Implementing Weather and Climate Data Networks for Agriculture

Daryl Herzmann[1]
Raymond Arritt[1]
Dennis Todey[2]

[1]Iowa State University
[2]South Dakota State

Outline

- Motivations for a Mesonet

- The Iowa Environmental Mesonet (IEM), a different approach

- Agricultural Applications

Spatial Variability

- As you know, weather and climate occurs on all spatial and temporal scales. How can we representively monitor these environments?

- AND, on a budget?
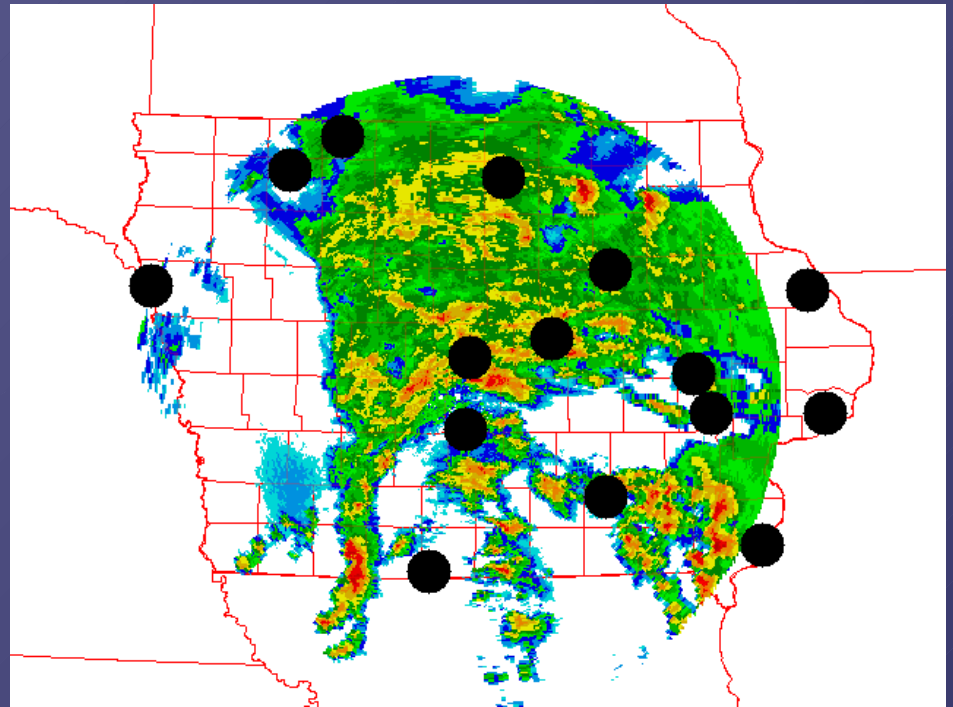
Example NEXRAD plot showing ASOS coverage.

IEM

Build a Mesonet!

- **Meso** – Spatial Scale, **Net** – Network
- Spatial scale from ~1 to 100s of km
- Tradiationally, mesonets have been built from scratch, which is very expensive!

The Iowa Environmental Mesonet, a new approach

- We realized that the state was already full of environmental observing platforms.

- Why not centrally collect these networks to produce a low-cost, high-return mesonet?

IEM

The Iowa Environmental Mesonet

Data Processed Daily

| Network	# of Sites	Obs/Site/Day	Obs/Day	Obs/Year
ASOS	15	24	360	131,400
AWOS	37	1,440	53,280	19,447,200
IA NWS COOP	145	1	145	52,925
DCP	161	48	7,728	2,820,720
ISU AgClimate	12	24	288	105,120
RWIS	49	144	7,056	2,575,440
SCAN	2	24	48	17,520
IA SchoolNet	55	1,440	79,200	28,908,000
Misc/Other/RAWS	3	24	72	26,280
Non-Iowa SchoolNet	29	1,440	41,760	15,242,400
Non-Iowa ASOS	300	24	7,200	2,628,000
	808		*197,137*	*71,955,005*

IEM

http://mesonet.agron.iastate.edu

Filling Ag Data Requests

- User defined query
- User defined Growing Degree Day criteria
- Updated daily with observed data

Climatological Differences

- Interactively query the NWS COOP climate database.

