



treasures
in the
canopy

300 feet above an
Oregon forest,
biologist Nina
Ferrari uncovers
the secrets of
warblers, juncos,
and other treetop
songbirds

BY MARINA RICHIE



From my perch high in a 200-foot-tall

Douglas-fir, I listen to the lone chord of a Varied Thrush sugaring upwards from the understory. *Chip chip chip* calls signal a flock of Red Crossbills rippling through the mid-canopy. Close by, a Pacific-slope Flycatcher whistles an uptick *Hap-PY?*

Secured by a rope and climbing harness, I gaze over a treescape like none I've ever witnessed. Gray spires—the tops of living and dead trees—rise like ship masts above a sea of textured Douglas-fir, western cedar, and western hemlock. No spire is the same. Some are straight, others forked. Everything has a signature. The sky on this early August morning is the blue of a Steller's Jay in flight. The rushing sigh of Lookout Creek breezes up on windless air. A western swallowtail butterfly wafts past my hand as I touch a lichen-draped branch. Embraced by the centuries-old tree, I am not afraid.

I hear, too, the metallic jingle of carabiners as bird biologist Nina Ferrari ascends on the second rope. At 27, she's the first to climb trees for a study of breeding forest songbirds in three dimensions. Some of the Douglas-firs she scales are close to 300 feet tall, rival the redwoods in height.

As Ferrari pops into view, we exchange grins. A wisp of dark curly hair escapes from beneath an orange climbing helmet. A few specks of bark spangle her shiny cheeks. Her eyes remind me of the golden-brown plumage of the Pacific Wren, a dweller here of moss-cloaked fallen trees, upturned roots, and a song like a trickling brook.

We linger in the crown of the tree she has affectionately dubbed "Traverse." Suspended in deep time, we are free from



Nina
Ferrari



Oregon Dark-eyed Junco



the pell-mell motion of daily life often quickening toward the next task. I ask her what word describes her feeling up in the canopy.

“Serene,” she says without hesitation. “You are small and insignificant yet connected and swaying with this huge tree you trust to keep you alive.”

Strong, cheerful, and capable, she lives up to her race-car last name. On one day she clambered up six study trees. In her first field season of 2022, she summited her chosen 14 Douglas-firs more than 50 times. That was the easy part. At 10-meter intervals up each trunk she had secured an audio unit for recording birds, and sensors logging temperature and humidity. Retrieving the data took acrobatic maneuvers on the single rope, which is not close to the trunk for most of the way up.

At the H.J. Andrews Experimental Forest, on the slopes of Oregon’s western Cascade Mountains, her graduate project takes pivotal climate and bird research within ancient forests to an elevated level. Ferrari’s quest is to track songbird movements within the breeding season

as temperatures swing ever more wildly, a result of human-caused climate change. Her hope is to identify the vertical habitat qualities birds seek for refuge in a warmer future.

She chose Douglas-firs as the most common conifer in the Andrews and also for consistency. Seven of the 14 firs are giants within a dynamic forest shaped by wind, storm, flood, and fire. The oldest trees date to about 500 years of age. The tallest of Ferrari’s selected trees is 300 feet, only five feet shy of the Statue of Liberty. The widest trunks at the base are close to six feet in diameter.

The other seven firs, also within the Andrews, grow within 60- to 80-year-old plantations. They range in height from about 90 to 135 feet tall. The 15,800-acre experimental forest is a mix of logged stands, and the 6,400-acre core of old forest—dedicated to ecological studies—has lasted centuries.

Commonly called “old-growth,” the timber term falls short of describing the thousands of years of natural processes forming forests of wondrous complexity and species diversity—brimming with

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Tree Star!
Nina Ferrari
studies birds
in three
dimensions—
scaling trees
as high as 300
feet.

towering old trees, standing dead snags, downed logs nourishing new life, and multi-layered canopies filtering sunlight to understory leafy plants. I prefer the term “ancient forests.” After more than a century of logging, the remnant forests are more precious than ever.

When I learned of Ferrari’s sky-breaking research, I knew at once I wanted to write a story and climb a tall tree in a wild forest. Admittedly, I’ve had a recent craving to return to my childhood joy. One summer at age 12, I spent days up in the bower of a maple reading the *Lord of the Rings* trilogy. Now in my early sixties, why wait any longer? But I was a tad naïve.

