Reeseville Railroad Bridge Design Improvements in Response to 500-year Flood in Beaver Dam River Watershed

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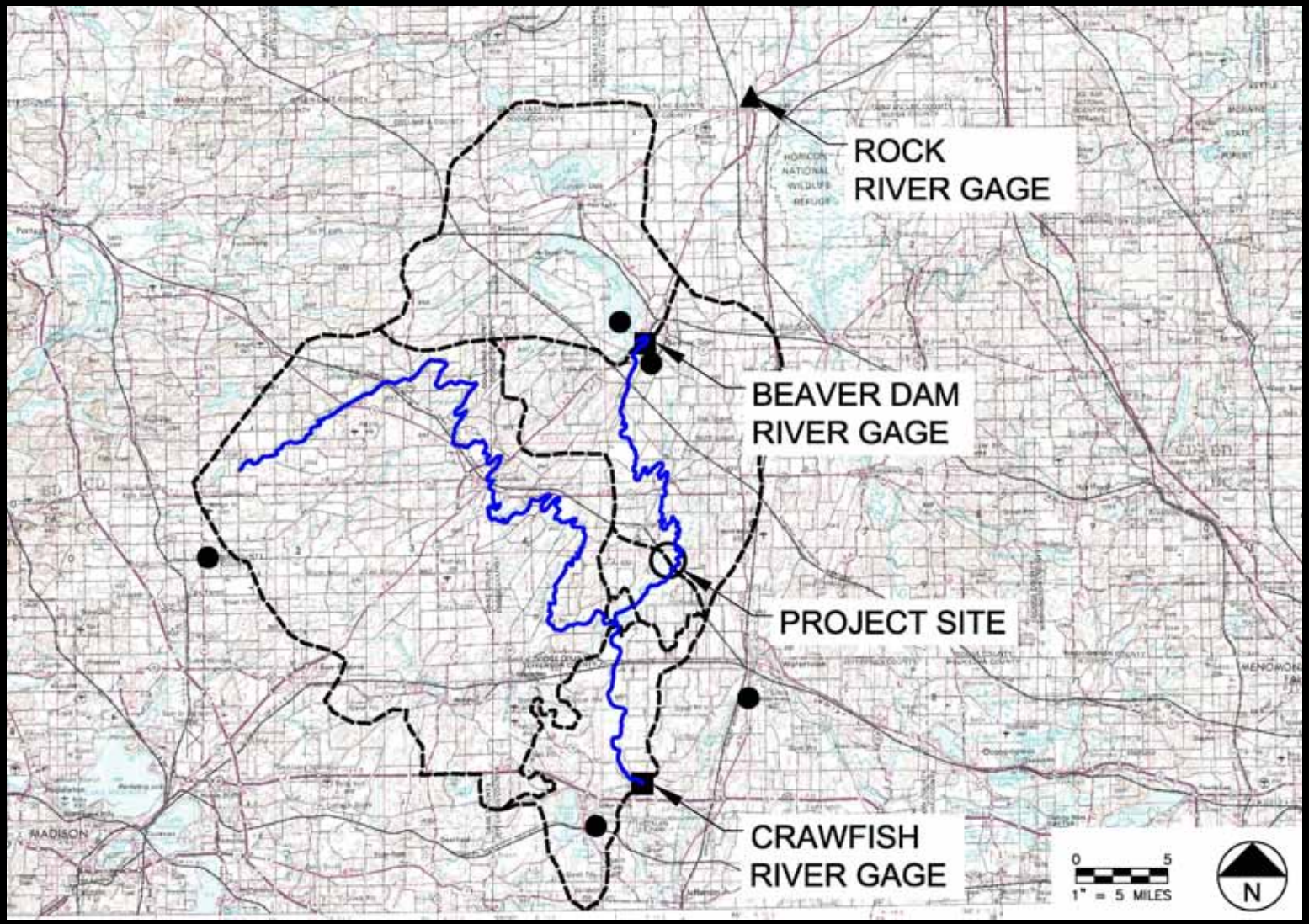
Agenda

- Site Background
- June 2008 Storm Event
- Hydrology and Hydraulics Modeling
- Proposed Design

