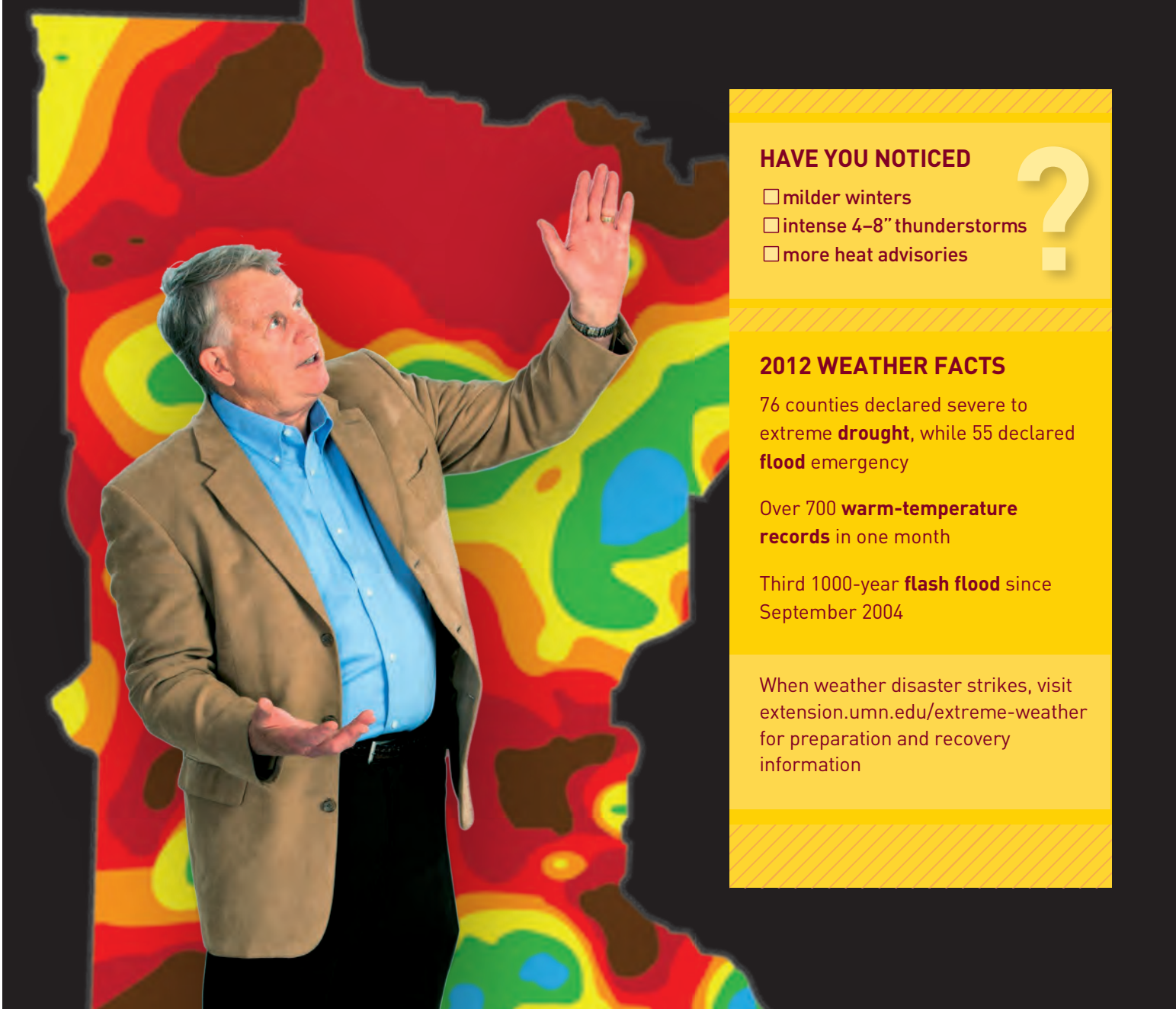

HAVE YOU NOTICED

- ☐ milder winters
- ☐ intense 4–8" thunderstorms
- ☐ more heat advisories

2012 WEATHER FACTS

76 counties declared severe to extreme **drought**, while 55 declared **flood** emergency

Over 700 **warm-temperature records** in one month

Third 1000-year **flash flood** since September 2004

When weather disaster strikes, visit extension.umn.edu/extreme-weather for preparation and recovery information

SEEING PATTERNS

Mark Seeley charts Minnesota's changing climate

Climate matters to Minnesota. Transportation, agriculture and recreational infrastructures are all based on it. Extension helps Minnesotans respond to new challenges caused by changing weather patterns.

