Duluth, MN Flood of June 2012

Chris Kleist
Program Coordinator
City of Duluth
Meet the Presenter

- Ely, MN
- Stormwater and wastewater industry
- Program Coordinator - Stormwater
- MS4 Permit Compliance
Overview

- Duluth’s Uniqueness
- Stormwater
- Summary of Duluth Flood
- Recovery
Ridge Axis Elevation ~1400 feet

Lake Level ~ 590 feet
Stormwater Challenges

- Grade
- Soils
  - C & D
- Bedrock
Two Sewers

- Sanitary
- Storm
Duluth’s Storm Sewer System

- Large
- Old
Duluth’s Stormwater Program

- Illicit Discharge
- Best Management Practices (BMPs)
  - Structural
  - Non-structural
- Runoff, erosion, and sediment issues
Duluth’s Stormwater Program
Stormwater Challenges
Overview: Duluth Flood
June 19th-20th, 2012

- 6-10 Inches of Rain in < 24 Hours
- Severe Flash Flooding Region-wide
- Record River Flooding for ~2 Weeks

Duluth KDLH Radar Storm Total Precipitation
## Records Broken

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Previous Record</th>
<th>New Record</th>
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<tr>
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<td>Rainfall</td>
<td>Date</td>
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<tr>
<td>24-hr</td>
<td>5.79&quot;</td>
<td>22-23 Aug 1978</td>
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<tr>
<td>2 Day</td>
<td>6.68&quot;</td>
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<td>June 24-hr</td>
<td>4.00&quot;</td>
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<tr>
<td>Single Calendar Day June</td>
<td>4.00&quot;</td>
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<td>June 19&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1.55&quot;</td>
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<td>June 20&lt;sup&gt;th&lt;/sup&gt;</td>
<td>1.77&quot;</td>
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“500 Year”

Duluth, MN Event, 19-20 June 2012
Annual Exceedance Probabilities (AEPs) for Worst Case 24-hour Rainfall

Hydrometeorological Design Studies Center
Office of Hydrologic Development, National Weather Service
National Oceanic and Atmospheric Administration
http://www.nws.noaa.gov/oh/ndsc/
Map created on 12 July 2012

Rainfall frequency estimates are from NOAA Atlas 14, Volume 8 Version1 (to be published in 2013). Observations come from COOP, CoCoRAHS, and ASOS datasets. Not all data have been verified.
Perspective;
Other Significant Flash Floods
Duluth – August 1972

• 3” of Rain in 2 hours
• $18M in damages Public Facilities
• President Nixon Declares Duluth a Federal Disaster Area

2 lives were lost
DULUTH FLASH FLOOD
September 20, 1972

[Map of Duluth area showing floodwaters and areas impacted]
Other Flash Floods

- **1972 July 21st – Little Falls, MN**
  
  *10.84” in 24-hours*
  
  Still holds 24 hour rainfall record for MN. 
  Damages were estimated at $20 million.

- **2005 October 3-5th Aitkin/Pine Counties Flood**

  *Totals Rainfall 7-9 inches*
  
  Significant Flooding in Brainerd, MN to Grantsburg, WI

- **2007 August 18-19th – La Crosse Area Flood**

  *8 lives were lost*
  
  *Totals Rainfall 10 – 17 inches*
  
  Massive Mud Slides and Debris Flows

- **2012 June 19-20th – Duluth, MN**

  *ZERO lives were lost*
  
  *Totals Rainfall 6 – 10 inches*
  
  Massive Infrastructure Damage

Pictures Courtesy Todd Shea
Radar and Surface Analysis

1 PM June 19th – 1 PM June 20th

- Surface Fronts
- Precipitable water (shaded green and in inches)
- Winds at 925 millibars
...FLASH FLOOD WATCH IN EFFECT FROM TUESDAY AFTERNOON THROUGH WEDNESDAY AFTERNOON...

THE NATIONAL WEATHER SERVICE IN DULUTH HAS ISSUED A

* FLASH FLOOD WATCH FOR PORTIONS OF MINNESOTA AND NORTHWEST WISCONSIN...INCLUDING THE FOLLOWING AREAS...IN MINNESOTA... CARLTON/SOUTHERN ST. LOUIS...CENTRAL ST. LOUIS...NORTHERN AITKIN...NORTHERN CASS...NORTHERN COOK/NORTHERN LAKE... SOUTHERN COOK/LAKESHORE...SOUTHERN ITASCA AND SOUTHERN LAKE/LAKESHORE, IN NORTHWEST WISCONSIN...DOUGLAS.

