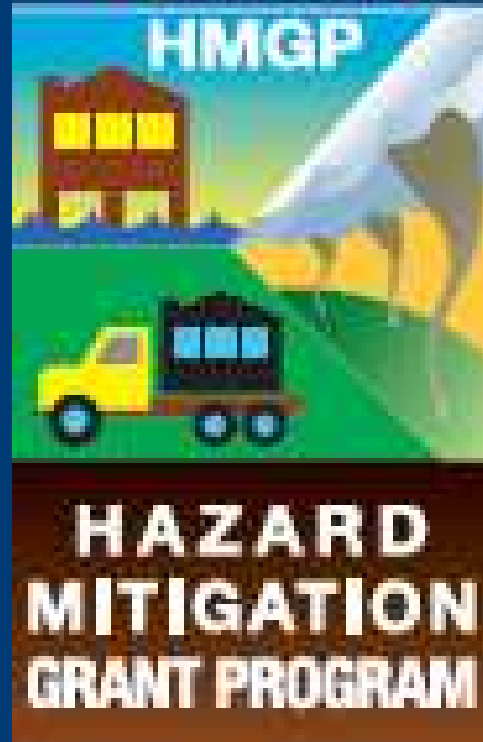


FEMA Perspectives on Natural and Nature-Based Features



Katie Grasty
FEMA, Region IX
Oakland, CA



FEMA

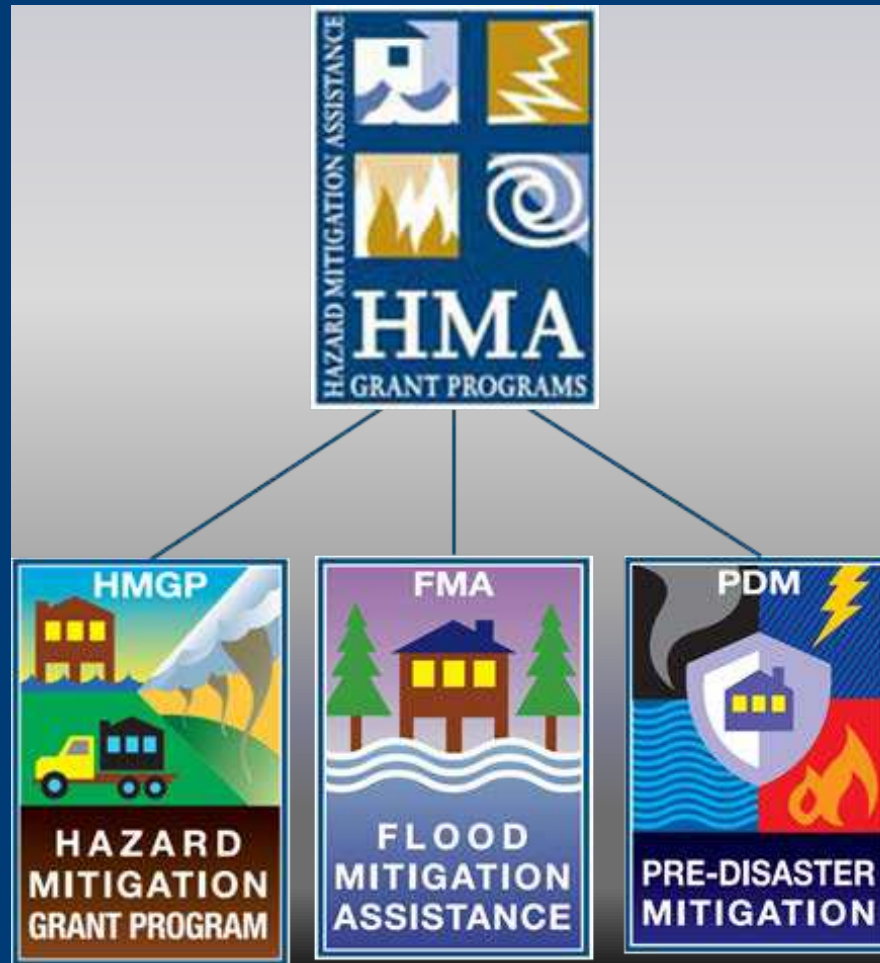
What is Mitigation?

