

NC NEWS

NORTH CENTRAL FOREST EXPERIMENT STATION

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In the News

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Landscape Change Issue—

One of our new integrated programs explores Landscape Change—how human development is transforming the social and ecological landscape of the Midwest. In this issue of NC News, we sample some change-related projects already underway at the Station.



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Here Comes the Neighborhood!

A New Gold Rush and Eleven Other Trends Affecting the Midwest

by Mike Vasievich, Project Leader, Forest Economics, East Lansing, MI

The forests of the Midwest are within the reach and influence of millions of people. For example, within a day's drive (500 miles) of Grayling, Michigan, there are 61 million people; 66 million within 1 day of Lake of the Ozarks, Missouri; and 28 million within 1 day of Brainerd, Minnesota. As communities merge, the labels "urban," "rural," "timber-dependent," and "tourist town" aren't as useful as they once were. Brainerd has a fairly large urban population (even larger on weekends), and Chicago uses so much wood fiber that it is truly a timber-dependent town.

How will the pressure of a spreading population shape our social and ecological landscape? Let's look at a dozen prevailing forces—our modern glaciers—that are both grinding and polishing the Midwest landscape:

1. Rural forest land is being consumed for seasonal homes.

There's a gold rush going on in parts of our region, and the urban-forest fringe is expanding at a rapid pace. Rural land is being chopped up to feed the crush of people looking for the good

life—the cottage on the lake or the perfect wooded paradise for rest and relaxation. This gold rush generates high demand and high property taxes, putting even more pressure on rural landowners to subdivide their woodlands. Water is an especially strong magnet, and surging shoreline development has huge effects on riparian areas and water resources.

This amenity migration is changing the character of forests and communities. New residents from the city often bring a dramatically different culture that conflicts with traditional residents' culture and changes the rural characteristics they seek. Communities struggle to provide expensive infrastructure like utilities and road access. Houses scattered throughout fire-prone areas present extraordinary challenges for rural fire protection districts. As land uses shift to amenity-based development, less timberland is available for harvest.

The effects of this gold rush are also likely to morph over time. What will change, for instance, when baby boomers retire and convert many seasonal homes into permanent residences?

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Chris Faust

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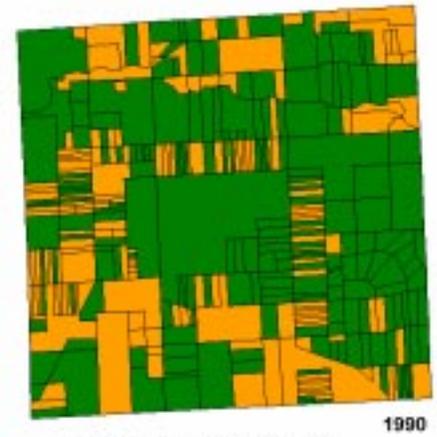
2. Forest recreation isn't what it used to be.

The boom economy, cheap gas, an aging population, and hot technology are creating new leisure activities and extending tourism to four seasons. People surge out of the cities on weekends for a fast-paced run at the woods and lakes with their RV's, mountain bikes, off-road vehicles, snow-mobles, high performance boats, sonar fish-finders, and jet skis. Trends favor short trips, high-quality experiences, and comforts afforded by high tech gear. Associated non-forest opportunities like casinos and golf courses draw people who enjoy playing in the woods as much as they do at the gaming tables and on the links.

Although tourism contributes to local income and employment, managers are now faced with congestion, conflicts between users, and resource-damaging excessive demand. In high-use places, especially popular rivers, use is rationed by permits. The notion that outdoor recreation should be free is falling by the wayside too. New mechanisms to charge user fees on public lands are being developed to allocate costs to those who benefit and to take pressure off general tax coffers.

3. NIMBY rules.

Though they are not new, NIMBY (not in my backyard) attitudes are stronger than ever. We want a sanitized world where the negatives are out of sight and therefore out of mind. Ads tell us we can have it our way, and, with a strong economy, we think we can afford it too! The upshot of all this is that any action that might change the environment is challenged and appealed. Society has responded with a whole range of laws restricting actions or protecting rights such as the right to farm and to hunt without harassment. Issues like regulatory takings keep bubbling to the surface too. The ability of people with money and power to blockade local change means environmental effects are often "exported" to where people with less money and power cannot resist. Environmental justice may be the new "cumulative effects" of our time—something to consider before we act.



