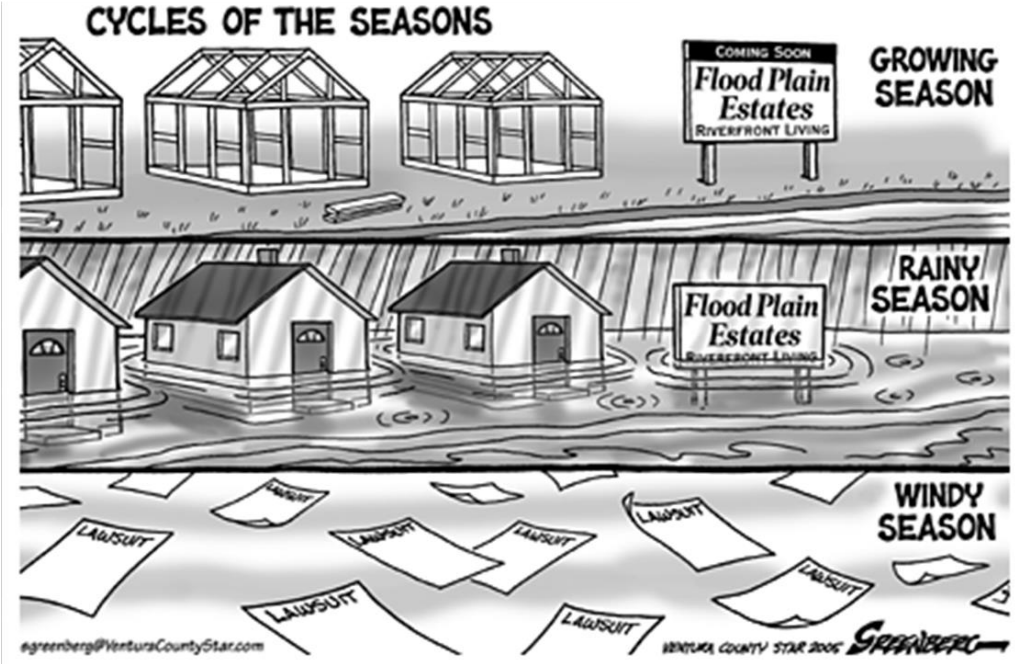
Illinois Raindrops Keep Falling
IAFSM 2024 - Peoria, IL
March 13, 2024

Office of Water Resources
Resource Management – Statewide Programs

Goals for Today's Presentation

1) OWR Map Revision Website Information
2) Map Revision Tools - FIRMS and FIS
3) FEMA Map Change Process
    a) MT-1 and MT-2 map revisions
4) **2024 IDNR-OWR Map Revision Manual**
5) Thirteen Questions (IAFSM abstract)
6) FEMA's Future Flood Risk Data Program 7-minute overview
    a) Nationwide remapping in "2-Dimensions"
    b) New concepts: SST – floodway challenges – probabilistic

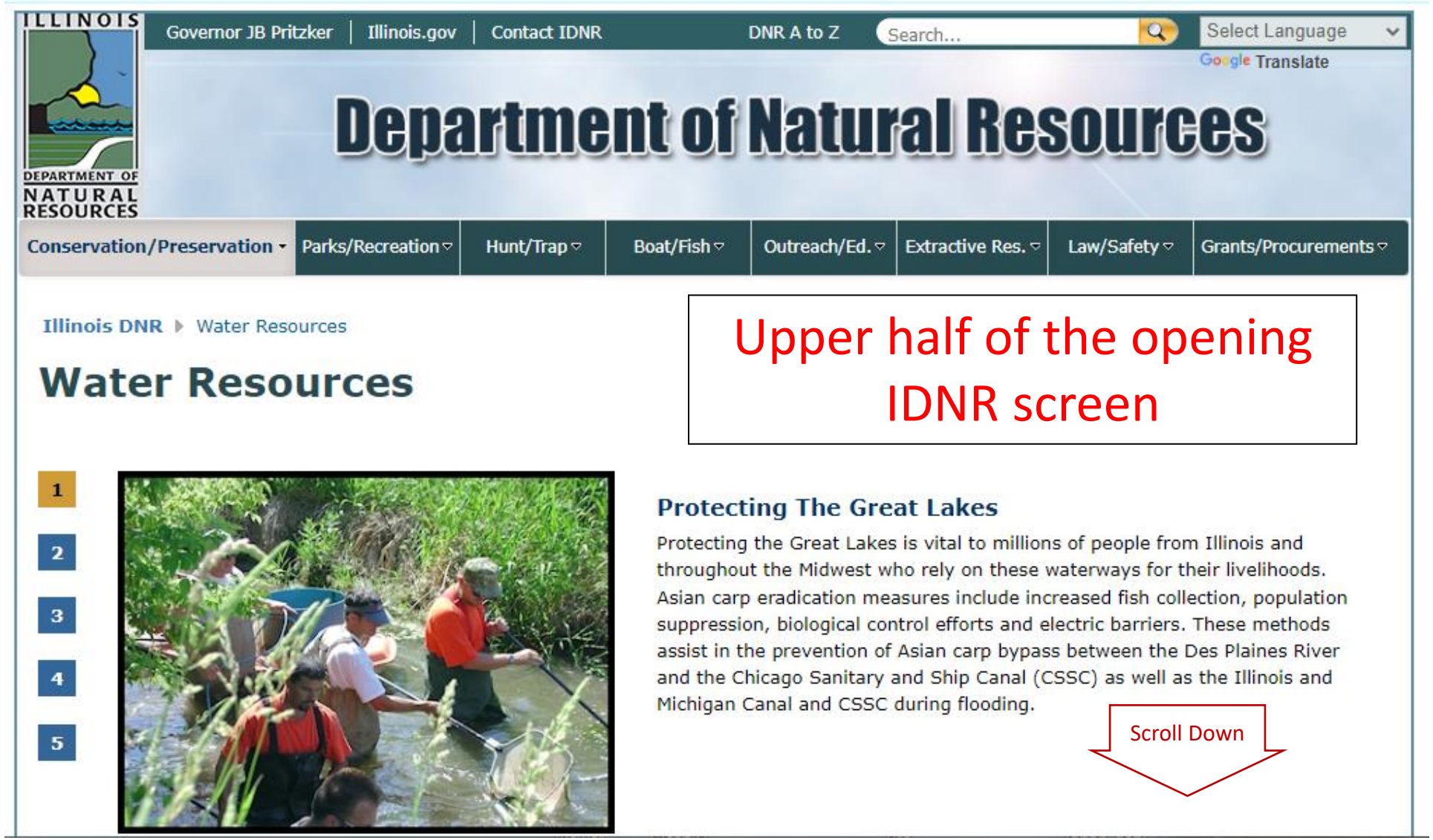


Good floodplain management requires accurate flood maps

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

IDNR – Water Resources – New Website

https://dnr.illinois.gov/waterresources.html



Upper half of the opening IDNR screen

IDNR – Water Resources – New Website

https://dnr.illinois.gov/waterresources.html

About OWR - Past & Present

- Mission and Structure
- Programs
- History
- Current and Prior Directors
- Waters and Facilities List
- Contact Water Resources

News

- Advertisements for Bids
- Public Notices
- The Flood Record Newsletter

Capital Programs

- Capital Programs
- Publications and GIS Maps
- Safety At Dams
- Yorkville Dam
- Water Supply

Resource Management

- Resource Management
- Notice of Draft Administrative Rule Changes
- Permit Programs
- Permits - Statewide
- Permit For Water Withdrawal
- Lake Michigan Water Allocation
- Joint Permit Application and Instructions
- Permit F.A.Q.'s
- Permit Application Fees
- Permit Application Fee E-Pay
- Floodplain Management Resources

Stream Conditions

- Current Flood Map
- Public Waters
- Summary Table (River Stage)
- Flood Surveillance
- Stratton Operations Update

Quick Access

- Coastal Management Program
- F.A.Q.'s
- Careers and Recruiting
- Maps (Water Resources-GIS)
- National Flood Insurance Program
- Publications and GIS Maps
- CMS Job Application 100
- So, You Live Behind A Levee
- Flood Preparedness
- Fox River Flood Commission
- State Water Plan Taskforce

Lower half of the opening screen

Resource Management Tab– Contains the OWR Regulatory Information and NFIP Resources

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IDNR - Menu Options on Resources Management Page

NE IL Regulatory Program

- Lake Michigan Water Allocation
- Permits Program
- Permit Application Fees
- Chicago Permit Applications
- Bartlett Permit Applications
- Statewide, Regional and General Permits
- Regulatory Programs
- Floodplain Regulations
- Protecting Illinois Waters
- Part 3730 - Allocation of Water from Lake Michigan
- Part 3708 - Floodway Construction in Northeastern Illinois

Downstate Regulatory Program

- Permits Program
- Permit Application Fees
- Permit Application and Instructions
- Springfield Permit Applications
- Statewide, Regional and General Permits
- Regulatory Programs
- Protecting Illinois Waters

NFIP Program

- The National Flood Insurance Program
- Floodplain Maps
- Mitigation
- Quick Guide to Floodplain Management
- Resource Guide for Illinois
- Emergency Management Institute | EMI Courses & Schedules
- ASFM Training & Education

Dam & Levee Safety Programs

- Dam Safety Program
- Levee Safety Program
- Guidelines for Dam Applications
- Guidelines & Forms for Dam Inspections

Lake Michigan Water Allocation

- Lake Michigan Water Allocation
- Public Water Management
- Part 3730 - Lake Michigan Allocation

Studies & Mapping

- Statewide Mapping & Studies Reviews
- Public Water Management
- Public Waters
- Guidelines for Projects in Public Waters

- Floodway Permitting
- Public Waters
- Lake MI Water Allocation
- Dam Safety
- NFIP Resources
- Mapping and Studies

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

IDNR- National Flood Insurance Program Tab

Floodplain Maps

FEMA and the State of Illinois have identified floodplains within the state. These floodplain maps are used by communities, planners, lenders, and insurance agents to identify flood risk areas. Floodplain maps of Illinois can be viewed on line at: **http://www.illinoisfloodmaps.org/** . You can also view floodplain maps at the **FEMA Map Service Center** searching any address.

On occasion, residents in Illinois will dispute a property's location within a floodplain. FEMA has a process to remove a property from a floodplain. However, before this happens a property owner must provide FEMA with technical or elevation data to prove the property is not at risk of flooding. Information on map changes can be found at: **Change Your Flood Zone (LOMA/LOMR)**

Link to LOMCs, FIRMS, Flood Insurance Studies, and mapping databases

The **Map Revision** Process for FEMA and IDNR-OWR explained

Illinois State Water Survey partnership with FEMA to draft new Flood Studies and FIRMS

FEMA Mapping Products

Map Products = Flood Maps (FIRMS) + Study Information (FIS)

Flood Insurance Study
- Download from Map Service Center
- History, study details, datums, profiles, floodway data table, etc.

Floodplain Map
- SFHA = Special Flood Hazard Areas
- Download from NFHL Viewer or Map Service Center

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Flood maps - Which floods does FEMA map?

The 1% Annual Chance Flood is the basis for the NFIP program

- 1% Annual Chance Flood known as the 100-year flood and the "Base Flood"
- Base Flood Elevation also known as "BFE"
- Flood area, also known as "Special Flood Hazard Area" "SFHA"

Detailed maps show 0.2% annual chance "500-year" flood

FIS profiles typically include:

- 10% Annual Chance (10-year)
- 2% Annual Chance (50-year)
- 1% Annual Chance (100-year)
- 0.2% Annual Chance (500-year)

Newer profiles include the 1% + profile (Demonstrates uncertainty and variability)

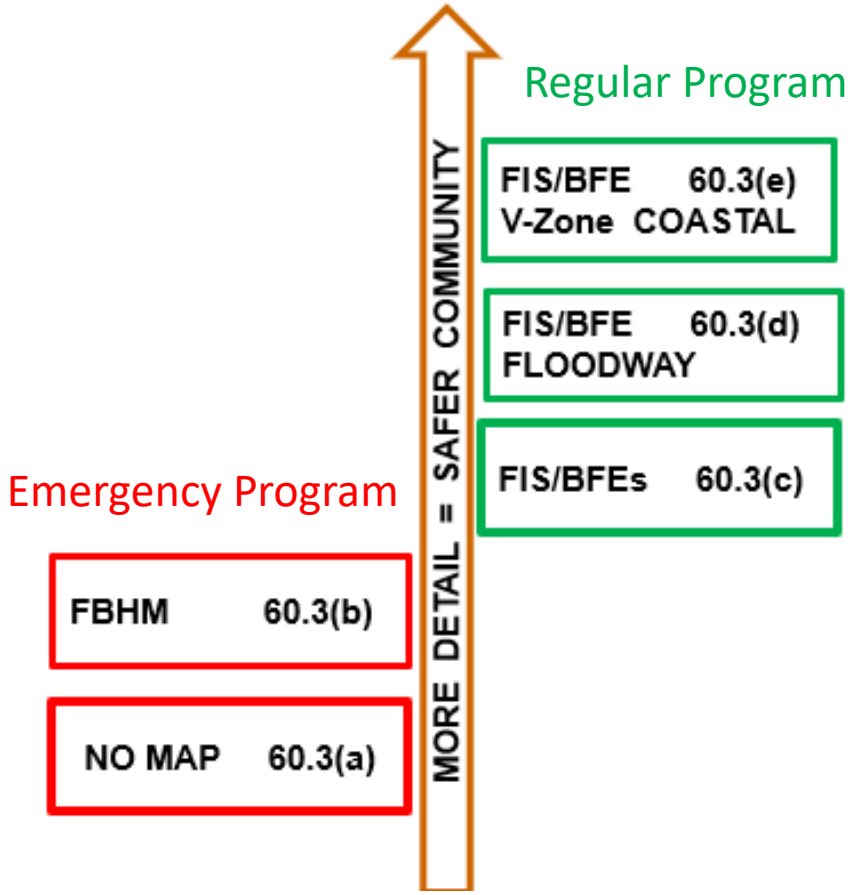
Types of Flood Risk Mapped on the FIRM

Type of flood risk shown on FIRM maps:

- Riverine
- Lacustrine (lake)
- Coastal/tidal

Development standards adopted by a community are dependent on the type of risk

As the accuracy of the FIRM gets better, communities are safer.



Flood Maps - Floodplain Detailed Delineations

3 Mapping Elements

- #1 Floodplain Geometry (topography)

  Shape and surface of the floodplain

- #2 Flood Discharge – Volume/rate (hydrology)

  How much rain runs off and how fast it collects

- #3 Flood Height – Depth/velocity (hydraulics)

  How does the water move downstream

Topography

Hydrology

Hydraulics

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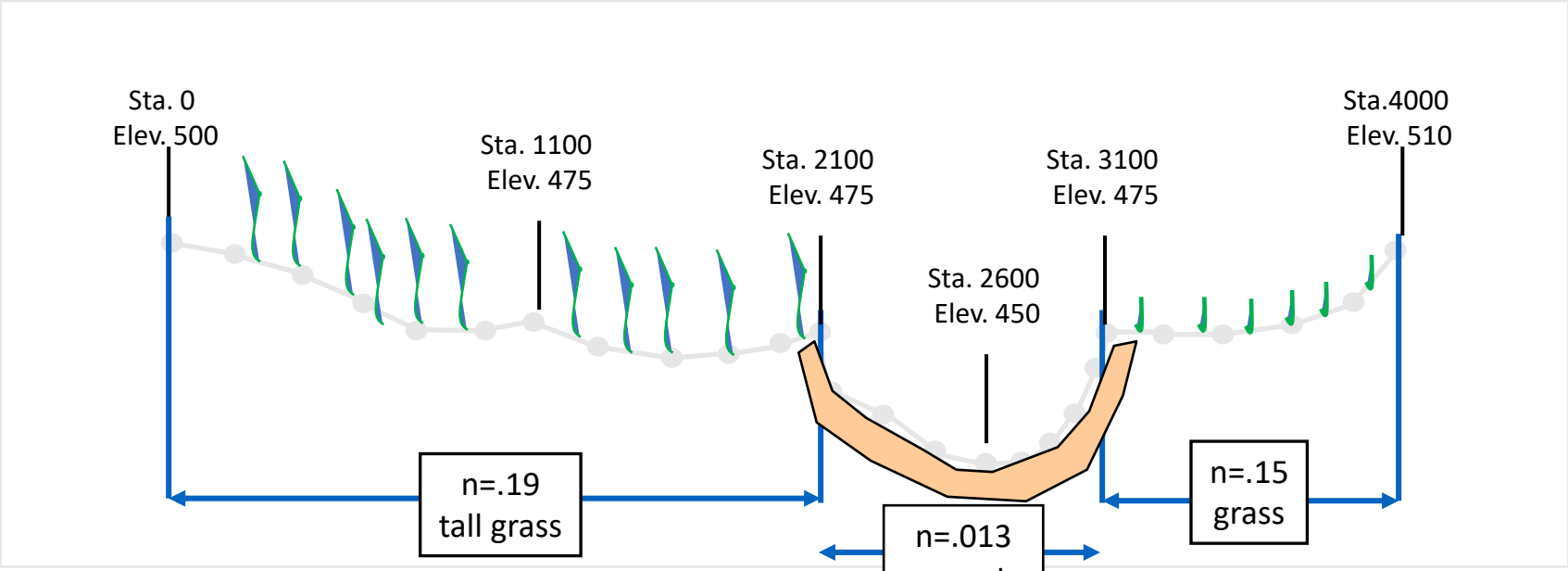
Topography 1st Mapping Element



Cross-sections show how water flows in channels

Channel Geometry are points in a straight line, each point having distance and elevation.

