USACE

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Assessment of Conceptual Nonstructural Alternative

Assessment of Conceptual Nonstructural Alternative Levee Setbacks along the Missouri River (Lower L-575 / Upper L-550 and Lower L-550)

Missouri River Flood Task Force Meeting

May 24, 2012

Flood Risk and Floodplain Management Section

USACE-Omaha District

Assessment Background

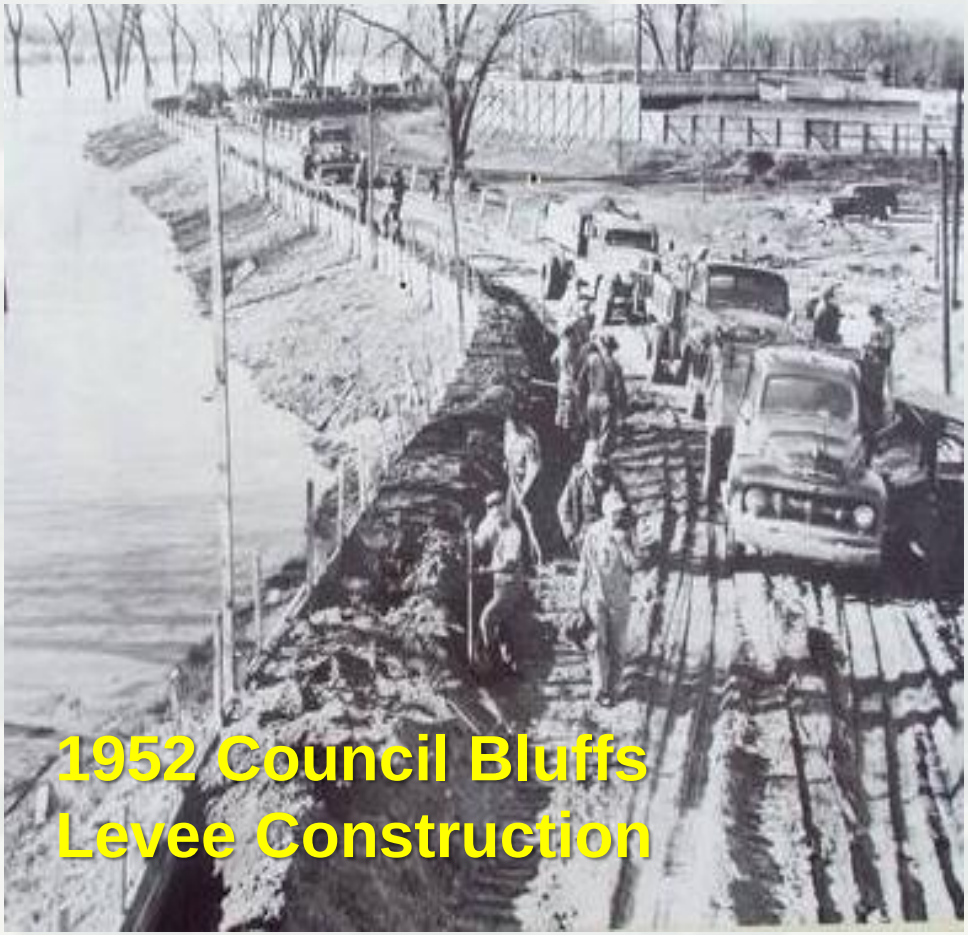
Historic Flooding along Missouri River

- long duration
- large discharges
- high stages
- high velocities
- levee breaches
- levee erosion
- excessive damages
- recurring damage locations

Conceptual Levee Setbacks

- alternative to repairs in-place
- risk based assessment
- flood risk considerations
  - reduced damages
  - sustainable
  - reliable

Levee System Authorization



Flood Control Act of 1944

Design discharges:

- 250,000 cfs at Omaha
- 295,000 cfs at Nebraska City

Freeboard: 2-feet

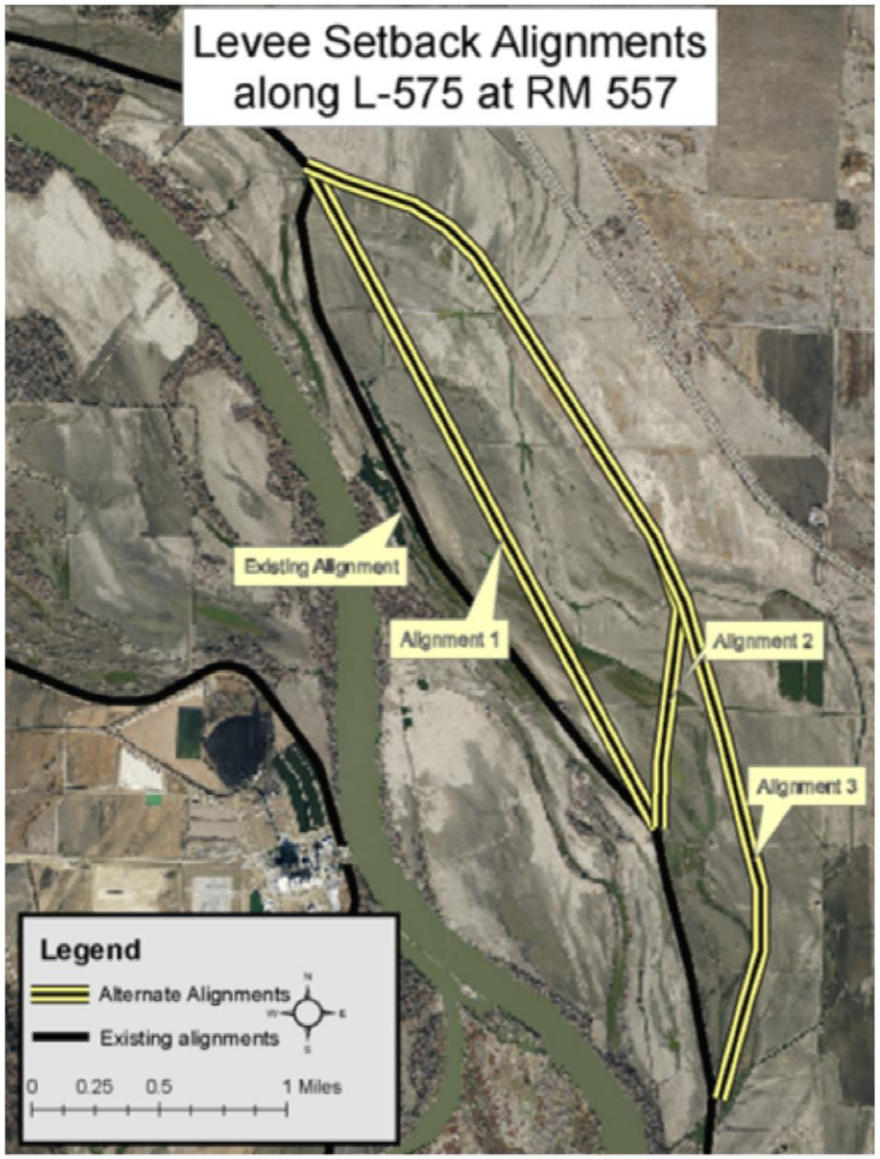
Minimum conveyance width: 3,000 feet

Levee System Constrictions

Federal Levee System	Levee to Levee (feet)	Levee to Bluff (feet)	Width at Bridge (feet)
R-520		34,390	
L-536		3,280	
L-550	3,170	2,730	1,770
R-548	3,170		
R-562	3,780		
L-575	3,780	3,140	1,090
R-573	4,960		
L-594	4,090	2,780	
Lake Waconda	4,091		
L-601		3,010	
L-611-614	2,910	2,390	1,260
R-613	2,950		
R-616	2,910		2,500
L-624		10,510	
L-627	2,760		1,180
Omaha	3,000	2,890	1,180

