Evolving Paradigms in Nature Conservation

Deane Wang, Associate Dean and Chair, Natural Resource Planning Program

In the last two decades, ecology (landscape ecology in particular) has provided a growing body of evidence on the importance of analyzing ecosystems at multiple scales. The emerging concept of ecosystem management explicitly includes issues ranging from local to regional.

New concepts and frameworks for thinking about large scale systems are emerging as landscape architects, regional planners, landscape ecologists, and conservation biologist begin working together. Adrian Phillips, senior adviser to the International Union for Conservation (IUCN) World Heritage Programme, described one of these evolving concepts for conserving Category V Protected Areas, in a recent visit to the University of Vermont. Included in the description were words like "local communities," "sustainability," "economics," and "stakeholders." We've come a long way from "national parks" as protected enclaves without people in them. (See the lecture at www.uvm.edu/conservationlectures)

The future of conservation in the U.S. and the world will be challenging and changing. While the specific tools and the political means to achieve conservation continue to evolve, one thing remains clear—practitioners of conservation will need to be more adaptable and interdisciplinary than ever before. Our Current Ecological Planners are working on research projects ranging from 45-18,000 acres. To be effective, our Ecological Planning curriculum will need to continue to keep pace with new ideas from many fields. Balancing fundamentals with general tools and integrative perspectives will always be a challenge. No two year experience can complete the impossible task of completely preparing students but I believe our initial educational philosophy—to learn about learning, to learn in the field, and to learn by doing in an environment where learners challenge each other—is still the right one.

As each new EP team takes to the field and the classroom, I'm continually impressed by how much they take control of their own learning and guide the future of the program. I am eager to know what we will be doing 10 years from now... and wondering what we will be calling Ecological Planning.

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ECOLOG

Newsletter from the Ecological Planning students, School of Natural Resources, University of Vermont
Spring 2003

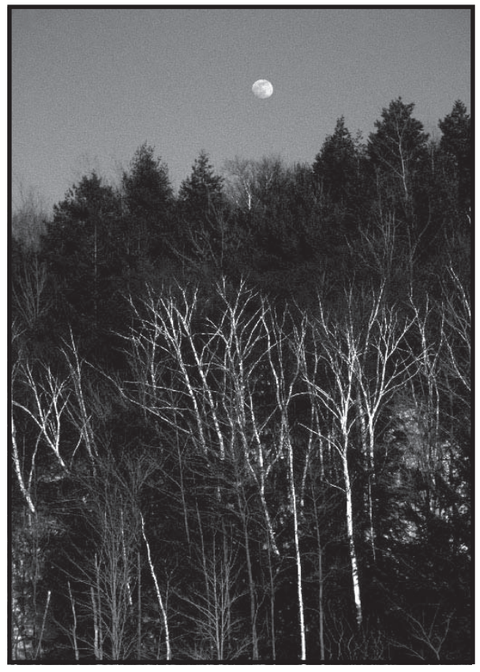
Volume 4

Reading a Frozen Landscape

Brooke Wilkerson EP⁴

Landscape Inventory and Assessment is the cumulating course for first-year Ecological Planners and Field Naturalists--a team's chance to put their skills and training to work to address a local conservation issue. Ed.

Scanning the frozen pond and surrounding woods, I mentally itemize the hundreds of tiny pieces that must be assembled into a coherent and compelling story over the next few months: geology, soils, natural communities, vegetation, wildlife, aquatic flora and fauna, human history, economic uses, and recreation impacts. Six of us have been hired by the town of Milton to conduct an ecological inventory and assessment of its 335 acre municipal forest over the course of one semester. It is a daunting task. Peter and I are out for our first day of field work; the temperature is 2° F, and we're standing on two feet of snow. The wind whips across the open expanse of the pond and numbs any thoughts I have beyond "fire…woodstove…hot chocolate…."



We duck behind a dense stand of hemlock, orient ourselves with the aid of an aerial photo, and get to work. Our goal for the day is simple; we will map the trails on the property using GPS. At least, our goal would be simple if there weren't so many

see Landscape, page 11

Plants and People: In Search of Place and Belonging

Kerstin Lange EP³

"Sense of place", "sense of belonging"—phrases so popular that I'd bet one of them will be named expression of the year by the Modern Language Association soon. It doesn't take a rocket (or field) scientist to figure out that they speak to a desire felt deeply by many people.

