less than five minutes during daylight hours. By my reckoning, the rate of quiet places extinction vastly exceeds the rate of species extinction. Today there are fewer than a dozen quiet places left in the United States. I repeat: fewer than a dozen quiet places and by that I mean places where natural silence reigns over many square miles.

In 1984, early in my career recording nature sounds, I identified 21 places in Washington State (an area of 71,302 square miles) with noise-free intervals of 15 minutes or longer. In 2007 only three of these places remain on my list. Two are protected only by their anonymity; the third lies deep within Olympic National Park: the Hoh Rain Forest in the far northwest corner of the continental United States. I moved near the Hoh in the mid-1990s just to be closer to its silences. In the Hoh River Valley, nature discovery occurs without words or even thoughts—it simply happens. Wondrously. But you have to listen.

And to do that, you first have to silence the mind. On the drive to the Hoh, I begin to shed all pressing thoughts—of work and family and the woes of the world. I generally stop for several hours at the Quileute Indian village of La Push and wash my mind clean, purify myself, in the Pacific Ocean. Summer and winter, the water temperature is always within a few degrees of 50 Fahrenheit. Five millimeters of neoprene closely wrapped around my entire body except for my face protects me from the cold. The rest is up to me. The ocean doesn't know me from a piece of driftwood. And it shows me a different look every time out. On this October morning, the ocean swells are six feet at 10 seconds—six feet high and 10 seconds apart—and rising nicely about 100 yards offshore opposite Lonesome Creek, where

the rip to James Island digs a channel in the shore bottom that attracts visitors such as whales, Steller sea lions, harbor seals, otters, and porpoises. I swim out through the surf in the manner of a needle through cloth, diving in front of a wave and holding my breath while the pressure and roar of a six-foot wave pass overhead. Then I skim across the sandy bottom and pop to the surface for a gulp of air before descending again. In time, I make it beyond the farthest breaking wave and rest.

The ocean is a drum. It beats the music of the global weather systems. In ancient times during days of sail, an experienced mariner could tell the weather far out at sea by interpreting the look and feel of the ocean's waves. The Pacific is my cradle, gently rocking my gaze, rising and lowering the offshore fog-framed islands. I look for my "friend," the harbor seal who often greets me with a flipper kick to the ribs to inform me I'm scaring his fish, but I don't see him and turn my attention to the approaching swells.

Unlike a surfer who catches a wave atop his board, I'm a bodysurfer. I employ no board, preferring no layer of separation between myself and the surging, glorious, thrusting wash of the surf. I wait until a wave crests, then with one quick kick I launch myself and join the wave. Changing my shape with changes in water-body pressure, I am able to travel with the wave toward shore until either the wave spills all of its energy or I separate myself voluntarily from the wave—or I wipe out. I'm at home here, where my body is the only brain that I need. All I have to do is choose the right wave, kick-start and drop in on the wave, then let my body respond.

After two hours my breath is peaceful, my body exercised, my mind blissful, and my thoughts clean. I am "innocent" again, as I like to think of it, and ready to listen. I take a quick freshwater rinse in Lonesome Creek, shed my wetsuit for my dry land clothes, and start the 90-minute drive to the Hoh Rain Forest with the car heater on high, or what passes for high in my '64 VW bus.

I pass the Hard Rain Café, a small eatery, but few other signs of civilization on the drive, if you don't count the scarred hillsides, clear-cut forests pushing up new growth. The 18-mile drive on the Upper Hoh Road off Highway 101 is lined on both sides by the tallest living things on earth: Sitka spruce and Douglas fir that stretch nearly 300 feet high, giant western hemlocks, and western red cedars, some as much as 1,000 years old. Pulling into Olympic National Park, I begin to feel the magnificence of this place,

the largest, most pristine stretch of temperate rain forest in the Western Hemisphere. Stretching over some 1,400 square miles of the mountainous interior of the Olympic Peninsula, the park is home to bald eagles and northern spotted owls and more than 300 other species of birds. Salmon migrate up many of the park's 12 rivers. Cougars, bears, and Roosevelt elk roam its forests. At least eight species of plants and 18 animal species can be found here and nowhere else in the world, among them, the Olympic marmot, Olympic snow mole, and Olympic torrent salamander. Olympic National Park is nothing short of a national treasure, recognized around the globe as a World Heritage Park and a designated World Biosphere Reserve.

But few value Olympic National Park as I do: with my ears. I believe that Olympic Park is quieter than any other national park or wilderness area in the 390 units of the 84 million acres managed by the National Park Service—including the largest, Wrangle–St. Elias in Alaska, where squadrons of vacationing flightseers break the silence on a clear day. Olympic National Park retains much of its natural quiet for one reason: overcast skies. The region has more than 200 completely cloudy days each year, and even more partially cloudy days that go uncounted. Many of those cloudy days are also rainy days. Rain, and lots of it, is a big deterrent to selling tickets for scenic tours.

Not only is Olympic Park the least intruded upon by human noise, but it also has the greatest diversity of natural soundscapes of any national park that I have been to. Often referred to as three parks in one, Olympic Park has a rugged mountainous interior with glacier-capped peaks, lush forested valleys with the world's tallest trees, and the longest wilderness seashore in the lower 48 states.

You would think that Olympic Park's premier status in both natural quiet and natural soundscapes would earn it special recognition by the National Park Service. Not so. Its unequaled acoustic environment has no special protection, no special management, and not a single person on staff specifically trained in acoustic ecology. It is clearly as vulnerable to the same administrative bungling that has destroyed the natural soundscapes of Grand Canyon and Hawaii Volcanoes National Parks. In the wake of the National Parks Air Tour Management Act, which Congress passed in 2000, requiring the Federal Aviation Administration (FAA) and the National

Park Service (NPS) to plan for air tours over national parks, Olympic Park has started to attract businesses catering to flightseers. One such business, Vashon Island Air, now offers tours on demand and advertises "The Grand Tamale . . . We fly past Mt. Olympus, then down the valley of the Hoh River, the only non tropical rainforest in the world."

Well, the Hoh Rain Forest is my Grand Tamale, too. America's quietest spot. It's the place I have chosen to defend from all human-caused noise intrusions, which, in effect, translates into keeping out all air traffic, commercial flights as well as air tours, because air traffic destroys a hiker's opportunity to listen to nature undisturbed, unimpaired. Those seeking solace away from a noisy world who instead hear an airplane roaring overhead return home unfulfilled, unbathed by the spiritually cleansing power of quiet. By the time the noise has traveled far enough to dissipate below audible levels, many square miles have been consumed by a single prop plane or passing jet.

But just as noise can affect quiet, quiet can affect noise. By keeping even one square inch 100 percent free of noise, or at least attempting to do so, I am able to push back aircraft for many miles and help to preserve natural quiet over much of the entire park. Natural quiet, like clean air and clean water, is part of a delicate ecosystem. So when man-made noise intrudes in the wilderness, the equivalent of crackling static on the phone line of all creatures but man, it impairs the ability of animals to communicate. And wildlife are just as busy communicating as we are.

