

# The Metro Sc

The New York Times



Keith Meyers/The New York Times

Ying Fan Reinfelder, an assistant professor at Rutgers, and Paul Stuart Wichansky, a graduate student, work with part of a 17-foot-long New Jersey map from the 1880's that they and colleagues are using to research landscape and climate changes.

## Mostly Sprawling and Warmer

Scientists Factor Land Use Into New Jersey's Climate



Ying Fan Reinfelder, an assistant professor at Rutgers, and Paul Stuart Wichansky, a graduate student, work with part of a 17-foot-long New Jersey map from the 1880's that they and colleagues are using to research landscape and climate changes.

# Mostly Sprawling and Warmer

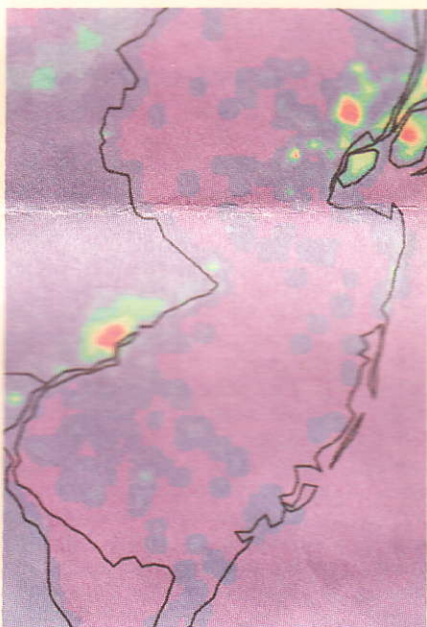
## Scientists Factor Land Use Into New Jersey's Climate

### Development and Climate

Scientists plan to run identical weather conditions through a computer simulation — using maps of New Jersey in the 1880's and the 1990's — and look at how landscape affects climate.

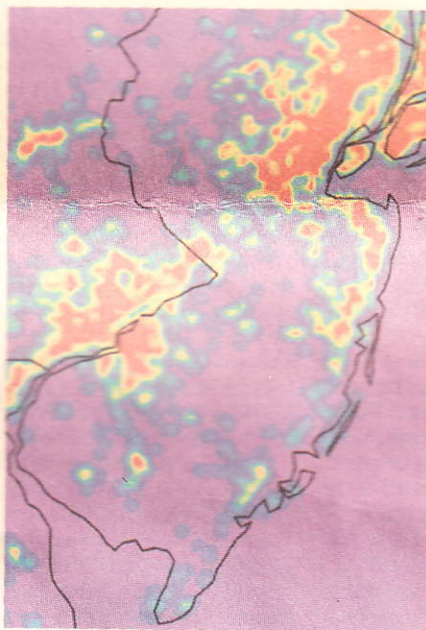
#### New Jersey, 1880's

Based on a historical map



#### New Jersey, 1992/93

Based on a satellite image



Brighter colors represent more urban development, and the darker colors less. The darkest color indicates a landscape like grassland, forest, wetlands or cropland.

Source: Rutgers University

By KIRK JOHNSON

NEW BRUNSWICK, N.J. — Scientists who study climate change can sometimes sound as if they have their heads in the clouds, with all the talk of invisible gases and nefarious hydrocarbons. Here, the search for atmospheric explanation is more down to earth.

A team of scientists at Rutgers University is looking at the land in New Jersey — the transition from farms and forests to strip malls and subdivisions — for clues about the state's weather in the past, and how future development could affect the climate 100 years from now.

"How would our local weather be different with a different land use?" said Alan Robock, a professor of meteorology who is leading the multidisciplinary team of urban planners, historians and biologists. "That's the question."

It's certainly not news that what's on the ground has an impact on what's in the sky. Deforestation in the Amazon has been studied for years in South America. Scientists have also shown how cities can often generate their own weather, creating so-called heat islands that spawn storms or change the paths of storms that come along. A parking lot absorbs heat differently, and channels water runoff differently, than a golf course.

But researchers say that the Rutgers study is one of the most ambitious attempts in the nation to pull all those strings together into one regional model. Half of the project looks back at how



Alan Robock, a professor of meteorology at Rutgers, with a supercomputer used in weather modeling.

# Factoring Land Use Into State Climate

*Continued From Page B1*

population growth and the sprawl of development over the last century have made for a different weather pattern. (An astonishingly detailed 17-foot-long map of New Jersey created in the 1880's figures in that part of the story, along with a hard-working graduate student.) The project's other half looks forward, at how the state's communities and residents could be affected by long-term climate change as a result of local land-use decisions in years to come.

