

Wisconsin scientists team up to predict local consequences of global climate change

Warmer, rainier winters and more intense storms would pose stormwater management challenge

By Michael Timm

When heavy rains and flooding collapsed an East Side manhole, turning an urban intersection into a sinkhole that swallowed a Cadillac Escalade, some people were probably wondering if Milwaukee's July 22 storm was a freak event or a sign of things to come.

Scientists agree that no one can predict future weather with total confidence. But recently, Wisconsin scientists have "downscaled" global models of climate change onto the Badger State to prepare for the likely local impacts of predicted and observed trends—a gradual average annual temperature increase, warmer and rainier winters, and more intense storms.

"Our climate is variable; it has been changing; and we have not been managing our resources as if that's the case," said David Liebl, statewide stormwater specialist at the UW-Cooperative Extension and a member of the Wisconsin Initiative on Climate Change (WICCI).

"It's interesting that in Wisconsin we've got regulation in stormwater quality but almost nothing about stormwater quantity."
—David Liebl, statewide stormwater specialist

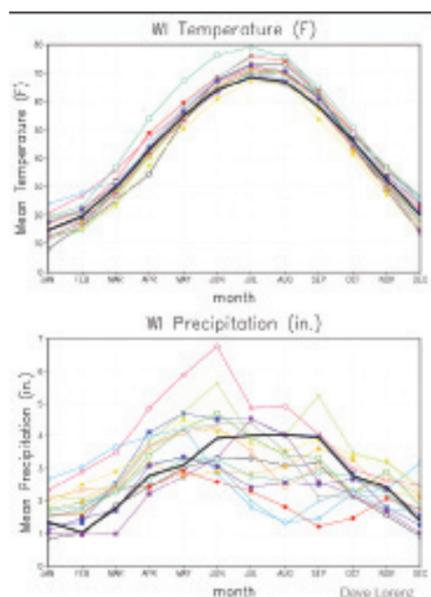
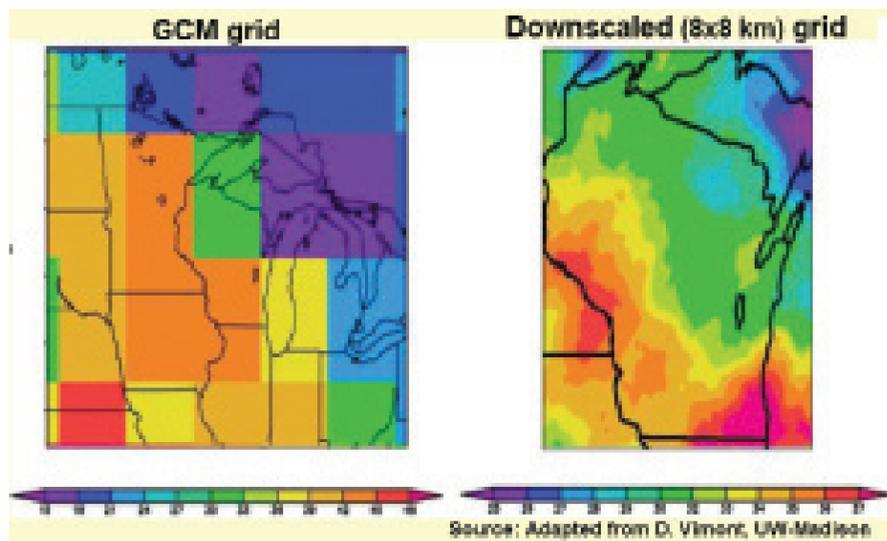
In an effort now being emulated across the continent, WICCI climate scientists Dan Vimont, Steve Vavrus, and Dave Lorenz developed a method to focus the global climate models assessed by the International Panel on Climate Change in 2007 onto a smaller geographic area, in our case, the upper Midwest.

WICCI's goal is to use such models to help Wisconsin adapt to the changing climate. Liebl compared WICCI's risk management approach to actuaries who calculate insurance risks. There are 15 working groups of scientists and professionals from across the state, dedicated to using science to come up with management and adaptation recommendations in areas like agriculture, human health, and stormwater management.

What the Models Predict

Once the climate scientists "downscaled" the 14 different global models, they ran them against actual 1980-99 Wisconsin weather data, to see how well the models predicted what had actually happened. The models matched historical temperature records closely, but were not as consistent in predicting actual precipitation.

Over the next half-century, the models predict an annual mean temperature increase of between 4 and 9 degrees Fahrenheit statewide. Warming is expected to be most pronounced during winter. The models also predicted a



Wisconsin climate scientists tested their downscaled climate models against two decades of actual weather data. The models (14 colored lines) fit closely with observed temperatures from 1980 to 1999 (thick black line). The models were not as consistent predicting historical precipitation data for the same years.