My initiative requires frequent visits to my little One Square Inch of Silence. I go as often as I can, thank God, and joyfully refresh my spirits. On most visits I observe no noise intrusions, only blissful solitude. Often I pack my high-tech recording gear, equipment capable of recording sounds fainter than the human ear can hear, such as the flapping of butterfly wings. But this time of year, autumn, it is dry and warm, a perfect time to travel light and observe rutting Roosevelt elk.

I reach the Hoh visitors center parking lot just before 3 p.m., eager to don my backpack, which I've stuffed with enough gear and provisions for three days. I kill the engine and swing open the car door. My welcome to the Hoh Valley is most unwelcome: noise coming from two directions, a nearby trail leading to the Hall of Mosses and the ranger station. Reaching in my pack for my sound-level meter, I head off toward the louder of the

two noises, the *Brrrrrrrrr* coming from the trail. After 200 yards I come upon a trail crew installing a guardrail as a safety precaution for wheelchairs on this handicapped-accessible trail. *Burrrrrrrrrrrrr.*

The sound morphs to *Briiiiiiiiiiiiiiiiiiii* as the chainsaw burns more gas to chew deeper, faster. I look at my sound-level meter and observe a reading of 75 dBA from about 35 feet away.

Sound is a slippery reality. Scientists who study the physics of sound commonly measure sound using decibels (dB) on a logarithmic scale named in honor of Alexander Graham Bell. Zero decibels (0 dB) is the threshold of human hearing, the faintest sound the human ear can hear. Ten decibels (10 dB) is 10 times the power of that faintest detectable sound. Twenty decibels (20 dB) is 100 times the acoustic event of that barely audible sound. But because humans hear some sounds more easily than others (the human ear is more sensitive to midfrequencies than low or high frequencies), dB measurements are misleading. So my sound-level meter (Brüel and Kjær SLM 2225) measures more accurately what the human ear hears by using a formula that takes this into account and calculates A-weighted values. What you hear is what you get: a dBA value. Most noise ordinances use dBA, not dB.

"We'll have to trim off the top of the post," says the oldest of the three workers. The chainsaw again roars into action, this time reaching 85 dBA. As each 10-decibel increase above the 30-decibel normal sound level results in a 10-fold increase in power, this is actually 100,000 times the normal ambient sound power or energy level for this time of year at the Hoh. As similar as a swimming pool is to a glass of water.

I approach the crew to ask them if they mind if I observe their activity, holding out my sound-level meter with its blinking light and dBA scale.

"Whatever, so long as that isn't some radioactive thing. We'll be done soon, I promise," says the trail boss, Ben.

"Are you park employees or contractors?" I ask.

"I am permanent trail crew and these guys are seasonal workers. You must be the sound guy."

I lost count long ago, well past 100 visits, of how many times I've hiked in the Hoh Valley, often with my recording equipment. I'm known by park officials, as is my One Square Inch of Silence campaign for soundscape preservation in Olympic National Park.

Eyeing their railing work, I see the cuts don't exceed a few inches, four at the most, in diameter.

"Any reason why you're using power tools rather than hand tools?"

"Right here you could go either way," Ben answers, explaining that personally he likes hand tools, but "obviously power tools are a lot quicker."

I explain my intention of hiking up the Hoh trail to One Square Inch to monitor for noise intrusions and share my hope of finding a herd of Roosevelt elk.

"Heard any elk recently?" I ask.

"Not down here."

No kidding, I think. Elk do venture as far down the valley as the trailheads near the visitors center. I've seen them around here on many occasions. But with a chainsaw roaring in place of a handsaw, elk will surely keep their distance, meaning that anyone in a wheelchair unable to venture more than 100 yards from the parking lot will have no chance to hear or possibly see these magnificent creatures.

On the way back to the parking lot to grab my backpack a passenger car drives by me at a distance of 20 feet (70 dBA); a John Deere tractor passes at the same distance (88 dBA); and in the parking lot, a car about 60 feet away honks its horn, reassuring its owner that it's made good on the push of a remote locking button (90 dBA).

Noise is still coming from the ranger station, so I head there instead of returning to my VW right away. A sign on the powerhouse reads "Ear protection required when equipment operating in area." But the powerhouse itself is silent. I proceed on, bushwhacking through some salmonberry bushes until I arrive at campsite 84 of Loop A. I recognize the ranger immediately. His uniform name badge says D. Ellison, but he goes by the nickname Smokey. Last year I found him on top of the Hoh Rain Forest visitors center with a gas-powered leaf blower doing fall cleanup, which registered 110 dBA on my sound meter.

"Hi, Smokey. You remember me? I'm Gordon."

"Yeah, I remember you."

"I'm headed to One Square Inch and measuring noise levels in the park."

"This is a different leaf blower than before," offers Smokey. "This is a four-valve. We got rid of the two-valve. And we're now using a truck, but in the summertime we use an electric cart."

"We can measure the noise level of your new leaf blower, if you're interested."

"Yeah, I'd be interested."

Smokey explains that after I'd pressed the point about worker noise in the park, there'd been a meeting. "We had a big talk here at the park about noise and went back through the catalogue and got these."

"There should be a sticker on the side that gives it a rating. Can you see one?"

"Category Three, seventy-five dB."

No way, my ear tells me. It's a lot louder than 75 dB.

A pull of the rope starts the motor. Smokey lets it idle, then brings it up to normal operating speed.

"It's ninety-three dBA at a distance of three feet."

This is 60 dBA above the normal baseline ambience for this area, and by far the loudest sound of the day. Good intentions or not, Smokey is still wielding a sonic hurricane in place of a rake.

I double back for my backpack. Its familiar 50 pounds swing easily over my shoulders and I set off. A short way from the visitors center I reach a small wooden bridge that spans a wonderful babbling brook. No salmon here yet; they must be waiting offshore at Hoh Head for the first big rain (42 dBA).

I head up the ancient riverbank, where a sign at the main trailhead reads "Elevation 773." I'm craving quiet, yet from several hundred yards away I hear the work of Ben's trail crew. *Aaaaaaaaaaaaaaeeeeeeeek.* Somebody's driving lag screws with a power tool.

Ten minutes later, about a half-mile up the Hoh River Trail, at 3:40 p.m., my sound meter finally becomes a quiet-level meter (22 dBA), just 2 dBA short of the meter's lowest possible accurate measurement. I hear only the distant hush of the Hoh River, low-running and filtered by more than 300 yards of ancient forest. The air is absolutely still. So still, in fact, that autumn stands frozen, as if in a photograph. A number of detached leaves rest on edge, house-of-cards style, atop other leaves and spruce boughs, silently awaiting the next breeze to set them sailing on their way to the forest floor amid the deciduous applause of other leaves flapping loose and taking flight.