Mike Vasievich

4. The economy is booming.

The Midwest has experienced a remarkable economic turnaround from earlier rustbelt years with expansions in forest products and tourism. According to a Federal Reserve Bank report, lumber exports from Illinois increased by 758 percent from 1987 to 1994, more than any other sector in that State. Paper exports were second—up by 372 percent. Thanks to low interest rates and a boom in the general U.S. economy, wood demand for housing and remodeling is strong. A second home is now within reach for many families. Those who can't afford to move can at least visit, and cheap gas has encouraged more fuel-hungry SUV's than ever to crowd into tourist towns. The net result is a stronger timber and tourist economy, bringing lots more people to the woods.

5. Global markets are changing food and fiber supplies.

Agricultural production and policies have shifted due to global competition, forcing U.S. producers to compete in a world market where labor costs are a fraction of ours. In response, U.S. agriculture has intensified on the best lands, and marginal lands are reverting to forest or development. While our currency is strong, we are importing more of our food and fiber. If this should change, or if world politics should destabilize, we may need local farms and forests to produce food and fiber. By allowing these marginal lands to revert to forests without active management, we are missing a great opportunity to secure future supplies.

6. Society wants sustainable forests.

We're finding that sustainability is hard to define and probably harder to achieve when you consider interactions among biophysical, social, and economic systems. Nevertheless, society wants sustainable forests, and government agencies, regional coalitions, and the forest products industry are searching for holistic and sustainable strategies. Those who have grappled with the realities—the choices and the costs—agree that the road ahead will be bumpy, fraught with tradeoffs that we may not like. If society remains committed to the journey, however, changes in consumer spending, price structures, resource management strategies, and product offerings may be ahead.

7. Information technology is exploding.

Technology has transformed our lives and our landscapes. People in info-intensive jobs can live in Marquette and work in Manhattan via satellite downlinks, overnight couriers, and faxes. Residents are no longer isolated when they can surf the internet and sample hundreds of television channels. These information channels provide new ways for special interest groups to target large audiences. The effect, it seems, is to heighten awareness and contention over most social issues, including those that involve forests.

8. The trees keep growing, but it's not the same.

Timber growth is up in our region, as are timber prices and harvests. Enough Lake States wood is cut each year (about 9



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million cords) for a continuous cordwood pile that snakes from New York to LA and back, twice. Although forest area is up, the forests themselves are changing. In the Lake States, aspen and birch forests have undergone many changes due to natural succession, human impacts, and changes in land use. (Despite these changes, the aspen-birch forests still comprise the second most common forest type.) Meanwhile, sugar and red maples are becoming more abundant in the Lake States, and even the beloved white pine is starting a comeback.

The large natural disturbances that shaped past forests, like fire and blowdowns, don't seem compatible with current settlement patterns, but they are still a force to be reckoned with. Global climate change, and the more frequent extreme weather events that may come with it, are a wildcard affecting forest composition and condition in ways that are difficult to predict.

At the moment, people are the greatest source of forest disturbance. Lots of people want to alter midwestern forests to make room for expanding cities, roads and rights-of-way, cottages, and supplies of saw logs and chips. At the same time, they want to prevent natural disturbances, like fire, that threaten property. Still others want to re-create presettlement forests. Given these polar positions, contention over fire and harvesting policies is greater than ever.

9. Some TES species are recovering, others are still in sick bay.

Threatened, endangered, and sensitive (TES) species are always of interest because they are high-profile indicators of our environment and because the Endangered Species Act is such a powerful influence on public policy. Lately, TES species have been getting more attention thanks to the de-listed bald eagle, the rising population of timber wolves in parts of the upper Lake States, and the highest-ever counts of Kirtland's warblers. Despite these successes, work to restore TES species has a long way to go. Concerns for neotropical migratory birds are especially keen. Their wide distribu-

tion and sensitivity to broad habitat loss, parasitism, and predation make restoration of these species a substantial challenge.

10. Exotic species are invading and taking a costly toll.

The invasion of plants, animals, insects, and microorganisms from foreign lands seems worse than ever. While old immigrants, like gypsy moth and Dutch elm disease, continue their march through urban and rural forests, new invaders like the Asian longhorned beetle show up to add to the mayhem. In a few highly publicized cases, SWAT-team rapid attacks, quarantines, and emergency containment research are trying to stop the invasion. Meanwhile, the vast majority of newcomers, like purple loosestrife, zebra mussels, and pine shoot beetles, slip through the net and spread unchecked. Species invasions are a price we pay for a global economy. To avoid this costly toll, we need to be ever vigilant and prepared.

