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A Succession of Successes: Jud Isebrands Wins Distinguished Science Award

In The News

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Editor's note:
Forgive us as we brag a bit about our latest award winners. Naturally, we're proud, but it's also a good way for us to report on their lifelong body of research, their future plans, and their unique approach to science.

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Congratulations are in order for Jud Isebrands, recipient of NC's highest honor, the Distinguished Science Award. The award celebrates a 30-year career that is so rich and varied that it's difficult to capture in a few paragraphs.

As you'll see, Isebrands is not one to avoid steep learning curves. Whether he's mastering a new discipline or masterminding a new facility, he has proven to be a leader, a mentor, and a researcher of the prolific persuasion. Hold onto your hats as we review his career so far.

Outstanding in Several Fields

Isebrands' approach to research resembles the forests that he studies. Dynamic and continually in the process of succession, one stage of his research prepares the ground for the next, more developed stage. His basic research into how healthy trees function, for instance, prepared him to notice the physiological differences in trees undergoing multiple environmental stresses. His understanding of growth processes prepared him for a foray into modeling, which led him to create software that "grows" a seedling under different stresses. Now, he's investigating physiological processes in a forest setting, exploring species' interactions in an altered atmosphere.

What's unusual about this succession is that it has happened not once in Isebrands' career, but many times, in different fields of study. It's as if he's had three careers, one studying hybrid poplars, one studying red oak, and the third exploring the effects of elevated CO_2 and ozone on northern forests.

Intensive Fiber Cultivation

Isebrands' first field of study—intensive culture of hybrid poplar plantations—began when he was hired to work on the pioneering research project headed by Phil Larson. It was with Larson that he

Jud Isebrands and Director Linda Donoghue.

developed what Dave Karnosky of Michigan Technological University calls a "simple, elegant, and eminently useful" index for estimating the physiological age of Populus leaves. "There's hardly a piece of research on gas exchange in poplar that doesn't refer to the Leaf Plastochron Index for cottonwood," says Karnosky. "Without the consistency it provides—the ability to compare similarly aged leaves—it would be impossible to compare treatment responses."

Isebrands expanded this research when he became leader of the Physiology and Raw Material Evaluation of Intensively Cultured Plantations research work unit. Richard Dickson, recently retired NC research plant physiologist, says Isebrands' knowledge of healthy plant processes came in handy when devising growth-inducing treatments (fertilization, irrigation, etc.) for hybrid poplar. "Jud took a physiologist's approach. Because he knew how trees assimilated carbon, how they photosynthesized, what their early transport patterns looked like, he knew at a deep level which treatments would help plants along," Dickson said.

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Growth of a Poplar, Now in 3-D

Isebrands' next substantial achievement was to put that knowledge into a whole-tree growth process model called ECOPHYS, so that a seedling could be "grown" and subjected to stresses in a computer. Here's what Jud's collaborator in that project, George Host, from the University of Minnesota's Natural Resources Research Institute, had to say:

"ECOPHYS is a wonderful integration of canopy architecture and plant physiology; we model each leaf of the tree in 3-D space. Ten years ago, people said this was computationally impossible. Jud believed it could be done, and we've done it, most recently with a major grant from the National Science Foundation. This certainly could not have been done without Jud's vision. His ability to link modeling together with experimental work has significantly advanced our understanding of how trees grow and respond to stress."

Today, managers use the ECOPHYS model to enhance growth on thousands of acres of intensively cultured poplar plantations for fiber and biomass production in the Pacific Northwest and the Midwest.

From Test Tube to Field Test: Red Oak Research

The theme in all three of Isebrands' "careers" is his ability to go from the basic to the applied, and from the molecular to the landscape scale. Isebrands' red oak work, for instance, evolved from understanding growth processes and carbon allocation in individual trees, to understanding the genetics of red oak populations in the Lake States, to understanding seedling improvement practices in the nursery, and finally, to evaluating silvicultural methods for regenerating this difficult-to-manage species.

This trajectory of research was put to the test in a cooperative study on regenerating northern red oak with the Nicolet and Chequamegon National Forests, the Wisconsin Department of Natural Resources, and northern Wisconsin counties. It was an excellent example of basic research laying the foundation for silvicultural solutions.

What Jud Isebrands is working on at the moment:

- Streambank stabilization using poplars and willows.
- Phytoremediation: using trees to take up pollutants or to create an environment where soil microbes do the work.
- Biomass for energy: matching the right fast-growing trees to climate and soil around the country.