My senses are beginning to sharpen. As I proceed along the path, step

after step, my body and mind make the transition from the rhythm of the sea to the rhythm of the rain forest.

At the 0.9 mile campsite marker, just short of a mile from the trailhead, I measure 36 dBA. I hear only the Hoh River beyond the trees.

Near the 1.4 mile campsite marker, with the river much closer, only 40 yards from where I stand and partially visible, the sound meter reads 46 dBA. Although I know how others might be seduced by the proximity of the river, I would never set up camp by the rushing water. First, the ambient river noise is too loud to talk comfortably, even at close range—not that that need be accounted for when hiking alone or that conversation is necessarily paramount when hiking with someone else. But the need to raise one's voice and strain to hear suggests a more important difficulty: the difficulty of hearing other sounds, informative sounds, such as the snap of a twig announcing a hungry raccoon, or one of many voices of the raven, or the alarm call of the Douglas squirrel.

Wildlife depend on their sense of hearing to detect the approach of predators and will not remain very long in places where it is difficult to hear, so the chances of wildlife observation are poorer in louder than in quieter locales. White-tailed deer drink here, at river's edge, but not for long. You can watch them listening and see their anxiety. They can move their long, funnel-shaped ears independently, first one, then the other, to determine the exact position of whatever produced the sound they detected. White-tailed deer are among my favorite advisers. Being an important food source for the many cougars that inhabit the park, they seldom remain close to a noisy river or stream for longer than the time required to drink, and while they do, they pause often and look in different directions to compensate for the temporary inability to use sound for their security surveillance.

Besides missing out on wildlife observation, there's another reason not to camp here, so close to the river. The riverbed affords an avalanche chute for frigid air from the mountainsides far upstream. Late in the day this phenomenon often goes unnoticed because the wind is from the west and warm. But in the early morning, when air layers find their own places by temperature alone, warm air rising and cold air falling, the riverbed offers a natural drainage channel for upriver cold air that arrives with its own wind chill. Maybe 50 feet away and 10 feet higher than the river the temperature will be 10 to 15 degrees warmer.

Beyond the 1.4 mile campsite, just off the trail, there's a spectacular view of Mt. Tom from the top of what was once the ancient riverbank, when glaciers were larger and river flow was significantly greater. The trail then passes through a fallen spruce log six feet in diameter, a four-foot column sawn out to reclaim the footpath. Here a chainsaw *was* needed to breach the recently fallen behemoth. The resulting sawdust smells sweet, even delicious, and I detect the scent of dried leaves and nearby mushrooms, the first smells of the day strong enough to hold my attention and cause me to stop.

At the 2.0 mile campsite signpost I drop my backpack and listen: 40 dBA. Distant river sounds. I walk into the campsite itself and measure again: 43 dBA. Finding a clear spot among the vine maples, I measure yet again. The 45 dBA is far higher than I would like, but just then I hear a water ouzel make the sounds *Kerr, kerr, cheep* before breaking into its beautiful song. Writing in the late 1800s, John Muir, whose steps I've carefully retraced through Yosemite Valley, called the water ouzel "the mountain streams' own darling, the hummingbird of blooming waters, loving rocky ripple-slopes and sheets of foam as a bee loves flowers, as a lark loves sunshine and meadows." He described the ouzel's separate songs as

> perfect arabesques of melody, composed of a few full, round notes, embroidered with delicate trills which fade and melt in long slender cadences. In a general way his music is that of the streams, refined and spiritualized. The deep booming notes of the falls are in it, the trills of rapids, the gurgling of margin eddies, the low whispering of level reaches, and the sweet tinkle of separate drops oozing from the ends of mosses and falling into tranquil pools.

How could I make camp anywhere else?

With daylight fading, I tug my tarp from my backpack. The 9-by-12-foot tarp is an old friend, purchased in Seattle in the 1970s at what was then a fledgling, single-store purveyor of outdoors gear called REI, long before it and another Seattle company became national brands. Worn thin like a favorite pair of corduroys, and nowadays lacking most of its waterproof coating, it borders on translucent but remains serviceable. I enjoy setting it up, first sizing up potential sleeping spots, then stringing it from suitable branches and bushes, tying off the light but strong, Boeing surplus, braided,

waxed line through each corner eyelet, making sure to tightly tilt the tarp into the prevailing weather, fashioning not so much a roof over my head as an umbrella. Today's blue sky offers no guarantee of a dry night. This is, after all, a rain forest. When this funnel-shaped valley captures the moist Pacific air as it rises to the nearby mountains, the rain falls with unimaginable force and volume: 13 feet in an average year, real snorkel weather. As much as I like to sleep completely out in the open, even on a clear night in the early fall before the rainy season, I remind myself that the Hoh could also be spelled H_2O.

I'm having dinner—some hunks of sourdough bread with cheddar cheese—when a jetliner intrudes overhead. I note the time, 5:25 p.m., but not the decibel count, because I'm eating. Before setting off on an afterdinner walk, I hang my food in a red alder tree about 30 feet up and out on a limb 10 feet from the trunk to protect it from raccoons and black bears. I fill my smaller shoulder bag with a headlamp, a camera, and the sound-level meter and head off farther up the valley. It's just past 6 p.m., close to sunset. Moonrise will be delayed at least two hours by the steep mountainside, but when it appears, the waning moon, three days past full, will shine brightly. I expect the elk will be active.

At the 2.3 milepost and campsite marker I measure an ambient sound-pressure level of 39.5 dBA. This is just 5 dBA less than at campsite 2.0, but it feels *much* quieter.

Decibels take some getting used to for the uninitiated, who are trained to think linearly. If the voice of one person registers 60 dBA, we'd expect two people speaking simultaneously, and hence making twice as much noise, to register 120 dBA. But the correct answer is 63 dBA because decibels are measured on a logarithmic scale. As noise levels decrease, their measurements are also surprising. For example, here in the Hoh Valley, away from the water sounds, the natural quiet is typically around 25 to 35 dBA. On paper this hardly looks quiet, but to most ears it will sound stone silent at first. Only after a period of minutes will small textures appear, typically the subtle sound of distant wind playing high in the forest canopy.

"So what's the big deal?" some might ask, of a jetliner cruising at 36,000 feet over the Hoh Valley and registering 45 to 55 dBA on the ground.

"That's quieter than a conversation." The problem is that the jet noise is so much louder than the quiet ambience: for every 3-dBA increase there is twice as much energy; for every 10-dBA increase an event will sound twice as loud. A noise intrusion of 20 dBA above the quiet of the Hoh Rain Forest is 100 times the natural sound power level! Here in the quiet wilderness, we experience this noise intrusion as a dynamite blast, except a dynamite blast would have *less* impact because it would be shorter in duration and limited to one area rather than a continuous roar that cuts through the silence from one end of the park to the other.

