



Discoveries

News and Views from Discovery Southeast Winter 2003

A deer's map of the forest

Richard Carstensen

Deer pay attention to the forest. As seasons turn, spring greens toughen, summer thickets flourish, fall lilies fade, and winter drifts migrate. A forest that provides for deer in July may withhold in December. Stands that feed survivors through the storms of March have little appeal in May. Deer are gypsies, with no insurance policy thicker than the fat on their backs, or more reliable than their understanding of forest variation.

Eating venison, we tap the Sitka black-tail's long-evolved familiarity with the temperate rain forest. For the most part, we are blind beneficiaries. As hunters and steak-flippers, we may sidestep the price of botanical illiteracy. But as loggers, conservationists, foresters, voters - as deciders of the fate of the forest - our ignorance is costly. We need lessons from deer, bear, goshawk, murrelet. We need a map of the forest that explains more than simply how many houses it can build.

The Southeast Alaska Forest Diversity Workshop In October 2002, I joined a 3-day workshop facilitated by John Schoen of the Audubon Society. US Forest Service biologists included John Caouette, Eugene DeGayner and Winnie Kessler. From the Alaska Department of Fish and Game we had Matt Kirchhoff, Dave Person, and Moira Ingle. Out-of-state forest aficionados included Paul Alaback (University of Montana), Marc Kramer (NASA), and Jim Stritholt (Conservation Biology Institute). Representing the Southeast conservation community were Bruce Baker (SEACC), Page Else (Sitka Conservation Society) and Brian McNitt (Alaska Rainforest Campaign). Our goal was to find a way of describing and mapping forest diversity that all could agree upon, as a first step toward tackling urgent conservation challenges, especially the protection of increasingly rare stands of large, old trees.

It occurred to me later that many of us had learned our forest ABCs under the mentorship of deer. Kirchhoff and Schoen are best known in this regard, coauthors of many papers on deer/forest relationships. Dave Person shared results of his studies of deer/wolf dynamics on intensively logged and roaded landscapes of Prince of Wales Island. Gene DeGayner has tracked the annual movements of telemetered deer through the forest mosaic of Mitkof Island, involving high school students in his work. For me, a forest without deer is as empty as a forest without trees.

Foresters have traditionally portrayed the Tongass with timber type maps. These maps paint the forest in shades of yellow and green delineating volume classes; the more wood per acre, the darker the green. Ranger

Districts use these maps to plan and defend timber sales. Researchers use them in wildlife studies. Environmentalists use them in lawsuits.

Timber type maps have a reassuring simplicity. Anyone can read them at a glance, the eye sweeping the archipelago and easily locating the darkest green pixels, the "most valuable forests" for both timber yield and, presumably, for fish and wildlife habitat.

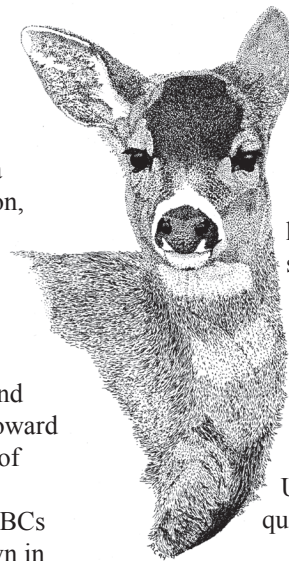
But as with most simple solutions to complex problems, timber type maps stumble. Volume alone fails to capture many important forest qualities. Although we've come to use the term "high volume forest" as synonymous with a forest of big trees, there are actually many kinds

of high volume. The highest volume one-acre stand I've measured, at 170,000 gross board feet, had *no* truly large trees, only medium-sized tall spruces packed closely together. Some of these densely stocked high-volume forests are so shady they offer little forage for deer.

The deer forest Matt Kirchhoff and Thom Hanley have developed a "quick cruise" for assessing winter deer habitat.

Using their procedure, you can quickly assign a score to a patch

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From the director

Larry West

Transitions can be scary or exciting, predictable or clueless, uneventful, or epic. To a degree, Discovery Southeast has been in transition since it was established in 1989, and all of these adjectives have applied at one time or another — sometimes all at once!

In the beginning, Discovery Southeast put adult Juneau residents in touch (literally) with their natural world, but it quickly became clear that the benefits of nature education—personal appreciation and enjoyment of nature, and the sense of responsibility that grows with understanding—accrue best if the experience of nature begins early in life. Fourteen years later, Discovery Southeast's programs now reach all ages, not only in Juneau but in communities from Wrangell to Haines.

