A Presentation of the

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Extreme Rainfall Events and 2008 Floods in Iowa

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What caused the floods of 2008?

- Land use change?
- Altered hydrology (e.g. channelization, drainage)?
- Agricultural management practices?
- Conservation practices?
- A significant amount of rain (i.e. the “perfect storm”)

Some Recent Columns

Quad-Cities Online
Dispatch·Argus·Leader

Posted Online: Jul 21, 2008 02:38PM

Letter: Ban no-till farming to end the flooding

Comment on this story

The whole Midwest farmland and cities are reaping the reward of no-till farming by suffering excessive flooding.

Farmland no longer is plowed as it was in the past, which leaves thousands of acres where the water has nothing to cling to and rushes immediately to the nearest stream, river, or lowland area.

No-till chemical faming only works a couple of inches of topsoil and leaves thousands of acres of farmland like a super shopping-center parking lot which does not retain or hold rainwater. Deep plowed fields had natural furrows every 16 inches to retain water and was plowed deep enough to absorb excess water.

These floods will be with us every year until we quit this no-till chemical farming which the congressional lobbyists sold to Congress saying that it would save the topsoil. This type of farming without deep plowing has just the opposite effect because the couple inches of topsoil cannot cling to the solid-packed earth underneath in heavy rainstorms and is washed away to the nearest stream, river or low farm area. This law that Congress passed forces farmers to no-till chemical farm, or they will not get their subsidy check. It must be repealed.

The chemical herbicides and insecticides sprayed on the fields to kill weeds also are poisoning our water supply which is causing numerous cancer cases, which already are on the rise. These chemicals also are killing off our bees, and beekeepers in the Midwest are losing complete hives and money.

Frank Painter,

East Moline

DesMoinesRegister.com

July 7, 2008

Guest column: Is 'conservation' increasing flooding?

MICHAEL BURKART is an associate professor, retired, in geological and atmospheric sciences at Iowa State University. GUESTY NAMEY is black and stuff ab

The June 27 interview with Iowa Secretary of Agriculture Bill Northey and the recent urban flooding may provide an opportunity for a public discussion about the consequences of conservation practices supported by the U.S. Department of Agriculture.

Northey gave a traditional view of conservation practices designed to protect annual row-crop production agriculture. Before more state and federal tax funds are spent on conservation practices, we need to know more about how they affect communities downstream from Iowa's industrial-scale agricultural landscape. Many conservation practices recognized by USDA have consequences that include increases in flood potential, stream sediment loads and reservoir sedimentation, plus other negative in-stream and downstream effects.

As examples, consider two conservation practices widely used in Iowa: terraces, mentioned by Northey, and surface and subsurface drainage.

Terraces are designed to reduce the rate of soil erosion on steep slopes. However, there is little evidence that stream sediment loads are reduced in a terraced watershed. First, terraces allow conversion of land from perennial vegetation used for grazing to annual row crops, increasing the potential for erosion. Like native prairies, perennial vegetation stabilizes soil, and it stores or uses water for as much as nine months each year. Annual crops provide limited soil stability and water use for only a few months. Water storage and use by perennial vegetation is particularly important in Iowa during spring and fall, when much of our rain comes, but annual crops are not active.

Second, terraces shift water from runoff to infiltration. Studies have shown that greater infiltration ultimately increases stream bank and bed erosion that can be witnessed in the extensively terraced parts of western Iowa. It is likely that sediment loads in many of Iowa's streams have actually increased since installation of terraces.

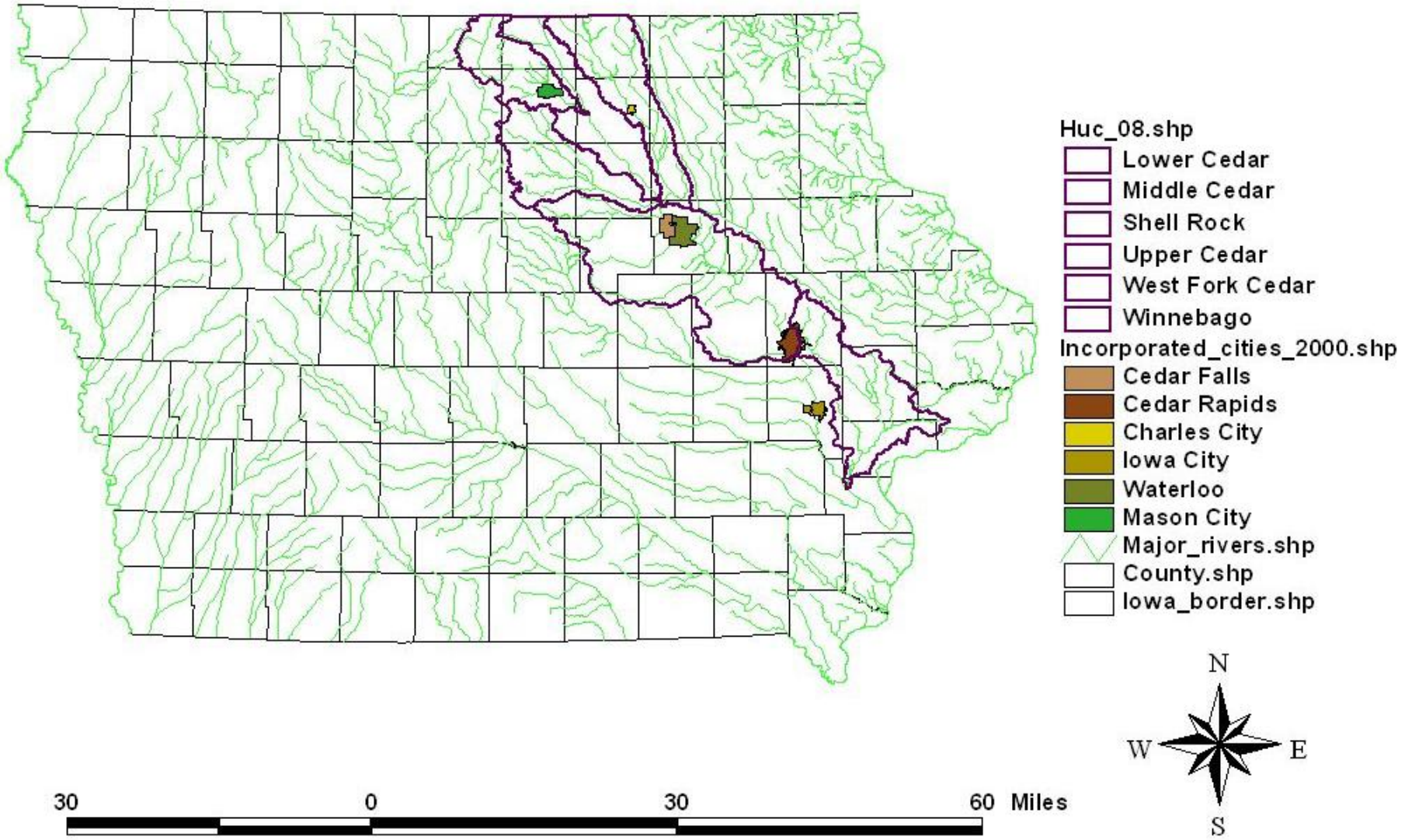
Conservation practices that have accelerated drainage include tile drainage, ditches and stream straightening. Tiles and ditches have eliminated most of the natural water-storage capacity of the land in central and northern Iowa. That was the purpose of these practices, and to that end, they have largely been successful. Unfortunately, that storage loss has increased the frequency, duration and intensity of flooding in the receiving streams.

Straightened and deepened streams provide farmers with more rectangular fields that more rapidly drain in most years. Unfortunately, they also have increased stream velocities, accelerating stream bank and bed erosion and increasing sediment loads until a new equilibrium is reached, perhaps taking centuries. These sediment loads are deposited in our large reservoirs, reducing their flood-storage capacity. The lost storage has increased the potential for uncontrolled water flow over emergency spillways, responsible for the recent flooding in Des Moines, Iowa City and other communities downstream of these reservoirs.

Both of these sets of practices have allowed conversion of land to annual row crops, directly increasing the wealth of individual landowners and indirectly improving Iowa's wealth. However, it is time to compare the benefit of this increased wealth with the cost to individuals and the state of flood damage, stream degradation and reduced reservoir life. Many of the conservation practices listed by the USDA transfer a water problem from the field to the stream or groundwater. While this transfer was intended, the collective downstream hydrologic consequences were likely not considered adequately.