The idea is not that New Jersey is an island, the researchers say, making its own little weather in splendid isolation, or that the global atmospheric system doesn't matter, but rather that in the end, weather and climate is like politics: it's all local. People and climate connect not in equations or theories, but on the ground.

"Say you build a new 100-acre development and then you get 10 inches less precipitation than normal — what will be the effect of that?" said Ying Fan Reinfelder, an assistant professor of geology who is working on the water-flow portion of the climate model. "What's the effect on ground water, and on stream flow? One side of this is climate; the other are man-made changes. We want to link them."

The Rutgers project, which is partly financed by the state's Department of Environmental Protection, has huge potential implications for the debate about open space and suburban sprawl, state officials and environmentalists say. If a housing development or a new shopping center can be scientifically linked to regionwide effects on water supply or weather, for example, then the battles over development and zoning that now seem purely local will be transformed. Regulators and courts will have a powerful new scientific tool, they say, as global warming becomes an aspect of urban planning becomes an aspect of politics.

"We've long known that better land-use practices reduce the costs of cleaning up our water and cleaning up our air," said Bradley M. Campbell, New Jersey's commissioner of environmental protection. "This work makes clear that good land-use policy is essential to stabilizing our long-term climate, as well."

Environmentalists say that the in-

terconnections are the key, because the model is expected to show how residents many miles from a proposed development project can be affected by something they had perhaps never even heard of.

[Gov. James E. McGreevey struck a similar note on Tuesday, when he told a conference on so-called smart growth that state government — from transportation to economic development — would coordinate to fight the sprawl that he said threatened New Jersey's future.]

"A study like this can really change the way we think about land use in New Jersey," said Barbara L. Lawrence, executive director of New Jersey Future, a research and planning organization that focuses on development issues. "To the extent that science can document changes that go way beyond the border of a municipality, you can build a case for more regional planning."

Scientists who are leading the project say that their ultimate goal is to produce a kind of scientific tool kit that planners could use to envision, through the grinding out of a few hundred million equations, multiple versions of the state's future based on land-use and climate trends.

"Once we get our tools working, we can say, 'What if the future of New Jersey 100 years from now is this, or what if it's this other plan — how will that affect the climate?'" Professor Robock said. "We'll be able to do those experiments in the next couple years and maybe that can give information to policy makers that will actually help them decide what the future development will be like."

But there are historical puzzles to be pondered, as well, and that's where the old map and the graduate student figure in.

In the 1880's, Prof. George H. Cook, who later had a college at Rutgers named after him — which, in the fullness of time, came to employ Dr. Robock, among others — led a team of topographers who crisscrossed New Jersey, recording and measuring as they went. In the annals of Victorian-era science, it was an amazing feat that few other states apparently ever attempted or completed. The Cook map — really multiple maps created over nine years — is 17 feet long when fully assembled and only a bit less accurate than a photograph taken from space.

Paul Stuart Wichansky's Ph.D.

dissertation is aimed at figuring out how the changes since Professor Cook's time have altered the state's climate. More to the point, he'll be running the same weather through the two very different New Jerseys, really: the current state, captured by satellite, and the version Dr. Cook saw in the 1880's, when farms dominated the landscape.

The computer, stocked with all that science knows about how land conditions can alter wind and water evaporation and runoff and albedo (how different surfaces reflect or retain heat), will replay history.

Mr. Wichansky spent a year in the Rutgers Library creating a digital version of the Cook map that could be fed into the school's climate modeling program. The huge map was divided into 3,774 individual cells, each of which had to be put into the computer one by one. He has just started his computer runs.

"I feel like Prof. George H. Cook is speaking to me through his maps," Mr. Wichansky said.

At the backdrop of the climate work here is the unavoidable reality that a record-breaking warm trend — short-term or long-term, no one can say — is under way. The 12 months through the end of September, in particular, was the warmest in New Jersey since the 1890's. Mr. Wichansky said that part of what he was looking for in his results were clues about how much of that warming effect was a result of atmospheric changes, and how much came from the ground.

"The land cover change project may enable us to quantify how much of this warming may actually be due to changes in the land surface itself as a result of human modifications," he said.

Some New Jersey environmental officials say they think that the results of the Rutgers project will be illuminating about how land and climate fit together, but that information, in the end, might still be problematic.

"It's one thing for the state to say you have to control this amount of polluted runoff," one senior state official said. "It's another to say you have to maintain this forest cover or this result will occur far away. That's not the traditional bailiwick of environmental regulation. We'll have to evolve ourselves to get to that point."