Along the way, our work has been enhanced by our own education. The time we spend outside ourselves—however casual or purposeful—adds fresh information, experience, and perspective that, through us, enlightens others. Lately, we have begun to formalize our professional development in new ways, chiefly by getting involved in a variety of research projects. Government agencies, municipal authorities, and other nonprofits increasingly look to Discovery Southeast naturalists for authentic, accurate, up-to-date information about nature. By applying keen, skilled senses and a wealth of experience over time, we're gathering information that can be used to benefit both the people of Southeast Alaska and the natural world around us. You'll be hearing more about our research projects in the near future.

Our upcoming summer programs will once again include the Admiralty Teacher Bear Expedition—an extraordinary opportunity for teachers to develop ideas and projects for learning in a variety of curricula, all oriented around what they learn during a week with bears and bear experts. For kids, our popular Outdoor Explorers program in Juneau has been expanded to six weeks this coming summer — three week-long day-camp programs each for kids ages 7-9 and 10-11. If you'd like more information or to register your child(ren), please call the office.

As you might expect, the growth we're experiencing comes at a cost. We're finding out that while opportunities seem unlimited, funding and human resources clearly are not! Discovery Southeast's budget has gone from \$190,000 last year to nearly \$300,000 this year. Much of the increase is due to our Creek Stewards program for middle and high school students, and to our research projects; funding for these is secure and comes largely from grants. However, some grants require matching funds — a demonstration that the community supports our work — which means we must raise approximately \$30,000 more this year than last.

We are deeply grateful to all of you who contribute time and resources to Discovery Southeast, and we want you to know that in times of transition, your feedback is every bit as important as your other contributions! Please don't hesitate to call with questions, comments, or suggestions.

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Discoveries is published by *Discovery Southeast*, Southeast Alaska's leading source for natural history and conservation education. Founded in 1989 in Juneau and serving communities throughout Southeast Alaska, Discovery Southeast is a nonprofit organization that promotes direct, hands-on learning from nature through natural science and outdoor education programs for youth, adults, and teachers. By engaging youth and adults in the study of nature, Discovery Southeast naturalists deepen and enrich the connections between the people of Southeast Alaska and nature.

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Discovery News

Larry West

Bear Education

The easiest way to train a bear is to teach people! At least that's the assumption Discovery Southeast and The City and Borough of Juneau are operating on. Careless disposal of garbage and storage of food products is a natural and irresistible temptation to bears that often leads them into conflicts with people. This is the second year that CBJ has asked us to offer a bear education program to every K-6 child in the Juneau School District — with the hope that children will in turn educate their families. In addition to learning about bears themselves, the kids will learn how best to ensure safety in bear encounters and how to avoid conflicts with bears by handling garbage and food responsibly.

New People at DSE

Discovery Southeast welcomes one new board member and two new apprentices. Catherine Connor, Associate Professor of Geology at UAS, will join the board of directors, and Kristine Martin and Jason Fellman will be assisting with Nature Studies and our Bear Education program for the Juneau School District.

Nature Studies Expands in Haines and Wrangell

I'm excited to report that the communities of Haines and Wrangell have seen their Nature Studies programs grow from once- or twice-a-year field trips to three-season programs for 3rd through 5th grades. This has become possible because we've found outstanding naturalists in those communities (Tim Shields, Megan Sherman, and Judy Hall in Haines; Vena Talea Stough in Wrangell) to do the work, and the communities themselves have been very supportive.

Thanks to contributions from the Nolan Charitable Trust (carried forward from 2002, when our program in Wrangell nearly ground to a halt), from the Wrangell Volunteer Fire Department, and from residents and other businesses, our programs at Evergreen Elementary School are entirely self-supporting. The same is true for Haines, where Howser's IGA, the Alaska Sportshop, Lynn Canal Conservation, and a growing group of supporters have made Nature Studies possible at Haines Elementary School. Community support ensures growth and sustain-

ability — our strongest desires for nature education.

On the horizon, several other communities have expressed interest in Discovery Southeast programs, including Sitka, Tenakee Springs, Port Alexander, Skagway, and Klukwan.