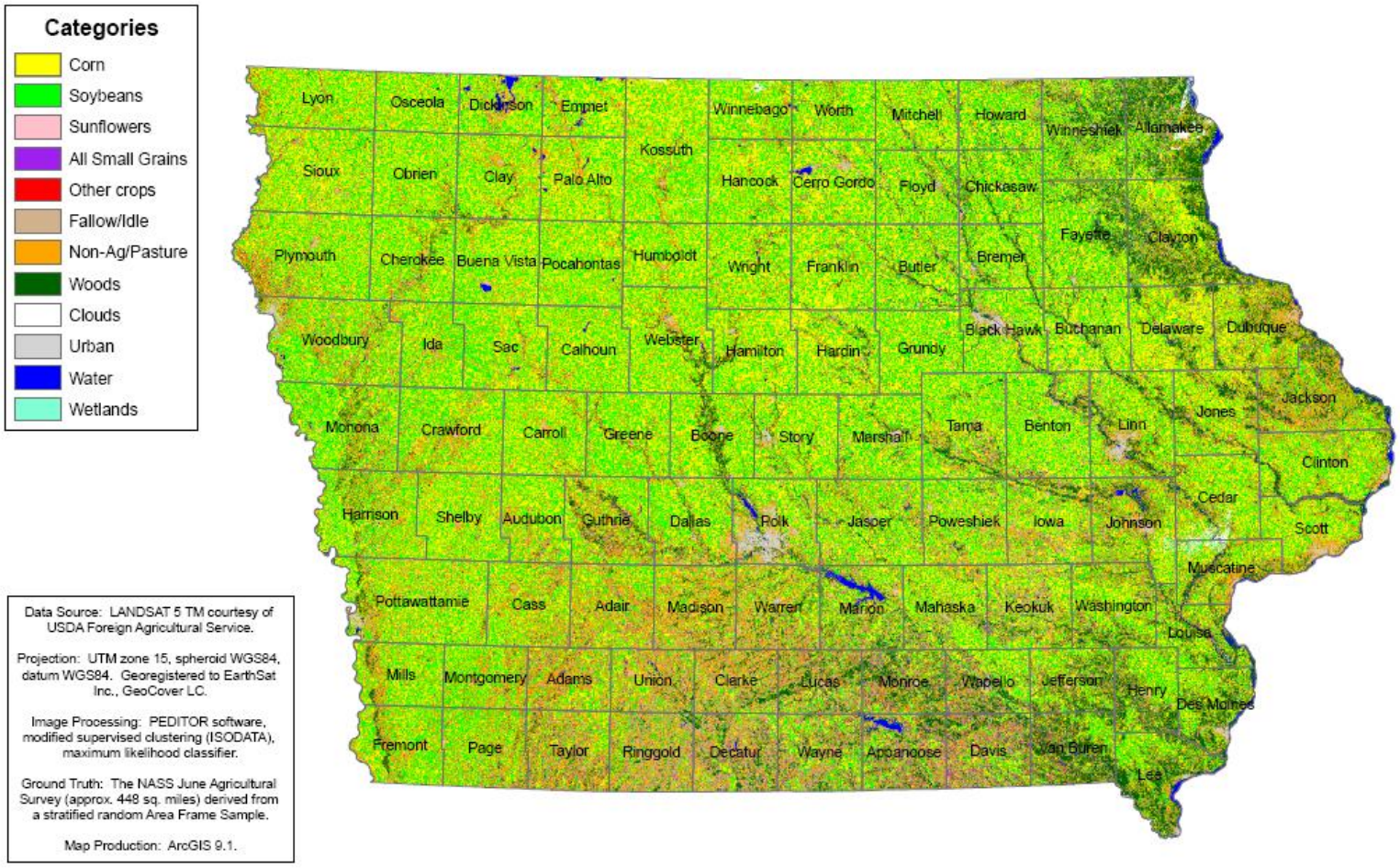
USDA recently started a study of the effects of conservation practices on water quality and quantity. Fortunately for Iowa, the National Soil Tilth Laboratory in Ames and Iowa State University are among a limited number of institutions conducting the Conservation Effects Assessment Project. Perhaps the