Significant Pinch Points

Levee Setback Fundamentals

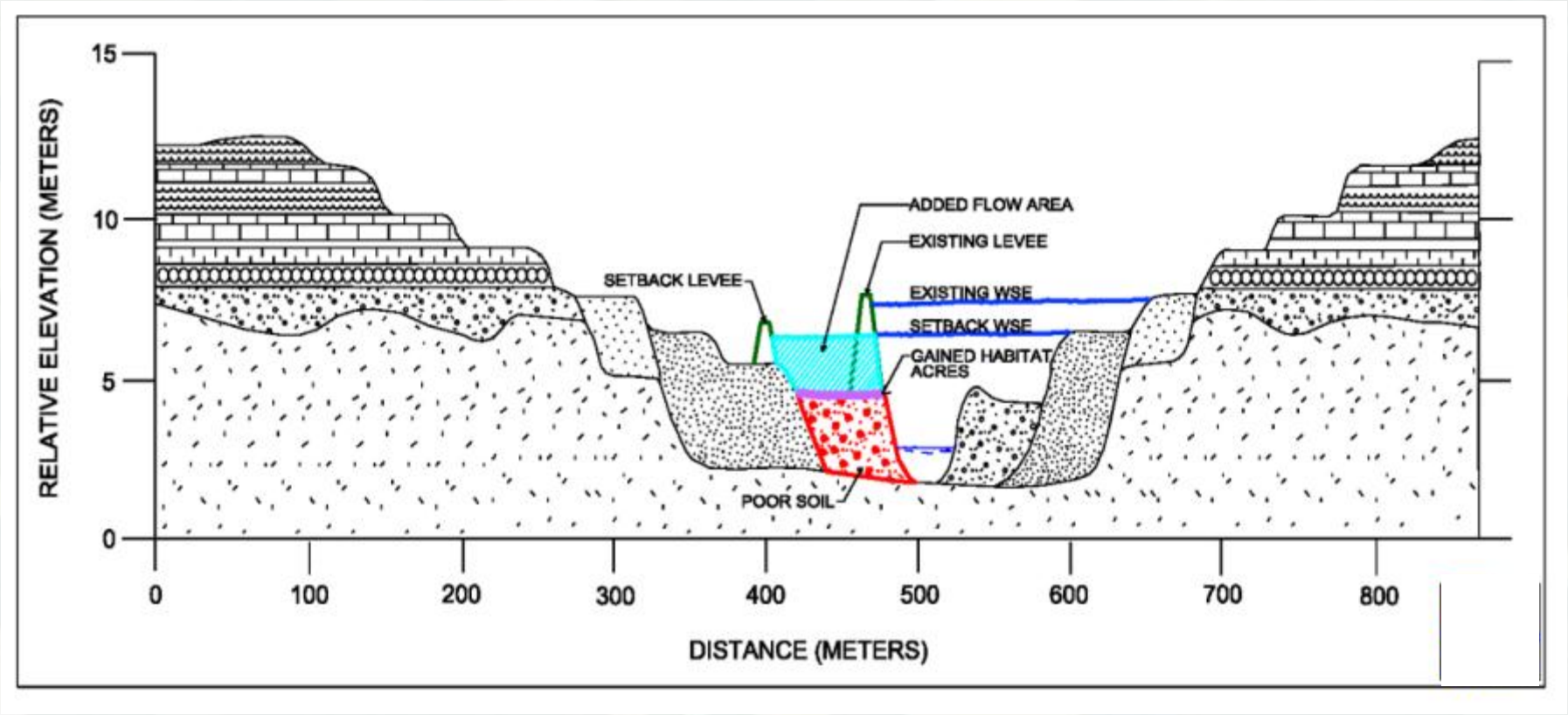


Levee Setbacks are a localized realignment using risk based levee design

Levee Setbacks are not the complete removal of levee systems or the complete realignment of levee systems

Levee Setback Fundamentals

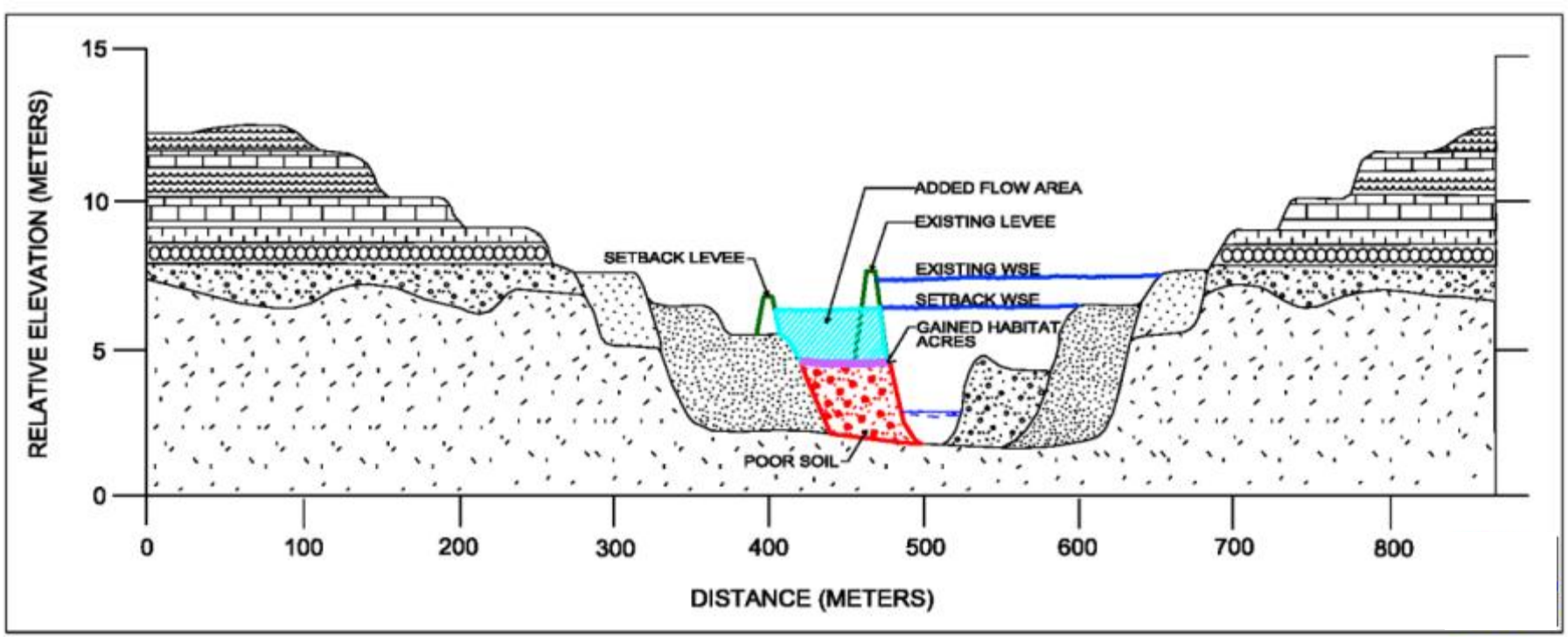
(potential impacts associated with existing system)