What does it mean to belong somewhere? And by the same token, what does it mean not to belong somewhere? Last summer, while inventorying the flora and fauna at the new VINS property along the Ottauquechee River, I asked myself these questions from a botanical perspective. I quickly found myself in the midst of the whole "humans and nature" question—the question that has followed me around for as long as I can remember. You see, of the 104 plant species I inventoried, 17 are non-native and are considered "invasives". Most are on lists with such unkind names as "rogues galleries," "New England's least wanted," and "dirty dozen." Vermont's Department of Agriculture has even quarantined several species, imposing fines if you import or propagate them.

That's serious, of course—and yet: Isn't "invasive" a rather harsh label? Who cares where a plant species came from, especially when the much bigger - at least more visible - problem seems to be the removal of

see Plants and People, page 10.

ECOLOG - Spring 2003

What is the EcoLog?

The Ecolog is the publication of the Ecological Planning curriculum of the University of Vermont's School of Natural Resources. The Ecolog is published once per year in the Spring semester. http://nature.snr.uvm.edu/ep

Editor: Jon Kart
Artwork/Images: Kerstin Lange, Tom Lautzenheiser, Bradley Materick, Josh Rapp

What is Ecological Planning?

Ecological Planning is the interdisciplinary study of how to apply ecology to policy and decision making. Along with the related disciplines of Ecological Design and Ecosystem Management, Ecological Planning addresses the question of how people can build a sustainable world that still includes people.

The Ecological Planning curriculum at the University of Vermont's School of Natural Resources is a concentration within SNR's Natural Resource Planning Program. Ecological Planning is an intense two-year learning experience that emphasizes teamwork, interdisciplinary thinking, and personal growth.

With most of its roots in hard field science, the Ecological Planning curriculum prepares students to assess landscapes though an ecology-colored "pieces-patterns-process" handlens--developing vegetation, soils, and natural community assessment skills. Students concurrently develop speaking, writing, and problem solving skills.

The curriculum's roots also reach into the social sciences. Students also take courses in land conservation, integration and natural resources planning, allowing students to create conservation solutions that address the complicated human side of many environmental problems.

Who are the Ecological Planners?

Ecological Planning has been a part of SNR since the year 2000. In 2001, one of the editors of this newsletter was confused about whether the phrase "first years" referred to the 2001 or 2002 cohort. So, we now say EP[1]=class of 2001, EP[2]=class of 2002, EP[3]=class of 2003.... Our sister program, the Field Naturalist Program in the Botany Department, uses letters. Thus the current FNs are the R- and S-Teams. This may be more than you wanted to know, but this is the only place you'll find it written!

A day in the field with master naturalist Liz Thompson beats...just about anything.

Landscape, *continued from page 1*

distractions. We've only traveled fifty feet when small pawprints intersect our trail. Peter pulls out a ruler and drops to his knees to measure the width of the track. Though the prints are fuzzy in the deep, dry snow, we make an educated guess: fisher. Further along the trail, the tracks intersect our path again. This time, scat accompanies the paw prints; it looks to be about the right size and shape for a fisher, and it's filled with hair. We confirm our educated guess.

Fisher? Martin? Hare? Raccoon!

At the southern edge of the pond, the trail continues east, away from the water. We snowshoe up a small ridge, and the landscape begins to change. At first, the signs of change are subtle; white pine becomes more dominant in the forest cover. Then other signs jump out at us: an old butternut riddled with woodpecker holes, the gnarled shapes of old apple trees deep in the woods. At a trail intersection, we notice the last remains of barbed wire protruding from deep within tree trunks. A row of sugar maples leads downhill, and we follow it. At the base of the hill, next to a beaver meadow, is an old foundation barely visible under the drifts of snow. I take a GPS point at the site, then put the unit back in my coat – the colder it gets, the slower it works. The same is true for my hands. Peter takes brief notes on what we've seen.