Some Areas of Most Significant Flooding

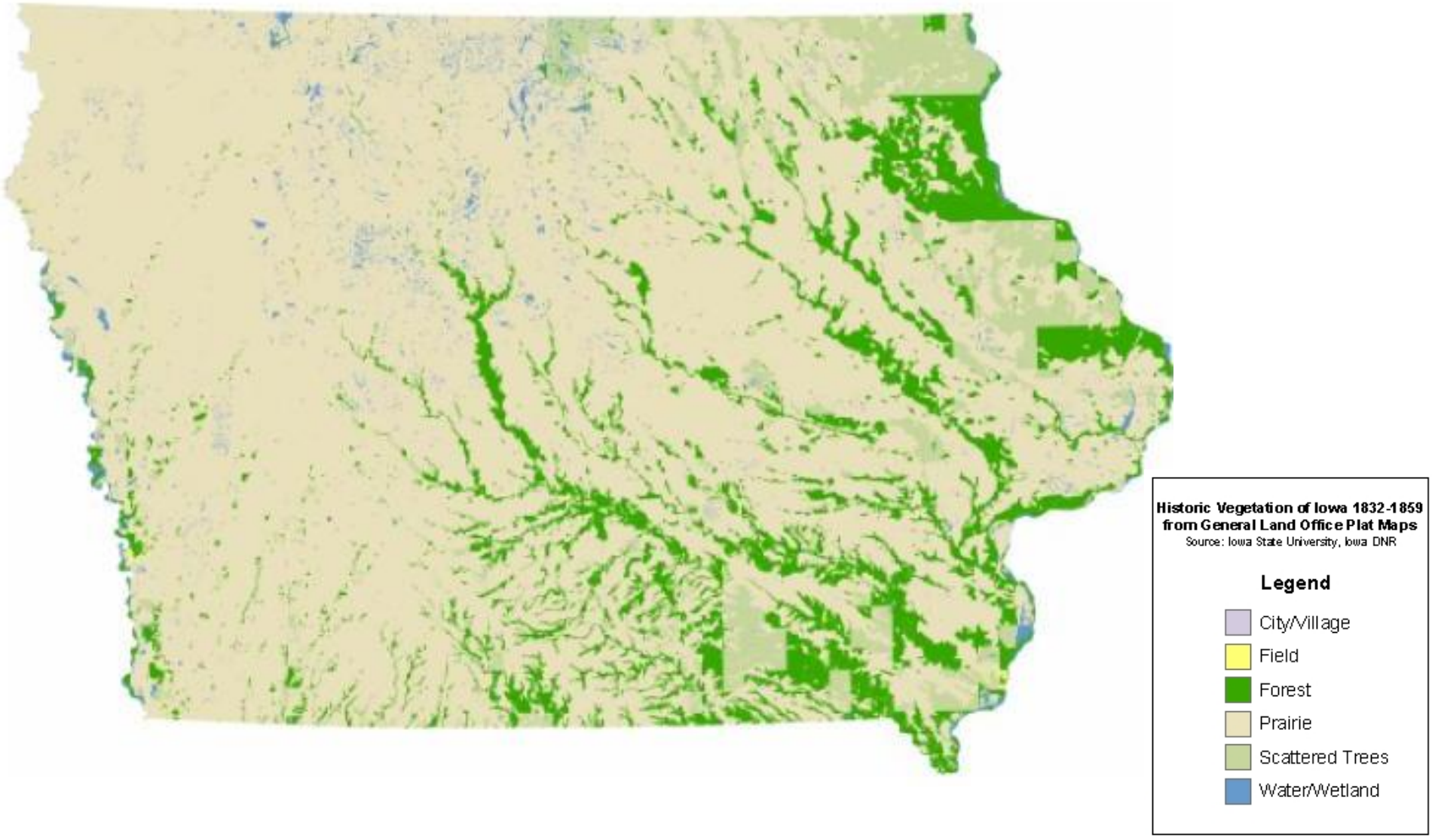


Landuse in Iowa – Present Day

2005 Iowa Cropland Data Layer

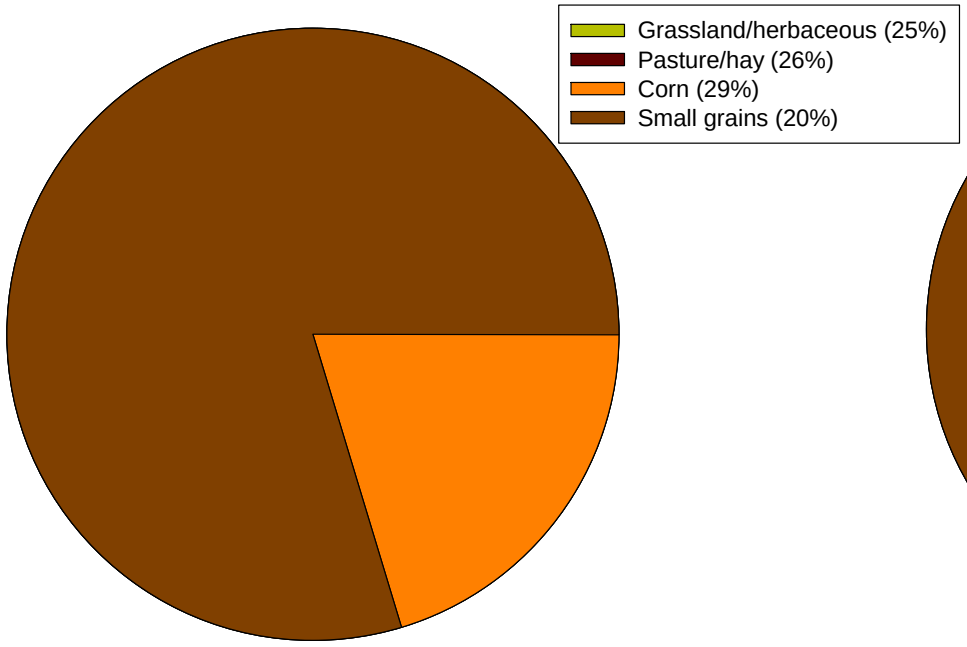


Landuse in Iowa - Historic

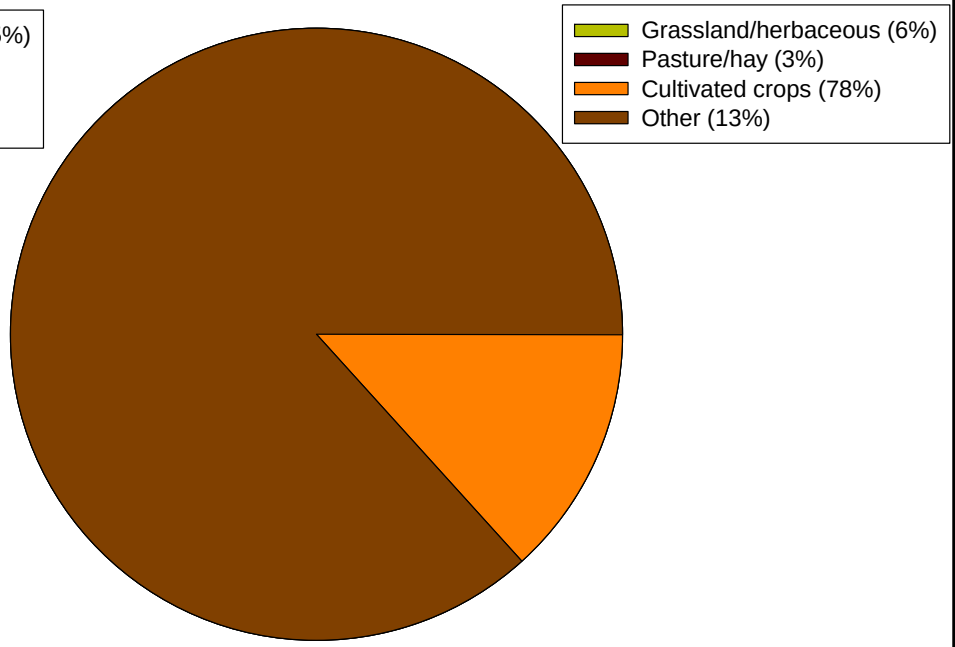


Cedar River Land Use

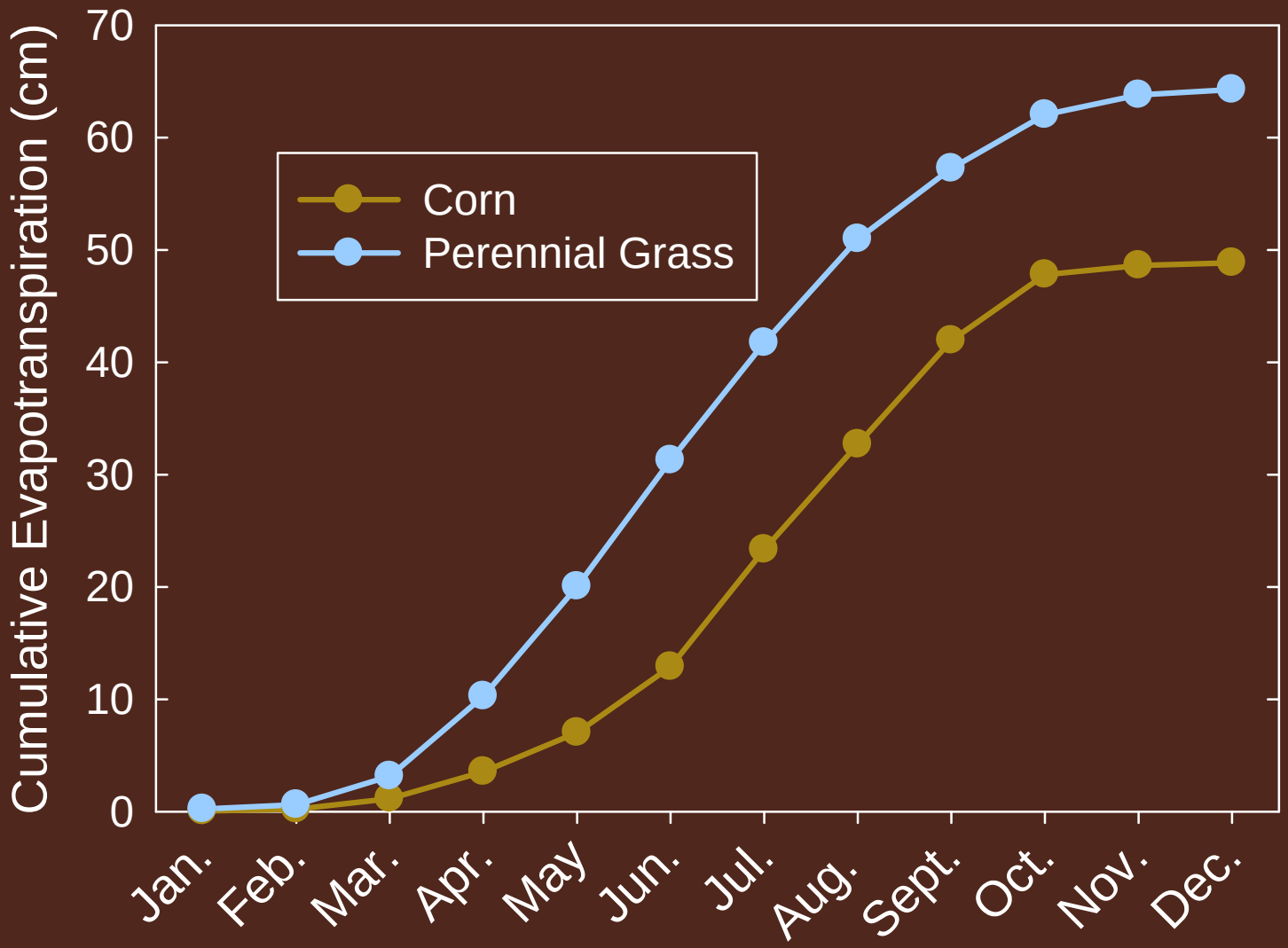
1940 Landuse



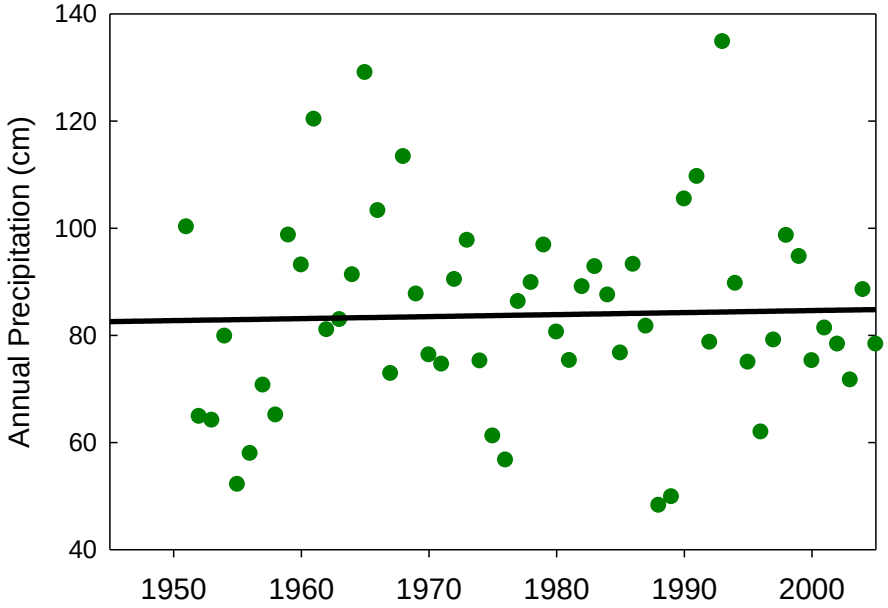
2002 Landuse

