NEBRASKA SILVER JACKETS

Many Agencies One Solution

Workshop on Reducing Your Community's Flood Risk
A Discussion of Nonstructural Flood Mitigation Strategies

Wednesday July 16, 2014

9:00am – 2:00pm

Agenda

1. Introductions and the Concept of Risk 9:00-9:30 – Tony D. Krause (USACE)
2. The Concept of Nonstructural – 9:30 – 10:00 - Randy Behm (USACE)
3. Path to Make it Happen – 10:00 – 10:10 Lori Laster (PMRNRD)
4. Cost Benefit Analysis – 10:10-10:30 Patrick Nowak (USACE)
5. Costs of Insurance – 10:30-11:15 Bob Butler (FEMA)
6. HMGP, FMA, and Hazard Mitigation Plans 11:15-11:45 – Mary Baker (NEMA)
7. Communicating the Benefits of Nonstructural – 12:45 – 1:15 (NDNR)
8. Examples of Implementation – 1:15-1:45 Lori Laster (PMRNRD)
9. Recap and Close 1:45 – 2:00 Tony Krause (USACE)

This page intentionally left blank.

Reducing your Communities Flood Risk
A Discussion on Nonstructural Flood Mitigation Strategies

July 16, 2014

Tony D Krause PE CFM
Hydraulic Engineer
Omaha District

Welcome

- Pre/Post Test
- Sign-in Sheet
- Scheduled Lunch 11:45-12:45
- Logistics
- Evaluation

BUILDING STRONG®

Agenda/Introductions

- Introductions
- Concept of Risk 9:00-9:30 – Tony D. Krause (USACE)
- Nonstructural – 9:30 – 10:00 - Randy Behm (USACE)
- Path to Make it Happen – 10:00 – 10:10 Lori Laster (PMRNRD)
- Cost Benefit Analysis – 10:10-10:30 Patrick Nowak (USACE)
- Costs of Insurance – 10:30-11:15 Bob Butler (FEMA)
- HMGP, FMA, and Hazard Mitigation Plans -11:15-11:45 Mary Baker (NEMA)
- Lunch
- Communicating the Benefits of Nonstructural – 12:45 – 1:15 (NDNR)
- Examples of Implementation – 1:15-1:45 Lori Laster (PMRNRD)
- Recap and Close 1:45 – 2:00 Tony Krause (USACE)

BUILDING STRONG®

Agenda/Introductions

- Introductions
- Concept of Risk 9:00-9:30 – Tony D. Krause (USACE)
- Nonstructural – 9:30 – 10:00 - Randy Behm (USACE)
- Path to Make it Happen – 10:00 – 10:10 Lori Laster (PMRNRD)
- Cost Benefit Analysis – 10:10-10:30 Patrick Nowak (USACE)
- Costs of Insurance – 10:30-11:15 Bob Butler (FEMA)
- HMGP, FMA, and Hazard Mitigation Plans -11:15-11:45 Mary Baker (NEMA)
- Lunch
- Communicating the Benefits of Nonstructural – 12:45 – 1:15 (NDNR)
- Examples of Implementation – 1:15-1:45 Lori Laster (PMRNRD)
- Recap and Close 1:45 – 2:00 Tony Krause (USACE)

Context and Overview

Implementation and Interactions

Examples

BUILDING STRONG®

Silver Jackets Program

- Formal and consistent strategy for an **interagency** approach to planning and implementing **flood risk reduction** measures.
- State based teams

Purpose/Goals

- Address State-prioritized risk issues
- Focus on life-cycle-preparation, response and mitigation
- Improve communication and collaboration
- Leverage existing resources and information - patchwork quilt
- Provide one stop multi-agency technical resource

Concept of Risk

Nebraska Silver Jackets – Nonstructural Outreach

July 16, 2014

Tony D Krause PE CFM
Hydraulic Engineer
Omaha District

Overview

- Definition of Risk
  - ►Probability
  - ►Consequences
- Risk Examples
- Flood Risk Management Life Cycle
- Risk Management Process
- Risk Treatment Options

Definition of Risk

Risk is the **likelihood** of occurrence and magnitude of **consequences**

Risk = f(Probability, Consequences)

Similar definitions are used in other fields

•Occupational Health & Safety Advisory Services: The product of the **probability** of a hazard resulting in an adverse event, times the **severity** of the event

•Finance: Risk includes the **possibility** of losing **some or all** of the original investment

•Food industry: The **possibility** that due to a certain hazard in food there will be an negative effect to a **certain magnitude**

•Insurance: A situation where the **probability** of a variable (such as burning down of a building) is known but when a mode of occurrence or the actual **value of the occurrence** (whether the fire will occur at a particular property) is not

•Securities trading: The **probability** of a **loss or drop** in value

•Workplace: Product of the **consequence** and **probability** of a hazardous event or phenomenon

Table 1. Federal agency definitions of risk.

AGENCY	DEFINITION OF *RISK*
NOAA	The impact of uncertain future events that could influence the achievement of an organization's objectives. Risk directly impacts on the service delivery objective of the organization, because it manifests as the chance of a loss[…]. (Source: "NOAA Risk Management Master," NOAA SECO 10-23-2005.
EPA	[…] EPA considers risk to be the chance of harmful effects to human health or to ecological systems resulting from exposure to an environmental stressor. A stressor is any physical, chemical, or biological entity that can induce an adverse response. (Source: {EPA} Risk Assessment Portal http://www.epa.gov/risk/
USACE	[…] risk is the likelihood of the occurrence and the magnitude of the consequences of an adverse event. Uncertainty can be thought of as the indefiniteness of some aspect of the values in the risk quantification process. (Source: Moser, D.A. (undated), "The use of risk analysis by the US Army Corps of Engineers," Institute for Water Resources, Alexandria.
USBR	Risk is the probability of adverse consequences. It is normally calculated as the product of the probability of the load, the probability of failure (given the load), and the consequences (given that failure occurs). (Source: USBR (2009). "Best practices—Glossary," http://www.usbr.gov/ssle/damsafety/Risk1
NRCS	Risk is exposure to an undesired event. It can be expressed in probability that the event will happen, often during a calendar year. (Source: Flood Damage Assessment Tools http://www.economics.nrcs.usda.gov/technical/models/flood/

Source: Quantifying Flood Risk (Gregory B. Baecher, 2009)

Definition of Risk

Risk = f(**Probability**, Consequences)

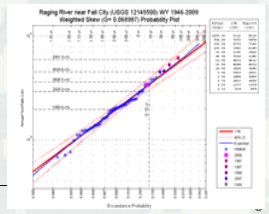
Probability is a measure or estimation of how likely it is that something will happen or that a statement is true.

Definition of Risk

Risk = f(**Probability**, Consequences)

Event probability vs. Life Cycle Probability

Annual Non-Exceedance probability	Recurance Interval	Probability of Exceedance in 10 year period	Probability of Exceedance in 30 year period	Probability of Exceedance in 50 year period
%	year	%	%	%
0.2%	500	2%	6%	10%
1%	100	10%	26%	39%
2%	50	18%	45%	64%
10%	10	65%	96%	99%



Definition of Risk

Risk = f(Probability, **Consequences**)

- **Protection of Life**
  - Some analysis include economics some don't
  - Mitigation options: warning systems, evacuation routes
  - Tools for computation of life-loss are being developed (LIFESim)
- **Critical Facilities**

(Concepts from Further Advice on EO11988)

  - Materials storage - If flooded, would this facility create an added dimension to the disaster (chemical storage)
  - Large gathering areas – would lead time/mobility permit sufficient evacuation (hospitals, schools, nursing homes)
  - Essential and irreplaceable facilities
    - Records
    - Utilities (water, power)
    - Emergency services (Police, EMT, hospital, etc)
- **Personal/Sentimental Consequences**
  - Personal/Sentimental consequences vary significantly from person to person

BUILDING STRONG®

Definition of Risk

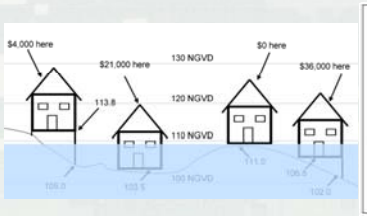
Risk = f(Probability, **Consequences**)

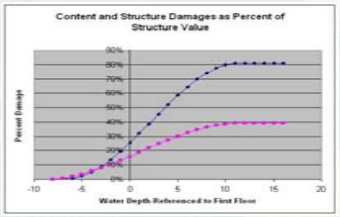
BUILDING STRONG®

Definition of Risk

Risk = f(Probability, **Consequences**)

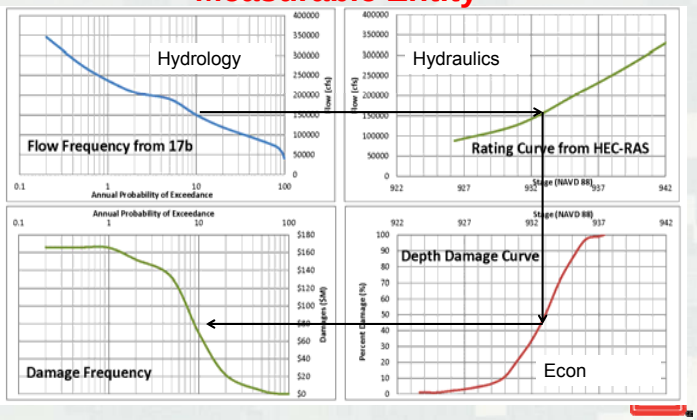
- **Financial**
  - National Economic Development (NED)
  - Common Financial Damage Sources:
    Buildings, Contents, Displacement, Loss of Income, Value of Service
  - Tools to compute financial damage
    FEMA BCA tool – USACE FDA – USACE FIA – Oracle Crystal Ball





BUILDING STRONG®

Converting Risk from a Concept to a Measurable Entity



BUILDING STRONG®

Table 1 - USACE Levee Safety Action Classification Table* 08 February 2011

Levee Safety Action Class	Characteristics of this class	Actions for levees in this class (Additional actions apply for 1) USACE Operated, and Maintained Levee Systems, and 2) Other Levee Systems in USACE Program
I Urgent and Compelling (Unsafe)	Probability of inundation due to breach prior to overtopping in combination with loss of life, economic, or environmental consequences results in extremely high risk; OR Combination of life, economic, or environmental consequences with the probability of inundation due to overtopping with or without subsequent breach, is extremely high	Immediately perform levee system inspection, expedite confirmation of USAC classification, communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public, stress improved floodplain management to include: immediate verification that warning, evacuation and emergency action plans are viable; recommend purchase of flood insurance; and vigilant levee monitoring program. 1) Take urgent action to reduce the likelihood of a breach prior to overtopping and mitigate overtopping and breach consequences through implementation of interim risk reduction measures. Support portfolio priorities for remediation. 2) Advise responsible entity to take urgent action to develop and implement interim risk reduction and remediation plans. Support portfolio priorities for remediation.
II Urgent (Unsafe or Potentially Unsafe)	Probability of inundation due to breach prior to overtopping in combination with loss of life, economic, or environmental consequences results in very high risk; OR Combination of life, economic, or environmental consequences with the probability of inundation due to overtopping with or without subsequent breach, is very high	Perform levee system inspection; verify classification; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verification that warning, evacuation and emergency action plan are viable; recommend purchase of flood insurance; and vigilant levee monitoring program. 1) Take immediate action to implement interim risk reduction measures; develop and implement remediation plan. Support portfolio priorities for remediation. 2) Advise responsible entity to take immediate action to develop and implement interim risk reduction and remediation plans. Support portfolio priorities for remediation.
III High Priority (Potentially Unsafe)	Probability of inundation due to breach prior to overtopping in combination with loss of life, economic, or environmental consequences results in moderate to high risk; OR Combination of life, economic, or environmental consequences with the probability of inundation due to overtopping with or without subsequent breach, is high	Verify inspection is current; confirm classification; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verify that warning, evacuation, and emergency action plans are viable; recommend purchase of flood insurance; develop and execute levee monitoring program. 1) Implement interim risk reduction measures; schedule development of remediation plan and support portfolio priorities. 2) Advise responsible entity on development of interim risk reduction and remediation plans. Support portfolio priorities.
IV Priority (Marginally Safe)	Probability of inundation due to breach prior to overtopping in combination with loss of life, economic, or environmental consequences results in low risk; OR Combination of life, economic, or environmental consequences with the probability of inundation due to overtopping with or without subsequent breach, is low to moderate. The levee system does not meet all essential USACE guidelines.	Continue routine levee safety activities; stress improved floodplain management to include: verify that warning, evacuation, and emergency action plans are viable; recommend purchase of flood insurance; develop and execute levee monitoring program. 1) Support portfolio priorities. 2) Support portfolio priorities.
V Normal (Adequately Safe)	There is a very low probability of inundation due to breach prior to overtopping. Levee system is considered adequately safe, meeting essential USACE guidelines; AND Residual risk is considered tolerable	Continue routine levee safety activities; normal inspections, stress improved floodplain management to include: operation and maintenance; annually ensure that warning, evacuation, and emergency action plan are functionally tested; purchase of flood insurance; maintain levee monitoring program.