I make it to the next creek, Mineral Creek, and view its lush waterfall in the fading light. I often think of this spot, about a mile short of One Square Inch, as my gateway to quiet because of the beauty of the falls. At nearly 70 dBA, measured from the footbridge over the creek and approximately 75 yards from the falls, the only sound is water in all its guises: its thundering cascade, gurgles in rock enclosures, and distant sprays.

From the sound of the water alone I've learned to distinguish the age of a tumbling stream. Older flows, such as those in Appalachia that escaped the last glaciation, have been tuning themselves for many thousands of years. Their watercourses and stony beds, smoothed to paths of least resistance by the ageless cycles of torrents and floods, sing differently. To my ears, they're quieter, more musical, more eloquent. Youthful streams, with their newly exposed and angular, unsmoothed rocks, push the water aside brashly, with a resulting clatter. In all cases, the rocks are the notes. I sometimes attempt to tune a stream by repositioning a few prominent rocks, listening for the subtle changes in sound.

The more you listen, the more you hear. At Mt. Tom Creek Meadows, where the footing is often soggy, a series of boardwalks overlie the trail. Here, as if walking on top of a long, wooden xylophone, it's possible to discern the condition of each slat by the sound it makes. Decaying boards produce a dull *thud*. Newly replaced boards resound clearly with a bright *bong*. Most boards are somewhere in between.

A bit later, above the distant hush of the Hoh, I hear my first elk and stop to enjoy its high, flute-like bugling. For a few minutes the sky shows through the trees as an incredible deep pastel pink and baby blue, and the

turning leaves of the vine maples glow scarlet. Then the forest slips into black. I reach for my flashlight. It refuses to light. Apparently it got switched on accidentally and the batteries are dead. I've got a backup flashlight but want to conserve its juice, so I hold out my pocket-size sound recorder, whose LCD display has an ambient glow that is just bright enough for slow, feeling footsteps on the familiar path.

I make it back in a half-hour. The ouzel is no longer singing. I hear no elk. I kneel to lay my sleeping bag beneath the tarp and slide in. In my heart I have the same feelings that I have late at night gazing at wood embers: reverence, loyalty, devotion, gratitude. I fall asleep to the distant hush of the Hoh.

A couple of hours later I stir. With the moon overhead, I stare dreamily at the overlapping shadows of the vine maple leaves, visible in silhouette through my aged tarp, before drifting back to sleep.

At 2:55 a.m. the first jet intrusion of the day is loud enough to wake me from a dead sleep. I'm too tired to fumble for the sound-level meter to take a reading, but I note the time so that when I'm back home I can log on to the Seattle-Tacoma International Airport WebTrak website to try to identify the plane and the airline responsible for the overflight. Still awake at 3:15 a.m., I hear a second jet.

As I sink deeper into my down sleeping bag, a bag of my own design I call the Worm, my toes rub up against my stove canister. On cold nights I tuck it inside the Worm with me to keep it warm and ready to light, much preferring a banged toe to any delay in the brewing of my morning coffee or tea. I can easily reach the stove because my sleeping bag has a drawstring at each end, permitting flow-through ventilation on warm nights and, when the mercury falls, a snug cocoon when drawn tight, there being no zipper to interrupt the enclosure of down. The Worm also serves me well at daybreak on frosty mornings. I often undo the bottom, freeing my feet, stand, tighten the lower drawstring around my waist, and angle the other opening from atop one shoulder and under the opposite arm, toga style; then I tighten the drawstring, leaving one arm free. I'll fire up the stove, brew some coffee, and after draining my cup, and though long since up and about, finally get out of bed. Soon after inventing the Worm

and arranging to have it made for me I tried to patent my design. I didn't mind when I learned that I wasn't the first to dream up a double-drawstring tubular design. What irks me to this day is that the patent is for a bowling pin cover.

The night silence returns. I lie snug in the Worm, each breath clearly visible in the moonlight.

Hoo. Hoo. Hoo-hoo.

After a pause, the call repeats over and over for the next four minutes. The great horned owl is right above me, in the giant Sitka spruce tree that shelters the campsite. To my ears this territorial proclamation goes unchallenged, but the owl's hearing is better attuned to an owl's voice and his position different from mine, so perhaps I'm treated to only one end of a dialogue.

At 3:35 a.m. I believe I'm hearing the beginnings of a third jet intrusion, when the sound takes on more subtle qualities and approaches me as if a breath with thoughts. John Muir describes this diaphanous sonic phenomenon in this fashion: "The substance of the winds is too thin for human eyes, their written language too difficult for human minds, and their spoken language mostly too faint for the ears."

Through my tarp I can see the vine maple leaf reflections dance slightly and a few of the boughs high overhead wave in the moonlight.

Quiet is quieting.

My eyes reopen just after 7 a.m. Snug in my sleeping bag, I'm awaiting the dawn chorus, the onset of birdsong triggered by the gradual increase in ambient light, as one by one different species chime in. I hear an *Ut. Ut. Ut.* What is that? As I listen, man intrudes once more. I hear a low-flying prop plane, probably looking for elk herds near the park's perimeter. It's hunting season, and the Roosevelt elk that wander freely in and out of the park make prized trophies when bagged outside of park borders.

Breakfast is simple: a Balance bar and Red Rose tea. Back home I live to eat, but in the wilderness I prefer to keep my diet simple, browsing like an animal, eating a little here and there, grazing on any huckleberries that the bear and elk leave behind. Real food is too much of a distraction and dulls my sensory edge.

Finally, sipping my tea, I hear the first notes from a western winter wren, a high-pitched twittering that goes on continuously, or so it seems, for

nearly a minute from a concealed position halfway up a towering western hemlock tree. Though similar in appearance to the eastern winter wren, its song is completely different. The song of the eastern winter wren is operatic and full; the song of the western winter wren is sharp and narrow. Many songbird species have these kinds of variations and even local "dialects," as ornithologists call them. Clearly, wild creatures use languages that we're just now beginning to decode.

One day, back home in my studio, I decided to do a little experiment with the song of a western winter wren I'd recorded in the Hoh Valley. To my human ears it was a long continuous stream of very fast modulations of amplitude and high frequencies. Though cheery and one of the few birdsongs heard even on the most dismal days of winter, it wasn't exactly sing-along material. I hypothesized that because I speak in one-breath sentences, the winter wren might, too. So I converted the length of the wren's "sentences" from its breath to my breath. Granted, I did this with great speculation, making the assumption that breath length is a function of animal size. Since this experiment was just for fun, I took a simple one-second song sample and expanded it to 12 seconds. The results astounded me. My studio wren sang a song as elaborate as any humpback whale. Since then, each time I hear the western winter wren's twittering, I am reminded of those intricate bends and twists that another winter wren might hear.

Finishing my tea, preparing to set off for One Square Inch, I realize that I can finally hear the river singing. Actually, the entire valley is singing. This phenomenon is so subtle that I have yet to record it successfully, but during optimal listening conditions I have heard it in nearly all of the river valleys I have visited worldwide. The valley must be forested, the river actively flowing and producing a broad-spectrum sound source, the air absolutely still, preferably in the morning, when it has been calm for several hours. Finally, and most important, my ears must be completely relaxed and my mind clear.