Channel roughness is given by segments called Manning's "n".

Hydrology 2nd Mapping Element

Hydrology = How rainfall runs-off on different land types

- Flood Discharge (CFS flow), cubic feet per second typically
- Flood Frequency (how often), % chance every year 1% = 100 year
- Climatology (Global Warming), total rainfalls are increasing (Bulletin 75)

Calibration = How to verify your computer model with obse

- Computer modeling
- Gaged streams – statistical analysis
- Ungaged streams - regression equations (USGS StreamStats
- Coastal storm modeling (Lake Michigan recent modeling)

Hydraulics 3rd Mapping Element

Hydraulics how floodwaters move in:

Lakes and Wetlands store water, releasing overflows

Rivers and Creeks water slowly moves down hill / slopes

Bridges and Culverts reduced conveyance

Computer Models (Steady HEC-RAS, Unsteady HEC-RAS

Hydraulic models set floodway limits

Hydraulics 3rd Mapping Element

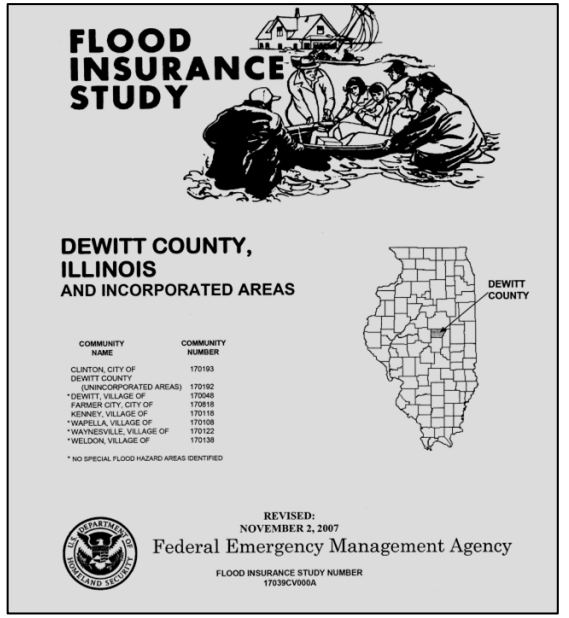
- Steady Flow Models [River has slope >1%]
  Step-backwater model (1D HEC-RAS)

- Unsteady Flow Models [River is flat <1%]
  Sloshing water back-and-forth (2D HEC-RAS)

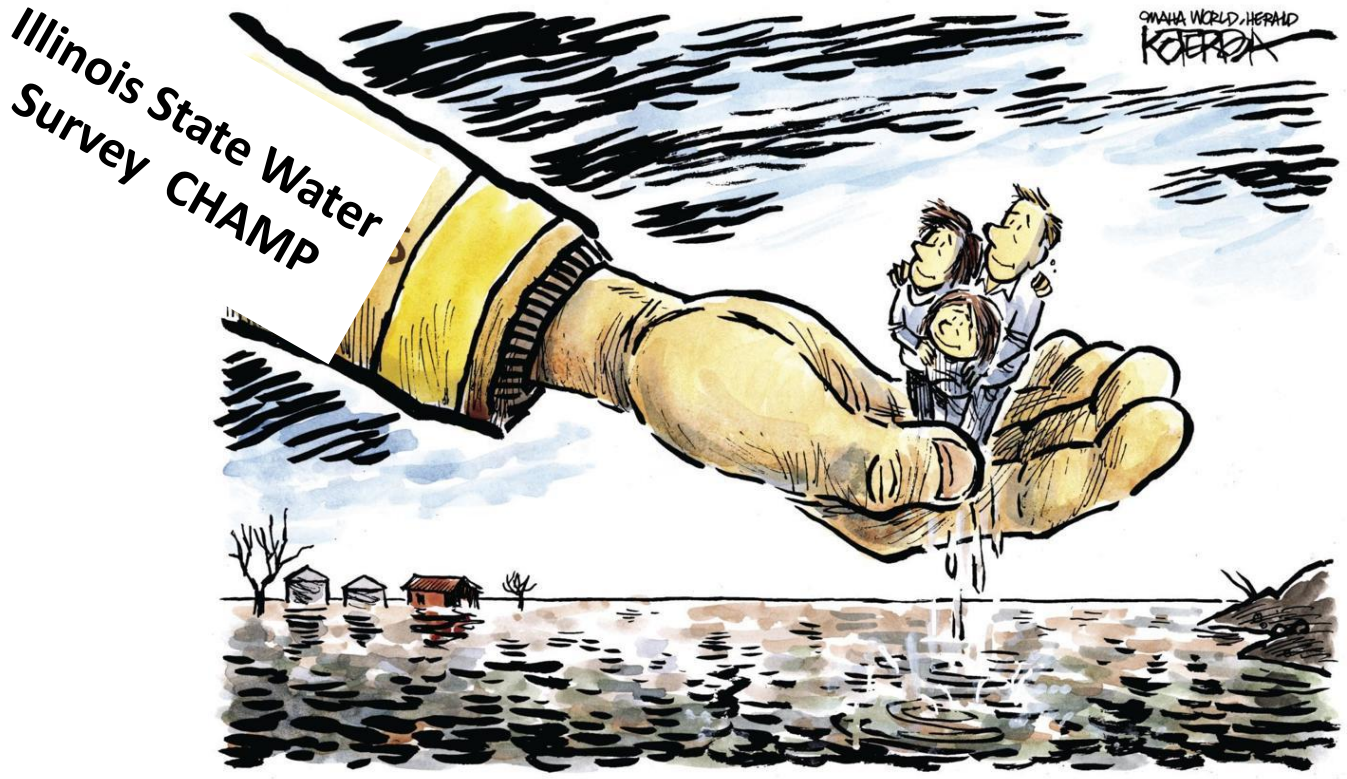
FEMA has approved list of computer models

Flood Insurance Study (FIS)

- FIS is a report that provides background information used in FIRMS
- The FIS summarizes data such as:
  - Study summaries and methodology
  - Certified Discharges Flood (Peak flows)
  - Lake Stillwater elevations
  - Waterway flood profile plots 10, 50, 100, and 500 profiles
  - Floodway Data Tables
- Main goal of the Map Revision Tools is to establish insurance risk zones (SFHA)



For New Flood Studies
What is the FEMA Map Production Process?



FEMA'S Flood Study Process Overview

Once FEMA has selected the mapping contractor the process begins.

Data collection, model and mapping development

- Community "Time & Cost" Scoping Meeting
- Collect Community floodplain information (Discovery and Flood Risk Review)
- Complete Hydrology / Hydraulic modeling GIS based

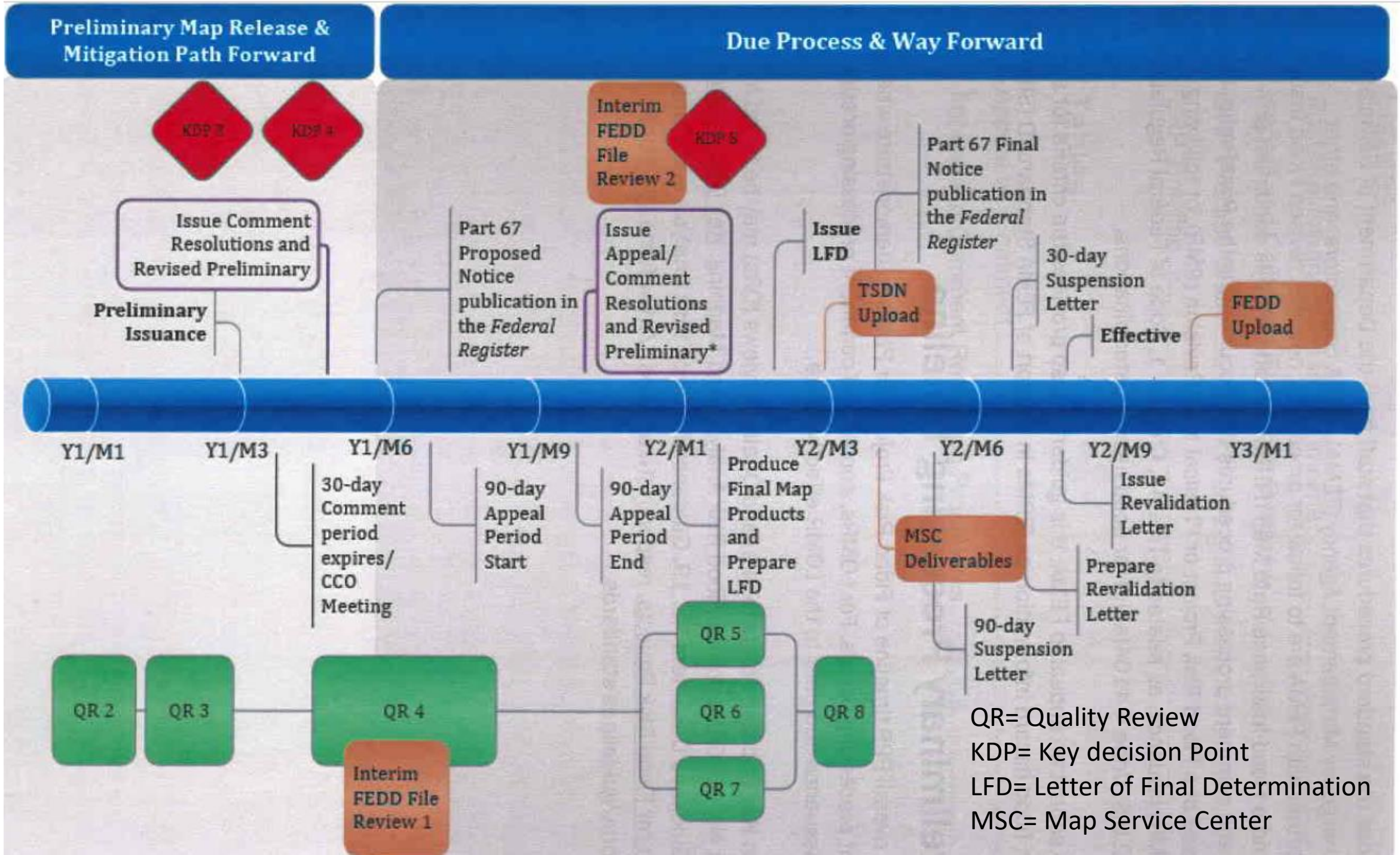
Preliminary Mapping and Study Review

- Meet with Community to discuss "Preliminary Map"
- Public meeting (Discuss "Preliminary Map")
- Preliminary Maps -Formal 90-day Appeals period

Final Mapping

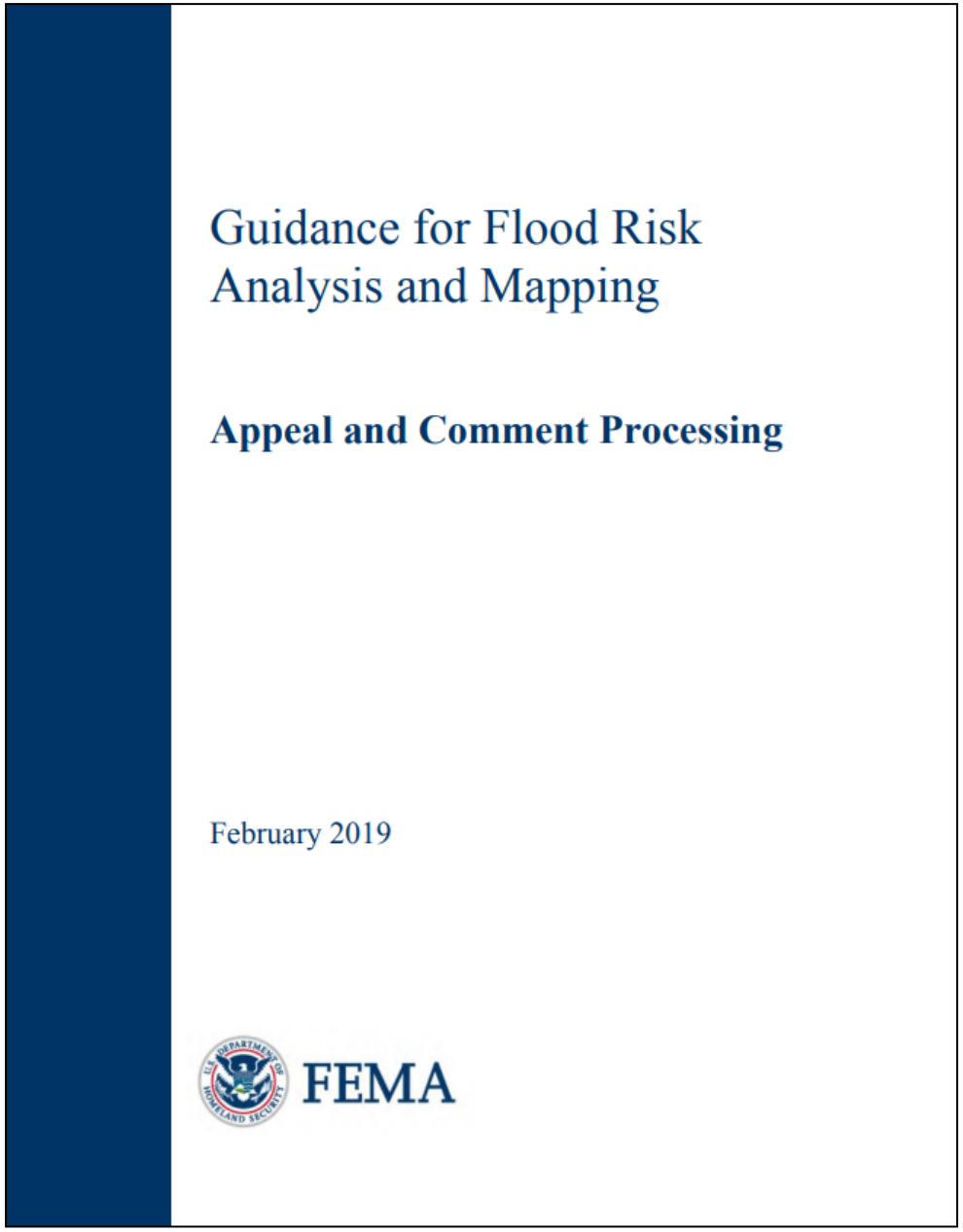
- Final maps and FIS are prepared with appeals addressed – LFD Issued
- Final Maps Issued- Community adopts maps via an ordinance

ILLINOIS DEPARTMENT OF NATURAL RESOURCES


Preliminary Map Release & Mitigation Path Forward
Due Process & Way Forward
KDP 3
KDP 4
Issue Comment Resolutions and Revised Preliminary
Preliminary Issuance
Part 67 Proposed Notice publication in the Federal Register
Interim FEDD File Review 2
KDP 5
Issue Appeal/ Comment Resolutions and Revised Preliminary*
Issue LFD
TSDN Upload
Part 67 Final Notice publication in the Federal Register
30-day Suspension Letter
Effective
FEDD Upload
Y1/M1
Y1/M3
Y1/M6
Y1/M9
Y2/M1
Y2/M3
Y2/M6
Y2/M9
Y3/M1
30-day Comment period expires/ CCO Meeting
90-day Appeal Period Start
90-day Appeal Period End
Produce Final Map Products and Prepare LFD
MSC Deliverables
Issue Revalidation Letter
Prepare Revalidation Letter
90-day Suspension Letter
QR 2
QR 3
QR 4
Interim FEDD File Review 1
QR 5
QR 6
QR 7
QR 8
QR= Quality Review
KDP= Key decision Point
LFD= Letter of Final Determination
MSC= Map Service Center

Ninety-Day Appeal Period

- Community or individuals may appeal and comment on the **proposed flood elevations** for the community.
- Property owners or lessees may appeal and comment the **Preliminary FIRM** of the flood insurance study.
- A **comment** **does not require technical data** and could be photos
- An **appeal** of the FIRM is based on information that shows the proposed flood hazard areas **are technically wrong**.
- Appeals and comments are not a **protest** of the FIRM based on emotion, politics, or more, (“non-technical”).



