NEEA 2012 Summary and Program Recommendation
Wetlands Mapping Consortium
April 18, 2012

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The National Map

National Enhanced Elevation Assessment
At a Glance

- Sponsored by the National Digital Elevation Program (NDEP) and funded by USGS, NGA,FEMA, NRCS and NOAA to:
    - Document national requirements for improved elevation data from technologies such as LiDAR and IfSAR
    - Estimate the benefits and costs of meeting these requirements
    - Evaluate multiple national enhanced program scenarios

- 602 mission-critical activities that require enhanced elevation data were identified by:
    - 34 Federal agencies
    - 50 states
    - A sampling of local governments, tribes, private and not-for profit organizations

- **A national program has the potential to generate $1.2 billion to $13 billion in new benefits each year when fully operational**

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+ Example Business Uses

602 Functional Activities (needs) documented and summarized in 27 Business Uses

Precision Farming
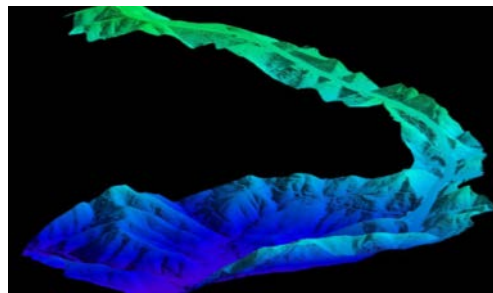
Land Navigation and Safety

Geologic Resources and Hazards Mitigation

Natural Resource Conservation

Infrastructure Management

Flood Risk Mitigation

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+ Benefits for Top Business Uses

Rank		Annual Benefits	
		Conservative	Potential
1	Flood Risk Management	$295M	$502M
2	Infrastructure and Construction Management	$206M	$942M
3	Natural Resources Conservation	$159M	$335M
4	Agriculture and Precision Farming	$122M	$2,011M
5	Water Supply and Quality	$85M	$156M
6	Wildfire Management, Planning and Response	$76M	$159M
7	Geologic Resource Assessment and Hazard Mitigation	$52M	$1,067M
8	Forest Resources Management	$44M	$62M
9	River and Stream Resource Management	$38M	$87M
10	Aviation Navigation and Safety	$35M	$56M
⋮			
20	Land Navigation and Safety	$0.2M	$7,125M
	Total for all Business Uses (1 – 27)	**$1.2B**	**$13B**

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+ BU #9 – Geologic Resource Assessment and Hazards Mitigation

<u>USGS Mission Critical Requirements:</u> Identify areas, level of activity & risk associated with Earth hazards to reduce losses and increase public safety.

<u>Update frequencies</u>: 4-10 years

<u>Expected combined benefits</u>: $31.25M/year

<u>Data requirement</u>: Predominantly QL 1
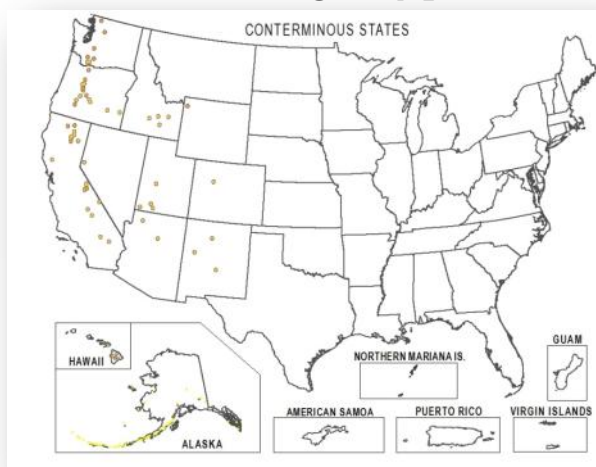
<u>Example applications:</u>

- Identify faults/landslides under thick vegetation
- Enhance infrastructure engineering design
- Estimate size, speed and effects of landslides
- Create loss mitigation strategies
- Provide maps and models to emergency planners

