DEVELOPMENT OF THE DUPAGE RIVER FEASIBILITY STUDY

Erin Maloney, PE

USACE, Chicago District

Planner, Hydraulic Engineer

Sarah Hunn PE, CFM

DuPage County Stormwater Management

Civil Engineer

IAFSM Conference

Peoria, Illinois

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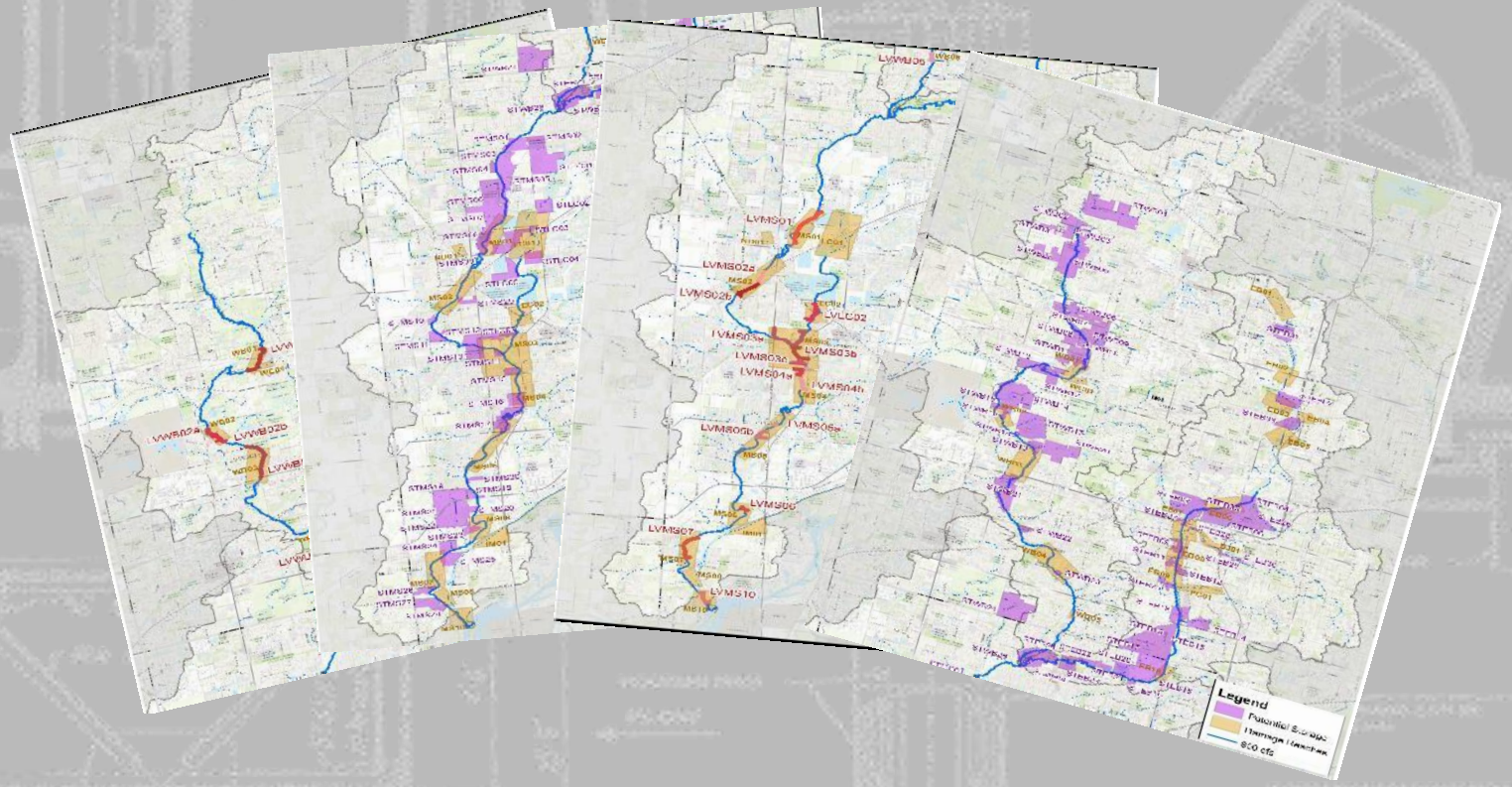

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DuPage County Stormwater Management

Will County Executive Office

Study Purpose

*Investigate overbank and backwater flooding along the **DuPage River and its major tributaries**, prioritizing high-risk areas and developing a range of possible structural and nonstructural alternatives to address flood risks.*

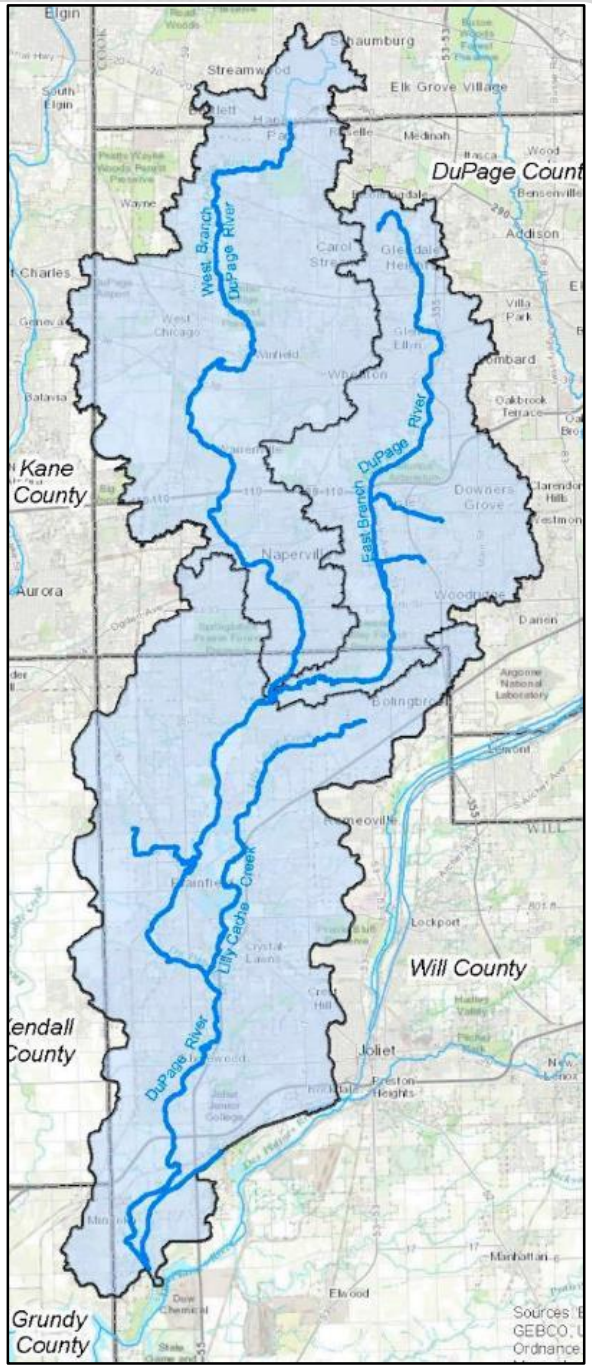
Study Location

Watershed Area: **378 mi²**

West Branch DuPage River	128 mi²
East Branch DuPage River	81 mi²
Mainstem DuPage River	169 mi²

Main Waterways:

West Branch DuPage River	32 mi
East Branch DuPage River	24 mi
Mainstem DuPage River	27 mi
Lily Cache Creek (tributary to mainstem)	14 mi



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Project Partners

Non-Federal Sponsor

DuPage County Stormwater Management Committee

Will County Executive Office

US Army Corps of Engineers

Chicago District

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Why is the U.S. Army Corps of Engineers, Chicago District involved?