This river singing varies in pitch and timbre from river valley to river valley, not so much affected by the river as by the type of vegetation and the size and shape of the valley. It is so distinct and characteristic that I can hum it, though I am always off-key because there are so many layers to it. I do better at imagining it and committing it to memory like a pop tune or advertising ditty and often carry it with me as a personal mantra for

days after I return from the trail. Eventually, intruded upon by more recent sounds, it fades from memory, encouraging me to go back for a refill.

I can only speculate about what precisely produces these valley sound signatures, but I imagine it goes something like this: Any broad-spectrum sound source such as a rushing river, waterfall, ocean surf, or even traffic noise sends out sound waves that travel in all directions, colliding with surfaces, penetrating objects, and otherwise becoming changed by the local environment. In environments that contain repetitious structures of similar size and shape, sound waves are modified as they travel through the environment, absorbing, refracting, and reflecting, some frequencies more than others. The result is that what started out as more or less static noise becomes a tune, one that varies with the environmental topography and atmospheric conditions.

I have listened to this environmental music while exploring coniferous forests, pebbled beaches, and canyons. Although it should be possible to hear in any place where conditions are right, I have not heard it in urban areas, perhaps because the patterns are all too big, the listening area too small, and the overall ambience too loud. This landscape music is best heard from a distance of a mile or more from the sound source, far enough so that the harmonics are clear and the local ambience quiet.

I particularly enjoy this kind of music, as compared to, say, the song of a bird, admirable and even inspirational as birdsong is. A whole-valley listening experience is the result of *place,* not an individual performer. I can feel the importance of the living community, how one thing is not more important than the other. It's *everything* that matters. When listening to this music of place, whether here in the Hoh or in the backcountry of Yosemite, I am inspired to be a better neighbor, a better parent, a better child because I feel part of something much bigger: a collective place that makes music and sings to me.

Not a leaf is turning; there is no wind or even a passing breeze. The rocks down by the river show a wet line a foot above the present river line, indicating that the water level fell during the night. The exposed sand pockets among the dry gravel bars have collected moisture for some reason and are cold, much colder than the surrounding areas.

My goal today is to pay another visit to OSI and continue to monitor for noise intrusions. At 8:20 a.m., passing the 2.3 mile campsite, I measure a

base ambience of 41dBA. I am surprised because it feels quieter, possibly because the surrounding trees create a nice pocket for warmer, lower tones. The first rays of sunlight have reached the mountaintops, but it will still be several hours before I remove my down jacket. There is no other sound except the *rush-hush* of the river—not a bird, not a squirrel, not an elk. I can hum the quiet music of the valley, and do. It is a sound full of love.

The sound of a jet roar just after 8:20 a.m. yanks my glance skyward, and because I am near the river, one of the few places to see large areas of the sky, I see the jet trail cutting southwest over the park. During the duration of the jet's overflight, I can no longer hear the river sing. Rather than grab my sound-level meter I listen more closely, trying, unsuccessfully, to hang on to the music of the valley.

The Hoh River is at its lowest flow rate of the year. Except for a few early arrivals in the deep pools, the river bears few salmon. The autumn rains will soon flood the river, sending a huge flush of fresh water into the ocean, signaling to the salmon that it is time to complete their life cycle. This low river condition is perfect for seeing the sound that is soon to arrive.

I see sound by studying the stones in the river, which are arranged, not at all randomly, but in a musical score. The largest stones, about the size of basketballs, make resounding thuds whenever they roll along, pushed by the strongest currents. These are in the main channels, and some lie partially buried. The smaller stones that produce the midtones and high pitches have arranged themselves in conspicuous bands corresponding to currents of different strengths of water flow. All are now silent, but when the heavy autumn rains return, the river's song will play loudly, so loud that you can hear the underwater concert from the trail.

During these autumn floods, I have dropped a hydrophone into the river to listen more carefully to the deluge concerto. At first, the music is only noise, loud and various, very similar to concrete going down a metal shoot, but within seconds the raucousness subsides or bursts into another clamor, as a boulder smashes through, crushing other stones into smaller sizes. Occasionally the ear can detect the riverbank eroding, spilling new stones on a seaward journey that may last centuries. The roots of even the largest trees are sometimes exposed in the torrent; I have heard them twist and splinter, like large bones slowly breaking. This is not relaxing to hear, but it is educational, for the sheer force of all this water helps produce another concert.

Stones of all sizes eventually make their way to the park's wilderness beach, where incredible music can also be heard. The stones arrange themselves in tonal bands, the result of having been swept and stroked by countless fingers of winter's storm waves. Many huge driftwood logs still bear enormous root cavities, big enough to walk into, like caves. Sitka spruce is the wood of choice for many of the finest guitars and violins and the soundboards of Steinway pianos because of its anisotropy, or elasticity. Compared to other woods, its uniform fibers vibrate easily. I have often recorded inside what I call "ears of wood," old-growth Sitka spruce logs, uncarved violins, if you will, that vibrate not with the touch of a bow, but with the crash of each ocean wave, and then by its more nuanced backflow as it retreats across the surf-smoothed stones.

Whenever I am asked to name one of my favorite sounds, this sound from these ears of wood comes readily to mind. I shared these ears of wood with my students at Olympic Park Institute, where I taught nature sound portraiture in the mid-1990s, but I would guess that fewer than 100 people have heard this incredible surf symphony in the wild. You have to poke your head inside the driftwood log to hear it. To my knowledge, not a single park ranger working at Olympic Park has heard it, which may explain why many of the finest musical logs were moved from Rialto Beach during the repair of a rock jetty in the late 1990s.

At 9:55 a.m. a propeller-driven airplane makes a wide circle over the Hoh Valley with a noise impact of 63 dBA. Because it is such a clear day (not a cloud in the sky) this activity is likely flightseeing, a scenic drive in the sky. In addition to the company offering the Grand Tamale tours, an outfit called Rite Brothers out of Port Angeles, Washington, offers similar flights, as do other businesses as far away as Victoria, British Columbia. These superficial "park visits" are at best gee-whiz aerial views that titillate—and tap only one sense. I wonder whether these operators and flightseers worry at all that their flight impairs the park experiences of others below, visitors who have a birthright to enjoy wilderness solitude?

Shortly after 10 a.m. I reach my One Square Inch turnoff landmark on the left side of the trail, a stilted Sitka spruce that offers an opening large enough to go inside for shelter during a heavy rainstorm. A short walk brings me to my sacred spot within this special forest, a chest-high, moss-

covered log that provides a noble, if oversized, pedestal for my tiny OSI marker, a simple red stone. This red stone was given to me by David Four Lines, the former cultural elder of the Quileute tribe, whose reservation lies at the mouth of the Quileute River, a sacred place where other rivers—the Bogachiel, the Calawah, the Sol Duc, and the Dickey—come together. In the right light, the stone, which David Four Lines used to smooth ceremonial wood carvings, seems to transcend mere rock, resembling living flesh or a piece of sushi-grade tuna.