Seismic

Quality Level
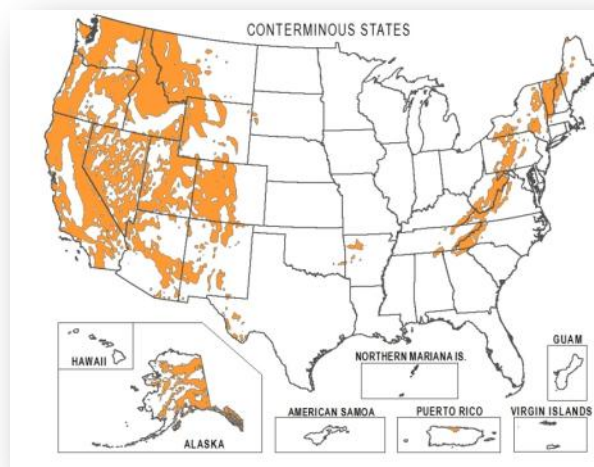- Quality Level 1
- Quality Level 2
- Quality Level 3
- Quality Level 4
- Quality Level 5

Volcanos

Landslides

+ BU #8 – Agriculture and Precision Farming

<u>J.R. Simplot Company Mission Critical Requirements</u> –
QL 3 LiDAR is required for all agricultural land for site-specific application of seed, fertilizer, lime, pesticides and water to optimize farm yields. Also used to reduce farm and pasture runoff that pollutes streams.

- <u>Update Frequencies</u> 6-10 years.
  - <u>Expected benefits</u> $50M/year in the Red River Valley (parts of ND and MN) for farm drainage-related losses to corn and wheat alone.
  - <u>Potential benefits</u> $2B/year. If 10% of drainage-related productivity losses were averted with improved elevation data on a national basis.
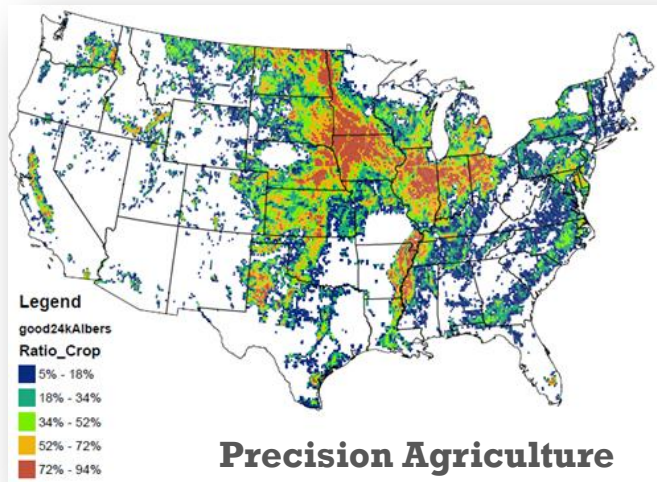

Legend
good24kAlbers
Ratio_Crop

- 5% - 18%
- 18% - 34%
- 34% - 52%
- 52% - 72%
- 72% - 94%

Precision Agriculture

Image from University of Missouri Extension

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+ NEEA Quality Levels

Quality Level	Horizontal Point Spacing (meters)	Vertical Accuracy (centimeters)	Description
1	0.35	9.25	High accuracy and resolution LiDAR example: LiDAR data collected in the Pacific Northwest
2	0.7	9.25	Medium-high accuracy and resolution LiDAR
3	1-2	<18.5	Medium accuracy and resolution LiDAR – analogous to USGS specification v. 13 and most data collected to date
4	5	46-139	Early or lower quality LiDAR and photogrammetric elevations produced from aerotriangulated NAIP imagery
5	5	93-185	Lower accuracy and resolution, primarily from IfSAR