* At any time, a levee from any action class can become an emergency requiring activation of the emergency action plan

BUILDING STRONG®

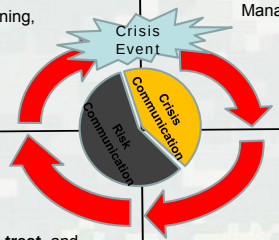
Flood Risk Management Life Cycle

Prevention / Preparation

Floodplain Management, Training, Readiness

Response

Management during the crisis event



Mitigation

Activities to identify, assess, **treat**, and monitor risk through transfer or reduction through the Risk Management Process

Rebuild/Recovery

Activities to **restore** immediately after a flood

BUILDING STRONG®

Flood Risk Management Life Cycle

Communication about crisis events that will occur in the future

Objective: Increase resiliency of community through the implementation of Risk Informed Decisions

- *Audience is not captive*
- *Audience will focus on positive information and negate negative information (normalcy bias)*
- *Audience will focus on probability for High Impact Low Frequency risk*

Communication about an imminent or ongoing crisis

Objective: Assist community in minimizing impacts of an ongoing crisis

- *Audience is paying attention but stressed and processes information below education level*
- *Audience will focus on negative information*
- *Audience will focus on consequence*
- *Audience will actively seek additional sources of information*

BUILDING STRONG®

Risk Management Process

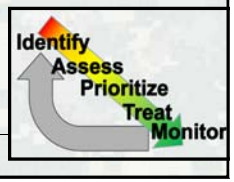
The process of making

Risk Informed Decisions

The Risk Management Process is the **only** place in the life cycle where existing risk is treated. It also occurs at a time when the audience is not engaged or in a mindset to take action.

Risk management is a process by which decision makers reduce, offset, or accept risk and subsequently make decisions that weigh overall risk against mission benefits.

Source: Defense Critical Infrastructure Program



Risk Management Process

The process of making

Risk Informed Decisions

1. Identify, characterize threat
2. Assess the vulnerability of critical assets to specific threats
3. Determine the risk
4. Identify ways to treat those risks
5. Prioritize risk reduction measures based on a strategy

(Source: ISO 31000 Risk management – principles and guidelines)

BUILDING STRONG®

Risk Treatments

- 3 types of risk treatment
  - ►Reduce – (risk reduction, risk mitigation)
  - ►Offset – (transfer, insurance)
  - ►Accept

BUILDING STRONG®

Risk Treatment

Risk Reduction – to modify the risk you either alter the probability or consequences

Risk = Probability x Consequences

Structural Flood Risk Reduction
-Levees
-Dams
-Channels

Nonstructural Flood Risk Reduction
-Elevation
-Dry/Wet flood proofing
-Buyout/Acquisition

Risk Treatment

Risk Transfer

- **Insurance**: equitable transfer of the risk of a loss, from one entity to another in exchange for payment
- Actuarial rates are based on risk

NATIONAL FLOOD INSURANCE PROGRAM

Overview

- Definition of Risk
  - Probability
  - Consequences
- Risk Examples
- Flood Risk Management Life Cycle
- Risk Management Process
- Risk Treatment Options
  - Risk Reduction
    - Structural and Nonstructural
  - Risk Transfer
  - Risk Acceptance

BUILDING STRONG®

This page intentionally left blank.

The Concept of Nonstructural Flood Risk Management

Randall L. Behm P.E., CFM
USACE – Omaha District
Chair – Nonstructural Flood Proofing Committee
July 2014

US Army Corps of Engineers
BUILDING STRONG®

Nebraska Flooding; Wide, Muddy, and Dangerous




BUILDING STRONG®

Is this the <u>new</u> Norm?

(Average Damages $46B Annually [2006-2013])


Hurricane Sandy


Colorado Flooding


Hurricane Katrina


Missouri River Flooding

BUILDING STRONG®

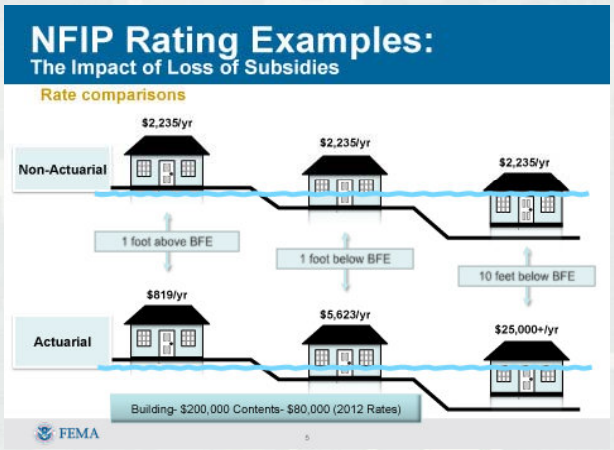
Flood Risk

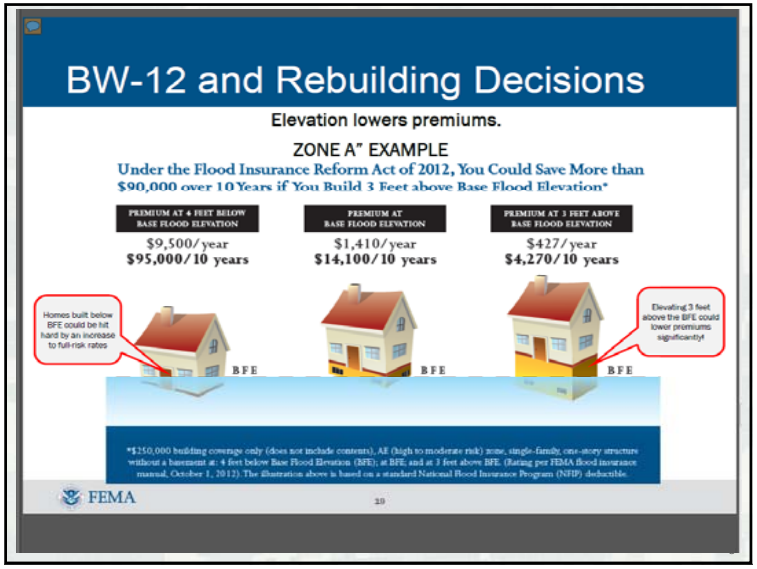
Risk = *f* [(Probability of Flooding) x (Consequences)]

(Probability of Flooding) is the frequency of flooding or how often does flooding occur in a particular location. Reduce the frequency of flooding and risk is reduced.

(Consequences) are the potential damages associated with flooding. The structures (residential, commercial, public, and industrial), land use (agricultural, urban, public) , and infrastructure (highways, roads, rail, utilities) make up the potentially damageable assets. Reduce the consequences of flooding and risk is reduced.

BUILDING STRONG®





Definitions

Nonstructural: Engineered measures which adapt to the natural floodplain and the inherent features of the floodplain without changing the characteristics of the flood. Generally considered to be in the form of elevation, relocation, acquisition, dry flood proofing, wet flood proofing, nonstructural berms or flood walls.

Structural: Measures such as levees, reservoirs and channel modifications which change the characteristics of flooding, by altering the frequency of flooding.

FRAM: FLOOD RISK ADAPTIVE MEASURES

BUILDING STRONG®

* Caution Caution Caution *

While nonstructural flood risk reduction measures may result in lower property damages, there could be potential restrictions which the property owner needs to investigate prior to implementation:

- **Local Ordnances**
- **State Regulations**
- **National Flood Insurance Program (NFIP)**

Work with your local Floodplain Administrator

Flood insurance is highly recommended, even for structures which may have been retrofitted with nonstructural measures, because not all floods are the same frequency.

BUILDING STRONG®

Common Nonstructural Techniques

- Elevation
- Relocation / Buyout / Acquisition *(Floodplain Evacuation)*
- Berms and Floodwalls (*when are these nonstructural?)*
- Dry Flood Proofing
- Wet Flood Proofing

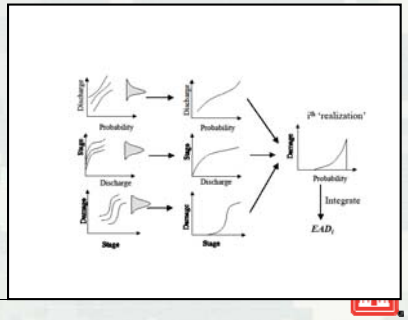
These techniques may be used to mitigate existing structures or for design and construction of new structures to reduce flood risk.
&
Structures should be vacated during a flood event.

Floodplain Management Techniques

- Flood Warning System
- Emergency Evacuation/Preparedness Plans/Systems
- National Flood Insurance Program (NFIP)
- Regulation of Flood Prone Land

What Analyses are Required for USACE Engineering of Nonstructural Measures

- **Hydrology**
- **Hydraulics**
- **Conduct Structure Inventory**
- **Identify Potential Nonstructural Measures**
- **Perform Economic Analyses**



Elevation Examples

Piers, Post, Columns & Piles

Extended Foundation Walls

Elevation Examples

Utilizing Fill

Concrete Slab

BUILDING STRONG®

Relocation / Acquisition / Buyout

- Eliminates Risk
- New use / opportunities: Open space – Recreation – Environmental Restoration

BUILDING STRONG®

Berms / Floodwalls

Not FEMA Accredited - Requires Interior Drainage - Reduces Risk

BUILDING STRONG®

Dry Flood Proofing

This measure involves sealing the walls of a structure with waterproofing compounds, impermeable sheeting or other materials and using closures for covering and sealing openings from flood waters

Simply stated…Make the Structure Water Tight

- Flood depths 3 feet or less
- Structurally sound buildings
- New structure design and construction
- Retrofitting existing buildings
- No basement or crawl space
- Check valve on building sewer
- Possible interior drainage and emergency power require.
- **May reduce insurance rates on nonresidential structures – (Not residential!)**

BUILDING STRONG®

Dry Flood Proofing Examples

BUILDING STRONG®

Wet Flood Proofing Examples

Floyd County Courthouse – Prestonsburg, KY

Elevated Utilities

Historical Structure Retrofit – Darlington, WI

BUILDING STRONG®

Floodplain Management & Regulation of Flood Prone Land

Floodplain Management Plan

- Manage development and construction in floodplain
- Plan future development
- Enforcement of regulations!

Regulation of Flood Prone Land

- Building Codes
- Zoning

Low Impact Development:

- Reduce / Retain storm run-off
- Green construction

Planter Box

Green Space

Porous Pavement

BUILDING STRONG®

FRM Matrix

Used to evaluate and select flood risk management measures based on:

- Structure Characteristics
- Flood Characteristics
- Site Characteristics
- Other - (Economic/Environmental /Social Characteristics)

NFPC Website:
http://www.usace.army.mil/Missions/CivilWorks/ProjectPlanning/nfpc.aspx

BUILDING STRONG®

USACE Flood Risk Management Authorities

Studies

- **Flood Plain Management Services (FPMS)**
  - **Cost Share: 100% Federal**
- **Planning Assistance to States (Section-22)**
  - **Cost Share: 50% Federal 50% Sponsor**

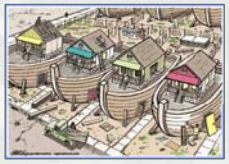
Studies to Construction

- **Continuing Authorities Program ($15M Limit)**
  - **Cost Share Study: 50% / 50%**
  - **Cost Share Construction: 65% Federal 35% Sponsor**
- **General Investigations Program (> $15M)**
  - **Cost Share Study: 50% / 50%**
  - **Cost Share Construction: 65% Federal 35% Sponsor**

BUILDING STRONG®



QUESTIONS?