Mission

Civil Works mission includes water resource development activities including *flood risk management*, navigation, recreation, and infrastructure and environmental stewardship

Authorization

Section 206, Flood Control Act of 1958 → "…surveys for flood control and allied purposes…Watersheds of the Illinois River, at and in the vicinity of Chicago, Illinois"

Appropriation

New Start funding received in 2015

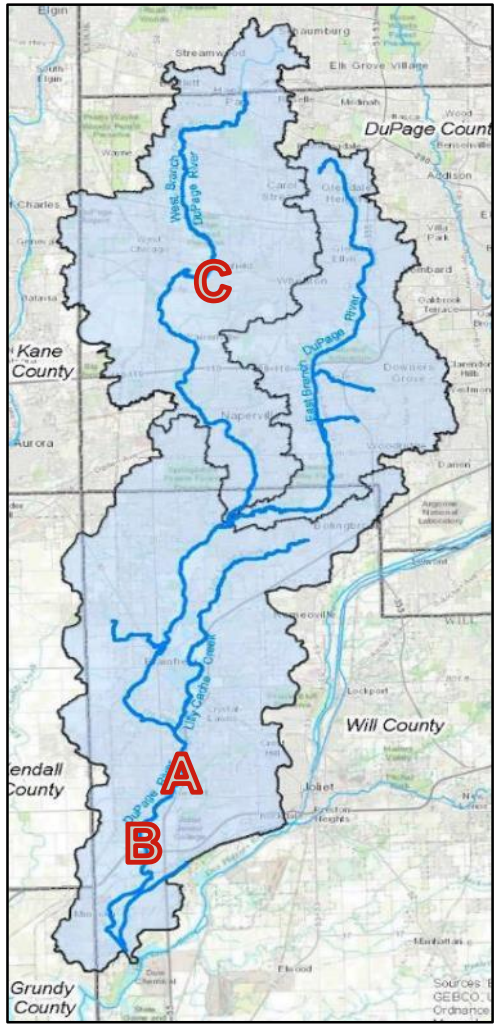
Historic Flooding

1996 – Up to 17 inches of rainfall over 24 hrs. Extensive structure damages, flooding at major roadways including Interstate 55.

2008 – Up to 10 inches of rainfall over 51 hrs. FEMA Individual Assistance (IA) totals: $2,300,000 (DuPage), $1,100,000 (Will).

2010 – Up to 7 inches of rainfall over 24 hrs. Impacts primarily on East and West Branches. FEMA IA total: $5,100,000 (DuPage).

2013 – Up to 7 inches of rainfall in 24 hrs. Record stages at several watershed gages. FEMA IA totals: $14,800,000 (DuPage), $4,300,000 (Will).



DuPage Mainstem at I-55 and Black Rd
July 1996

DuPage Mainstem at River Road
September 2008

West Branch at Winfield Creek
April 2013

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Study Scope

Overbank ✓

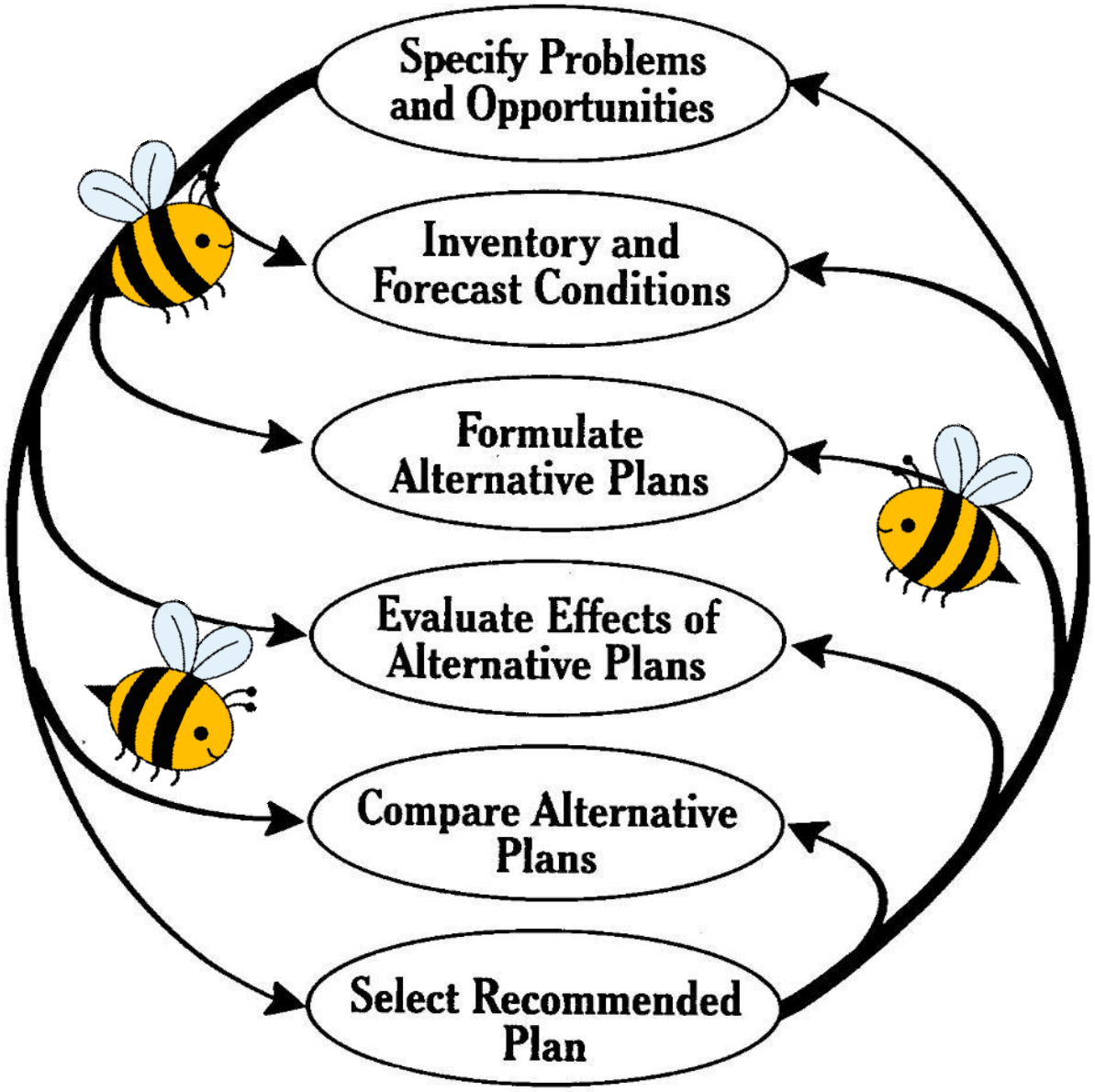
Elevated Groundwater ✓

Local Drainage X

Local Sewer Backup X

USACE Planning Process

USACE 6-Step Planning Process



- Structured approach to solving problems
- Iterative process – with increasing level of detail
- Can we?... Should we?
- Planning weaves environmental, social, scientific and engineering challenges into solutions
- Uses interdisciplinary, multiple agency, sponsor and stakeholder teams