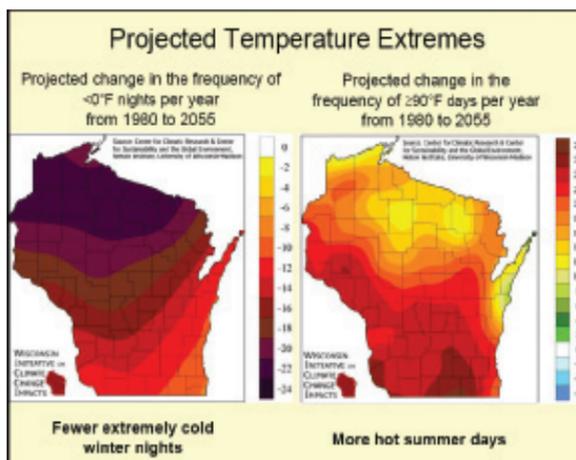
small, gradual increase in annual precipitation.

But perhaps more important with regard to stormwater management, Liebl said, is that the models are in greater agreement about a precipitation increase in late winter and spring. "Most of flooding takes place in springtime," Liebl said. "That's not a good time to be getting more precipitation in general."

And warmer temperatures will increase the likelihood of that precipitation being rain instead of snow. With the ground frozen, ice blocking storm drains, and without transpiration from trees and plants, significant increases in stormwater runoff could overwhelm existing infrastructure, resulting in greater flood risk.

"Right now most flood-related management strategies are based on previous experience of floods," Liebl said. "Our concern is if flood peaks are getting considerably

Wisconsin climate scientists "downscaled" global climate models (left) to a scale more meaningful for Wisconsin (right), composed of data pixels eight kilometers square, to provide "a statistical range of probable climate change."



Over the next four decades, climate models predict a significant decrease in the number of below-zero winter nights and a significant increase in the number of over-90-degree summer days across Wisconsin.

A Need for Better Data

Better data can help scientists refine their climate models and make better recommendations about how to manage stormwater.

Scientists are already using weather radar to actually measure the amount of rainfall from storms, Liebl said, which should provide more precise precipitation data as well as better alert people about flood potential.

Continuous hydrologic modeling would be a useful tool to better understand stormwater risks, Liebl said, but the state will need more rain and stream gauges to collect quality real-time data. "Right now people are probably not aware of how few rain gauges we have in Wisconsin," Liebl said. The same goes for stream gauges, he said. "We don't have as many as we need to be as accurate as possible."

Over the next five to 10 years, Liebl also expects much more robust climate models as climate scientists develop new analytical methods.

higher, we'll never be in a position to manage floodwater because it will always be a little more flooding than expected."

Challenge for Infrastructure

Liebl said urban storm drains were typically designed to handle so-called "10-year" rain events over 24 hours, or the amount of rainfall with a 10-percent chance in any year. Streets carry any volume above that. But in Wisconsin, Liebl said those "normal" volumes were calculated based on mid-20th-century rainfall data from a historically dry period. Add to that the "very gradual, long-term" increase in precipitation overall—plus the increase in the amount of precipitation during storms and incrementally larger surface flows—and actual 10-year rain events will be incrementally larger in volume, meaning that much existing infrastructure is not currently adequate to convey all that stormwater.

Liebl's group is not suggesting a total re-ramp of existing sewer systems, but he said new infrastructure should follow updated data trends. The National Oceanic and Atmospheric Association is due to recalculate rainfall data for Wisconsin in 2011, incorporating the storms of the past few years, Liebl said, which should help infrastructure designers gain a more accurate picture of how much precipitation is possible.

"It's important to realize that the design standards are used—they're not arbitrary—but they don't take into effect the size of rainfall that could occur," Liebl said. Even so, he said the costs and benefits have to be weighed. "No matter how much we increase the capacity of our infrastructure there will always be more rain."

Recommendations & Outlook

WICCI's next task is educating the public and stakeholders about the risks and management options to deal

with a changing climate that has already lengthened growing seasons and altered bird migrations in Wisconsin.

Liebl hopes that increased awareness will encourage land-use more sensitive to stormwater management, for individuals and across communities. "It's interesting that in Wisconsin we've got regulation in stormwater quality but almost nothing about stormwater quantity," Liebl said.

He doesn't believe a large regulating authority is the answer, and said that commu-

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Stream Gauge Data

In Wisconsin, the U.S. Geological Service maintains 230 stream gauges, according to Rob Waschbusch, USGS hydrologist. It costs about \$12,500 per stream gauge plus \$11,500 to run each gauge annually, Waschbusch said. USGS can contribute 30 percent of new gauge costs if it gets a 70 percent local match.