180-Day Compliance Period or Ordinance Adoption

After appeals have been resolved, FIMA (Federal Insurance & Mitigation Administration) sends community formal notification of final flood elevation determination. Called a Letter of Final Determination "LFD".

- Elevations will become effective six months after the LFD letter is sent.
- Ordinance adopting the new maps and FIS meeting minimum state and federal requirements must be effective by the end of the six months.

Not always so easy to finish new FIRMs.

Levees and other appeals can stall the process for years.

Once the final maps and study are issued the 180-Day clock begins

Illinois has a 100% adoption rate by NFIP participating communities

FEMA Map Revision Categories

County-wide Maps

Full restudy and new FIRM maps are issued

FEMA Initiated

Must meet FEMA Flood Risk Analysis and Mapping Guidelines

(Major updates issued, November 2023)

Physical Map Revisions (PMR)

FEMA or Community Initiated

More complex map change, typically based on a watershed

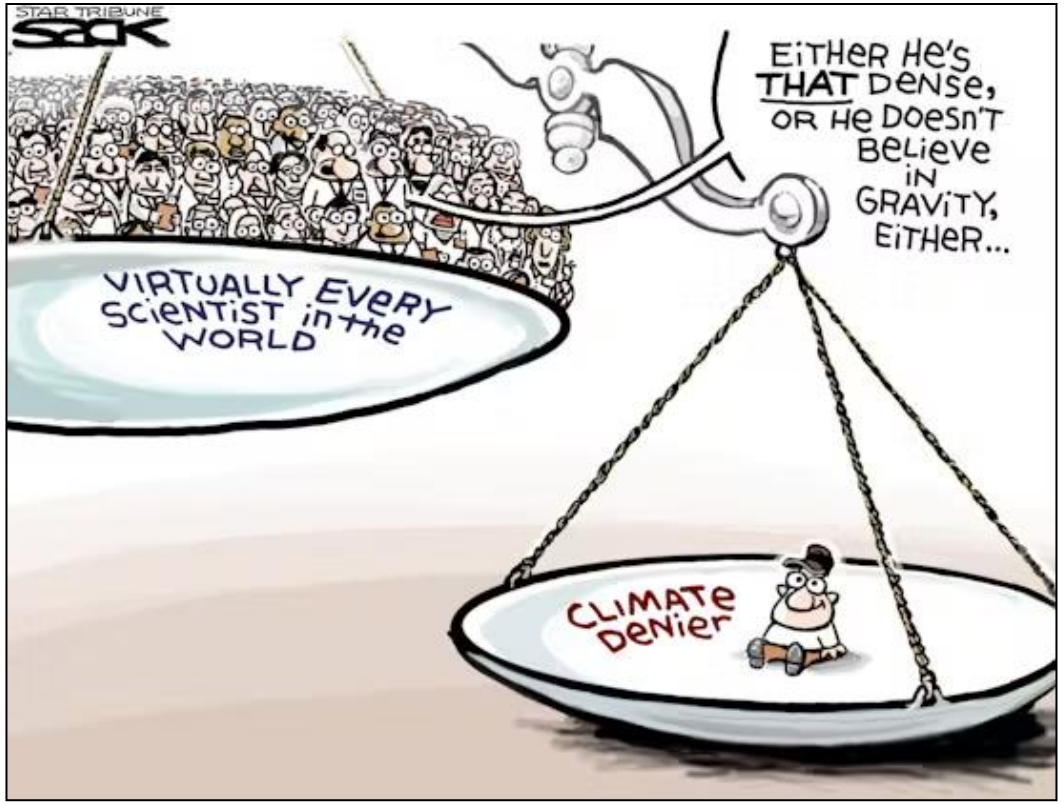
New map panels issued

Localized Map Amendments

LOMCs: LOMA, LOMR-F, and LOMR

Property Owner or Community Initiated

LOMC = Letter of Map Change



Letters of Map Change (LOMCs)

Amendment (MT-1):

Naturally high ground outside of floodplain
Filled flood fringe, no floodway impact
Buildings or legally defined area of land
No H&H Analysis
MT-1 form or MT-EZ submittal

Revision (MT-2):

More complex map change
Not usually lot or structure specific
Requires H&H analysis
MT-2 form submittals

MT-1

LOMA / CLOMA
LOMR-F / CLOMR-F
LOMR-FW (a LOMA with a Floodway Correction)

MT-2

PMR
LOMR
Conditional LOMR = CLOMR

CLOMA / CLOMR clarifications

CLOMR does not change FIRM
CLOMR has Fees
After 6 months past construction, the applicant must submit a LOMR

Obtaining FEMA Flood Study Information

FEMA Flood Map Service Center

https://msc.fema.gov/portal/home

Download Flood Insurance Studies providing background for FIRM panel data.

https://msc.fema.gov/portal/resources/contact

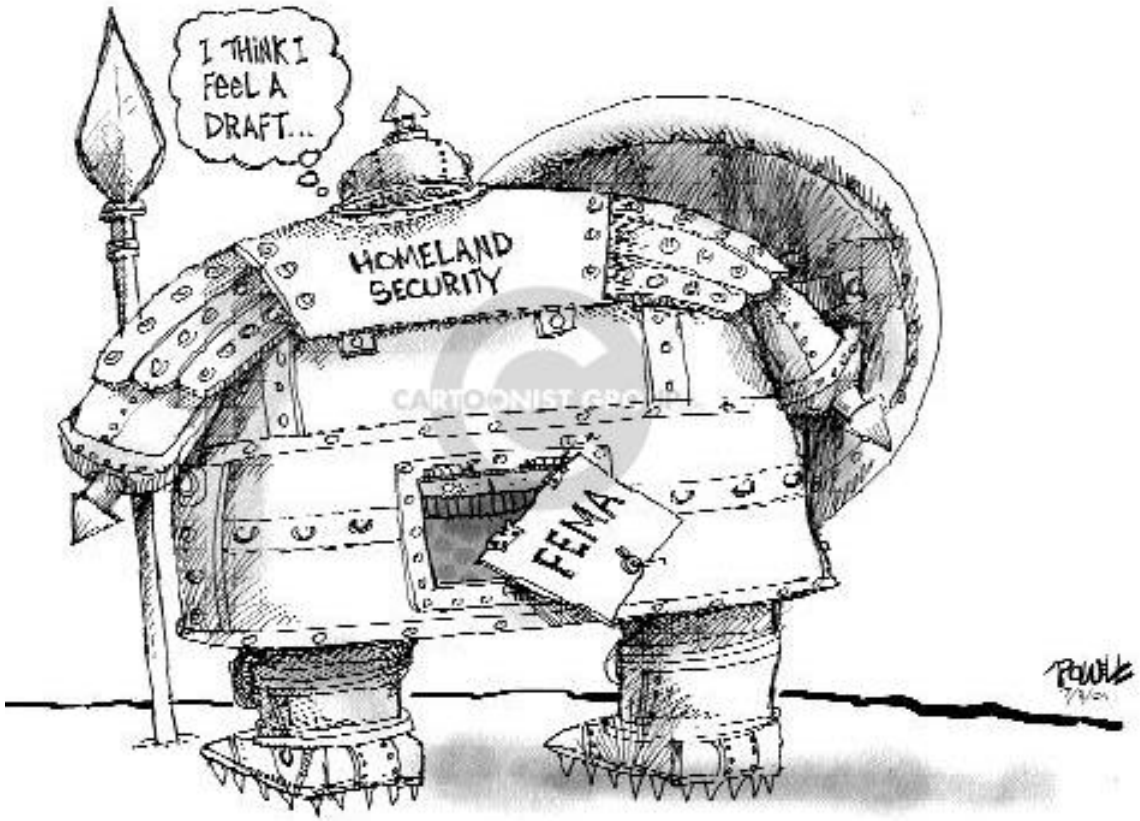
Request digital flood insurance study computer models from past studies.

Coordinated Hazard Assessment and Mapping Program (CHAMP) IllinoisFloodMaps.Org

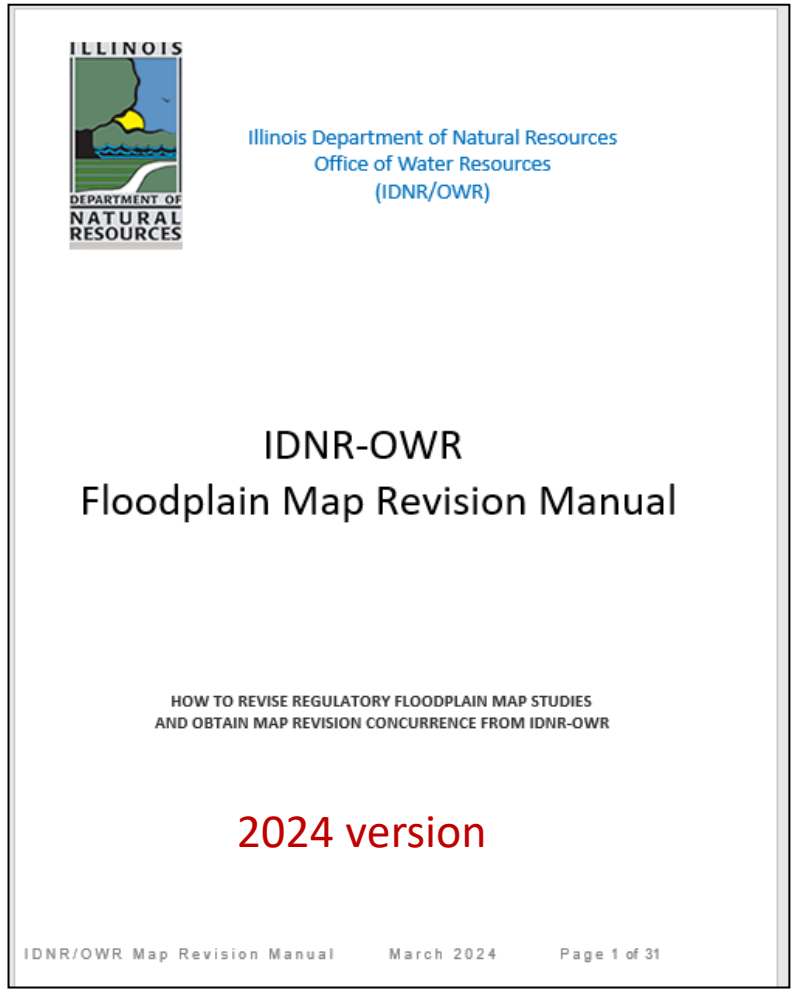
https://www.isws.illinois.edu/champ

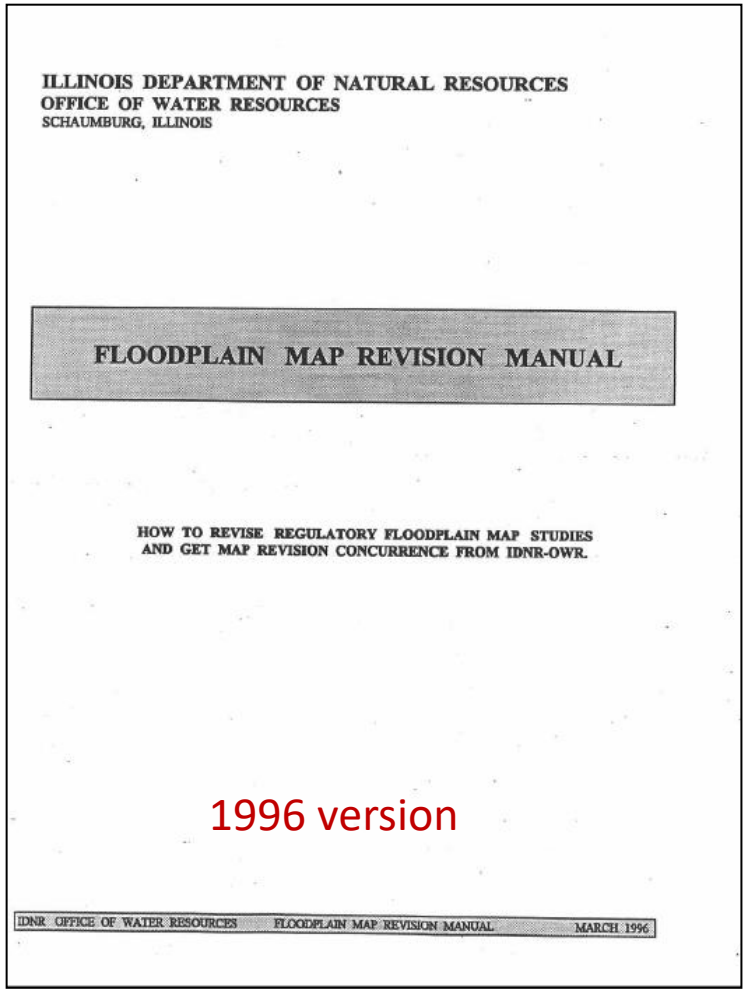
https://www.illinoisfloodmaps.org/destined-dfirms.aspx

Mapping CTP for FEMA. Illinois Flood Maps.org provides details on recently completed and nearly completed FIRM mapping projects.



IDNR-OWR 2024 Map Revision Manual





The 1996 version refers to digital submittals with a "IBM compatible Diskette".
No references to internet sites.
FYI, Google started in 1998.

IDNR-OWR Overview

1) General Overview
    a. Office of Water Resources (OWR) Floodplain Mapping and Permitting
    b. National Flood Insurance Program (NFIP) = Regulations, Insurance, and Mapping
    c. Evolution of FEMA FIRM Maps
    d. Revising Regulatory FEMA FIRM maps
    e. Illinois State Water Survey (ISWS) Partnership with FEMA as a CTP
    f. IDNR-OWR Map Revision Manual
2) Definitions
3) OWR Regulations and State Statutes

General Overview
Background on FEMA map revision process

General concepts within the IDNR-OWR Map Revision Manual

Why Obtain a Map Revision?

1) Accommodate New Development
    a. Use effective Regulatory Study and Map
    b. Change Effective Study
2) Updating Disputed Effective Flood Studies and mapping
    a. Inadequate Topography
    b. Future Land Use Considerations
    c. Public Flood Control Projects
3) Hydrology and Hydraulics (H&H) for Unstudied Watersheds

Why a Map Revision?
Reasons for map revision submittals

Future land use considerations and mapping flood control projects

Hydrologic & Hydraulic SUBMITTAL APPROACHES

1) HYDROLOGIC Design Storm Approach
   a. Critical Storm Duration
   b. Huff Rainfall Distributions
   b. SCS Parameters
   d. 2-Dimensional Modeling verses 1-Dimensional Modeling

2) HYDRAULICS Defining the Illinois Definition Floodway
   a. 90% Storage verses a Conveyance Floodway
   b. Modeling Restrictive Bridges

3) Submittal Check lists
   a. New or Updated Hydrology
   b, New and Updated Hydraulics
   c. Discharge Certification

4) Presubmiital Meeting Topics

5) Common Submittal Mistakes

6) Published Documents and Websites
   a. Bulletin 70 and 75
   b. OWR Regulations
   c. FEMA Guidelines and Standards (November 2023)
   d. US Army Corps Models and User Manuals

H&H Submittal Approaches

Process of modeling various duration storms to select the peak flows

Define Huff Quartiles
90% Floodway definition
Modeling restrictive bridges

Checklists for more complete submittals

Presubmittal topics
Common submittal mistakes

Various websites for reference information

Appendices

RAINFALL	A-1	Technique to define Huff Distribution percentages using 7th Order Polynomials	
BLANK SUBMITTAL CHARTS	B-1	10 & 100 Year Profile changes	(Floodway Revision)
	B-2	Incremental Floodway Storage	(Floodway Revision)
	B-3	Conveyance, N-Values, and Velocity	(Floodway Revision)
	B-4	Discharge Certification Form	(Hydrology Revision)
PROCEDURAL FLOWCHARTS	C-1	Defining the Illinois Regulatory Floodway	
	C-2	OWR Discharge Certification	
	C-3	Correcting Regulatory Hydraulic Models	
	C-4	Changes to Regulatory FIRMS	
	C-5	Sample Public Notice	

D-1 More Map Revision Websites

- FEMA National Flood Hazard Layer Viewer (NFHL)
- USGS StreamStats
- Illinois Public Land Survey System
- FEMA Flood Map Service Center
- Illinois Elevation Finder
- Illinois DNR – Office of Water Resources
- Coordinated Hazard Assessment and Mapping Program
- IllinoisFloodMaps.Org

Appendix A
Digital 7th order equation to define Huff quartile distributions for any time step

Appendix B
Define parameters used in modeling **Discharge certification form** has locations of flow certifications.

