The State and Future of U.S. Soils

National Academy of Sciences
December 5, 2016

Jo Handelsman
Associate Director for Science
White House Office of Science and Technology Policy

Value of Soil

- Food Security (on Earth and Mars)
- Climate mitigation (carbon storage)
  - 1,300-1,600 Gt of organic carbon in the top meter of soil
  - >2x atmosphere, >3x all plant biomass
- Water quality and availability
- Bioenergy
- Human health
- Biodiversity

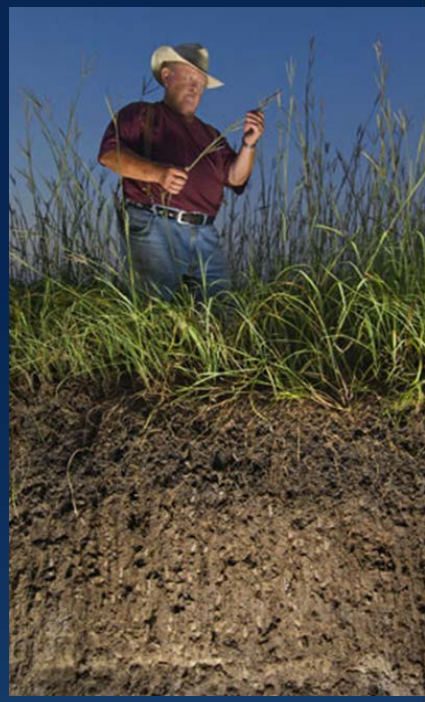
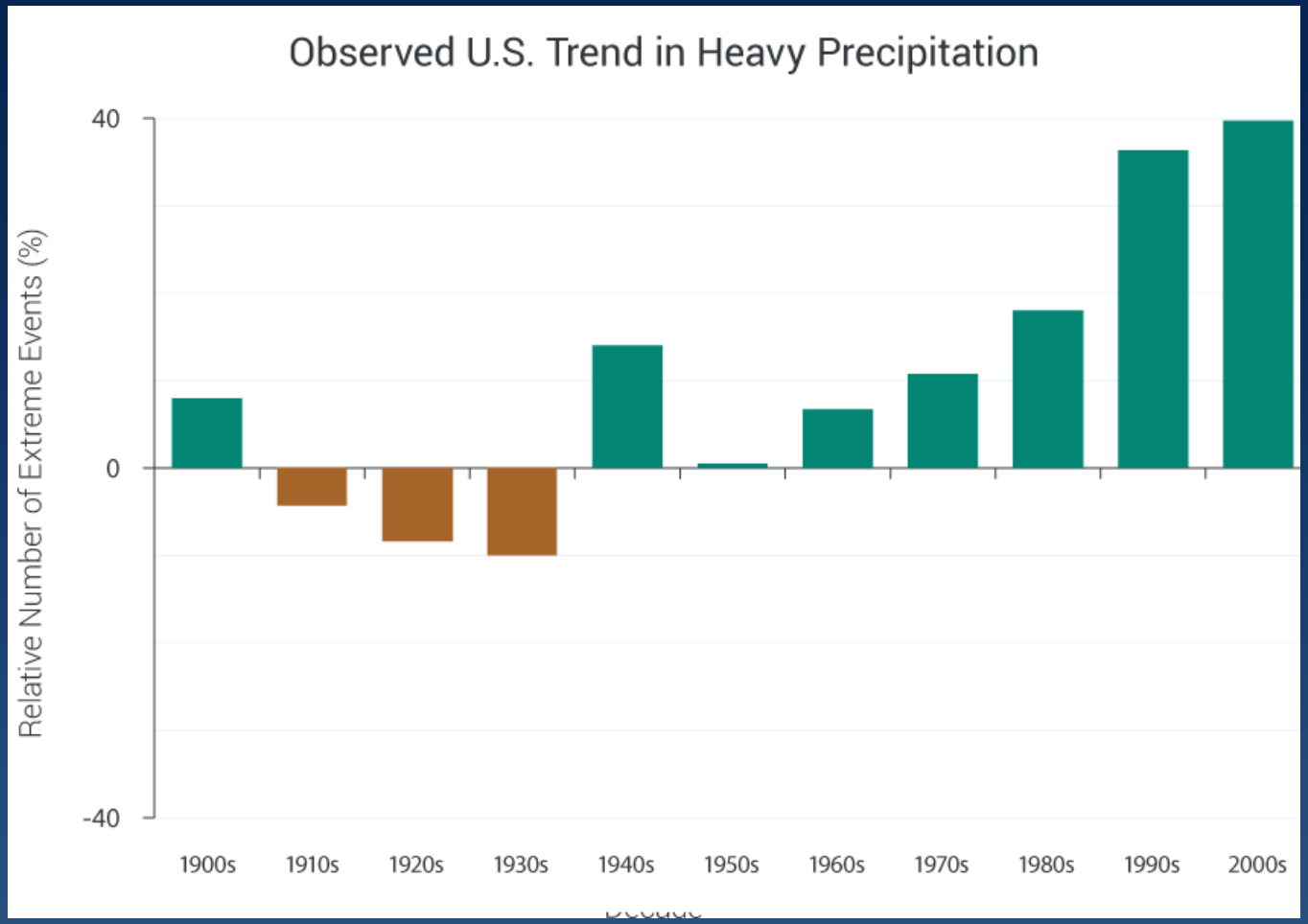