+ National Digital Elevation Program (NDEP)
Status of Elevation Data

Map depicts public sources of LiDAR in all states
plus IfSAR data in Alaska
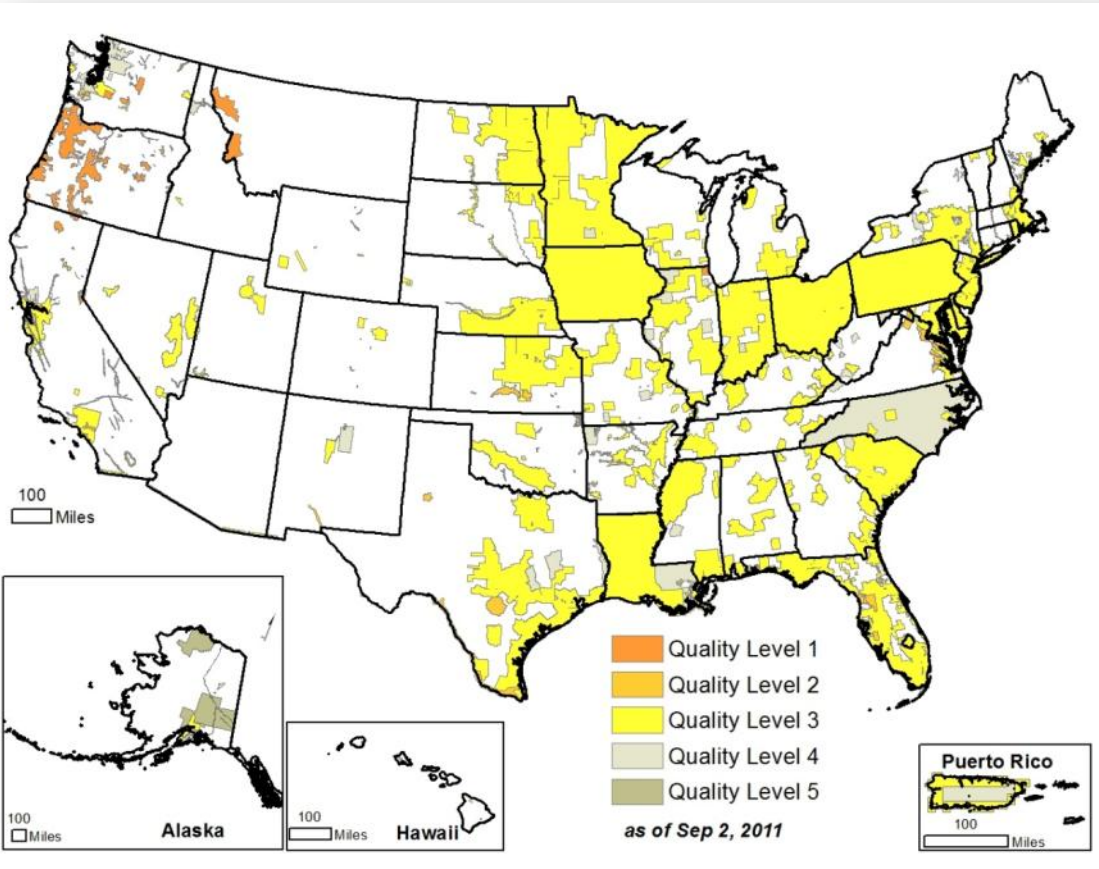

1996 - 2011

- 28% coverage - 49 states
- 15% coverage – Alaska
- 30+ year replacement cycle
- Program is efficient – less than 10% overlap of coverage
- Cooperative data projects work
- Data quality variable

Why is this a problem?

- Remaining 72% coverage is 30 or more years old.
- Alaska – very poor quality
- Meets 10% of need
- Current and emerging needs require much higher quality data.

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+ 10 Program Scenarios Developed