Appendix C
Flowcharts for revision submittals

Appendix D
Various useful websites

Flowchart C-4 Revisions to Regulatory Maps

Step 1 Obtain Effective (regulatory) computer model(s)

Contact FEMA Map Service Center at:
Contact the Illinois State Water Survey at:
If no model is available a) Outreach to OWR, community's county, MWRDGC (in Cook), etc.
b) Draft Best Available computer model of the waterway

Step 2 Update the Effective Model with existing topography

This is called the "Modified Effective" model. Include all existing topography with additional cross sections needed to define the Pre-project conditions.

Option 1
Water surface elevations drop (>0.1 ft) resulting from "Modified Existing " model results. Dropping water surface elevations require updated hydrology (Flowchart C-2)

Option 2
Water surface elevations equal or higher than "Modified Existing" model results. New hydrology is not required. **Goto Step 5**

Step 3 Add project into "Modified Existing" model = "With-Project Model"

Option 3
Applicant lowers the water surface elevations resulting from with-project model results. New hydrology is required to update the peak flows. Goto Flowchart C-2

Option 4
The "With-Project" water surface elevations are equal or higher than "Mod-Exist" model results. **Goto Step 4**

Step 4 Applicant meets all other OWR regulations and policies.

Step 5 OWR concurrence pending completion of Public Notice

Step 6 OWR issues Letter of Concurrence following successful Public Notice

Revise Regulatory FIRM maps

Contact FEMA or ISWS to obtain digital models (maybe others?!)

Modified Effective Model (MEM)=
Effective Model (EFM) + updated topography

If **MEM WS < EFM WS** then update hydrology

After update Hydrology add in the project = With Project Model (WPM)

If WPM WS < MEM WS make sure **hydrology meets IDNR-OWR Bulletin 75 criteria.**

If IDNR-OWR agrees w/ model
Issue 21 day Public Notice
After Public Notice issue
Letter of concurrence

Flowchart C-3 Revising Regulatory Hydraulic Models

Effective Study omits Significant Watershed / Channel Characteristics

Added Features MUST Result in either:

A) 1% chance flood water surface changes by +/- 0.1 feet

B) 1% chance flood peak discharges vary by more than 10%

Step 1A Submit Better Topography

Option 1 Water surface elevations increase
Goto Step 3

Option 2 Water surface elevations decrease
Goto Step 2 Submit hydrologic calcs.

Step 1B Add Storage or Restrictive Culvert

Option 1 Model the additional storage per the restrictive crossing criteria.

Option 2 Should significant changes occur In water surface or flows **Goto Step 2**

Step 2 Revised Hydrology model required Use Flowcharts C-1 and C-2

Generate an hydrologic model with updated topography or significant restrictive crossings or channel geometry revisions. Otherwise, the effective peak flows could be used. Future land use is recommended, but not required for developing watersheds.

Step 3 OWR agrees with Model results. Issues a Public Notice (for LOMCs)

OWR issues a 21 day Public Notice allowing for affected property owners and government Agencies to respond. All comments or concerns should be in writing and technically based. Should a valid concern be received, the Public Notice will be re-issued allowing for another 21-day review period. Public Notice process is required for all designated floodway revisions.

Step 4 OWR issues a Concurrence Letter following successful Public Notice

The OWR Letter of Concurrence is sent to FEMA Region V, Illinois State Water Survey, and the applicant. Any construction in the floodway can not begin until FEMA has issued their final map revision approval.

Updating hydraulic models

Significant flow or water surface (WS) changes
Change Topography > change WS?
Change flows > +storage or +conveyance

If you lower WS then **update hydrology**

If IDNR-OWR agrees w/ model
Issue 21 day Public Notice
After Public Notice issue
Letter of concurrence

D-1 Useful Map Revision Websites

FEMA National Flood Hazard Layer Viewer
https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd
Website to access effective FEMA FIRM maps, to determine location of floodway and floodplain limits. These maps are updated at least every 30 days. LOMA and LOMR approvals are also included in the mapping.

USGS StreamStats
https://streamstats.usgs.gov/ss/
Provides regression equation generated peak flood flows for 50 percent to 0.2 percent floods. Generates a report complete with basin delineation overlaid on various available base maps.

Illinois Public Land Survey System
https://prairie-research.maps.arcgis.com/apps/webappviewer/index.html?id=16239dfab62f49e48e692bb93b495fd9
Useful site to determine Section-Township-Range designations on the Joint Application Form

FEMA Flood Map Service Center
https://msc.fema.gov/portal/home
Download Flood Insurance Studies providing background for FIRM panel data.
https://msc.fema.gov/portal/resources/contact
Request digital flood insurance study computer models from past studies. Can also contact the ISWS at

Illinois Elevation Finder
https://maps.dnr.illinois.gov/elev/
Provides LiDAR digital elevations for site investigations.

Illinois DNR – Office of Water Resources
https://dnr.illinois.gov/waterresources.html
OWR website providing useful permit and map revision information.

Coordinated Hazard Assessment and Mapping Program IllinoisFloodMaps.Org
https://www.isws.illinois.edu/champ
https://www.illinoisfloodmaps.org/destined-dfirms.aspx
Mapping CTP for FEMA. Illinois Flood Maps.org provides details on recently completed and nearly completed FIRM mapping projects.

Map Revision Websites

All these websites have valuable available information for Map Revision submittals

A-1 Using 7th Order Polynomials to define Huff Distribution Percentages

Appendix A
(Map Revision Manual)

	Cumulative Rainfall				
Total (Min)	60	180	360	720	1440
100 Year	1 HR	3 HR	6 HR	12 HR	24 HR
Rain Total	3.6	4.7	5.8	6.3	7.4
Increm MIN	3	9	18	36	72
% Time	HUFF 1	HUFF 1	HUFF 1	HUFF 2	HUFF 3
5	0.29	0.38	0.46	0.19	0.22
10	0.61	0.80	0.99	0.50	0.44
15	1.22	1.60	1.97	0.76	0.67
20	1.80	2.35	2.90	1.01	0.89
25	2.27	2.96	3.65	1.39	1.11
30	2.56	3.34	4.12	1.83	1.41
35	2.74	3.57	4.41	2.46	1.70
40	2.88	3.76	4.64	3.21	2.00
45	2.99	3.90	4.81	3.91	2.37
50	3.10	4.04	4.99	4.41	2.81
55	3.17	4.14	5.10	4.79	3.33
60	3.24	4.23	5.22	5.10	4.22
65	3.31	4.32	5.34	5.36	5.18
70	3.35	4.37	5.39	5.54	5.85
75	3.42	4.47	5.51	5.73	6.29
80	3.46	4.51	5.57	5.86	6.59
85	3.49	4.56	5.63	5.99	6.81
90	3.53	4.61	5.68	6.11	7.03
95	3.56	4.65	5.74	6.17	7.18
100	3.60	4.70	5.80	6.30	7.40
	Cumulative Rainfall				
	3.60	4.70	5.80	6.30	7.40

Fitting Huff percentage numbers to smaller time intervals

In order to maintain the Huff distribution curves, it is reasonable to develop an equation that will give you the exact Huff distribution for smaller time intervals.

Two Main Steps

A) **Goto website** for the 7th order polynomial equation
B) **Copy the equation into an Excel spreadsheet** that has small increments of cumulative storm time.

Step A

Paste published Time and Huff distributions into website

1) Cumulative Percent time of storm
2) Exact Huff cumulative rainfall for each time value

Website below:

http://polynomialregression.drque.net/online.php

Step B

Copy the 7th order polynomial into an excel spreadsheet and have it reference the cumulative incremental storm time step. The value of the huff distribution will be calculated by the polynomial equation. Simple huh?

A-1 Using 7th Order Polynomials to define Huff Distribution Percentages

Area < 10 SM							
HUFF 1 Quartile		HUFF 2 Quartile		HUFF 3 Quartile		HUFF 4 Quartile	
0	0	0	0	0	0	0	0
0.05	0.16	0.05	0.03	0.05	0.03	0.05	0.02
0.1	0.33	0.1	0.08	0.1	0.06	0.1	0.05
0.15	0.43	0.15	0.12	0.15	0.09	0.15	0.08
0.2	0.52	0.2	0.16	0.2	0.12	0.2	0.1
0.25	0.6	0.25	0.22	0.25	0.15	0.25	0.13
0.3	0.66	0.3	0.29	0.3	0.19	0.3	0.16
0.35	0.71	0.35	0.39	0.35	0.23	0.35	0.19
0.4	0.75	0.4	0.51	0.4	0.27	0.4	0.22
0.45	0.79	0.45	0.62	0.45	0.32	0.45	0.25
0.5	0.82	0.5	0.7	0.5	0.38	0.5	0.28
0.55	0.84	0.55	0.76	0.55	0.45	0.55	0.32
0.6	0.86	0.6	0.81	0.6	0.57	0.6	0.35
0.65	0.88	0.65	0.85	0.65	0.7	0.65	0.39
0.7	0.9	0.7	0.88	0.7	0.79	0.7	0.45
0.75	0.92	0.75	0.91	0.75	0.85	0.75	0.51
0.8	0.94	0.8	0.93	0.8	0.89	0.8	0.59
0.85	0.96	0.85	0.95	0.85	0.92	0.85	0.72
0.9	0.97	0.9	0.97	0.9	0.95	0.9	0.84
0.95	0.98	0.95	0.98	0.95	0.97	0.95	0.92
1	1	1	1	1	1	1	1
EQUA 1		EQUA 2		EQUA 3		EQUA 4	

Area > 10 SM and < 50 SM							
HUFF 1 Quartile		HUFF 2 Quartile		HUFF 3 Quartile		HUFF 4 Quartile	
0	0	0	0	0	0	0	0
0.05	0.12	0.05	0.03	0.05	0.02	0.05	0.02
0.1	0.25	0.1	0.06	0.1	0.05	0.1	0.04
0.15	0.38	0.15	0.1	0.15	0.08	0.15	0.07
0.2	0.51	0.2	0.14	0.2	0.12	0.2	0.09
0.25	0.62	0.25	0.21	0.25	0.14	0.25	0.11
0.3	0.69	0.3	0.3	0.3	0.17	0.3	0.13
0.35	0.74	0.35	0.4	0.35	0.2	0.35	0.15
0.4	0.78	0.4	0.52	0.4	0.23	0.4	0.18
0.45	0.81	0.45	0.63	0.45	0.27	0.45	0.21
0.5	0.84	0.5	0.72	0.5	0.33	0.5	0.24
0.55	0.86	0.55	0.78	0.55	0.42	0.55	0.27
0.6	0.88	0.6	0.83	0.6	0.55	0.6	0.3
0.65	0.9	0.65	0.87	0.65	0.69	0.65	0.34
0.7	0.92	0.7	0.9	0.7	0.79	0.7	0.4
0.75	0.94	0.75	0.92	0.75	0.86	0.75	0.47
0.8	0.95	0.8	0.94	0.8	0.91	0.8	0.57
0.85	0.96	0.85	0.96	0.85	0.94	0.85	0.74
0.9	0.97	0.9	0.97	0.9	0.96	0.9	0.88
0.95	0.98	0.95	0.98	0.95	0.98	0.95	0.95
1	1	1	1	1	1	1	1
EQUA 5		EQUA 6		EQUA 7		EQUA 8	

Area >50 and < 400 SM							
HUFF 1 Quartile		HUFF 2 Quartile		HUFF 3 Quartile		HUFF 4 Quartile	
0	0	0	0	0	0	0	0
0.05	0.08	0.05	0.02	0.05	0.02	0.05	0.02
0.1	0.17	0.1	0.04	0.1	0.04	0.1	0.03
0.15	0.34	0.15	0.08	0.15	0.07	0.15	0.05
0.2	0.5	0.2	0.12	0.2	0.1	0.2	0.07
0.25	0.63	0.25	0.21	0.25	0.12	0.25	0.09
0.3	0.71	0.3	0.31	0.3	0.14	0.3	0.1
0.35	0.76	0.35	0.42	0.35	0.16	0.35	0.12
0.4	0.8	0.4	0.53	0.4	0.19	0.4	0.14
0.45	0.83	0.45	0.64	0.45	0.22	0.45	0.16
0.5	0.86	0.5	0.73	0.5	0.29	0.5	0.19
0.55	0.88	0.55	0.8	0.55	0.39	0.55	0.21
0.6	0.9	0.6	0.86	0.6	0.54	0.6	0.25
0.65	0.92	0.65	0.89	0.65	0.68	0.65	0.29
0.7	0.93	0.7	0.92	0.7	0.79	0.7	0.35
0.75	0.95	0.75	0.94	0.75	0.87	0.75	0.43
0.8	0.96	0.8	0.96	0.8	0.92	0.8	0.54
0.85	0.97	0.85	0.97	0.85	0.95	0.85	0.75
0.9	0.98	0.9	0.98	0.9	0.97	0.9	0.92
0.95	0.99	0.95	0.99	0.95	0.99	0.95	0.97
1	1	1	1	1	1	1	1
EQUA 9		EQUA 10		EQUA 11		EQUA 12	

	Huff	Area < 10 SM
EQUA 1	1	$f(x) = -0.003190567886219914 8 + 3.893645590795 13x - 8.010788892871345x^2 + 10.08932320676792x^3 - 7.894966429268 13x^4 + 3.886900454405475 7x^5 - 0.963325240257526x^6$
EQUA 2	2	$f(x) = -0.006348569305089 03 + 1.577876529775699 6x - 13.33799672135055 3x^2 + 70.83766322916303x^3 - 140.3127393903061 2x^4 + 119.7835540169530 5x^5 - 37.54628590990248x^6$
EQUA 3	3	$f(x) = 0.005043816087292332 - 0.11070958463755938x + 10.79612289530172 3x^2 - 57.31473375738438x^3 + 132.6347039405650 6x^4 - 131.5480298008122x^5 + 46.54246205643528 4x^6$
EQUA 4	4	$f(x) = -0.004189993581296905 + 0.853536013708776 2x - 5.206093590562 65x^2 + 28.03112514432682 5x^3 - 64.92629114336 21x^4 + 67.53967569150763x^5 - 25.28894937924423x^6$
		Area >10 and <50 SM
EQUA 5	1	$f(x) = 0.001683862031686 5633 + 1.781284478402909 2x + 12.23642246232065 2x^2 - 60.58788097729585x^3 + 108.6533881939182 2x^4 - 88.13542370144062x^5 + 27.05181063865231 6x^6$
EQUA 6	2	$f(x) = -0.002096415661631099 + 1.176786842507795 9x - 11.03550750210999 9x^2 + 66.46891235125901x^3 - 136.7546749941750 2x^4 + 118.5545979623141 5x^5 - 37.41307422197288 4x^6$
EQUA 7	3	$f(x) = 0.004342623560011 9946 - 0.503465636829 2754x + 16.12100234197042x^2 - 84.15856765290486x^3 + 189.0269293215231x^4 - 183.2587392366 4838x^5 + 63.77595974400786 4x^6$
EQUA 8	4	$f(x) = -0.006716867673387629 + 1.137407376727480 2x - 9.884505772362129x^2 + 50.05254771501333x^3 - 112.9886935991731 6x^4 + 116.2137139469121 6x^5 - 43.52565604595624x^6$
		Area >50 and <100 SM
EQUA 9	1	$f(x) = 0.002965845748451 6942 + 0.049348280113315 86x + 28.06155618441957 2x^2 - 113.0788305934267 9x^3 + 190.9021095813232 6x^4 - 149.9097208559981 3x^5 + 44.97769008335475x^6$
EQUA 10	2	$f(x) = 0.000544305935611956 + 0.607349711325631 4x - 6.477497181216 6x^2 + 52.78614652971362 6x^3 - 116.4109001746985 4x^4 + 103.5806163494862 2x^5 - 33.08967692509377x^6$
EQUA 11	3	$f(x) = 0.004586939630414755 - 0.577777166133920 4x + 16.72728100605136x^2 - 90.40140589829977x^3 + 206.8784710517368 5x^4 - 202.3202518504546x^5 + 70.69924503405358x^6$
EQUA 12	4	$f(x) = -0.006509644944425255 + 1.184110623197549 1x - 12.24906636053158 8x^2 + 63.04555864758377x^3 - 144.4477698789938 2x^4 + 150.4662063929676 2x^5 - 56.99572413082128x^6$

Wait a Minute…

The IAFSM abstract says 13 questions will be answered !