Cross-Cultural Nature Education

Discovery Southeast is anxious to develop cross-cultural opportunities for nature education throughout Southeast Alaska by combining our scientific approach to learning with traditional Tlingit ways of knowing. If you'd like to help, Discovery Southeast is seeking interested and qualified individuals who can share traditional knowledge of the natural world and help us to integrate Tlingit perspectives into our science-based understanding of natural things. Please call director Larry West at 463-1500.

Vanderbilt Creek Crew

Nonna Shtipleman

If you came to Discovery's Members Meeting last November, you probably remember Becky, Andrew, Kristopher and Stephen, the new Vanderbilt Creek crew from DZ's Spruce House. Together we spent 7 weeks last fall wandering around the watershed, getting the lay of the land and looking for the sources and consequences of non-point source pollution.

We'll continue our efforts this spring and look forward to working with Spruce House 6th graders. These bright, curious kids are the future of the project. If you're interested in Vanderbilt Creek — an amazing, important, and yet all too easy to overlook salmon stream — join us as we map, monitor and explore the watershed, learning as we go. We hit the creek mid-April.

If, however, you're interested in watching experts at work, join the Cedar House 8th graders as they whiz through 6 water quality indicators: pH, dissolved oxygen, iron floc, flow, air and water temperature. Some, like Levi Benning, have been Vanderbilt Creek Stewards for 3 years — long enough to teach *us* a few things about working, learning and laughing with middle school students. We'll focus on outreach this spring — on sharing their years of findings with the community.

As we gear up for our last few weeks together, before summer break and high school next fall, we would like to say THANKS!!! to outgoing 8th graders for their hard work and inexhaustible sense of humor, their genuine interest in restoring a small but important salmon stream, and their enthusiasm for sharing what we learn.

even great explorers sometimes lose their shoes



A decorative border surrounds the central text area, featuring various line drawings of natural objects. At the top, from left to right, are a piece of wood, a seed, a shell, a leaf, a stick, a pinecone, a spotted stone, and a dandelion seed head. On the right side, from top to bottom, are a mussel, a pinecone, a seed, a four-leaf clover, a feather, a shell, a pinecone, and a leaf. At the bottom, from left to right, are a stick, a bean, an apple core, a feather, a shell, a pinecone, and a leaf. On the left side, from top to bottom, are a piece of wood, a seed, a shell, a leaf, a pinecone, a mussel, a seed, a four-leaf clover, a feather, a shell, a pinecone, and a leaf.

Kids' Page

Duplication

Do you have a good memory? Are you a good observer? Practice your observation and memory powers with this naturalist game for kids, adults, and families.

Players: 2-8

Equipment: Two large bandannas

How to Play:

Before the game begins, one player (the "leader") gathers 5-15 different natural objects (feathers, stones, cones, seeds, leaves... be creative—try to gather some things that will be easy to find, and others that will be harder) The rest of the players don't watch.

After gathering the objects, the leader arranges them on one bandanna and covers them with the other bandanna—then calls the other players. All players gather around the hidden objects. The leader lifts the top bandanna and gives the players one minute to study them. Players should pay careful attention not just to what kind of objects are there, but also to their shapes, colors, and sizes.

The leader re-covers the objects, and each player now searches for a duplicate for each object. Players should try to find duplicates that are as similar as possible to the original object: for example, if the leader has put out a rounded granite stone, players should try to find a stone that is similar in shape, size, and substance.

At a pre-arranged signal, players gather around the bandanna, bringing their duplicates. Leader takes one object at a time from underneath the bandanna, and players show their matches.

Who remembered the most objects? Who found the most duplicates? Whose duplicates were the closest to the originals?

Play again, with a new leader!

continued from page 1

of forest, rating its ability to support deer in winter. Half of the score relates to availability of food, the remainder to how the forest deals with snow. A very high-scoring forest has abundant low-growing ever-green forbs like bunchberry, five-leaved bramble and fern-leaved goldthread (see p.9) beneath a thick shrub layer of blueberry. It should face into the low winter sun, sloping at more than 15°, with no high shadow-casting ridges to the south. It should be within a half mile of the beach and less than 500 feet in elevation.

The Kirchhoff/Hanley quick cruise focuses on “heavy-winter” deer habitat. In times of deep snow, most surviving deer pack into the relatively few forests that earn high scores by this assessment. Obviously, these stands should be on our forest map. But we also need to map the May fresh-sprout forest, the August montane parkland forest, the November peatland rutting forest, and the mild-winter scrub forest, where dispersed conifers and abundant light encourage thick, brushy understories. None of these forests are effectively portrayed on timber type maps based solely on volume.