Jud Isebrands at the FACE site.

FACEing the Effects of Fossil Fuels

Isebrands' most recent research theme is the impact of greenhouse gases and ozone on tree growth. Starting with single trees in growth chambers and evolving to outdoor chambers, this research culminated in the station, together with Michigan Tech University, establishing a world-class research facility near Rhinelander, Wisconsin, known as a FACE (Free-Air Carbon Dioxide Enrichment) experiment.

The 80-acre FACE site is part of an international network that provides a window into the "what if?" of global climate change. Twelve rings of gas-emitter tubes surround stands of aspen, birch, and maple, fumigating them with year-2025 levels of two greenhouse gases—ozone and carbon dioxide. It's the first time the interaction of both gases will be studied on trees growing from the seedling stage in mixed-species groups. By examining insects, soil, atmospheric changes, and tree response from "root tip to shoot tip," this multi-million dollar project is at the leading edge of integrated climate change research.

The research team, led by Jud Isebrands and Dave Karnosky, includes more than three dozen scientists from the U.S., Canada, Estonia, Italy, Finland, Slovakia, and Great Britain, hailing from many different disciplines. Funding comes from an equally complex network, including NC, the Forest Service's Northern Global Change Program, U.S. Department of Energy, National Science Foundation, National Council of Air and Stream Improvement, Michigan Tech. University, Canadian Forest Service, Finnish Academy of Science, and University of Wisconsin Foundation.

The very fact that Harshaw Farm is now home to the world's largest FACE facility is a testament to Isebrands' ability to dream and to work with others to bring that dream to fruition. Karnosky comments that Isebrands' leadership has greatly raised the profile of NC's Rhinelander lab: "Among many international scientists, the name 'Rhinelander' is recognized even before the name 'Forest Service'."

CO_2 is expected to double in the next century. What the FACE researchers reveal will be critical, no doubt, in the drafting of governmental policies on fossil fuel use and allowable emission levels. Once again, Isebrands' work advances our understanding of ecosystem dynamics and does so in a policy-relevant fashion.

Teaching by Example

When asked about scientists he has mentored over the years, Isebrands will talk instead about who influenced *him*. "If I've had success it's because I've had the good fortune to work alongside top scientists in the Forest Service, people like Phil Larson, John Gordon, Don Dickmann, Richard Dickson, Neil Nelson, Tom Crow, John Zasada, and Don Riemenschneider. It's hard not to do well

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Protecting the Commons: Haight Wins Quality Research Award

Bob Haight

Buy land: they're not making any more. In an era of galloping sprawl, the old adage is truer than ever. Nationwide, voters are pooling their money in open space bonds, asking officials to shop for land that will provide recreation, conserve biodiversity, control floods, and more.

Imagine yourself on such a shopping spree. How would you choose which lands in your rapidly developing township to set aside? Is there an optimal mix, given costs, ecological attributes, and what's left of the larger landscape? If so, how would you find it? Is there an efficient way to "comparison shop" land protection strategies to find the one that meets community goals without breaking the bank?

That's the category of problem Bob Haight has been working on since 1995, when he began looking at the economics of biodiversity protection. One seminal paper that emerged from this work was chosen for this year's Quality Research Award. *"Wildlife conservation planning using stochastic optimization and importance sampling"* published in *Forest Science* in 1997.

Despite the formidable vocabulary, the premise of the work is to make land manager's lives much easier. As Haight explained, "Managers often have two different goals: (1) minimize the cost of reserving land, and (2) maximize the chance that wildlife populations will survive as a result. I realized that economists had cost-optimization models and biologists had population-viability models, but the models had never been merged."

The Best Protection Money Can Buy

Haight and coauthor Laurel Travis (Associate Professor, Information and Computer Science, Metropolitan State University) met the challenge of merging these models. Their contribution was twofold. First, they streamlined the process by having the model winnow the possible management scenarios down to those that were "feasible," that is, likely to meet the manager's goals of species persistence.

"Let's say the manager wants to protect pine marten, and sets a goal of a population of at least 40 individuals," Haight said. "We run various management scenarios—from passive set-asides to active habitat restoration—under all sorts of environmental conditions: a drought, a fire, a very early spring. The management scenarios that manage to keep 40 individuals alive are the feasible ones.

