

May 2015 Salt Creek Flooding and Response – Simulation vs. Reality



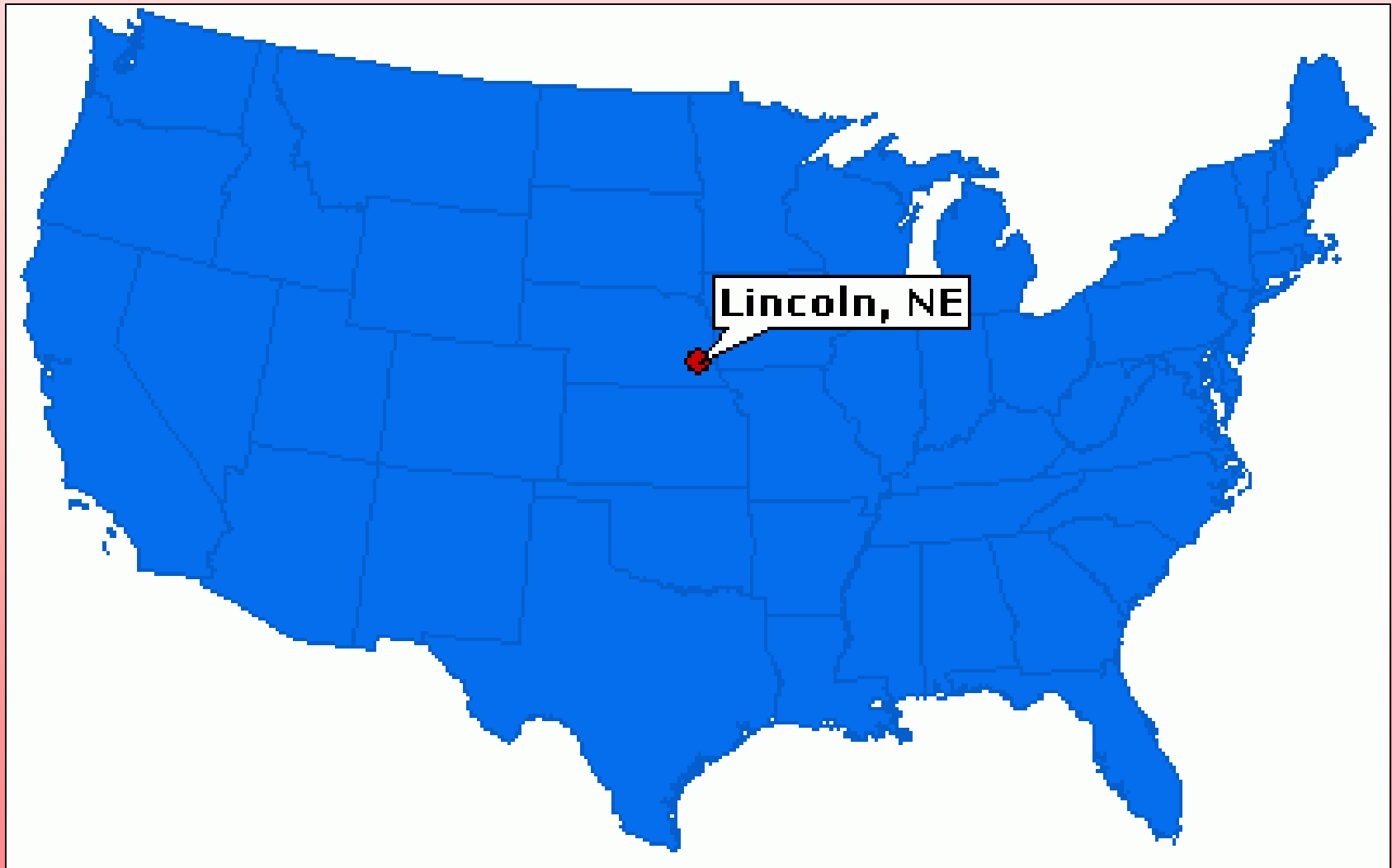
ASFPM Conference – Phoenix, AZ
21 June 2018



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natural resources district



Lincoln, NE





Agenda



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- ✓ Salt Creek Historical Flooding and Levee History
- ✓ Salt Creek Flood Study and Floodplain Mapping History
- ✓ May 2015
- ✓ SWIF
- ✓ Flood Risk Evaluations
- ✓ Risk Awareness Efforts
- ✓ Where to next?



FLOOD OF 1950



Looking north over Sherman Field from Van Dorn Street. Overflow channel lower left, Gooch Mill right center. Flood of May 9, 1950.