11. Plentiful deer are munching their way through forests.

Deer are the undesigned beneficiaries of forest subdividing, especially in the expanding urban/forest fringe areas. With few predators to stop them, record numbers of deer now wander through subdivisions, helping themselves to gardens and shrubbery. In forests, repeated clipping is a form of selection; it makes regeneration of tasty tree seedlings all but impossible. In Michigan, 65,000 deer-vehicle collisions occur each year, generating hundreds of millions of dollars in insurance claims. Finally, bovine tuberculosis has now been linked to deer,

causing major economic harm to the Michigan cattle industry. Controlled hunts are now being tried, and we'll need to float more solutions to cope with this unintended consequence of landscape fragmentation.

12. Public land management is being transformed.

As national forest planners revamp their circa-1980's strategic plans, they're facing new public expectations. This time around, people want biodiversity, old growth, rare communities, and healthy ecosystems in addition to timber and recreation. Sorting through the cacophony of voices is a challenging job. States aren't immune from this either, and calls for more holistic approaches to managing State forests ring loud to State managers. Providing guidance on how to manage the changing, patchwork landscape of private ownerships is a special challenge too. Resolving conflict on these varied ownerships isn't easy, fast, or cheap; in fact, we could be in for a long and expensive climb on the learning curve.

The View From Here

Connect the dots and the picture is clear: As more people demand more from our limited land base, the job of maintaining healthy and productive forests is getting tougher. True innovation will take much new information, collaborative efforts, and a strong social will. As researchers, we believe science-based approaches can bring much-needed objectivity to the table, providing answers that balance interests of all inhabitants of this abundant region.



Huron-Manistee National Forest

Coming Home to the Urban Fringe

At a recent North Central meeting, John Dwyer, project leader of the Managing Forest Environments for Urban Populations unit in Chicago, quoted an eye-opening study entitled *Under Pressure—Land Consumption in the Chicago Region 1998-2028* (1999, 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.

And Chicago is only one of the major metro areas in our region. Draw ripples of development around each one, and you see why rural policymakers are bracing themselves. “As more people move to what was the ‘hinterlands,’” Dwyer said, “quality of life can change along with the natural environment. Land values can rise, economic patterns can shift, open space can shrink, and local government services can be stretched to the limit. These prospects raise important policy questions.” What follows is a sample of the studies North Central researchers are planning to help policymakers navigate this era of explosive growth.



Mike Vasievich

Why Do We Buy Where We Do?

How do buyers decide which house is home? In addition to traditional attributes such as price, transportation, and schools, are buyers influenced by the presence of trees, forest, water, and open space? How do these buying decisions, in aggregate, affect patterns of development on the landscape?

In a cooperative agreement with the Chicago project, Rohit Verma of DePaul University, along with colleagues from Lehigh University, the University of Sydney, and Portland

State University will use a method called discrete choice analysis to identify factors that sway people’s buying choices. Presented with experimentally designed profiles of various houses, respondents will be asked to choose which house they would buy, providing the team with information about how people make decisions.

“We’ll be able to identify segments of the buying public, and model the process by which they make tradeoffs among attributes,” Verma said. “It’s useful to see, for instance, what percentage of the buying public are green-space advocates, and how strongly this influences their purchase.” Ultimately, the team will develop computer simulations that will allow planners and policymakers to “experiment” with landscape change in a virtual setting, to see how proposed regulations, incentives, and zoning policies might affect patterns of development.

Great Getaways—The Lure of Urban-Proximate Recreation Counties

The U.S. Census doesn’t recognize “recreation counties,” but it’s a useful designation, referring to places that offer amenity resources such as lakes and forests and other kinds of natural playgrounds. When these counties are close to an urban area they are prime candidates for development. Whether they will urbanize or retain their rural character will depend on the foresight of, and the information available to, civic leaders.

Research can help by giving planners a sense of the relative desirability of their community, and what growth patterns they may face. “If people want to attract amenity-based migrants, we can give them information about what draws people. If they want to slow growth, we can give them a model for how they might do that,” said Sue Stewart, who is conducting the research with collaborator Kenneth Johnson, a sociology professor at Loyola University in Chicago.

The team plans to survey 800 people—long-term residents, amenity migrants, and second-home buyers—in Walworth County, Wisconsin, home to Lake Geneva and only a 2-hour drive from Chicago and Milwaukee. They will ask them why they were attracted to the county, how they currently make their living, and how they spend money in their community. They will also analyze published sources such as the IRS “migration files,” a little-used motherlode of data showing where people move and where they come from. By gathering this information into a profile (a predictive model), Stewart and Johnson will create a new lens that will help communities see themselves as others see them, so they can get ready for future change.

