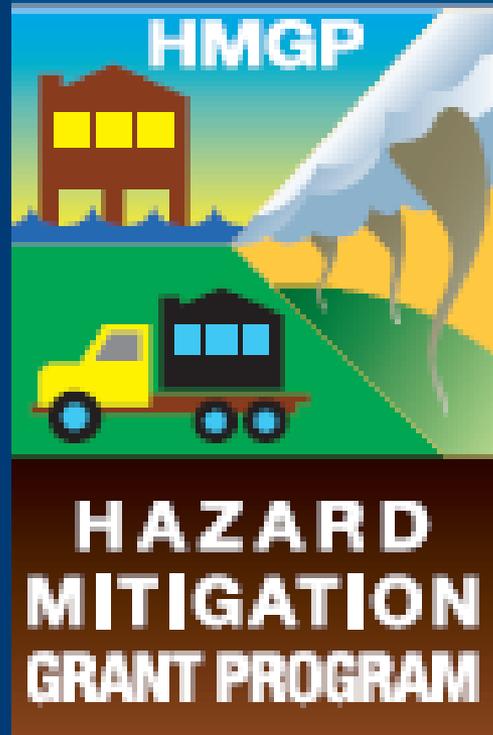


FEMA Perspectives on Natural and Nature-Based Features



Katie Grasty
FEMA, Region IX
Oakland, CA



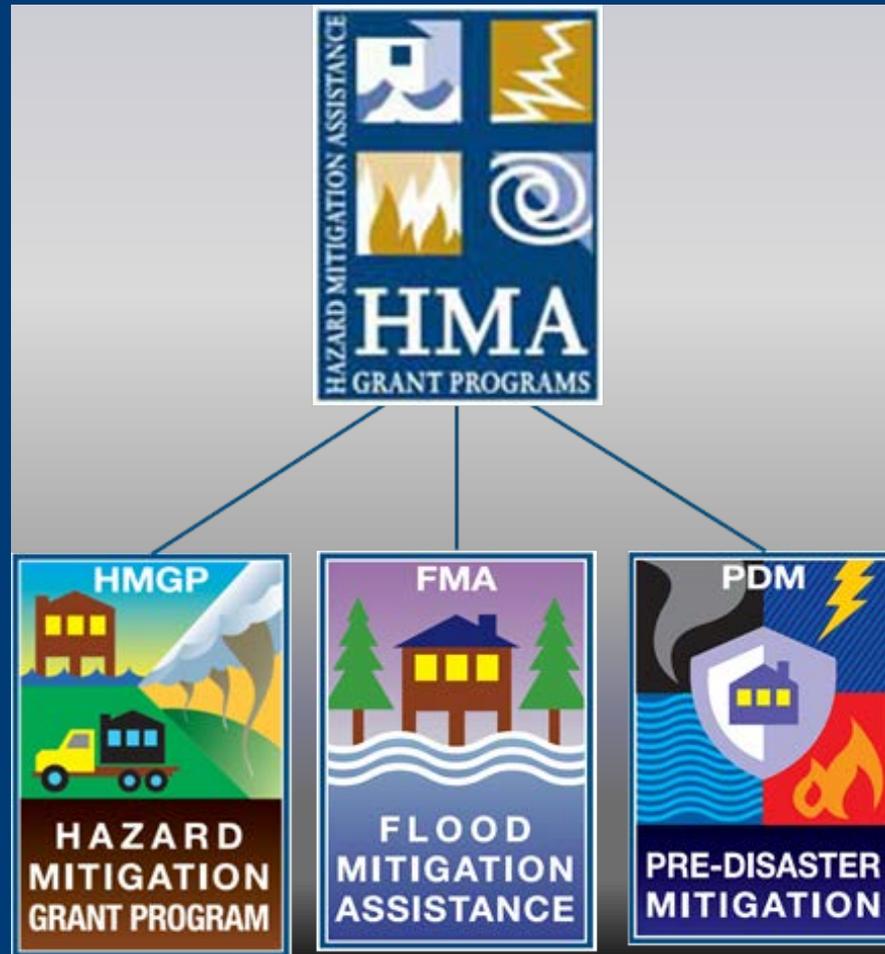
What is Mitigation?