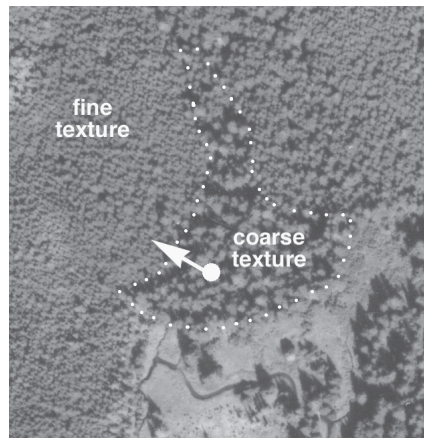
Beyond volume The problem with volume has been bugging John Caouette for about 5 years. John is a statistician with the Forest Service, assigned the daunting task of drawing a defensible forest map. He is also a core member of the Landmark Trees Project, an effort to document and understand Alaska’s remaining patches of giant spruces. Of the many forest assessments we’ve done together throughout the Tongass, Juneau’s Mayfly Creek stands out as a pivot-point in John’s thinking.

Mayfly Creek is a small stream that passes through the Methodist Camp at Eagle River. Here we established Landmark Tree site #19 on an 8-acre deposit of well-drained gravel and cobbles. Such “alluvial fans” develop at the base of steep slopes where streams dump their load. On nutrient-rich alluvial fans and riverside floodplains, large spruces usually thrive, at least until the chainsaws arrive. The Mayfly fan is one of the last unlogged fans along the Juneau road system.

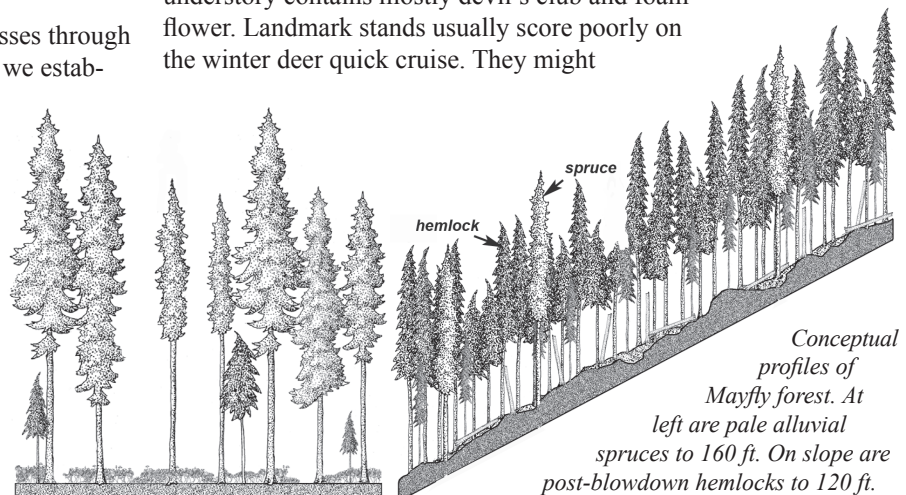
From almost anywhere on Mayfly fan, you can see beyond the 3- to 5-foot-diameter spruces to a surrounding



Above: Big spruce-devil’s club-alluvium community in foreground, 81 mbf (thousand gross board feet). Arrow in background shows young hemlock-blueberry blowdown forest on upland slope, 82 mbf. (You can find a 3D image of Mayfly Fan on page 4 of the Fall 2000 issue of Discoveries, at coordinates B-14) **Left:** Air photo of the small alluvial fan on Mayfly Creek. Large spruces are widely spaced, shady gaps resulting in “coarse texture.” Surrounding hillsides were blown down in 1883. Recovering even-aged forest of closely spaced, same-sized hemlocks has “fine texture.” Dot and arrow shows photopoint for view above.



upland forest of closely spaced 1- to 2-foot-diameter hemlocks. In 1883, a massive storm leveled almost the entire hillside, and the little subcanopy hemlock saplings not crushed under the jackstrawed previous forest have since grown into a tight, same-aged stand. Because the slope faces southeast into the sun, it’s less shady than most similar “blowdown forests.” Bunchberry, five-leaved bramble and fernleaf goldthread – the winter deer plants – are common on the forest floor. Cover of blueberry shrubs is about 20%. Down on the spruce-dominated fan, such winter forage species are scarce. This typical Landmark Forest understory contains mostly devil’s club and foam-flower. Landmark stands usually score poorly on the winter deer quick cruise. They might



Conceptual profiles of Mayfly forest. At left are pale alluvial spruces to 160 ft. On slope are post-blowdown hemlocks to 120 ft.

instead be named the “big spruce-devil’s club-salmon-eagle-bear forest.”