The sun is low on the horizon, and with the lure of hot chocolate firmly planted in our minds, we begin our trek back to the car. Peter's beard is frosted by his own breath. My eyelashes begin to knit together with tiny crystals of ice as we cut across the blustery pond to shorten our trip back. This is the first of what is sure to be many trips to Milton's municipal forest. As our base of knowledge about the site grows, we will assemble the bits and pieces of information we've collected into a vivid and telling story that will connect the past, present, and potential futures of this piece of land.

Hitting the Road EP/FN Style

Kendra Schmiedeskamp EP[4]

The email from Dr. Deane Wang said to meet at 8:00 a.m. at the Aiken Center loading dock. So there I was, on a warm Sunday morning in August, ready to join the other new Field Naturalists and Ecological Planners for our first adventure together—Deane's summer field course on ecosystem and landscape ecology. I self-consciously heaved my gear up onto the dock. I had a full pack, festooned with a Therma-rest, boots, and a sleeping bag. What if the other students were John Muir-types, content with just the clothes on their back and a tarp to sleep under? My fears left me as each student arrived and added their share to the growing mountain of gear. After a brief introduction to the course, we organized cooking utensils and loaded the botany van. We worked well together, each person taking on a role and helping others when needed. It was a good sign.

The class was a tour of landscape ecology at breakneck speed. To save time, we watched videos about ecology as we drove in the van on winding mountain roads. Regan Brooks rode with a piece of paper against her stomach, a family cure for motion sickness. On our hikes, every moment was filled with discussion. On Mt. Mansfield, we debated the issue of reserve size as we slid down slippery rocks and got tangled in tree roots. Deane encouraged us to look at ecosystems in a new way, to concentrate on the flow of matter and energy in the system. When we visited the Hubbard Brook Experimental Forest and the Wolcott Research Forest, we evaluated the studies being conducted there with this new conceptual framework. Each night, we would read and write until our tired brains fizzled. "Am I getting it?" I would ask myself after a hard day of seeing and thinking, of struggling to put the pieces together. Trying to understand the natural world and our place in it is a daunting task. On the bright side, I knew one thing after five days of eating, sleeping, and learning alongside Deane, Brooke, Kristen, Peter, Bradley, and Regan—I was in good company.

In just a few short months EPs learn to size up any landscape.

Plants and People, *continued from page 1*

vegetation in favor of shopping malls, roads, and residential subdivisions? And if the plants are invasive, what about the people? Where does anyone belong, plant or person?

I, for one, am certainly non-native here, coming from the same part of the world—Europe—where many of the plant species on those lists originated. In fact, don't we all come from somewhere else, ultimately? Many of my fellow Vermont residents came here from New York, New Jersey, and other places around the country; their ancestors, from all corners of the globe. Even the ancestors of the remaining Abenaki—the "original" Vermonters—came across the Bering Strait in a seemingly distant past; only they came tens of thousands of years ago, rather than a few hundred years or less. Isn't it part of the human story to be from somewhere else? If we celebrate our diverse cultural backgrounds, why not welcome a fresh infusion of plant species? Plants, after all, have migrated for as long as they have been around, too.

But of course, not all migrations are the same, and not all non-native species are invasive. Time and scale are important. The effects of invasive plants have only become large-scale problems since their rate of movement has sped up to the point where ecological processes can no longer keep up. In our ever-expanding travels, humans have become a veritable FedEx service for plants, conveying them to the farthest corners of the earth—sometimes on purpose, sometimes unwittingly. True enough, many species become naturalized and, with some ecological adjustments, become integrated


KL

components of their new ecosystems. Others, having left the predators they contended with in the places where they evolved, spread out aggressively in their new homes and drive the extinction of native species and an overall loss of biodiversity.

So what are we to do, aliens and, often, invasives ourselves? What can we do about invasive plants and about our own invasive tendencies?

For plants as well as people, I see a great opportunity in the work required to restore some balance between native and non-native species: This work requires that people spend time on the land and get to know the vegetation. Rather than feeling like invaders, we can become stewards: Strangely enough, dealing with invasive plants can help us become native in the places we are now, whether we came from somewhere else or not. We can commit to a place, get to know it, and be at home in it. Bill McKibben once put it this way: "The best thing we can do for the planet is to stay put."