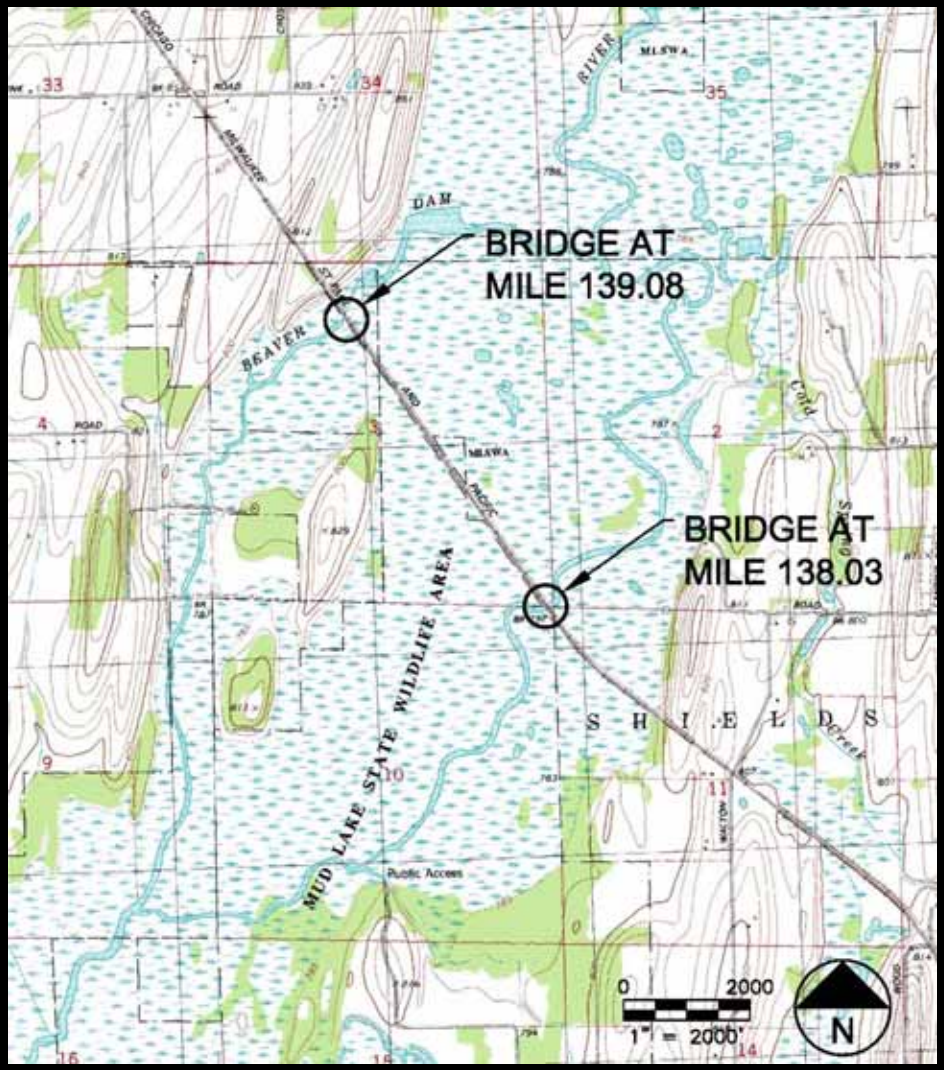
Site Background

Site Location Map

Watershed Map



Reeseville Marsh

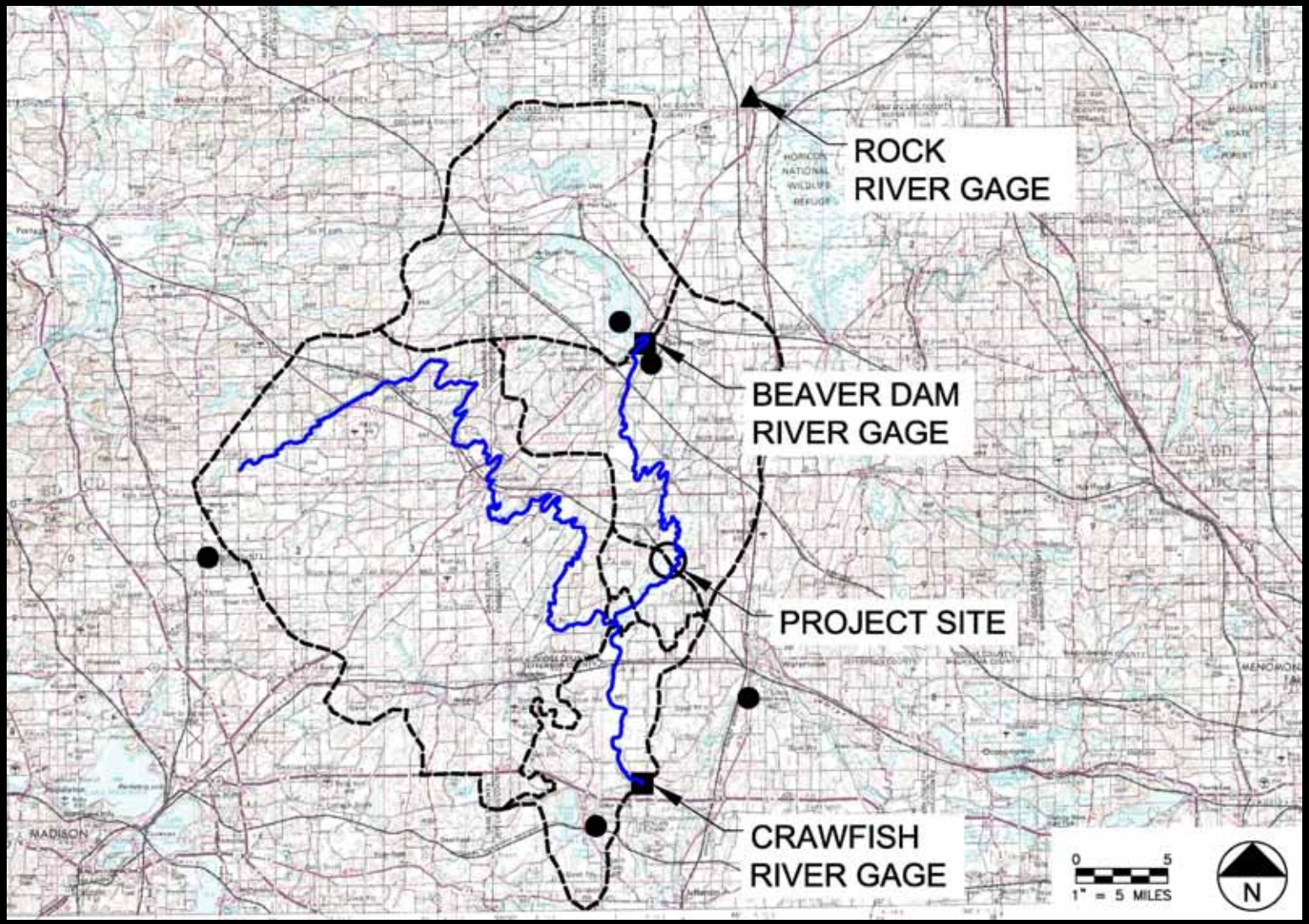


Reeseville Railroad Statistics

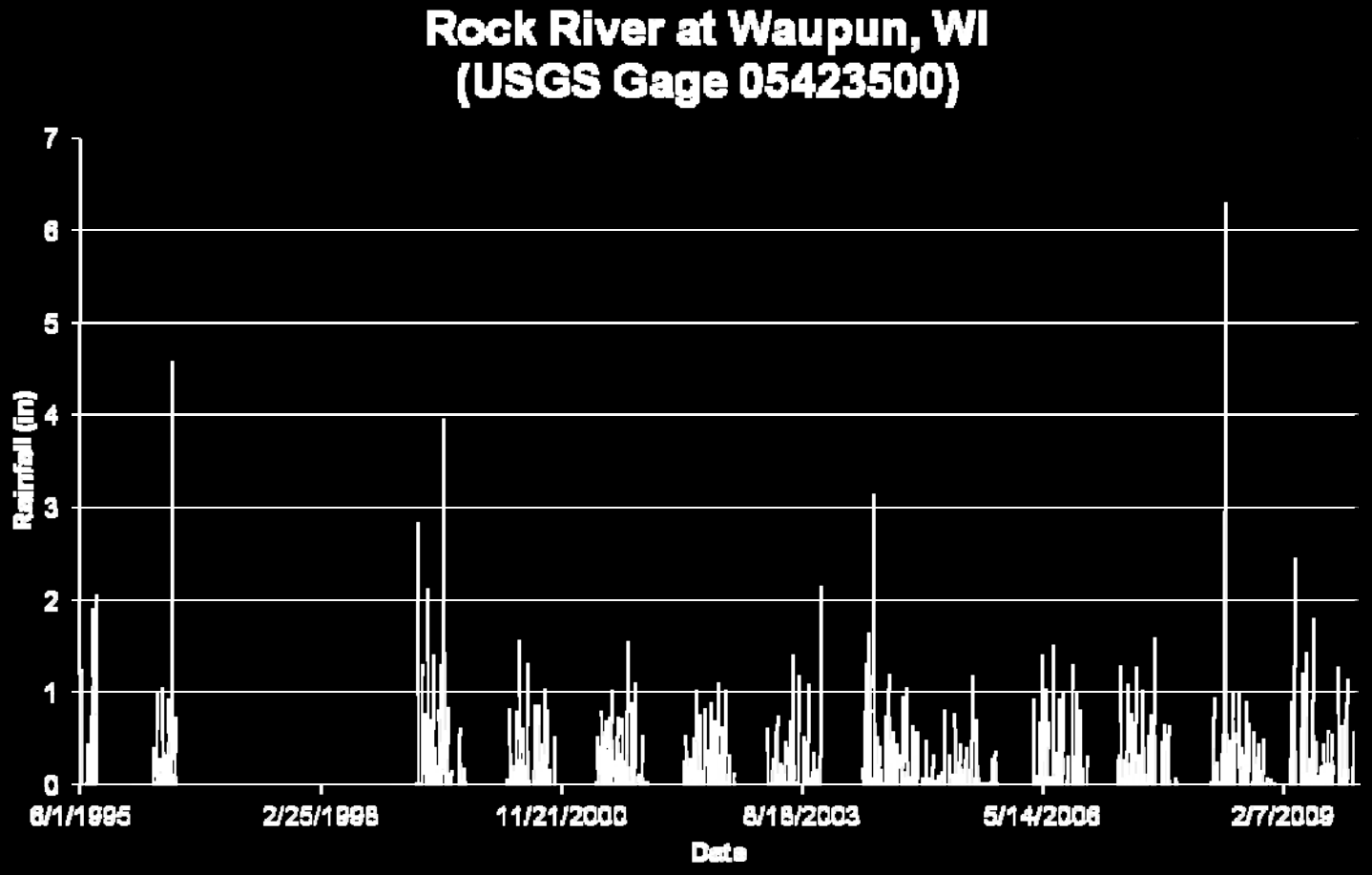
- Originally built in 1858
- Track length is approx. 1.2 miles
- Embankment is approx. 5 to 8 feet above marsh bottom
- Track settles approx. 0.2 in/year due to organic soil base
- Serves approx. 300,000 Amtrack passengers per year
- Transports approx. 4.7 billion ton-miles of freight per year
- Track has closed due to flooding at least 8 times since 1930