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Problems, Opportunities, Objectives, & Constraints

Problem

Development increases rainfall-runoff and flooding, leading to increased flood damage risk and life-safety risk

Opportunities

- Manage flood risk (flood damages and life-safety)
- Improve resiliency
- Increase recreation opportunities

Objectives

- Reduce risk of flood damages to structures and infrastructure
- Reduce life-safety risk associated with flooding
- Maximize use of nature based features
- Compatible recreation

Constraints

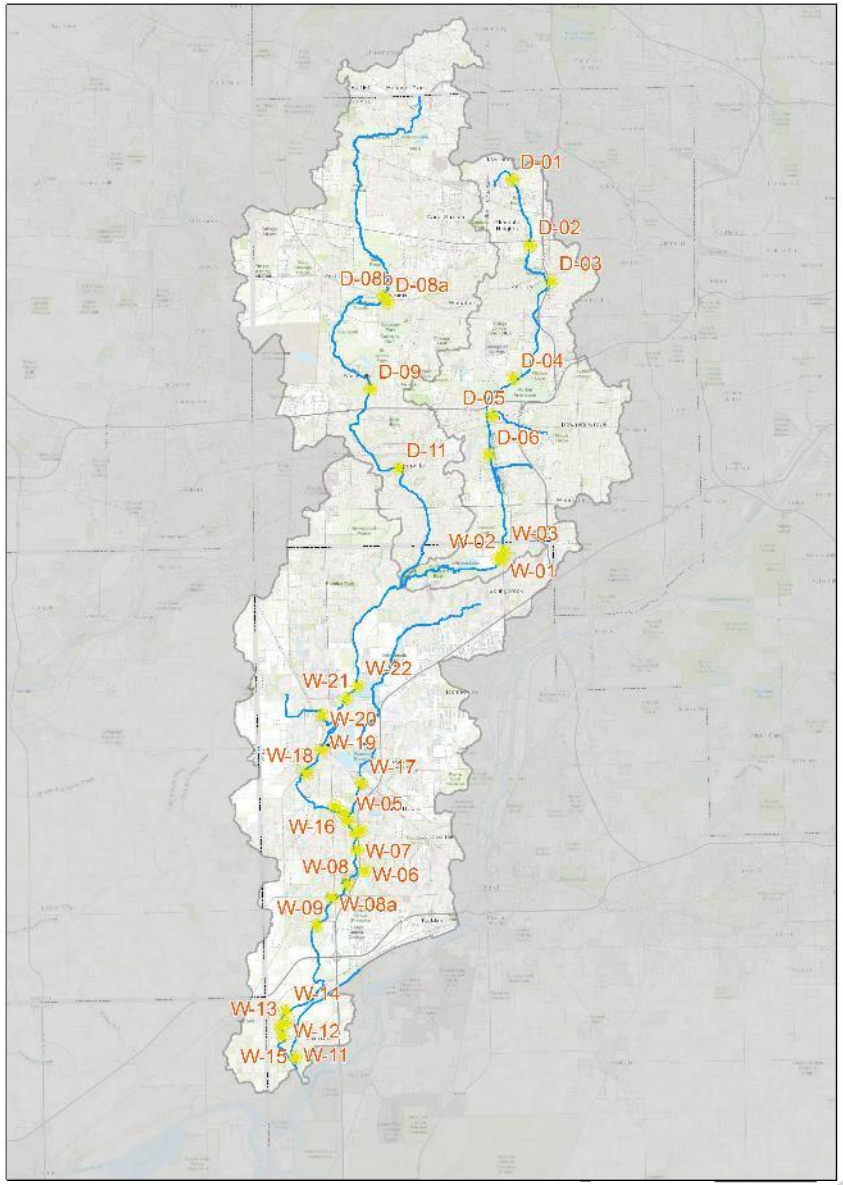
- Preserve natural and beneficial floodplain values
- Avoid adverse flood impacts

Inventory of Without Project Conditions:

Existing Flood Problem Areas

34 Damage Areas identified

- Site visits with NFS and all communities within the watershed
  - Communities have been extremely proactive in executing buyout programs and floodplain management practices
- NEPA Scoping – public and agency comments
  - 2 public meetings conducted
- Review of FEMA flood maps
- Confirmed by H&H model outputs



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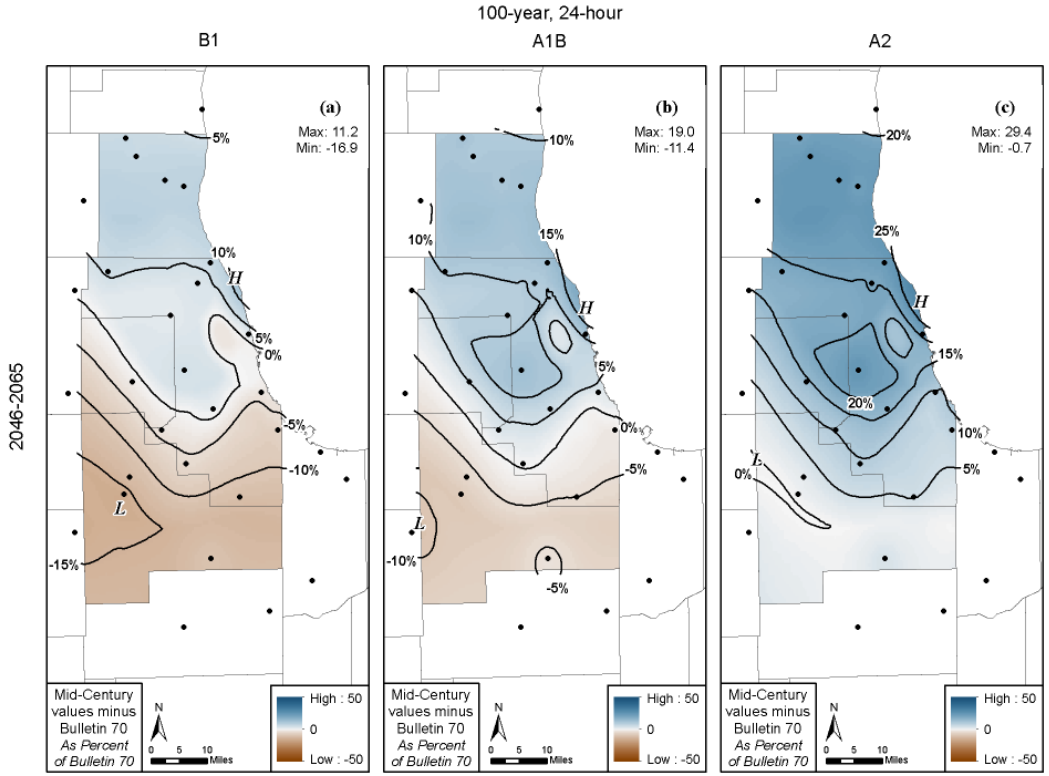
Forecast of Without Project Conditions:

Climate Change and Precipitation Trends

- Quantitatively incorporated precipitation projections in future conditions
- Illinois State Water Survey has documented trends towards increased storm intensity (up to 30%) and overall precipitation (10-15%)
    - Projected precipitation data for Northeast Illinois was developed for mid- and late-21st century using downscaled climate models



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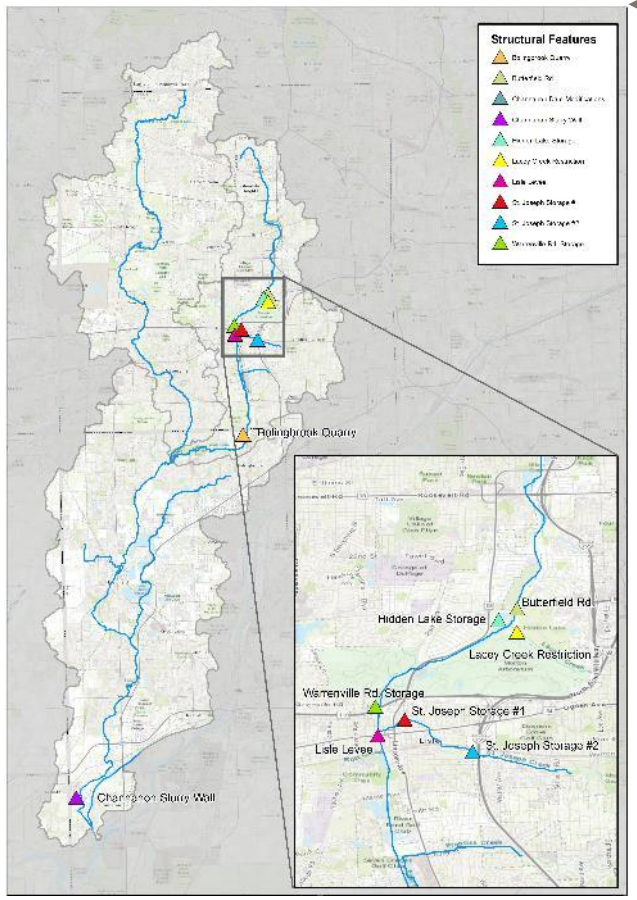
Formulating Alternative Plans: What was considered

Measures Considered

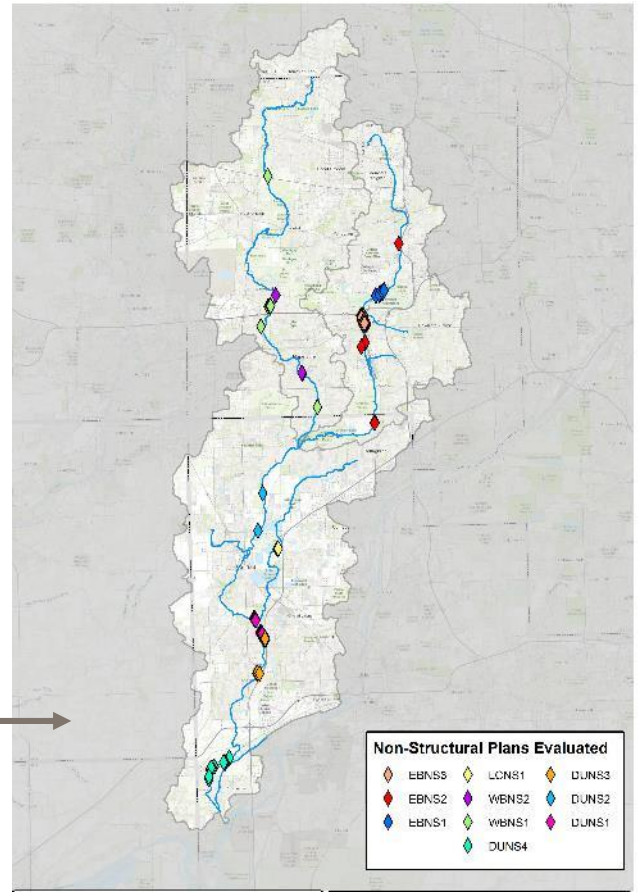


Structural

- Levees / Floodwalls –overbank protection fir flood prone areas
- Reservoirs – store floodwater
- Diversions – route flows away from damage prone areas
- Channel Modifications – alter bridges or widen channels
- Groundwater Control Structures

Non-Structural

- Raise/floodproof structures
- Buyouts
- Flood warning and preparedness



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Screening and Evaluation Criteria

Individual measures and formulated plans evaluated based on:

- Technical Feasibility
- Cost Effectiveness
  - *Economic Benefits Exceed Costs*
- Environmental Acceptability

Evaluating Effects of Alternative Plans

USACE Economics

Flood Control Act of 1936, Public Law 74-738

- Federal Government should participate in such flood projects *"…if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected."*

Principles and Guidelines (U.S. Water Resources Council, 1983)

- Establish standards and procedures for use by Federal agencies in formulating and evaluating alternative plans for water and related land resources
- Established the planning and economic procedures to be used and the four (4) accounts for measuring project benefits
  - Regional & **National Economics**, Environmental, and Other Social Effects

Deriving National Economic Development Benefits

The National Economic Development (NED) plan is the scale of alternative that reasonably maximizes expected net benefits

Project benefits equal the incremental positive change between the with and without project conditions

To estimate these changes, we must derive:

- Vehicles, Structures and Contents
  Depreciated replacement values (DRVs)
- Delay Values
  Lost wages
- Forgone Inputs
  Lost production investment

Economic Model Inputs

Key Inputs:

- Hydrology and Hydraulics (flow and frequency)
- Structure Inventory (value, type, use, elevation, location)
- Feature Reliability (e.g. levee fragility curves and overtopping elevations)

Uncertainty applied to each input

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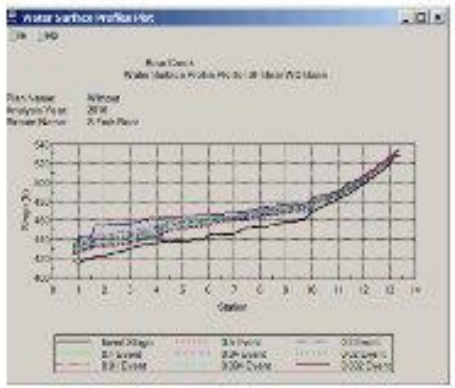
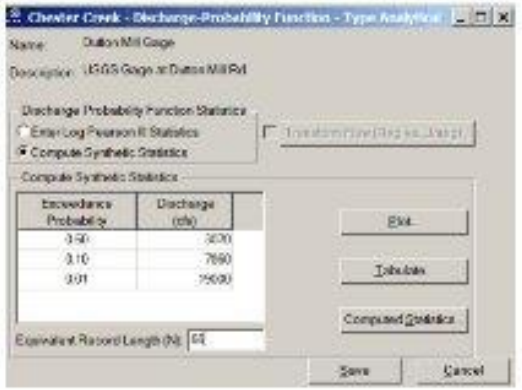
Hydrologic Engineering Center

HEC-FDA
Flood Damage Reduction Analysis





Plan Evaluation, Comparison, and Recommendation

Plan Selection

From the Principles and Guidelines:

A plan recommending Federal action is to be the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (the NED plan), unless the Secretary of a department or head of an independent agency grants an exception to this rule. Exceptions may be made when there are overriding reasons for recommending another plan, based on other Federal, State, local and international concerns.