JR

What, though, about our globetrotting ways, our desire for new places? Marcel Proust wrote that the best way to travel is not to go to more places, but to have "other eyes". Seeing our favorite places with the eyes of observation not only deepens our sense of place and belonging, it may also just help us lead more sane and centered lives.

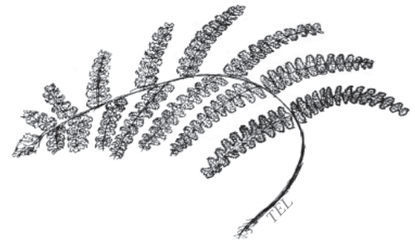
Master's Project 2003 Previews

Assessing convervartion value in NE Maine -Brooke Wilkerson

Brooke will spend the summer working with the Maine Natural Areas Program conducting ecological inventories in the Aroostook Hills and Lowlands.

This region, 2.5 million acres in size, covers the northeast portion of the state. Almost half the area is owned by timber interests, and more than half of the region is "unorganized townships," areas so sparsely populated that they have no local governance. Less than 3% of the region is in public or private conservation ownership, yet it is known for harboring several rare natural communities, including eccentric bogs and patterned raised bogs.

Brooke will assess relative conservation values of identified areas, enhancing the state's data set on rare plants, animals, and outstanding natural communities, and providing interpreted results to landowners, in addition to learning the best tactics for surviving swarms of black flies.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Natural Community Mapping in the St. Lawrence-Champlain Valley -Kendra Schmiedeskamp

Kendra will map natural communities for the Nature Conservancy in a matrix block in the St. Lawrence-Champlain Valley ecoregion. Because the 18,647 acre block is mostly under private ownership, one of the challenges of the project will be to communicate with landowners to gain access for necessary field work.

Kendra will also look at the relationship between patterns of natural communities and physical features in the matrix block. "But most of all," she says, "I'm looking forward to spending time in one place, watching it change through a growing season. For me, that is the ultimate treat of doing fieldwork."

Notes from Afield- *Where are the EP grads now?*

Ecological Planning grads are off doing wonderful things in wonderful places!

Elissa Arnheim (EP1) is back in beautiful Port Angeles, Washington. She's working for the USGS in Olympic National Park on a vegetation monitoring protocol development project: counting plants, wading through data, and thoroughly enjoying the park. She's also grant writing for the North Olympic Land Trust. She writes, "The steelhead are running and the salmon berry's blooming…come visit!"

Brian Carlson (EP1) is packing his bags for Marquette, Michigan, where his wife will complete her residency. Brian has been working at the Winooski Valley Park District in Burlington conducting reptile and amphibian surveys as well as working on management plans for two properties owned by Burlington. He's looking forward to Marquette and learning about a new place!

Jillian Liner (Butler) (EP1) continues her work with Audubon New York as their Important Bird Areas (IBA) coordinator. Recent work includes a second round of IBA site identifications, which involves soliciting grassroots nominations and performing a GIS assessment of New York's bird habitat. Life is good and only got better when she married Eric Liner this past fall in the Adirondacks.

Heather Fitzgerald (EP1) teaches Forest Ecology and Community College of Vermont and will begin teaching Practical Field Ecology for UVM's Environmental Program this fall. She doubles as a freelance journalist in her spare time.

Tom Lautzenheiser (EP2) is happy to report he has landed his dream job, helping land trusts, towns, landowners, and state agencies gather and understand natural history information, as a member of the Massachusetts Audubon Society's Ecological Extension Service.

Tess O'Sullivan (EP2) is an Ecologist/Conservation Planner for Lava Lake Land & Livestock. With the help of a Nature Conservancy ecologist, she developed a Conservation Plan for the company's sheep and cattle ranch that operates on 750,000 acres in central Idaho and has now been hired to implement the plan. She's also having a great time skiing, biking, and hiking in the big playground of Sun Valley.

Introducing the Current EPs

EP³ - Class of 2003

Jon Kart

For the past decade Jon has been working to protect threatened and endangered species and ecosystems in the Pacific Northwest. As a conservation lobbyist, he helped elected officials, land management agencies and the general public to see forest, riparian and high desert ecosystems in terms other than board feet of lumber, Kilowatts, or livestock feed units.