June 2008 Storm Event

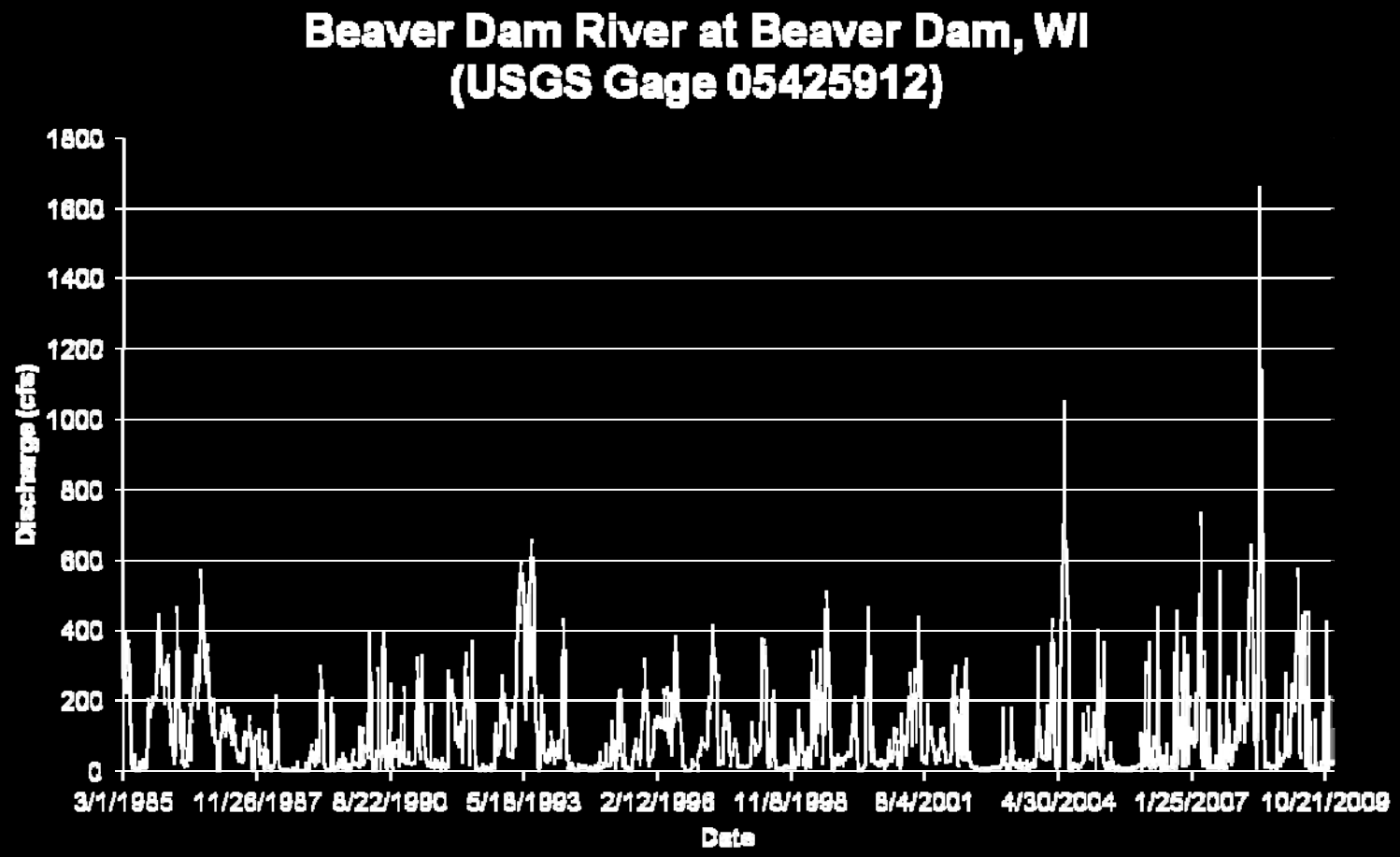
Gage Locations



Rainfall for June 2008 Flood



Discharge Hydrograph for June 2008 Flood



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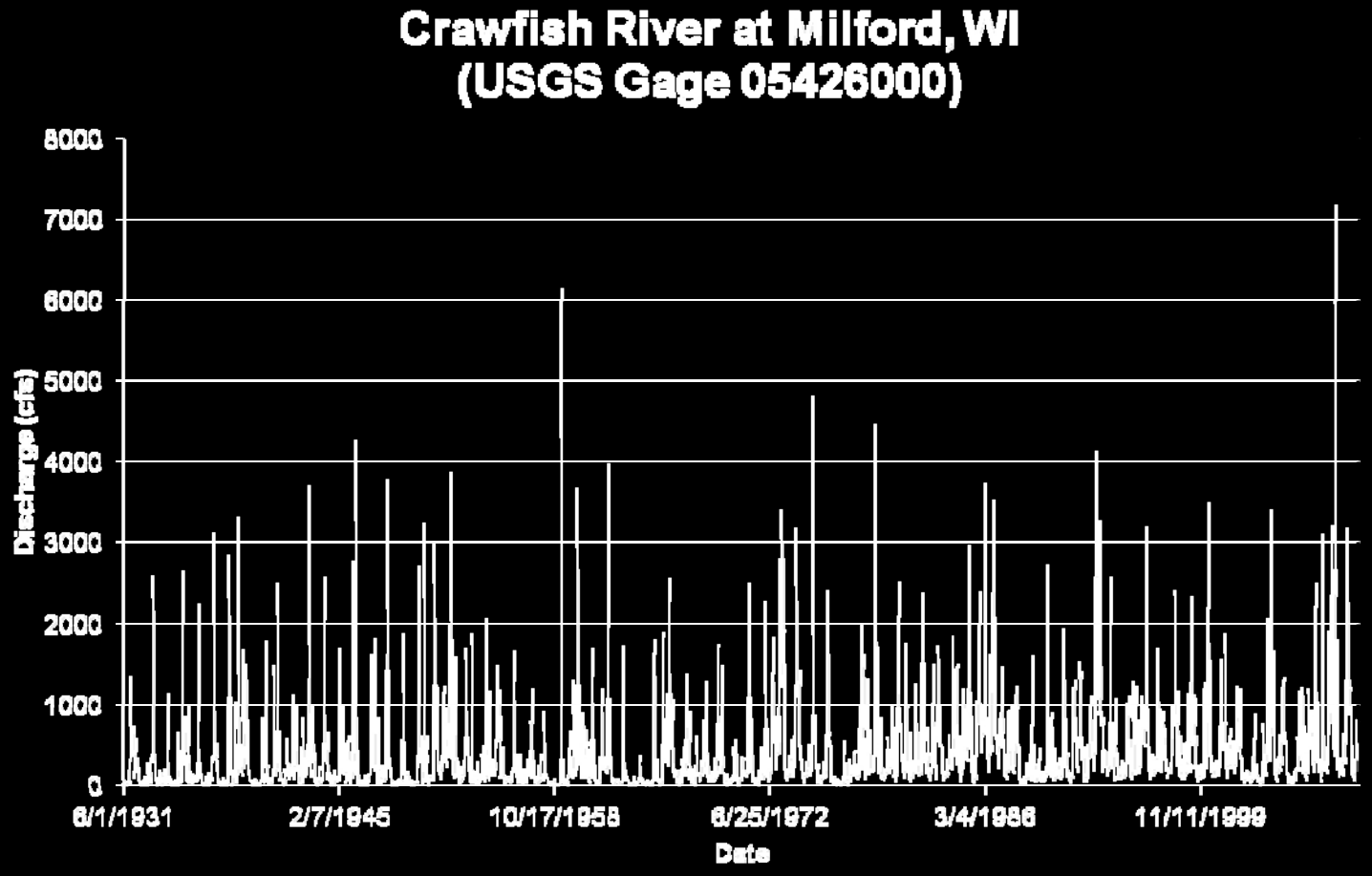

June 2008 Flood Photographs

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June 2008 Flood Statistics