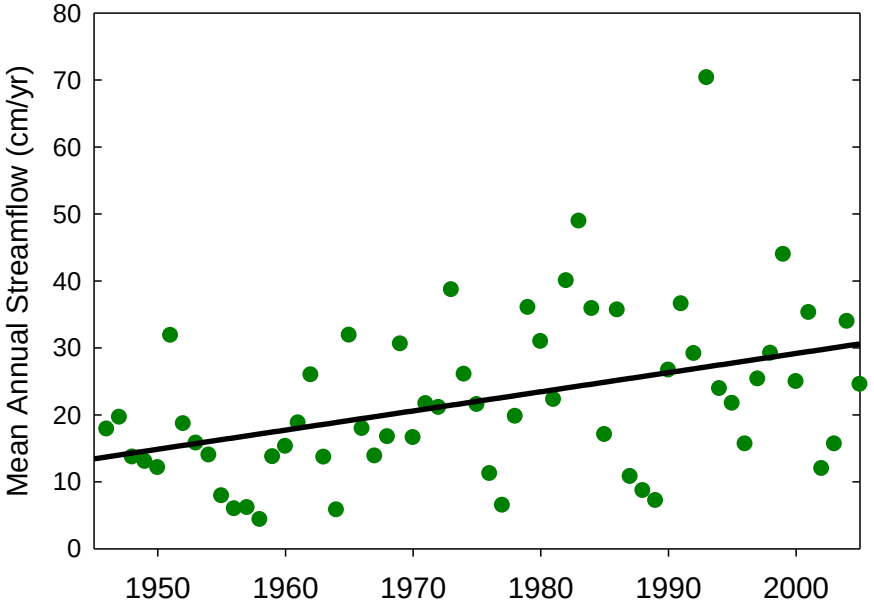


Simulated Alteration in Water Use



Streamflow of Cedar River



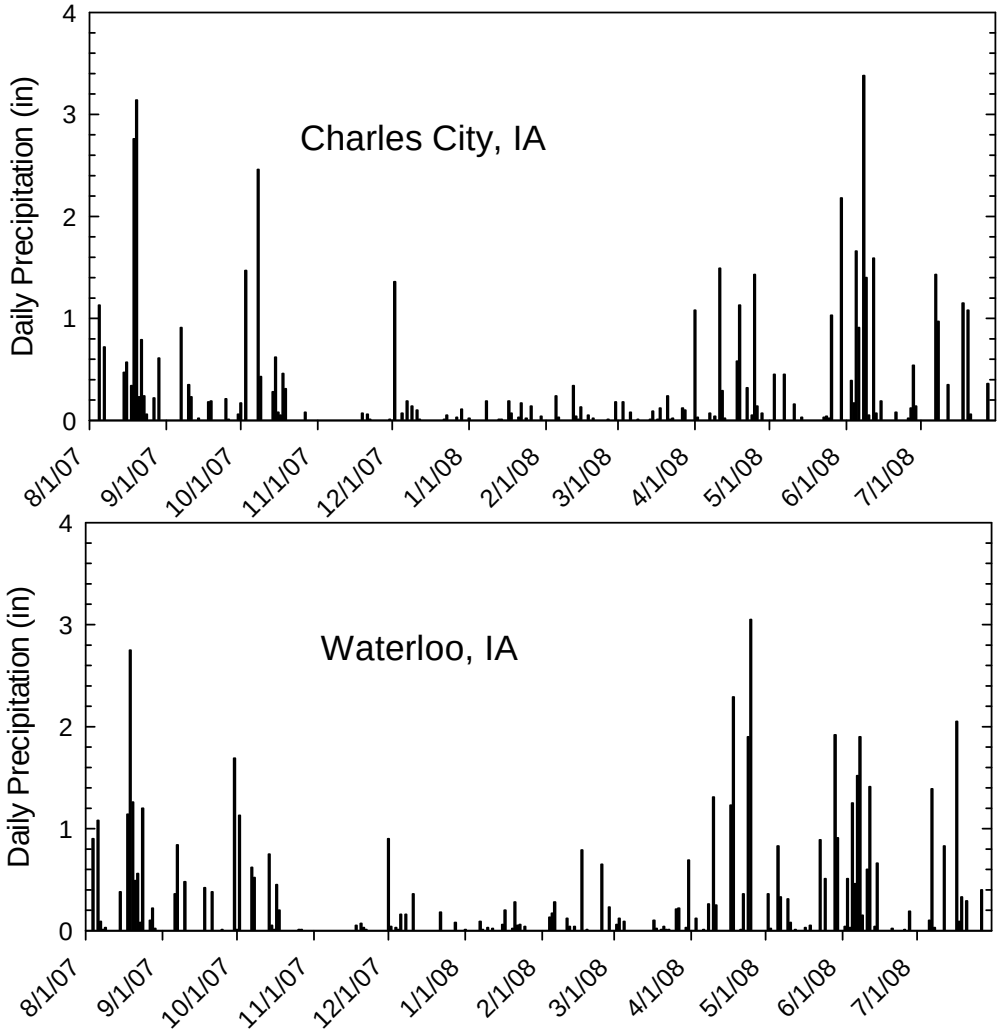


Expected Rainfall for a 24-hr Storm Period for Various Recurrence Intervals

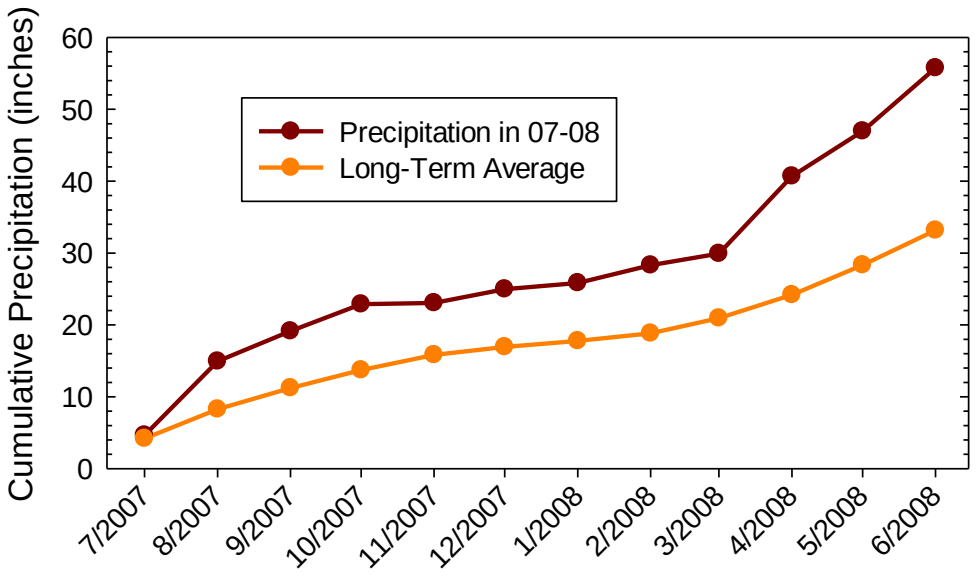
Recurrence Interval	Rainfall (Inches)
6-mo	1.94
1-yr	2.4
2-yr	3.06
5-yr	3.84
10-yr	4.44
25-yr	5.42
50-yr	6.25
100-yr	7.13