Maximizing Net Benefits

Plan Name	First Cost	Equivalent Average Annual Values ($1,000s)		
	($1,000)	Benefits	Costs	Net Benefits
WBNS1	$1,481	$93	$55	$38
WBNS2	$571	$34	$21	$12
EB1	$37,907	$213	$1,404	($1,191)
EB2	$18,910	$229	$700	($472)
EB3	$34,094	$228	$1,263	($1,035)
EB4	$43,834	$216	$1,624	($1,407)
EB5	$15,571	$210	$577	($367)
EB6	$3,973	$177	$162	$14
EBLL1	$4,647	$208	$212	($4)
EBLL2	$6,562	$455	$283	$172
EBNS1	$1,321	$56	$49	$7
EBNS2	$1,311	$147	$49	$99
EBNS3	$10,070	$324	$373	($49)
EBBQ	$17,000	$15	$630	($615)
DUNS1	$2,152	$62	$80	($18)
DUNS2	$901	$96	$33	$63
DUNS3	$2,543	$88	$94	($6)*
DUNS4	$1,842	$14	$88	($74)
Levees	$19,500	$241	$722	($481)
LCNS1	$921	$14	$34	($20)

Example Economic Analysis Table

Plans identified to be likely to have positive net benefits

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DuPage River Feasibility Study

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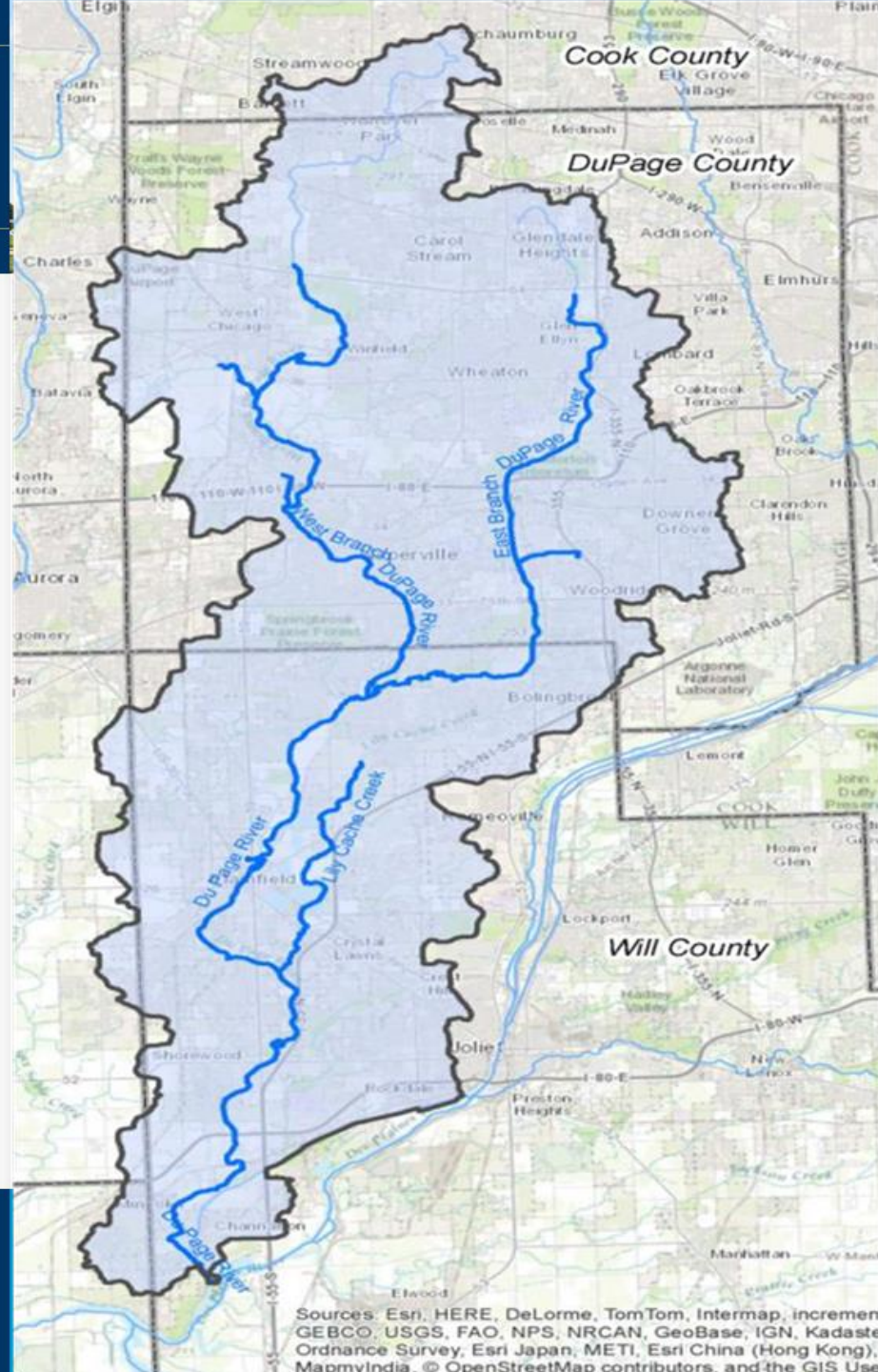

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DuPage River Feasibility Study