As always at OSI, I listen for noise intrusions, noting now that the base ambience measures 28 dBA and consists mostly of the sounds of the river arriving through several hundred yards of forest. A Douglas squirrel chatters away from a hemlock branch 50 feet up (50 dBA). In the animal world of listening, the loudest sound in an ambience is an important one. Normally, the loudest sound is often made by the creature at the top of the food chain, who feels most secure and least at risk of predation—this morning's flightseers, for instance. And this squirrel, too—although perhaps foolishly, should there happen to be a hungry owl nearby.

At 10:10 a.m. I record another high-altitude noise intrusion (40 dBA): jet aircraft. Based on the sound alone I would normally picture the jet traveling south to north, but I have learned that the mountainsides bounce the sound around so well that the jet might be traveling west to east or even north to south. Nevertheless, I often mark the apparent direction, even though, without visual contact, this information remains uncertain, for it may aid me in identifying the aircraft when I'm back home, sitting at my computer. Just as this jet noise fades out at 10:13 a.m., I hear a prop plane over the north ridge of the Hoh Valley toward the city of Forks (39 dBA).

At 10:21 a.m. a plane flying west to east produces a noise impact of 68 dBA. This is very loud, especially when compared to the 28 dBA base ambience. Recalling that each 3-dBA jump on the meter signals roughly a doubling of the sound wave power of the noise intrusion, that means the 40-dBA increase represents more than a doubling of the audible acoustic energy *13 times over.* If you had a dollar and doubled it 13 times it would grow to $8,192.

I've come to think of silence in two ways.

Inner silence is that feeling of reverence for life. It is a feeling we can carry with us no matter where we go, a sacred silence that can remind us of the difference between right and wrong, even on a noisy city street. It resides at a soul level.

Outer silence is different. It is what we experience when we are in a naturally quiet place without the modern noise intrusions that can remind us of modern issues beyond our control, such as economic aggression and the violation of human rights. Outer silence invites us to open up our senses and get connected, once again, to *everything* around us. No matter in what direction you look it is all the same connection. Outer silence can recharge my inner silence. It fills me with gratitude and patience. I don't think I have been either tired or hungry while in a place of outer silence. The experience of *being there* is so complete. And then, after I return home, I generally sleep long and hard.

Fountains of Youth, that's what John Muir called our national parks. Already, less than 24 hours since my arrival in Olympic National Park, I can feel my senses heightening, including my sense of smell, along with my sense of hearing. In the morning's still, moist air I detect undisturbed pockets of scent—sweet, sometimes musky, occasionally herbal.

At 10:34 a.m. another prop plane travels east to west at 59 dBA. More flightseers on a clear sunny day? Or have hunters taken to the air to pinpoint one of the elk herds that wander in and out of the park boundaries? Four noise intrusions in just over a half-hour. This is the highest rate I have observed in the 18 months I have been logging noise intrusions at OSI.

I have never met a person who thinks that aircraft noise belongs in a wilderness. In fact, I have played my recordings of nature to children who, hearing an aircraft intrude, ask in disbelief, "What is that?" When I tell them, they ask, "Why is that allowed?"

Fact: In 1992 aircraft noise was audible in Yosemite Valley more than 50 percent of the time, according to a park ranger who shared with me the results of a noise study he undertook because nobody else wanted the job.

I reach beneath the One Square Inch log and pull out my Jar of Quiet Thoughts. Actually, it's not a jar at all. I did begin with a jar some eight months after establishing One Square Inch of Silence, leaving a pencil and

some paper inside and inviting the thoughts and impressions of pilgrims to my designated quiet sanctuary. But the jar's screw-top lid proved no match for the H_2O of the Hoh. When I returned a few weeks later, the jar looked like an aquarium, with paper and pencil swimming inside. Now I use an antique metal ice cream container, a quart-size cylinder from the early 1900s that customers would bring to the dairy and get filled with hand-packed ice cream. It's about five inches in diameter and seven inches high; most important, its metal lid overlaps the cylinder by about two inches and fits snugly because I've added a layer of foam and a piece of rubber inner tube to tighten the seal. Inside I've also slipped in a few silica gel packets to serve as desiccants.

Thoughts left in the jar are private to this place. They can be read only by those who visit One Square Inch. Today I find a ten-dollar donation to One Square Inch of Silence among the 50 or so notes. One note tells of a marriage proposal, made right here. A silent proposal, of course. I am encouraged. This is the way things happen, one step at a time, same as any other trail. Could it be any other way?

10:46 a.m. A jetliner intrudes. 36 dBA.

Most visits to OSI produce no observations of noise intrusions, but already, in less than an hour, there have been seven. I wonder if this is because the day is so clear; there is no layer of clouds to reflect the noise. I can't remember another day in the Hoh as clear or as calm. The sonic insults continue apace: four more jetliner intrusions in the next half-hour. This makes 11 noise intrusions in the past hour and six minutes, all of them from aircraft. I remind myself not to be led by anger.

As I walk back to the trail there's one last jet intrusion at 11:20 a.m. But I don't reach for my sound meter. I need lunch. I need direction. I need some answers. Where did all these needs come from? I need to make sense.

As I pass the waterfall at Mineral Creek near Mt. Tom Creek Meadows a jet intrusion is so loud that it is clearly audible over the roar of the waterfall. I look at neither my watch nor the sound-level meter, but stare only at the cascading water, which takes its own form, a fluid without a vessel. Why can't Olympic National Park become an FAA-assigned no-flight zone? I'd like to meet the person or persons who believe that there is any reason good enough to have this kind of noise in the Hoh Rain Forest.

Walking back to camp, I am thankful that my frightening brush with hearing loss proved fleeting, thankful I can hear the river singing. The air is sweet with dried alder leaves and grasses, sorrels and mushrooms. I plan to bathe in the Hoh near my campsite and dry in the sunshine, a rare treat at any time of year.

After washing up and eating, I feel ready for another walk, this time in search of elk. I head a bit up the trail, freezing when I hear a new sound, a faint, dry, tinkling sound coming from a salal bush low to the ground. I look closer and see that a clump of hemlock needles decorates the bush; the needles have fallen more than 100 feet! This sound reminds me of a late-night campfire after the fire has finished its rage, when the heartwood is solid ember and the wood tissue has been hollowed and begins to collapse like a glass ornament slowly breaking.