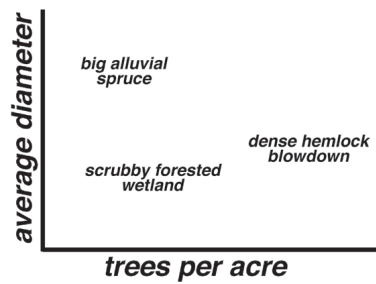
The textbook-clear juxtapositioning of forests at Mayfly Creek solidified John Caouette’s opinion that we need to move “beyond volume.” The upland and alluvial forest types both measured about 80,000 gross board feet, yet structurally they could hardly be more different. Researching systems of forest classification elsewhere around the world, John found an alternative standard – the relationship of average tree diameter to stand density. Mayfly’s Landmark spruce forest had large diameters but low density, while the upland hemlock forest had small diameters at much higher density.

Slowly, John and his Forest Service colleagues like Gene DeGayner began to cobble together a new forest map based on tree size and density. Because foresters can’t possibly go out and physically measure the 7 million or so acres of mature forest in Southeast, the maps are only predictive models. They employ more easily quantified factors like canopy texture, slope, soil moisture and aspect to make educated guesses about size and density. Unlike the timber type maps with their one-dimensional yellow-to-green volume gradients, the newer two-dimensional “size-density” maps have a kaleidoscope of primary colors. It takes a while to get used to them. But I like to think that they come a few steps closer to a deer’s map of the forest.

Wind and topography Another participant in our Forest Diversity Workshop was Marc Kramer. I first met Marc on a small island in Rocky Pass, south of Kake, where he spent 4 intense years of dawn-to-dusk field work and late-night data entry. Marc’s study focused on wind disturbance to the forest, and its relation to topography. He selected 4 mini-watersheds on opposing sides of a low ridge, and measured literally every tree. He climbed and instrumented trees, dug hundreds of soil pits, and drilled countless trunks with a chainsaw-powered increment borer to learn tree ages. I doubt that any forest in Alaska has been so painstakingly quantified.

Standing on the ridge top separating Marc’s watersheds, you witness another textbook-clean border between forest types. On the gale-exposed south side are even-aged, densely stocked hemlocks that date to a storm in the 1920s. Soil pits reveal pale, fluffy, churned soil from millennia of vigorous uprootings. Trees are growing 2 feet per year. The dense, closed canopy of this “teenaged stand” admits little light. Few understory plants are yet available to deer.