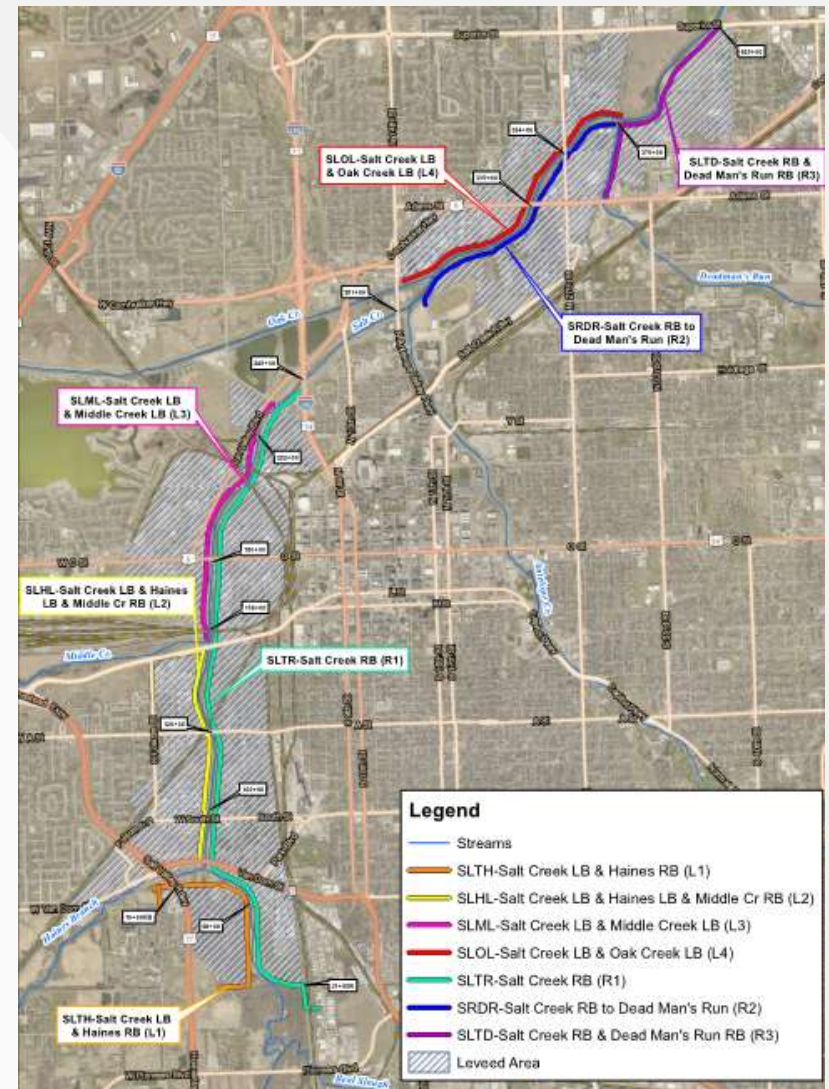


Salt Creek Levee System



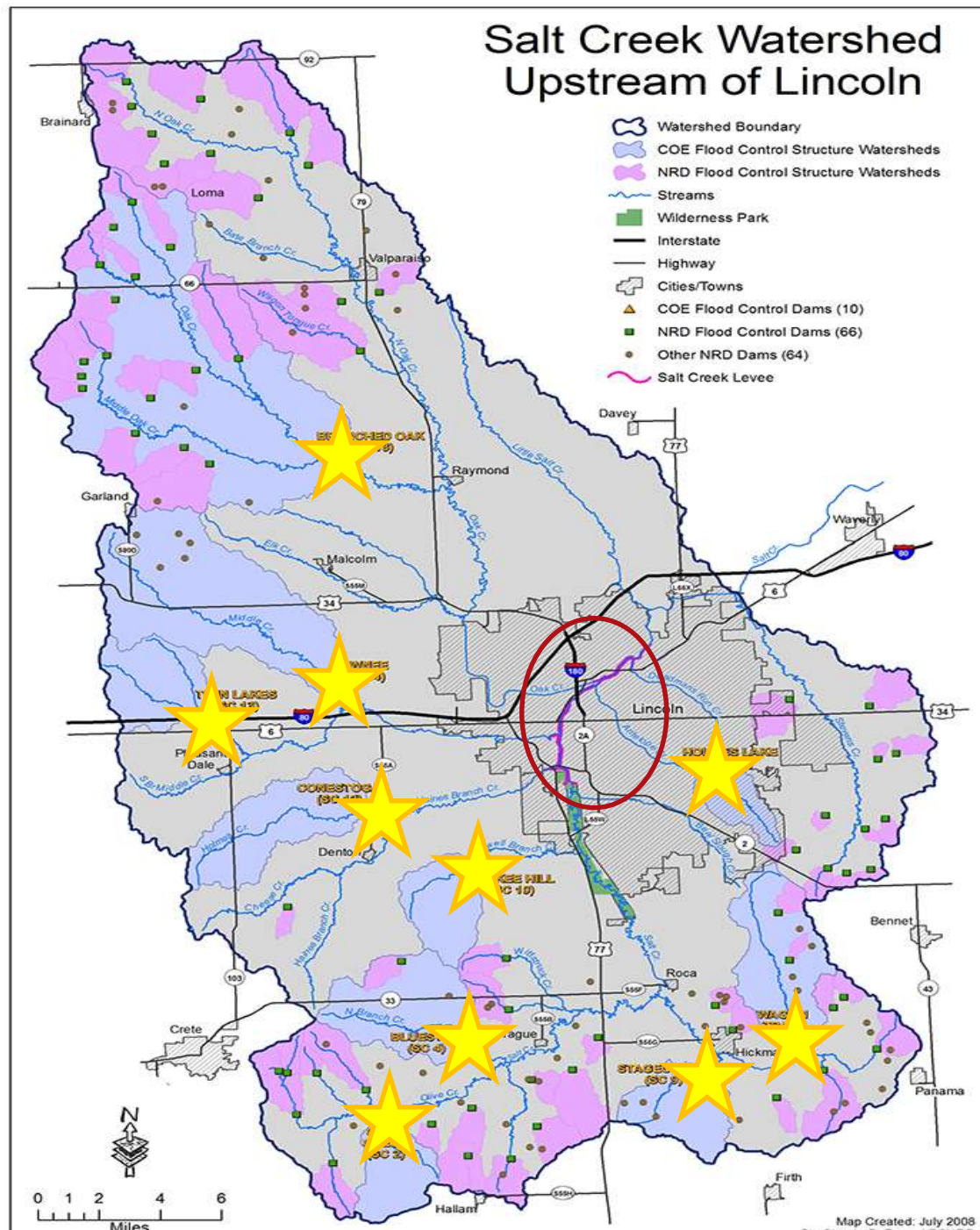
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- ✓ The LPSNRD is the owner and operator of 7 levee systems (13 miles total)
- ✓ Designed and built in the **1960's by USACE** in response to flooding in **the 1940's – 1960's**; included levee and channel improvements
- ✓ Flood risk reduction system also includes 10 USACE reservoirs upstream of Lincoln





- Salt Creek Drainage Area entering Lincoln – approximately 177 square miles
- Salt Creek Drainage Area leaving Lincoln – approximately 830 square miles





Flood Study and FIRM History



- ✓ Levee Design – 1964
- ✓ Various Early FEMA Floodplain Maps
 - 1970's – initial identification
 - 1986 – major change – levee de-accredited
 - Largely unchanged from this point until 2006 re-study
- ✓ 2006 Revised Study
 - Updated hydrologic models, not calibrated/verified
 - 1D Unsteady
 - Reflected on FIRM in 2011