Randall L. Behm P.E., CFM
Randall.l.behm@usace.army.mil
(402) 995-2322

BUILDING STRONG®

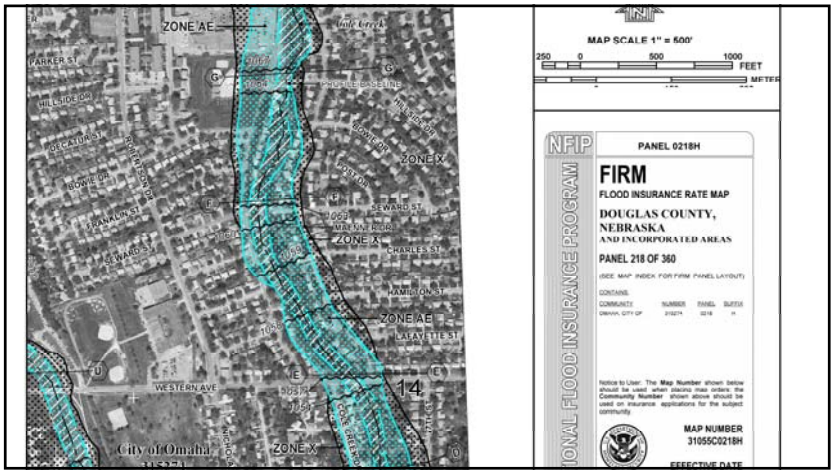
Path to Make it Happen

LORI ANN LASTER, CFM

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

Site Selection

- Special Flood Hazard Area
- Documented Damages



Funding

- FEMA Hazard Mitigation Assistance
  - Hazard Mitigation Grant Program
  - Pre Disaster Mitigation
  - Flood Mitigation Assistance
- USACE
  - Section 205 – Small Flood Risk Management
- Small Business Administration Loans
- HUD Community Development Block Grant-Disaster Recovery
- Flood Insurance – Increased Cost of Compliance

Benefit-Cost Analysis

Financial Benefits > Cost of Project

Benefit-Cost Analysis

- Project Costs
  - Land Acquisition
  - Construction Costs
  - Environmental Remediation
  - Contract Services
  - Other Ancillary Costs
    - Surveying
    - Permitting
    - Legal Services
    - Renter Displacement

Benefit-Cost Analysis

- Project Benefits
  - Value of Damages Prevented
    - Structure Replacement Value
    - Value of Structure Contents
  - Potential Displacement Costs
  - Value of Services Provided
  - Environmental Benefits

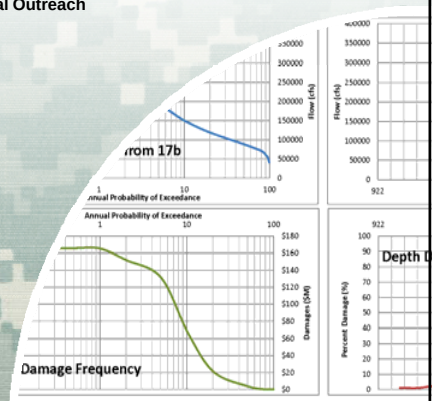
Questions

Benefit Cost Analysis

Nebraska Silver Jackets – Nonstructural Outreach

July 16, 2014

Patrick Nowak PE
Economist
Omaha District



US Army Corps of Engineers
BUILDING STRONG®

Overview

- Why do we use Benefit Cost Analysis?
- What is does this analysis quantify?
- What is the process?
- What tool are available?

Why do we use Benefit Cost Analysis

- Expected Value Decision Making
  - ►*"Decision making is what distinguishes engineers from scientists" – George Hazelrigg*
  - ►We must be asking and answering a question, in most cases the question is: *Is this investment worth the cost?*
  - ►We must establish criteria to answer that question.

Why do we use Benefit Cost Analysis

- "The Federal objective of water related and land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment" Principles and Guidelines
- "Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units…"

Why do we use Benefit Cost Analysis

- "The Federal objective of water related and land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment" Principles and Guidelines
- "Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units…"

ANSWER: TO RECEIVE FEDERAL ASSISTANCE IN IMPLEMENTATION

What is Quantified in Analysis

- Types of consequences
  - Life and Health
    - Loss of Life
    - Critical Facilities
  - Financial
    - Damage to Buildings
    - Contents,
    - Displacement
    - Loss of Income
    - Value of Service
  - Emotional/Sentimental

Typical analysis is focused at Financial Impacts

1:35-1:50

What is Quantified in Analysis

Risk = f(Probability, **Consequences**)

•Protection of Life
- •Some analysis include in economics some don't
- •Mitigation options: warning systems, evacuation routes
- •Tools for computation of life-loss are being developed (LIFESim)

•Critical Facilities

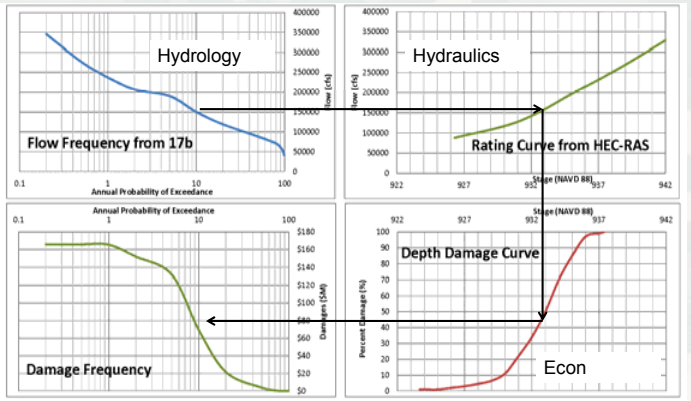
(Concepts from Further Advice on EO11988)
- •Materials storage - If flooded, would this facility create an added dimension to the disaster (chemical storage)
- •Large gathering areas – would lead time/mobility permit sufficient evacuation (hospitals, schools, nursing homes)
- •Essential and irreplaceable facilities
  - •Records
  - •Utilities (water, power)
  - •Emergency services (Police, EMT, hospital, etc)

•Personal/Sentimental Consequences
- •Personal/Sentimental consequences vary significantly from person to person

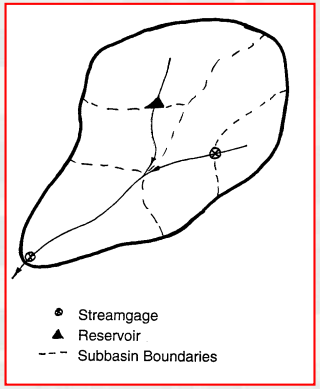
Basics of Benefit Cost Analysis

- a systematic approach to estimating the strengths and weaknesses of alternatives that satisfy transactions, activities or functional requirements for a business. It is a technique that is used to determine options that provide the best approach for the adoption and practice in terms of benefits in labor, time and cost savings etc

Converting Risk from a Concept to a Measurable Entity

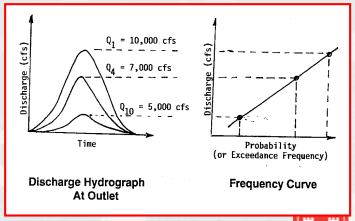


Hydrologic Studies



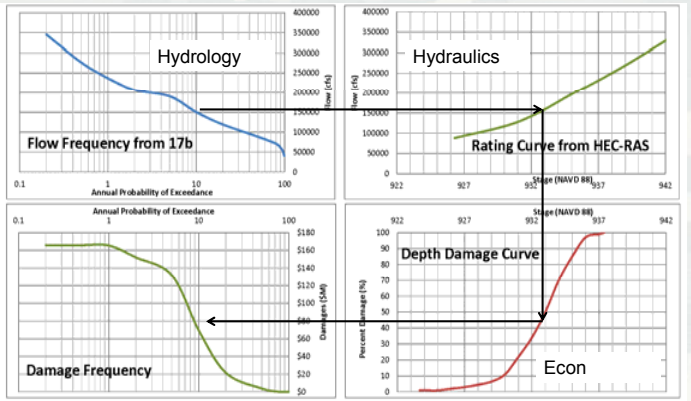
Sub-basin Delineations

- Stream Topology
- Streamgage Locations
- Project Locations

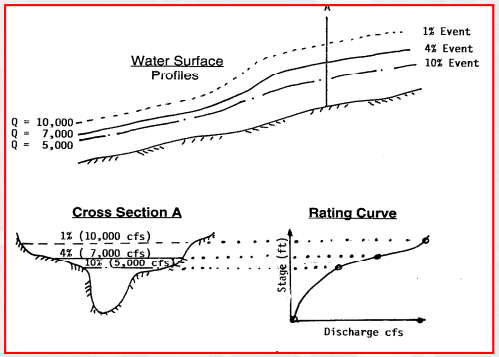


Slide taken from: Overview of Risk Analysis for Flood Risk Management Projects, Matthew McPherson P.E., D.WRE Institute for Water Resources

Converting Risk from a Concept to a Measurable Entity

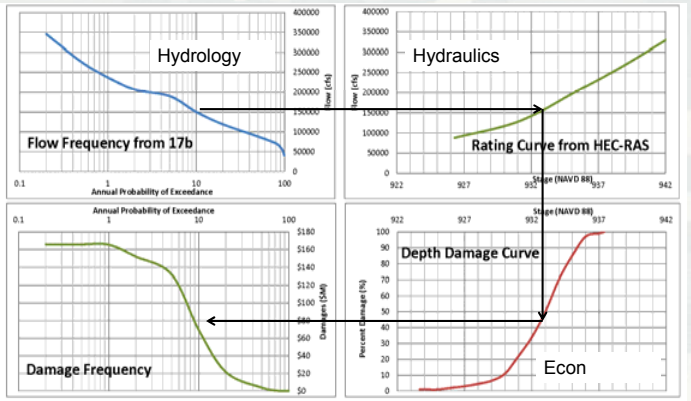


Hydraulic Studies

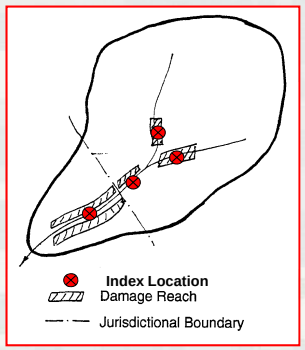


Slide taken from: Overview of Risk Analysis for Flood Risk Management Projects, Matthew McPherson P.E., D.WRE Institute for Water Resources

Converting Risk from a Concept to a Measurable Entity



Economic Studies



Damage Reach Delineation

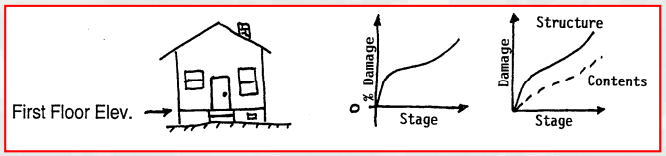
- Consistent Frequency Curves
- Project Locations
- Jurisdictional Boundaries/ Reporting Conditions

Index Location

- Stream station used to specify discharge-frequency, stage-discharge, and stage-damage relationships with uncertainty for that damage reach
- Normally where data is deemed most reliable, such as a streamgage location.