High flood stages
High erosive velocities
Potential unsuitable foundation soils
Potential high underseepage
Recurring damages

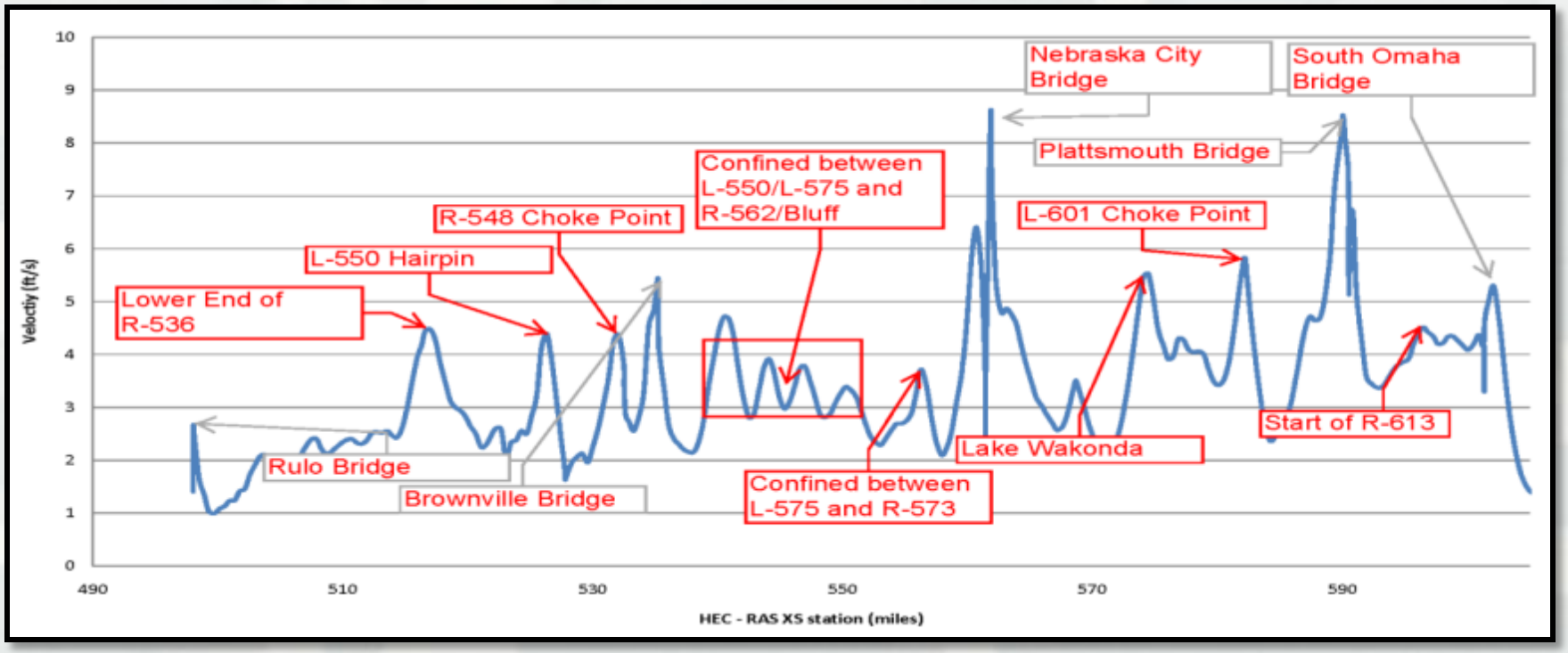
Levee Setback Fundamentals

(potential benefits associated with levee setback)