Historical Floodplain Mapping – Levee De-accredited in 1986

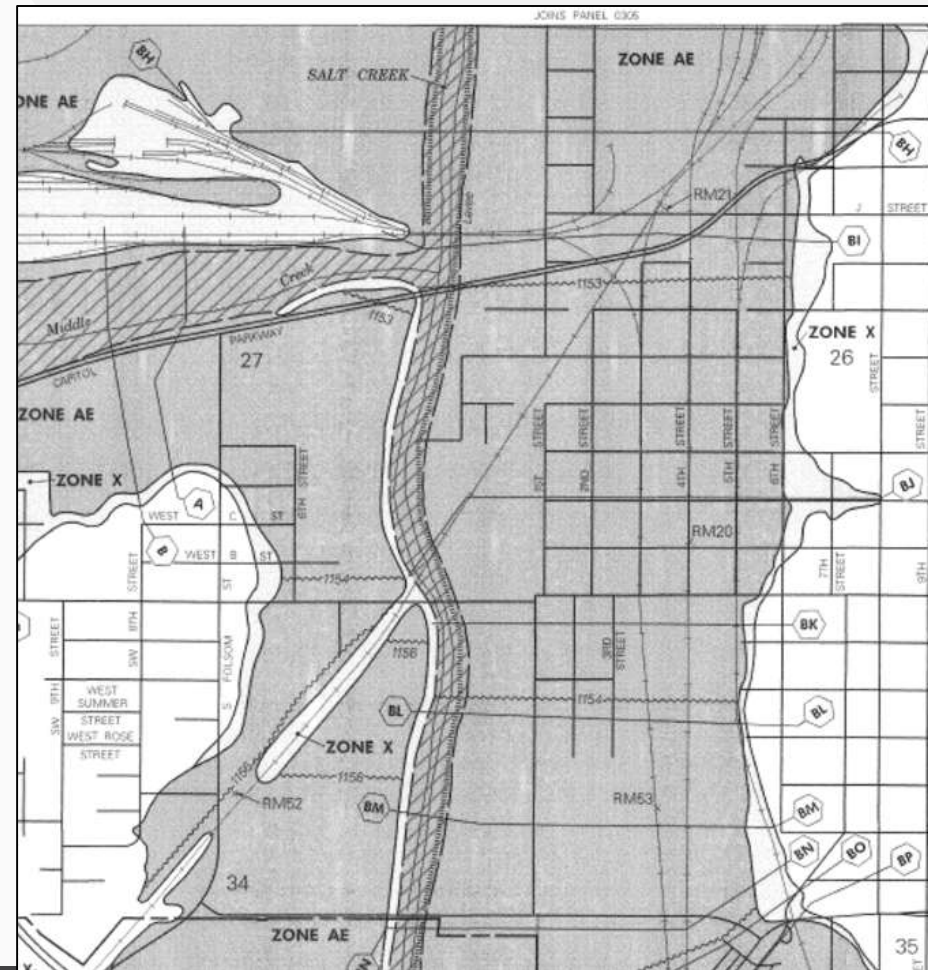


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1976



Post-1986



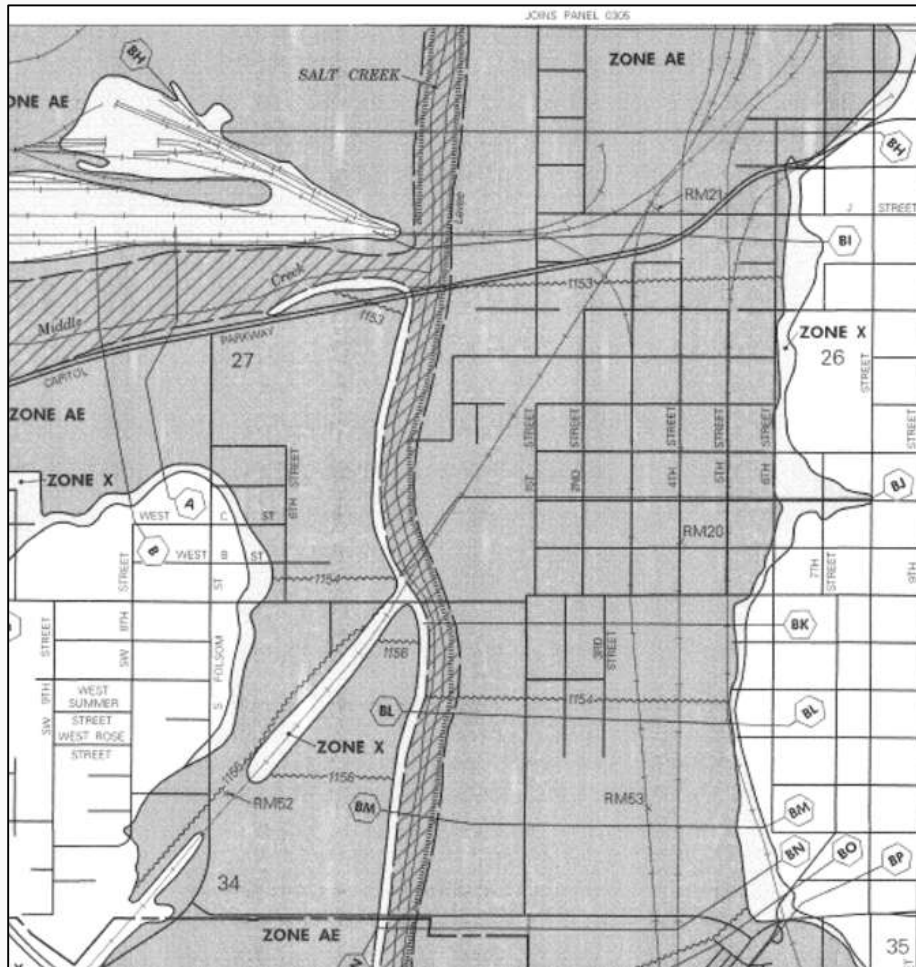


Historical Floodplain Mapping – 2006 Revised Study