Rain Gauge Data

At the end of 2009 there were approximately 240 weather stations submitting precipitation data to the state's official climate network, according to assistant state climatologist Ed Hopkins of the Wisconsin State Climatology Office, part of UW-Madison's Atmospheric and Oceanic Sciences Department.

Another 65 citizen monitoring stations in Wisconsin participated in CoCoRaHS, the Community Collaboration Rain, Hail & Snow network that is now nationwide and reports data at cocorahs.org.

Hopkins said there's definitely a need to modernize the state's rain gauge data network but that the effort will boil down to money and commitment.

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GOD'S OUTLAW



Comprising God's Outlaw are Bay View's Brian Smith, lead vocals and guitar; Eric "E-Man" Bulgrin, electric guitar; Jason Loveall, fiddle; and Steve "Naked Man" Ramlow, upright bass. —photo Lynn Allen

By Jason Haas

It all started when a Johnny Cash cassette tape got stuck in Brian Smith's truck.

As that tape played over and over during his commute, the plunking guitar and Cash's baritone voice grabbed Smith like never before. The music took the Bay View resident back to his childhood and memories of road trips with his grandfather, who would play music by country singers Boxcar Willie, Conway Twitty, and, of course, Johnny Cash. Hearing Cash's tales about an honest man's struggles, a prisoner's longing to be free, and his classic Christian message resonated with Smith's own religious beliefs.

Smith had been the singer for the hard rock band Double Life until its breakup in 2002. Following a year and a half of "musical abstinence," Smith said that he felt driven to pick up a guitar and figure out the three chords that comprise most of Cash's songs.

With those songs in hand, Smith found a chance to play at the Commodore (now Hector's) on Delaware. Folks thought he sounded pretty good, so he pressed on. By 2008, Smith had begun playing the aptly named "Sunday Morning Coming Down" shows at Frank's Power Plant. Soon he had a ragtag band behind him to fill out the sound. Smith's former band mate Eric "E-Man" Bulgrin rejoined him, with a twangy Fender Telecaster electric guitar in hand. That same year, upright bass player Steve "Naked Man" Ramlow joined the band. (He acquired "Naked Man" status for riding his Harley through a campsite wearing nothing but a beard.) With the addition of nickname-less Jason Loveall on fiddle, the band lights people's britches on fire with their raw country sound.

What Makes It "Outlaw"?

The songs that God's Outlaw play are the sort of music that people played to deal with the overarching skies of the Western plains and the heat of farmland on a hot day.

"It's different from what everyone else is doing. We don't use fancy effects, no exploding barrels of hay. I've seen naked guitar players..." Smith said. "I've seen it all."

Smith and company take a different approach from the charts-driven country music that fills the airwaves today.

"Keep it simple so people can understand it," Smith said is the band's philosophy, noting that to make the hay explode, "somebody has to light the fire—I'd rather be the one lighting the fire."

His music is rowdy enough to please the members of Outlaws Motorcycle Club on First Street, where Smith once played a solo show. At the same time, it's deliberately simple. Their sound breaks away from the norm of overproduced modern country music, hearkening back to a time when the United States had more train tracks than clogged freeways. "I don't want to do anything that I can't play live," Smith said.

While God's Outlaw performs rowdy covers

of songs like T. J. "Red" Arnall's classic "Cocaine Blues" and has over 95 Johnny Cash songs in their muster, like so many Americans, the band walks the line between sin and redemption.

Take their original song "Ten Rules," which has a straightforward chorus: "God has just 10 rules. How 'bout you?" Hope for redemption is also the theme in the song "U-Haul," which is based on a story from Smith's life. Following a long argument with his wife, Smith took a drive to cool off. Coming home, he saw a U-Haul truck pull up in front of his house. Was it a sign that his marriage had come to an end? Not so—the truck turned around and pulled away, leaving his home intact.

Local Band, Local Focus

When Smith's voice washed over the crowd at the 2010 Bay View Bash, people instinctively began to tap and nod their heads, do a private little dance. The music felt like hearing from an old friend who's been gone too long, but is sure glad to visit.

God's Outlaw's sound is similar to the Milwaukee honky-tonk band The Carpetbaggers, who have similar instrumentation, even similar hats and clothes. Two key differences are Smith's voice, which is lower than The Carpetbaggers' singer-guitarist Matt "MF" Tyner's, and that God's Outlaw gets the crowd moving without the help of a drummer. They get along mighty fine without one.

Smith, 40, was born in Pittsburgh, and has lived all over the country, from New Mexico to Michigan. Following his service in the U.S. Air Force, in which he served in Operations Desert Shield and Desert Storm, Smith settled in Bay View with his wife Lori Walenczyk Smith. The birth of their two daughters in 2001 and 2004 prompted him to trade his career as a mixed martial arts fighter and complete his degree in marketing and mass communications at UW-Milwaukee. He works in sales for RCC Western Wear.