- Example, compare daily temperature climatology versus what actually happened that year!
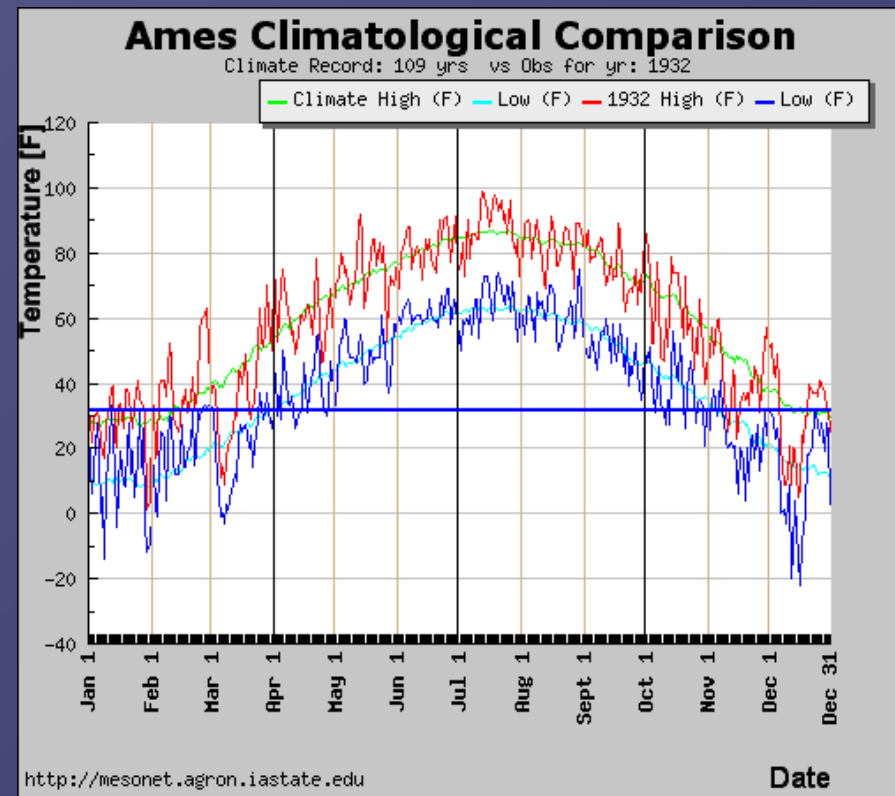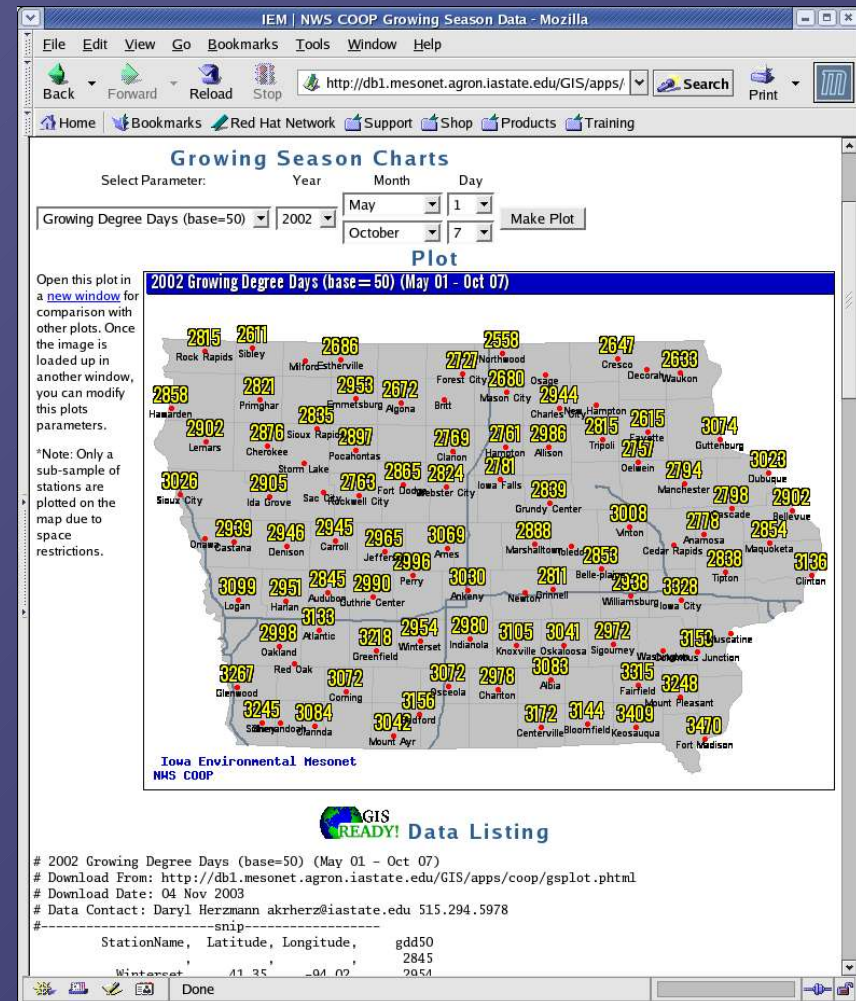
Daily Temperature Spreads