Slide taken from: Overview of Risk Analysis for Flood Risk Management Projects, Matthew McPherson P.E., D.WRE Institute for Water Resources

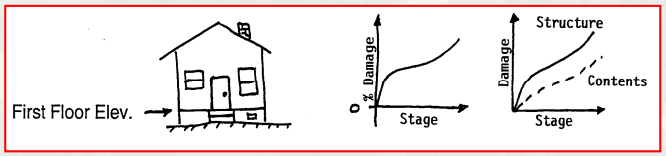
Economic Studies



Structure Inventory Data

- Structure ID
- Location/Address
- Structure Value
- Content Ratio
- Damage Category
- Depth-Damage Function
- First Floor Stage
- Ground Stage
- Coordinates
- Stream Station

Economic Studies

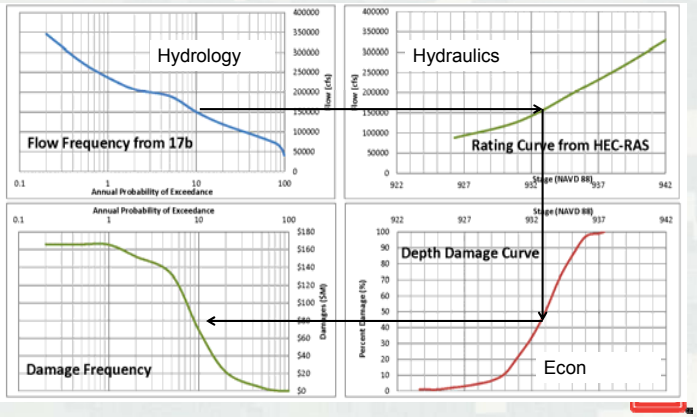


Structure Inventory Data

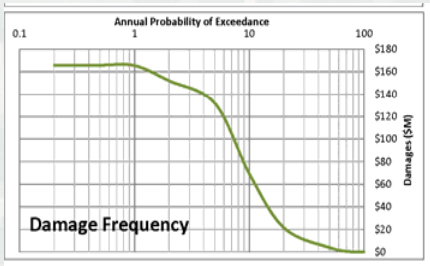
- There are curves available at:
- http://planning.usace.army.mil/toolbox/library/IWRServer/92-R-3.pdf
- http://planning.usace.army.mil/toolbox/library/EGMs/egm04-01.pdf
- http://www.wseas.us/e-library/transactions/environment/2009/28-907.pdf

Slide taken from: Overview of Risk Analysis for Flood Risk Management Projects, Matthew McPherson P.E., D.WRE Institute for Water Resources

Converting Risk from a Concept to a Measurable Entity

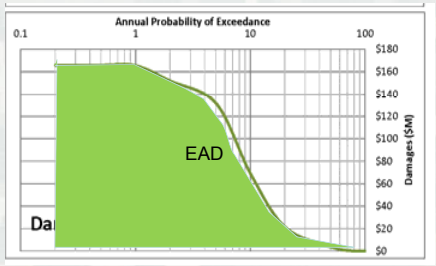


Benefit Cost Analysis



- Combining three curves to get damage frequency
- Area under the damage frequency curve = EAD
- EAD= Expected Annual Damage = the annualized financial cost of living in a risk area

Benefit Cost Analysis



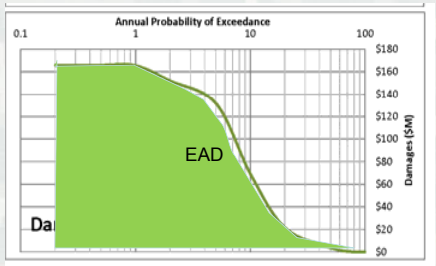
- Combining three curves to get damage frequency
- Area under the damage frequency curve = EAD

EAD= Expected Annual Damage
•the annualized financial cost of living in a risk area
•Mother Nature's Tax for living at a location prone to flood damage

Benefit Cost Analysis

- EAD as a way of thinking about Insurance
- If cost of insurance is less than EAD who is covering the surplus damages?
- How do insurance companies protect against surplus risk being transferred to them?

Benefit Cost Analysis



Change in EAD from Pre to Post Project = Benefit
Annualized Cost of Investment = Cost

BCR = Benefit Cost Ratio = Benefit/Cost

Benefit Cost Analysis

- Uncertainty – sometimes the what you know about what you don't know is important

HEC-FDA Uncertainty

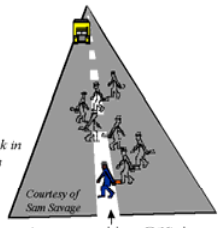
Example: Drunk on Highway

X = Position in road

$f(X)$ = State of the drunk
upright or flattened

$f[E(X)]$ = Upright
the state of the drunk in his average position

$E[f(X)]$ = Flattened
the average state of the drunk



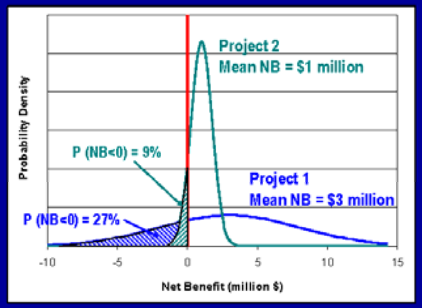
Average position, $E(X)$, is the center line.

Moral:
*Sometimes the **consequences** of diverging from the mean are large, and must be represented in the analysis.*

Slide Taken from Beth Faber PhD PE (HEC)

HEC-FDA Uncertainty

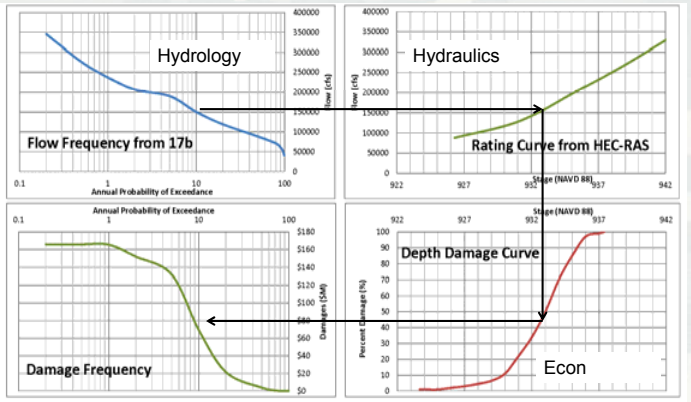
Net Benefit Distributions for 2 Projects



Corps of Engineers
IWR-HEC

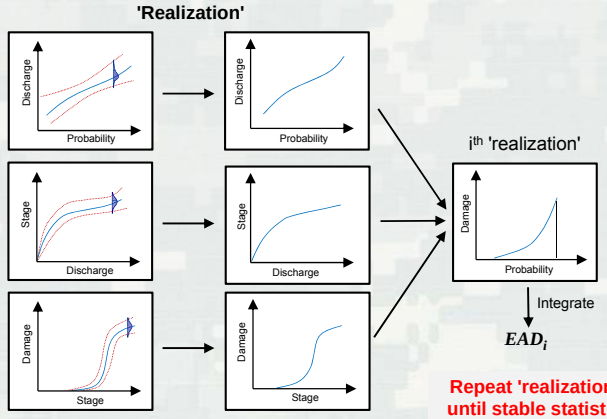
Slide Taken from Beth Faber PhD PE (HEC)

Converting Risk from a Concept to a Measurable Entity



BUILDING STRONG®

Risk Analysis using Monte Carlo



Slide taken from: Overview of Risk Analysis for Flood Risk Management Projects, Matthew McPherson P.E., D.WRE Institute for Water Resources

BUILDING STRONG®

Nonstructural Measures in BCA

Risk Reduction – to modify the risk you either alter the probability or consequences

Risk = Probability x Consequences

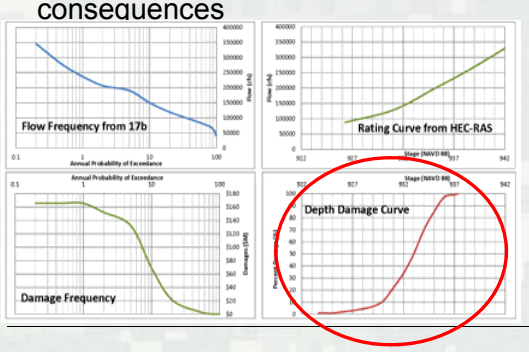
Structural Flood Risk Reduction
-Levees
-Dams
-Channels

Nonstructural Flood Risk Reduction
-Elevation
-Dry/Wet flood proofing
-Buyout/Acquisition

Benefit Cost Analysis

Risk = f(Probability, **Consequences**)

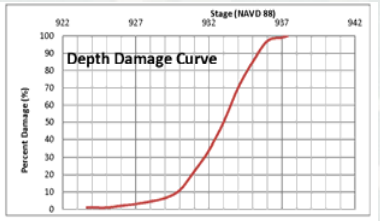
- Nonstructural approaches modify the consequences



BUILDING STRONG®

Types of Nonstructural

- Elevation
- Relocation
- Nonstructural Berms
- Dry Flood proofing
- Wet Flood proofing



Each alternative impacts the Depth Damage curve in a different way

BUILDING STRONG®

Claimable Benefits

- Reduction in primary flood damages to structures and contents

Slide taken from: *Formulating and Evaluating Measures for Flood Risk Management, USACE Prospect Course*

BUILDING STRONG®

Floodwarning

Run away! Run away!

Claimable Benefits

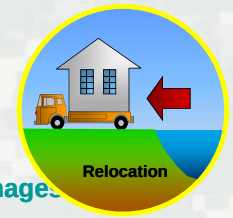
- Reduction in primary flood damages to contents
- Reduction in damages to vehicles

Slide taken from: *Formulating and Evaluating Measures for Flood Risk Management, USACE Prospect Course*

BUILDING STRONG®

Relocation:
Floodplain Evacuation/Buyout

Claimable Benefits



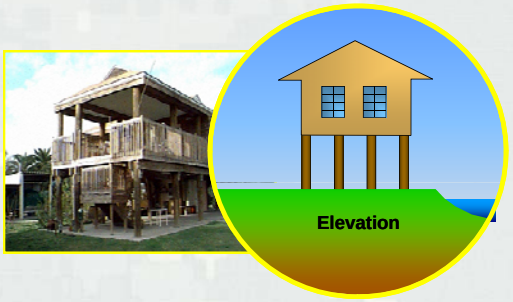
- Reduction in primary flood damages to structures and contents
- Reduction in FIA overhead
- Value of new use of vacated land
- Recreation benefits
- Reduction in damage to public property, utilities, roads
- Reduction in post-emergency evacuation/cleanup costs

Slide taken from: *Formulating and Evaluating Measures for Flood Risk Management, USACE Prospect Course*

BUILDING STRONG®

Elevation:

Elevate structure on fill/beams/etc.
Raising-in-Place, Raising to Target

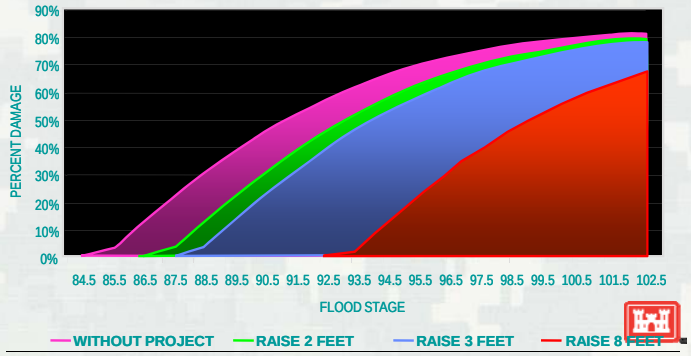


Raising-in-Place

Structure Flood Proofed by Abandoning First Floor and Moving Living Quarters to Upper Levels

Stage-Percent Damage Curve

(Comparison of Raising a 1-story, No Basement Residential Structure)



Hypothetical Example

Evaluate and Optimize Raising Residential Structure

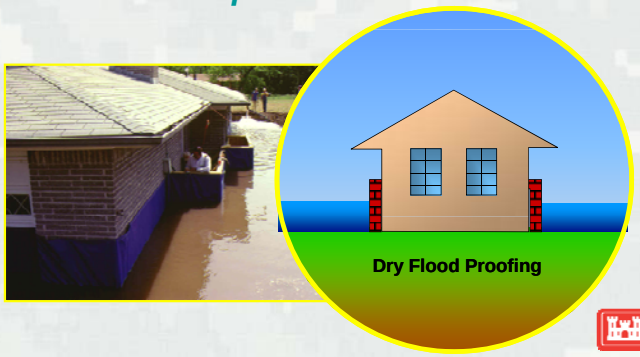
	DAMAGES	DAMAGES REDUCED	PWE BENEFITS	PWE COSTS	PWE NET EXCESS BENEFITS	AAEV NET EXCESS BENEFITS
EXISTING	$8.51					
RAISE 2 FT	$2.34	$6.17	$92.41	$79.43	$12.98	$0.87
RAISE 3 FT	$0.23	$8.28	$123.98	$82.69	$41.29	$2.76
RAISE 8 FT	$0.00	$8.51	$127.37	$96.39	$30.98	$2.07

Optimization of Raising-in-Place

Net Excess Average Annual Equivalent Benefits Comparison-- Raising in Place

Dry Flood Proofing:

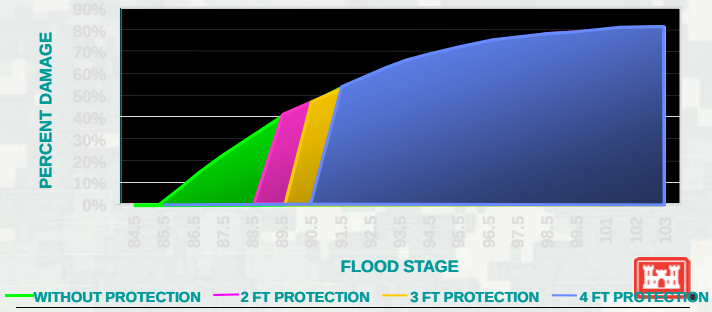
Seal/Waterproof



Dry Flood Proofing :

seal/waterproof and Levees, Floodwall, and Berms

Comparison of Stage-damage for Flood Proofing a 1-story, No Basement, Residential Structure