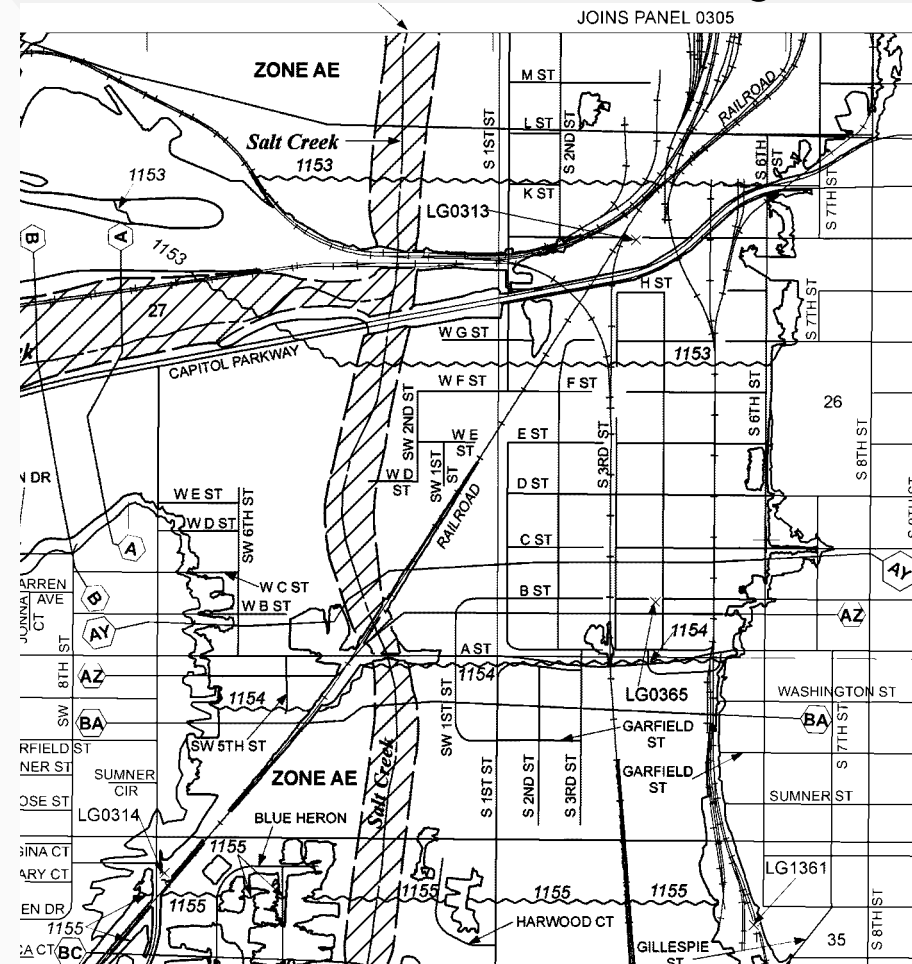


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Post-1986

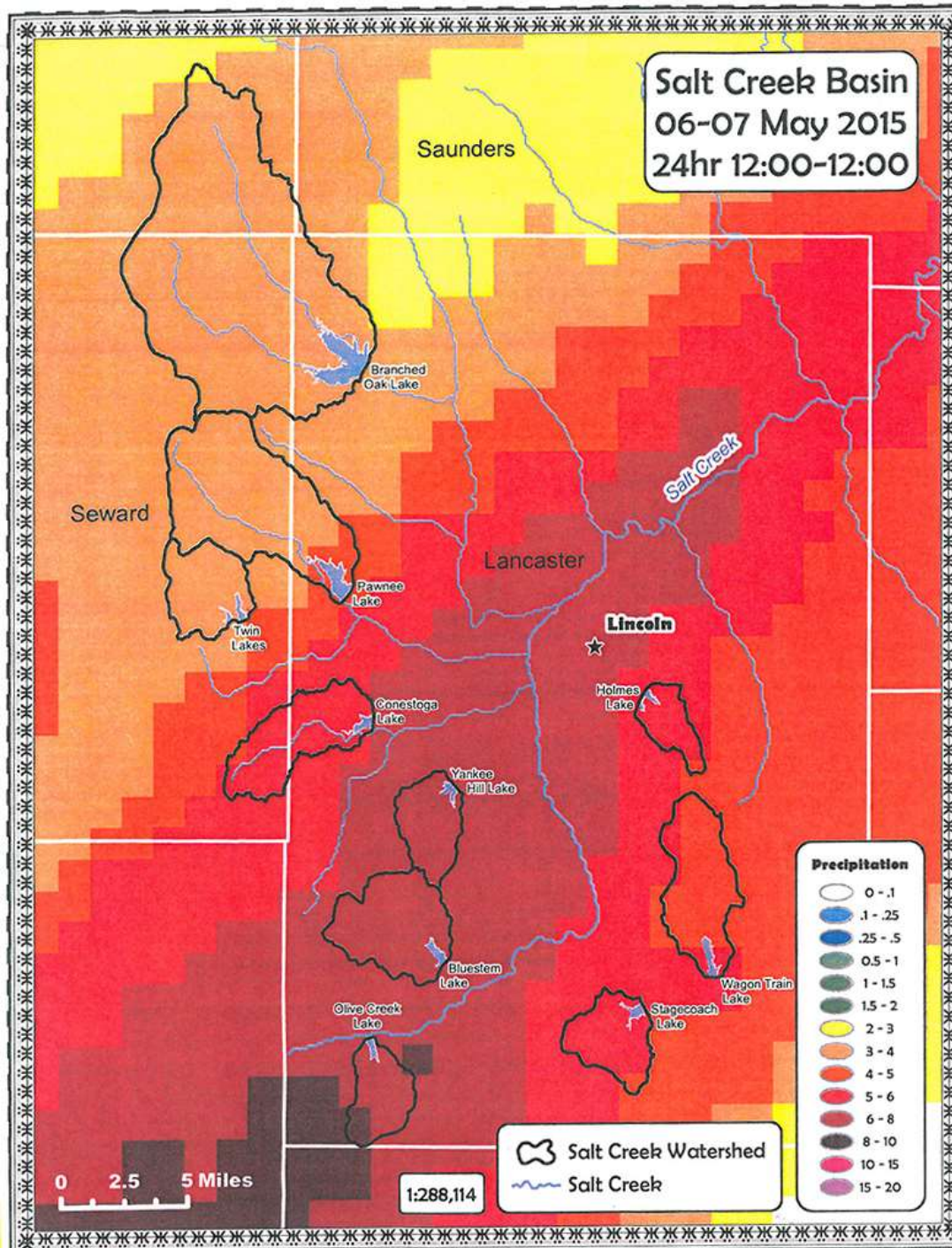


Effective (2006 Study)



May 7, 2015: it could have been a lot worse...