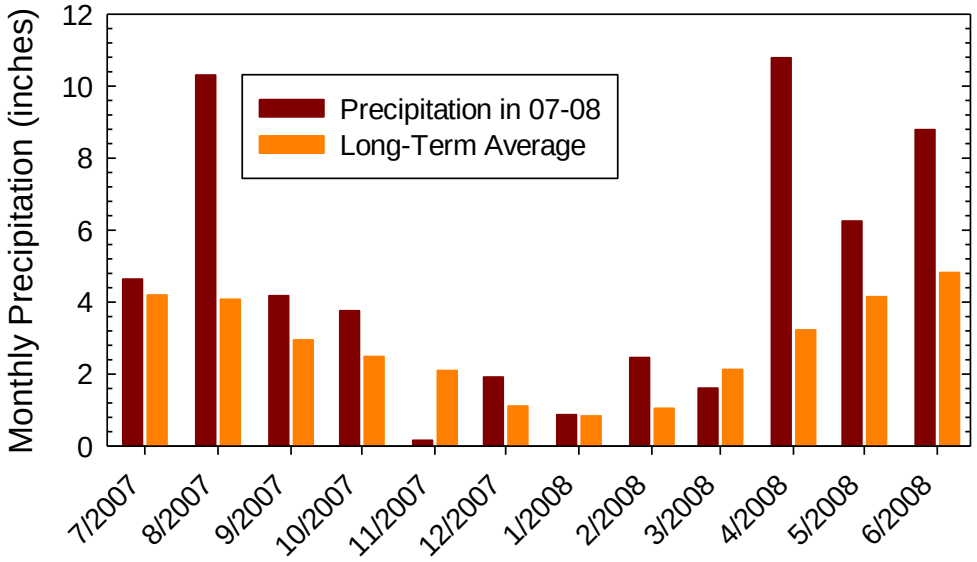
What Happened in 2008?