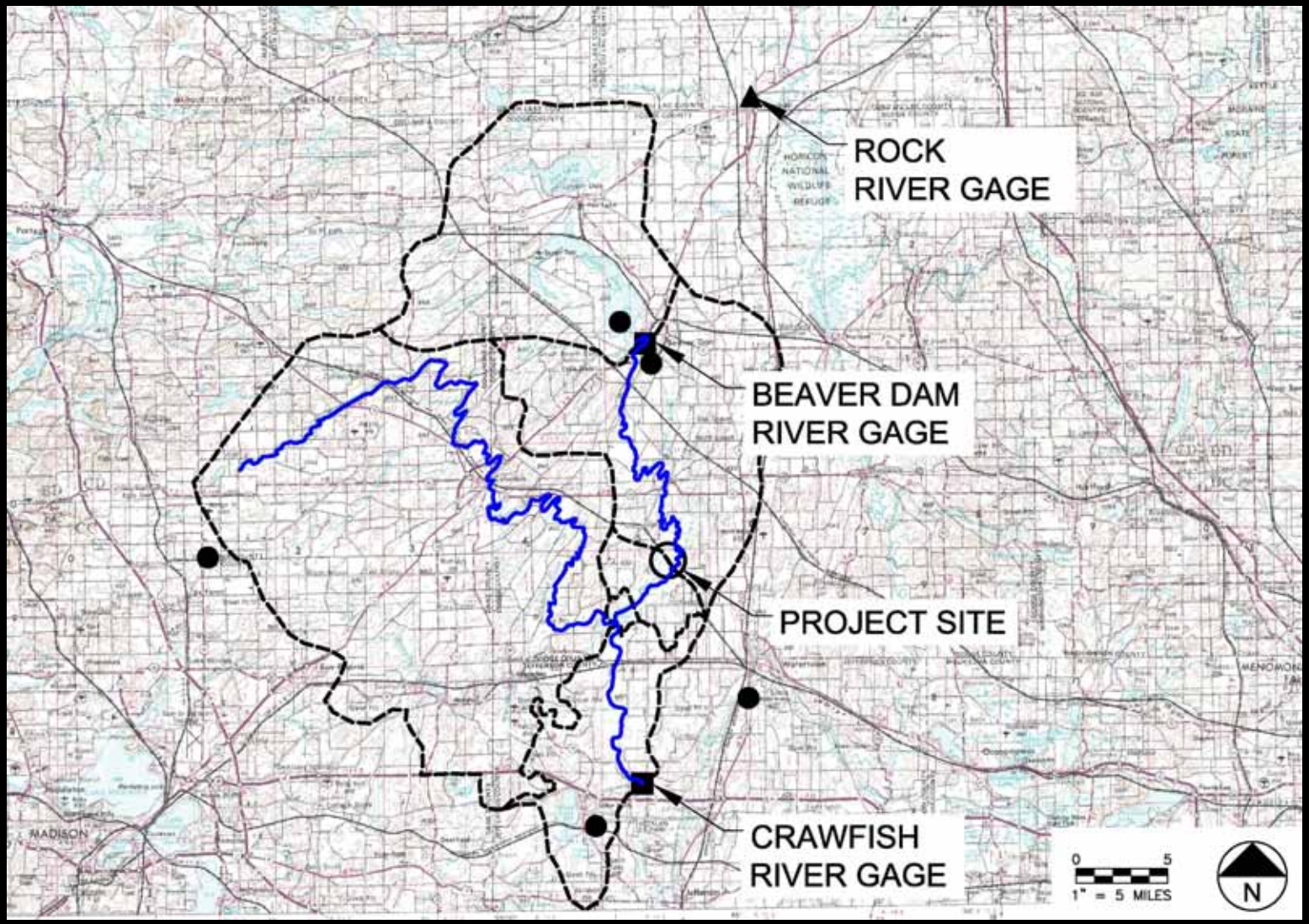
- Rainfall began 6/4/08 and lasted for 9 days
- Total rainfall was 14.48 inches
- Rainfall and discharge probabilities are estimated as greater than 500-year events
- Track was closed from 6/9/08 through 6/29/08 (20 days)
- Peak water surface elevation at site occurred on 6/16/08