On the protected north side of the

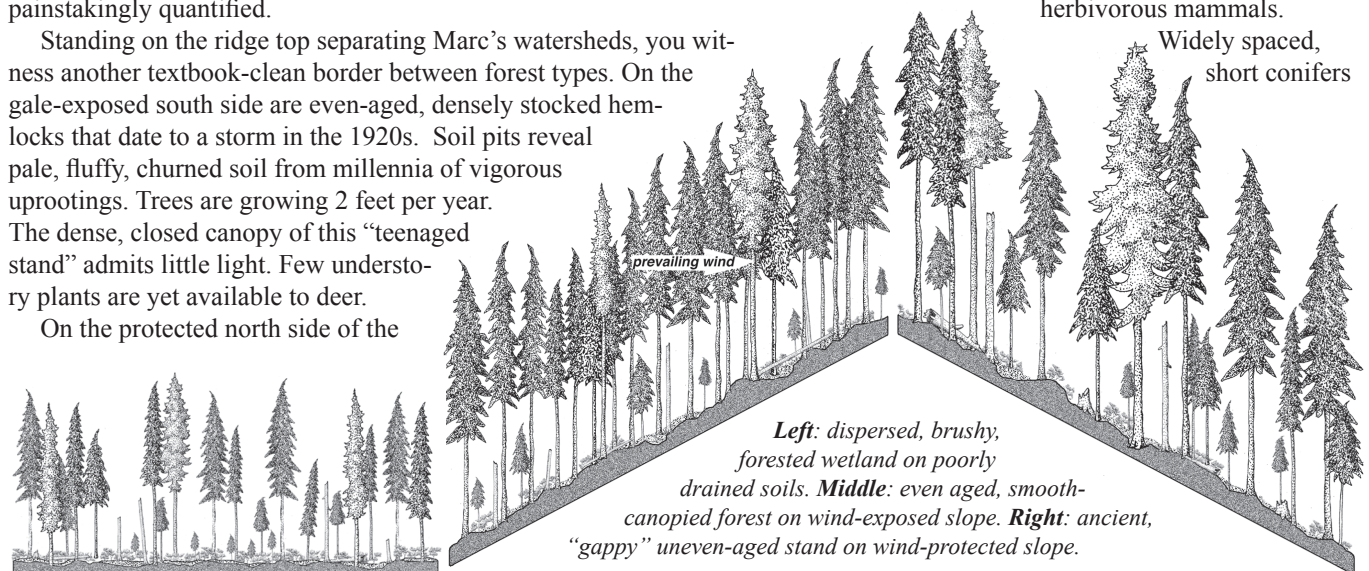


ridge, Marc found spruces nearly 1,000 years old. Canopy structure is complex and multi-layered. The soil is compacted, leached and greasy, with distinct horizons of different colors. Tree growth is extremely slow.

Forests at risk At our Forest Diversity workshop in October, two special forest types emerged as most in need of immediate attention. One is the big-tree forest. Giant spruces grow not only on alluvium but also on karst surfaces (soluble limestone and marble bedrock). The majority of our alluvial big-tree forests have been cut, and the once-great karst forest of even larger trees has been virtually extinguished.

The second forest-of-concern is the truly ancient hemlock-dominated old growth that develops over millennia on upland sites protected from stand-replacing disturbance. Originally, such forests held little interest for loggers because of the prevalence of rotten and diseased trees, and the lower value of hemlock. But as the last available bottomland spruce forests disappeared in the 1980s, logging shifted to the upland slopes. Unlike alluvial and exposed-slope windthrow forests, the ancient hemlock forests are slow to regenerate. Logging here is environmentally and economically inappropriate.

Other forest types may be just as important to wildlife as the big-spruce and ancient hemlock stands, but are less directly threatened by human activities. On poorly-drained lowlands such as the raised marine benches rimming Douglas Island, forested wetlands predominate. These scrubby stands are unattractive to loggers, developers and human bushwackers, but valuable for many herbivorous mammals.





Marc Kramer and John Caouette with a slow-growing 800-yr-old spruce on the lee slope of Marc's study site.

admit plentiful light to the understory, resulting in prolific blueberry/menziesia thickets and heavy green carpets of winter deer forbs. During light-snow winters like the current one, deer spend a lot of time in these forests.

Structural diversity The ideal landscape for deer is a diverse mosaic of forest and wetland types, offering something for every season and in winter's constantly varying snow depths. Diversity of tree species in Southeast Alaskan forests is comparatively low, but *structural* diversity - both within and between stands - is rich. In coastal landscapes to the south, like Washington and Oregon, higher productivity resulted (before logging at least) in more uniformly forested country. At our more northerly latitudes several factors lead to a finer-grained mosaic of forest, wetland and montane habitats:

- 1) Infrequent summer drought north of Vancouver Island results in widespread peatlands. In an extreme form this means open bog and fen, grading to a sparsely treed woodland of pine, cedar and hemlock, thence to scrubby forested wetlands.

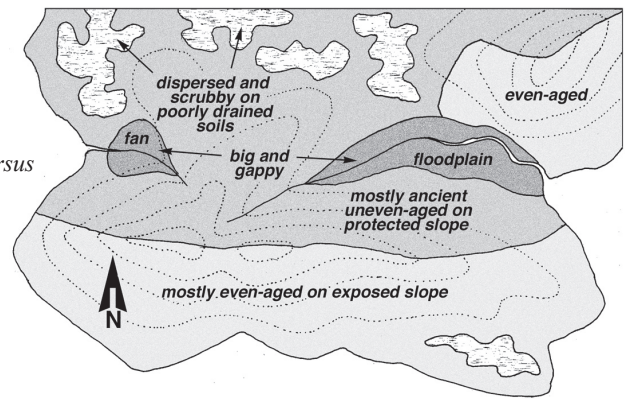
- 2) Periodic gale-force winds paint a contrasting pattern of fine and coarse-textured canopies (with associated understory changes) on exposed and lee sides of ridges.