- Accumulate all high / low temperatures for a day and produce a histogram

- Dynamically generated on the website


04 Feb : Daily High/Low Histogram
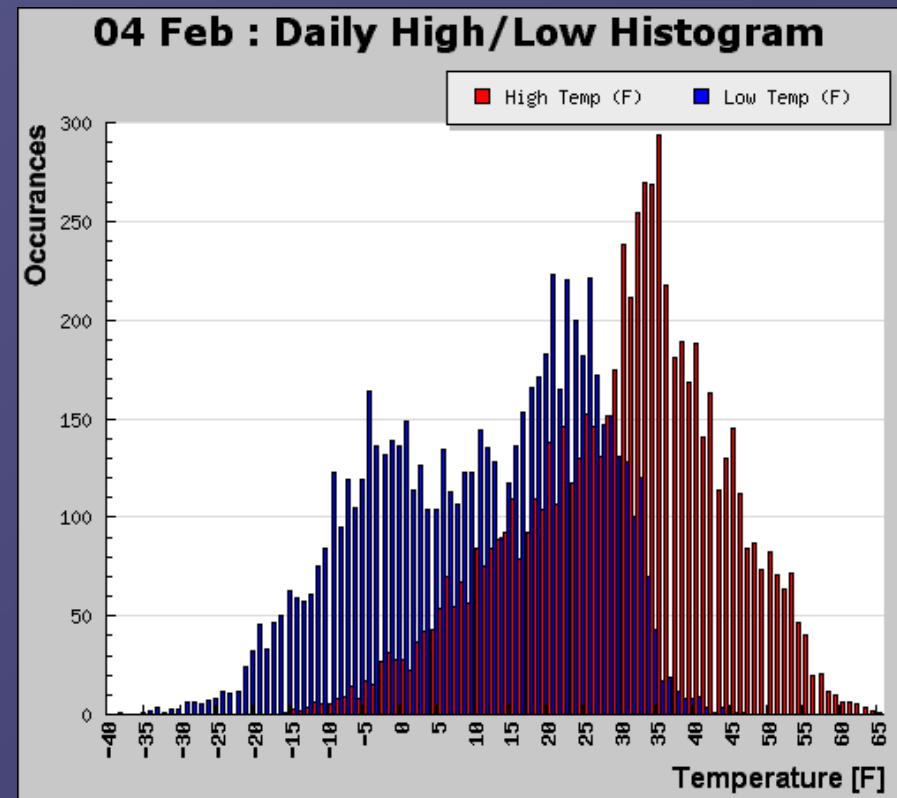
Historical GDD data

- Dynamically generate GDD, SDD from the COOP climate archive

- Customized Period

- Dynamically generated output plot.