Dry Flood Proofing :

Seal/waterproof also

Levees, Floodwalls, and Berms

Optimization of Protection Height

	DAMAGES	DAMAGES REDUCED	PWE BENEFITS	PWE COSTS	PWE NET EXCESS BENEFITS	AAEV NET EXCESS BENEFITS
EXISTING	$8.51					
2 FT PROTECTION	$1.71	$6.80	$101.76	$11.20	$90.56	$6.05
3 FT PROTECTION	$0.50	$8.00	$119.82	$16.40	$103.42	$6.91
4 FT PROTECTION	$0.00	$8.51	$127.37	$26.70	$100.67	$6.72

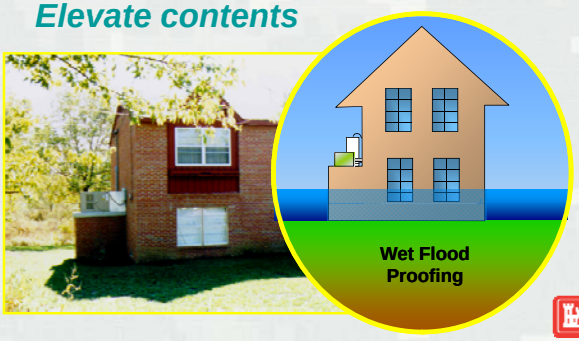
Dollars X 1,000

Optimization of Protection Height

Net Excess Average Annual Equivalent Benefit Comparison -- Floodwall Height

Wet Flood Proofing:

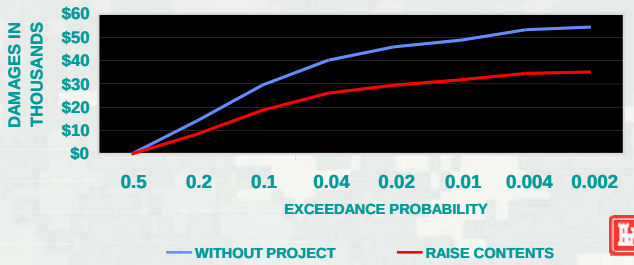
Flood Proof first floor, Elevate contents



Wet Flood Proofing:

Hypothetical - Change to Content Damages Only

Damage Frequency Curve For One-story, No Basement Residential Structure $75,000 Value

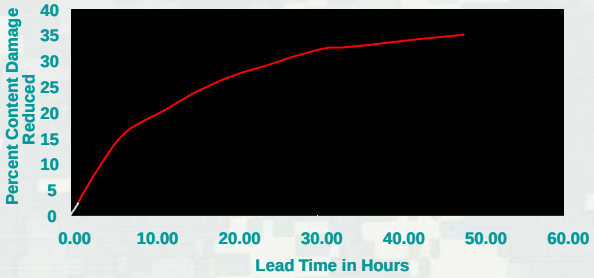


Flood Warning Response

WARNING TIME IN HRS	PERCENT CONTENT DAMAGE REDUCTION	AAEV CONTENT DAMAGES REDUCED
0.00	0.00	$0.00
0.25	0.63	$0.02
0.50	1.25	$0.04
0.75	1.88	$0.06
1.00	2.50	$0.08
6.00	15.00	$0.47
12.00	21.00	$0.66
18.00	26.00	$0.81
24.00	29.00	$0.91
30.00	32.00	$1.00
36.00	33.00	$1.03
42.00	34.00	$1.06
48.00	35.00	$1.10

Flood Warning

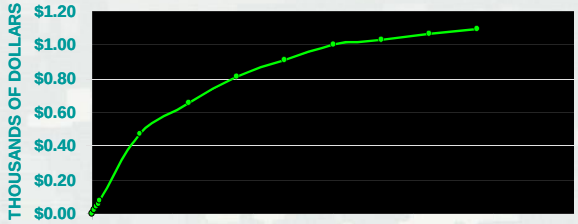
Lead Time Damages Prevented



Day, Harold. "Flood Warning Benefit Evaluation-Susquehanna River Basin," NOAA Tech Memo, WBTM HDRO-10, March, 1970.

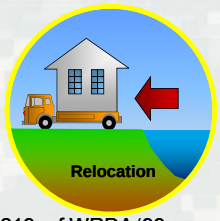
Flood Warning:
Damage Reduction Estimate

Average Annual Equivalent Content Damages Reduced For One-story, No Basement, Residential Structure, $75,000 Value



Relocation:
Floodplain Evacuation/Buyout

Claimable Benefits



- Reduction in primary flood damages to structures and contents
- RE: Implementation Guidance for Section 219 of WRDA '99
- Reduction in FIA overhead
- Value of new use of vacated land
- Recreation benefits
- Reduction in damage to public property, utilities, roads
- Reduction in post-emergency evacuation/cleanup costs

Implementation Guidance for Section 219, WRDA '99

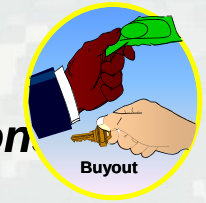
Nonstructural Flood Control Projects

- **Directs that Corps calculate benefits for nonstructural flood damage reduction similarly to methods for structural projects**
- **Corps now calculates benefits for evacuation/relocation projects as *total flood damages reduced*, not just the externalized flood damages as previously required.**
- **Real Estate costs used for *benefit-cost calculation* will use comparable flood-free lands costs in the valuation of floodplain land.**

Relocation:

Floodplain Evacuation/Buyout

Other Consideration



- **Opportunities for Ecosystem Restoration, however, ecosystem restoration may require a separate local sponsor, depending on situation and sponsor's extent of authority**
- **Need to act swiftly to execute buyouts once the public becomes aware of the impending action**
- **Need to demolish structures and clear debris immediately to minimize vandalism and protect the surrounding neighborhood**

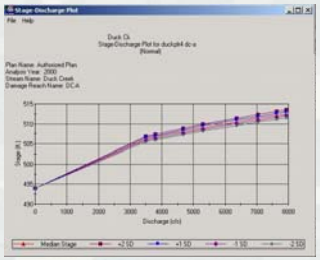
Slide taken from: *Formulating and Evaluating Measures for Flood Risk Management, USACE Prospect Course*

What tools perform this analysis?

- HEC-FDA
- FEMA BCA
- Oracle Crystal Ball

What tools perform this analysis?

- HEC-FDA
  http://www.hec.usace.army.mil/software/hec-fda/
  - ► Pros
    - Works with large data sets
    - Incorporates uncertainty analysis (USACE 408 process)
    - FREE
  - ► Cons
    - Not very user friendly



What tools perform this analysis?

- FEMA BCA
  http://www.fema.gov/benefit-cost-analysis
  - ► Pros
    - Identified tool for analysis of applicability in FEMA's HMA grant programs
    - Can evaluate BCA for other natural hazards (e.x. Tornado, Wildfire)
    - Can calculate BCA based on historic damage information
    - FREE
  - ► Cons
    - Not setup for large data sets

What tools perform this analysis?

- Oracle Crystal Ball

  http://www.oracle.com/us/products/applications/crystalball/

  - ► Pros
    - Elaborate analysis methods
    - Uncertainty analysis
    - Setup for general risk analysis
  - ► Cons
    - Not Free

The Cost of Insurance

How Insurance Works

- Insurance works through the following steps:
- Risk is transferred from an individual or entity (insured) to a third party (insurer).
- The third party (insurer) pools all the risk exposures together to compute potential future losses with some level of accuracy. The insurer uses various forecasting techniques, depending on the distribution of losses.
- The pooling of the risk leads to an overall reduction of risk in society because insurers' accuracy of prediction improves as the number of exposures increases.
- Insurers discriminate via underwriting—the process of evaluating a risk and classifying it with similar risks. Both the transfer of risk to a third party and the pooling lead to reduced risk in society as a whole and a sense of reduced anxiety.

How insurance works

- Private insurance companies could not profitably provide flood coverage at an affordable price, primarily because of the catastrophic nature of flooding and the inability to develop an actuarial rate structure which could adequately reflect the risk to which flood-prone properties are exposed.

The NFIP

- The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages.
- Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses.
- This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods.

The NFIP

- When the NFIP was created, the U.S. Congress recognized that insurance for "existing buildings" constructed before a community joined the Program would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these flood-prone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. Under the NFIP, "existing buildings" are generally referred to as Pre-FIRM (Flood Insurance Rate Map) buildings. These buildings were built before the flood risk was known and identified on the community's FIRM.

Pre-FIRM vs Post-FIRM

Rating Example

Post-FIRM Example*:
AE zone (+1 BFE)

$200,000 Building
$80,000 Contents

Single Family
One floor
No Basement

*$200K/$80K Building/Contents Oct 2010

Elevation Certificate

SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number	B2. County Name	B3. State

B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use base flood depth)
					746.2

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9.
☐ FIS Profile ☐ FIRM ☐ Community Determined ☐ Other (Describe)

B11. Indicate elevation datum used for BFE in Item B9: ☐ NGVD 1929 ☐ NAVD 1988 ☐ Other (Describe)

B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☐ No
Designation Date ☐ CBRS ☐ OPA

SECTION C - BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.

C2. Elevations – Zones A1-A30, AE, AH, A (with BFE), VE, V1-V30, V (with BFE), AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO. Complete Items C2.a-h below according to the building diagram specified in Item A7. Use the same datum as the BFE.

Benchmark Utilized _____ Vertical Datum _____

Conversion/Comments _____

			Check the measurement used.	
a)	Top of bottom floor (including basement, crawlspace, or enclosure floor)	747.5	☐ feet	☐ meters (Puerto Rico only)
b)	Top of the next higher floor	n/a	☐ feet	☐ meters (Puerto Rico only)
c)	Bottom of the lowest horizontal structural member (V Zones only)	n/a	☐ feet	☐ meters (Puerto Rico only)
d)	Attached garage (top of slab)	746.5	☐ feet	☐ meters (Puerto Rico only)
e)	Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	746.5	☐ feet	☐ meters (Puerto Rico only)
f)	Lowest adjacent (finished) grade next to building (LAG)	746.6	☐ feet	☐ meters (Puerto Rico only)
g)	Highest adjacent (finished) grade next to building (HAG)	746.5	☐ feet	☐ meters (Puerto Rico only)
h)	Lowest adjacent grade at lowest elevation of deck or stairs, including structural support		☐ feet	☐ meters (Puerto Rico only)

FEMA NFIP Agent Training Program

Rating Example

Post-FIRM Example*:
AE zone (+1 BFE)

Single Family/1 floor/ no Basement

What does the elevation certificate say?