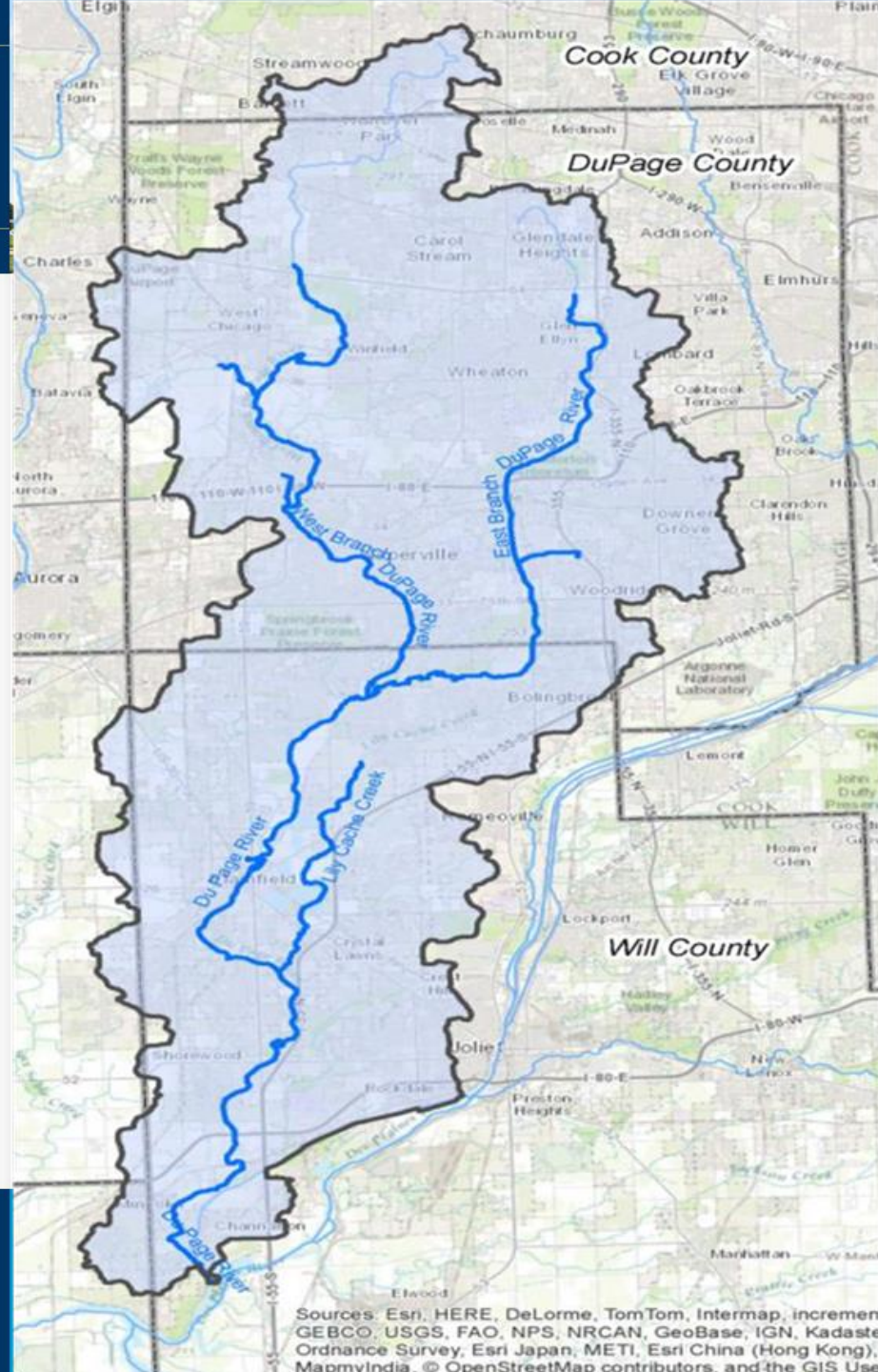
Local/DuPage County Prospective

Regional Project Criteria

- Funding Partnerships
- Long Term Inspection/Maintenance/Upkeep

Community Discussion

- Project Buy-In
- Project Ownership
- Local/Landowner Impact



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DuPage River Feasibility Study

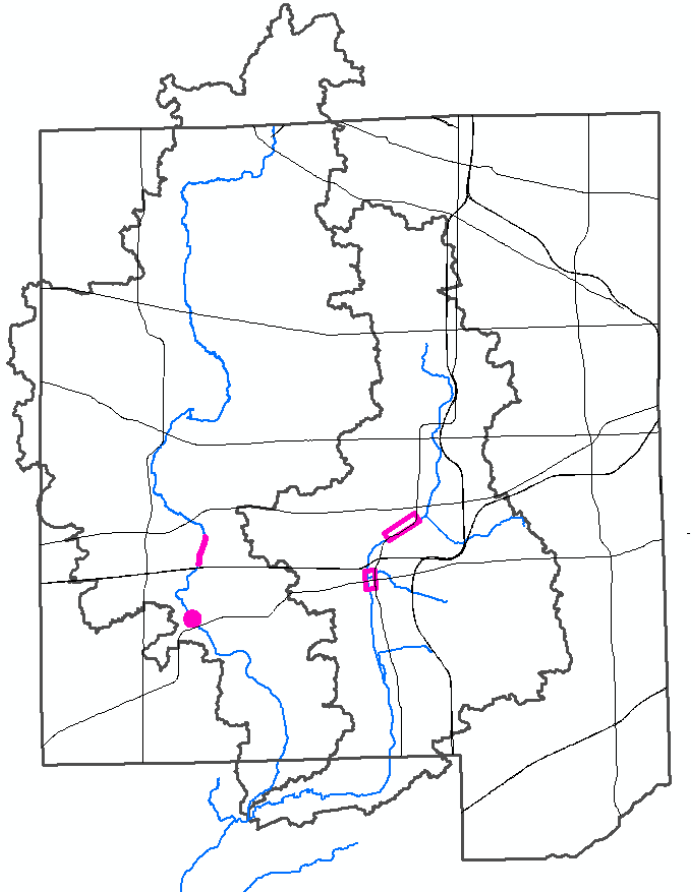
Past Projects

East Branch DuPage River

- Pump Station
- Flood Prone Property Buy-Outs (Voluntary)

West Branch DuPage River

- West Branch Flood Mitigation & Restoration
- Fawell Dam Rehabilitation



DuPage River Feasibility Study

Past Projects

East Branch DuPage River

- Flood Prone Property Buy-Outs (Voluntary)
  - *Valley View (Unincorporated)
  - *River Dumoulin (Lisle)

DuPage River Feasibility Study

Benefit – Cost Analysis

- No agency has same funding “calculation”

Project Analysis

- Low Hanging Fruit is gone
  - Voluntary Flood Prone Buy Out Program
  - Large Storage Projects
  - Wetland Creation Projects
- What Projects are Feasible
  - Levee Restoration
  - Dam/Storage Combinations

DuPage River Feasibility Study

Project Analysis (Continued)

- What Projects are Feasible
  - Levee Restoration
  - Dam/Storage Combinations
  - Structural Elevations

Key Questions

- Will the area be more resilient after a project
  - Levee Restoration
  - Dam/Storage Combinations

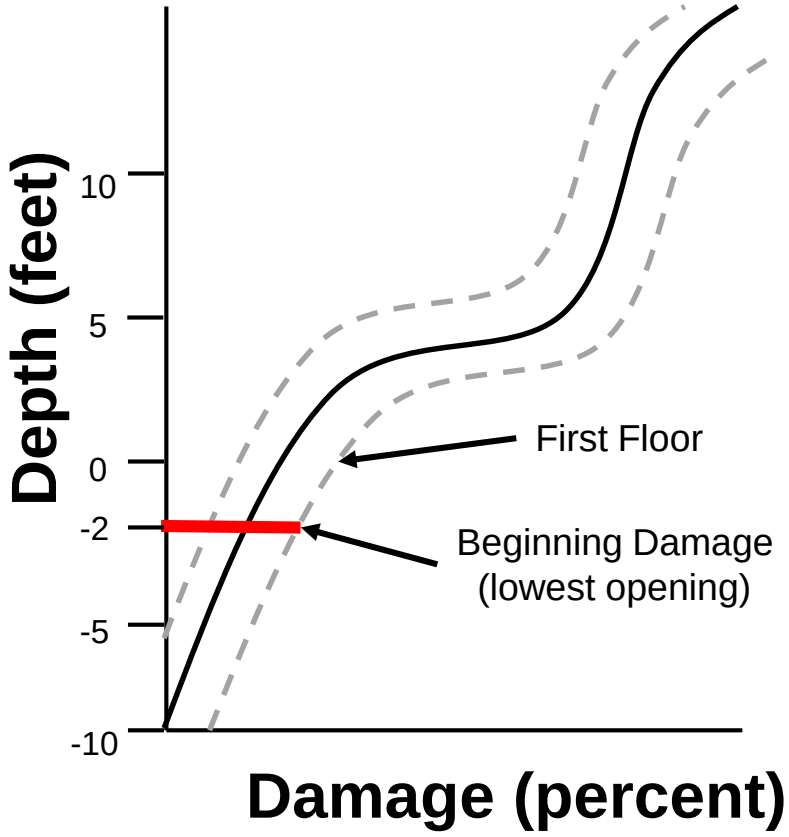
Questions?