Daily Precipitation at Charles City and Waterloo, IA

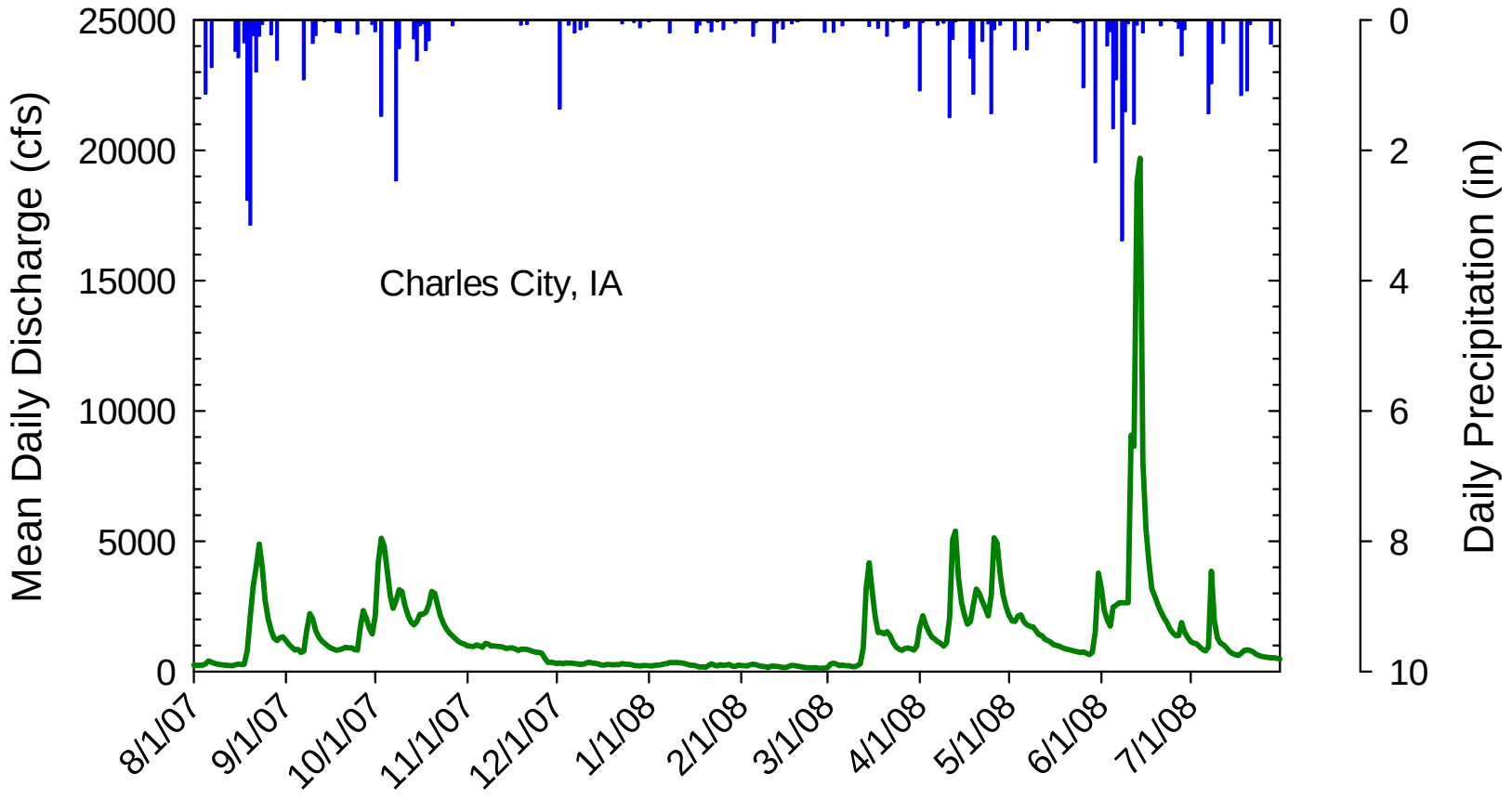


July 2007-June 2008
Precipitation near Waterloo, IA

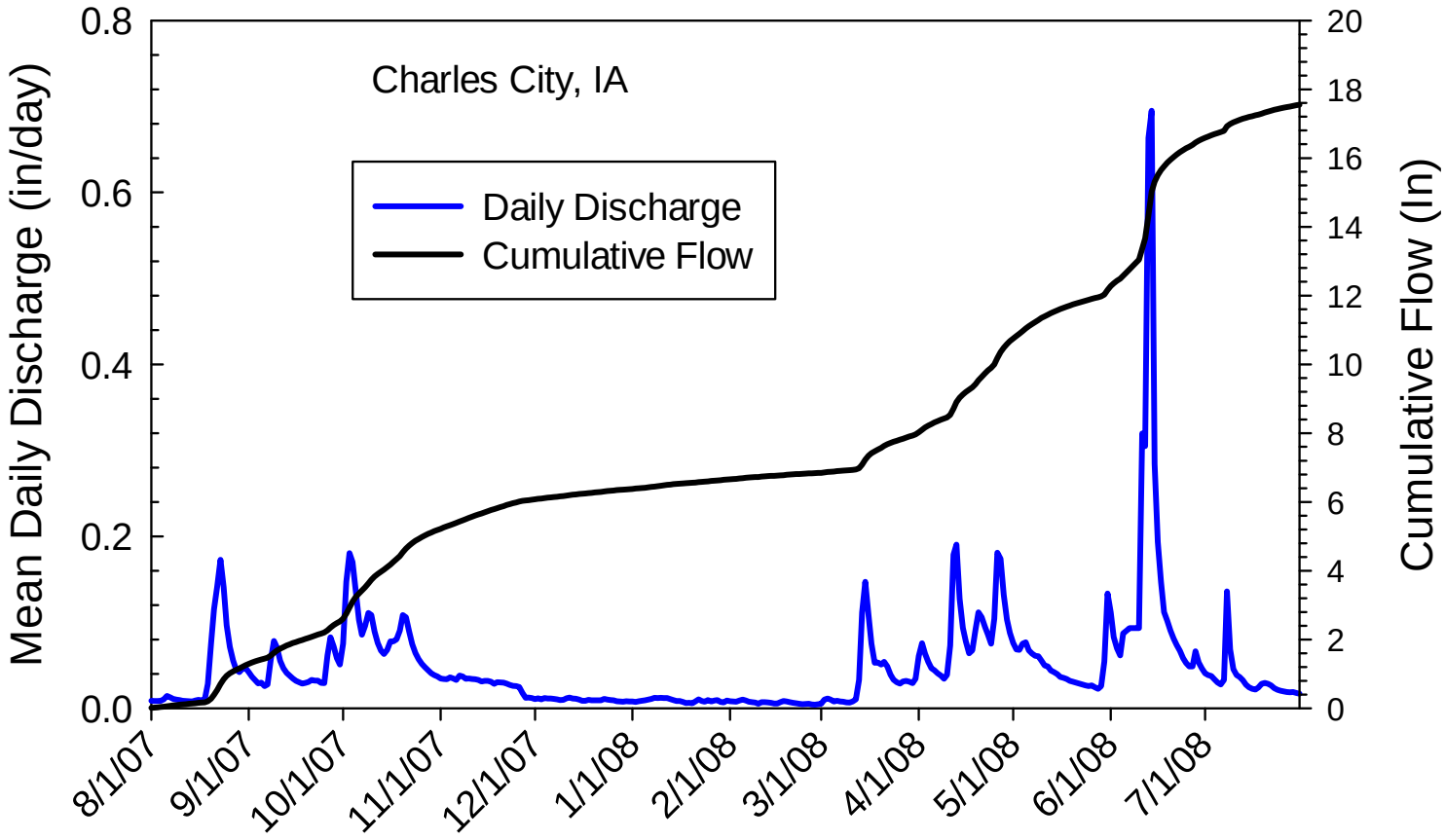




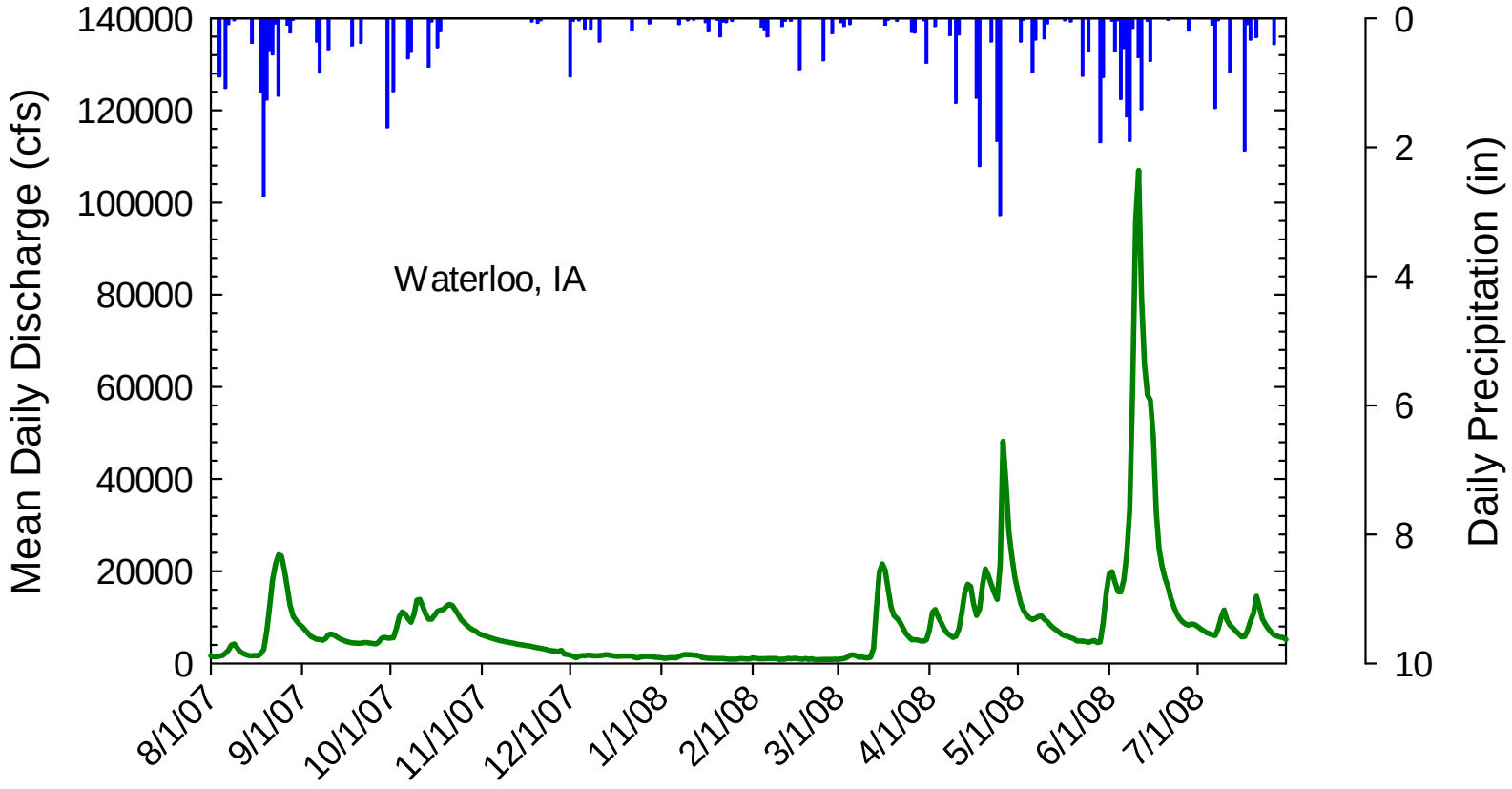
Streamflow at the Charles City, IA Gaging Station on the Cedar River



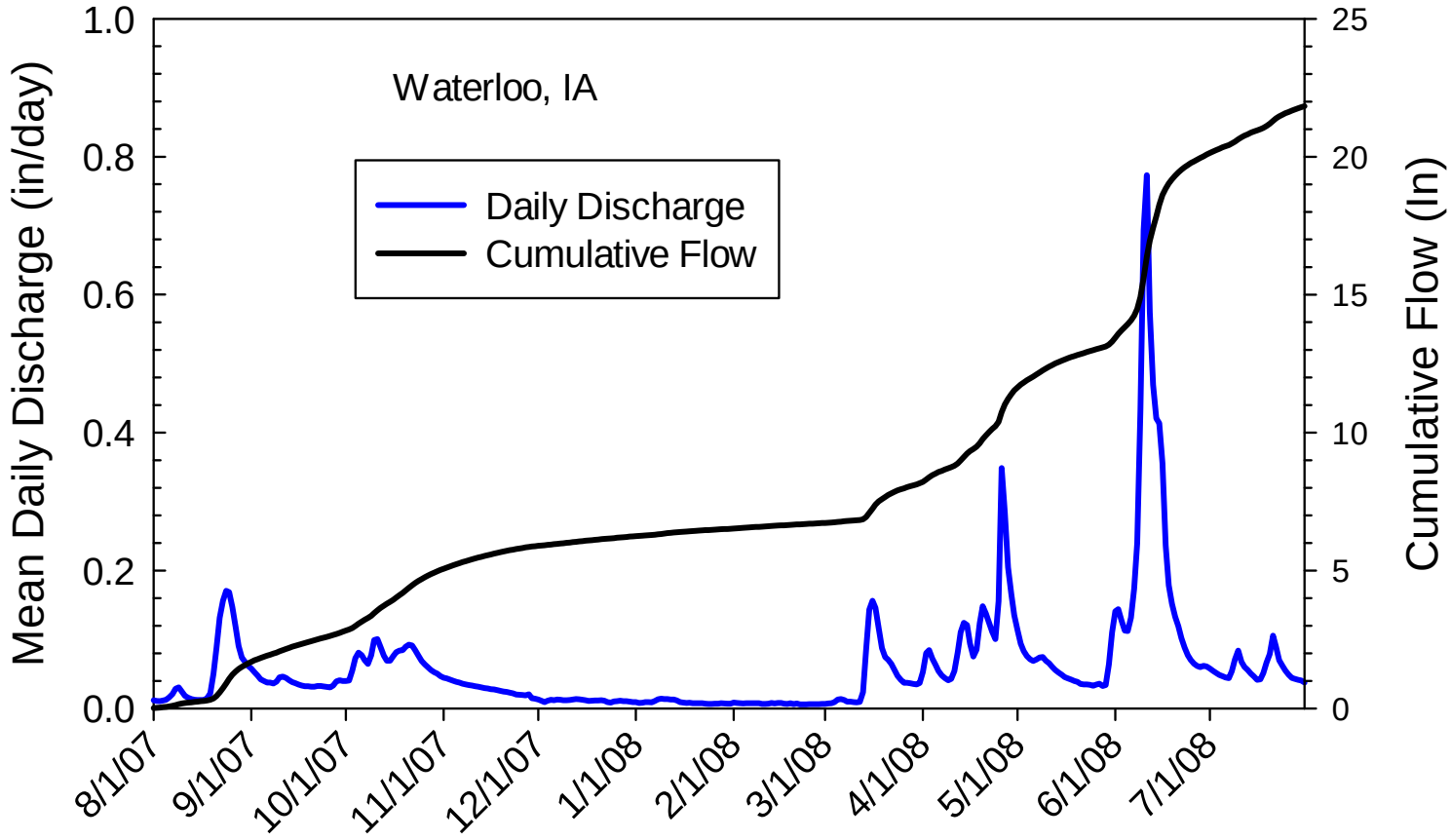
Streamflow at the Charles City, IA Gaging Station on the Cedar River