To the ear of the animal, a sound as simple and soft as dried hemlock needles falling onto salal leaves speaks of

> *Security*: This is a quiet environment where it is possible to detect very delicate sounds, such as the approaching footsteps of a predator. This is an unlikely spot to be at risk and a good place to bed down if you are tired.
>
> *Remote location:* It takes many square miles of isolation to produce an ambience of such simple character. There are few places left in the United States, let alone the world, where such a simple sound can be heard unadulterated by noise pollution.
>
> *Vegetation:* This is a tall coniferous forest. Besides the fact that the sound of falling needles is different from the sound of falling broad leaves, the wind that caused these needles to be released is not evident in the sound of their impact on salal. This indicates that the forest canopy is high overhead, very high, in fact, or there would have been at least a stir of other leaves within the forest understory.

This tall coniferous forest, in fact, offers cathedral-like acoustics with a reverberation time lasting about two seconds, which adds time to the interpretation of sound events. There is also its distinctive microclimate: the forested space is walled-in and thus more sheltered from temperature

and weather extremes experienced in open spaces and high above the forest floor in the treetops. Moderate microclimates are less demanding on warm-blooded animals to regulate temperature than open, exposed areas, and therefore allow more leisure activities, such as resting and socializing.

Western winter wren at 50 feet. 40 dBA.

Red-breasted nuthatches and chestnut-backed chickadees at 30 feet. 45 dBA.

1:45 p.m. A helicopter passes over and along the ridge north of the Hoh Valley. 50 dBA.

Unlike the previous overhead noise intrusions, the National Park Service itself may be responsible for this one. The NPS uses helicopters for various park jobs, including counting elk in the Hoh Valley. I confirmed this in an e-mail correspondence with an NPS public information officer named Barb Maynes, who wrote that helicopter flights for counting elk remained "high enough above the canopy that the downdraft from the helicopter did not cause upper tree limbs to move, or epiphytic plants or duff to fall from the upper canopy." In other words, she addressed visual impacts of the helicopter flights but said nothing about the potential noise impact on the elk herds or the rest of the wildlife community or the degradation of the natural soundscape, which the Park Service's own management plan specifies it must preserve to the greatest extent possible. Are they doing so?

At 2:25 p.m. I find myself at a big leaf maple grove just as the day's first strong breeze rolls up the valley. I hear a little rustle and the loosening of the first leaves and watch these brittle gliders rock and swirl before coming to a temporary rest on the thick ground layer of ferns. Individual leaf impacts on fern fronds average 30 dBA at six feet. The entire event peaks at only 40 dBA, like a breath in the silence. Walking through the dry leaves creates a sound of 45 dBA; when I switch to a kid's foot shuffle, I manufacture one of the loudest events in the forest: 65 dBA. A solitary bumblebee whizzing by might register 34 to 44 dBA.

Later I lie down in one of the giant maple groves to take a nap. I drift off watching the colorful patterns of maple leaves, both the big leaf maple, which is yellow with brown spots, and the vine maple, which turns to bright reds, oranges, and yellows.

I wake to a jet intrusion at 6:04 p.m. (44 dBA). I return to camp and prepare dinner near the river's edge and away from camp, where food smells might attract unwanted dinner guests, such as a black bear or a raccoon. Even with the relatively high dBAs produced by the river, I can hear part of the evening rush hour at Seattle-Tacoma International Airport, about 75 miles away as the crow flies. I add to my time sheet of jet intrusions: 7:55 p.m., 8:00 p.m., 8:15 p.m., 8:20 p.m., and 8:30 p.m.

I wake during the night to see the riverbed brightly illuminated by the moonlight, the trees framing the view from my sleeping bag clearly silhouetted. I can hear the distant bugles of elk coming from more than a mile farther to the west. I drift back to sleep vowing to find a herd tomorrow.

At 7:30 a.m. I stir and gaze out at the first morning light. I spend the morning in quiet observation of the natural wonders around me. A solitary tree frog at 30 feet (55 dBA). Its voice is nearly as loud as a casual human conversation and perfectly suited to the human ear—slow, deliberate, and clear, similar to a dry rubber hinge.

The hiking trail shows elk hoofprints without dry or sagging edges. Recently made prints. The vegetation bears many browse scars, so a large herd must be nearby, but not too close, as I cannot smell their sweet musk odor. I look to the riverbed and then to the forest; they could be anywhere, I think. Their usual behavior is to seek the solitude of the forest during the day and the openness of the riverbed at night, particularly in bright moonlight. I decide to wait here.

4:12 p.m. A small prop plane rides along the north ridge. 44 dBA.

At 4:50 p.m. and still in the same spot, I hear an elk bugle coming from the direction of the south-facing slope of the north ridge, loud and clear. I decide that I have waited long enough and head off-trail and into the rain forest on the preferred path used by the rest of the wildlife—white-tailed deer, black bear, and cougar, to name a few. I carefully pick my way through a dense patch of young Sitka spruce, pricklier than salmonberry bushes, trying not to become a blip on the auditory radar of the Roosevelt elk. They do not seem to see very well, but they are good listeners. My

steps are slow and rounding. I lay each foot down at the edges and then curl my step inward and forward to spread my energy and quiet my footfalls as much as possible.

I see one: a large bull elk standing in a moss-covered opening between two large hemlock trees. His rack is magnificent. Then I hear *Ew* coming faintly from deeper in the forest and look in that direction. I spot more than eight females. Behind them stands another bull, even larger than the first. Before I can count his points he moves behind the wildwood, a twisted mass of moss and vine maple. Another *Ew* sound, and I look to see more females. The herd numbers more than 30 elk: four adult males, more than 20 adult females, and several immature elk.

We can thank the Roosevelt elk, perhaps the ancestors of this particular herd, for the very existence of this wilderness preserve. Olympic National Park was established in 1938 from a Federal Reserve that was established to protect the Roosevelt elk. Understandably. The sound of the mature male is one of the most beautiful natural sounds that I have heard. From a distance of a quarter-mile or more, the preferred listening position, the sound is flute-like: a long, drawn-out, whimsical note that lifts slightly in pitch before the echo travels great distances. At closer distances the same sound is different: it is brassy, but still long and smooth, and often ends with a series of three or more stiff grunts. This sound is not nearly as musical to my ears because the acoustics of the towering rain forest, its habitat, have not *sweetened* it. At close range, the same sound is an aggressive, adrenaline-filled bellow with deep gurgles and fear-inspiring grunts intended to dissuade all serious contenders and convince them to back off—myself included. But I remain.

The *Ew* of the females and young appears to be a contact call that allows members of the herd to monitor their relative positions. It is important to spread out far enough to allow efficient feeding, but not so far as to lose contact with one another. This call also appears to convey several emotional states, such as distress, loss, and even sexual readiness.

I have also heard male elk produce a sound like a bark. This impulse sound is loud and distinct, an alert to all those within hearing range to be on guard because something unusual is in the air. This bark may precede a stampede, and since these animals are as large as horses, the bark of an elk deserves attention and respect.