- 3) Cooler climate means lower treeline. Consequently, deer and other wildlife can quickly move from lowland forests up into montane parkland and succulent subalpine meadows only a few thousand vertical feet away.

- 4) Our extremely dissected shore-

Structural diversity on Prince of Wales. Forested wetland at lower left contrasts with tall, gappy, alluvial spruces in upper right

Hypothetical forest mosaic on exposed versus lee slopes, and on well drained versus poorly drained soils. Direction of major stand-replacing storms is from the south.



line means that no point on land is more than a few miles from coastal marshes, uplift meadows, and - on the outer coast - unique "salt-spray forests."

Forests on the edge In recent years I've developed a strong bias for landmark-caliber forests of 6- to 10-foot diameter streamside spruces. But as with automobiles, bigger is not always better. Before my detour into "landmarking," the forest types that most excited me were more spartan. Two stand out in particular. One fronts the open ocean; the other perches at the altitudinal limit of tree growth.

My first open-sea paddling was off the outer coast of Chichagof Island with former Discovery naturalist Dave Lubin. Davey, a more experienced kayaker, calmly led us into waves draped with thick white foam that reminded me how deeply I love the land. That evening, safely camped above a storm beach stacked with impact-shredded driftlogs, we went botanizing.

The outer coast forest had a multisensory magic. Roar of surf and smell of sea spray followed us well into the bonsai woodlands. Gnarly, lichen-hung pines and yellow cedars gave way to pure spruce forests with a startlingly unusual understory of hummocky Nootka reedgrass. We circled back to a sea cliff looking out to the pale albite lumps of the White Sisters. Deer trails wove between grass tussocks. I wrote in my



Mountain hemlock parkland at 2500 feet on Admiralty

field notes that this was the prettiest forest I'd ever seen.

Of course I was biased by adrenaline; I was alive, after a day of big waves, in country few are privileged to walk.

My reaction to mountain hemlock parkland may be equally subjective. But it has less to do with fear and novelty than with a 35-year devotion to high places.

On a transect from beach to alpine summit, winter snow depth is greatest at the halfway point, where montane forest becomes sprinkled with ferny glades, then breaks into tree islands encompassed by delicious subalpine meadows. Slow downhill "snow creep" over broken topography prunes woody stems from the meadow swales, perpetuating the mosaic. This is the deer forest of July and August, where 20-hour sunlight releases a flush of deer cabbage and twisted stalk. Deer scats are almost liquid, from the steady diet of tender greens. Some deer essentially follow spring up the mountainside, never far from a melting snowpatch until the first fall flurries descend. The great Southeast ridge-walker Jay Williams claimed that this is why Alaskan venison is the best tasting in North America.

A deer's map of the forest is all about "edges." For a hundred-pound herbivore that could mean the edge between an elfinwood storm shelter and the nearest choice subalpine meadow herb. Six months later it could



mean the ragged quarter-acre windthrow gap in old-growth forest, beneath which evergreen forbs flourish at close proximity to snow-intercepting canopy.

In early winter, after a long day of tracking deer through snow, I slip into the bag at night, close my eyes, and smile. Against my eyelids a forest slowly appears - big trunks on undulating upland slopes. There, burning amongst them, stands the animal I've been hoping for, who gives me the forest, like stars best seen obliquely.

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Discovery Southeast members receive our quarterly newsletter, Discoveries, discounts on adult-education workshops, and notification of