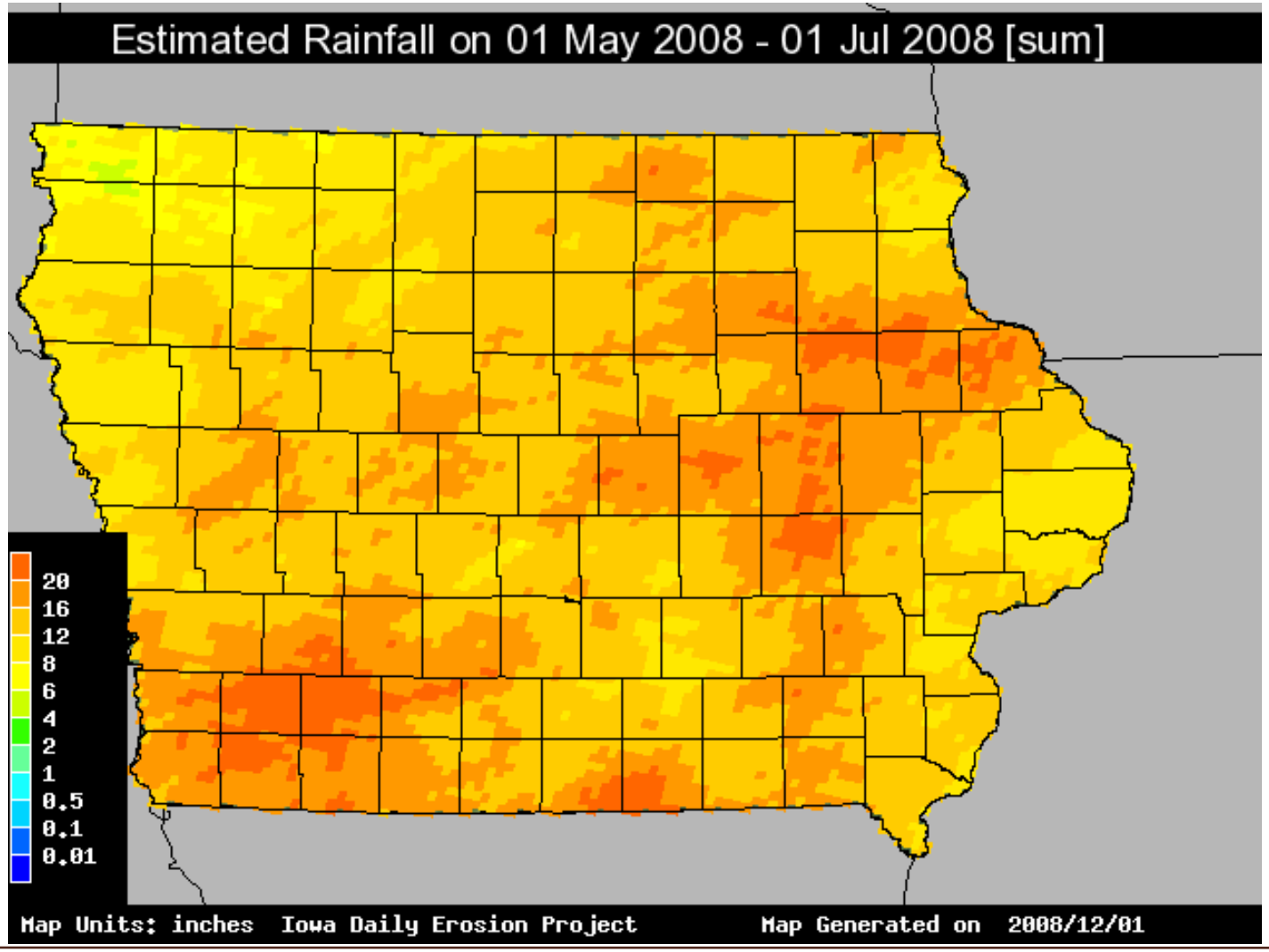
Streamflow at the Waterloo, IA Gaging Station on the Cedar River



Streamflow at the Waterloo, IA Gaging Station on the Cedar River



Estimations from Iowa Daily Erosion Project



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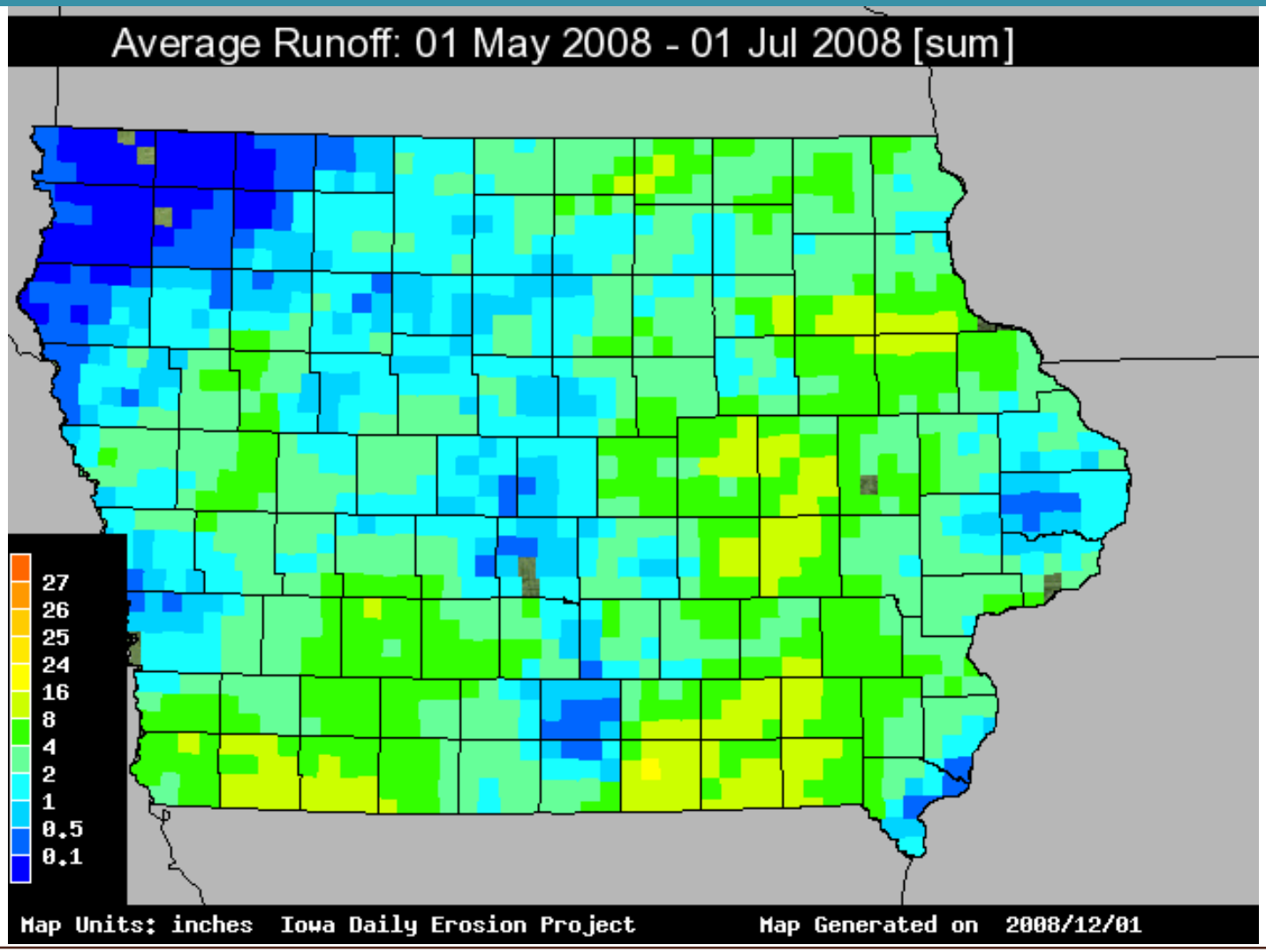