- 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

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



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

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



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!**

Eligible Activities

| Eligible Activities |  HAZARD MITIGATION GRANT PROGRAM |  PRE-DISASTER MITIGATION |  FLOOD MITIGATION ASSISTANCE |
|---|--|---|--|
| 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*



D
I
O
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V
C
E

| 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

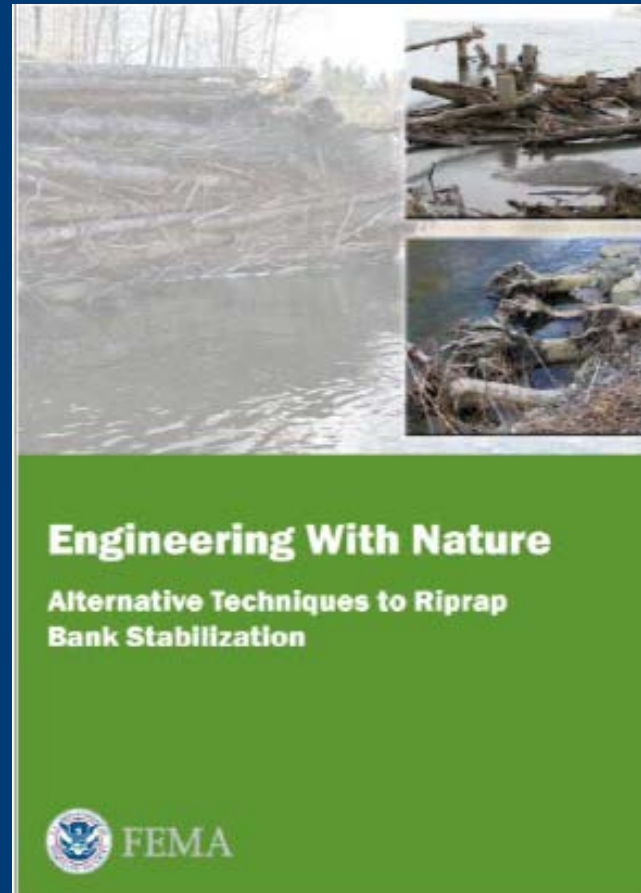


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[illegible]

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Engineering with Nature



Available here:

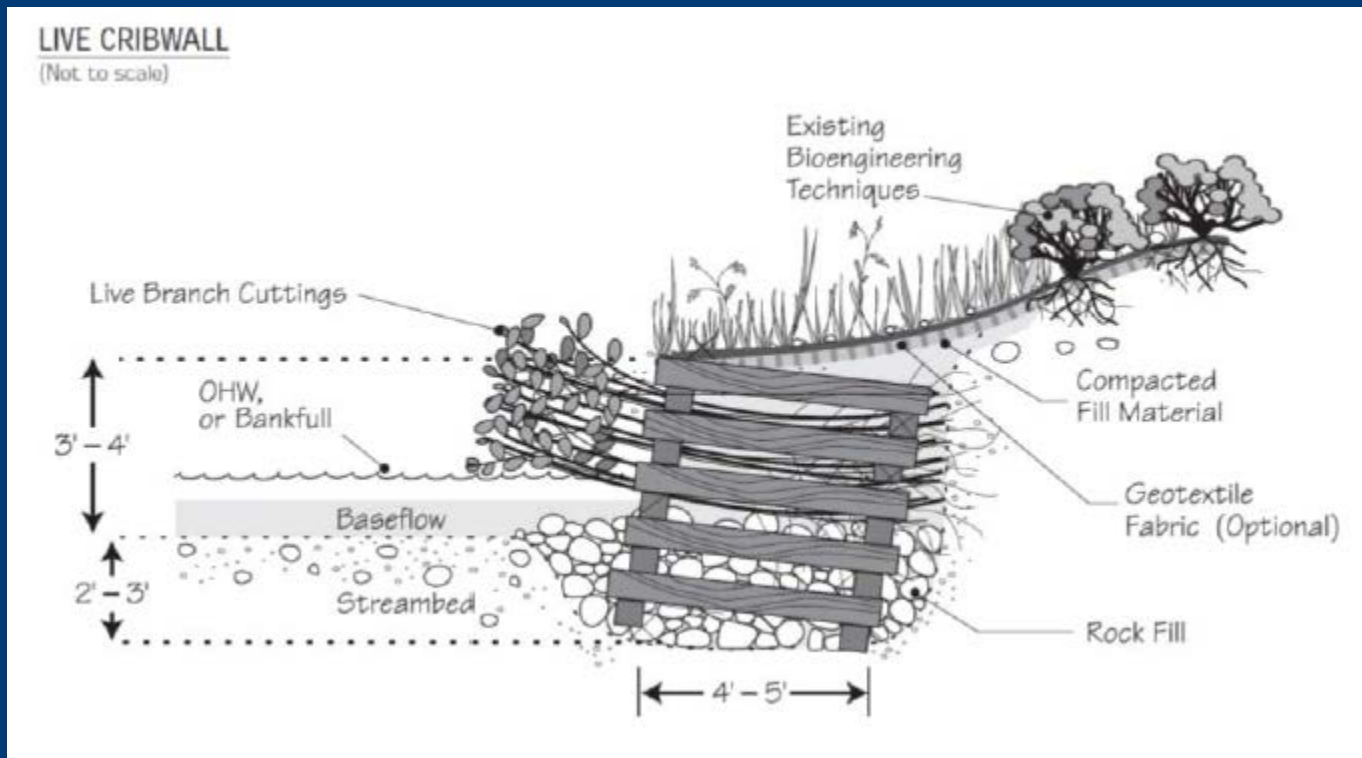
https://www.fema.gov/pdf/about/regions/regionx/Engineering_With_Nature_Web.pdf

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.



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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

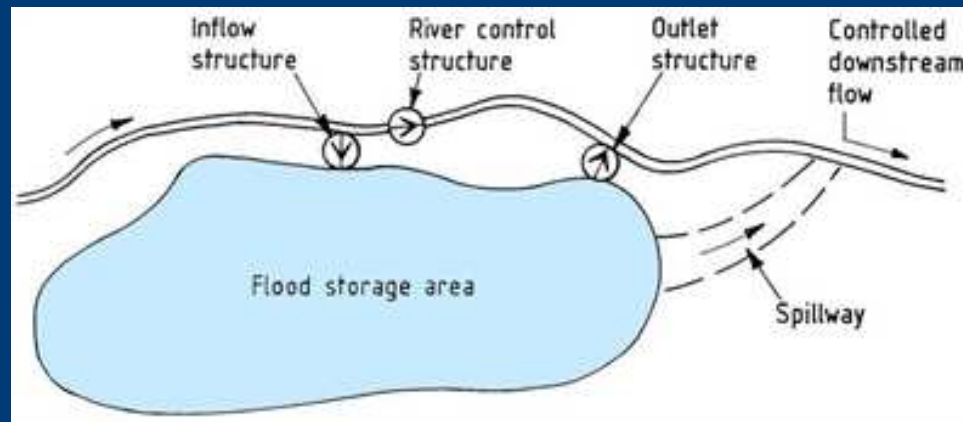


Image Source: www.evidence.environment-agency.gov.uk



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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: mygreenenvironment.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/conserv 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



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 Total Land Use Benefits:



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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



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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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