Once we've narrowed that down, we can run economic models on just the feasible strategies to see which are most cost-effective. In the end, you arrive at the management scenario most likely to keep the population alive and keep you within budget."

Besides streamlining, there's something else that sets this tool apart from anything that's come before: flexibility. It's designed to allow users to "fiddle with the knobs," that is, to tweak the viability thresholds to get the optimal management strategy. "Let's say you wanted to know what it would cost to provide for 50 or 60 pine marten individuals instead of 40. You could do this, and see that for just a bit more money, you might double the certainty of protection. This helps when you're trying to decide how to get the biggest conservation bang for the buck," Haight said. This feature is called sensitivity analysis, and in the modeling community, it's big news.

Since publishing the awarded paper, Haight has helped biologists estimate the best ways to choose Research Natural Areas on National Forests, and habitat parcels to help conserve the endangered Kirtland's warbler and San Joaquin kit fox. According to Katherine Ralls with the National Zoo, Smithsonian Institution, "Bob's models help us understand how to best spend the limited amount of money we have available for habitat acquisition."

Choosing Legacy Lands

Now Haight has teamed with research social scientist Paul Gobster from the Natural Environments for Urban Populations unit and Jane Ruliffson from the Department of Applied Economics at the University of Minnesota to bring this same approach—merged models, streamlined choices, user control—to the challenge of keeping a green necklace of lands open despite heavy development pressures around Chicago. According to a 1999 report from the Openlands Project, "If current land consumption trends continue, the thirteen-county area that comprises the Chicago metropolitan region could double in size over the next thirty years—creating an urbanized area the size of sixteen Chicagos."

The researchers will begin by interviewing decisionmakers to learn their goals for the land, current prioritizing methods, and information needs. Second, they'll compile a database of potential natural areas, listing size, ownership, ecological attributes, and price. Finally, they'll develop a series of optimization models for selecting sets of reserves, and then evaluate the tradeoff among land protection goals by giving them the same "problem" to solve.

For example, one problem might be to choose the set of sites that connect to

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Hearing the Whole Community: Westphal and Gobster Win Multicultural Achievement Award

NC's Multicultural Achievement Award honors NC employees who make an effort to "hear all voices" and work towards environmental justice for all. Lynne Westphal and Paul Gobster, research social scientists with the Natural Environments for Urban Populations project in Chicago, are deserving recipients of this year's honor.

Behind Westphal's and Gobster's research is a simple philosophy: To make equitable decisions, policymakers need to understand the wishes of their *whole* community. To that end, these scientists design their studies so as to hear and document the widest possible spectrum of voices.

This means going the extra mile when it comes to interview design. "If you want to reach people who don't own a phone," Paul Gobster explained, "You can't rely solely on telephone book sampling. You have to look for other ways." Likewise, you have to invite people to contribute in a variety of ways. As Lynne Westphal said, "We use both verbal and non-verbal methods (e.g., drawings) in our interviews, as well as bilingual written questionnaires, so that people with different communication preferences and abilities can participate."

Paul Gobster

"We've been called the environmental justice 'conscience' because we keep raising equity issues with our partners," said project leader John Dwyer, "As I see it, that's our responsibility as Federal researchers. If more of us were to do that, day in and day out, ways of doing business would change."

Take Me to the River

The project that put equity into action was ChicagoRivers, a National Park Service-led initiative that involved community groups in the restoration of the surprisingly natural Chicago River corridor.

"It's not that cities are devoid of natural settings," says Lynne Westphal. "It's that these areas are often perceived as polluted, inaccessible, and crime ridden. Helping citizens restore their rivers and reverse this perception presents an exciting opportunity to enhance the lives of all urban people—including low-income and minority residents."

"For Paul and Lynne, environmental justice is not just a hat they wear to work," said Dwyer. "It's the way they live their lives. As a result, they were instrumental in making sure ChicagoRivers would benefit and involve residents that programs sometimes miss."

For starters, they made sure that all reaches of the 156-mile long Chicago River were given attention, including those that flowed through inner-city neighborhoods. When it came to gathering data about people's uses and perceptions of the river corridor, they really pulled out the stops, contacting nearly 5,000 people, including residents and officials in minority or poor neighborhoods.