* FROM TUESDAY AFTERNOON THROUGH WEDNESDAY AFTERNOON

* THUNDERSTORMS WILL DEVELOP ON TUESDAY...ESPECIALLY IN THE AFTERNOON AND OVERNIGHT HOURS LASTING INTO WEDNESDAY. HEAVY RAIN WILL BE POSSIBLE WITH THESE STORMS...WITH RAINFALL OF 2 TO 4 INCHES POSSIBLE THROUGH WEDNESDAY MORNING...WITH SOME SPOTS RECEIVING EVEN HIGHER AMOUNTS.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A FLASH FLOOD WATCH MEANS THAT CONDITIONS MAY DEVELOP THAT LEAD TO FLASH FLOODING. FLASH FLOODING IS A VERY DANGEROUS SITUATION.

YOU SHOULD MONITOR LATER FORECASTS AND BE PREPARED TO TAKE ACTION SHOULD FLASH FLOOD WARNINGS BE ISSUED.
Tuesday, June 19th

713 pm
Torrential rain starts to fall on the north side of Duluth.

727 pm
The Duluth NWS issues a statement: “high-end and life-threatening flash flood event appears to be developing across a large part of northern Minnesota.”

Torrential rain was due to extremely high water content of the air mass over the region.

99th Percentile for Values ever recorded (1.8”)
Tuesday, June 19th

800 pm

Water reported over the Highway 61 near Larsmont Resort (Two Harbors).

820 pm

Reports of water flooding down Sixth Avenue East in Duluth’s Hillside, and over lanes of U.S. Highway 53 near Minnesota Highway 194.
Tuesday, June 19th

827 pm
Flooding reported on Interstate 35 in the downtown Duluth tunnels, with at least one car stalled.

832 pm
Flooding reported on Third Street between Sixth and Seventh Avenues East in Duluth, in the vicinity of what would become a massive wall collapse near Whole Foods Coop.
Tuesday, June 19th

1000 pm

- Minnesota State Patrol closes Highway 61 between Duluth and Two Harbors

- Travelers reported stranded at Betty’s Pies north of Two Harbors, unable to go either direction on Highway 61 because of flooding

- Duluth Police ask drivers to stay off city streets

- Manhole spouting “like a water fountain” near Greysolon Plaza in downtown Duluth.
Tuesday, June 19th

1140 pm
Water reported to be knee-deep along Mall Drive near Wells Fargo in Duluth.

1148 pm
Water reported to be reaching the bottom of parked cars near Fitger’s in downtown Duluth.
Wednesday, June 20th

1201 am

Sidewalk along Eighth Avenue East between First and Second streets in Duluth reported to be caved in.

First Street and the Interstate 35 tunnels
1213 am
Gravel reported to be washing down 40th Avenue West from higher elevations along Haines Road in Duluth.

1224 am
Upper elevations of Glenwood Street reported to be “littered with chunks of asphalt.”
Wednesday, June 20th

1241 am
Water reported to be shooting from manholes along Boundary Avenue in Proctor.

1252 am
Car reported to have just fallen in sinkhole on Skyline Parkway near Ninth Avenue East; four occupants escape.

117 am
Report of someone trapped in car partially submerged in sinkhole on Seventh Avenue East at First Street

Skyline Parkway, Duluth, MN
Wednesday, June 20th

139 am
The National Weather Service in Duluth reports: “This appears to be a flood reminiscent of the flood of 1972 and one that should not be taken lightly. ... We cannot stress what a major threat this is for the city of Duluth and along the North Shore.”

225 am
Report of 6.38 inches of rain and counting in Duluth’s Lester Park neighborhood.

Evacuations under way in and near the Fond du Lac neighborhood of Duluth.
Fond du Lac
Wednesday, June 20th

240 am
Report on police scanner of a seal swimming on Grand Avenue near the Lake Superior Zoo

255 am
Water reported to be rising to level of windows on Grandma’s Restaurant on Maple Grove Road in Duluth.
Wednesday, June 20th

319 am

Evacuations reported at homes along 59th Avenue West in Duluth, near Keene Creek.

Four feet of water reported on streets in central Proctor.