Photo: Jim Richardson, Small World Gallery

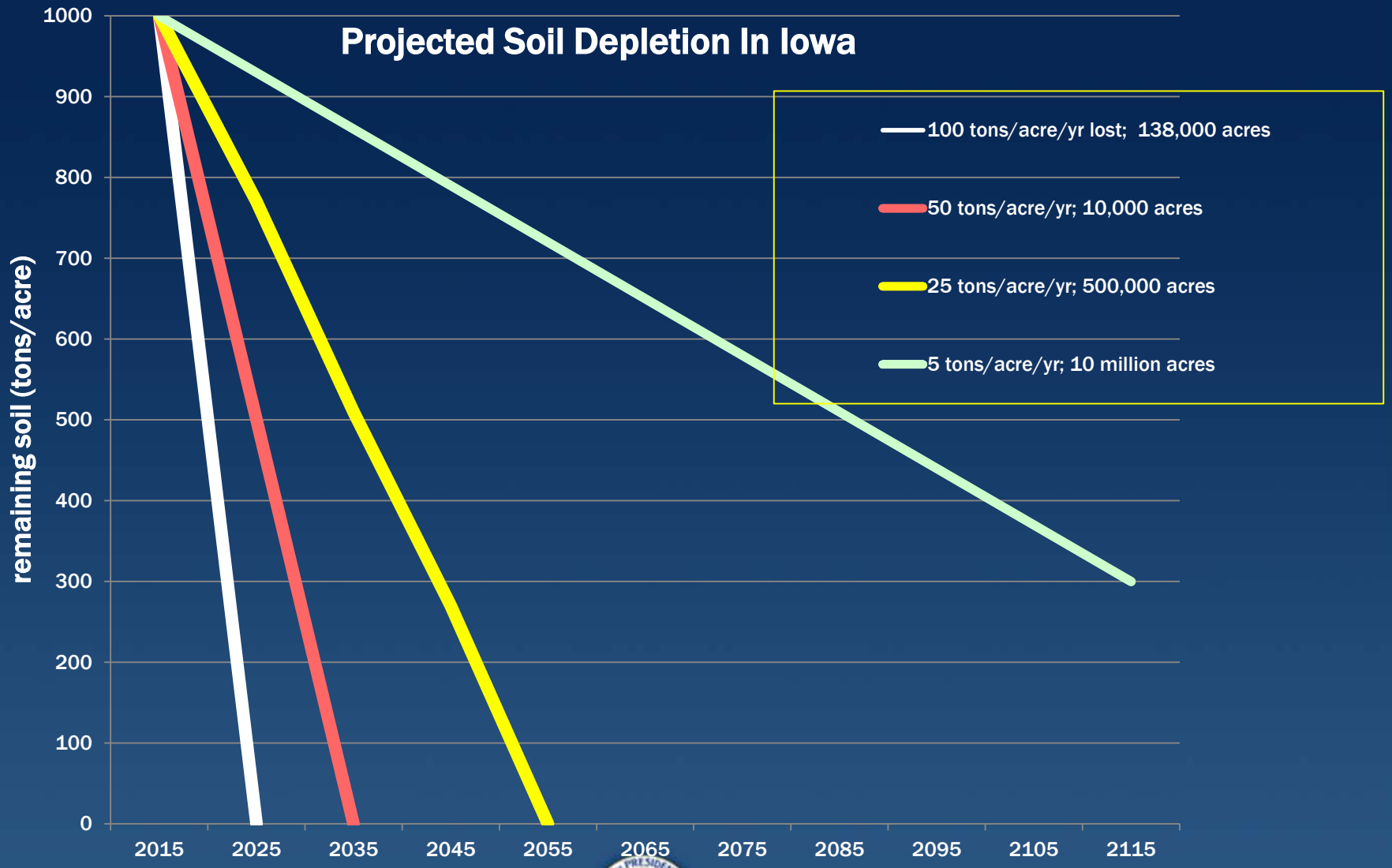
Challenges

- Land-Use and Land-Cover Change
  - Expansion of cropland to vulnerable lands (e.g. wetlands)
  - Urban development
  - Mining and resource extraction
  - Conversion of forests to urban and crop land
  - Other changes (e.g. landslides)
- Unsustainable Land-Management Practices
  - Effects on soil biodiversity
  - Biomass management and fires
  - Resources pressures, water management, nutrient pollution
  - Managing farms: cover crops, no-till, etc
  - Grazing practices
- Climate and Environmental Change
  - Changes in hydrology and precipitation