Sarah Hunn, P.E., CFM
Deputy Director
630-407-6676
630-514-8867 (cell)
Sarah.hunn@dupageco.org

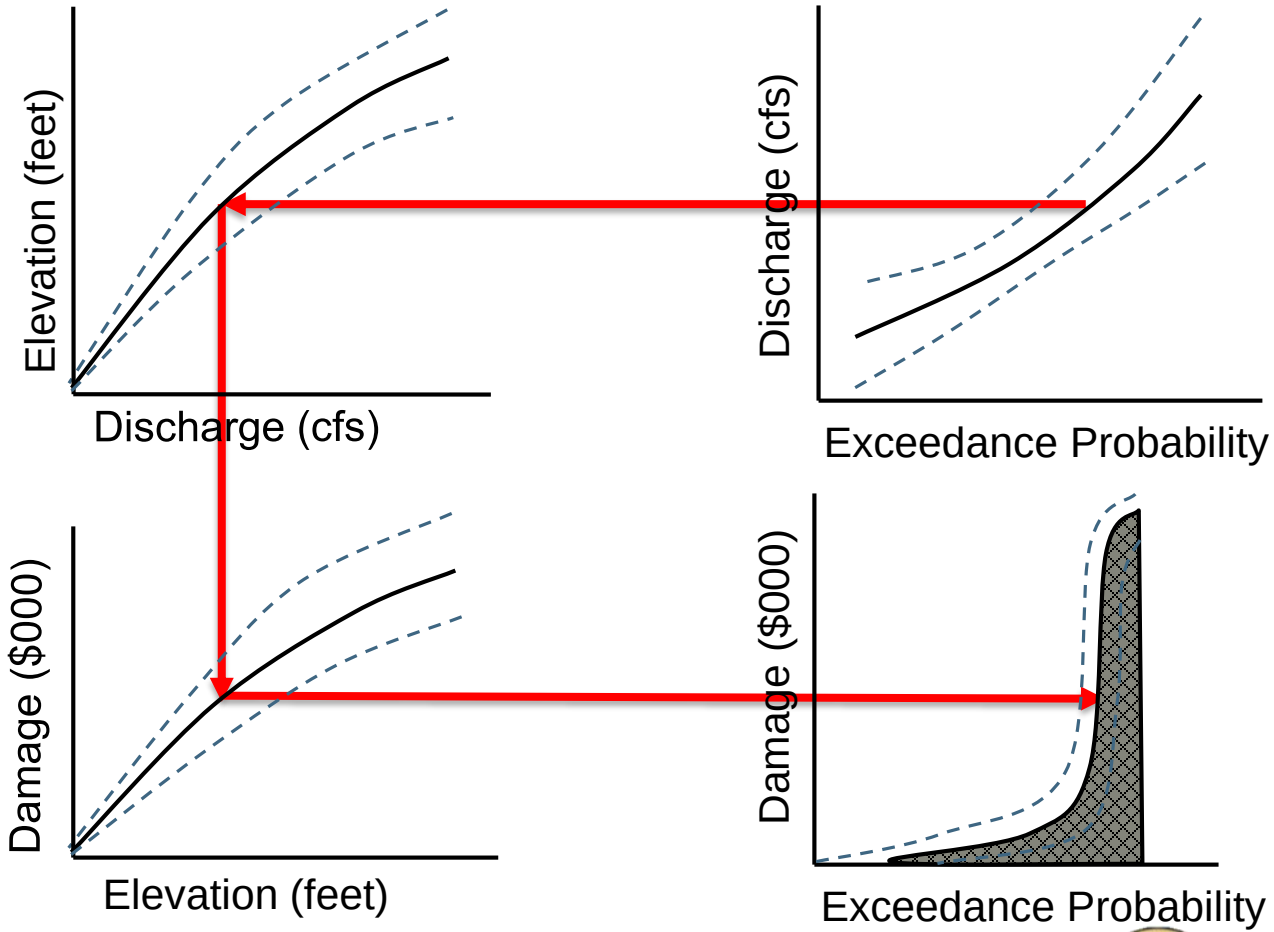
Erin Maloney, P.E.
Planner/ Hydraulic Engineer
312-846-5525
Erin.C.Maloney@usace.army.mil