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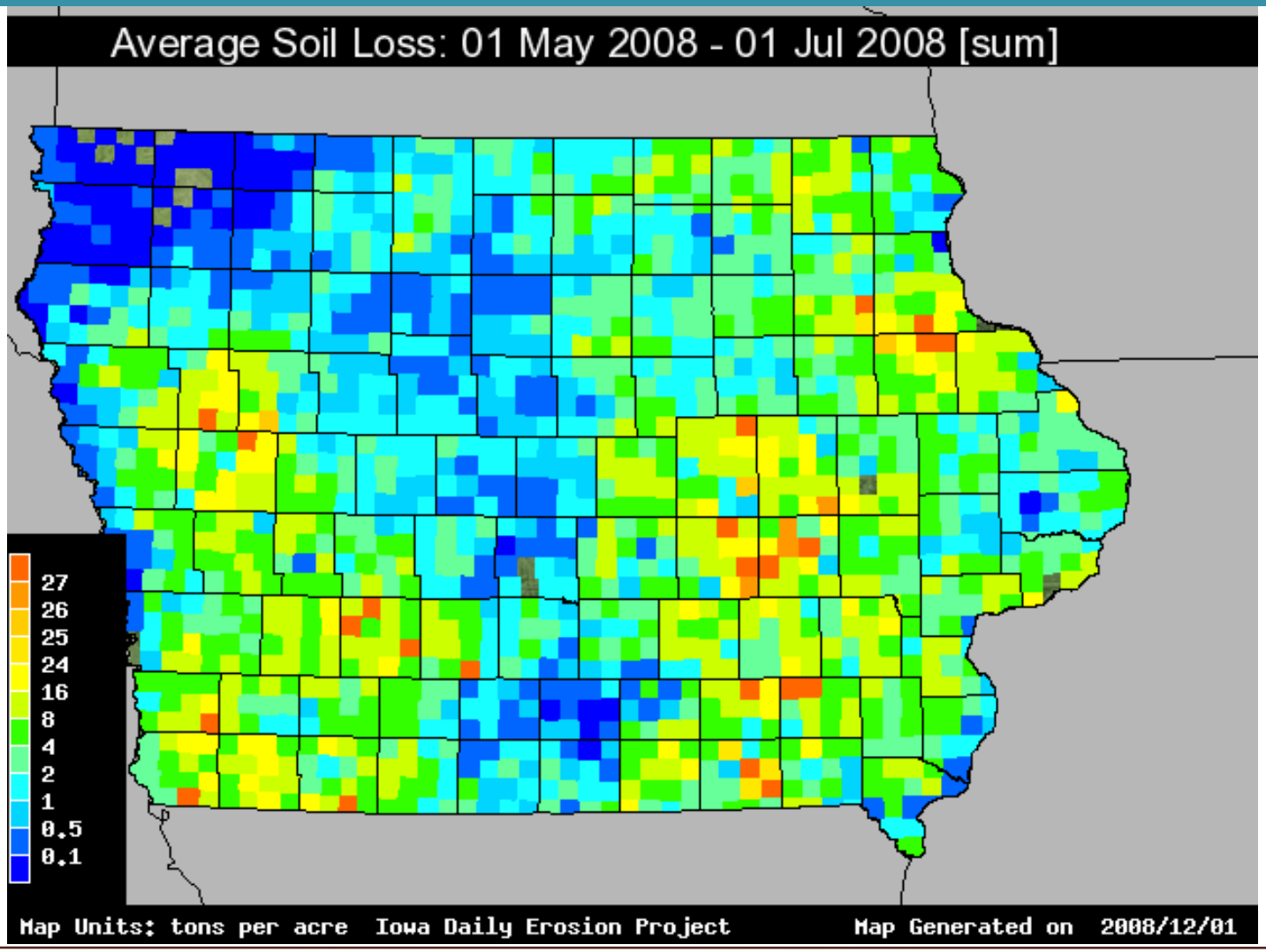
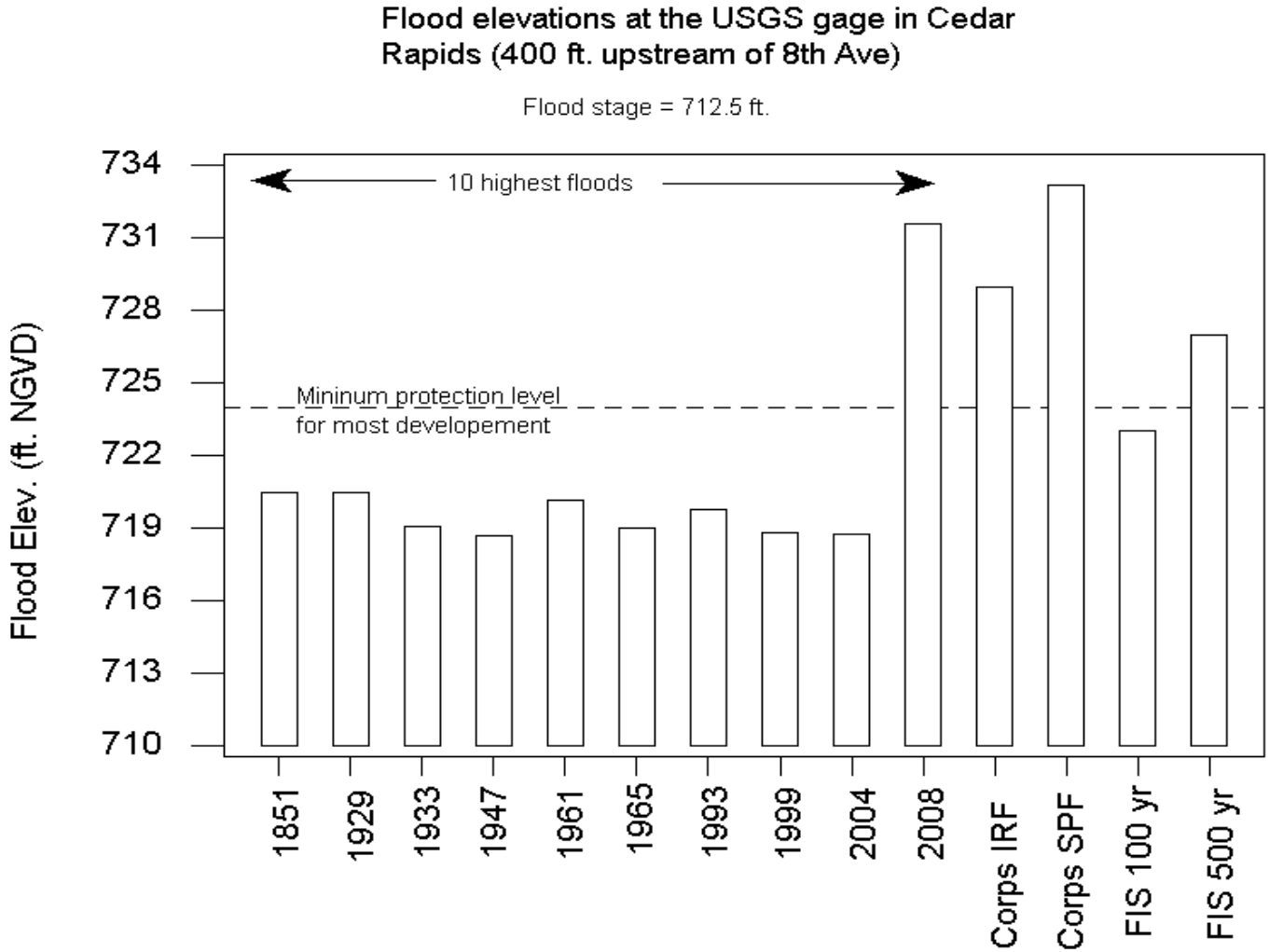


Cedar River at Cedar Rapids



Summary

- Many factors contributed to flooding
- While land management and hydrologic alterations undoubtedly contributed to some extent
- Wet last six months of 2007 and wet first six months of 2008 (12 month precipitation from July 07- June 08 > 22 inches above normal rainfall at Waterloo, IA) created the ideal conditions for flooding (i.e. “perfect storm conditions”)

Questions?

- How do we think about floodplain management in the future?
- How do we make our landscape more resilient to major precipitation events?
- How do we manage expectations about what engineered structures can and can not do?
- Do we know how various agricultural management practices perform under a range of precipitation events (e.g. what impact does drainage have on these major runoff events)?

Questions, Comments, and Discussion

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