- any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects



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Mitigation Funding Programs



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Public Assistance (406)

POST-DISASTER MITIGATION	
406 Hazard Mitigation (HM)	404 Hazard Mitigation Grant Program (HMGP)
Post-disaster	Post-disaster
Funding through FEMA PA Program	Funding through FEMA HMGP Program <i>Funding is limited.</i>
Incident-specific Grants	Multi-hazard/Area-wide Grants
Funding available for Disaster-damaged Elements of Facilities Only	Funding available for Damaged + Non-damaged Facilities

BEFORE MITIGATION: ROAD NEAR HOLLY BEACH ERODED



AFTER MITIGATION: ROAD NEAR HOLLY BEACH EROSION CONTROL MATS



Natural Hazard Mitigation Saves



Natural Hazard Mitigation Provides the Nation \$6 in Benefit for Every \$1 Invested

National Benefit-Cost Ratio (BCR) Per Peril

**BCR numbers in this study have been rounded*

Overall Hazard Benefit-Cost Ratio

Beyond Code Requirements

\$4:1

Federally Funded

\$6:1

	Beyond Code Requirements	Federally Funded
 Riverine Flood	\$5:1	\$7:1
 Hurricane Surge	\$7:1	Too few grants
 Wind	\$5:1	\$5:1
 Earthquake	\$4:1	\$3:1
 Wildland-Urban Interface Fire	\$4:1	\$3:1

This Interim Study quantified a number of benefits from mitigation, including reductions in:

- Future deaths, nonfatal injuries, and PTSD
- Repair costs for damaged buildings and contents
- Sheltering costs for displaced households
- Loss of revenue and other business interruption costs to businesses whose properties are damaged
- Loss of economic activity in the broader community
- Loss of service to the community when fire stations, hospitals, or other public buildings are damaged
- Insurance costs other than insurance claims
- Costs for urban search and rescue

HMGP Key Elements

- Available after a disaster is federally declared
- 15 or 20% of total damages (PA, IA, Mission Assignments)
- Statewide, all hazards
- State, territories, and Federally recognized tribes are eligible applicants
- State agencies, local governments, special districts, PNPs, and Federally-recognized tribes are eligible subapplicants
- Must have approved Hazard Mitigation Plan
- 25% cost share



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HMGP Key Elements cont.

- NEPA compliance required
- Project, planning (7%) and special initiatives (5%)
- Cost effective (BCR 1.0 or greater)
- Long-term, independent solution
- Sound engineering and technically feasible
- **State-run program!**



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Eligible Activities



Eligible Activities	HMGP	PDM	FMA
1. Mitigation Projects	✓	✓	✓
Property Acquisition & Structure Demolition	✓	✓	✓
Property Acquisition & Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction	✓	✓	✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓
Minor Localized Flood Reduction Projects	✓	✓	✓
Structural Retrofitting of Existing Buildings	✓	✓	✓
Non-Structural Retrofitting of Existing Bld. & Facilities	✓	✓	✓



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Eligible Activities *Continued*



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Eligible Activities			
1. Mitigation Projects			
Safe Room Construction			
Infrastructure Retrofit			
Soil Stabilization			
Wildfire Mitigation			
Post-Disaster Code Enforcement			
5% Initiative Projects			
2. Hazard Mitigation Planning			
3. Management Costs			



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Eligible Activities

- Soil stabilization →→→
- Erosion control
- Wildfire mitigation
 - Defensible Space
 - Ignition Resistant Construction Materials
 - Hazardous fuels reduction (within 2 miles of at-risk structures)
- Post-disaster code enforcement



[Comprehensive list can be found on Page 33 of the HMA Guidance](#)