Lowest Floor-	747.5
BFE-	746.2
Elevation Diff.	**+1.3 = 1.0**

*$200K/$80K Building/Contents Oct 2010

FEMA NFIP Agent Training Program

Rating Table

TABLE 3B. REGULAR PROGRAM -- POST-FIRM CONSTRUCTION RATES
ANNUAL RATES PER $100 OF COVERAGE
(Basic/Additional)

FIRM ZONES AE, A1-A30 -- BUILDING RATES

Elevation of Lowest Floor Above or Below BFE[1]	One Floor No Basement/Enclosure/ Crawlspace[4]		More than One Floor No Basement/Enclosure/ Crawlspace[4]		More than One Floor With Basement/ Enclosure/Crawlspace[4]		Manufactured (Mobile) Home[2]	
	1-4 Family	Other Residential & Non-Residential	1-4 Family	Other Residential & Non-Residential	1-4 Family	Other Residential & Non-Residential	Single Family	Non-Residential
+4	.24 / .08	.20 / .08	.24 / .08	.20 / .08	.24/ .08	.20 / .08	.26 / .09	.22 / .09
+3	.27 / .08	.22 / .09	.25 / .08	.20 / .08	.25 / .08	.20 / .08	.28 / .09	.24 / .09
+2	.42 / .08	.29 / .09	.28 / .08	.23 / .08	.27 / .08	.22 / .08	.48 / .09	.37 / .10
+1	.73/ .10	.52 / .11	.52 / .09	.32 / .09	.34 / .09	.26 / .09	.92 / .11	.75 / .13
0	1.80 / .12	1.47 / .14	1.17 / .11	.88 / .17	.82 / .10	.67 / .16	2.39 / .13	1.92 / .20
-1[3]	4.30 / 1.25	5.39 / 1.26	3.70 / 0.97	3.65 / .59	2.15 / .60	1.93 / .66	***	***
-2	***	***	***	***	***	***	***	***

.73/.10

FIRM ZONES AE, A1-A30 -- CONTENTS RATES

Elevation of Lowest Floor Above or Below BFE[1]	Lowest Floor Only -- Above Ground Level (No Basement/Enclosure/ Crawlspace[4])		Lowest Floor Above Ground Level & Higher Floors (No Basement/Enclosure/ Crawlspace[4])		More than One Floor With Basement/Enclosure/ Crawlspace[4]		Manufactured (Mobile) Home[2]	
	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Single Family	Non-Residential
+4	.38 / .12	.22 / .12	.38 / .12	.22 / .12	.38 / .12	.22 / .12	.38 / .12	.22 / .13
+3	.38 / .12	.22 / .12	.38 / .12	.22 / .12	.38 / .12	.22 / .12	.38 / .13	.24 / .13
+2	.38 / .12	.24 / .12	.38 / .12	.22 / .12	.38 / .12	.22 / .12	.38 / .15	.34 / .15
+1	.52 / .12	.35 / .16	.38 / .12	.25 / .12	.38 / .12	.22 / .12	.58 / .17	.53 / .23
0	1.18 / .12	.81 / .31	.67 / .12	.59 / .20	.41 / .12	.32 / .12	1.12 / .23	1.11 / .31
-1[3]	3.45 / .70	2.29 / .90	2.00 / .47	1.53 / .60	.66 / .14	1.06 / .14	***	***
-2	***	***	***	***	***	***	***	***

.52/.12

FEMA NFIP Agent Training Program

Rating Example

Post-FIRM Example*:
AE zone (+1 BFE)

Single Family/1 floor/ no Basement

What does the elevation certificate say?

Lowest Floor-	747.5
BFE-	746.2
Elevation Diff.	**1.3 = 1.0**

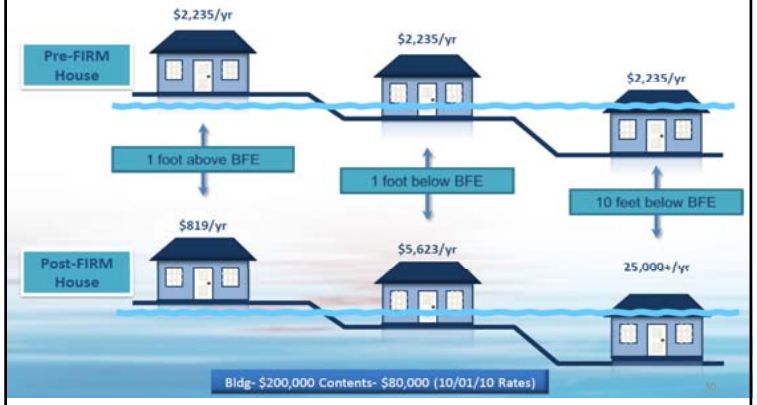
Rating Calculation

Blg- .73/.10	$578.00
Cont- .52/.12	$196.00
Policy Fee	$ 40.00
ICC	$ 5.00
TOTAL	**$819.00**

*$200K/$80K Building/Contents Oct 2010

Pre-FIRM vs. Post-FIRM and elevation

Rate comparisons



Pre-FIRM "subsidized" rating

TABLE 2A. REGULAR PROGRAM – PRE-FIRM CONSTRUCTION RATES[1]

ANNUAL RATES PER $100 OF COVERAGE (Basic/Additional)

On or after October 1, 2013, this table may not be used to rate the following:
1) Pre-FIRM properties that are newly purchased or newly insured on or after July 6, 2012; 2) Policies that have lapsed in coverage and are being reinstated on or after October 4, 2012; or 3) 1–4 Family Severe Repetitive Loss properties. For Non-Primary Residence use Table 2B.

FIRM ZONES A, AE, A1–A30, AO, AH, D[2]

	OCCUPANCY	SINGLE FAMILY		2–4 FAMILY		OTHER RESIDENTIAL		NON-RESIDENTIAL	
		Building	Contents	Building	Contents	Building	Contents	Building	Contents
BUILDING TYPE	No Basement/Enclosure	.91 / .77	1.15 / 1.38	.91 / .77		.91 / 1.61		.99 / 1.84	
	With Basement	.97 / 1.14	1.15 / 1.16	.97 / 1.14		.91 / 1.34		1.05 / 1.80	
	With Enclosure[3]	.97 / 1.37	1.15 / 1.38	.97 / 1.37		.97 / 1.68		1.05 / 2.26	
	Elevated on Crawlspace	.91 / .77	1.15 / 1.38	.91 / .77		.91 / 1.61		.99 / 1.84	
	Non-Elevated with Subgrade Crawlspace	.91 / .77	1.15 / 1.16	.91 / .77		.91 / 1.61		.99 / 1.84	
	Manufactured (Mobile) Home[4]	.91 / .77	1.15 / 1.38					.99 / 1.84	
CONTENTS LOCATION	Basement & Above[5]				1.15 / 1.16		1.15 / 1.16		1.93 / 3.07
	Enclosure & Above[6]				1.15 / 1.38		1.15 / 1.38		1.93 / 3.67
	Lowest Floor Only – Above Ground Level				1.15 / 1.38		1.15 / 1.38		1.93 / 1.62
	Lowest Floor Above Ground Level and Higher Floors				1.15 / .96		1.15 / .96		1.93 / 1.38
	Above Ground Level – More Than 1 Full Floor				.42 / .19		.42 / .19		.29 / .23
	Manufactured (Mobile) Home[6]								1.93 / 1.62

Types of Grandfathering

- Pre-FRIM Buildings can be grandfathered due to continuous coverage.
- Post-FIRM Buildings may be grandfathered provided that the owner can show that they were built in compliance with the FIM in effect at the time of construction.

Changes Have and are Coming to the NFIP

- **On July 6, 2012 Congress passed the Flood Insurance Reform Act of 2012 (BW-12), which:**
  - Raises rates on certain classes of property to reflect the "true" flood risk which in turn allows people to make better all around decisions before and after flood events.
  - Trigger rate changes for certain properties within a revised or updated map area to accurately reflect the flood risk (on hold).
- **On March 21, 2014 the "new" Homeowners Flood Insurance Affordability Act of 2014 (HFIAA), which repeals and modifies certain provisions of the Biggert-Waters Flood Insurance Reform Act.**
  - The law will lower the BW-12 rate increases on some policies while leaving other increases in place, prevent some future rate increases, provide for refunds to a subset of policyholders, authorize additional resources to complete an affordability study, and implement a surcharge on all policyholders.

Who Will Be Affected by Subsidy Changes?

Biggert-Waters 2012

- Owners of subsidized *<u>non-primary residences</u> in a SFHA will see 25% increase annually until rates reflect true risk – began January 1, 2013.

Defined:

- **Subsidized Premium Rate.** A rate charged to a group of policies that results in aggregate premiums insufficient to pay anticipated losses and expenses for that group.
- **Principal/Primary residence.** A single-family dwelling in which, at the time of loss, the named insured or the named insured's spouse has lived in for either 80% of the 365 days immediately preceding the loss, or 80% of the period of ownership, if less than 365 days.

*Definition of Primary Residence changes June 1, 2014

HFIAA 2014

- **No change**

Photo by FEMA News Photo

Who Will Be Affected by Subsidy Changes?

Biggert-Waters 2012

- Owners of subsidized <u>**property that has experienced severe repetitive flood losses**</u> or <u>**that has incurred flood cumulative damage with flood insurance payments exceeding the value of the structure**</u> will see 25% rate increase annually until rates reflect true risk – beginning October 1, 2013.

Severe repetitive losses.

- 4 or more separate claim payments of more than $5,000 each; or
- 2 or more separate claim payments where the total value of the payments exceeds the current market value of the property

HFIAA 2014

- **No Change**

Photo by Liz Roll FEMA

Who Will Be Affected by Subsidy Changes?

Biggert-Waters 2012

- Owners of subsidized <u>**business properties in a Special Flood Hazard Area**</u> will see 25% rate increase annually until rates reflect true risk -- beginning October 1, 2013. New applications will identify business properties separate from other non-residential buildings. Business properties will be rated as non-residential until the rulemaking process is complete.

  - **Business Property**. Any non-residential building that produces income or a building designed for use as office or retail space, wholesale, hospitality, or similar uses.

HFIAA 2014

- **No Change**

Photo by Robert Butler FEMA

Who Will Be Affected by Subsidy Changes?

Biggert-Waters 2012

- **Pre-FIRM subsidized policies written between July 6, 2012 and October 1, 2013 that were:**
  - New policies
  - Policies that were written as new business or as an assigned policy as the result of the property being purchased.
  - Polices that have lapsed and have been reinstated on or after October 4, 2012 and before October 1 2013.
- These policies will not be renewed and will only receive a letter 60 days prior to renewal and one expiration letter.

HFIAA 2014

- **Pre-FIRM subsidized policies written between July 6, 2012 and October 1, 2013 continue to be eligible for pre-FIRM subsidized rates and:**
  - Will receive retroactive refunds
  - Will receive minimum rate increases of 5%
  - Limits maximum increase to 18% for any single property unless due to certain lapsed policy circumstances.
  - New purchasers of pre-FIRM properties may assume the prior owners policy until the new rates and guidance are finalized.

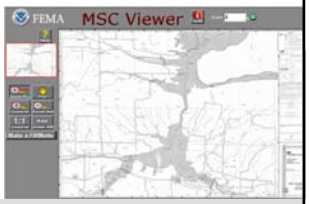
PRP Eligibility Extension Changes

Biggert-Waters 2012

- The Preferred Risk Policy (PRP) Eligibility Extension allows structures mapped into Special Flood Hazard Areas (SFHAs) on or after Oct. 1, 2008 to remain insured at the lower PRP rates.
  - Policies receiving the PRP Eligibility Extension rates will see average annual increases of 20 percent starting October 1, 2013.
  - New PRP EE rating class established
  - Currently there is no two year limitation on PRPEE

HFIAA 2014

- Only direction was to provide PRP rates for properties newly mapped into a SFHA for the "first" year.
- It is yet undetermined what this will mean for the two year PRPEE program.



What about when a new flood map is adopted?

Biggert-Waters 2012

- **If you live in a community which adopts a new, updated Flood Insurance Rate Map (FIRM) :**
  - Charging of insurance premiums based on a prior FIRM -- grandfathering -- will be phased out for some properties.
  - The Biggert-Waters Act Section 100207 calls for a phase-out of grandfathering discounts for properties shown on Flood Insurance Rate Maps that are updated.

Never Implemented

HFIAA 2014

- Completely restores "grandfathering"
- Requires FEMA to phase in full risk rates for properties newly mapped to the SFHA buy increasing premiums by 5 to 15 percent a year.
- Allows PRP for "first' year.

Reserve Fund

Biggert-Waters 2012

- **The legislation requires establishment of a reserve fund to pay for future losses**
- **In addition to rate increases accounting for true and changing risk, a 5 percent premium increase will go toward the reserve fund**
  - Exception: Preferred Risk Policies and Group Flood Insurance Policies
- **Pre-FIRM premium increases related to the phase out of subsidies and discounts include a 5 percent increase for the reserve fund**

HFIAA 2014

- **Keeps reserve fund.**
- **Adds annual premium surcharges as follows:**
  - $25 for primary residences
  - $250 for all others

Who Won't Be Affected by Subsidy Changes?

Biggert-Waters 2012

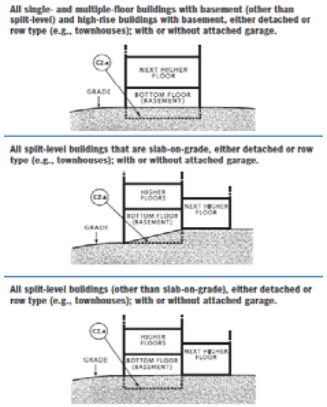
- **Owners of primary residences in SFHAs <u>will be able to keep their subsidized rates unless or until:</u>**
  - You sell your property (new rates will be charged to next owner if they insure;)
  - You allow your policy to lapse;
  - You suffer severe, repeated flood losses; or,
  - You purchase a new policy (after July 6, 2012).

HFIAA 2014

- Eliminates these "triggers"
- Allows for the transfer of pre-FIRM subsidized rates/policy from the old property owner to the new property owner.
- Restores pre-FIRM rates and provides for refunds to some.