While he found it both challenging and rewarding to make change happen at the policy level, Jon now wants to translate that policy into on-the-ground improvements to ecosystems. To do so he realized he needed more training.

Jon saw UVM's Ecological Planning concentration as a natural choice. He hopes that that his understanding of our political system coupled with training in ecology and natural resource planning, will allow him to make contributions to the design and implementation of conservation strategies that are firmly rooted in sound science and have the political and social support to be implemented before they become moot.

Kerstin, Kendra, Brooke, Jon and Josh take a break in the sun.

Kerstin Lange

With graduation approaching and the question of "what's next?" gathering up momentum, Kerstin has been reflecting on her experiences as an EP. While she says that to really know what she learned here and what it all means will take several more years, certain themes stand out. First, learning the tools to "read" landscapes has refined her vision, in the sense of Marcel Proust's comment that the best kind of travel is not to go to more places, but to have new eyes. Hiking the Long Trail or looking at any landscape will never be the same with these "new eyes", Kerstin says. Knowing how to go about getting at questions like "Why is this place the way it is?" has made her appreciation of nature and natural history that much stronger. The EP curriculum has helped her develop those skills in an applied context, similar to the European apprenticeship system.

Second, effective conservation

species of shrubland birds whose populations are in steep decline.

The Nature Conservancy owns 365ha within the Barrens and wishes to preserve this exemplary pitch pine-scrub oak barrens community. Unfortunately, have been poorly studied and TNC needs to begin on a site conservation plan and adaptive management program within the year.

To better assess species distributions under these time constraints, I used several monitoring techniques to quantify bird and Lepidoptera abundances. To assess the distribution and habitat preferences of birds in this community, in particular, the eastern towhee (*Pipilo erythrophthalmus*) and brown thrasher (*Toxostoma rufum*), I used a spot-mapping technique. To better assess Lepidoptera occurrence and distribution, I sampled for moths using black lights and bait regularly through the spring and summer finding six rare species. Although data analyses are ongoing, these datasets should allow for better management recommendations for rare Lepidoptera and shrubland birds at the Ossipee Pine Barrens Preserve.

Time Travel in a Changing Landscape: Taking Stock of the Present, Tracing the Past and Imagining the Future at the new VINS Property

Kerstin Lange EP³

The Vermont Institute of Natural Science (VINS) 47-acre property along the Ottauquechee River in the town of Hartford (southeastern Vermont), as the future site of its headquarters and visitor center. Situated in easy walking distance from Quechee Gorge — one of Vermont's most dramatic natural features — the site is expected to attract over 100,000 visitors annually. In order to develop a sound management plan and maximize the effectiveness of its educational programs, VINS hired me to conduct a biological inventory and natural history investigation of the site, and to make recommendations for management, educational uses, and monitoring of the site.

After spending a number of rainy spring nights tuning my ears to the breeding calls of various frog species and checking pitfall traps for vernal pool-

breeding frogs and salamanders, I turned my attention to the vegetation and landforms. My goal was to get as complete a picture as I could of "the story" of this landscape in order to know not only "what's there" but also to understand what it means and how it came to be the way it is now. In the process of the vegetation inventory, I became closely acquainted with a number of invasive plant species: one of many legacies of intensive land uses over the past 230 years, including pasturing and gravel extraction, and of the altered flooding regime stemming from several dams along the Ottauquechee River.

My product for VINS is a set of maps showing the plant associations I identified, cultural features, existing and proposed trails and educational displays, and the occurrence of invasive plant species. In formulating my recommendations for management and educational programs, I focused especially on ways in which VINS can 1) multiply the effects of its conservation work and management practices beyond the boundaries of the 47 acre plot, 2) link the site to its existing educational programs, and 3) develop new educational programs both for transient visitors and for local and regional visitors.

Ecological Planning[3] Master's Projects

Ecological Community Classification and Mapping at the Lake Umbagog National Wildlife Refuge

Josh Rapp EP[3]

Land managers are increasingly relying on cover-type classification and mapping in the management of landscapes. Ecological communities are defined as interacting assemblages of organisms occurring together in a specific environmental setting. As such, they provide ecologically meaningful landscape-scale management units that can be used in managing land for the conservation of individual species and entire ecosystems.