Backup Slides
Additional Information

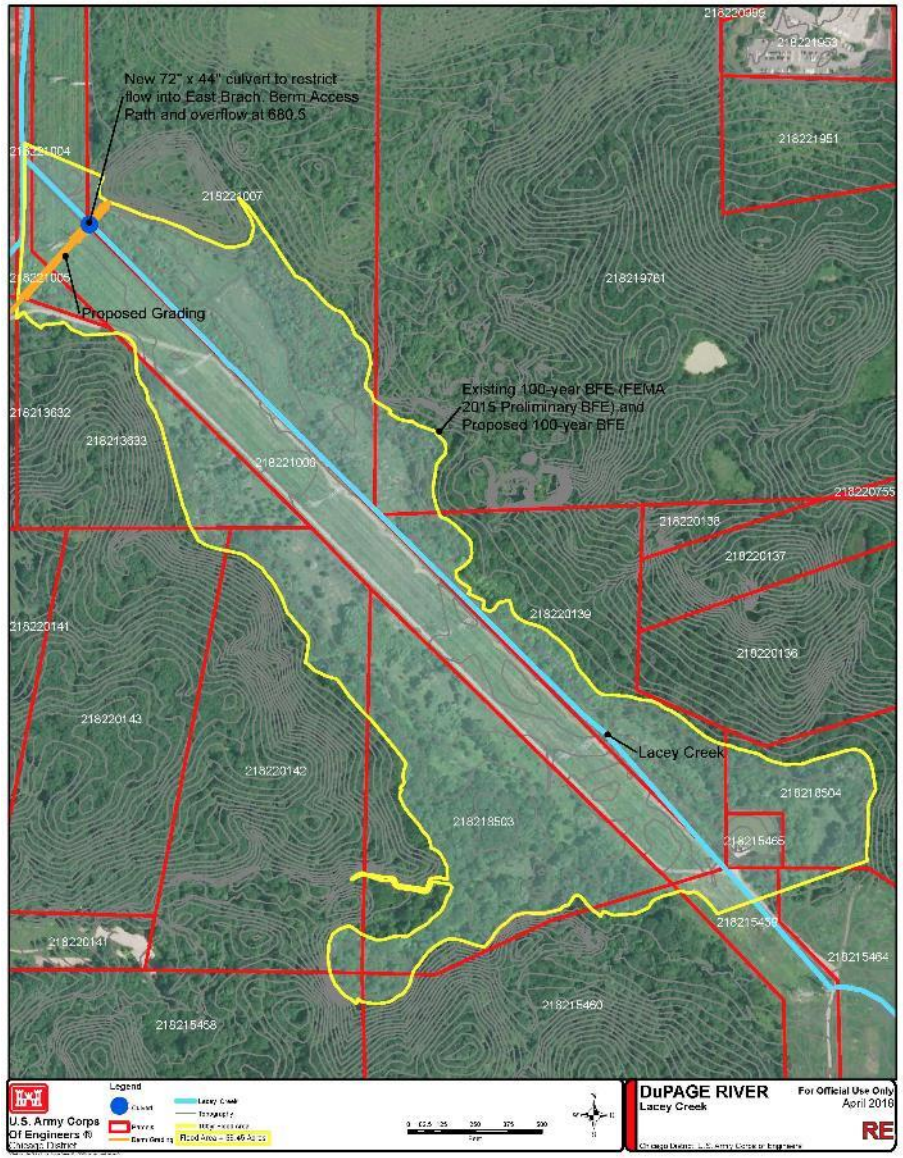
Depth-damage functions

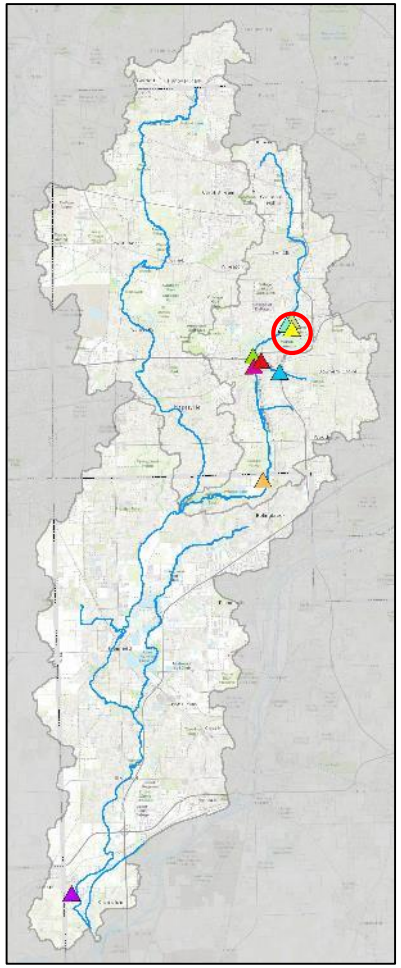


Economic Damages Calculations



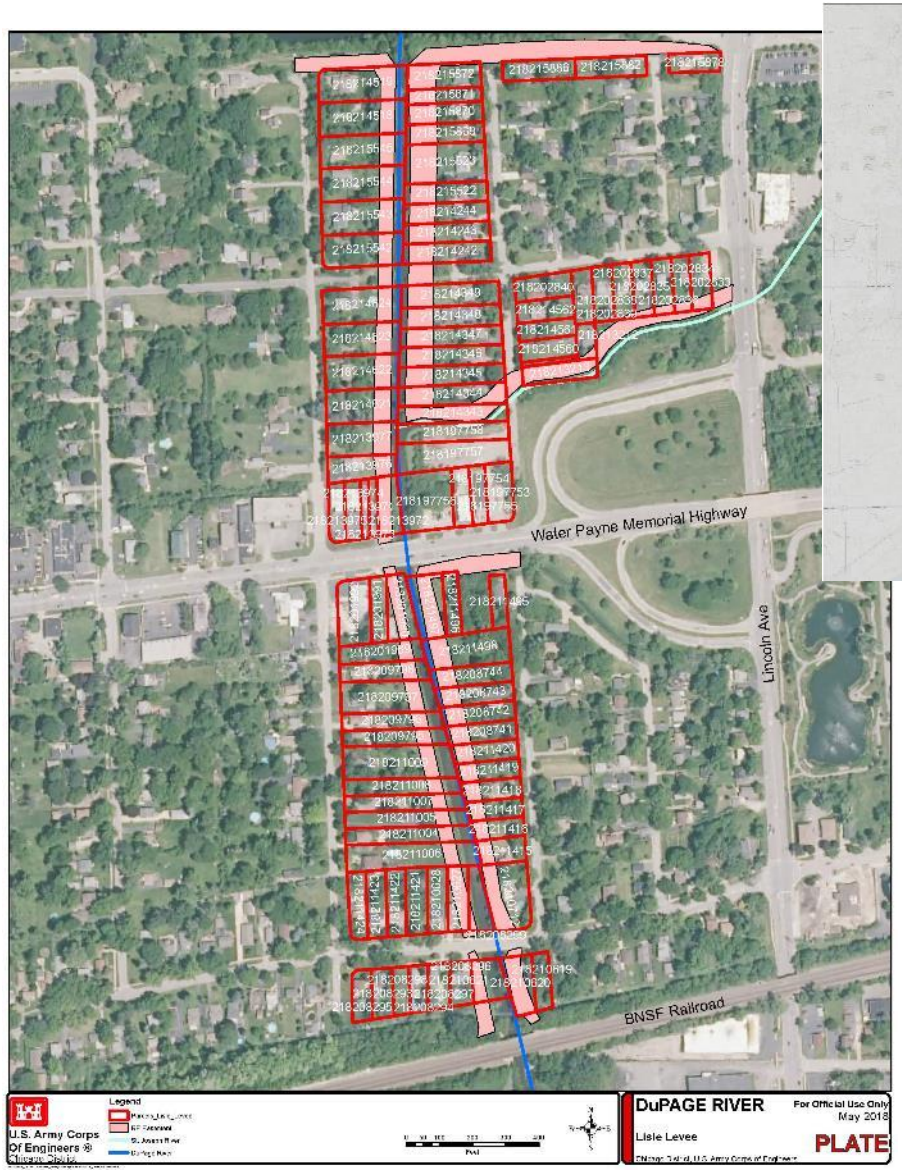
Final Array – Lacey Creek Restriction

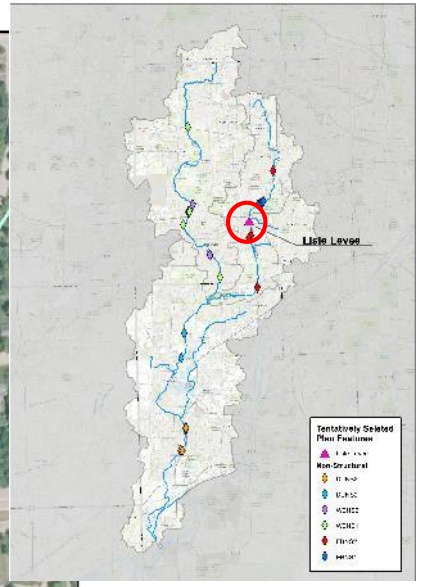




- New impoundment to restrict flow on Lacey Creek, tributary to the East Branch
- Approximately 283 acre-feet of storage for 1% ACE event
- Culvert to allow baseflow but constrict larger storms
- Impounded land is owned primarily by Forest Preserve
- Impoundment is infrequent
- Structure would be considered Dam based on impoundment volume
  - Breach analysis to be completed prior to ADM
- Provides benefits on the East Branch
- No Mitigation Requirements Expected

Lisle Levee Plan Components





- Remove vegetation and encroachments on and within 15 feet of the levee
- Increase height of levee to provide additional protection
- Flatten side slopes
- Install erosion control features