1) **When is a map revision required for your project?**
2) **How is an Illinois storage floodway calculated?**
3) **Is Bulletin 75 rainfall necessary for all hydrologic simulations?**
4) **Can StreamStats peak flows be used for my project?**
5) **Does the OWR consider floodway map revisions for watersheds less than one square mile?**
6) **How does the OWR coordinate with the Illinois State Water Survey for map change submittals?**
7) **When is a Conditional Letter of Map Revision required?**
8) **Can an unsteady flow model be used to define an Illinois Storage Floodway?**
9) **How can a community allow for a conveyance floodway definition?**
10) **What are the rules for removing restrictive culverts or bridges?**
11) **What calculations and exhibits are typically needed for a successful map revision submittal?**
12) **What types of map changes are included within the category “Best Available Data”?**
13) **How may future 2D modeling change existing FIRM maps, especially considering floodways/floodplain regulations?**

1) When is a map revision required for your floodway construction project?

YES, a Map Revision is required

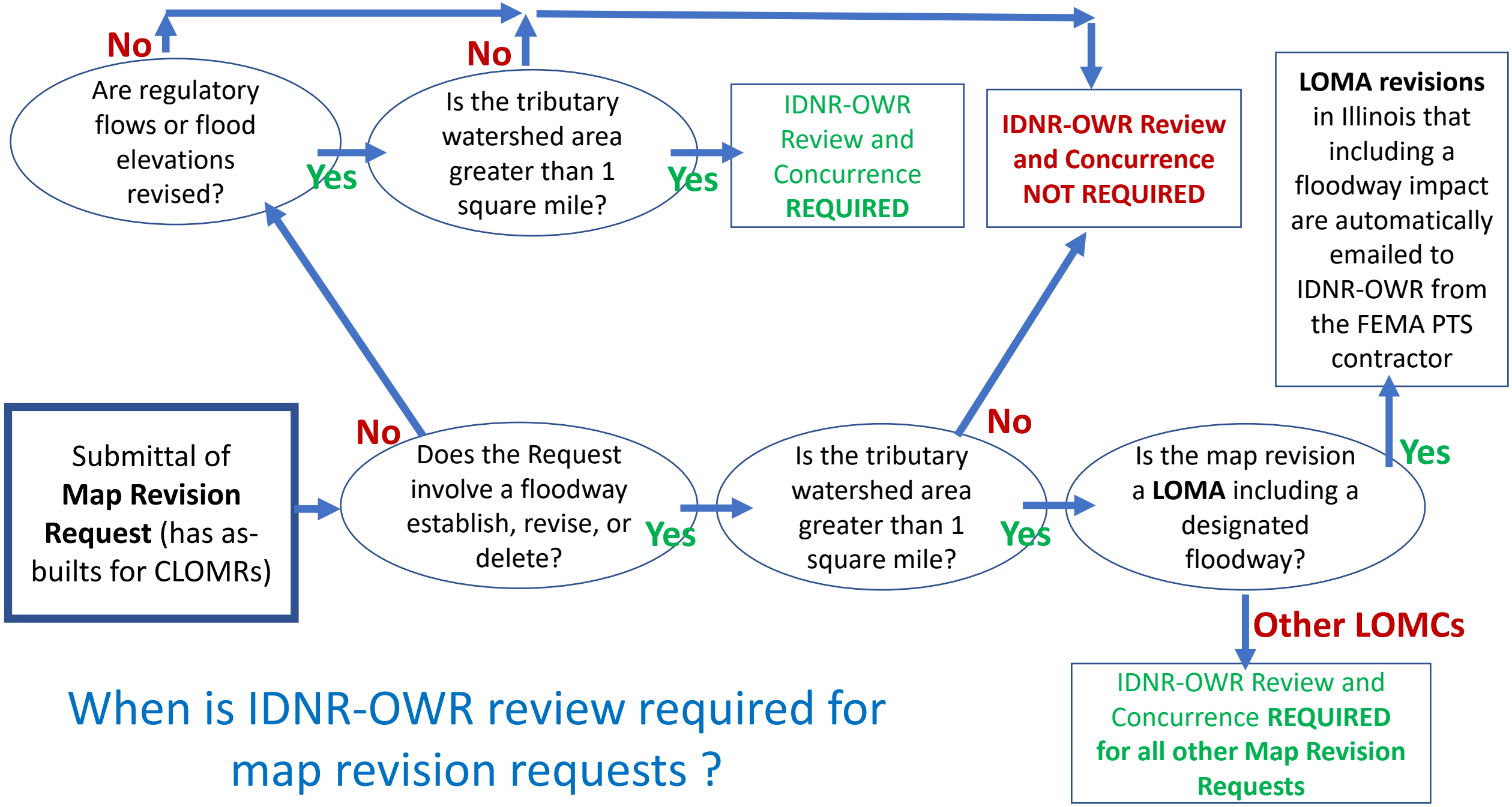
Changes that have:

- Increased or decreased regulatory Base Flood Elevations
- Impacted existing upstream structures causing increased flood damages
- Changed peak flood flows by more than 10%
- Channel relocated

No, Map Revision is not required

Changes that have:

- Not increased or decreased the Base Flood Elevations
- Not changed the peak flood flow changes by more than 10%
- Have Not relocated the channel



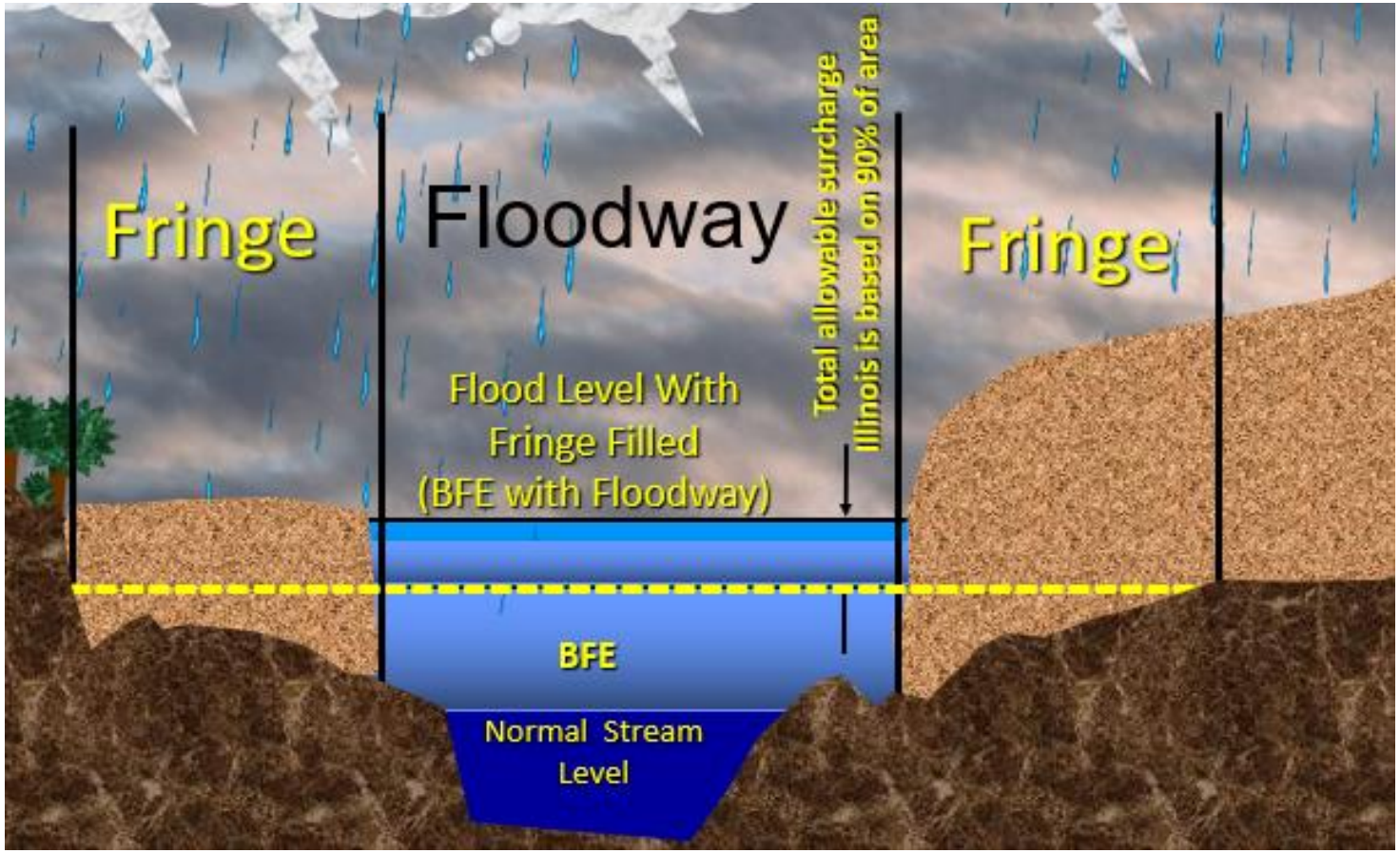
When is IDNR-OWR review required for map revision requests ?

2) How is the Illinois storage floodway calculated?

At all cross sections within the hydraulic model:

Select the **widest floodway compared to:**

1) 0.1-foot floodway water surface increase
2) 5% (by area) filled equally by area (volume) defining the fringes
3) 10% max increase in velocity



3) When does IDNR-OWR require applying Bulletin 75 rainfall hydrology?

YES, Bulletin75 is REQUIRED

MAJOR PROJECTS = Impacts multiple existing residences / businesses

Proposed Detailed studies that update FIRMS out-of-date, and do not meet FEMA standards

Approximate Flood Zones studied to become designated floodways

Public Flood Control Project

Channel relocation

A site with floodplain upstream damages use B75 and consider design alternatives

NO, Bulletin75 is not REQUIRED

MINOR PROJECTS = **Bridge spanning** the floodplain on piers with trivial impact

Channel stabilization

Underground utilities

Existing large rivers such as: Fox River, Des Plaines River,
(IDNR-OWR accepts effective FEMA peak flows for major rivers)

3) When does IDNR-OWR require applying Bulletin 75 rainfall hydrology?

Portions of an IDNR-OWR memo from Liana Winsauer (March 2020)

Full text within Appendix D in 2024 Map Revision Manual

1) The effects of Bulletin 75 are expected to be **reasonably and gradually implemented** into the effective floodplain delineations.

2) **Large projects** such as flood control projects will be reviewed on a case-by-case basis.

3) If **as-built conditions** proposed mapping has a significant impact to hydrologic flows, Bulletin 75 should be used.

4) Can the USGS StreamStats peak flows be used for my project?

StreamStats https://streamstats.usgs.gov/ss/

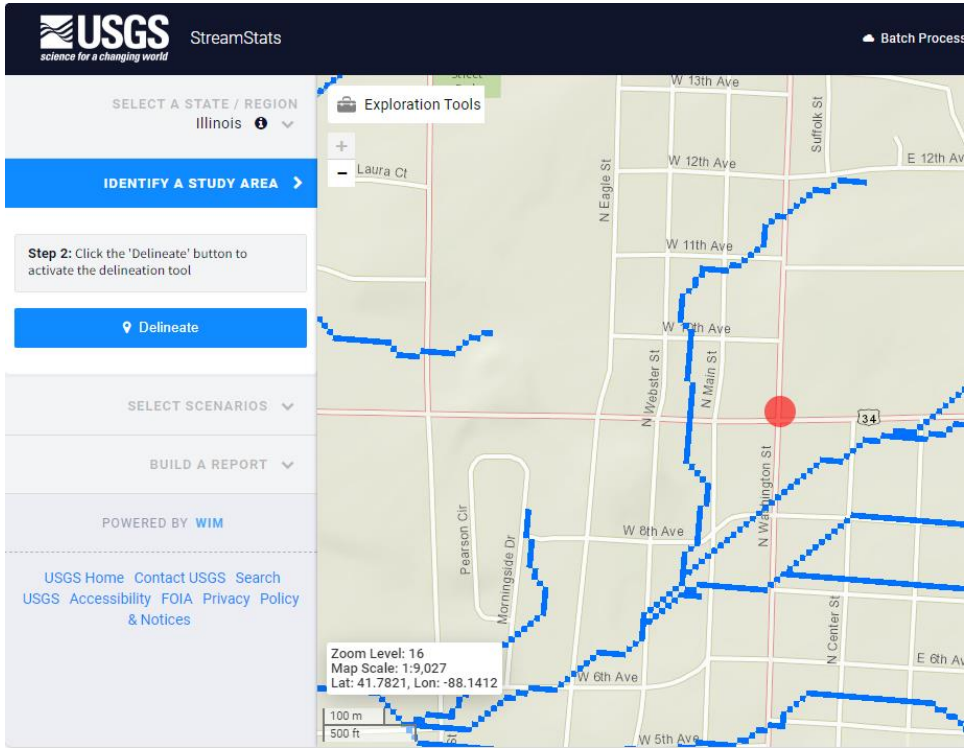
- Watershed delineation (drainage area)
- Peak flows are calculated based on **regression equations from existing (nearby) stream gage data.**
- **User defines** (sometimes) watershed parameters: slope, land-use, soil conditions, urban percentages, etc.

Yes - Use StreamStats flows for:

- Comparison for **watershed area delineation**
- **Comparison to detailed studies** (StreamStats equations consider physical features, wetlands, ponds)
- **Approximate studies** that delineate but not publish proposed flood elevations
- **Peak flow estimates** for minor project designs

No - Do not use StreamStat flows for:

- Final flow estimates **for detailed studies**
- Complex urban areas

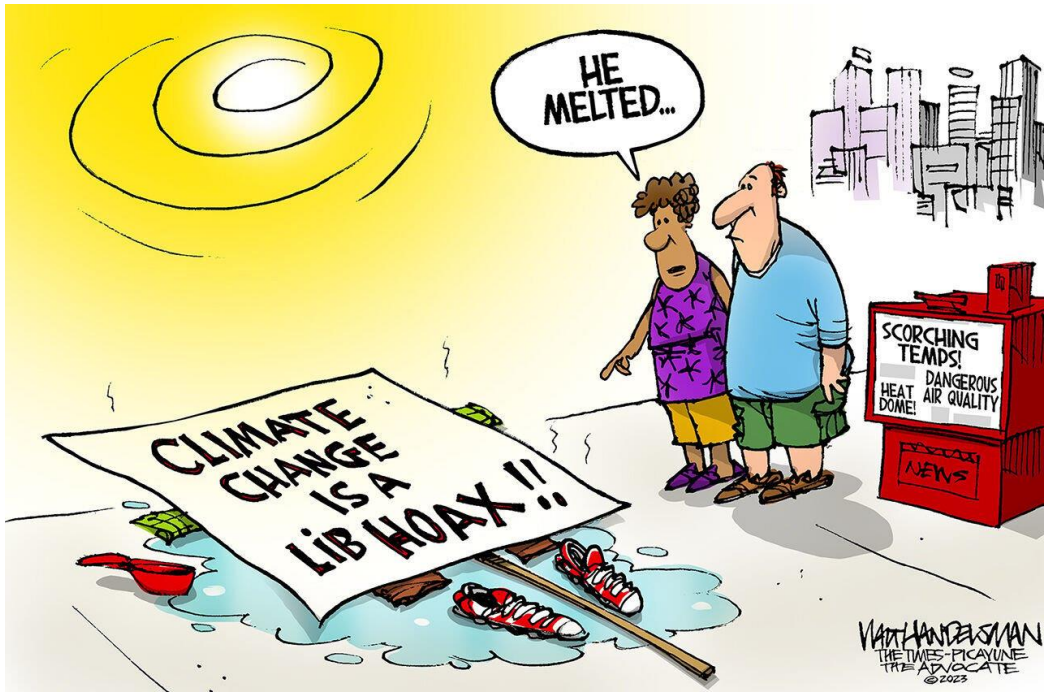


5) Does the OWR review floodway map revisions for watersheds less than one square mile?