Hydrology and Hydraulics Modeling

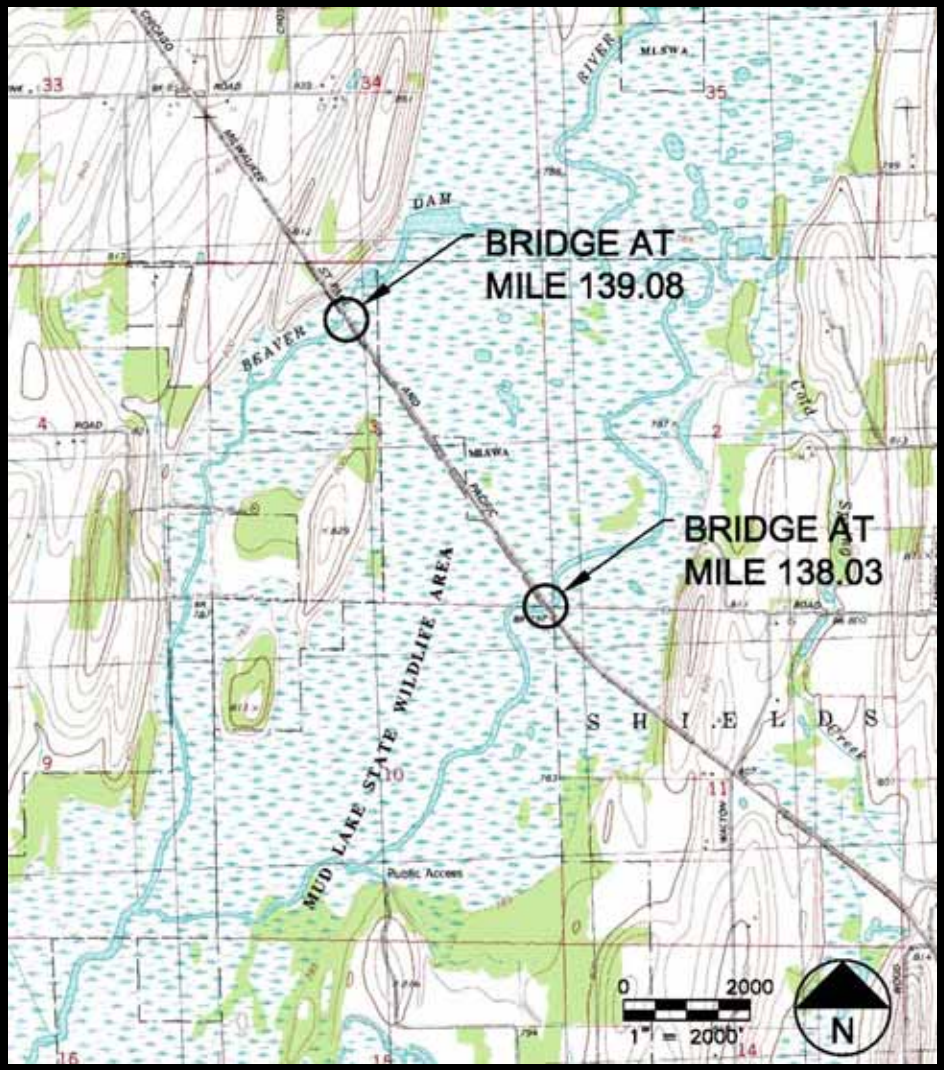
Modeling Approach

- Hydrology
  - HEC-HMS
  - Clark unit hydrograph method
  - Reeseville marsh treated as reservoir
  - Input parameters calibrated to gage data
  - Iterate input parameters and reservoir rating curve until accurate calibration is achieved
- Hydraulics
  - HEC-RAS steady flow
  - Reservoir rating curve used as starting condition