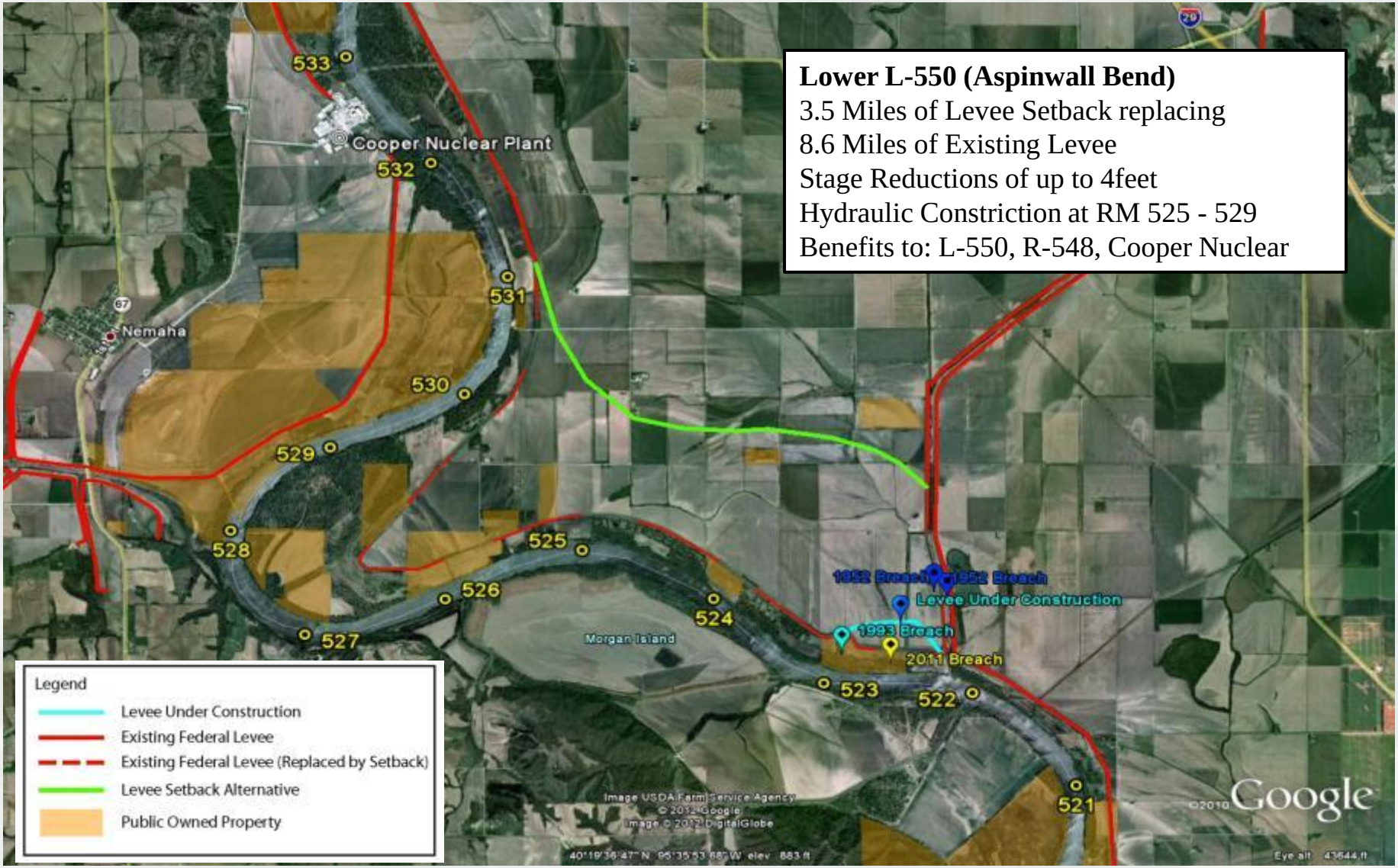
Reduced flood stages
Reduced flood velocities
Potentially more favorable foundation soils
Reduced O&M RRR
Reconnected historic floodplain