Needs addressed by data quality and replacement cycle combinations

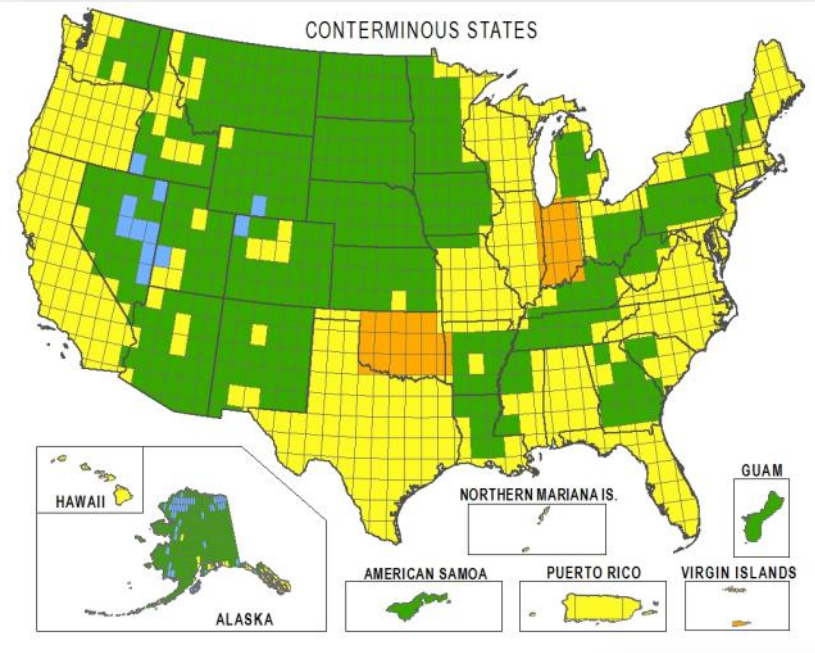**USGS**
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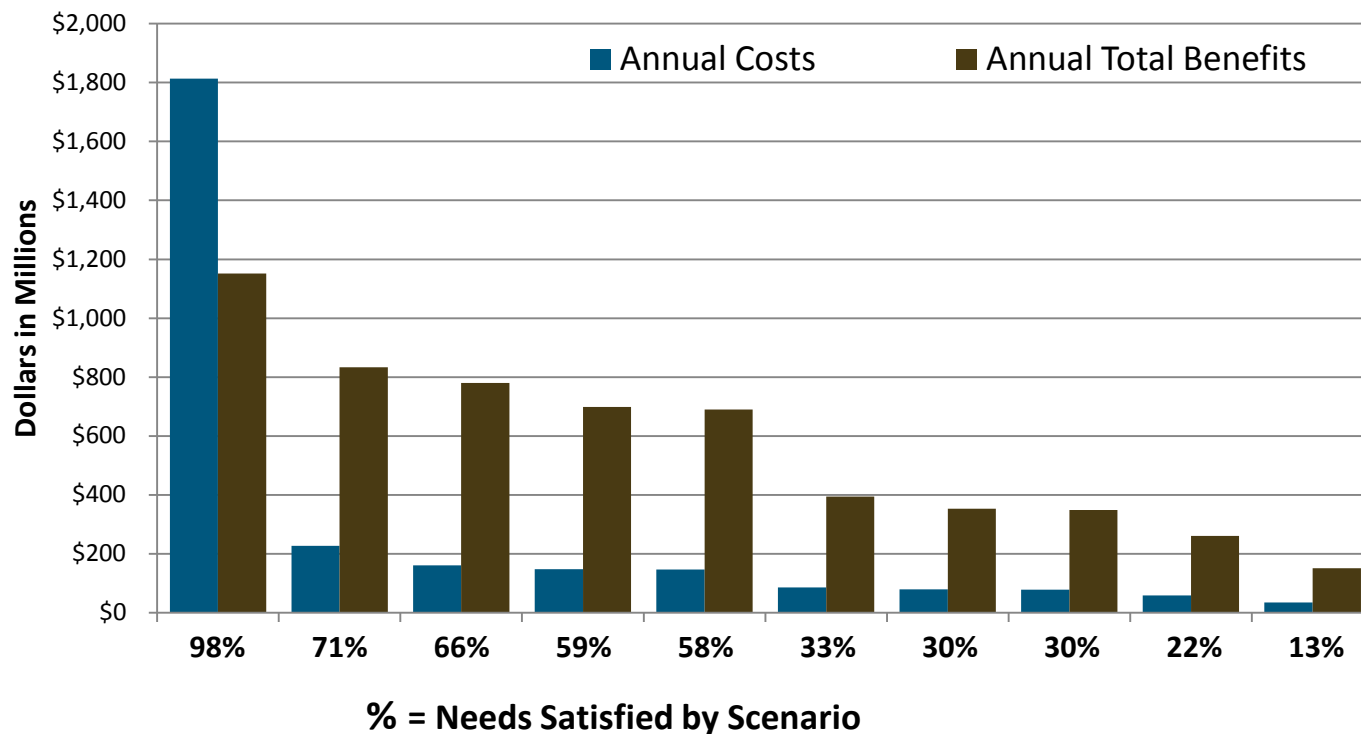
+ Scenario: Highest Net Benefits for Combined
Federal, State and Nongovernmental Organizations
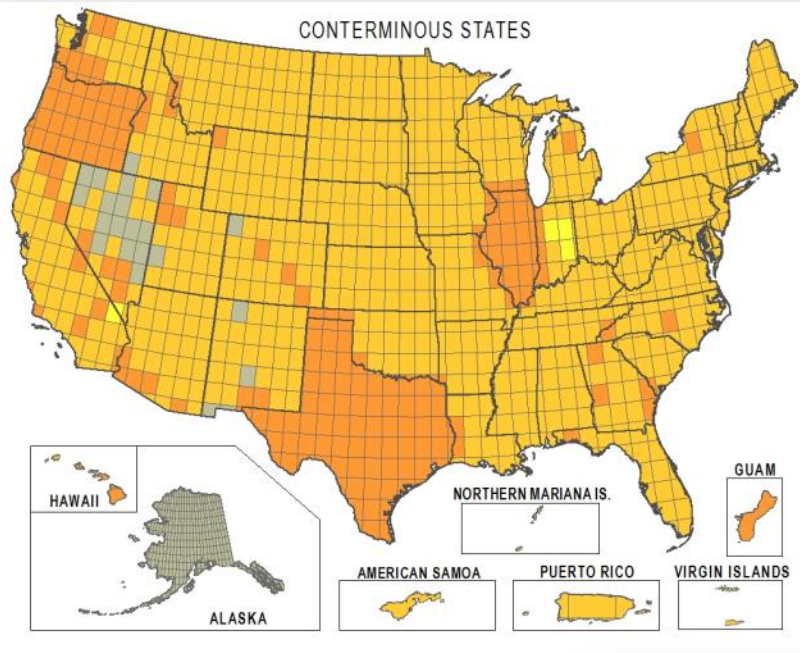
Quality
Levels