The United States Fish and Wildlife Service (USFWS) has made ecological community mapping an integral part of their Comprehensive Conservation Planning (CCP) process for National Wildlife Refuges across the country. With support from the Trust for Public Lands and the USFWS, and field assistance from Tom Lautzenheiser (EP[2]), I mapped ecological communities on 18,000 acres in and around the Lake Umbagog National Wildlife Refuge using the National Vegetation Classification System (NVC).

A summer of fieldwork spent scrambling up and over steep ridges and slogging through swamps gave me an intimate knowledge of the diversity of communities packed into this exceptional corner of the north woods. Time spent staring at aerial photos and delineating community boundaries with GIS resulted in a map showing the extent and distribution of these various communities across the landscape. The refuge staff is now using this map and community descriptions in developing their CCP.

Since the NVC is still in development and has not yet been used extensively for community mapping, the question of how well it works for this application is of interest. By comparing the community classification of 100 randomly placed points assigned in the field with the map designation, I can provide an accuracy assessment the map. By analyzing the sources of error I can also evaluatelimitations of the NVC for ecological community mapping and make recommendations as to how it can best be used for this application.

Bugs, Birds and Burning Issues: Rare Lepidoptera and Shrubland Birds In The Ossipee Pine Barrens—A Challenge for Conservation Planning

Jon Kart EP[3]

The Ossipee Pine Barrens once covered an estimated 2,800ha in eastern New Hampshire. Habitat conversion has reduced the barrens to less than 1,200ha and habitat fragmentation and fire suppression have significantly degraded what remains. Despite this degradation and the continued threat of development, the Ossipee Pine Barrens is the last viable Pitch Pine-Scrub Oak Barrens in New Hampshire. It is also home to at least 15 rare Lepidoptera (moths and butterflies) and several

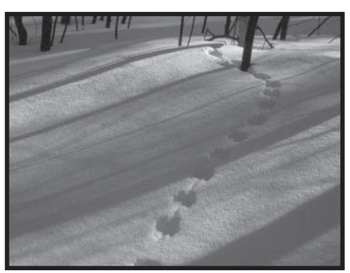
EP[4] - Class of 2004

Kendra Schmiedeskamp

Kendra recently moved to Vermont from Oregon, where she worked for a forest advocacy non-profit and The Nature Conservancy. Kendra studied environmental policy at the University of Michigan's School of Natural Resources and Environment. Her interest in both natural history and policy led her to the Ecological Planning Program

Brooke Wilkerson

Brooke comes to the EP program from mid-coast Maine, where she's spent the past four years researching international energy policy for a nonprofit, writing and editing a quarterly journal for educators in the Gulf of Maine watershed for an environmental education foundation, and farming. She attended Oberlin College where she was a double major in English and geology. Through the EP program, Brooke hopes to develop land conservation solutions that integrate thinking across disciplines.



Josh Rapp

At age seven Josh and his family moved from New Mexico to upstate New York via a circuitous route that visited 15 national parks. Though the long car rides have vanished from memory he has vivid recollections of staring across the expanse of Death Valley, climbing granite boulders in Yosemite, and exploring tide pools on the Olympic Peninsula. These early experiences planted the seed for Josh's love of beautiful landscapes.

During a course in the geology of national parks at Duke University, Josh became fascinated by landforms and the processes that create them. While geology gave insight into why landscapes look the way they do, a worldview limited to one discipline didn't satisfy him. He wanted a more comprehensive view that included the life above the rocks.

After graduation Josh set out to see more of the world for himself. Living, working, and traveling in as diverse places as Colorado, New England, California, Honduras, and Chile reinforced his love of landscapes, and fueled in him the desire to learn more about the natural world. "I've come back to school to focus on understanding how landscapes work by integrating pieces, patterns, and processes into a synthetic whole and to more effectively convey the wonder, beauty, and complexity of nature to others. My hope is that through understanding, people will develop an appreciation for the natural world that will grow into a determination to protect the beauty everywhere around us."

After graduating, Kerstin plans to share the tools and 'new eyes' she has gained with other people who want to deepen their sense of place and understanding of the land.