Which Lands Do We Put in the Lifeboat?

There’s another purchasing decision that’s becoming increasingly important as land is swallowed by development: natural area protection. Nationwide, voters have shown a willingness to pay to preserve open space. This presents regional policymakers with a choice: given high land costs and competing goals, which lands do we purchase?



If You Don't Like the Climate, Wait 'Til the Landscape Changes

“Disturb a landscape, and you affect the way the local atmosphere behaves,” says Warren Heilman, NC’s lead research meteorologist. Disturbances at the Earth’s surface can be natural—a blowdown that levels a huge swath of the Boundary Waters, or human-caused—a bulldozer that levels a forest for housing. Either way, the microclimate at that site is changed. The land heats up and cools down in different ways; the over-story lets in sunlight or blocks it; a curtain of vegetation intercepts wind, pollutants, disease spores, and migrating insects, or it lets them pass through.



Warren Heilman

Meteorologists study the effect of forest edges and gaps on the climate beneath the forest canopy.

What these changes ultimately affect, contends Heilman, is the fate of the future forest. “When you rearrange the architecture of a forest,” he said, “you change air flow, hydrologic cycles, and temperature regimes. This creates a growing environment that favors some species and selects against others.” To see how this effect unfolds, Heilman and NC colleagues Ron Teclaw, Jud Isebrands, and John Zasada (all from Rhinelander, Wisconsin) installed meteorological instruments in a cutting experiment near Park Falls, Wisconsin, in 1994. One of the plots was clearcut, one was 50 percent cut, and another was uncut. Each plot has a 10-meter tower bristling with instruments at various heights, collecting hourly air temperatures, relative humidity, wind speeds, wind direction, rainfall, radiation, and soil temperature.

“We have a real gold mine of data,” said research meteorologist Brian Potter, who published the team’s first article in the *Canadian Journal of Forest Research* with research silviculturist John Zasada. They analyzed how the various degrees of cutting affected late-spring freezes. “We theorized that trees, even before they leaf out, tend to store daytime heat, like thermal masses in a passive solar home. This protects against late-spring freezes, which are especially hard on frost-sensitive seedlings like red oak.” To help test this theory, the team used a computer model that accounted for thermal mass of wood when looking at energy loss and gain. Potter is now working on a predictive model that links frost sensitivity to forest biomass and other site properties. “We want to give people a guideline—if you live in this area, with this susceptibility of frost, here’s how changing the vegetation will affect frost-sensitive species,” Potter said.

Something New in the Air

In other studies related to fragmentation, Heilman’s team is modeling the chemical creation, destruction, and atmospheric transport of low-level ozone. This ozone is produced when sunlight reacts with auto and industrial gases and with hydrocarbons emitted from vegetation. Surprisingly, the ozone that we breathe and that lands on vegetation in rural and forested counties sometimes travels from sources many miles away. To figure out when, why, and how this happens, Heilman and Department of Energy colleagues from the Battelle Pacific Northwest National Laboratory in Richland, Washington, are simulating past rural incursions. “We’ve already identified five atmospheric scenarios associated with these occurrences,” Heilman said. “We’ll incorporate these into computer models that simulate what the atmosphere is doing when these ozone events occur.” Ultimately, Heilman would like to post animated maps of ozone movement on the web, showing how typical ozone events evolve and where pollutants in the rural Great Lakes region are coming from.

“The ozone transport scenarios are bound to change as we alter the landscape and urbanize new places,” Heilman said, “and that’s an important forest and human health issue.” To get a preview of the future, researchers at Rhinelander’s Free Air Carbon Dioxide Enrichment (FACE) facility are fumigating growing forests with the levels of ozone and CO₂ that are predicted for the year 2050. While other researchers measure vegetation changes, Heilman will be watching the climate and weather inside the FACE rings. “I’m interested in the secondary effects—how a change in vegetation resulting from higher CO₂ and ozone leads to altered forest microclimates, and how these new microclimates further impact forest vegetation.”

Where Does an Edge Begin and End?

The team is also interested in the “edges” (the boundary between forest and non-forest) that we create each time we subdivide a forest. “What is the definition of edge from a meteorological standpoint?” asks Brian Potter. “How far into the forest do you have to go before you are past ‘edge effects’ such as increased exposure to high winds, pollutants, winter burn, etc.? Since we’re creating more and more edge, it’s important to know how much of the forest will be affected by these new conditions.” The team wants to address this question through transect studies, following a gradient from field to inner forest.