This was my third trek with Ferrari over the course of three months. In June, I was stymied by rain and cold, but learned the basics of gear—more daunting than anticipated. I fumbled with simple equipment, like the double-locking carabiners designed for safety. Ferrari handed me one to borrow in July after our second hike to the most massive of her study trees, called “Wolfy.” There, I’d twirled on a rope about 15 feet up, but we were

thwarted by the set-up of the second rope, which jammed on a high limb.

“Now I know you’re coming back to return the carabiner and try again,” my patient climbing instructor said. For the next month, I carried the D-shaped metal ring and practiced pressing the locking mechanism upward, turning clockwise, pushing the opened hinge down, pretending to press a rope into place, and then letting the carabiner snap back.

At last, on this day I’m merging with firs, hemlocks, and cedars gathering sunlight to photosynthesize for energy. In the process? The trees are scrubbing the overlaid atmosphere of carbon dioxide. The bigger they are, the more carbon they store within their vast trunks and roots. When trees die, they continue to store carbon and nurture biodiversity—essential for a livable planet.

Ancient forests also know the companionship of indigenous peoples whose legacy is one of belonging and knowledge gained from detailed observations over the millennia. Today, traditional ecological knowledge and western science are

starting to braid together to inform forestry practices honoring reciprocity.

Far below on the forest floor, Ferrari’s advisor Matthew Betts of Oregon State University waits for us. Earlier in the season, he’d reveled in his first tall tree climb. Betts is the leader of Long-term Ecological Research at the Andrews Forest. He’s also the author and a co-author of several research publications linking bird survival to old forests in a rapidly changing climate.

I picture Betts among the huckleberries, rhododendrons, and ferns pondering another strand to follow in the never-ending web of questions. Perhaps he peels back and then replaces a strip of moist, fragrant cedar from an emerald mossy nurse log, a haven for salamanders. Always the naturalist, Betts has a gentle mannerism that belies his competitive background as a national-level cyclist.

“Birds have long been considered indicators of environmental change,” Betts says. “Now, we’re seeing massive declines in bird populations across North America. We’re finding that old-growth forests

can help keep birds cool as the Northwest heats up, and this has positive effects on populations.”

He compares the high biomass of these forests to a swimming pool—coolest in the deepest waters. The latest bird science at the Andrews, led by Hankyu Kim for his 2022 Ph.D. dissertation, showed Hermit Warblers, Wilson’s Warblers, and Chestnut-backed Chickadees finding relief in the natural air-conditioning of microclimates within a deep, layered forest.

Ancient forests help nesting birds in other ways, as Kim’s study illustrated. A warmer climate is leading to earlier plant leafing and caterpillar emergence in spring, which is a potentially deadly timing mismatch for migratory birds unable to adjust their nesting for chicks to hatch when caterpillars are at their peak. However, within forests of high diversity, insect diversity is also high. Each kind of caterpillar has a unique life history, including time of emergence. Some will pop out later in spring and summer. Voila. The birds can find food for their chicks for

longer periods.

Kim conducted his eight-year study from the ground. The next step? Climb into three dimensions. But there was a hitch. What graduate student would be able and willing to endure long demanding days of monkeying up mammoth trees in a temperate rainforest known for mists, showers, storms, winds, and mosquitos?

When Betts met Ferrari—a rock climber—he broached the subject. Without hesitation, she said yes. She’d chosen Oregon State specifically to learn from Betts and study at the renowned Andrews Forest. After graduating from the University of Vermont in 2016, Ferrari tracked birds for field studies in remote northern Maine, on Mount St. Helens, and in the Sierra Nevada before pursuing her master’s degree.

Growing up with scientist parents, Ferrari had that enviable childhood where a muddy face and hair tangled in leaves marked a good day. Her mother worked as a volcanologist for the U.S. Geological Survey and her father as a plankton

biologist for the Smithsonian Institution.

“I was the kid who’d put a slug on her face,” she said earlier when we’d hiked into the forest in July. As a small girl in northern Virginia, she’d pull her red flyer wagon down the street collecting caterpillars and bringing them home. Once, her bedroom reeked from collecting jars jammed full of dead cicadas. That’s when her mother put her foot down.

Despite Betts’ confidence in Ferrari, he had a few qualms. “I was excited; but sending someone up a tree close to 300 feet tall made me nervous, too.”