Park Avenue Bridge



Salt Creek Levee at South Street



South Street Bridge



Salt Creek Levee at Haymarket Park/I-180



UP/BNSF Railroad Bridge



Upstream of Superior Street



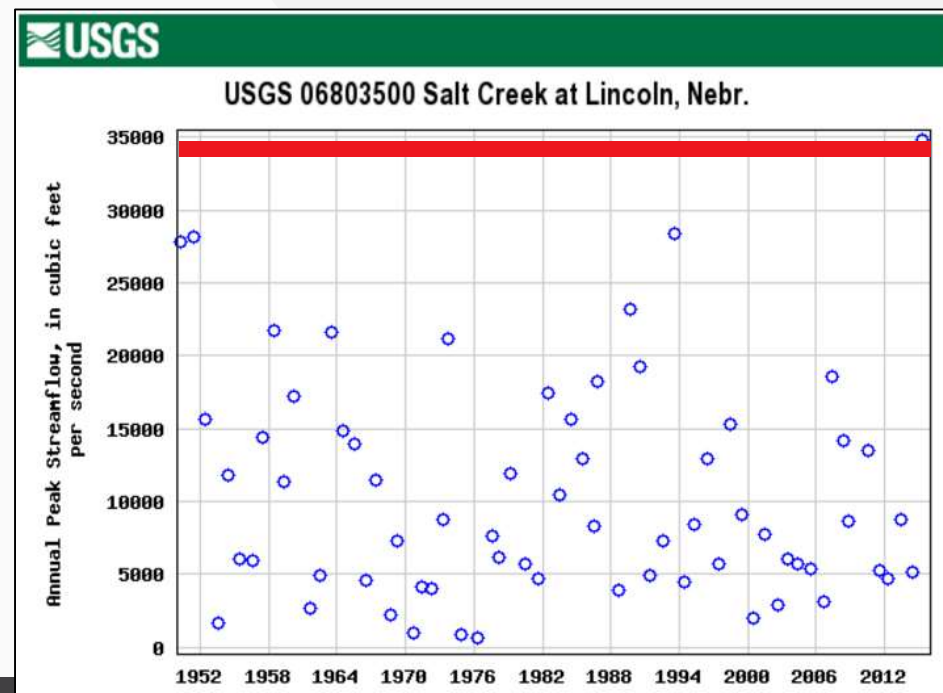
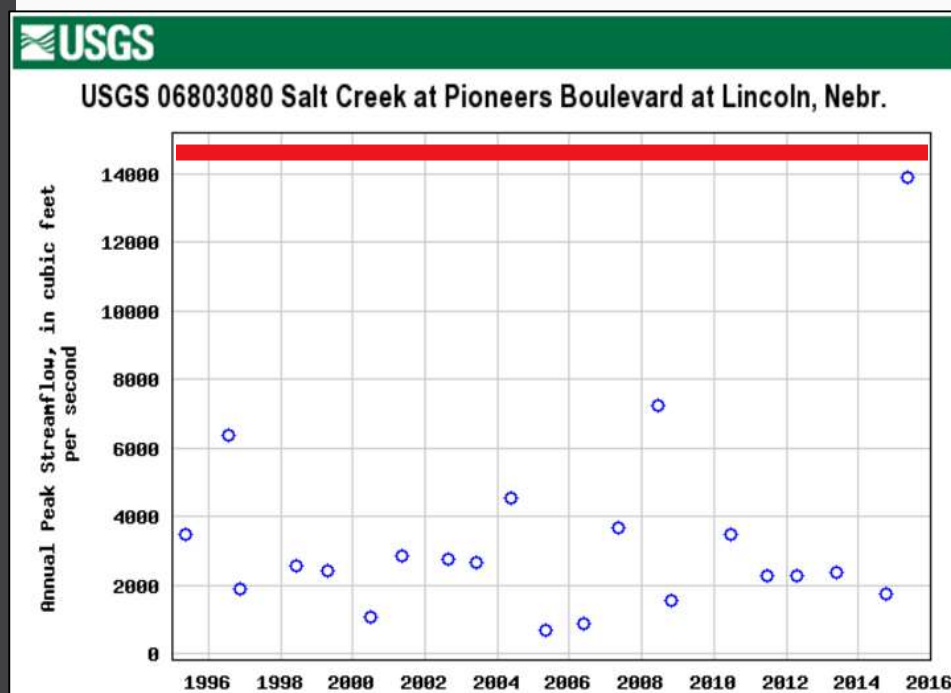


Levee Benefits



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- ✓ 2015 Flooding – Peak flow of record at two primary Salt Creek stream gages in Lincoln
- ✓ Approximately \$125M damages avoided over time, + more recent events





System Wide Improvement Framework



Identify and
assess extent
and risk of
deficiencies

Prioritize for
rectification

Reduce risk
in the
interim

Develop cost
estimates
and
schedule



Risk Assessment at Key Locations



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- ✓ Deficiency impacts
- ✓ System performance





Historical Hydraulic Analysis Progression

1D Steady

- Does not account for timing of tributary inflows
 - o 1964 Design Analysis; Effective FIRM Prior to 2011

1D Unsteady

- Accounts for timing of tributary inflows
- More detailed, but limited inundation mapping capability at backwater areas
 - o 2006 FIS Study; current Effective FIRM
 - o FIS Study focused on broad floodplain delineation needs