Costa Rica: Crossroads in the Plant World

Josh Rapp EP[3]

During the first three weeks of January 2003, 14 students joined Dr. Dave Barrington, professor of botany at UVM, for his 13th tropical botany field trip in Costa Rica. With Dr. Barrington as our guide, we set out to get a grip on the Costa Rican flora, an overwhelming experience for neophytes to tropical botany. For anyone who has struggled to key out the relatively few plant species in a woodlot in New England, the forests of Costa Rica present such diversity that it is hard to know where to begin. More than 9,000 plant species are estimated to be present in Costa Rica, a country the size of West Virginia.

Why is Costa Rica so diverse? Certainly its position in the tropics and the diversity of habitats created by a rugged topography and varied climate are big factors. But even these factors would not necessarily lead to such high diversity if it were not for the variety of sources from which plant

species have come to Costa Rica. Where have the plants of Costa Rica come from?

Some of the Costa Rica's plant immigrants came from points north. A first glance at the bark of 'roble blanco' might make one wonder if it is indeed the same white oak of eastern North America. Actually a

These roble blanco (white oak), each more than 4-feet in diameter and 150 feet tall, are found in the Talamanca range of central Costa Rica.

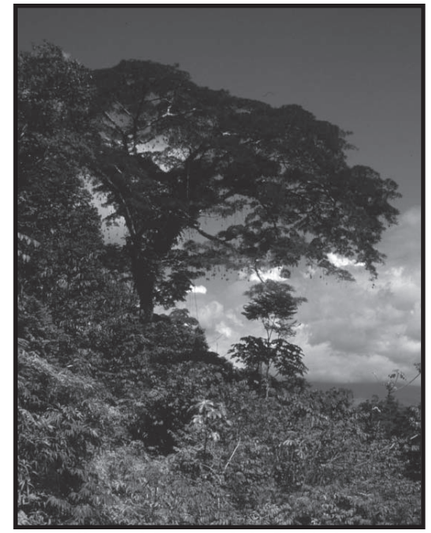
different species of the same genus (*Quercus*), it lives in mid- to high-elevation forests in Costa Rica.

The heath family *(Ericaceae)* is also familiar to New Englanders. Instead of residing in bogs and barrens, like our familiar blueberries, Costa Rican members of the heath family are often epiphytes, growing on branches of forest trees. Though these habits may seem very different, they can provide similar conditions for plant growth. Leatherleaf growing on a raised bog in New England and an epiphyte growing in a cloud forest in Costa Rica both have to live in challenging conditions, without the benefit of mineral soil. Instead, they must draw all the nutrients they need from rainwater or the decaying organic matter around them. This specimen of the genus *Cavendishia* has a tuber that can store water and nutrients for the lean times.

This heath, Cavendishia, *is a epiphyte that grows on trees such as the the roble blanco.*

As surprising as it was to see plants similar to those in North America in Costa Rica, I was just as surprised to recognize plants like those I'd seen during travels in southern latitudes. The genus *Gunnera* is found in the cool and wet forests of mid-elevation montane regions of Costa Rica, a climate strikingly similar to coastal southern Chile, where a different species of the genera grows. In both cases these fast growing plants colonize disturbed areas, such as landslide scars and road cuts in the mountains of Costa Rica, and sea-side bluffs and dunes in southern Chile.

Gunnera *leaves can be more than three feet across.*



Bat pollenated flowers of the Parkia *hang pendant-like below majestic branches.*

The Osa Peninsula in southern Costa Rica receives its weather from South America, and many of its plant species as well. But instead of harboring species from the Andes, the rainforests of the Osa have an affinity with Amazonia. A legume of the genus *Parkia*, is found in the Amazon Basin and in Africa, a fact that hints at another biogeographic story. This species became established before South America split from Africa 100 million years ago and has been a canopy tree in the majestic rainforests of both continents ever since. Its migration to Costa Rica has been a much more recent event, occurring only during the past 3 million years, when Costa Rica linked up with South America.

Though too geologically young to have had a chance to develop a truly unique flora, Costa sits at a crossroads between two continents, allowing plants from North America, the Andes, and Amazonia to coexist in a small, but surprisingly diverse country.