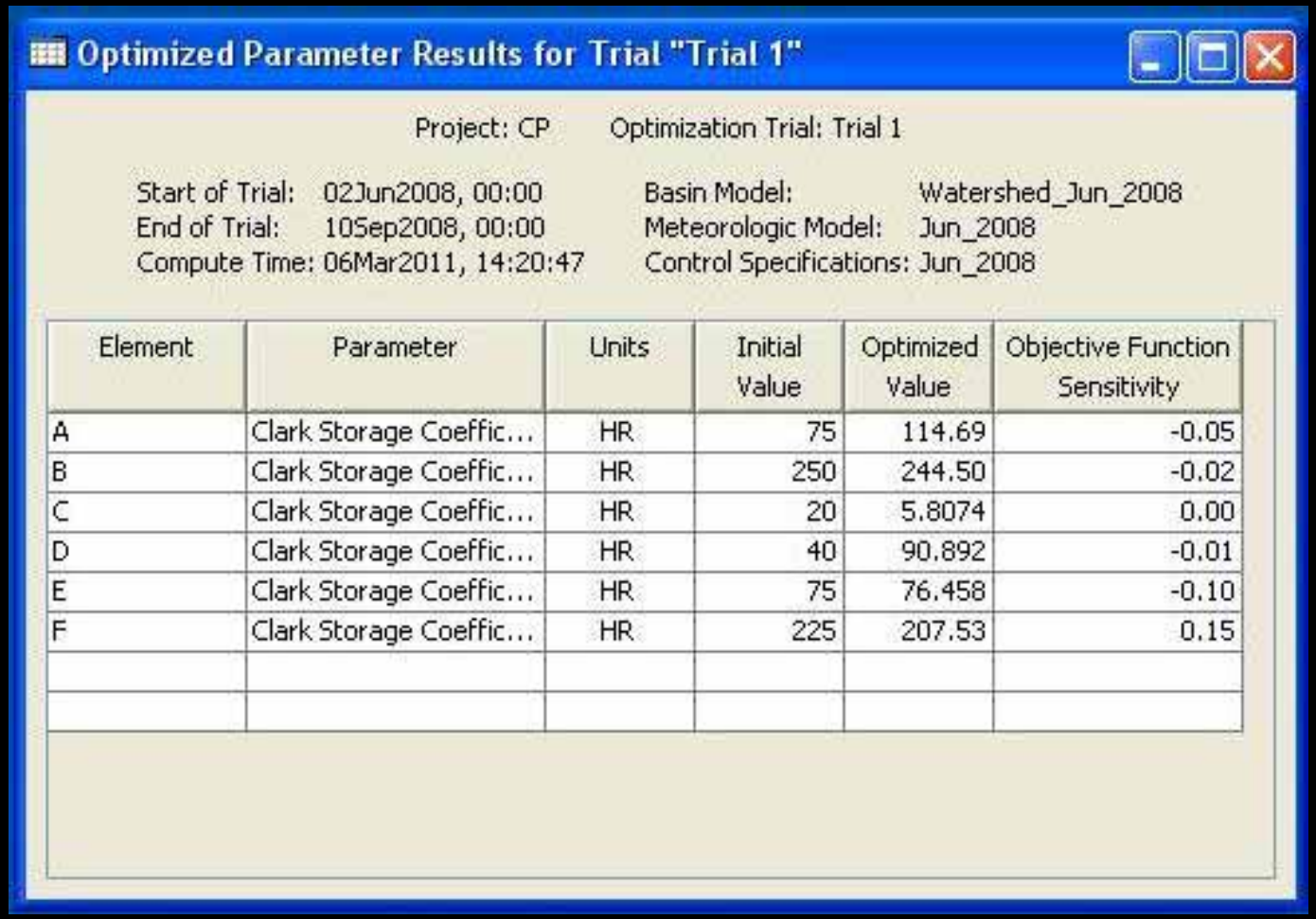
Watershed Map



Reeseville Marsh



Model Calibration



Optimized Parameter Results for Trial "Trial 1"

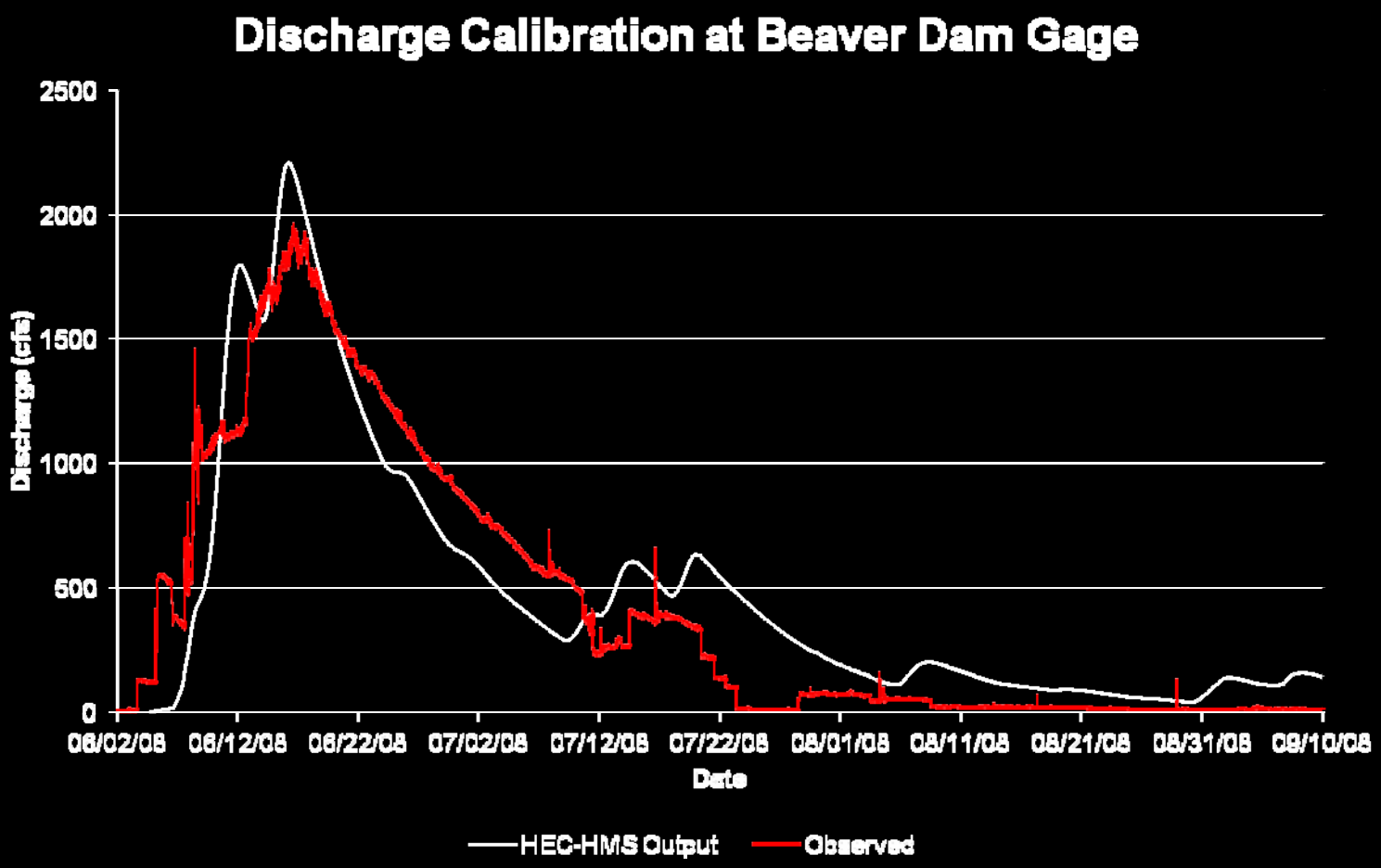
Project: CP Optimization Trial: Trial 1

Start of Trial: 02Jun2008, 00:00
End of Trial: 10Sep2008, 00:00
Compute Time: 06Mar2011, 14:20:47