Ferrari learned tree-climbing skills at Oregon State from the legendary ecologist Eric Forsman. His Spotted Owl studies in the 1970s showed the birds were threatened with extinction from the widespread logging of old-growth forests. Protecting owls under the Endangered Species Act in turn shaped protections of some threatened forests under the Northwest Forest Plan in the 1990s. Now in his 70s and an expert trainer of research climbers, Forsman helped Ferrari tailor some of her gear

Chestnut-backed
Chickadee.





Yellow-rumped
Warbler



Cape May Warbler



Bay-breasted
Warbler



Black-throated
Green Warbler



Bob Fred/Shutterstock

for an unusual task.

Forsman co-taught the class with James (Jimmy) Swingle, wildlife biologist with the Pacific Northwest Research Station. He summits tall Douglas-firs in search of red tree voles nesting on platform-like branches and sipping dew from needles that are their only food. The secretive voles are the prey of Spotted Owls. Both are increasingly rare as ancient forests continue to dwindle.

Andrews Forest Director Mark Schulze took Ferrari under his wing, too. She relied on his strength and skills when they rigged trees for ropes and fastened the audio-recording units and temperature loggers to the trunks. That task was like putting a belt around an elephant. Schulze does plenty of his own climbing to reach treetop cameras capturing the timing of cone ripening.

While Ferrari's ascents are mostly solo, her field crew of three undergraduate students help lug the heavy packs on steep terrain and assist from the ground. Safety is paramount.

"I'm rarely scared, but I'm aware of the risk and that can invoke fear," she said. "Sometimes I feel like I'm not

strong enough. Then, I remind myself I'm right for this study for reasons beyond physicality."

Earlier on my big climb morning, I'd faced the grand tree with heart pounding and silently asked Traverse for permission. I would be a two-legged spider ladder my way up via a system arborists call "rope walking," which requires three ascender devices—one for your hand, one for your right foot, and one for your left knee.

The rhythm was tricky. Gradually, I took bigger steps as I pushed the hand ascender up the single rope. About 30 feet off the ground, I paused to take in the enormity of tree columns in every direction. Close by, a shaggy-barked western red cedar flexed limbs bearing needles like pressed ferns.

Clambering up the sky ladder ever higher and closer to the trunk, I breathed harder in a rhythm of ascension. At about 90 feet, I reached the first branches—sturdy, shortened, and bearing a trove of papery, crusty lichens waiting for rain after a scorching week-long heat wave. Progress slowed as I navigated past limbs and grazed my fingers over curtains of

fir needles. I pondered who lives in this Lilliputian world. So far, scientists have identified more than 3,100 invertebrate species alone in the Andrews Forest—from insects, spiders, and millipedes to slugs. When I reached the highest point, I placed one hand in reverence upon the resolute trunk.

Now with Ferrari, our hushed conversation shifts to questions. On the lookout for patterns, she points to the small hemlock cones spilling from uppermost branches of nearby trees. Why are there so many this year? We contemplate their bounty, which will soon attract Red Crossbills extracting seeds from cones with their exquisitely adapted beaks.

Dark-eyed Juncos are trilling. Chestnut-backed Chickadees chitter in camaraderie. Once while climbing at great heights, Ferrari came face to face with a hovering Rufous Hummingbird inspecting her bright helmet as if finding an exotic wildflower.

Several questions guide her study. How are the birds dividing up vertical space in a time of accelerating climate change? Can birds adapt quickly enough to take advantage of microclimates? What about

competition among species seeking food and shelter? Where are those cool places located within the secretive recesses of a forest replete in branches, limbs, trunks of almost infinite variety? How do birds fare within a tree plantation in comparison?

To simplify, are the birds like high-rise apartment dwellers sticking to their given addresses? In an emergency, what options will they have to move? Will they compete or cooperate?

Back in 1958, Robert MacArthur changed the course of ecology with his classic study of five warblers—Cape May, Yellow-rumped, Black-throated Green, Blackburnian, and Bay-breasted. Prior to his research in a northeastern conifer forest, ornithologists assumed the warblers flew randomly about tree crowns seeking insects. For his Ph.D. dissertation, he tested whether this premise was true.