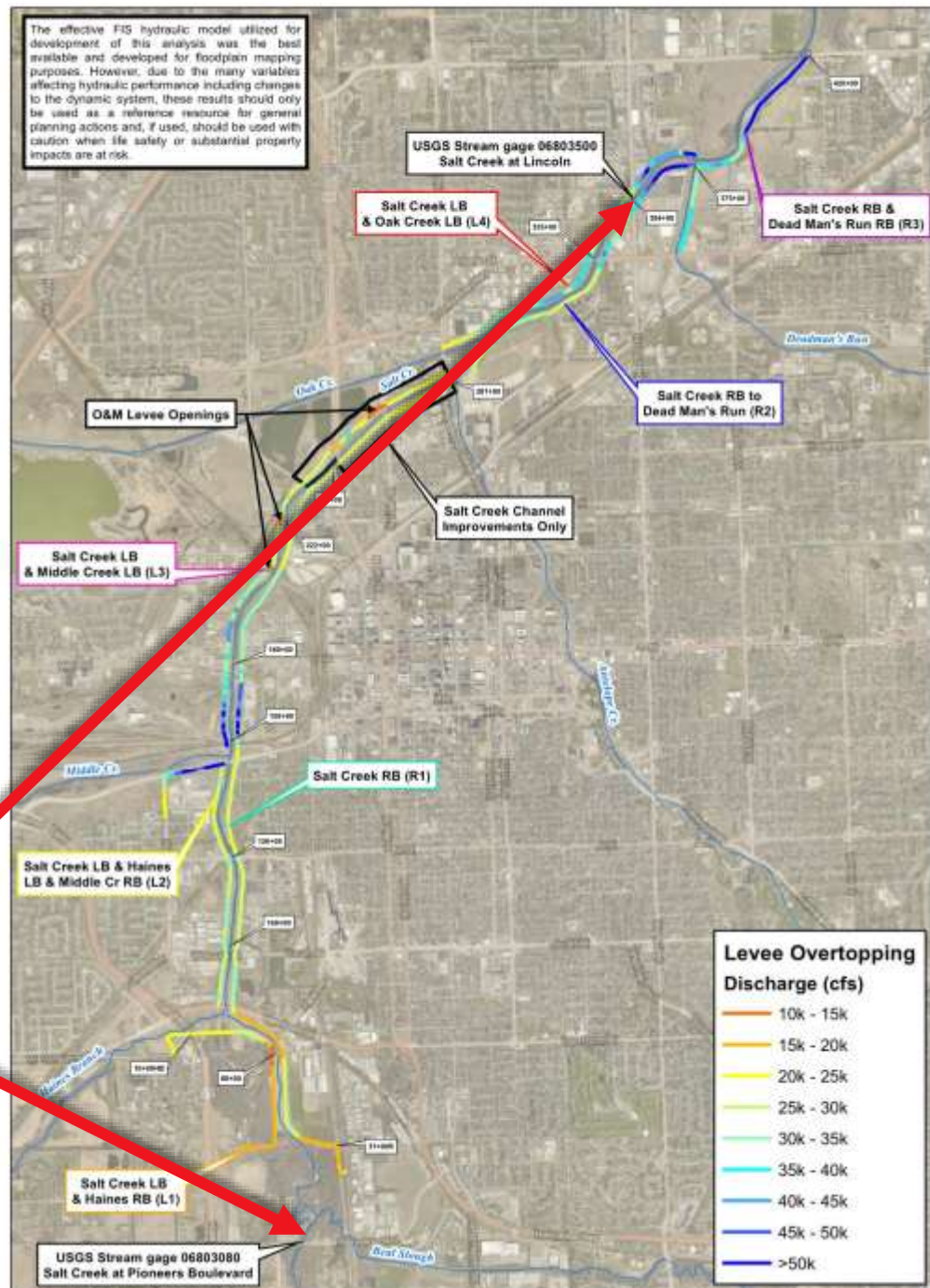
2D Unsteady

- Based on two-dimensional surface
- More accurately accounts for inter-related backwater flow areas at tributaries
- Hydrologic timing may still be suspect if not calibrated/verified
 - o Site specific analyses completed through SWIF



Observed Performance vs. Effective Models

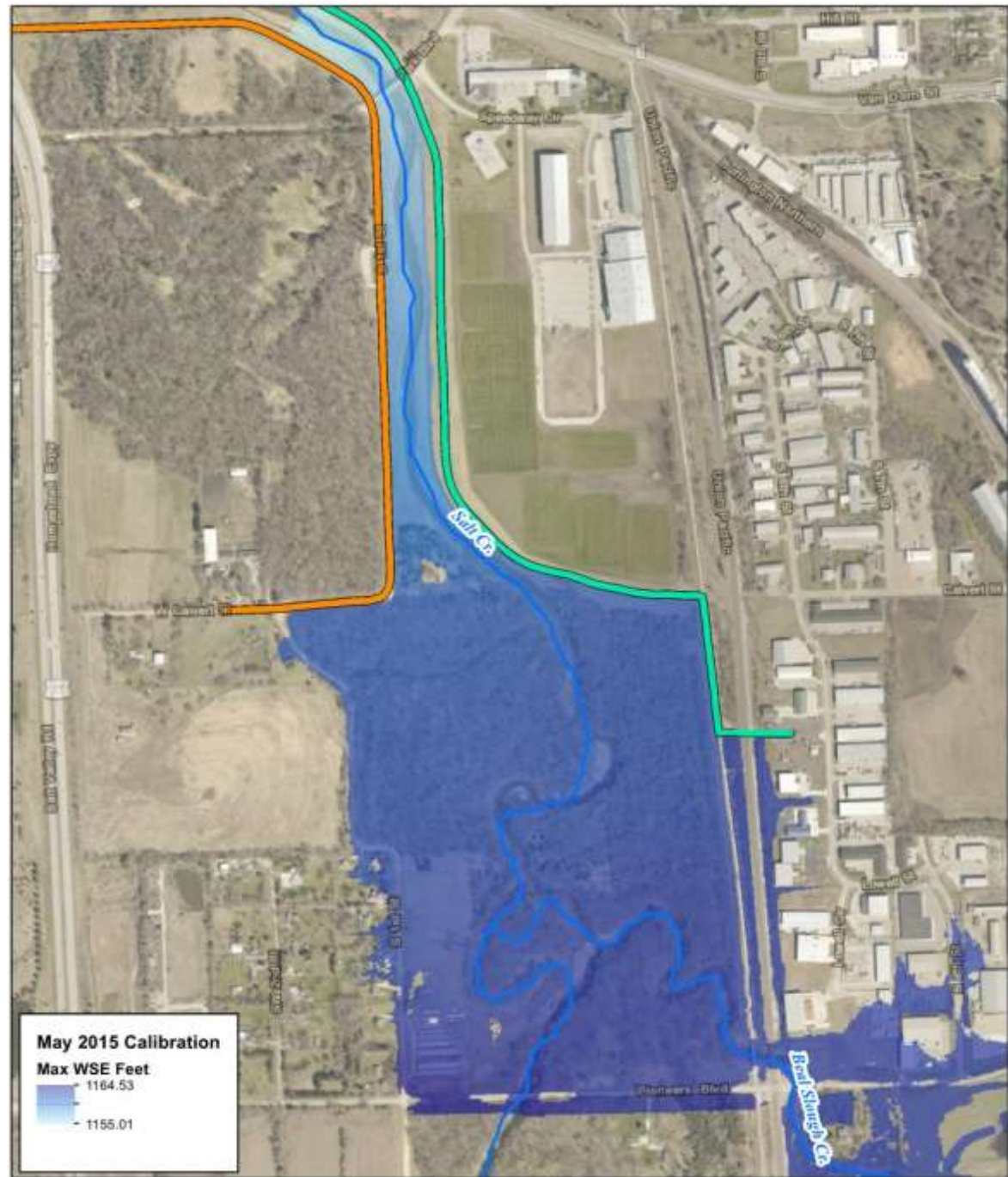
- ✓ Overtopping Discharge near gages vs. 2015 observations



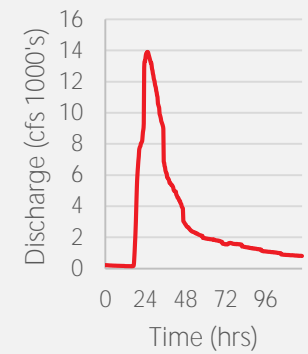


Observed Performance vs. Effective Models

- ✓ Beal Slough Site – Observed vs. Modeled; accounting for site details



Salt Creek May 2015
Flood Event
May 6th – May 12th



Peak Discharge
13,900 cfs



Risk Awareness Activities



- ✓ Provide information of flood risk to local officials for communicating to the public
- ✓ Involve the public as a partner in communicating flood risk (<http://saltcreeklevee.jeo.com/>)
- ✓ Plan carefully and evaluate efforts relative to managing risk including identification of vulnerable areas and activities to mitigate the risk
- ✓ **Listen to the public's specific concerns regarding the risk**
- ✓ Coordinate and collaborate with other credible sources
- ✓ Meet the needs of the media
- ✓ **Empathize, don't just throw info over the fence**



Risk Awareness Communication Plan: Message Timing

- Ideal: Communicate to Mitigate
- Essential Component: Communicate to Prepare
- Critical Component: Communicate During Response





Risk Awareness Communication



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Risk = f(Hazard, Performance, Consequences)

Consequences = f(..., Awareness)

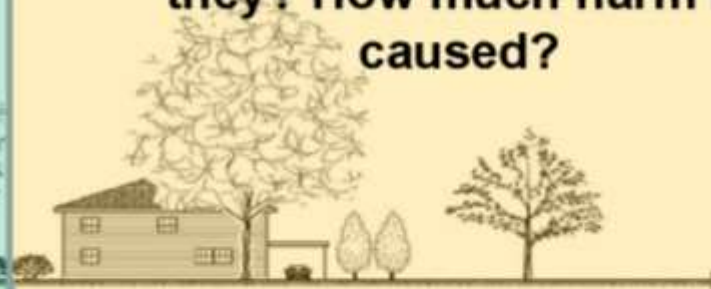
What are the hazards and how likely are they to occur?