- GIS Ready dataset presented immediately below

Iowa Soil Erosion Project

Estimated Average Soil Loss on 04 May 2003

tons per a
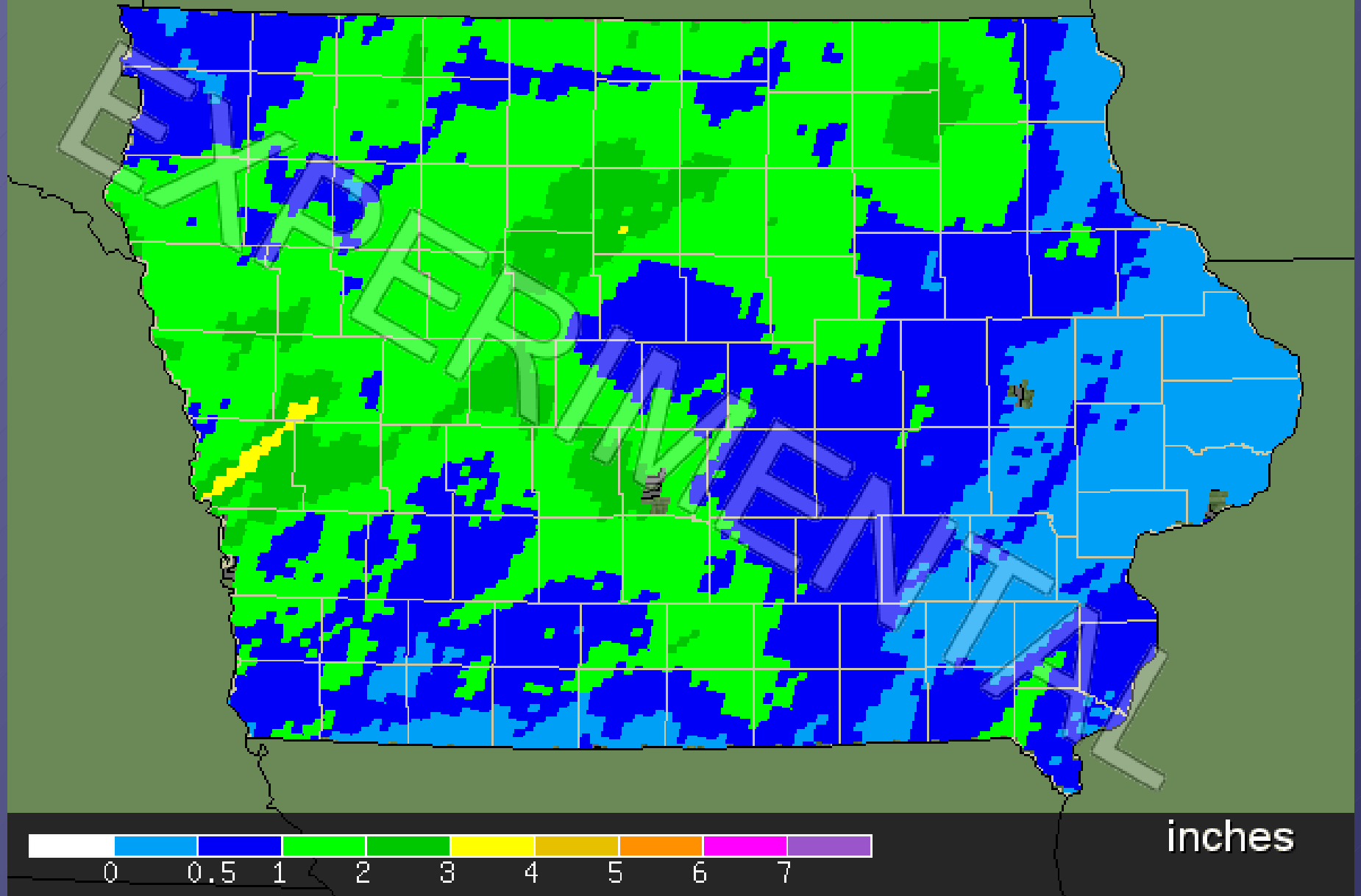
0 1 2 4 8 16 32 64 128

- PI: Rick Cruse, ISU
- Collaborators:
  - ISU Agronomy
  - U of Iowa Hydrology
  - National Soil Tilth Lab
  - NSERL @Purdue
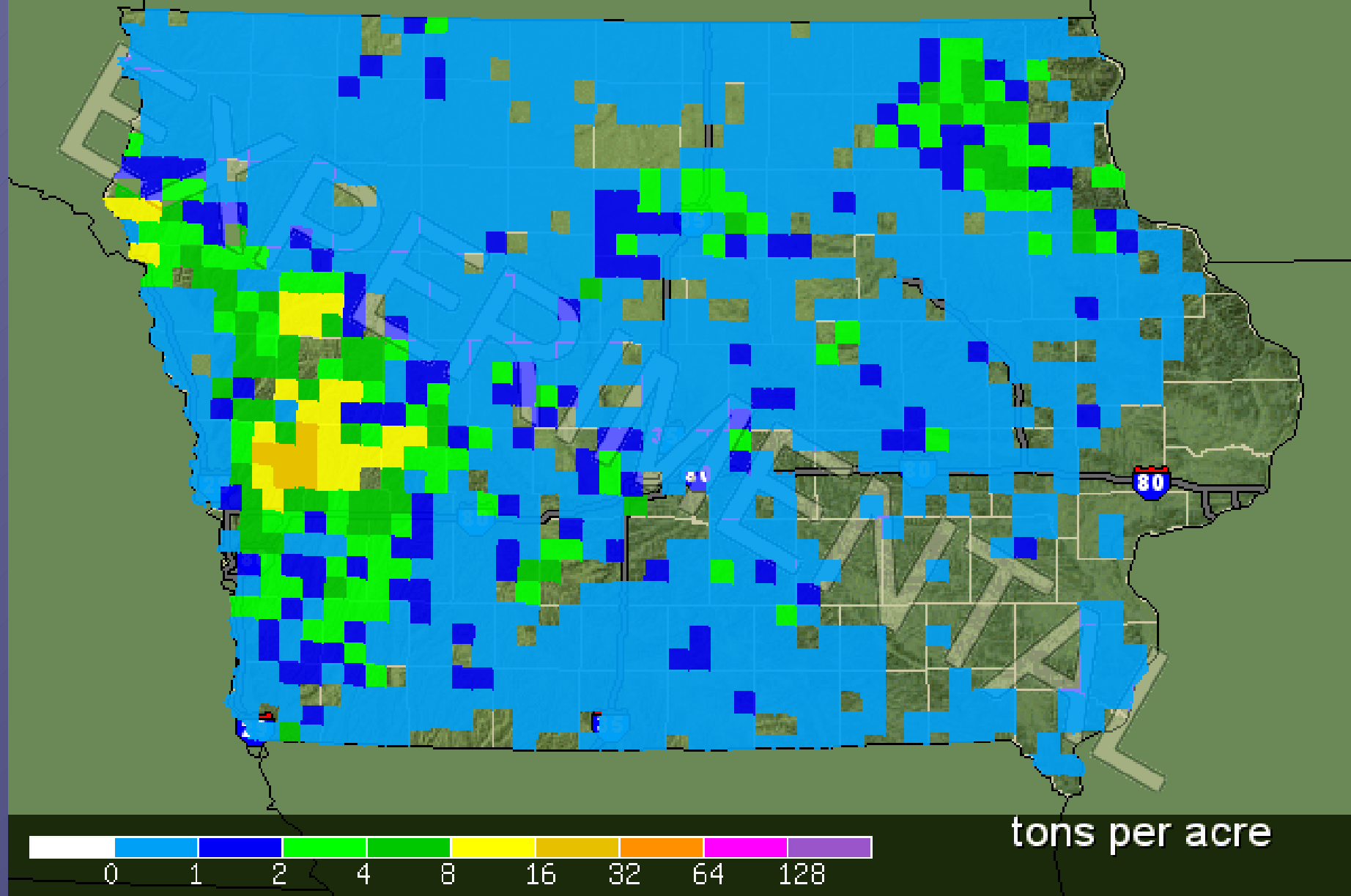 - ISU Statistics
  - South Dakota State
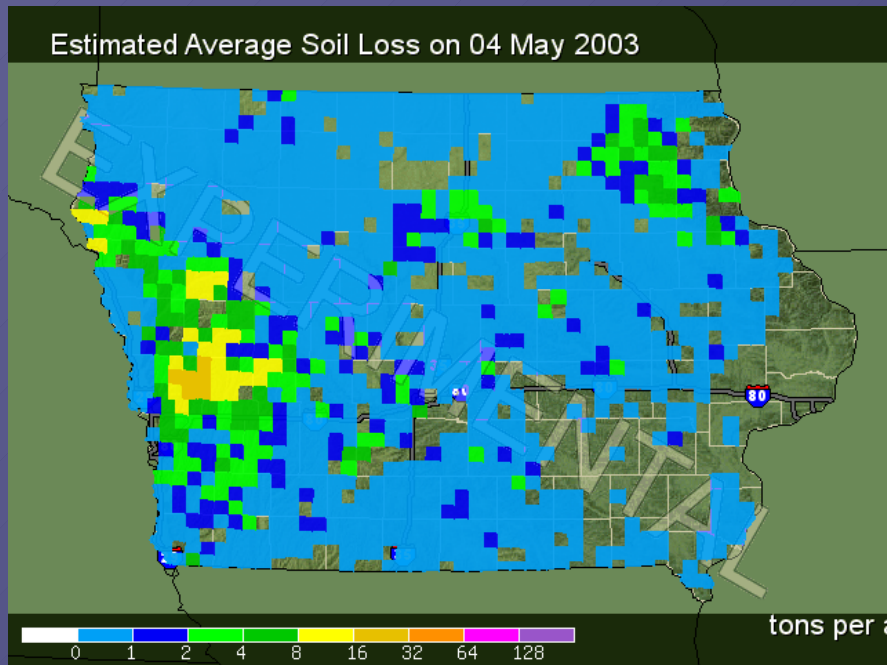
Erosion Project Ingredients

