UPPER MISSISSIPPI RIVER – ILLINOIS FLOOD RISK ASSESSMENT

STRUCTURE DAMAGE FLOOD RISK ASSESSMENT ~ LOSS AVOIDANCE SILVER JACKETS STUDY

Rock Island District

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DEPARTMENT OF



Presentation Expectations....

The Illinois Silver Jackets team is sharing and encouraging the use of our collaboratively developed inter-agency flood mitigation tools.

Based on real data and science, the Upper Mississippi River communities can better plan and promote flood risk reduction mitigation activities such as elevation or buyout projects.

Products meet State and County Hazard Mitigation Plan expressed needs:

- a) Encourage intergovernmental cooperation, coordination, and communication to mitigate against all hazards;
- b) Build support capacity and commitment to prevent or reduce risks from all hazards for protection of Illinois' residents and their property;
- c) Mitigation Measures.

A synopsis of these projects is available on-line.....

https://www.mvr.usace.army.mil/Missions/Flood-Risk-Management/Silver-Jackets/

SILVER JACKETS GOALS ~

Continuous collaboration to identify and address risk management issues and solutions (annual call for proposals)

Increase / improve interagency risk communication

Leverage information / resources to develop new risk management tools

Provide coordinated hazard **mitigation assistance** (identified by state mitigation plans)

Identify gaps among agency programs in implementation of actions to address these issues.



ILLINOIS Illinois State Water Survey PRAIRIE RESEARCH INSTITUTE







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Upper Mississippi River – Illinois Flood Risk Assessment

(23 communities East Dubuque to Quincy, IL)

Structures-based Assessments

In partnership with the state of Illinois, the U.S. Army Corps of Engineers is conducting assessments which will provide accurate and accessible information to help communities become safer from floods.

The goal of this project is to develop information community officials can use to help make informed decisions and aid in mitigation planning.









Upper Mississippi River – Illinois Flood Risk Assessment

(23 communities East Dubuque to Quincy, IL)





COMMUNITY ENGAGEMENT AND RISK COMMUNICATION

Objectives ~

- Recognize and enhance activities to build risk awareness and understanding.
- Increase a communities ability to communicate risk.

Goal ~ Create a database deliverable to assist the affected communities and State understand and quantify risk behind the system by:

- Providing property level flood depth w/ associated loss and damage info
- Supporting mitigation plans and project prioritization
- Enhancing information quality provided to citizens regarding flood risk
- Facilitating rapid grant preparation to pursue federal dollars
- Integrating with ISWS's existing structural flood risk web application





SCOPE OF WORK – TASKS

Data Collection

 Initial coordination w/ city for parcel data, GIS data, ID structures, prepare surveyor maps.

Structure Survey

 Lowest entry point and first floor elevation for all residential, commercial and industrial structures within the .2% annual chance floodplain.

HEC-RAS Hydraulic Model

- Simulate frequency floods for 10% to .2% annual chance events
- Develop multi-frequency Flood Depth Grids

HAZUS Level 2 Analysis

Level 2 results – single event damages and average annualized loss

Following the path forged by ISWS...





DATA COLLECTION



Initial Identification of Structures

- LiDAR extracted or Microsoft building footprints
- Parcel Data from Counties
- Floodplain Boundary (FEMA NFHL)
- Latest and greatest imagery to confirm structure locations





STRUCTURE SURVEY

Field Maps to guide work

But really relying on survey crew's assessment of area







STRUCTURE SURVEY

Critical Data Collection

- First Finished Floor Elev.
- Low Entry Elev.
- Low Entry Ground Elev.
- Structure Photo
- Garage info and other details
- Foundational data for HAZUS generated loss estimates
- QA office assumptions: existence of structure and in/out of floodplain
- IDNR/OWR, Patrick Engineering, American Surveying & Engineering







HEC-RAS HYDRAULIC MODEL

Corps Water Management System (CWMS) Model

- Model adjusted to match Upper Mississippi River Flow Frequency Study, January 2004, U.S. Army Corps of Engineers
- CWMS model advantage is updated river bathymetry and LiDAR derived overbank areas







HAZUS ANALYSIS - OVERVIEW

A Brief Description of HAZUS

- FEMA Authored software that runs from within ArcGIS
- Provides hazard specific, standardized methods, to estimate potential losses
 - Earthquake
 - Hurricane
 - Flood
 - Tsunami
- Provides a data backend that includes default inventories for loss estimation
 - General building stock
 - Critical infrastructure
 - Transportation infrastructure etc.
- Provides great out-of-the-box functionality but...







HAZUS ANALYSIS – USER DEFINED FACILITIES

Assessor/Parcel Data Use

- Building Value: Assessed structure value
- Year Built: Where available

Key Assumed Values

- Content Value: % of building value based on occupancy type
- Tax Exempt Building Values: Estimated using HAZUS supplied equation. RSmeans price per square foot, by occupancy.