336 am

Water reported to be several feet deep on South Street below London Road; spilling over onto Interstate 35.
Wednesday, June 20th

336 am

Water reported to spilling over onto Interstate 35.

352 am

Initial reports of a polar bear missing from its enclosure at the Lake Superior Zoo. Police and fire officials assisting zoo staff in tracking down animals unaccounted for on zoo grounds.
Duluth Zoo/Kingsbury Creek
Wednesday, June 20th

430 am
Flooding in Duluth making Twin Cities and National News

451 am
Reports of roads caving in near Barker’s Island in Superior, WI.

The River Inn Bar Scanlon, MN
Photo by Amanda Graning

7th Ave East, Duluth, MN
Photo by Derek Montgomery, MPR
Wednesday, June 20th

500 am
Duluth Police advise emergency travel only in the city.

508 am
Water rescue situation reported on Wahl Road in Lakewood Township

530 am
Carlton County Sheriff’s Office recommends no travel in county; evacuations recommended in Thomson area

US Highway 210, Jay Cooke State Park
Photo courtesy NWS
Wednesday, June 20th

630 am
White Pine River reported to be flowing 2 to 3 feet deep over Highway 33 north of Cloquet, MN.

730 am
The Minnesota Department of Public Safety’s Division of Homeland Security and Emergency Management activates the state emergency operations
Wednesday, June 20th

800 am

Evacuations under way in Thomson after Thomson Reservoir and spillway overflow into the community.
- Jay Cooke State Park evacuated
Wednesday, June 20th

**830 am**

Lake Superior Zoo reports that “all zoo animals have been secured. Sadly the zoo experienced the loss of several animals, among them many of the barnyard residents.

**1030 am**

Interstate 35 reported closed near Carlton, MN

Saint Louis River, downstream of Scanlon Dam. Carlton, MN
Wednesday, June 20th

1030 am
National Weather Service issues Severe thunderstorm warnings issued for Twin Ports as another round of storms sweeps across the area.

1135 am
City of Superior declares a state of emergency.

City of Hermantown declares a state of emergency.
Wednesday, June 20th

1230 pm
Reports of a child washed into a culvert near Proctor; child is found, injured but alive, within the hour.
- *He was swept into a culvert and traveled about 6 blocks before being ejected out into the woods. Only minor injuries.*

442 pm
Spotter reported storm total of 10.10 inches of rain northeast of Duluth.
Community Impacts
Shopping & Travel Came to a Halt

Recently Closed Kmart

Target

Savers

Grandma’s Restaurant

Republic Bank

Verizon

Wendy’s

Fred’s Motors

Grizzly’s Grill and Saloon

Photo by Bob King, Duluth News Tribune
Impacts on the Region

Road Closures Due to Flooding

Counties Declared Presidential Disaster Areas by FEMA

Railroads
Economic impacts (tourism – MSP advertising, etc)
Recovery time/cost – debris removal
A flooded Chester Creek roars over MacFarlane Road. Duluth, MN. Wednesday, June 20, 2012. (Photo courtesy Jay Monson)
A raging Miller Creek floods Lincoln Park in West Duluth.

(MPR Photo/Conrad Wilson)
A raging Miller Creek floods Lincoln Park in West Duluth.

Steve Kuchera
small creek that carried debris down Chester Parkway in Duluth Wednesday morning.
(Bob King / rking@duluthnews.com)
Why so much damage?

- System sizing
- Materials
Why so much damage?

- Debris
Where do we go from here?

- FEMA
- MRTF
  - BWSR
  - DNR
- NRCS
- more
Where do we go from here?

- Cost $12.6M
- Received $2.4M
- Debris and Sediment
- Bank Stabilization
- Habitat Improvement
Considerations

- Complex
- Cost
- Long recovery
Questions?

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Acknowledgements

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- Limnotech
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The Duluth News Tribune
Timeline of the Duluth Flood. Andrew Krueger, Duluth News Tribune
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http://www.duluthnewstribune.com/event/article/id/235117/group/homepage/
- Daryl Herzmann at Iowa State University/Iowa Environmental Mesonet
- Minnesota Department of Transportation
- Wisconsin Department of Transportation
- U.S. Geological Survey (USGS)
- National Aeronautics and Space Administration (NASA)
- North Central River Forecasting Center
- Various Photo Contributors