- National Resources Inventory (NRI)
  - Provides detailed information used to produce soil, management, and crop data files
- Rainfall data from IIHR @ U of Iowa
  - 15 minute ~4km resolution
- IEM provides climate summary data
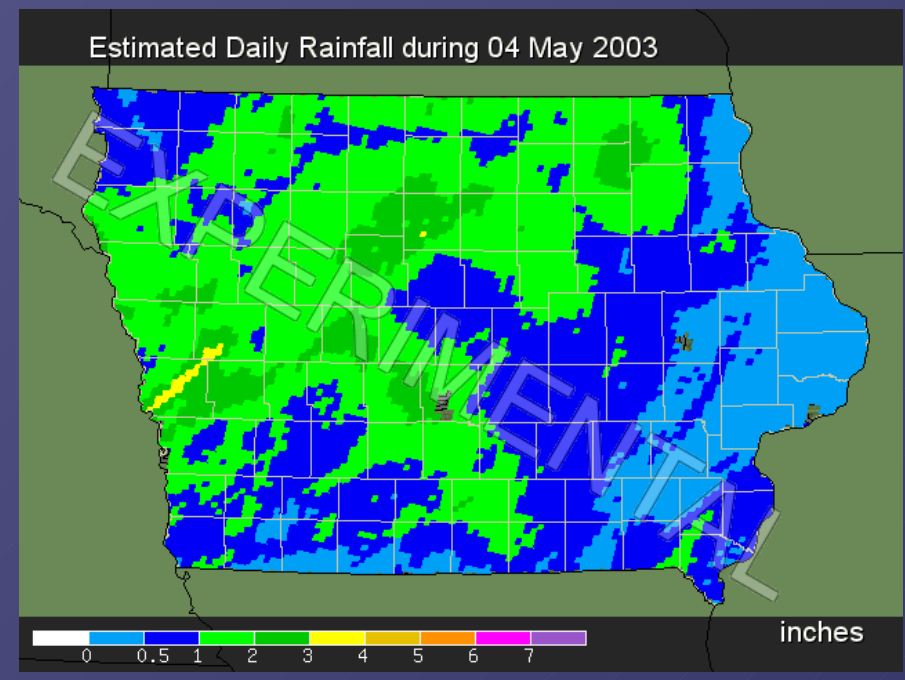- WEPP Soil Erosion Model