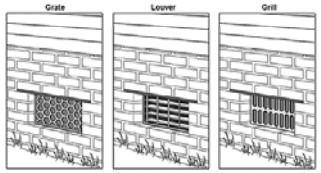
Residential Building Considerations

- **Homeowners with lowest floor below Base Flood Elevation face difficult choices**
  - High risk of water damage
  - Restricted coverage in basements
- **Options**
  - Fill in basement/crawlspace
  - Wet-floodproofing/Venting (garages, crawl spaces)
  - Potentially pay more for flood insurance
  - Elevate or re-build



Other mitigation techniques

- **In addition to elevating the structure:**
  - Relocating the structure to an area on the property that is above the BFE or to another lot outside of the floodplain.
  - Elevate / Raise utilities, such as a furnace, air conditioning unit and/or water heater, above the BFE;.
  - Create flood openings on the home's foundation so floodwaters can flow through; or fill in sub-grade crawlspaces to the same height or higher than the exterior finished grade.



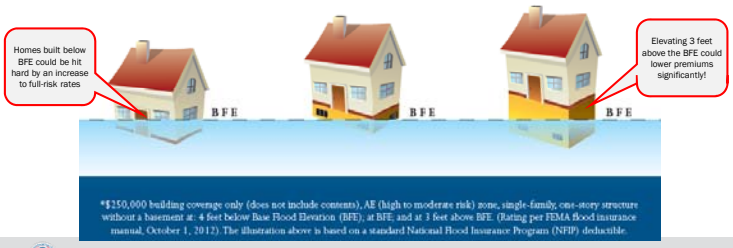
No substitute for elevation

Elevation lowers premiums.

ZONE A" EXAMPLE

Under the Flood Insurance Reform Act of 2012, You Could Save More than $90,000 over 10 Years if You Build 3 Feet above Base Flood Elevation*

PREMIUM AT 4 FEET BELOW BASE FLOOD ELEVATION	PREMIUM AT BASE FLOOD ELEVATION	PREMIUM AT 3 FEET ABOVE BASE FLOOD ELEVATION
$9,500/year	$1,410/year	$427/year
$95,000/10 years	$14,100/10 years	$4,270/10 years



*$250,000 building coverage only (does not include contents), AE (high to moderate risk) zone, single-family, one-story structure without a basement at: 4 feet below Base Flood Elevation (BFE), at BFE, and at 3 feet above BFE. (Rating per FEMA flood insurance manual, October 1, 2012). The illustration above is based on a standard National Flood Insurance Program (NFIP) deductible.

Substantial Improvement / Damage Ordinance Compliance

- **Substantially Improved / Damaged Pre-FIRM structures must be brought into compliance with NFIP regulations and other requirements in the local FPM ordinance as if it was new construction.**
- **This means substantially damaged Pre-FIRM homes, including the basement, must be elevated at or above the BFE.**
- **Substantially damaged Pre-FIRM non-residential structures may perform FEMA approved engineered dry flood-proofing.**

Branson, Mo.
Substantially damaged April 2011 w/ 1 foot of flood water.
Elevated to 1 foot above BFE (±8 feet).

ICC

- Increased Cost of Compliance (ICC)
- ICC is used to bring a building into compliance with State or local government floodplain management laws or ordinances
  - Building must be located in the SFHA
  - Coverage is available up to $30,000 (the total amount claimed for a loss cannot exceed the policy limit of liability)
  - ICC pays for the cost to flood-proof, relocate, elevate, demolish (FRED)
  - Building must sustain repetitive loss or be substantially damaged by a flood only

NEBRASKA
EMERGENCY MANAGEMENT AGENCY

Grant Programs for Non-Structural Projects

STATE HAZARD MITIGATION PROGRAM

STATE HAZARD MITIGATION STAFF

- Public Assistance Planning Specialist for over two years @ NEMA
- Retired Nebraska Air Guard/Air Force-24 years
- Budget work in Military & State Government over 12 years

Hazard Mitigation Officer
Mary Baker

HM Planning Specialist-
John Cook

- Masters in Emergency Management
- Volunteer Fire Fighter
- 7-years EM Consultant experience

Flood Risk Management Life Cycle

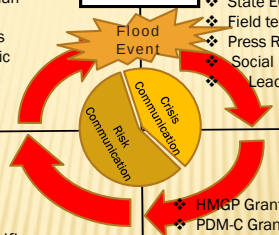
Prevention / Preparation
Floodplain Management, Training, Readiness

- State Hazard Mitigation Plan
- Local Hazard Mitigation Plan
- LEOPs
- Debris management plans
- Training- Mitigation specific
- Agency out reach

NEMA

Response
Management during the crisis event

- State lead for Emergency Response
- EM lead- Parent organization
- State EOC
- Field team response
- Press Releases- JIC established
- Social Media- FB-Twitter- You Tube
- Lead- Agency Coordination



- HMGP Program-DR specific
- Local Hazard Mitigation Plans
- State Hazard Mitigation Plan

- HMGP Grant Program
- PDM-C Grant Program
- FMA Grant Program
- Coordinate Federal DR's
- Co-Chair Gov Task Force
- Lead agency- Communities transition into Recovery phase

Activities to identify, assess, **treat**, and monitor risk through transfer or reduction

Mitigation

Activities to **restore** immediately after a flood

Rebuild/Recovery

NEBRASKA
EMERGENCY MANAGEMENT AGENCY

WHAT IS HAZARD MITIGATION?

Sustained action that reduces or eliminates long-term risk to people and property from natural or manmade hazards and their effects.

GOALS OF HAZARD MITIGATION

1. Doing something today to help reduce the loss of life and property during future events.
2. Establishing an on-going effort to lessen the impact disasters have on people and property.
3. Assist local governments and public entities in using safer building practices and improving existing structures and supporting infrastructure.
4. Support the State/Local Hazard Mitigation plans by funding Hazard Mitigation measures that are in line with respective plans.

Promote Public Awareness of hazards and associated response.

HAZARD MITIGATION PROCESS

- Development of a Hazard Mitigation Plan
- Implementation of the Plan- Advanced Project Development
- Periodic review of the plan
- Working the Plan (in the case of an incident)
- Examination of the plan (after an incident)

MITIGATION PLAN STEPS TO DEVELOPMENT

- Assess Community Support
- Build the planning team
- Engage the public- all local jurisdictions
  - Organize resources
  - Assess & analyze the risks
  - Develop strategies to address the top risks
  - Develop a mitigation plan
  - Implement the plan and monitor progress
  - Advance Planning of projects for future funding

MITIGATION PLAN RISK ASSESSMENT

- An overview of potential losses to guide implementation of mitigation measures.
  - Identify Hazards
    - List the potential hazards that may impact or affect your jurisdiction.
    - Natural Hazards
      (Floods, Severe Winter Storms, Tornados)
    - Manmade Hazards
      (Chemical, Terrorism, Hazardous Materials)

MITIGATION PLAN RISK ASSESSMENT

- *Elements*- evaluate all hazards in the State plan
  - Profile the Hazards
  - Assess Your Jurisdictions Vulnerability
  - Estimate Losses in Your Jurisdiction
  - Choose a strategy to apply to the hazard
  - Advance Plan Projects-future funding

DEVELOP A HAZARD MITIGATION PLAN

- *Develop the Local Mitigation Plan*
  - Submit draft & final reviews -NEMA
  - Final approval by FEMA-crosswalk
  - Jurisdictions adopt Local Mitigation Plan
  - Maintenance of Plan- on-going
  - Five year review cycle

FEMA PROGRAM ELIGIBILITY

Program	Tribal Mitigation Plan Requirement /Grantee Status
Public Assistance (PA) (Categories A & B)	No Plan Required
Public Assistance (Categories C-G)	✓
Individual Assistance (IA)	No Plan Required
Fire Management Assistance Grants	✓
Hazard Mitigation Grant Program (HMGP) Planning Grant	✓
HMGP Project Grant	✓
Pre-Disaster Mitigation (PDM) Planning Grant	No Plan Required
PDM Project Grant	✓
Flood Mitigation Assistance (FMA)	✓

Types of Mitigation Programs

- Hazard Mitigation Grant Program (HMGP)
  - Disaster Related funding
- Pre-Disaster Mitigation -Competitive (PDM-C)
  - Annual FEMA grant
- Flood Mitigation Assistance Program (FMA)
  - Repetitive Flood Claims (RFC)
  - Severe Repetitive Loss (SRL)
  - *FMA Grant administered by NDNR-Mitch Paine*

TYPES OF MITIGATION PROJECTS

- Non-Structural Methods
  - Property acquisition
  - Elevation
  - Relocation
  - Wet-Dry Flood proofing
  - Minor Flood Control

TYPES OF NATURAL HAZARD MITIGATION

NON-STRUCTURAL METHODS

- Flood warning Systems
- Flood Preparedness Plans

National Environmental Policy Act (NEPA)

- FEMA Regulations for NEPA are found in 44 CFR Part 10.
- Required process.

- Review for all proposed projects can include:
  - Archaeological sites
  - Historical sites
  - Low-income populations
  - Floodplains
  - Wetlands
  - Hazardous substances
  - Other sensitive natural areas
  - Threatened or endangered species

BENEFIT COST ANALYSIS (BCA)

- Factors to Consider During a BCA
  - Total Project Cost
  - Life of the Project
  - Value of the Property Being Protected
  - Specific Documented Damages
  - Documented Past Damages
  - What costs would be prevented by this project?
  - Source of funding for the local match
  - Displacement costs
  - Event frequency
  - Effectiveness of the Project
  - How many people will it benefit?

HAZARD MITIGATION GRANT PROGRAM

Solution Found, but have you considered….

- Environmental Laws?
- Natural Resources?
- Social Concerns/Impacts?
- Cultural Concerns/Impacts?

MITIGATION AT ITS FINEST

- What is our overall goal(s)?
  - Reduce or eliminate any and all risk to our people and property.
  - Achieve these goals in the most cost efficient way
  - Do so in the most Environmentally sensible way possible

This page intentionally left blank.

Promoting Flood Risk Reduction Projects

Reducing Your Community's Flood Risk Workshop
Nebraska Silver Jackets/Nebraska DNR
July 16, 2014

Nebraska
Department of Natural Resources

Types of Activities

- Community-wide
  - Buyouts
  - Emergency response
  - Floodplain management planning and zoning regulations
  - NFIP's Community Rating System (CRS)
- Building-specific
  - Elevation
  - Floodproofing
  - Re-location

Types of Benefits

- Community-wide
  - Natural functions of floodplains preserved
  - Emergency response burden reduced
  - Safe facilities, safe community
  - Flood risk communication information
  - Peace of mind – less potential for displacement or disruption of daily life
- Building-specific
  - Flood insurance premium reduction
  - Safer building – risk reduction
  - Reduced potential for flood damages and losses

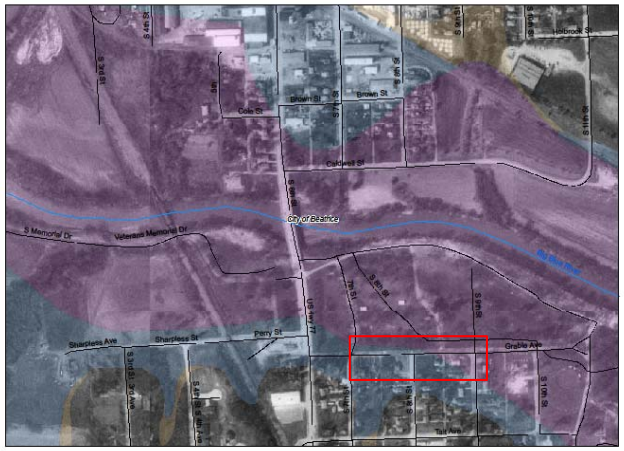
Buyouts, Elevation, Re-location

- Project Benefits:
  - A large buyout or re-location program may leave many acres of open space
  - Expensive, but saves homeowners and structures any future flood damage
  - Preserves natural functions and adds flood storage to protect other parts of community as well
  - Coordinates with parks, recreation, open space amenities for community
  - Elevations reduce risk and flood insurance costs