In telephone as well as on-site surveys, focus groups, and in-depth interviews, Paul and Lynne asked people what they liked about their river, what they didn't like, and how they'd go about improving it. To make sure no one was excluded,

Lynne Westphal

focus group discussions were held in inner-city public housing as well as suburban neighborhoods. The gathering methods allowed people to speak, write, or draw their responses.

Ripples From the River Project

ChicagoRivers' goal was to help communities build enthusiasm for their river and then pitch in to improve it. NC's in-depth assessment helped by identifying promising project ideas that, with some funding and/or technical assistance, could help communities realize their dreams. Some dreams coming true include:

- The Beaubien Woods-Flatfoot Lake restoration project in southeast Chicago.
- Memorial trails and river cleanups that are transforming rubble fields into open space for Chicago Public Housing Authority developments.
- Private landowners providing public access to their riverfronts.

Chicago, of course, is not the only urban center with an "undiscovered" river. This model of environmentally just research, planning, and management could take hold in cities throughout the United States. So far, more than 5,000 printed copies of the final report on the project "*People and the River*" have been distributed, and more are downloaded from NC's web site each day.

Walking the Talk in Our Research

One of the most energetic ripples from ChicagoRivers is research in the 2,000-acre Calumet area, a wetland-rich "study of contrasts" on Chicago's south side. "A

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Closing the Loop: Black Walnut Expert Jerry Van Sambeek Wins Tech Transfer Award

It happens every 7 years—a state-of-the-science meeting for black walnut researchers and cultivators. It's hosted by the Walnut Council, composed of landowners, researchers, and forestry professionals promoting sustainable management of American black walnut and other fine hardwoods.

Luckily for walnut growers everywhere, the Council's last symposium, held in 1996, has been captured in the highly readable *Knowledge for the Future of Black Walnut*. This 256-page publication was compiled and edited by Jerry Van Sambeek, winner of this year's Technology Transfer Award. The contributors—a who's-who of leading names in walnut cultivation and research—tackle topics from site evaluation to walnut planting in the Conservation Reserve Program to thinning techniques, and more.

As one Council member commented, "Because of the broad coverage of topics included, *Knowledge for the Future of Black Walnut* will continue to serve as the primary document that the Walnut Council recommends to new members."

It's Who You Know

Van Sambeek became involved in the project 2 years before the 1996 meeting, when meeting planners asked him to assemble a list of technical topics and speakers. "My work with the Walnut Council came in handy here," said Van Sambeek. "After years of attending national meetings (he's only missed one since 1980), I knew what growers and researchers wanted to know. I also knew who was working on these topics because I'd been editor of the quarterly Walnut Council Bulletin."

In turn, just about anybody who's studying black walnut anywhere knows Jerry Van Sambeek's research. In fact, his recommendations on grass control and leguminous (nitrogen-fixing) cover crops are now cultivation standards.

Jerry Van Sambeek

The Gift that Keeps on Giving

For Van Sambeek, this publication was a chance to tangibly give back to the walnut community for their support of NC's research program: "I was in the process of winding down almost 20 years of walnut research, and I wanted to make sure my findings and others' were readily available." He also made sure new topics were included, such as agroforestry, nut production, fertilizing with municipal solid waste, inventory figures for walnut plantations, novel herbicides, walnut growing in France and Germany, and a new angle on economic analysis. Van Sambeek ensured rigor by having each manuscript reviewed by researchers and users familiar with the topic.

Van Sambeek also felt strongly about capturing the lessons shared at the Landowners' Show and Tell portion of the annual Walnut Council meetings. "For me that's the best part of the program!" Van Sambeek said. "The landowners are the ones who ultimately put our theories to the economic test." Knowing growers may be too busy to write papers, Van Sambeek took detailed notes, wrote their remarks into article form, and then asked growers to respond, expand, and edit them.

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Kudos from Around the World

"We are very proud of Jerry Van Sambeek, his work, and his dedication to research on behalf of walnut and other fine hardwoods. We think few researchers can hold a candle to Jerry."

Larry Frye, Executive Director
American Walnut Manufacturers Association

Congratulations from all your Chinese friends, and we want to say that you are highly qualified for this award! What impresses us most is your diligent style of work, outstanding contributions to the research program and publications of black walnut, and your competent knowledge in this field. Thanks again for the many ways that you helped with the Chinese Introduction Program of Black Walnut.