Levee Setback Site Selection Process

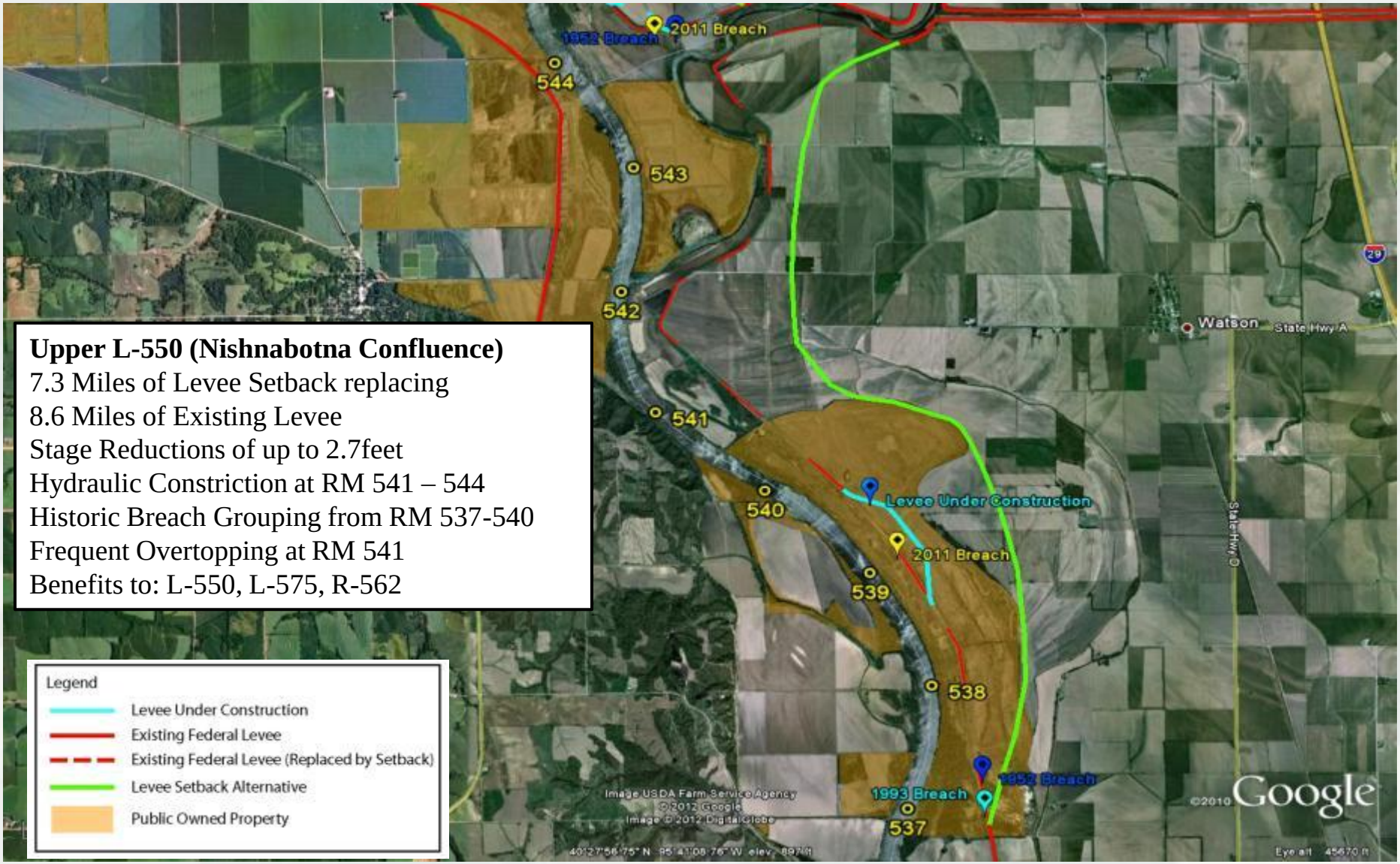


- Hydraulic (conveyance/velocities/scour/deposition)
- Geotechnical (soils/seepage/slopes)
- Habitat (aerial photos/ wetlands)
- Critical Facilities (live risk/economics)