Basin Model: Watershed_Jun_2008
Meteorologic Model: Jun_2008
Control Specifications: Jun_2008

Element	Parameter	Units	Initial Value	Optimized Value	Objective Function Sensitivity
A	Clark Storage Coeffic...	HR	75	114.69	-0.05
B	Clark Storage Coeffic...	HR	250	244.50	-0.02
C	Clark Storage Coeffic...	HR	20	5.8074	0.00
D	Clark Storage Coeffic...	HR	40	90.892	-0.01
E	Clark Storage Coeffic...	HR	75	76.458	-0.10
F	Clark Storage Coeffic...	HR	225	207.53	0.15

Model Calibration



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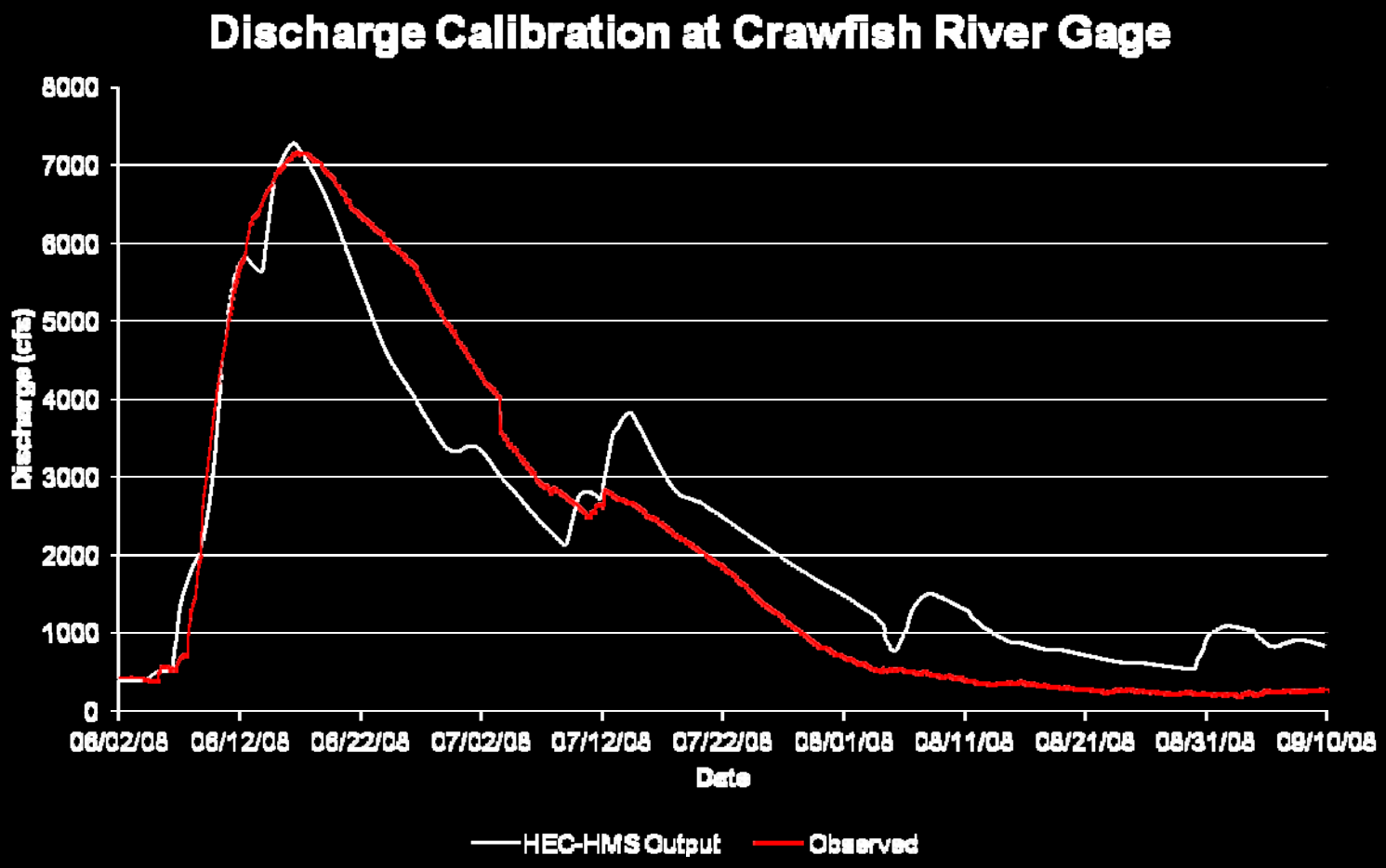

