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More Rain, More Often

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Ohio should expect extreme flood events more frequently and on a greater scale in coming years, according to research by a University of Dayton geologist. An increase in water pollution similar to Grand Lake St. Marys is also forecasted as Ohio experiences drier summers and wetter winters.

Using historical precipitation data and future-oriented global climate models, geology professor Shuang-Ye Wu projects that "100-year flood" events in the Dayton area are likely to increase by 13 percent.

"Another way to look at it is that with an expected 20 percent increase in precipitation, the '100-year flood' is likely to occur more frequently, about once every 35 years," Wu said. Her study of the potential impact of climate change on flooding in the upper Great Miami River watershed is published in the current issue of *Hydrological Sciences Journal*.

Wu created a statistical model to predict changes in peak stream flow in the Great Miami watershed. She used local historical precipitation data from 123 regional stations to adjust 14 global climate models for use on a local scale. Eleven of the 14 models predicted an increase in 100-year peak stream flow, with an average 13 percent increase.

"This research has social and economic implications for the Dayton area, as more of the heavily developed area along riverbanks will likely be exposed to increased flood risk," Wu said.

She plans to further study the impact of such flood risk by mapping the present and future flood plain and overlaying it with land use, population distribution and infrastructure.

The Great Miami River watershed is highly vulnerable to flooding, Wu said. The Great Dayton Flood of 1913, which was the greatest natural disaster in Ohio history, was created by a series of three winter storms that hit the region in March 1913. Within three days, 10-12 inches of rain fell on frozen ground, resulting in more than 90 percent runoff that caused the river and its tributaries to overflow. The existing series of levees failed, and downtown Dayton experienced flooding up to 20 feet deep.

Wu recently completed research on precipitation patterns, which is yet to be published, that supports her findings in the flood research.

"The most important finding of my latest research on precipitation in Ohio is that the number of extreme precipitation events is going to increase, and the magnitude of those events will be disproportionately larger," she said.

By combining historical trends and global forecasts, Wu forecasted Ohio rainfall patterns through 2100. He findings showed extreme weather events ¿ those that generally occur once every 1, 5, 10 or 25 years ¿ will become more severe. For example, Ohio is likely to experience 7 percent more rainfall for a 1-year event and 14 percent for a 25-year event.

Her findings also showed average precipitation will increase 15 to 20 percent in winter and decrease 10 to 15 percent in summer.

"This will have a serious impact on water quality, as well as water quantity," Wu said. "Because Ohio is still largely agricultural, the early spring is a popular time to fertilize land. If rainfall increases at this time, nutrients will be flushed into the rivers before plants can absorb them. And if summers are drier, reduced stream flows will likely increase the concentration of pollutants. All of this could lead to more frequent episodes of severe algae bloom as experienced at Grand Lake St. Marys this summer."

Wu said climate change is largely responsible for the expected changes to Ohio's precipitation and flood patterns.

"The problem is a global problem, and we can either try to lessen climate change by reducing the amount of carbon dioxide in the atmosphere, or we can try to reduce our vulnerability to such change through water management strategies."

Wu teaches a variety of courses at the University of Dayton, mainly environmental geography, including physical and human geography, geographical information systems and changes in the Earth's systems. Her research interests focus on the

potential impacts of climate change, particularly on coastal and inland flooding.

For more information, contact Cameron Fullam, assistant director of media relations, at 937-229-3256 or fullam@udayton.edu.