The times they are a-changin', goes the old Bob Dylan song. The climes are changing too. Have you noticed? Extension climatologist Mark Seeley sure has.

Climatologists have recorded temperatures on a statewide basis for 119 years, yet seven of Minnesota's 10 warmest years have occurred in the last 15 years.

2012 was the third hottest on record for Minnesota, and the hottest ever for the 48 contiguous states. Moorhead was the hottest place on the planet at 6 p.m. on July 19, 2011, with a heat index of 134 degrees.

Nobody knows Minnesota's climate better than Seeley. He is heard weekly on Minnesota Public Radio, and regularly in public forums, including the Minnesota Legislature, where he helps decision-makers understand the implications of changing weather patterns.

At heart, he's a scientist who follows the data. "I'm a measurement guy, so when I see changes in data from our own backyard, I take notice," he says.

Hot and humid

Higher dewpoints, which translate into higher heat index values, is one change Seeley notices. Even Voyageurs National Park, in northern-most Minnesota where people go to escape summer heat, is becoming steamier.

The National Weather Service has issued more heat advisories in recent years due to higher dewpoints. High heat can severely stress livestock—not to mention humans. Milder winters also mean more insects and plant diseases survive and thrive rather than dying off each year.

It's not all bad; higher temperatures also translate to a longer growing season. In fact, the U.S. Dept. of Agriculture changed plant hardiness zones in 2012 for the first time in 20 years, allowing for a wider range of plants that can now survive in northern zones.

Flood and drought merry-go-round

Today's growers need to choose plants that can withstand the combination of drought and heavy rains brought by climate change. Records show that annual precipitation is increasing in most places, and more comes from intense thunderstorms. These bursts of rain bring more flash floods, increased soil erosion and saturated crop fields.

Minnesota has experienced its share of floods in the last 20 years. Southern Minnesota saw three 1,000-year flash floods in the last nine years, while parts of the Red River Valley have reported six of the top 10 spring snowmelt floods since 1997.

At the same time, Minnesota has experienced historic droughts. By the end of the 2012 growing season, 76 of Minnesota's 87 counties were in severe to extreme drought. At the same time, 28 counties suffered the effects of flooding. Crop yields were reduced, aquifers ran low or dry, and drought exposed some landscapes to wildfire risk.

Coping with climate change

Seeley believes that Minnesotans need to adapt to climate change community by community. "We face important questions," he explains. "Will we protect a city from floods by building a more robust storm sewer system, or is it too expensive? How much should a farmer invest for tile drainage systems to manage such extreme variations in rainfall?"

On a broader note, Seeley wonders if people will support long-term preservation of natural resources systems. "We're already changing the way we stock fish–using a different mix of species–due to climate change. What other accommodations are we going to make?" he asks. "Are we going to manage our resources so that future generations can enjoy Minnesota's lakes, streams and natural beauty to the same extent that we have?"

If Seeley has his way, that answer will be a resounding yes.

NOTE: Mark Seeley will present at the first Conference on Climate Adaptation, November 7, 2013, at the Science Museum of Minnesota. Professional planners will learn about climate adaptation strategies in transportation infrastructure, natural resources, public health and agriculture. For more information, visit www.extension.umn.edu/environment/climate

Milder winters bring uninvited pests

Insects have always come to Minnesota as tourists, according to Jeff Hahn, Extension entomologist. "A variety of insects are arriving all the time, on the wind, on human travelers or in foreign cargo." Changing weather patterns can make it easier for them to survive the winter and reproduce, possibly becoming invasive, especially if no natural predator exists for them here.

Even insects that can't survive the winter may arrive earlier in spring and stay through harvest season, causing more damage.

Extension does the research, and then educates producers on ways to deal with these uninvited pests.

Spotted wing drosophila suzukii

Fruit fly from Asia damages Minnesota's fruit and berry crops.

Extension monitors crops and teaches growers to identify and manage.

Western corn rootworm

Diabrotica virgifera virgifera

Pest from southern North America causes up to $1 billion in lost revenue.

Extension studies crop rotation and variety selection to reduce impact.

Potato leafhopper

Empoasca fabae

Sap-sucker feeds on soybeans, alfalfa, beans, ornamentals and potatoes.

Extension teaches growers to prevent infestations.