A vision for a more resilient Iowa

The Iowa Watershed Approach

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Average annual precipitation (inches). Estimates are based on the 30-year annual average (1981-2010).

(Data source: http://www.prism.oregonstate.edu/).
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Observed change in heavy precipitation (the heaviest 1%) between 1958 and 2016. Figure taken from The Climate Science Special Report (Easterling et al. 2017) (https://science2017.globalchange.gov/).

(Data source: http://www.prism.oregonstate.edu/)
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Flood-related FEMA Disaster Declarations 1988-2016

Total: 951

Declarations

- 4 - 8
- 9 - 12
- 13 - 17

Raw data source: https://www.fema.gov/
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Total: $13.5 Billion

 Millions of $

- 10 - 20
- 20 - 50
- 50 - 100
- Above 100

Raw data source: http://hwri.geog.sc.edu/SHELDUS/

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Total: $4.1 Billion

Millions of $

- 8 - 20
- 20 - 50
- 50 - 100
- Above 100

Raw data source: http://hvri.geog.sc.edu/SHELDUS/
https://www.rma.usda.gov/data/cause.html
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West Fork Cedar River
Finchford

Shell Rock River
Shell Rock

Cedar River
Janesville

Waterloo

Cedar Rapids

Beaver Creek
New Hartford, IA

Black Hawk Creek
Hudson, IA

Wolf Creek
Dysart, IA

Cedar River
Cedar Rapids, IA

USGS Gage
Rainfall Pixel
Mesh

0  5  10  20 Miles

Iowa Flood Center
Hydroscience & Engineering
Analysis of Watershed Scenarios

• High Runoff Potential Areas
• Increased rainfall intensity
• Analysis of Flood Mitigation Strategies
  • Native Prairie
  • Mitigating the Effects of High Runoff with Increased Infiltration/Cover Crops/No-Till
  • Mitigating the Effects of High Runoff with Distributed Storage
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Hydrologic Model Calibration and Validation

Observed and simulated average monthly runoff depth (in inches) for the Middle watershed. Results are shown for both the calibration and validation periods (2002-2016). Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart.

Simulated versus observed annual maximum peak daily discharges (cfs) for the Middle Cedar. Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart.

Observed and simulated daily flow time series. Calibration period. Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart. Measured flows were obtained from USGS gauge stations USGS 05464500, USGS 05464220.
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Runoff Coefficient

Runoff Coefficient

- 0.26 - 0.30
- 0.31 - 0.34
- 0.35 - 0.38
- 0.39 - 0.43
- 0.44 - 0.47

0 10 20 Miles
## Pond Locations and Index Points

<table>
<thead>
<tr>
<th>Index Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USGS 05463000 Beaver Creek at New Hartford</td>
</tr>
<tr>
<td>2</td>
<td>USGS 05463500 Black Hawk Creek at Hudson</td>
</tr>
<tr>
<td>3</td>
<td>Middle Cedar at Gilbertville</td>
</tr>
<tr>
<td>4</td>
<td>USGS 05464220 Wolf Creek near Dysart</td>
</tr>
<tr>
<td>5</td>
<td>High Flood Risk Spring Creek</td>
</tr>
<tr>
<td>6</td>
<td>Bear Creek Near 380</td>
</tr>
<tr>
<td>7</td>
<td>Hinkle Creek Inflow Vinton</td>
</tr>
<tr>
<td>8</td>
<td>Blue Creek - Tributary to Cedar River</td>
</tr>
<tr>
<td>9</td>
<td>Dry Creek at Palo</td>
</tr>
<tr>
<td>10</td>
<td>Otter Creek above Cedar River</td>
</tr>
<tr>
<td>11</td>
<td>Flood Plain</td>
</tr>
<tr>
<td>12</td>
<td>USGS 05464500 Cedar River at Cedar Rapids</td>
</tr>
</tbody>
</table>

Ponds (684) placement in the Middle Cedar
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Projected change in heavy precipitation. Twenty-year return period amount for daily precipitation for mid- (left maps) and late-21st century (right maps). Results are shown for a lower emissions scenario (top maps; RCP4.5) and for a higher emissions scenario (bottom maps, RCP8.5). Figure taken from The Climate Science Special Report (Easterling et al. 2017) (https://science2017.globalchange.gov/).
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Scenario Results/Historic Precipitation/Increased Precipitation

Site 1

- $20\%$ avg. peak red. under IP

Annual Maximum Peak Discharge (cfs)

Exceedance Probability (%)

Site 2

- $20\%$ avg. peak red. under IP

Site 3

- $4\%$ avg. peak red. under IP

Site 4

- $21\%$ avg. peak red. under IP

Site 5

- $21\%$ avg. peak red. under IP

Site 6

- $18\%$ avg. peak red. under IP
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Scenario Results/Historic Precipitation/Increased Precipitation (IP)

Native Vegetation. 100% adoption.

Cover Crops/Soil Health/No-Till scenario. 100% adoption.

Distributed Storage. 684 ponds. 20 acre-ft. 12” outlet pipe.
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Scenario Results/Historic Precipitation/Increased Precipitation (IP)

Native Vegetation. 100% adoption.

Cover Crops/Soil Health/No-Till scenario. 100% adoption.

Distributed Storage. 684 ponds. 20 acre-ft. 12” outlet pipe.
Scenario Results/Summary

- Native Vegetation. **100% adoption.**
- Cover Crops/Soil Health/No-Till scenario. **100% adoption.**
- Distributed Storage. 684 ponds. 20 acre-ft. 12” outlet pipe.
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Average annual precipitation (inches). Estimates are based on the 30-year annual annual average (1981-2010).

(Data source: http://www.prism.oregonstate.edu/).
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Flood-related FEMA Disaster Declarations 1988-2016

Declarations
- 0 - 5
- 6 - 10
- 11 - 15
- Above 15

1. Texas 1765
2. Missouri 1347
3. Kentucky 1242
4. Iowa 951
5. Virginia 948
6. Louisiana 889
7. North Carolina 824
8. Tennessee 787
9. Florida 762
10. Oklahoma 736

Raw data source: https://www.fema.gov/
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Counts: Des Moines, Buchanan, Butler, Howard, Muscatine, Louisa, Montgomery, Chickasaw, and Wapello