Estimated Daily Rainfall during 04 May 2003

inches

0   0.5 1   2   3   4   5   6   7

05 Nov 2003: ASA Meeting

http://mesonet.agron.iastate.edu

Estimated Average Soil Loss on 04 May 2003

tons per acre

0   1   2   4   8   16   32   64   128

05 Nov 2003: ASA Meeting   http://mesonet.agron.iastate.edu

Comparing Input to the Output

Estimated Average Soil Loss on 04 May 2003 — tons per a

0 1 2 4 8 16 32 64 128

Estimated Daily Rainfall during 04 May 2003 — inches

0 0.5 1 2 3 4 5 6 7

I'm done, questions?
http://mesonet.agron.iastate.edu
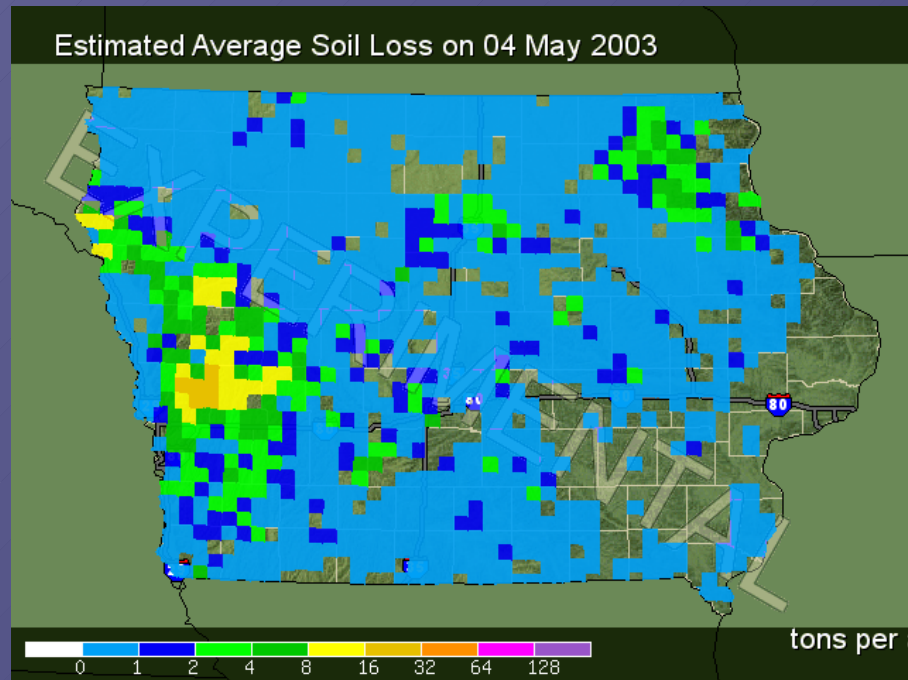
Daryl Herzmann

3010 Agronomy

515 294-5978

akrherz@iastate.edu