The answer is NO

IDNR-OWR legal counsel has set the threshold for all floodway and floodplain jurisdictions as MUST DRAIN GREATER than one square mile. Watersheds less than one square mile outside the jurisdiction of IDNR-OWR.

Even if the FIRM has floodway defined… and drains less than one square mile IDNR-OWR does not legal jurisdiction for permit review.



6) How does OWR coordinate with the ISWS for map revisions?

ISWS = FEMA's CTP for Study and Map Revision Review

The ISWS is under contract with FEMA Region V to update FIRM maps as a **Cooperating Technical Partner**. This includes

1) The ISWS is building **countywide GIS based** restudies **(hundreds of miles)** of all Illinois counties
    1) Using BLE levels of mapping accuracy. Generally, BLE more accurate in urban areas
    2) **Coordinate with IDNR-OWR** to ensure IL higher standards are met = Floodway definition and Rules
    3) Coordinate with Letters of Map Change
    4) Extensive outreach to NFIP communities TOWARDS Discover meetings, Map Adoption and LFD
    5) Assist in Emergency Disaster help (RAFT program)

IDNR-OWR = State of Illinois Floodway Change Review

IDNR-OWR ensures that Adopted Rules = Part 3700 – 3702 - 3704 – 3708 are enforced

1) Review ISWS major countywide flood studies
2) Ensure Illinois higher standards are met for floodway delineation
3) Coordinate with FEMA , Letters of Map Change in floodways

7) When is a Conditional Letter of Map Revision (CLOMR) required?

CLOMR = An approved map revision BEFORE any construction starts. A CLOMR is a PRE-approval LOMC.
CLOMR is followed by a LOMR and the LOMR changes the FIRM. A CLOMR alone does NOT change the FIRM.

FEMA (ISWS) Required CLOMR

1) Any change in water surface elevation (100-year flood) upstream or downstream of a project by more than 0.1 feet,
2) Significant change in SFHA area or limits of flooding, and
3) Any Floodway revisions.

IDNR-OWR Required CLOMR

1) An upstream increase in water surface elevation (100-year flood) by more than 0.1 feet
Significant change in SFHA area or limits of flooding,
2) Any floodway revisions
3) Significant land use change (such as new residential subdivision), that alters channel geometry requires a CLOMR.

8) Can an unsteady flow model be used to define an Illinois Storage Floodway?

Steady flow has been the standard for most FEMA flood insurance studies. One peak flow value sets flood elevations.
Unsteady flow creates models where flood flow can change directions (flat watersheds). Flow changes with time

A floodway is a steady flow concept.
Difficult to pick a static water surface at each cross section as the flow varies with time so the floodway varies across the reach. New methods may solve this problem such as Depth vs. velocity plots. Need to define in EACH CROSS SECTION of an unsteady flow model where most of the flow conveyance is located.

Convert Unsteady Flow models to Steady Flow models

IDNR-OWR will review on case-by-case basis

IDNR-OWR will discuss all unsteady flow model submittals ahead of time to determine how a "storage floodway" may be defined. FEMA is working on how to define 2D unsteady floodways.

9) How can a community allow for a conveyance floodway definition?

Several Chicagoland communities have been IDNR-OWR approved for the conveyance definition floodway.

A conveyance only floodway requires floodplain storage to be maintained for all future floodway development. All future floodplain construction must provide compensatory floodplain storage at two intervals:

1) 0 to 10-year floods
2) 10 year to 100-year floods

Most communities require **more** flood water volume than filled (1.5 : 1) IDNR-OWR only requires 1:1 cut to fill mitigation.

IDNR-OWR Conveyance Floodway Approval Process

Process steps:

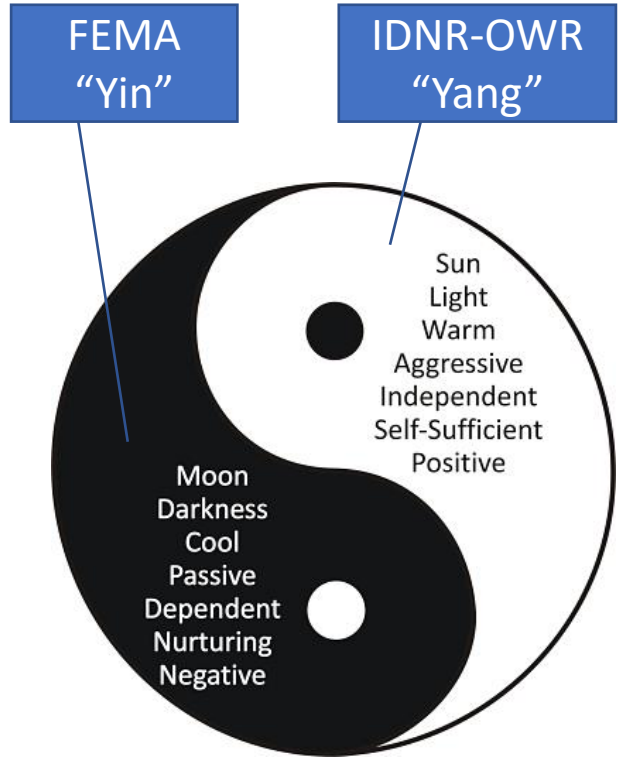
1) **The community must pass a Community Assistance Visit (CAV)** as being compliant with the NFIP
2) **Identify waterway for the agreement** (Must have a significant reach distance within the Community's corporate limits)
3) **Submit an updated hydrologic/hydraulic model** of the waterway to FEMA and IDNR-OWR for review
4) **Complete a MOU Conveyance Only Floodway Memorandum of Understanding** (MOU) signed by the Community's CEO

10) What are the rules for removing restrictive culverts or bridges?

The State of Illinois regards runoff flood water legally as a “common enemy”.
This means that the higher landowner can discharge runoff and floodwater onto the lower property landowner.

FEMA requires a LOMC for opening of a restrictive crossing,
should the downstream 100-year flood elevation be increased by more than 0.1 feet or if flood peak flood flows increase significantly.

IDNR-OWR **does NOT regulate downstream** flood elevation increases.
IDNR-OWR does regulate upstream flood elevation increases.



IDNR-OWR allows restrictive crossings to be opened

FEMA may require LOMC for Opened Restrictive Crossings

11) What calculations/exhibits are needed for a successful IDNR-OWR map revision submittal?

Submit the following:

1) Map Revision Report outlining the project scope and reason for the map change (LOMC)

2) Digital Hydrologic and Hydraulic calculations

(no need to plot all cross sections, maybe just significant bridges/culverts)

1) **Calibration/Verification** ? Stream gages, StreamStats, observed recent storm high waters
2) **HEC-HMS** commonly used for hydrologic peak flows
    1) Use Huff Distributions and Critical Duration storms 1,3,6,12,24,72 hour simulations
3) **HEC-RAS** commonly used for 1D analysis
    1) Include floodway simulations and estimate storage floodway volumes

3) Annotated map

1) Show existing and proposed floodplain lines

11) What calculations/exhibits are needed for a successful IDNR-OWR map revision submittal?

Map Revision Supporting Information

- Narrative (Meet with us before submittal)
- Location Map (project location and size of property)
- FIRM (use the National Flood Hazard Layer maps)
- Site Plan (show property limits, 11x17 sheets are ok)
- Grading Plan (overlay existing and proposed grades)
- Provide Cross Sections (especially road projects)
- Construction Drawings (PE sealed title sheet)
- Computations/H&H Analyses (provide digital models)
- Engineering Report (w/ flood damage assessments)

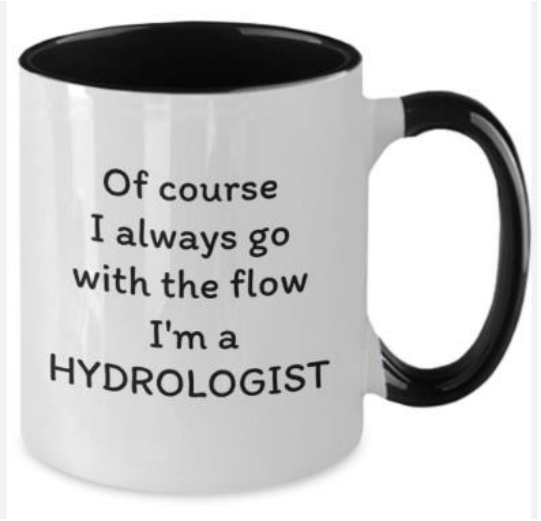
National Flood Hazard Layer viewer
Please highlight your project location.

ONLY ONE COPY of APPLICATION SUBMITTAL IS NEEDED…

11) What calculations/exhibits are needed for a successful IDNR-OWR map revision submittal?

Map Revision Submittal Information

- Narrative Outline
  1. Existing Conditions Locate by major roadways, FIRM panel Number
  2. Proposed Project Phased construction? Upstream damage?
  3. Hydrology and Hydraulics FEMA model? Add Cross Sections?
  4. Mitigated Storage Calculations Floodway fill calcs.: 0-10 & 10-100 ?
- No Wetlands Information needed
- Plot too many HEC-RAS Cross Sections
- See Tables for Hydrology and Hydraulics (2024 Map Revision Manual)
  - Water surface changes (10yr. & 100 yr.)
  - Conveyance, storage, and % velocity at each cross section



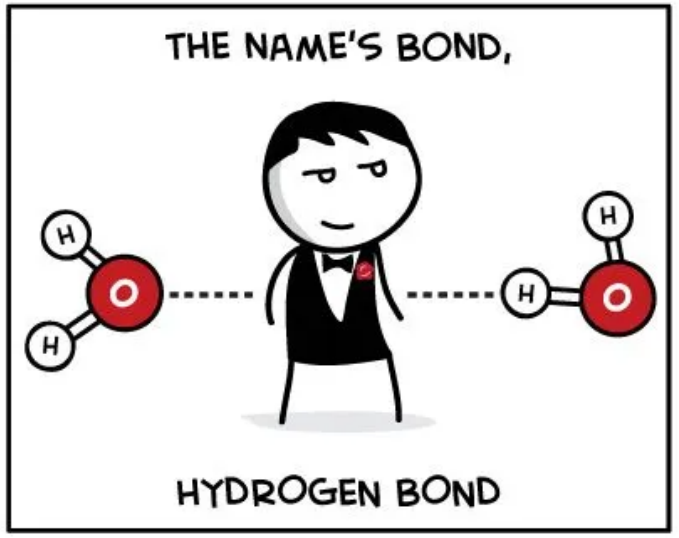
11) What calculations/exhibits are needed for a successful IDNR-OWR map revision submittal?

New Hydrology/Flow Approval Checklist

- ☐ Narrative
  - ☐ Project Description
  - ☐ General Location Map
  - ☐ Analysis Methods
  - ☐ Rainfall Amounts
  - ☐ Rainfall Distributions
  - ☐ Sensitivity Analysis
  - ☐ Calibration
  - ☐ Documentation of Restrictive Road Crossings
  - ☐ Signed & Sealed by P.E.
- ☐ Maps & Schematics
  - ☐ Include Subbasins & Names
  - ☐ Include Other Significant Points
  - ☐ Aerial Photography
  - ☐ Topography
  - ☐ Land Use
  - ☐ Soils
  - ☐ Floodplain/Floodway
  - ☐ Model Schematic
- ☐ Supporting Calculations
  - ☐ Curve Numbers
  - ☐ Lag Time/TC
  - ☐ Rating Curves
  - ☐ Routing Parameters
- ☐ Models
  - ☐ Hydrologic - Print & Electronic
  - ☐ Hydraulic - Print & Electronic
  - ☐ Floodway Definition
  - ☐ Structure-Specific
- ☐ Summary Tables
  - ☐ Subbasin & Section IDs
  - ☐ General Hydrology Results
  - ☐ Sensitivity Analysis
  - ☐ General Hydraulic Results
  - ☐ Floodway Definition

Use Huff Quartiles within the critical duration analysis to capture peak flows for each sub-watershed.
Use **Bulletin 75** rainfall
Calibrate several events if possible.

Larger watersheds peak with longer duration events, often near their time of concentration durations.



12) What types of map changes are included within the category “Best Available Data”?

The State of Illinois approves “Best Available Data” map revisions generally as **Approximate A-Zones**

New A-Zone models are built on topographic LiDAR and include unpublished Base Flood Elevations
These new Approximate Zone studies are approved by IDNR-OWR as Best Available Data.

New A-Zone Study

BAD studies are generally associated with
A-Zone determinations (not Detailed Studies)

1) New A-Zone studies
2) A-Zone new studies generally use:
    1) Approximate flows (StreamStats),
    2) No bridge survey and
    3) LiDAR topography

Effective Study NOT Found Use “Only Available Study”

After submitting a request to FEMA and/or ISWS
Map Service Center https://msc.fema.gov/portal/resources/contact
ISWS https://www.isws.illinois.edu/champ
and no study is found…

Then contact other government agencies
Counties, MWRDGC, USACE, NRCS etc.
If a study is located it becomes a “Best Available Study”
or “Only Available Study”

13) 7-Minute Introduction to FEMA Future Flood Risk (FFRD)

ALL FIRMS to be REMAPPED NATIONWIDE

Future Flood Risk Data (FFRD) is in a **research phase with pilot programs** and help from USACE-NOAA-USGS etc. For several years… FEMA has been evaluating pilot studies/programs.

FFRD 2D MODELING APPROACH

Two-Dimensional (2D) modeling **used nationwide**:

1) Mainstems and tributaries in one simulation. **3 hours per simulations** are common
2) **Rain on mesh** determines hydrographs. Each cell in watersheds have runoff and storage components.
3) **Floodway definition** still evolving Depth x velocity and others
4) Researching **model maintenance** ways to cut and paste LOMRs.
5) **Complex GIS based modeling** **USACE driven** **(**new HEC-RAS 2D models)

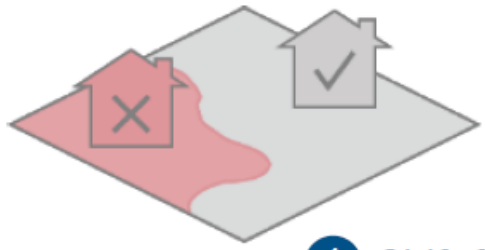
GENERAL FFRD CONCEPTS

Floodway testing: DxV relationships, RAS6.4 functionality & HEC improvements, future FW concept testing
Cell size sensitivity: mesh specifications and configurations for current & FFRD
Bathymetry sensitivity: various options considered for current & FFRD
Rain-on-Mesh calibration: evaluation various approaches and tolerances for current & FFRD
Large-scale model maintenance: check-out/check-in concept for future living model concept

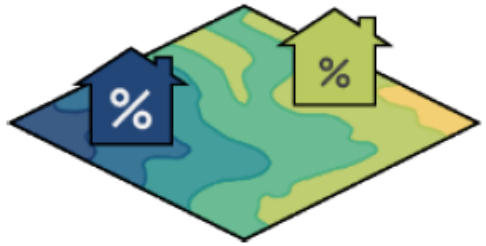
The Intent of FFRD

SLTT = State-Local-Tribal -Territorial

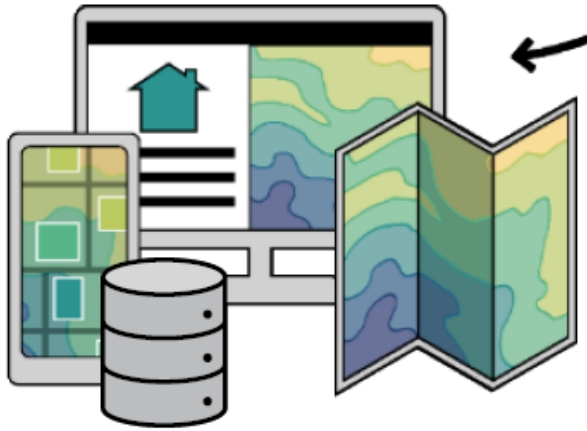
Binary = In or out structure determination