Data Requirements

Quality Level
- 🟧 Quality Level 1
- 🟨 Quality Level 2
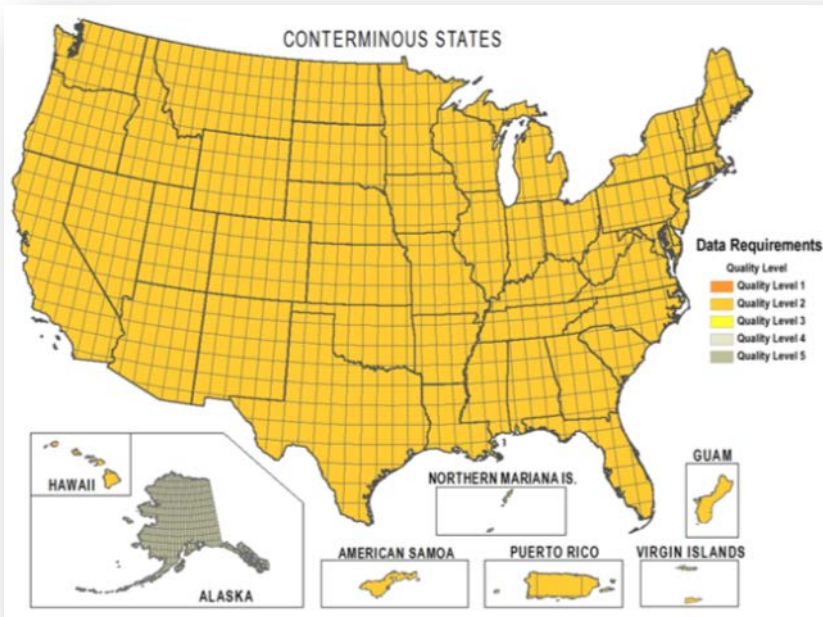- 🟨 Quality Level 3
- ⬜ Quality Level 4
- ⬜ Quality Level 5

Update
Frequencies

Legend

Update Frequency
- 🟥 Annual
- 🟧 2 - 3 years
- 🟨 4 - 5 years
- 🟩 6 -10 years
- 🟦 > 10 years

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+Scenario: Uniform QL2 (QL 5 in AK)