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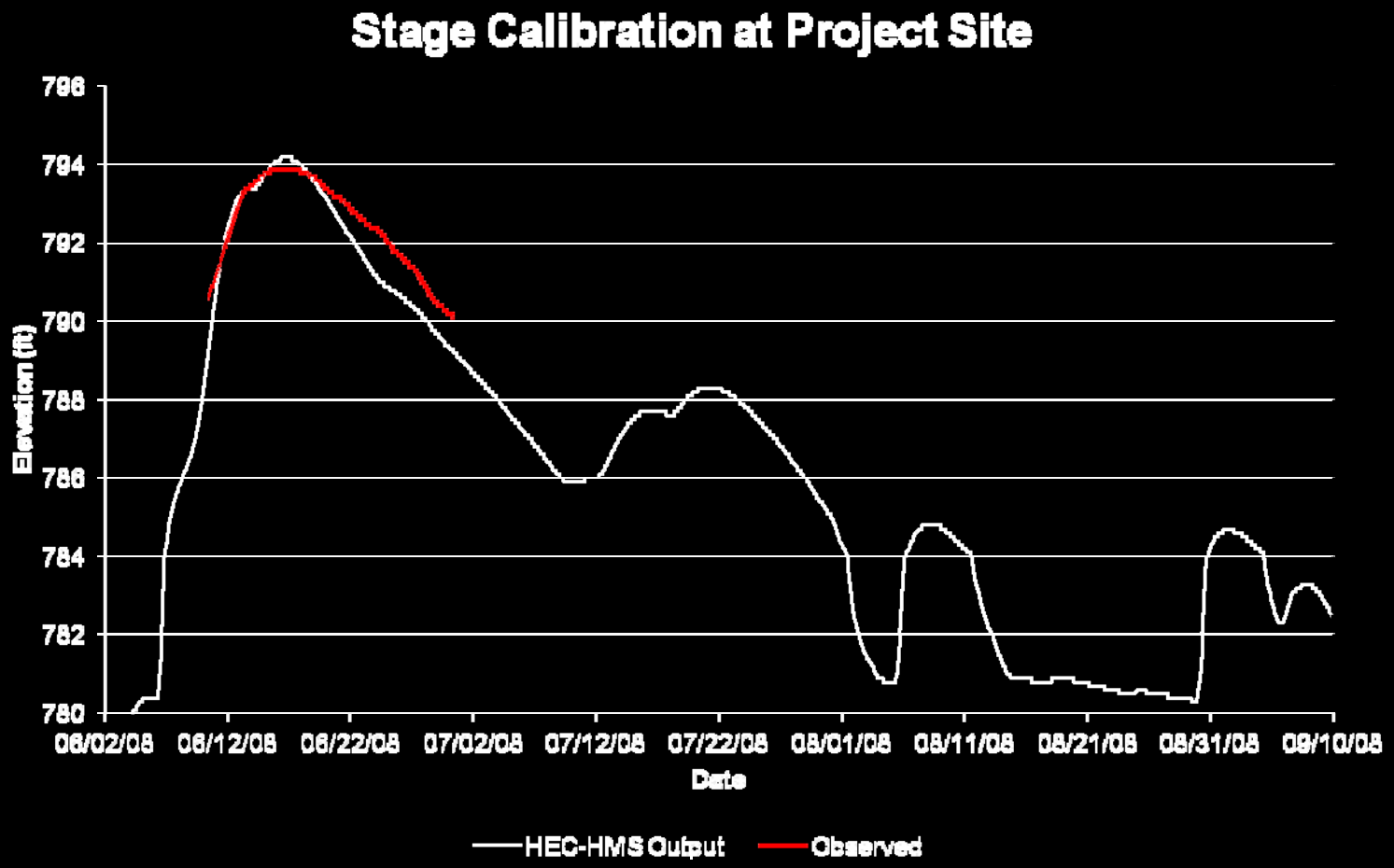

Modeling Conclusions

- Hydrology
  - Calibrated model output compared well with gage data
  - Calibrated model used with Huff distribution storms to determine design discharge at project site
  - Reeseville marsh reservoir elevations used as downstream starting condition in HEC-RAS model
- Hydraulics
  - Flat hydraulic grade line confirms that marsh acts as reservoir for high flow events
  - Model used to determine impact of design alternatives

Proposed Design

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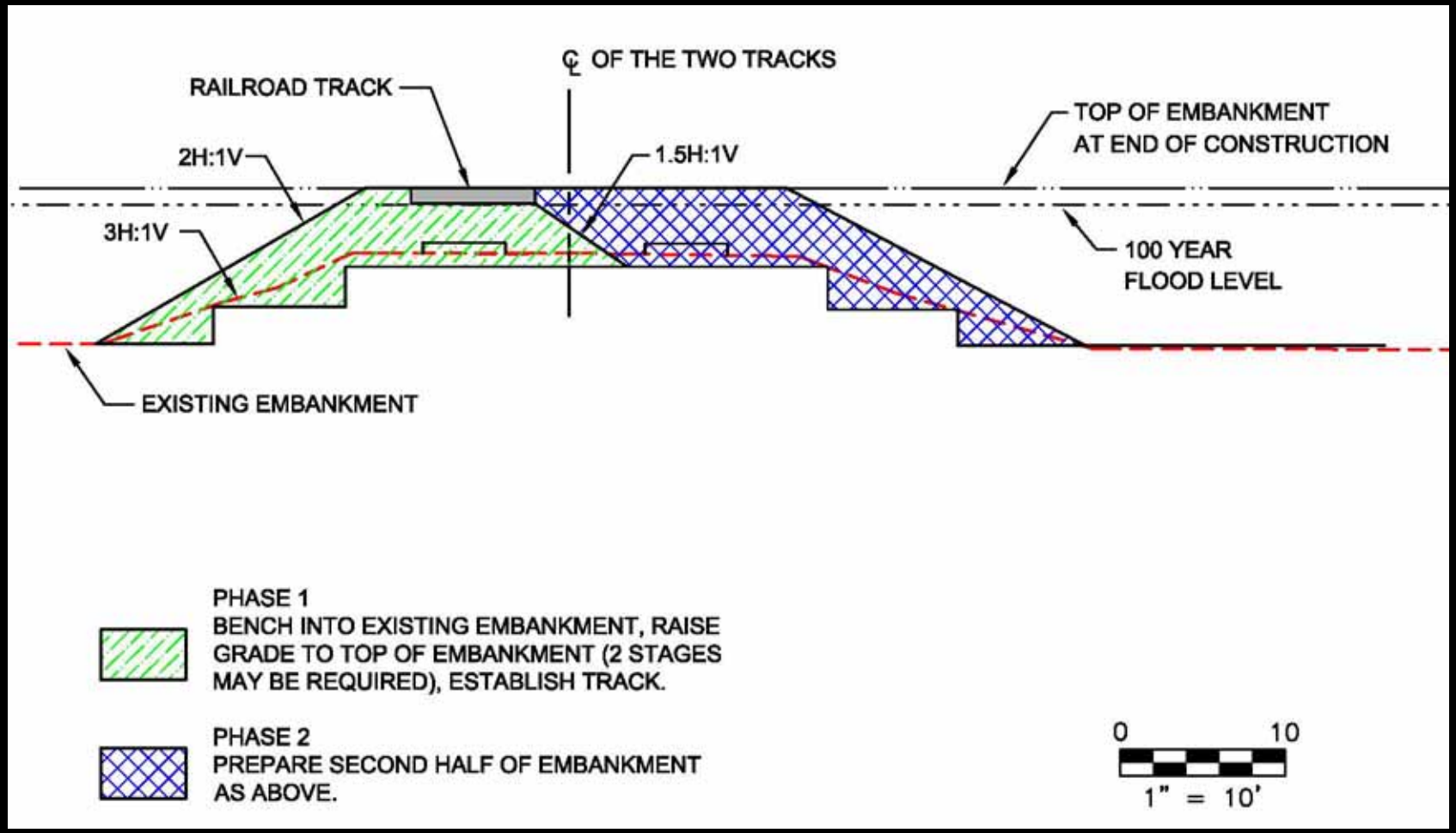

Questions?