1 Shift from binary to probabilistic analysis

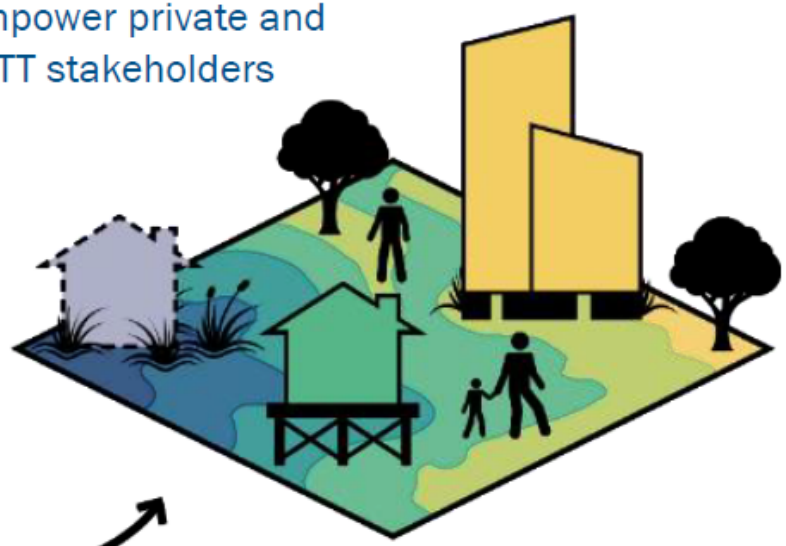


Probabilistic = percent flood may be larger than the 1% chance flood



2 Modernize data management and delivery

3 Empower private and SLTT stakeholders



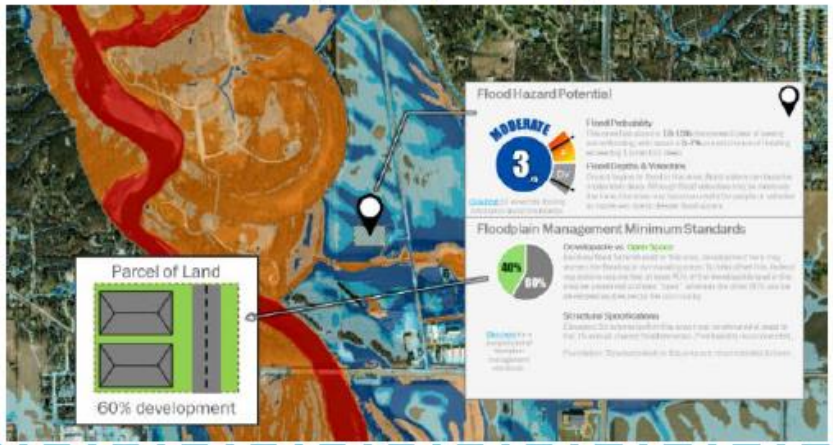
4 Drive risk-informed actions

Future Floodway Concepts

Floodway definition is central to many existing flooding ordinances. D*V has promise, but other ideas still being considered.

wrapping up testing

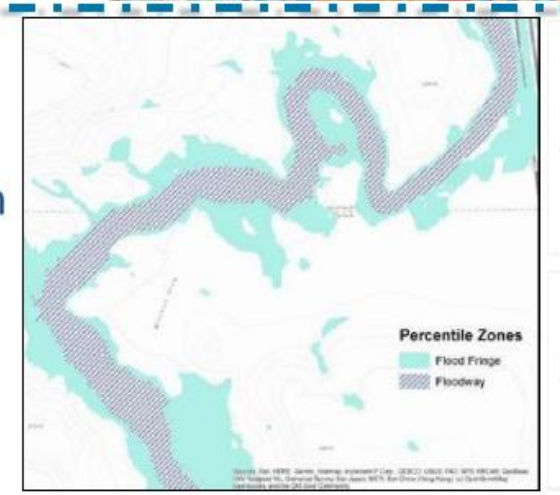
Graduated FPM by D*V Hazard Zones & % Allowable Development

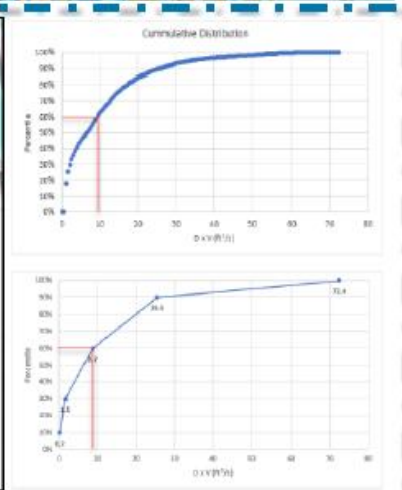


in testing

Conveyance Impact Zones

Floodway and Flood Fringe Zones by Depth x Velocity Percentiles





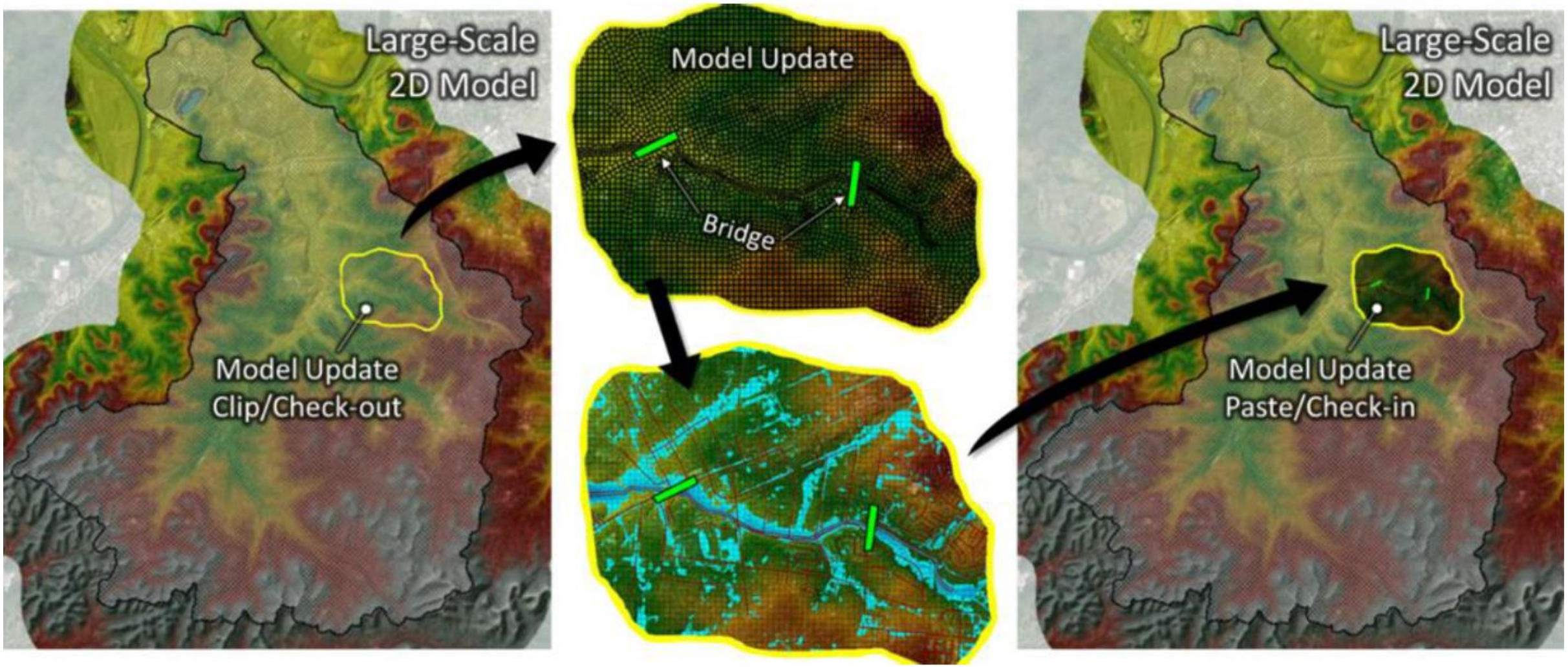
in testing

Community-Driven Floodway Selection/ Delineation

Large Scale Model Maintenance

Very challenging to do this, the USACE is finalizing routines to be available within future HEC software.

Testing 3 approaches – mostly successful manually, evaluating automated approaches now

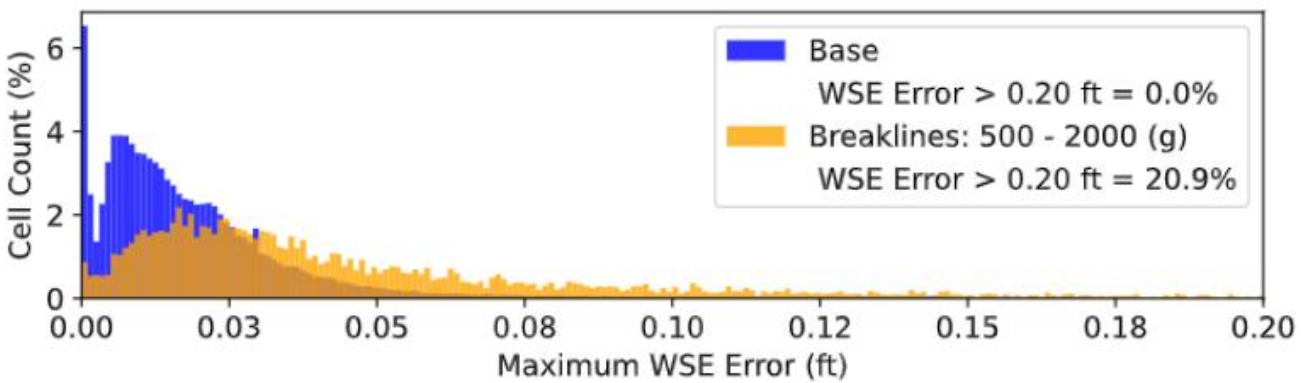


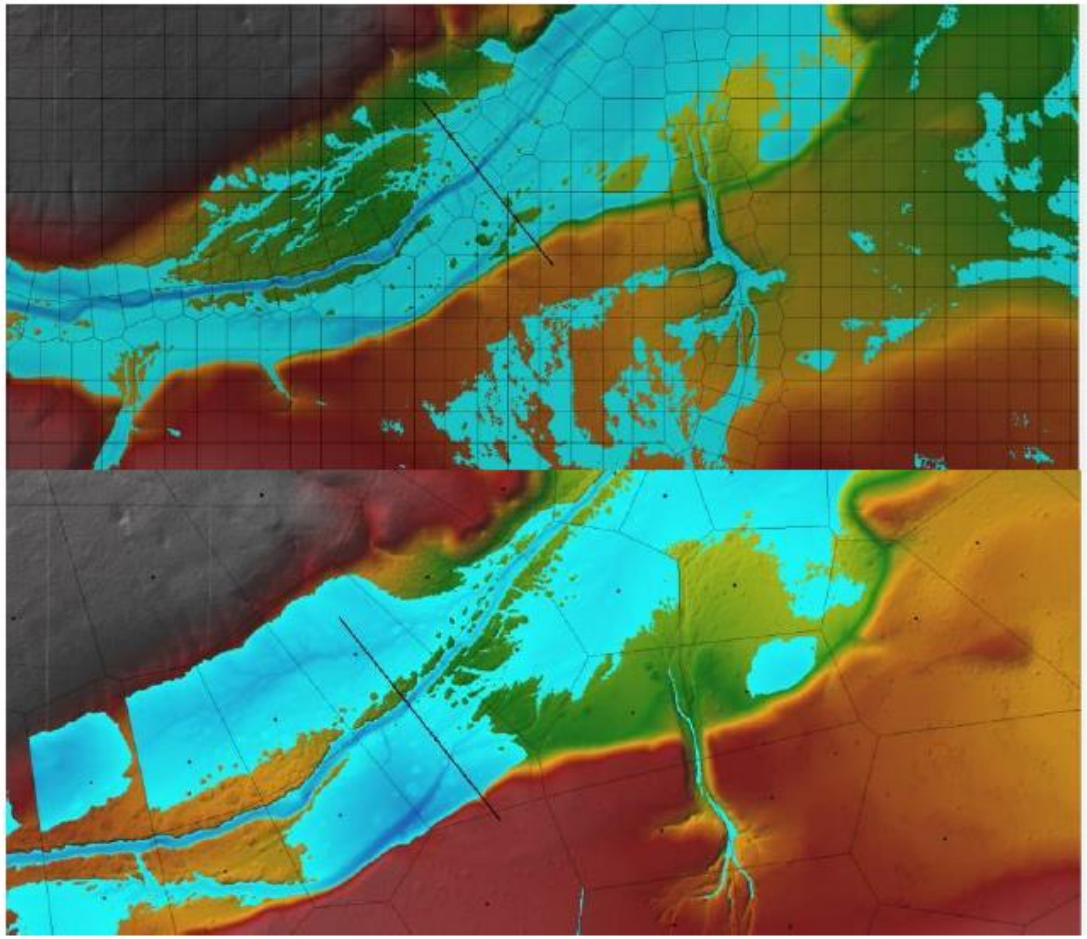
Cell Size Sensitivity

FFRD has a good handle on this from their 5 pilot programs. BLE may change cell size criteria.

- Evaluating model sensitivity to cell sizes used in rain-on-mesh 2D models
- Tracking impacts to run times, model results (flow, water surface elevations, velocity, etc.), and map-ability
- Goal: Provide guidance on cell size thresholds and level of refinement.

  Both Base Level Engineering (BLE)/regulatory and Future of Flood Risk Data (FFRD)



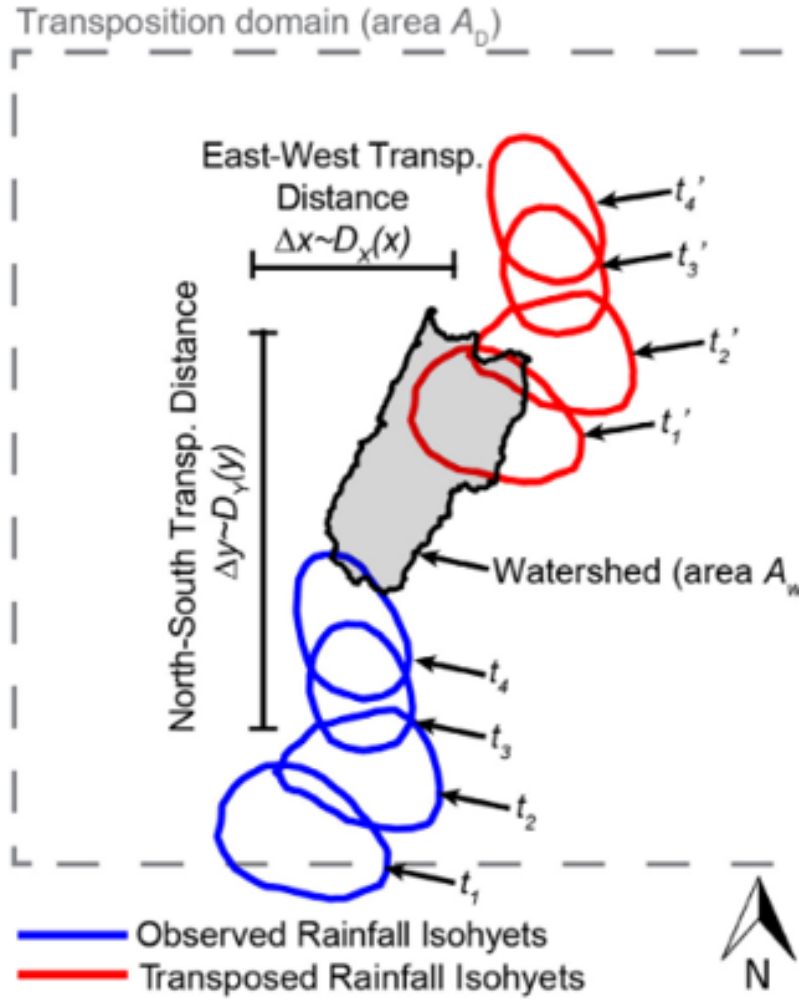


Has significant statistical advantages by recreating and moving an existing recent large flood event..