Today, Smith and his band are in the fortunate position of not having to ask for gigs. Instead, venues come to him, a status God's Outlaw achieved by establishing themselves as a raucous, hard-pickin' country band. According to the band's website, they have played dozens of shows in the past two years, ranging from the aforementioned Bash, Harley-Davidson's 105th Anniversary festival, and Smith's solo shows for patients at the St. Ann Center for Intergenerational Care. There, even the infirm come alive, moving their hands and heads to the familiar sound of Johnny Cash.

At this moment, aside from playing military tribute shows at Rocco's, the band is focused on recording their first album at Basement Tapes in downtown Milwaukee. True to form, the recordings will be made with analog tape, rather than digitally. And when the album comes out next year, you'd be right to reckon they'll throw a mighty good party—without any exploding hay bales.
Upcoming Gigs: Rodeo Bar, 4177 S. Howell Ave., Nov. 23, 2:30-5:30pm. With Cathouse Drifters and Western Starlanders.

Releases: three EPs due out in late 2010, full album early 2011.

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nities' self-interest should motivate them. Planning low-impact development and reducing impervious surfaces are two ways to be smart about stormwater. In already-built environments like the city, anything that promotes on-site infiltration—rain gardens, rain barrels, porous pavement, green roofs, and bioretention swales—can help reduce stormwater runoff.

Liebl compared stormwater management to Wisconsin's snow shoveling ethic. "Everybody knows snowfall is something you have to deal with," Liebl said. "Rainfall has a way of going downhill, out of sight, out of mind."

But he said people need to remember that stormwater has consequences downstream, even if not always as dramatic as an SUV sputtering in a sinkhole. ❄

WICCI is a partnership between the Wisconsin Department of Natural Resources and the University of Wisconsin-Madison. It was developed in 2007 after a bipartisan committee of state legislators wanted to know how climate change would affect their constituents and districts. Focus on Energy funded the climate research, supported by UW-Madison and DNR. A report synthesizing the predictions and recommendations of the WICCI working groups is expected by early 2011. More info: wicci.wisc.edu.

Source for all images: David Liebl's Sept. 14, 2010 WICCI presentation, "Projected Climate Impacts and Adaptation Strategies for Wisconsin's Urban Areas."

Trees Help Manage Stormwater

One of the recommendations for managing stormwater is to increase tree cover. "For every 5 percent of tree cover added to a community, stormwater is reduced by approximately 2 percent," according to a presentation, "Trees and Their Role in Storm Water Management," by Mindy Habecker at the Dane County UW-Extension.

In 2009, the city of Milwaukee's estimated tree cover was 21.5 percent, according Forestry Services Manager David Sivy, up from 16.5 percent in 1998. In the 3,732-acre 14th Aldermanic District, tree cover is 20 percent (Forestry's goal is 30 percent) and grass cover is 26 percent, according to Sivy.

Forestry has been more focused on "Emerald Ash Borer readiness" and has not moved forward with any private tree-planting initiatives, Sivy said. However, in spite of the economy, Forestry's funding for street tree replacement is holding steady, Sivy said, and they've added over 2,400 shade trees to boulevards over the past couple years.

A CITYgreen spatial analysis of Milwaukee's urban tree canopy estimated the stormwater benefit at \$15 million, according to Sivy, but this study did not project increased stormwater reduction benefits associated with increasing canopy.

Milwaukee Bioswales

In an effort to increase stormwater quality, the city of Milwaukee has installed approximately 20 bioswales on N. 92nd Street from Capitol Drive to Good Hope Road and about 10 on Grange Avenue from 26th Street east to the freeway, according to Scott Baran, with DPW's Environmental Services.

Both projects are helping Milwaukee attempt to reach its goal of reducing the city's total suspended solids loading. DNR has mandated that the city attempt to reach a 40-percent reduction in TSS by 2013, which Baran termed "a very ambitious goal."

More bioswale projects are anticipated for S. Bay St. in 2011, and a project along S. Sixth Street from Howard to Layton is under consideration.

"These bioswales have been well received so far and also help with beautifying the boulevards," Baran said, and have included the addition of 100 new street trees.

Greendale's Bioretention Swales

In 2009, when planning a Municipal Street Improvement Project along Grange Avenue between 60th and 68th streets, the Village of Greendale added median bioretention swales with wild flowers, mulch, and engineered soils that serve to remove silt and pollutants from stormwater runoff before it flows into Dale Creek.

Carl Tisonik, Greendale director of public works, said the project has exceeded expectations. The project was budgeted at \$220,000, Tisonik said, and the state provided 80 percent of the funding; the village 20 percent.

Tisonik credits Greendale engineer Len Roecker with the idea and MMSD for PR support. Tisonik said he's gotten calls from as far as Florida and Nevada asking about the project.

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