At first glance, tracking this invisible microclimate seems like studying the stars at noon. But by keeping track of what we can’t see, NC meteorologists are showing what we will see—how fragmentation can unwittingly change a forest’s “weather,” which will in turn shape the next forest. “The effects of microclimate change can be positive or negative,” Heilman said. “Understanding the difference can help us understand the future.”

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Should we concentrate on critical natural areas, or should we simply acquire the most acreage possible? Should we preserve new areas for recreation and wildlife, or should we link existing public holdings to extend protected areas? How do we spread these purchases equitably among constituents? Given this complexity, is there an efficient way to make this choice?

Bob Haight, research forester with the Social and Economic Dimensions of Ecosystem Management unit in St. Paul, is working on a model that will help planners cut through the complexity. "I'm excited about this project because it'll be among the first to evaluate natural area protection strategies in a large metropolitan area. We'll start by identifying the conflicts and commonalities associated with different people's goals for natural area protection," Haight said. They'll then develop models of natural area selection, and use these models to investigate tradeoffs among various selection strategies. "From a practical standpoint, we want to identify land-acquisition strategies that are cost-efficient and that meet as many natural area protection goals as possible," Haight said.

If we are to protect the beautiful places that more and more of us are calling home, these strategies for protecting "the commons" will be essential. Look for more research on the dynamics and implications of landscape change in upcoming editions of the NC News.

People on the Move



Congratulations!

Sue Barro, *Chicago*; **William Dijak**, *Columbia*; **Nancy Dudley**, *Grand Rapids*; **Garret Shruck**, *Rhineland*; **Jay Solomakos**, *St. Paul*, and **Jim Williams**, *Springfield*, were promoted.

Rachel Giblin, *St. Paul*, received an award for her outstanding performance in the care of research plants and greenhouse facilities while continuing to perform other assigned duties at a high level.

Pamela Jakes, *St. Paul*; and **John Dwyer**, *Chicago*, received awards for their outstanding presentations to the Green Team on their visions for the Forest Service's social sciences research agenda in the 21st century.

Marcia Larsen, *East Lansing*; and **Tim Swedberg** and **Diane Veilleux**, *St. Paul*; received awards from the Washington Office for their support of the U.S.-hosted International Carbon Conference.

Syble Thon, *St. Paul*, received an award for her superior performance and "can do" spirit, recreating the Station web page following the system crash.

Mike Vasievich, *East Lansing*; and **John Wright**, *Rhineland*, received awards for their leadership in developing the Great Lakes Assessment.

Adam Wiese, *Rhineland*, received an award for his exceptional efforts in designing and building new display tables, work tables, and storage areas for the Forestry Sciences Laboratory main office and workshop.

Emergency Funds Directed to Asian Longhorned Beetle Research



J.E. Appleby, University of Illinois

Residents of parts of Brooklyn and Chicago have had first-hand experience with the Asian longhorned beetle, a dangerous forest pest believed to have stowed away in shipping materials from China. Entomology researcher Bob Haack believes several more cities might unknowingly harbor the fugitive.

The only way to prevent spreading is a "sanitation harvest," which consists of cutting and then chipping and burning affected trees. For urban residents whose trees are understandably dear to them, the prospect is troubling. No one can predict what might be in store if the beetle should escape to non-urban natural forests. To keep ahead of the situation, the Department of Agriculture has authorized \$1.4 million in emergency funds for critical research, marking the first time that such funds have been used for research.

The research, jointly administered by the Northeastern and North Central Stations, will focus on how to detect, monitor, and control the beetle. "The work is restricted to what can be done in 2 years, and it is very product oriented," said NC's Assistant Director Nancy Lorimer. Expected products include detection techniques that are more foolproof than visual inspections, and systemic pesticides that may be used in lieu of the sanitation harvests. The level of urgency, the real-world time lines, and the product orientation make this a unique approach to an emergency that could, unfortunately, become more commonplace as markets globalize.

John Wright, *Rhineland*, received an award for unselfishly and generously helping the Ecophysiological Processes unit with computer hardware and software problems over the last year.

Reassignment

Debbie Carr, *East Lansing*, was reassigned to the Social and Economic Dimensions of Ecosystem Management unit.

Moving on...

Ryan Anderson, *Aurora, MN*, transferred to Rocky Mountain Research Station.

Susan Huber, *St. Paul*, resigned.

Mary Humenberger, *Grand Rapids*, transferred to Chippewa National Forest.

Jessica Modert, *East Lansing*, transferred to Natural Resource Conservation Service.