Stochastic Storm Transposition (SST)

- Non-parametric space-for-time substitution
- Resample severe storm events from a catalog
- Preserve properties of real storms
- Develop watershed-average precipitation-frequency
- Transpose multiple storms per year

✓ Use a data-driven approach to reduce assumptions



Wright, Smith, and Baeck (2013)

Radar videos can be created to show various SST simulations.

Storms Database for Stochastic Storm Transposition (SST)

Storms Database Viewer

Development space for searching historic storms

Metric

Average

Normalized Average

Maximum

Rank

1 to 50 ok

Sort by

Average Accumulation

Clear all filters

Year

See all

Seasons

See all

Duration

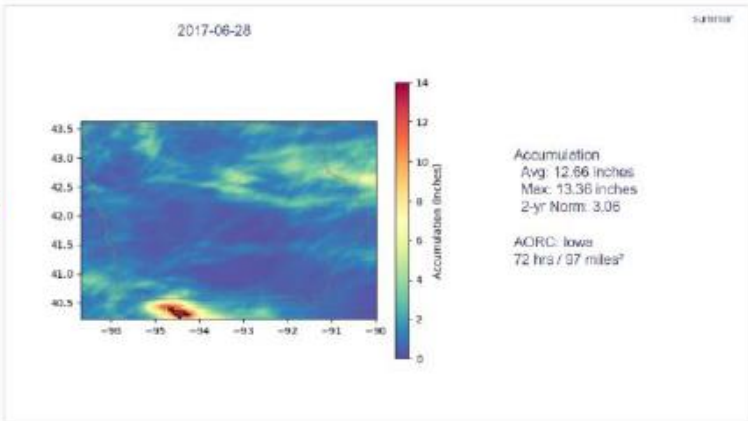
72 440

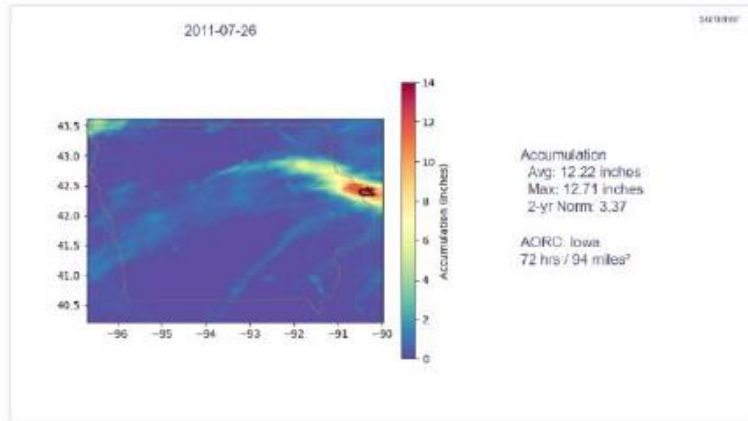
Sources

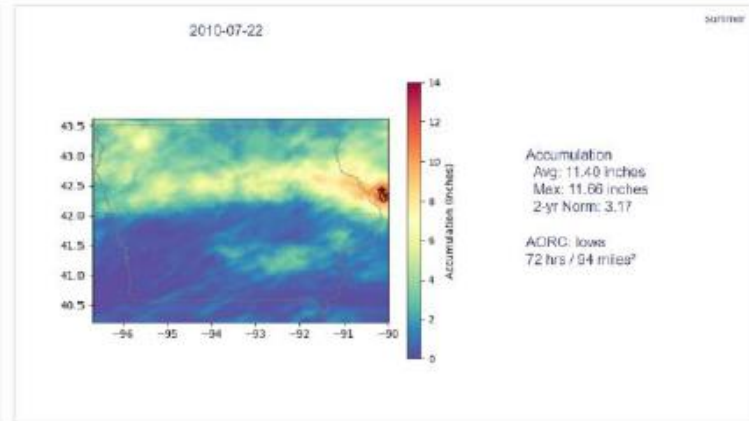
AORC 440

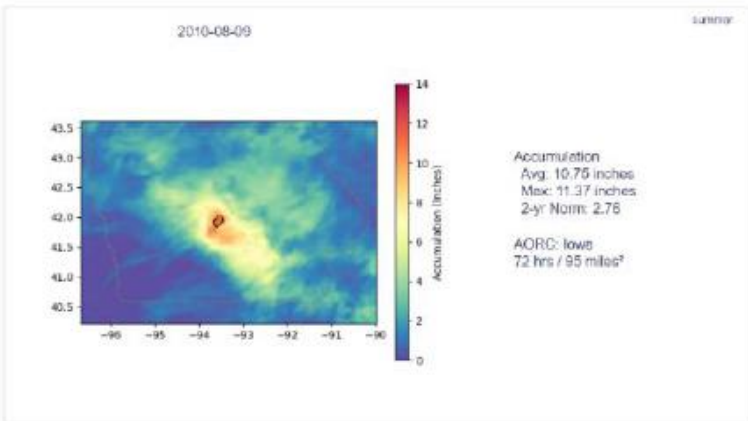
Transposition Areas

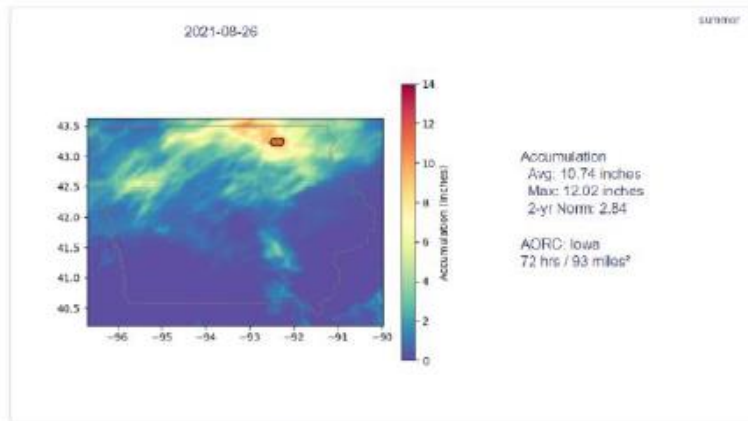
Iowa 440

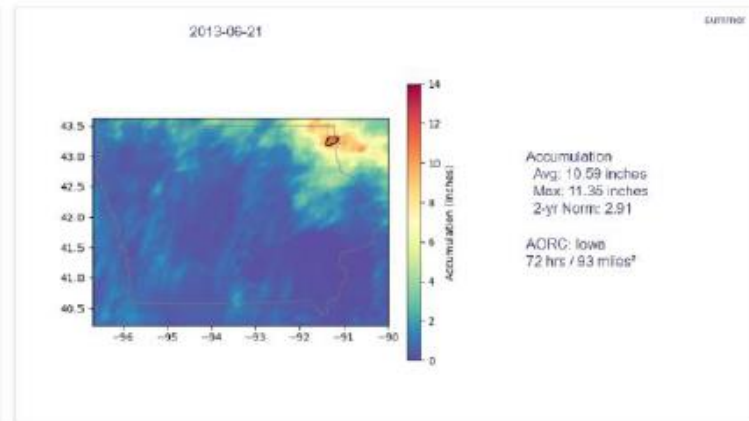












Description – What the Effort Entailed?

- Extensive efforts, collaboration, and documentation related to coastal and inland probabilistic methodology exploration and testing, including application within multiple geographies to support RR2.0 team; explorations into leveraging 2D BLE investments and upgrading to probabilistic
- Development of multiple graduated hazard and risk dataset and product prototypes that leverage probabilistic data, with outputs developed to benefit stakeholders beyond insurance and mapping
- Multiple pilots and data compilations to help illustrate the types and formats of data that would be available once FFRD has been "delivered" within a geography (ongoing)

Main Takeaways

- Probabilistic engineering methods have been extensively tested and validated as the way to produced graduated flood hazard and risk data
- USACE is a key partner and is leading final probabilistic methodology development
- Coastal is farther along than inland – coastal methods have been finalized and probabilistic data has been generated in coastal Louisiana; USACE is actively finalizing inland probabilistic methods
- Sample FFRD datasets and user guides will be produced for internal review by Fall 2023

Future Recommendations & Limitations

- Integration with future conditions has been briefly explored but likely needs additional focus
- Once finalized, inland methods likely will require testing/application and external review by multiple partners to fully validate, prior to national operationalization.

Synergy with Other Efforts

Close ties w/ the 2D modeling efforts, as 2D modeling is envisioned as the modeling framework for performing probabilistic analyses in the future. USACE coordination projects also are closely related, as USACE led methodology development for coastal and is nearing completion of SOPs for inland flooding. Projects here also are connected with some of the Stakeholder Engagement projects, as many of the graduated data prototypes developed as part of these projects were shared with multiple internal stakeholders over the past few years. PFRA efforts also validated the application of probabilistic methods within the cloud environment and therefore has synergy w/ the IT projects.

Sample FFRD Summary slide
(portion of the slide)

Main Issues within this slide:

1) Coastal modeling is near final,
2) Inland probabilities (Spring 2024)
3) 2D modeling is the future for FEMA mapping projects

* use in the cloud
* stakeholders reviewing results
* more uses than just insurance
* integrate with future conditions
* review is ongoing

Probabilistic Methods and Graduated Data

Start	Fall 2017
End	Ongoing

Origin & Desired Outcome

Exploration, testing, and application of probabilistic flood hazard and risk methodologies as the foundational engineering methodology to create FFRD data and support FFRD's goals. Prototyping and development of various datasets and products to help communicate the graduated nature of flood hazards and risks.

Description – What the Effort Entailed?

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Entities Involved (beyond RMD)

Regions	Grants	FPM	Ins.	USACE	Other
x		X	X	X	

FFRD Tie-Ins (no, low, med, high)

H&H/2D Products	Prob Risk	Future Pluvial	Engage IT/Tech	Dam/Lv Other

Geography (no, low, med, high)

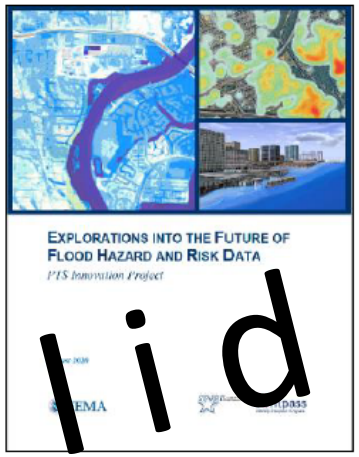
Inland	Great Lakes	Atl/Gulf/ Carib	Pacific CONUS	Pacific OCONUS

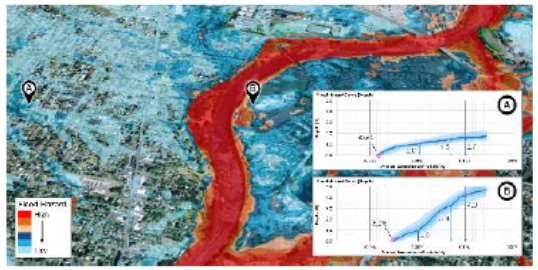
Technical Components Advanced

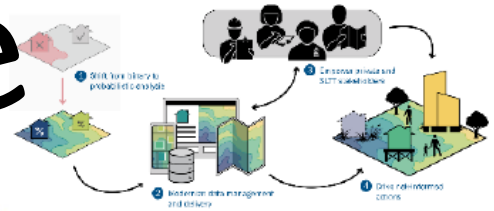
AEP, Losses & Uncertainty	Flexible Framework	National Coverage	BW-12 Req'ts

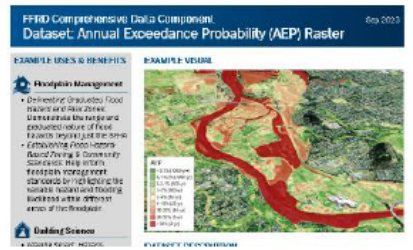
Visuals

of activities: 25









Full Slide

The FFRD FEMA program is a coordination of USACE, NOAA, FEMA, GIS, IT, OTHER AGENCIES, merging each expertise into a process than can be replicated and is good science.
It appears at first to be too complicated, yet good science is not always simple.

Future Flood Risk Data (FFRD)

Pre 2024 FIRMS

- 1% Annual Chance Flood Flow
- **Steady Flow Analysis used in most waterway FIRMs will be phased out**
- Each mainstem has separate H&H modeled tributaries

Post 2024 FIRMS under FFRD

- SST Multiple storms, continuous **2D simulations use statistical probabilities**
- One major watershed model with all tributaries included
- Maps would have no clear “In or Out”… Probabilistic Analysis – FFRD FIRMS can be used for mitigation projects, more accurate damage assessments, flood control projects, etc.

The FFRD program will take time to understand and implement.
It has a very positive future potential.

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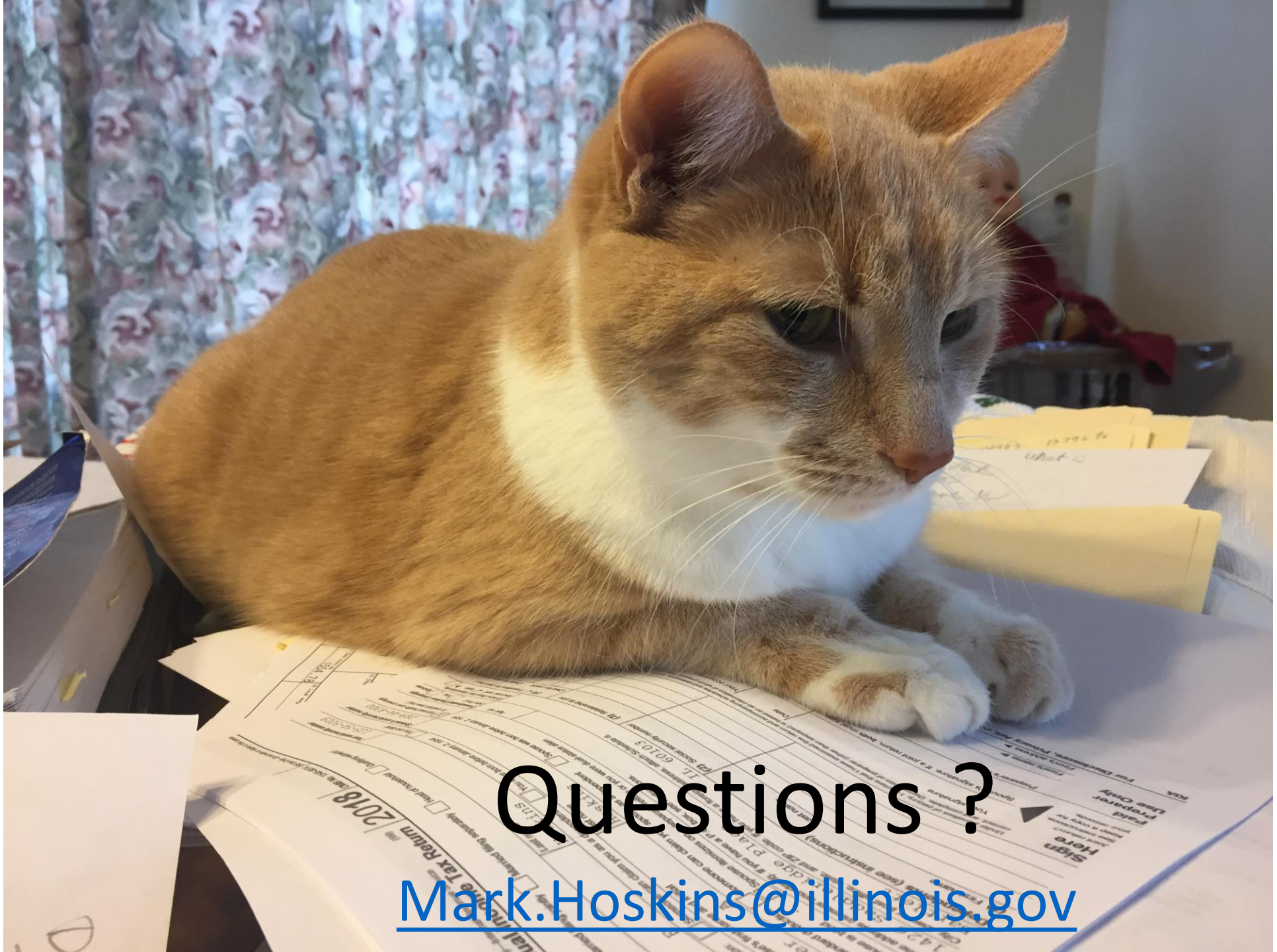

Questions ?

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