  - Effects of higher temperatures on soil carbon
  - Carbon sequestration
  - Atmospheric deposition
  - Invasive species

Climate Change Threats to Soil



Projections of Soil Erosion (OSTP)



Impacts of Legislation and Policy

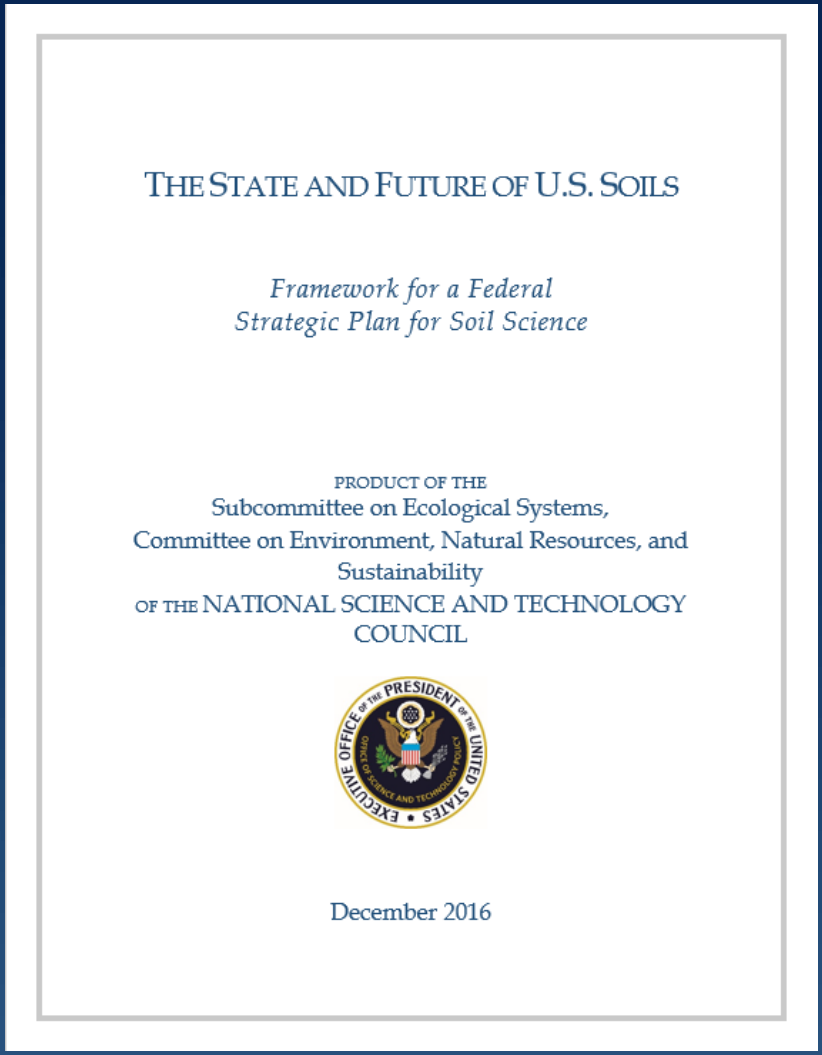
- 1985 Food Security Act – reduced erosion dramatically in first decade
- 1990 amendments to Clean Air Act – protected soil by addressing acid deposition, though recovery has been slow
- Under Sec. Vilsack, Farm Bill conservation programs have grown by nearly 200 million acres
- Federal Govt's authority to ensure compliance is limited, many programs operate by self-certification