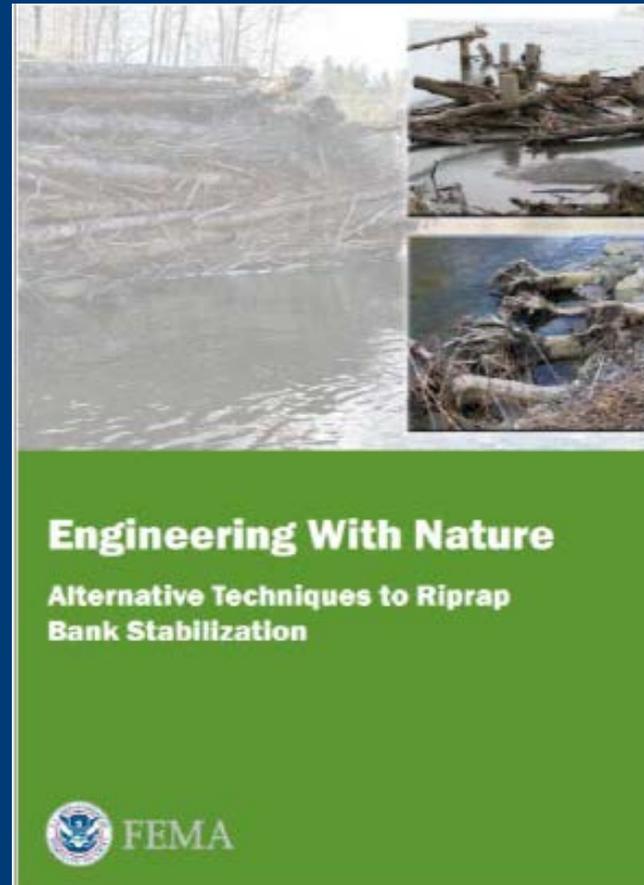
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Flood Drainage- “grey” solutions



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Engineering with Nature



Available here:

https://www.fema.gov/pdf/about/regions/regionx/Engineering_With_Nature_Web.pdf

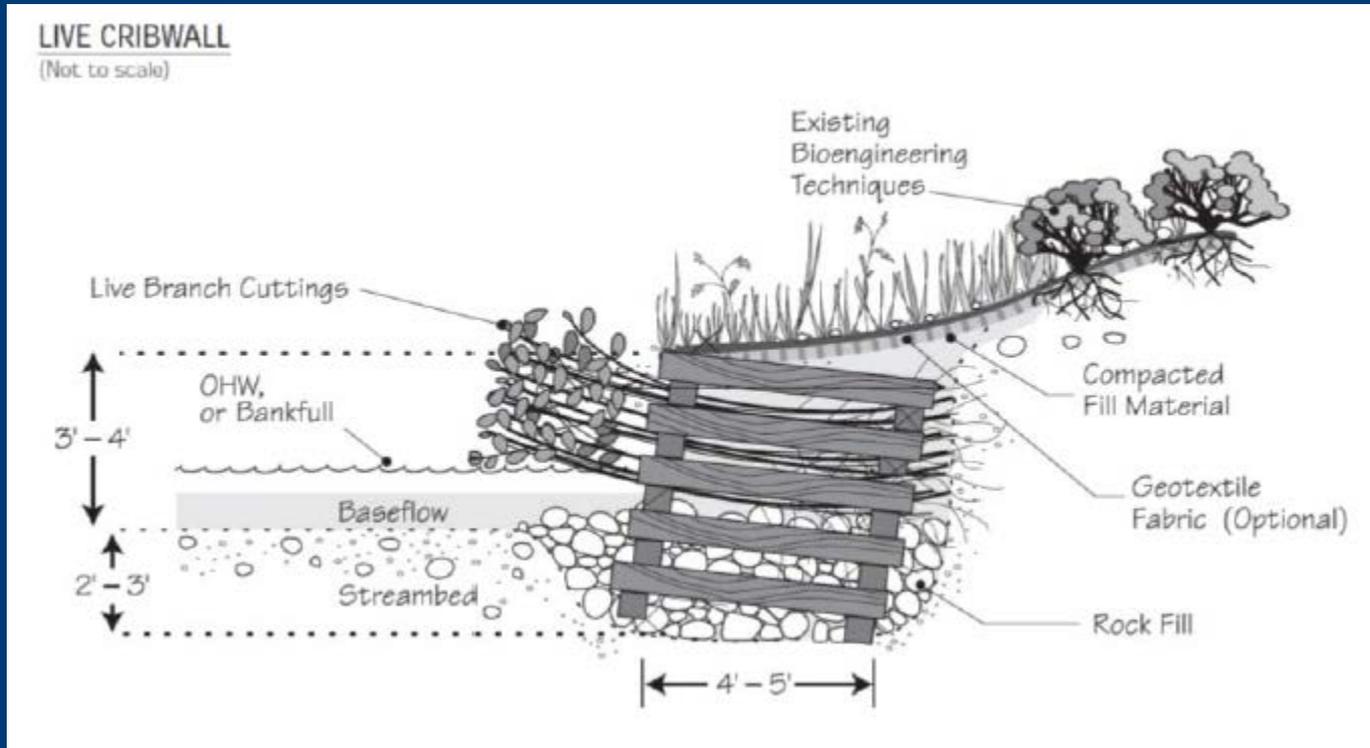


Vegetated Rip Rap



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Engineering with Nature - Live Crib Wall



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Floodplain Bench



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New Climate Resiliency Project Types:

- Flood diversion and storage:
 - Diversion and storage of floodwaters into reservoirs, floodplains, wetlands, and green infrastructure.
- Green infrastructure:
 - Replicates a site's predevelopment, natural hydrologic function infiltrating into ground.
- Floodplain and stream restoration:
 - Remove structures, restore native vegetation, ensure connectivity and storage capacity.

Flood Diversion & Storage (FDS)

- Diverting floodwaters into above-ground reservoirs, floodplains, wetlands, green infrastructure elements, or other storage facilities.
- Flood Damage Reduction + Ecosystem benefits
- Drought mitigation: replenish water supply through groundwater recharge, increasing base flows, and enhancing usable water supply

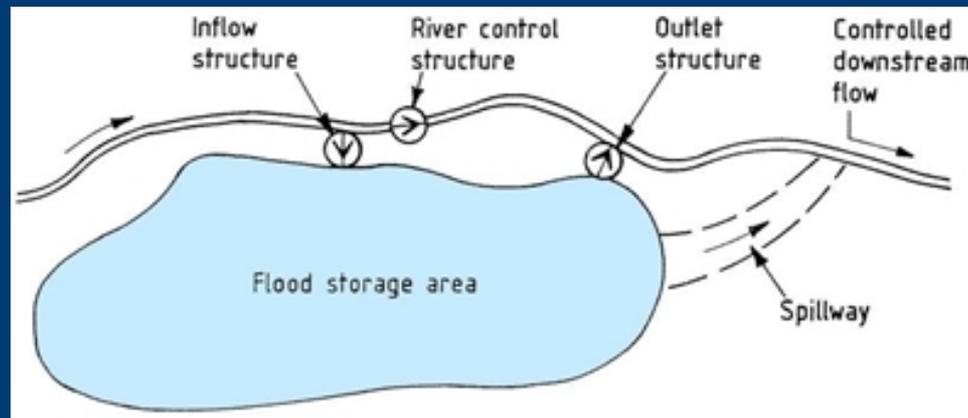


Image Source: www.evidence.environment-agency.gov.uk



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Green Infrastructure (GI)

Examples

- Rain Gardens
- Bio-retention Areas
- Bio-swales
- Green Roofs
- Green Streets
- Porous Pavement
- Stream Buffer Restoration
- Constructed Wetlands



Image Source: www.biocycle.net

Benefits

- Improved air & water quality
- Local water supply
- Local flood control
- Groundwater replenishment
- Energy reduction
- GHG reduction
- Urban heat island reduction
- Increased open space
- Increased recreation
- Increased/improved habitats
- Deferment of grey infrastructure
- Green jobs
- Public education



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Floodplain & Stream Restoration (FSR)

- Reestablishment of the structure and function of ecosystems and floodplains
- Flood risk reduction while improving water quality and habitat for fish and wildlife, recreational opportunities, and erosion control.