I work my way closer, to about 100 feet, and aim my camera, careful to use the telephoto lens in manual mode to disengage the motor of the automatic focus. The vegetation is thick, the light is weak, so I continue to move forward in stealth mode, looking for emergency exits along the way. At this time of year the testosterone-primed males are unpredictable, and I would never want to accidentally come upon one and make it feel challenged. I see several potential shelters, root cavities at the base of giant trees large enough for me to pop inside but too small for a rack exceeding four feet.

The elk herd has picked a beautiful forest amphitheater in which to leisurely spend the day, a big open space draped with moss so thick it looks sprayed on with a giant flocking gun. I make a mental note to return here in springtime with my sound-recording equipment to make a portrait; the trees will host many birds and provide wonderful acoustics.

The elk are browsing at a very leisurely pace on vine maple leaves, huckleberry, and salmonberry. The sound of their activity, mostly soft twig snaps, without grunts or vocalizations, measures 32 dBA at a distance of 75 feet.

A male emits a loud bark. I've been busted. Must have been the sound of the camera shutter that gave me away. The herd heads away from me toward the river. I rattle off a few more shots but don't follow. I am not interested in changing their behavior. After they leave, I hightail it back to the main trail and go east, up the valley to where I know I can intercept the herd if they continue toward the river.

Yep, good call. Just as I get to the Mt. Tom overlook location, a large male with a respectable rack steps into the trail about 50 feet in front of me and faces off. The rest of the herd passes behind him, and eventually the Grand Bull himself crosses, and all proceed down the riverbank to the flood plain. I take a position on the bank and continue to take pictures and observe their habits.

The Grand Bull is easily the largest elk that I have ever seen in my 25 years of visiting the Hoh. He goes unchallenged, ruling the herd, if not the valley. I dub the other three males the Executive (the one who blocked the trail) and the Two Cowboys (who are always jousting with each other). The Executive apparently earns his time with the females in exchange for taking care of a lot of the Grand Bull's business. The Two Cowboys have figured out that it is going to be a while before they have a chance to mate

and spend most of their time heads down, antlers locked, grunting and pushing and generally venting their frustrations on each other while gaining strength and skill at fighting.

At 5:35 p.m. a military jet booms up the valley, but at a high altitude, keeping the noise impact down to 50 dBA. The event is very quick, with a fast onset and somewhat longer decay—less than a minute in all. Nonetheless, a distraction. I look back at the tussling Cowboys and hear them kicking up the cobblestones in the riverbed as they try for better footing. Their antlers make an unusual sound, similar to wood but denser, and their grunts at this distance of more than 100 feet sound more like complaints of exhaustion than bursts of bravado.

At 5:55 p.m. another jet intrusion breaks the spell, and I head back to camp, fix dinner, and go to bed early.

I wake at 2:45 a.m. and listen to the river sing through the valley. It is a strumming-humming sound with surprising changes. It would surely rank high on my life list of favorite sounds. What other sound comes from an entire place, and due principally to the plant life, no less! Surely the dawn chorus would be among the finalists, too, beautiful and inspiring, distinct and expressive. But this sound, the Hoh-hum, is sacred, made all the more so by its simplicity. I am going to try to hum some of it here on the page.

First of all, there is a low, river-rush layer of sound. A *Psssssssssssssssssssssss*. Kind of like that. Then there is the very faint echo of the actual gurgles—*Lelelelgurlgle*—which is bouncing off nearby surfaces. Then there's an *Aaaaaaaaahhhhhhh* layer of sound. Well, it is actually a little higher than that, more like *Heeeeeeeeeeee*. Together they blend finely, ebb in and out of each other, and twist-tie into an almost inseparable whole.

This humming sound is so delicate that it cannot stand up to the slightest noise intrusion. Even the listener must remain absolutely quiet—no talking, no foot or arm movements, and quiet, slow breaths with open mouth. I believe an open mouth improves hearing for two reasons: it straightens the auditory canal and it enables the mouth to serve as a resonant chamber, amplifying faint sounds to more audible levels. This is exactly what children do instinctively when the lights go out: the jaw drops and faint sounds are more easily heard.

Does a place have a soul? Yes, I think so. And a place has intelligence,

too. Just look at any clear-cut hillside. What does that place want to do? Heal itself.

This Hoh-hum sound of the entire valley is so reassuring, all-pervasive, and satisfying that I cannot imagine any man-made product from this forest timber producing anything as rewarding, not even a violin. I feel so light and free from the burden of possessions when I am backpacking. I often think about how I will simplify my life even more when I return home.

4:05 a.m. Jet intrusion. 44 dBA.

I climb out of my sleeping bag at 7:00 a.m. under foggy conditions, fix tea, pack quickly, and head out. Within the hour I intercept the same elk herd I saw yesterday, this time reverse-commuting from the riverbed to the forest. The fog has formed a layer 100 feet above the forest floor, allowing good ground visibility. One male shows 10 points and another far more. I am able to take up a position within 30 feet of a browsing male and begin to snap frames. I hear hoof clomps resonate in the wood-laden soil and look to see a buck coming up the riverbank unaware of me. I remain motionless and watch him pass close enough that I can smell the mustiness of his moist coat.

When the elk move on I continue my hike back down the valley, coming next upon a pair of white-tailed deer. I watch, listen, and snap away. Not only have the white-tailed deer advised me on where not to set up camp for the night, but by following their tracks I've discovered some spectacular listening spots. Invariably, again for reasons of safety, they bed down in places where sounds naturally collect. I never pass up an opportunity to sit and stay a while when I come upon a matted and sometimes still warm place on the forest floor where a white-tailed deer has slept.

A few moments later I come to a maple grove. The ambience is profoundly quiet: 20 dBA, the lowest reading of my sound-level meter. Still, it is not silent; there's a changing sense of space as I move. This is the presence of life.

Phip. Something falling from the forest canopy. 39 dBA.

Dee, dee, dee. Chickadee. 31 dBA.

Thump. Thump. Woodpecker tapping. 25 dBA.

All these tiny sounds punctuate the silence of the fog-drenched forest. But walking back down the trail, my stay in the wilderness coming to an end, I hear the hollow sound of internal doubt. I've never experienced so much aircraft noise over the Hoh Valley: jets, prop planes, even a helicopter. Is One Square Inch of Silence enough? Something deep within me is shifting. That much I know.

I eventually arrive back at the Hoh Visitor Center. A sign announces its autumn hours: "Open Friday, Saturday, Sunday 10–4." How can I expect the Park Service to budget for natural quiet management when they can't even afford to keep the Visitor Center open more than a few days a week?

Crossing the parking lot to my VW, I pass a visitor who nods a silent "Hello" and then points his key remote to lock his car. I feel my body tense. But, hallelujah. Instead of a confirming car horn, thanks to some bright (and quiet-minded) automotive engineer, the headlights flash instead. Yes, I think, there's one more vote for quiet.

But then there's a thunderous boom. A moment later, Murray's Olympic Disposal rumbles into sight on its way to the ranger station. It's time to take out the trash.