Today's Announcements from the White House Office of Science and Technology Policy

Federal Soil Science Framework

- Chartered SSIWG with 15 Federal agencies to develop a Federal Strategic Plan for Soil Science

- Available on the Federal Register for public comment until January 10, 2016



THE STATE AND FUTURE OF U.S. SOILS

Framework for a Federal Strategic Plan for Soil Science

PRODUCT OF THE
Subcommittee on Ecological Systems,
Committee on Environment, Natural Resources, and Sustainability
OF THE NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

December 2016

Five Priorities for the Future

1. Support applied social-science research in soil sciences and enhance public awareness of soils.

2. Advance the national research infrastructure for soil-data storage, analysis, and sharing.

3. Support a coordinated research effort on the interactions between soils and the global climate.

4. Support the expansion of, and increased investment in, long-term research to better understand, document, and manage the effects of land-use and land-cover change on soils.

5. Support the development of programs and assistance to promote sustainable land-management practices and programs to minimize unsustainable practices.

New Actions to Maintain and Create Healthy Soil

- Promoting interdisciplinary research and education
- Advancing computational tools and modeling
- Expanding sustainable agricultural practices

Promoting Interdisciplinary Research and Education

Federal

- $20 million for research from DOE's Pacific Northwest National Lab
- >25 soil research projects expanded by ARS
- 100-year biodiversity experiment by the Smithsonian

Collaborating Organizations

- University of Alabama will create the *Southern Urbanism and Policy Initiative* with 15 collaborating organizations
- New faculty hires at Colorado State University, University of Alabama, and Oregon State University

… and more

Advancing Computational Tools and Modeling

Federal

DOE's **Lawrence Berkeley National Laboratory**

- $450,000 in Eco-FAB project
- Develop microcosms to model soil
- Leverage synthetic biology tools to help prevent soil erosion improve soil productivity, and support rural ag development

Collaborating Organizations

- At least $7.5 million at University of Arizona to study soil formation in controlled environments
- New regional soil laboratory California State University, Chico

… and more

Expanding Sustainable Agricultural Practices

Federal

- MOU between ARPA-E and The Nature Conservancy
- Expand applied soil research and conservation on agricultural lands
- Focus on soil-carbon sequestration, clean water, and more

Collaborating Organizations

- $200 million from Fall Line Capital to expand sustainable practices with a net zero soil loss target
- Soil conservation practices expanded to more than ~8 million acres of agricultural land
- One Acre Fund — soil health research collaboration with >4,500 farmers in Kenya and Rwanda

… and more

View the Framework & Fact Sheet

OSTP.gov