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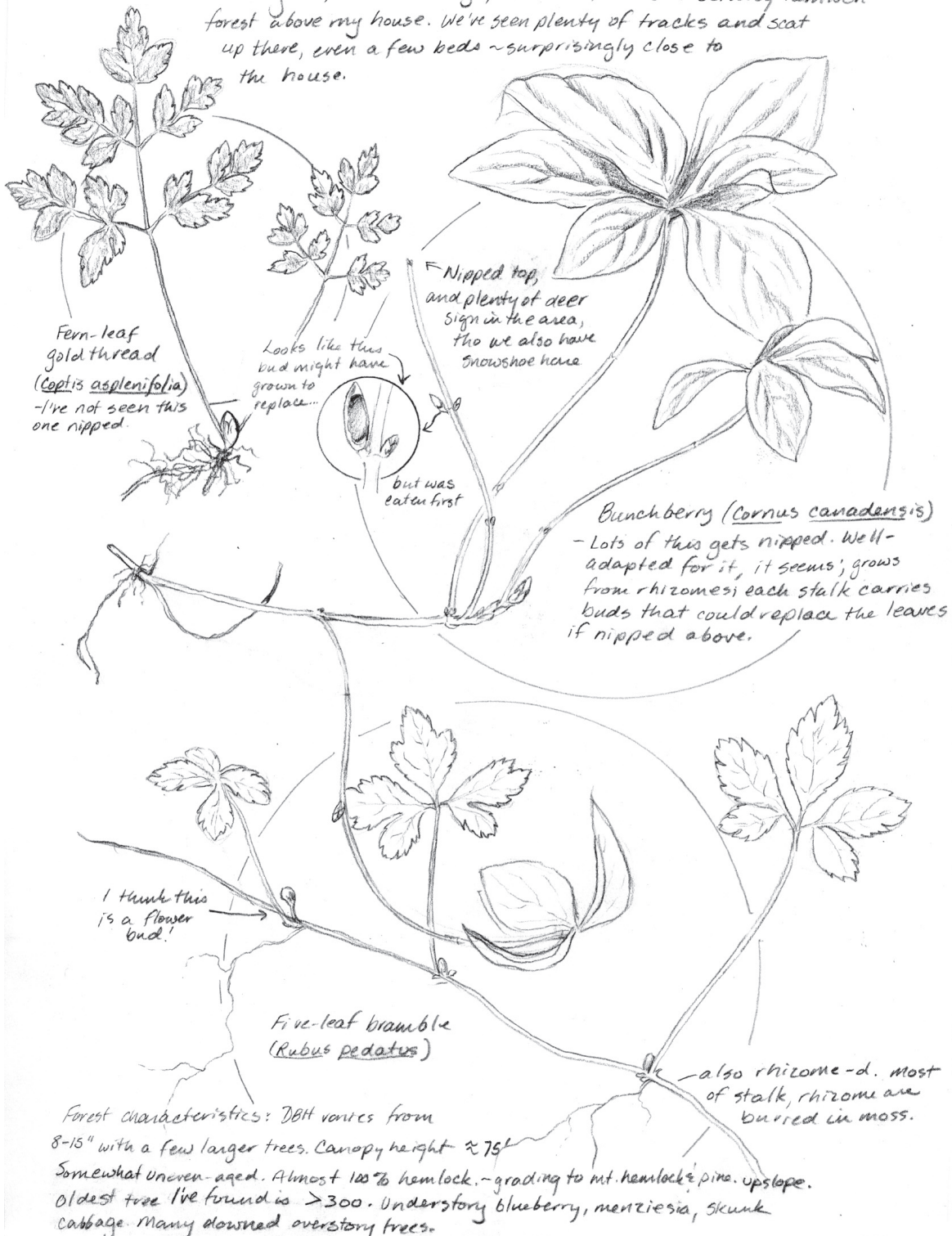
Return to Discovery Southeast, PO Box 21867, Juneau, AK 99802

Sketches from a field notebook

Kathy Hocker

18 March 2008 · N. Douglas · Deer food

A tangle of winter forage, collected from the scrubby hemlock forest above my house. We've seen plenty of tracks and scat up there, even a few beds ~surprisingly close to the house.

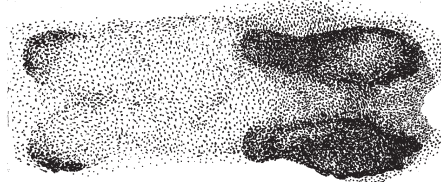


Many thanks to our great supporters!

Grant support

Discovery Southeast thanks the following foundations and organizations for their generous support in the past year.

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Operating Support
U.S. Forest Service
Bears of Admiralty Teachers' Expedition



A special thanks to parents ...

Nature Studies is supported at each Juneau Elementary School thanks to a 50% match from the parent groups. It would be impossible to engage every third through fifth grade student in Nature Studies without this terrific support.

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Glacier Valley PTO
Harborview PTA
Juneau Community Charter School
Mendenhall River PTO
Riverbend PTA

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Thank you, too!

So many of you help in so many ways! Special thanks to the Alaska Department of Fish & Game, Clay Wertheimer, Holy Trinity Church, Avis Car Rental, DIPAC, Susan Phillips, Sally Rue, and NAEYC.

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