How will the infrastructure perform in the face of these hazards?



Who and what are in harms way?
How susceptible to harm are they? How much harm is caused?

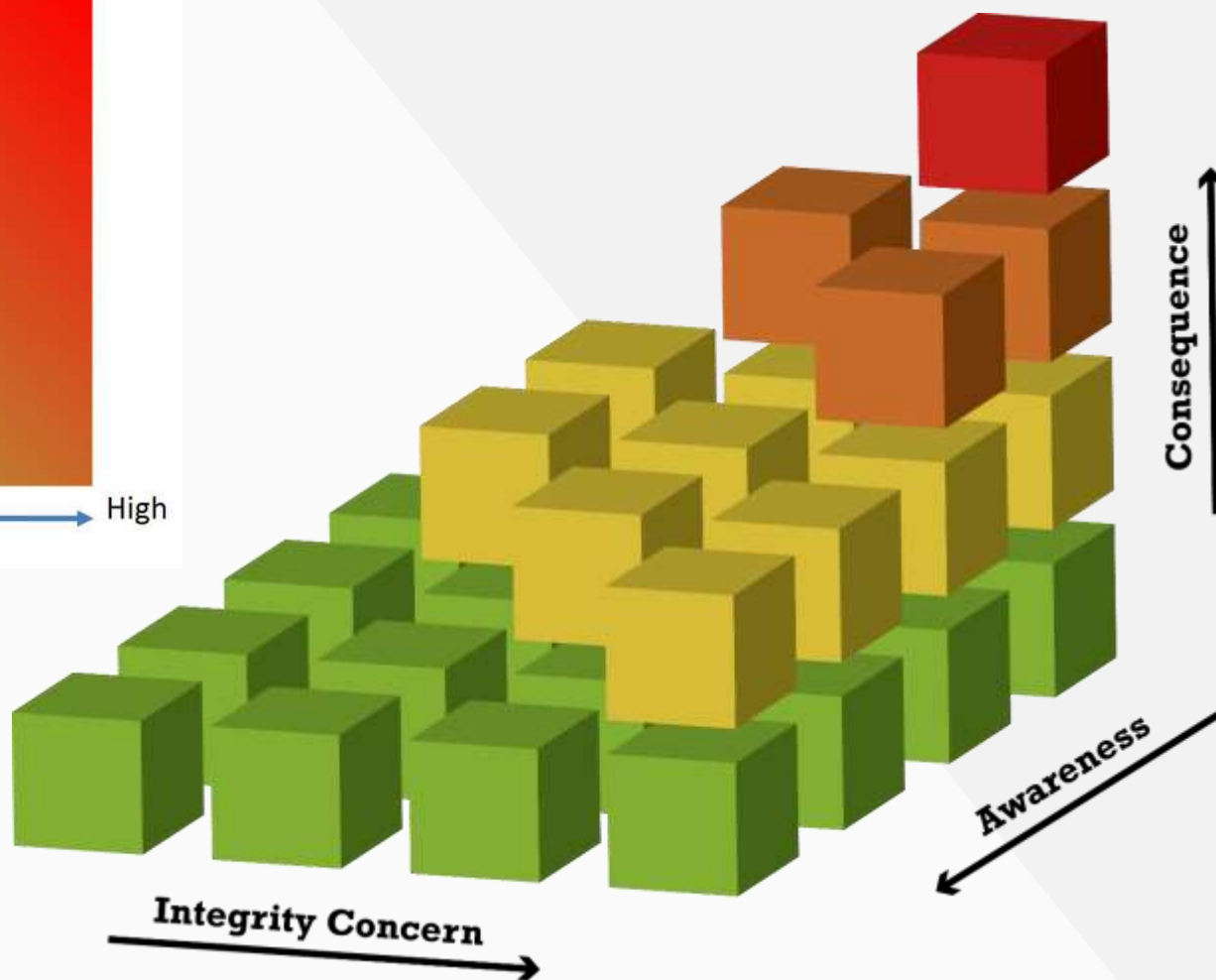
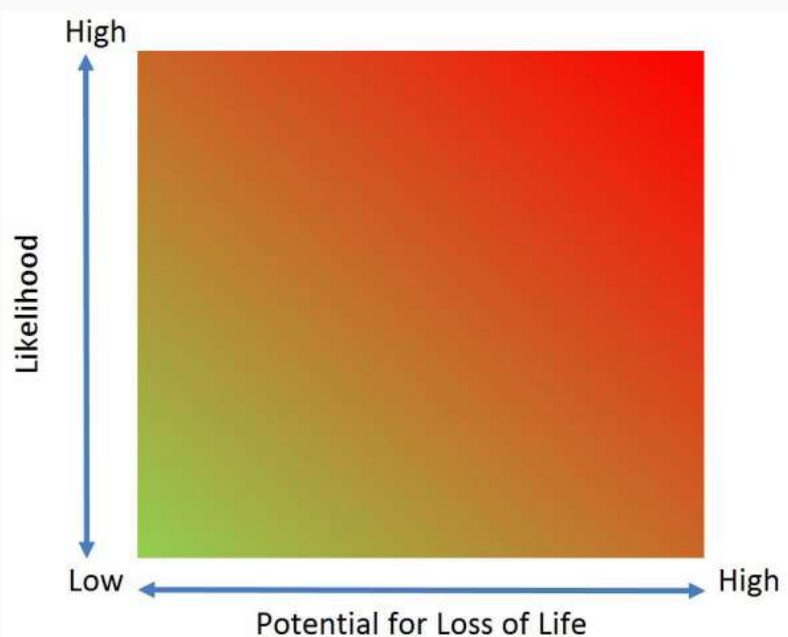