Image Source: www.enr.com



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Ineligible Activities

- Projects for which actual physical work has occurred prior to award (groundbreaking, demolition, construction, etc.)
- Projects that do not reduce risk to human life, structures, or improved infrastructure
- Projects that are dependent on a contingent action in order to be effective (reliant on another project)
- Property acquisition projects that are not compatible with open space guidelines and do not maintain open space
 - Deed-restricted in perpetuity to open space uses and restore/conservate natural floodplain functions
- Flood projects related to the repair/replacement of dams and other flood control structures or repair of dams for purpose of regular pre-scheduled or damage-induced maintenance



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Ineligible Activities

- Preparedness activities or temporary measures
- Beach nourishment or re-nourishment
- Hazardous fuels reduction in excess of 2 miles from at-risk buildings
- Retrofitting facilities primarily used for religious purposes
- Studies not directly related to design and implementation of a proposed project
- Projects that address the operation, deferred or future maintenance, rehabilitation, restoration, or replacement of existing structures, facilities, or infrastructure without increasing the level of protection



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Common Eligibility Issues

- No LHMP
- Projects where a physical construction activity has already started
- Capital improvement projects
- Projects that only consist of repairs
 - HMGP doesn't repair/replace; Public Assistance pays for disaster damages
- Projects that aren't cost effective once reviewed
 - Not enough supporting information provided
 - Overestimated BCA data



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Nature-based Project Considerations

- Primary purpose **MUST** be to reduce risk to life and/or property
 - NOT habitat creation
 - NOT to promote development
- No plans/designs alone without construction
 - Must be standalone, long-term solution
- Cost-beneficial
 - Document future, expected damages

Environmental Benefits in the BCA

- Can be added only when BCR is 0.75 or greater using traditional benefits
- Must know total size of area associated with
- Includes creation of green space and riparian areas
 - Green Open Space @ \$2.57 per square foot
 - Riparian Areas @ \$12.29 per square foot

Environmental Benefits in the BCA

PROJECT: Detention basin improvements for 10yr flood mitigation, STRUCTURE: J23 and J33 detention basin
MITIGATION TYPE: Damage-Frequency Assessment - Drainage Improvement

Save and Go Back

Environmental Benefits

Land Use

Square Feet Acres

Total Project Area (Acres)

<input checked="" type="checkbox"/> Green Open Space	<input type="text" value="50%"/>	\$8308/Acre/Year	<input type="text" value="\$ 3,481.00"/>
<input type="checkbox"/> Riparian	<input type="text" value="0%"/>	\$39545/Acre/Year	<input type="text" value="\$ 0.00"/>
<input checked="" type="checkbox"/> Wetlands	<input type="text" value="50%"/>	\$6010/Acre/Year	<input type="text" value="\$ 2,517.98"/>
<input type="checkbox"/> Forests	<input type="text" value="0%"/>	\$554/Acre/Year	<input type="text" value="\$ 0.00"/>
<input type="checkbox"/> Marine & Estuary	<input type="text" value="0%"/>	\$1799/Acre/Year	<input type="text" value="\$ 0.00"/>
Total Percentage	<input type="text" value="100%"/>	Total Land Use Benefits:	<input type="text" value="\$ 5,998.74"/>



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Nature-Based Projects-Paradise Creek



Paradise Creek looking downstream, limit conveyance impacting senior center located downstream.



Paradise Creek after flooding receded, scouring of channel banks



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Sonoma County Green Valley Creek Flood Control

- Floodplain and Stream Restoration project
 - Existing stream channel has significantly aggraded
 - Reduce peak flood stages to protect Green Valley Road crossing and bridge, valuable farmland and restore ecological habitat
 - Will remove 32,000 cubic yards of sediment from creek and re-align a 600-ft reach of the existing channel



Sonoma County Green Valley Creek Flood Control



Looking downstream (north) 600-ft portion of channel that will be re-aligned.



Looking north, current conditions of historic channel to reactivate. 29
Vegetation is mixed riparian woodland



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Hurricane Sandy-Rockaway Boardwalk

\$19M Elevate boardwalk and construct sand barriers



Hurricane Sandy-Rockaway Boardwalk

Protects against sea level rise, tidal flooding & storm surge

- Engineered wetlands & bioswales
- Raise shorelines
- Oyster reefs
- Restore wetlands
- New berms with pathways
- Riprap or stone revetments



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Spokane County Hazard Road Drainage Improvements



Elder Road

Going Green!

Fixing the culvert was a top concern for the county.

- 1) A combination of “grey” and “green” techniques were proposed to meet this priority.
- 2) Instead of mainly filling the gaps with concrete, rocks would be the main support.
- 3) Over top, a mixture of soils from the area would steady the culvert.
- 4) Developing root systems of native plants would hold the soil in place.



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Questions?

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