Levee Setback Details for Lower L-550

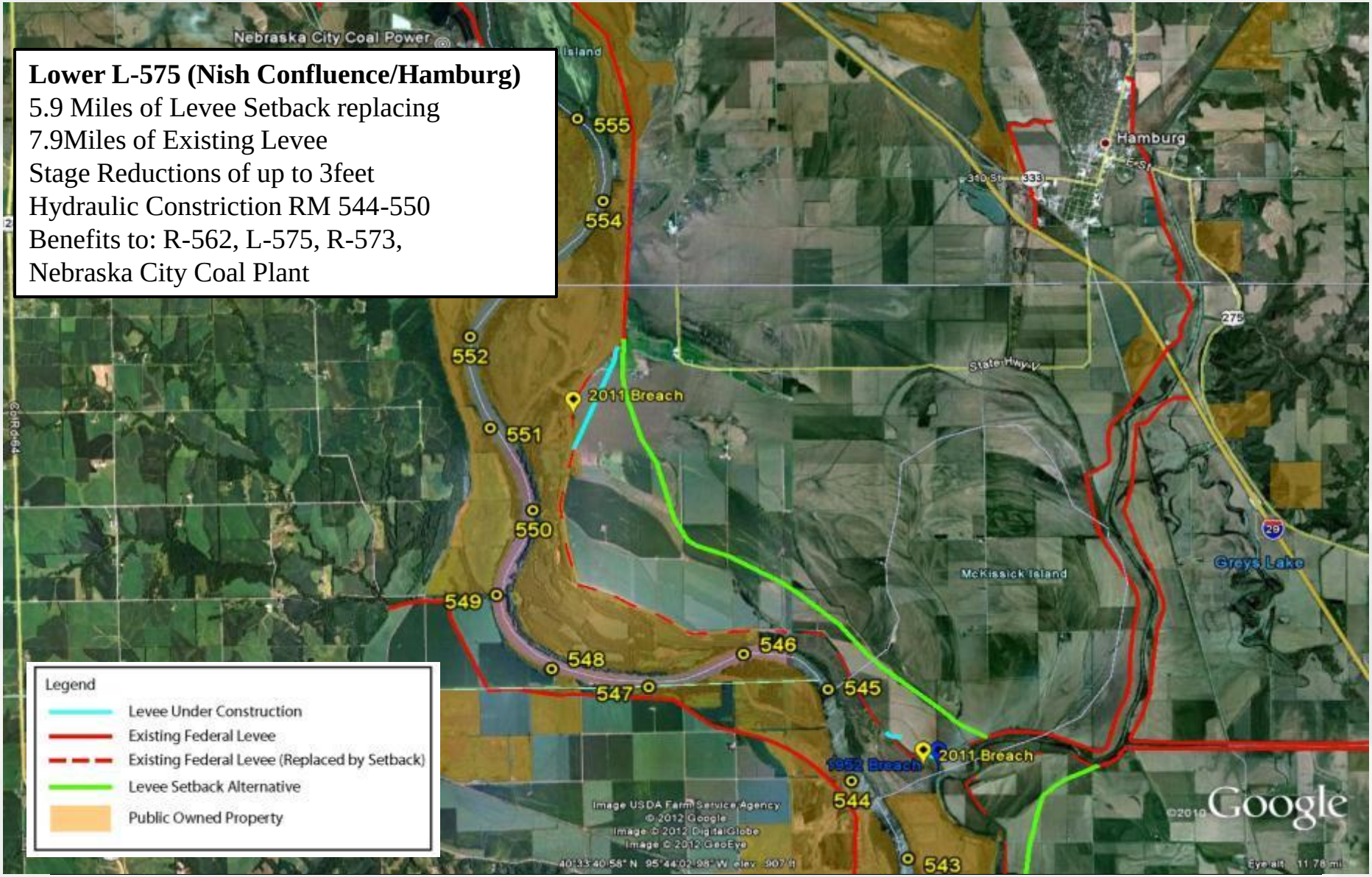


Levee Setback Details for Upper L-550



Upper L-550 (Nishnabotna Confluence)
7.3 Miles of Levee Setback replacing
8.6 Miles of Existing Levee
Stage Reductions of up to 2.7feet
Hydraulic Constriction at RM 541 – 544
Historic Breach Grouping from RM 537-540
Frequent Overtopping at RM 541
Benefits to: L-550, L-575, R-562

Levee Setback Details for Lower L-575



Setback results in ~50% increase in level of protection on L-550 and L-575

Changes to Levee Loading Frequencies at Setback		
	L-575	L-550
Frequency of Loading to Authorized Elevation with current alignment (year)	30	20
Frequency of Loading to Authorized Elevation with setback alignment (year)	44	28
Frequency of Loading to Levee Top with current alignment (year)	100	100
Frequency of Loading to Levee Top with setback alignment (year)	114*	120*
* 100 yr used for economic analysis		

Setback results in ~100% increase in levee level of protection on adjacent levee systems

Changes to Levee Loading Frequencies at Adjacent Systems			
	R-548	R-562	R-573
Frequency of Loading to Authorized Elevation with current alignment (year)	17	44	57
Frequency of Loading to Authorized Elevation with setback alignment (year)	36	114	105
Frequency of Loading to Levee Top with current alignment (year)	49	113	166
Frequency of Loading to Levee Top with setback alignment (year)	95	288	360

Reduced Probability of Flooding = Reduced Risk

BCR Summary for Conceptual Levee Setback Alternatives			
	Fix In-Place Alternative (from PIRs)	**Setback Alternative with Original Level of Protection**	**Setback Alternative with Original Levee Height**
L-550 Level of Protection	20 years	20 years	28 years
L-575 Level of Protection	30 years	30 years	30 yrs upper L-575 56 yrs lower L575
System Protected Area	72.9 sq miles	64.6 sq miles	64.6 sq miles
Traditional BCR computations:			
Total Cost	$166.8M	$193.8M	$212.6M
Annual Cost	$10.7M	$12.7M	$14.0M
Annual Benefit	$33.3M	$32.1M	$32.3M
BCR	**3.11**	**2.52**	**2.30**
BCR computations including R,R&R benefit:			
Annual Cost	$10.7M	$12.7M	$14.0M
Annual Benefit (including R,R&R)	$33.3M	$32.5M	$33.2M to $34.5M
Annual R,R&R Cost-Savings	$0.0M	$0.4M	$1.0M to $1.8M
BCR	**3.11**	**2.55**	**2.37 to 2.59**

Other Benefits Associated with Setback Alternatives:

- Critical Facilities – $2.4M Cooper Nuclear, $4.4M Neb City Coal, Transportation
- System Benefits – Increased Level of Protection on adjacent systems
- Reduced O&M RR&R on adjacent systems
- Less Frequency of Emergency Operations and flood-related activities
- 6,471 acres of potential habitat