Field Name	Data Type	Description	
ID	Text	Field Size: 8	
Name	Text	Field Size: 40	
Address	Text	Field Size: 40	
City	Text	Field Size: 40	
State	Text	Field Size: 2	
ZipCode	Text	Field Size: 10	
Contact	Text	Field Size: 40	
Phone	Text	Field Size: 14	
Occupancy 🔶 🖊 🖊	Text	Field Size: 5	
BldgType 🔶 🦛	Text	Field Size: 15	
Cost 🔶 🗧	Currency	Field Size:	
YearBuilt 🔶 🔶	Number	Field Size: Integer	
Area	Number	Field Size: Single	
NumStories 🔶 🔶	Number	Field Size: Byte	
DesignLevel	Text	Field Size: 1	
FoundationType 🛛 🗧 🗧	Text	Field Size: 1	
FirstFloorHt 🔶 🔶	Number	Field Size: Double	
ContentCost 🔶 🔶	Currency	Field Size:	
BldgDamageFnId	Text	Field Size: 10	
ContDamageFnId	Text	Field Size: 10	
InvdamageFnId	Text	Field Size: 10	
FloodProtection	Number	Field Size: Long Integer	
ShelterCapacity	Number	Field Size: Integer	
BUPower	Yes/No	Field Size:	
Longitude	Number	Field Size: Decimal (11,6)	
Latitude	Number	Field Size: Decimal (11,6)	
County	Text	Field Size: 40	
Comment	Text	Field Size: 40	





US Army Corps of Engineers.

HAZUS ANALYSIS – USER DEFINED FACILITIES

Survey Data Use

- First Floor Height: First Floor Elev. Low Entry Ground Elev.
- Foundation Type: Photo interpretation
- Occupancy Type: Photo interpretation
- Building Type: Photo interpretation
- Number of Stories: Photo interpretation





HAZUS ANALYSIS – DEPTH DAMAGE FUNCTIONS

Background

- Relationship between depth of flooding and percent damage to a structure or content
- Produced by a variety of orgs/agencies, generally based on empirical studies
 - HAZUS allows user to define which to use

Use

- Flood depth First floor height = damage initiation
- Specific functions applied to specific combinations of building/structure attributes. commercial, 2 story, slab -vs- residential, 1 story, basement
- Damage percent is used to determine structure/content loss in USD from supplied structure/content/inventory values



HAZUS ANALYSIS – KEY LEVEL 2 COMPONENTS

Inputs

- Hazard data: flood frequency depth grids
- User defined structure inventory

Outputs

- Building Loss
- Content Loss
- Inventory Loss
- Percent damage for structure
- Average Annualized Damages

Additional Calculations – ISWS

- Annual percent chance of flooding
- Percent chance of flooding in 30 years





RESULTS – ROCK ISLAND COUNTY

Percent of Building Damaged – 0.2% Annual Chance Flood







RESULTS – ROCK ISLAND COUNTY

Building Loss in USD – 0.2% Annual Chance Flood







RESULTS – ROCK ISLAND COUNTY

City	Mean Bldg Damage %	Mean Cont. Damage %	Total Bldg Loss USD	Total Cont. Loss USD	Total Inv. Loss USD	Structure Count
MOLINE	17	21	26,961,000	34,528,000	7,673,000	1513
ANDALUSIA	28	34	5,515,000	3,788,000	989,000	202
EAST MOLINE	20	21	4,192,000	2,328,000	48,000	471
ROCK ISLAND	20	22	3,568,000	18,210,000	169,000	168
PORT BYRON	27	21	3,252,000	1,796,000	756,000	236
COAL VALLEY	42	37	3,004,000	2,339,000	1,070,000	414
HAMPTON	24	21	2,791,000	1,138,000	2,000	132
CARBON CLIFF	33	38	2,115,000	1,514,000	1,043,000	139
ILLINOIS CITY	47	54	1,756,000	1,380,000	-	34
CORDOVA	16	16	1,329,000	662,000	-	35
RAPIDS CITY	28	28	1,275,000	600,000	-	42
BARSTOW	11	13	739,000	729,000	-	53
TAYLOR RIDGE	16	20	643,000	589,000	39,000	42
HILLSDALE	5	8	624,000	1,255,000	53,000	348
MILAN	20	23	398,000	249,000	19,000	51
NEW BOSTON	74	77	205,000	106,000	-	3
N/A	13	50	127,000	579,000	24,000	14

Results based on 0.2% Annual Chance Flood HAZUS Analysis





PROJECT PROGRESS

Field Survey Progress

- Structures identified across study area
- Adams, Hancock, Henderson, Mercer, Rock Island, Whiteside and Carroll field work complete. Jo Daviess in progress
- Adams, Hancock, Henderson and Rock Island office processing complete

HAZUS Analysis Progress

- Preliminary results for Rock Island County
- Adams County data preparation underway
- Data prep and HAZUS analysis to continue as surveys roll in
- Anticipate completion Oct./Nov. 2019.





COMMUNICATION OF RESULTS

ISWS Web Mapping Application to Host

 Depth grids, HAZUS and survey results presented and housed in the SAFR web application

Stick around for the next presentation...





Thanks for listening.

Questions? Comments?