Sheng Ke Xi
Chinese Academy of Forestry
Advisor of Chinese State Bureau of Foreign Experts and Affairs

Jerry's teaching goes far beyond publishing articles. He is present on field trips and group presentations, sharing his knowledge on a person-to-person basis. Whenever I have an obscure question, I can rely on Jerry for an answer. Only rarely has he had to say "I don't know," and when he does, he usually offers to find a source for the answer. That is true technology transfer.

Larry Severeid
Landowner and Walnut Council Member

People on the Move. . .

Congratulations!

William Danfield and **Rodney Eternicka**, *Rhinelander*, received awards for their exceptional help and service during Wisconsin's Millennium Tree Celebrations.

See articles in this issue about our latest crop of NC award winners: **Robert Haight**, *St. Paul*, **Paul Gobster** and **Lynne Westphal**, *Chicago*, **Jud Isebrands**, *Rhinelander*, and **Jerry Van Sambeek**, *Columbia*.

Moving on . . .

Bob Cecich and **Paul Johnson**, *Columbia*, **Richard Dickson**, *Rhinelander*, and **Marcia Larsen**, *East Lansing*, retired.

Becky Fletcher, *Salem*, **Dee Hubbard**, *L'Anse*, and **Jeremy Vlcan**, *Columbia*, resigned.

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when you're working with these guys."

Isebrands is now returning the favor for dozens of new researchers. He is an adjunct research professor at the State University of New York, Iowa State University, University of Minnesota, University of Washington, Michigan Tech. University, the Swedish University of Agricultural Sciences, and University of Wisconsin-Stevens Point.

Several of his former graduate students and post-docs are now leaders in research in the Forest Service, at various universities, and in other research organizations.

Around the Next Learning Curve

As an editor who has thoroughly enjoyed interviewing Jud over the years, I can imagine him telling me, "Don't look back—tell them what I'm working on now!" (See sidebar, page 2.) But in the end, it's not only what he's worked on, but how he's managed to always prepare himself for the future, that makes his career so exciting and so deserving of the Distinguished Science Award. Congratulations, Jud! We can't wait to see what you do next.

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existing recreation corridors *while* protecting the maximum number of different plant communities—savanna, forest, wetland—all within a budget ceiling. In addition, the problem must account for the fact that availability and price of land is uncertain. The models will then be used to generate information about the tradeoffs between competing ecological, social, and economic goals. The ultimate result? A computerized tool that will provide decisionmakers with information they need to negotiate the tricky terrain of natural area protection.

What distinguishes Haight's work is its practicality coupled with its boundary-breaking scientific rigor. The computational challenges solved in these models, for instance, help advance the entire field of simulation science. Haight has shown that models once used primarily by operations engineers can now be used by resource managers, allowing the goals of conservation biology to merge with those of the forestry community. Crossing discipline boundaries, enlarging the usefulness of research—there's an optimization strategy worth emulating, and rewarding. Congratulations on your achievement, Bob!

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new restoration and economic development plan is helping Calumet rise from the ashes of its industrial past," said study leader Lynne Westphal. "We're supporting that revitalization with studies nearly as diverse as Calumet's ecosystems and human cultures." (See *Kissing TOADS and Greening Brownfields* on the web in the January 2000 issue of NC News.)

In their research as well as their lives, Westphal and Gobster are committed to keeping equity front and center. This award shows that cultural diversity is not just a catch phrase in our recruitment brochures for employment in the Forest Service. It's also an important part of how we view, and how we investigate, our world.

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This extra effort to make the publication current, authoritative, and *useful* is a sign of Van Sambeek's belief in the importance of closing the loop in research. "If we're doing research to answer someone's questions, it's essential to get those results back out to them, not just to other scientists," Van Sambeek said. "The whole cycle isn't complete until our research information takes root in the fields."

Secrets of Successful Tech Transfer

Van Sambeek's number-one tip to scientists who want to practice technology transfer? "I've found it invaluable to be in a user group such as the Walnut Council. You get a solid feel for research needs, and you have a direct line back to the people asking the questions. It's a feedback loop that works because the infrastructure's in place—the Council, its board, its bulletin, and its meetings."

If you're interested in obtaining a copy of *Knowledge for the Future of Black Walnut*, you can surf over to www.walnutcouncil.org. Van Sambeek says he's pleased with the results: "This should hold us for a while, at least until next decade, when there'll be a whole new crop of papers for someone to compile and distribute."