MacArthur documented where the warblers liked to dine and linger. He found they are choosy. For example, Cape May Warblers fed on the outer tips of branches at the tops of spruce trees. Bay-breasted Warblers plucked insects off the

needed branches in the middle of lower limbs. The birds specialized, too, in their capture techniques—from upside-down gleaning to hovering and hawking (hunting on the wing). Called “niche partitioning,” this divvying up of a forest canopy assures there’s enough food to go around without competition.

Until Ferrari’s project, no one had tried to replicate MacArthur’s brilliant research in a comparable Pacific Northwest forest across multiple trees. The sheer height of the firs, hemlocks, and cedars alone obscures the view from the ground. One distinct advantage today is LIDAR (Light Technology and Ranging), a technology applying lasers to generate three-dimensional maps, now available for the entirety of the Andrews Forest. That means Ferrari does not have to describe the unique layered branches of every tree as part of her field work.

When she finishes her second field season this year, Ferrari will trade climbing gear for hours at the computer analyzing her final data set unlike any ever collected before. She’s now pursuing a PhD,

reflecting the complexity of the research, her enthusiasm for science, and a desire to keep leading the way into unexplored realms. Each study at the Andrews adds height and depth to our understanding of forests in a time of climate emergency. Birds are leading biologists to their havens—safety nets that could save them from extinction. Ferrari inspires other budding scientists to follow their passion, to say yes, and to enjoy the journey no matter how challenging.

Returning to my luminous morning high in the treetops and secure in a climbing harness, I am wildly exuberant. All I lack are feathers, hollow bones, and wings. When the Pacific-slope Flycatcher next calls *Hap-PY?* I whistle back. 🐦

Marina Richie is the author of the award-winning book *Halcyon Journey: In Search of the Belted Kingfisher* (Oregon State University Press, May 2022). She is a frequent contributor to *BirdWatching*, and her work has appeared in *National Wildlife* and other magazines. She lives in Bend, Oregon, and pens a bimonthly blog on her website, www.marinarichie.com.

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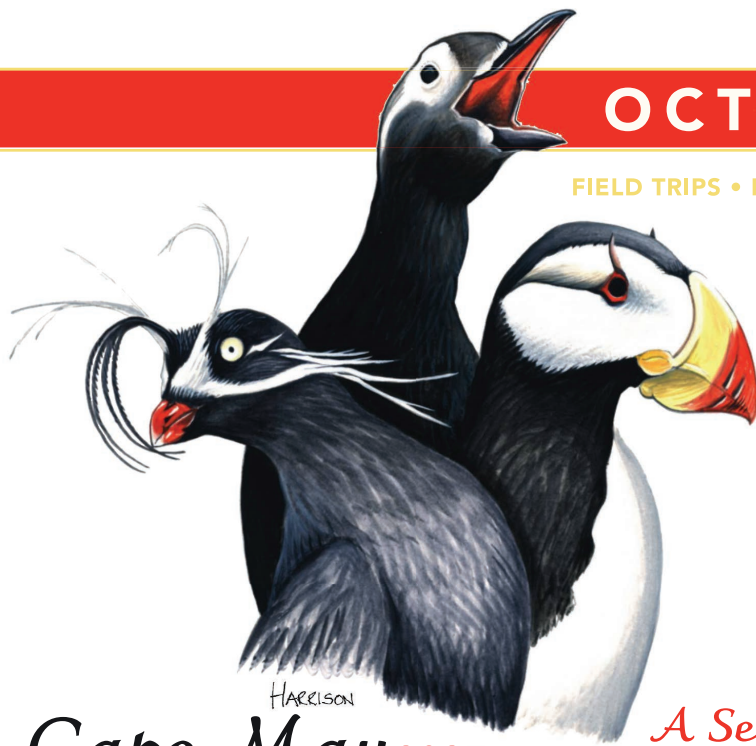
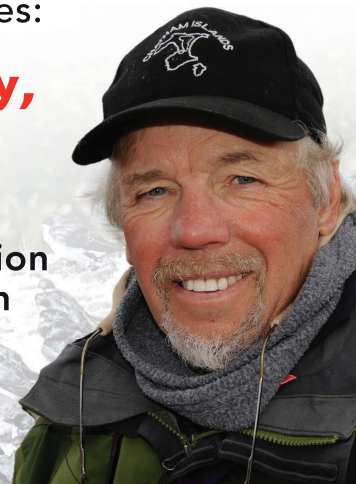
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