8 year acquisition

Avg. Annual Costs: $146M

Avg. Annual Benefits: $690M

Avg. Annual Net Benefits: $544M

B/C Ratio: 4.7:1

Total Possible Benefits Satisfied: 58%

15 year acquisition

Avg. Annual Costs: $78M

Avg. Annual Benefits: $349M

Avg. Annual Net Benefits: $271M
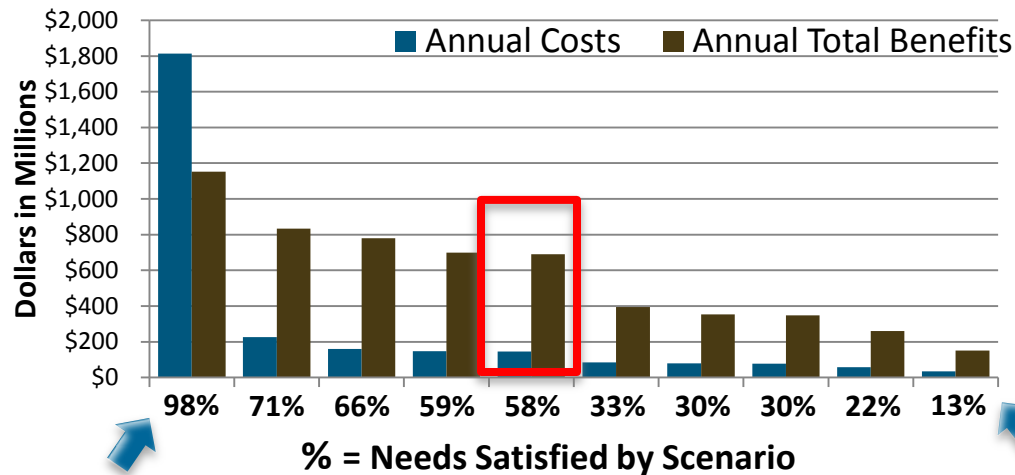
B/C Ratio: 4.5

Total Possible Benefits Satisfied: 30%

+ Summary of Findings and Conclusions

- Status quo program relatively efficient but meets less than 10% of measured needs.

- All program scenarios provide favorable benefit cost ratios.

- All program scenarios combine multiple requirements and collect data in large regular blocks to achieve improved cost efficiency.

- IT infrastructure needed to manage data for all scenarios.

- No technical barriers to moving ahead

- Major dollar benefits are realized from high quality data.

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+ National Program Recommendation

- LiDAR, Quality Level 2 for 49 states, IfSAR, Quality Level 5 in Alaska
- 8 year acquisition
- Average Annual Costs: $146 M
- Average Annual Benefits: $690 M (B/C: 4.7:1)
- Total Possible Benefits Satisfied: 58%

Annual Costs ■ **Annual Total Benefits** ■

Dollars in Millions

% = Needs Satisfied by Scenario

98% 71% 66% 59% 58% 33% 30% 30% 22% 13%

Highest quality level (QL1) on an annual cycle

Quality level of existing program (QL3) on a 25 year cycle

- 10 scenarios were evaluated
- Needs addressed vary with data quality and replacement cycle

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+ Recommended Elevation Data Program
QL2 LiDAR* - 8 year acquisition)

Advantages:

- Achieves the majority of benefits

- High benefit-cost ratio and net benefits

- Benefits realized in 8 years instead of 30+ years for status quo

- Meets all lower QL requirements and partially satisfies QL1

- Cost efficiencies achieved through large area acquisition strategy

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* Note: All scenarios include QL5 (IfSAR) for Alaska
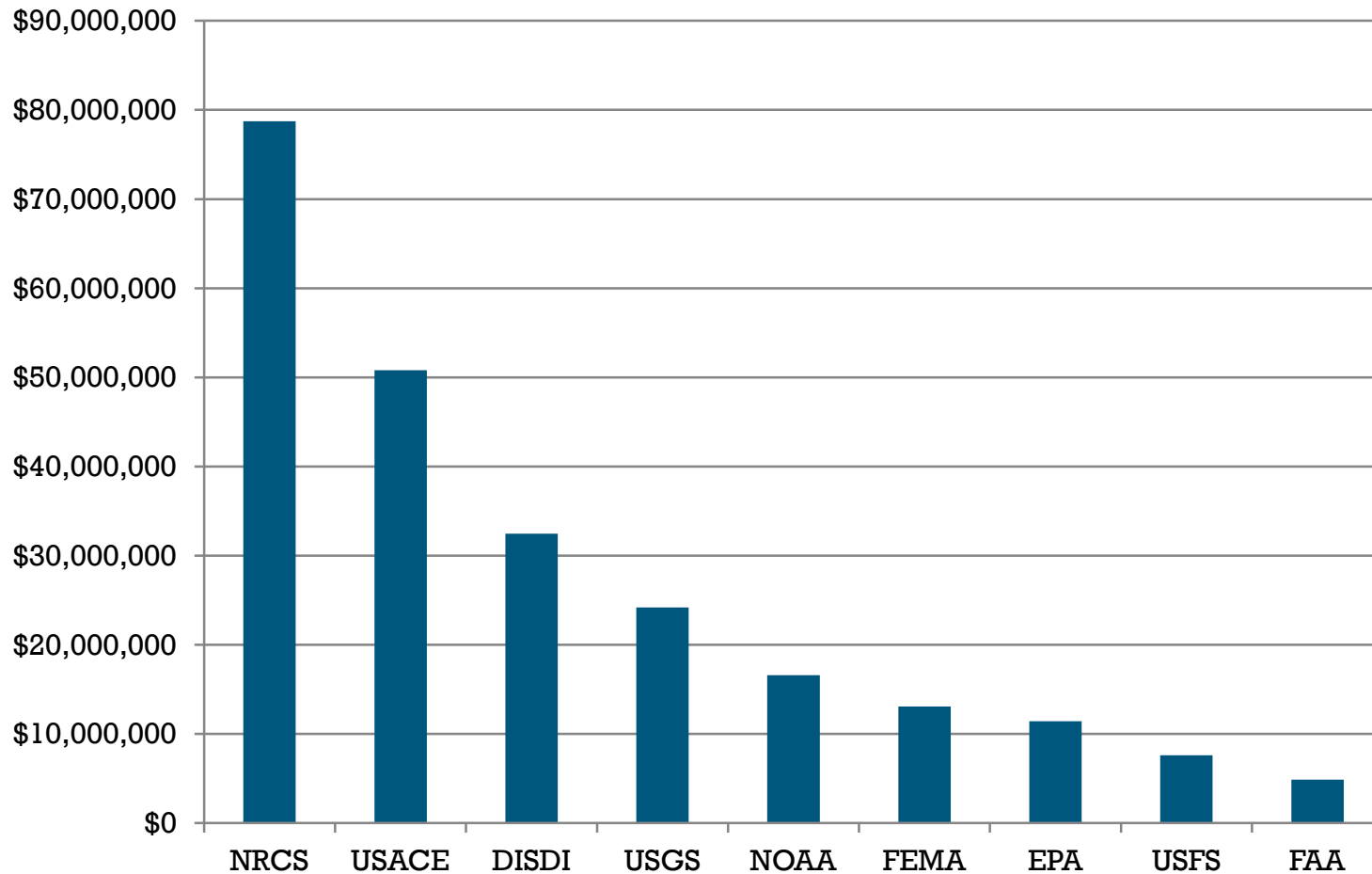
+ Program Development
Next Steps

- Communications ongoing with potential partners and other stakeholders

- FGDC review of program recommendation

- Develop governance model for community review (June/July)

  - Flexible process to meet annual requirements of partner agencies

  - Use existing mechanism as the forum for negotiations: National Digital Elevation Program

  - Use lessons learned and consider other successful partnerships: National Agriculture Imagery Program

+ Proposed Funding Strategy Outline
Cooperatively Funded Program Executed by USGS

- Coalition of Federal agencies commit funding to a national program (in rank order of benefits): NRCS, USACE, DISDI, USGS, NOAA, USFS, FEMA, EPA, FAA, NGA

- States and other partner agencies will be invited to participate

- Collection priorities will be based on coalition partner agency needs

- Acquisition cycle scales with funding

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For more information

- NEEA Webpage
  - Http://nationalmap.gov/3dep/neea.html

- Greg Snyder, NEEA Project Manager
  - gsnyder@usgs.gov

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