Levee setbacks would be a more expensive construction effort than repair in-place

All levee setback options result in a positive benefit-cost ratio and would be worth consideration of federal investment

Reduced RR&R costs increases BCR

Constraints of taking Concepts to Reality

Time and Costs

- Construction costs are likely higher than repairing levees
- Development of setback plan thru construction takes longer than repairs

Authorities

- The PL 84-99 program relies on sponsor for real estate
- Levee repairs generally require little or no real estate

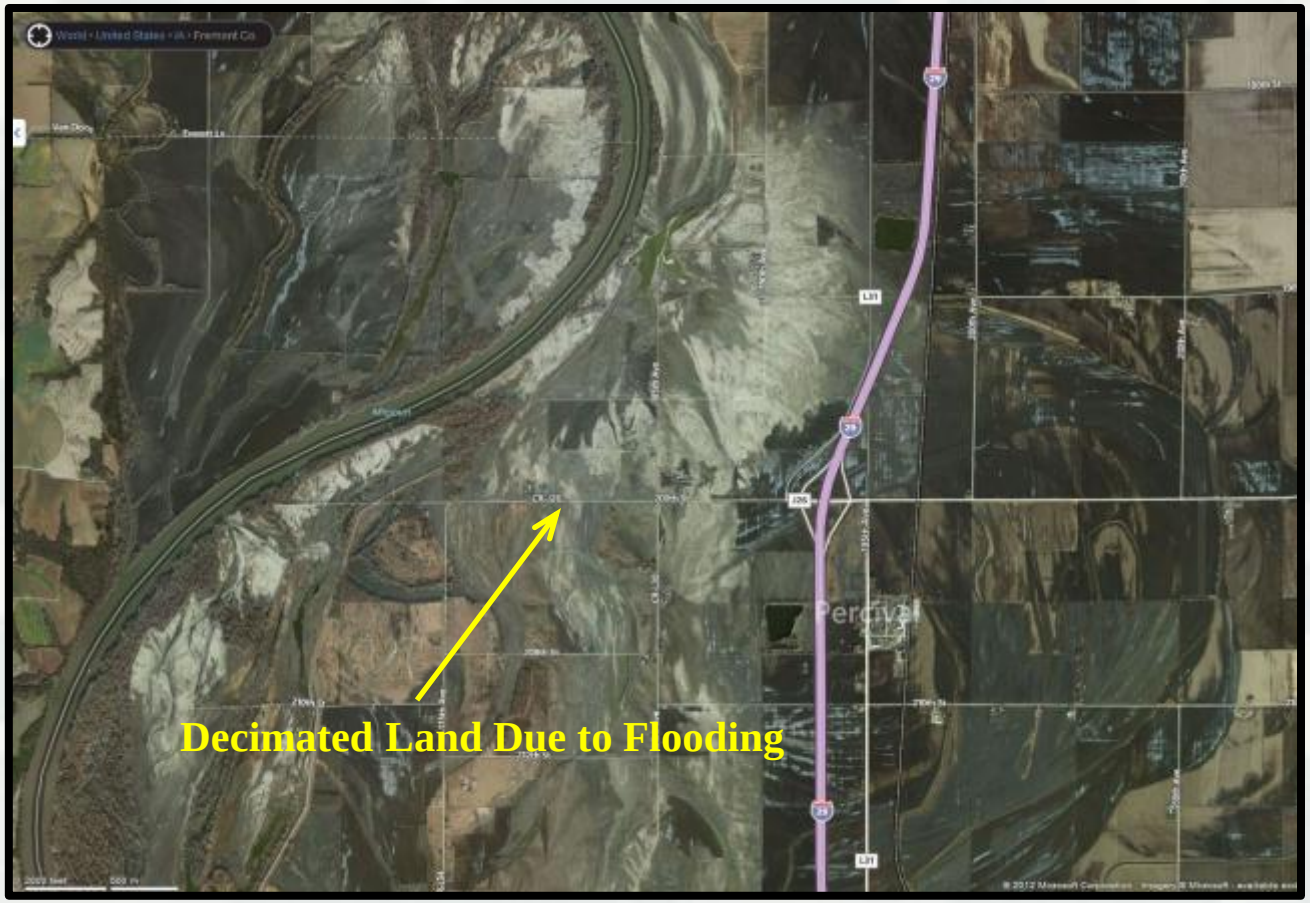
Benefit to Cost Quantification

- Current methodology inhibits innovation
- Quantify O&M RRR, habitat, adjacent Systems, critical facilities
- Frequency of damages to levee system (recurring damages)

Societal Concerns

- Unfamiliar processes
- “Not on my Land” initial responses

A Flood Risk Question:
If we continue to do what we have always done, why would we expect different results?



Questions / Comments