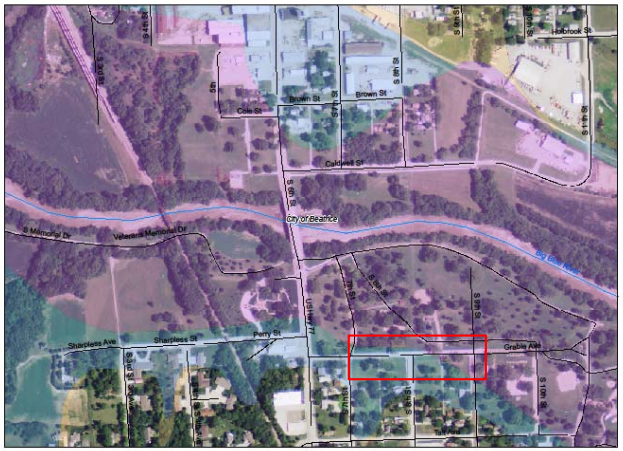
Buyout Programs

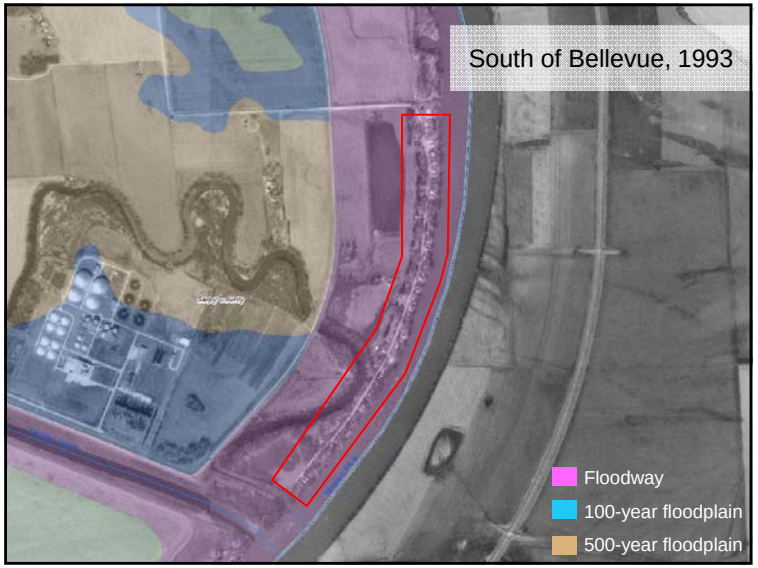
- As communities look at hazard mitigation plans, they should focus on floodplains – predictable hazards
- Buying out floodprone properties and making floodplains open space
- Long-term strategy
- Beatrice: received grant in 1997 to clear floodplain from 1993 floods, still have a few left
- Bellevue/Sarpy County: received grant after 1993 to buy out multiple subdivisions, still working on them

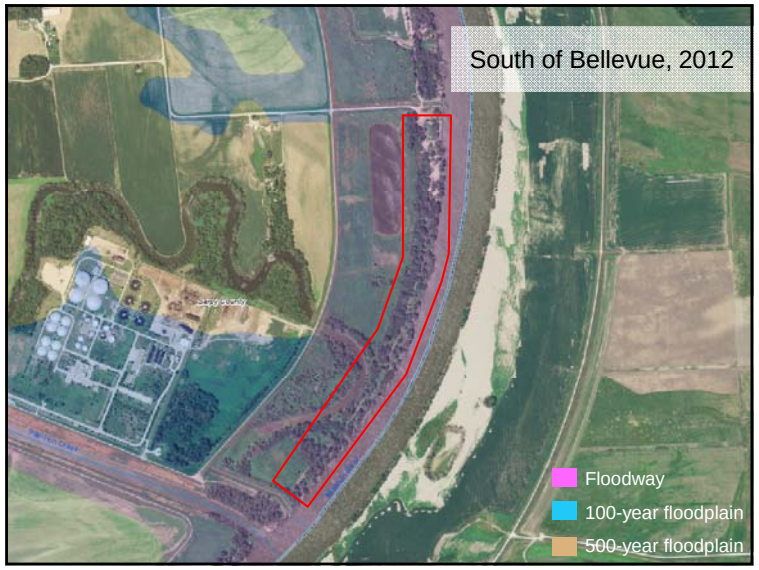
Beatrice, 1993



Beatrice, 2012

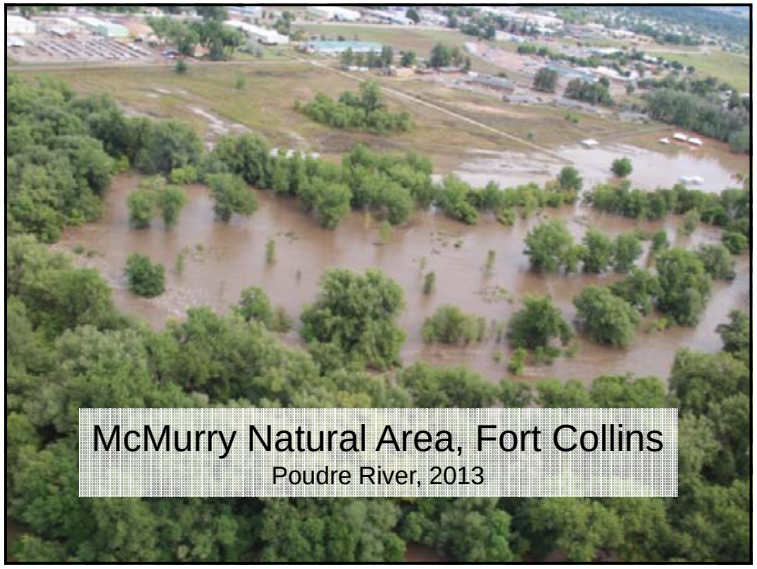






Fort Collins, Colorado

- Fort Collins Natural Areas Program has purchased property in the floodplain along Poudre River for several decades
- Currently, 980 acres out of 1500 acres in the floodplain preserved as open space, nearly 66%
- After 2013 flooding, damage throughout Fort Collins was minimal, in part because of this
- Open space supports CRS credit and reduces flood insurance premiums for properties still in the floodplain – CRS Class 4



Elevation and Flood Insurance Cost Reduction

- Benefits:
  - Homeowners, if they have a mortgage, are required to purchase flood insurance
  - Elevating a structure, while expensive, can drastically reduce flood insurance costs
  - Flood insurance generally reflects risk and if the risk is reduced, the flood insurance cost is reduced
  - Less flood insurance paid in a community means more money can be used for other purposes
  - NFIP CRS participation is supported – leads to more points which leads to flood insurance premium reductions community wide

Flood Insurance Cost Reduction

Emergency Response

- Benefits:
  - Community/State is responsible for rescuing people when trapped in their flooded house
  - Fewer homes in the floodplain mean fewer people who need to be rescued, fewer homes that need emergency protection
  - The better critical facilities are prepared, the less vulnerable people at risk in nursing homes and hospitals
  - Fewer critical facilities in floodplains mean better ability for the community to recover

Floodplain Management Planning and Zoning

- Any community with a river/stream will have floodplains, forever
- Floodplains provide important natural functions
- Development regulations in floodplain that have to be followed – local ordinances
- Many stakeholders participate in floodplain management

Floodplain Management Planning and Zoning

- Risk reduction pays off, creates resilient communities
- Long-term strategy required to reduce flood risk, no quick or easy fix
- Comprehensive plans are good places to talk about risk reduction
- Floodplain management gives you risk maps and other tools
- Community discussion important – balance with other priorities

NFIP Community Rating System

- CRS credits community actions that reduce flood risk
  - Public Information Activities
  - Mapping and Regulations
  - Flood Damage Reduction Activities
  - Warning and Response
- Encompass a wide range of possible community actions, including mitigation projects talked about
- Serves as a good roadmap for going above and beyond NFIP minimum standards

NFIP Community Rating System

- Benefits for Community:
  - Improved flood risk awareness
  - Improved floodplain management
  - Cost savings for residents
- Benefits for Policy Holders:
  - Improved flood risk awareness
  - Cost savings on flood insurance premiums
    - Likely more beneficial due to BW-12 implementation

NFIP Community Rating System

- 6 Nebraska communities participate and save on flood insurance premiums:
  - Lincoln – Class 6 ($392,000/year)
  - Valley – Class 8 ($41,000/year)
  - Papillion – Class 8 ($5,600/year)
  - DeWitt – Class 9 ($4,000/year)
  - Fremont – Class 9 ($44,000/year)
  - Omaha – Class 9 ($45,500/year)

Flood Loss Reduction Goal

- The true goal of floodplain management overall is to reduce losses from flooding to human lives and property
- We do that building by building
- When someone calls about high flood insurance costs, tell them that there are options. These options not only reduce their insurance, they make their family safer
- Acquiring properties ultimately reduces flood losses by ensuring no structures get damaged
- Ensuring no structures are built in floodplains ensures that no structures get damaged too
- Communicating risk helps develop community support for programs

Reasons to Promote Mitigation

- Flood loss reduction overall
- Reduction in emergency services burden
- Reduced disruption to daily life – peace of mind
- Flood insurance premium reduction
  - Direct benefit
  - CRS benefits
- Community benefits – open space
  - Preserve natural functions, increase open space
  - Incorporate into community planning
  - Possible property value benefit
  - Use to communicate the risks of floodprone areas

Contact Information

Mitch Paine
mitch.paine@nebraska.gov
402.471.9252

John Callen
john.callen@nebraska.gov
402.471.3957

Nebraska
Department of Natural Resources

Realization
Completed Projects in Nebraska

LORI ANN LASTER, CFM
PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

Yes, it can be done


Common Practices

- Elevation
- Acquisition and Demolition

Elevation

Lift an existing structure above the base flood elevation

Before

During

During

During

During

During

During

During

After

Details

- Original lowest floor elevation 4 feet below base flood elevation
- 780 square foot, concrete block building
- Raised 5.5 feet (1.5 feet above BFE)
- Approximately $58,000 Construction Cost

Before

During

During

During

During

During

After

After

Details

- Original lowest floor elevation 1.5 feet below base flood elevation
- 993 square foot, wood frame building on concrete block foundation
- Raised 3 feet (1.5 feet above BFE)
- Approximately $54,000 Construction Cost

Acquisition and Demolition

- Remove structures and allow land to flood

Acquisition and Demolition

- P-MRNRD Developed Floodway Buyout Program 1993
- 102 structures removed from Missouri River floodplain
- Structures removed from Platte River, Elkhorn River and Papillion Creek Watershed floodplains

Acquisition & Demolition

How did they do that?

- Public Outreach
  - Risk Communication
  - Benefits
  - Let the public know about programs and funding opportunities
- Funding Partners
  - Cities
  - Counties
  - Non-Profit
- Time and Effort
  - It doesn't happen overnight
  - Projects don't finish themselves

Yes, even a barn.

Questions

Lori Ann Laster, CFM

Papio-Missouri River Natural Resources District

(402) 315-1773

llaster@papionrd.org

Reducing your Communities Flood Risk
A Discussion on Nonstructural Flood Mitigation Strategies

July 16, 2014

Tony D Krause PE CFM
Hydraulic Engineer
Omaha District

Recap

- Introductions
- Concept of Risk 9:00-9:30 – Tony D. Krause (USACE)
- Nonstructural – 9:30 – 10:00 - Randy Behm (USACE)
- Path to Make it Happen – 10:00 – 10:10 Lori Laster (PMRNRD)
- Cost Benefit Analysis – 10:10-10:30 Patrick Nowak (USACE)
- Costs of Insurance – 10:30-11:15 Bob Butler (FEMA)
- HMGP, FMA, and Hazard Mitigation Plans -11:15-11:45 Mary Baker (NEMA)
- Lunch
- Communicating the Benefits of Nonstructural – 12:45 – 1:15 (NDNR)
- Examples of Implementation – 1:15-1:45 Lori Laster (PMRNRD)
- Recap and Close 1:45 – 2:00 Tony Krause (USACE)

Recap

- Concept of Risk
  - Risk = f(probability, consequences)
- Nonstructural
  - Nonstructural Flood Risk Reduction provides a method to reduce risk by modifying the consequences
- Path to Make it Happen
- Cost Benefit Analysis
  - Actuarial Process of evaluating Risk – Converting Risk from a concept to a Measurable Quantity
- Costs of Insurance
  - Insurance costs and concept
- HMGP, FMA, and Hazard Mitigation Plans
  - Importance of the Hazard Mitigation Plans and strategies through HMGP and/or FMA
- Communicating the Benefits of Nonstructural
  - Other Benefits of Nonstructural
- Examples of Implementation
  - Nonstructural is an implementable strategy in Nebraska

Questions - Discussion

?

Thank you

- Pre/Post Test
- Evaluation
- NeFSMA Conference