Communicating Risk Is The First Step



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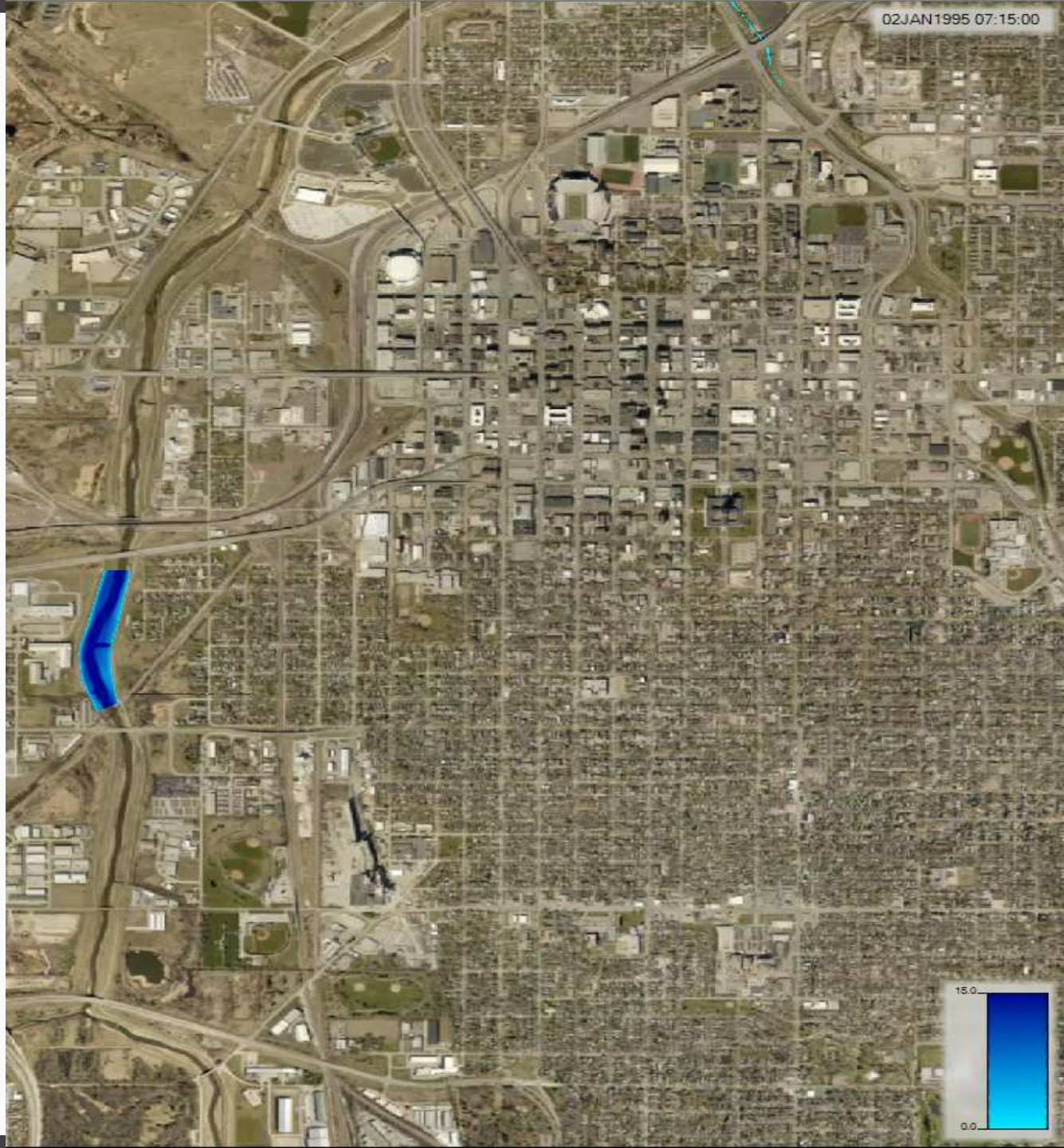
Risk Awareness Communication: Levels of Communication





Additional Risk Assessment

- ✓ Hypothetical
levee breach
impact
assessment





Support Group - Let's Talk Through This



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Risk Awareness Communication



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Levees Prepare History Projects People Resources

Salt Creek Levee Project

Reducing flood damages in Lincoln for over 50 years.

LEARN MORE

LATEST UPDATES

Welcome to the Salt Creek Levee Project

"Lincoln has benefited from this NRD-maintained levee system for over 50 years. It's important to keep the public informed of improvements we make for the system. We are also pleased to share important information regarding flood risk in the Salt Creek Levee System. Thanks for visiting!"

-Glenn Johnson, LPSNRD General Manager



How do levees work?

Levees are an engineered system that reduce the frequency of flooding for the areas they protect.

Levee Simulator



Learn How Levees Work

The FloodSmart Levee Simulator shows different ways a levee can fail. It covers every type of levee failure and reminds everyone that simply living near a levee doesn't guarantee your home's protection.

LAUNCH LEVEE SIMULATOR

Levee Simulator

Launch the Levee Simulator to see how levees work to reduce flood risk and what happens if they fail.

[Launch Levee Simulator](#)

LEVEE UPDATE CONTINUES



A drone capturing video of Salt Creek approaches the "O" Street Bridge from the south. The transparent map on the left tracks the drone's flight and current location.

As LPSNRD continues to update the infrastructure of the 60-year-old Salt Creek Levee and revise procedural plans, we're also just watching Salt Creek. Closely. JEO Consulting Group flew the entire levee system twice this spring with a drone; once at high altitude and again at about the eye level of a great blue heron waiting for breakfast. By themselves, the videos are mildly impressive, but we're hoping to learn more about Salt Creek and how it changes when we compare the new videos to similar ones JEO made two years ago.

The periodic video comparisons, infrastructure updates and revised plans are all part of a years-long process

administered by the U.S. Army Corps of Engineers called a SWIF plan - short for System Wide Improvement Framework. The overall goal is to keep the levee system dependable and functioning efficiently. When SWIF is completed, the 13-mile levee system that protects Lincoln homes and businesses will not offer any more protection than it does now, but hopefully, SWIF will extend the life of the levee at least another 60 years. LPSNRD is budgeting \$500,000 for the next 15 years for SWIF. The public needs to remember the levee is not a guarantee against flooding and warnings from authorities during high water events need to be heeded to keep people safe.



Potential Next Steps for the Salt Creek Levee System



- ✓ Work the Plan, Reevaluate Priorities
- ✓ Hydrology Calibration and Verification
- ✓ Hydraulics Approach Improvements
- ✓ Continued Risk Awareness Campaign
 - Targeted Risk Assessments
 - Community vs. FEMA Timeline

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Salt Creek Levee Website

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THANK YOU!