Future Interstate Study

Change :: Resilience :: FHWA perspectives

A Presentation by

Joe Krolak, P.E.
Principal Hydraulic Engineer
FHWA
Washington DC

27 March 2017
Listening Session

FHWA, Change, & Resilience

- **Where Are We?**
  - ***Quick Current Snapshot***
- **How Did We Get Here?**
  - ***Milestones & Lessons***
- **A System of Change**
  - ***Beyond Status Quo***
- **Conclusions & Takeaways**

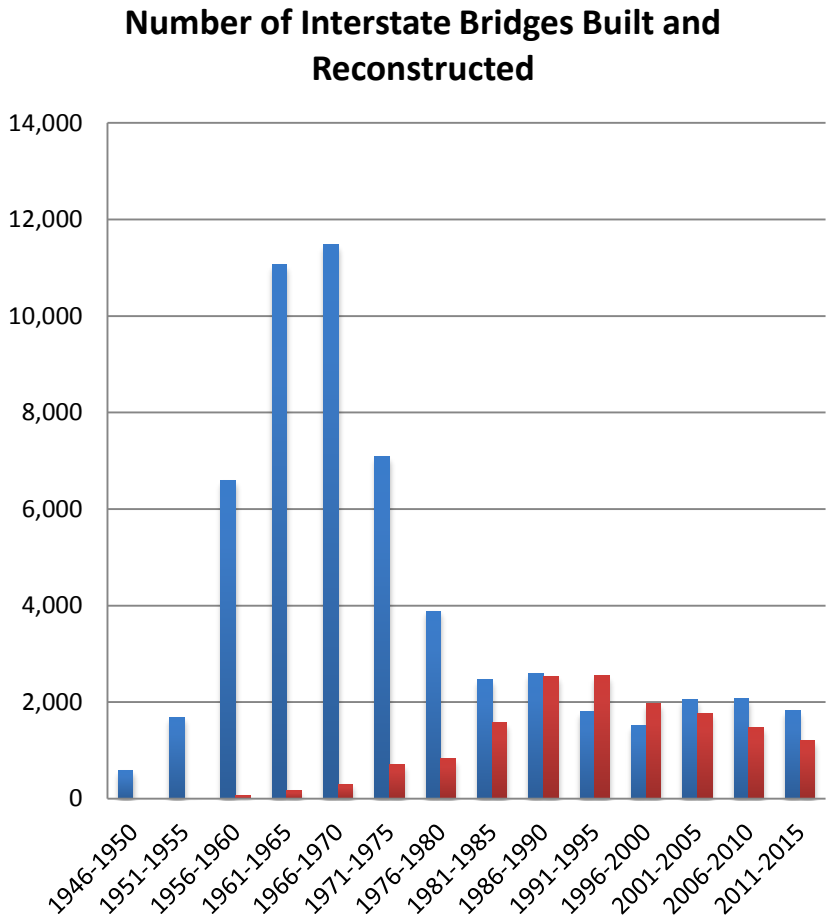
Interstates :: Our Partners

Interstates :: Where We Are – A Quick Snapshot …

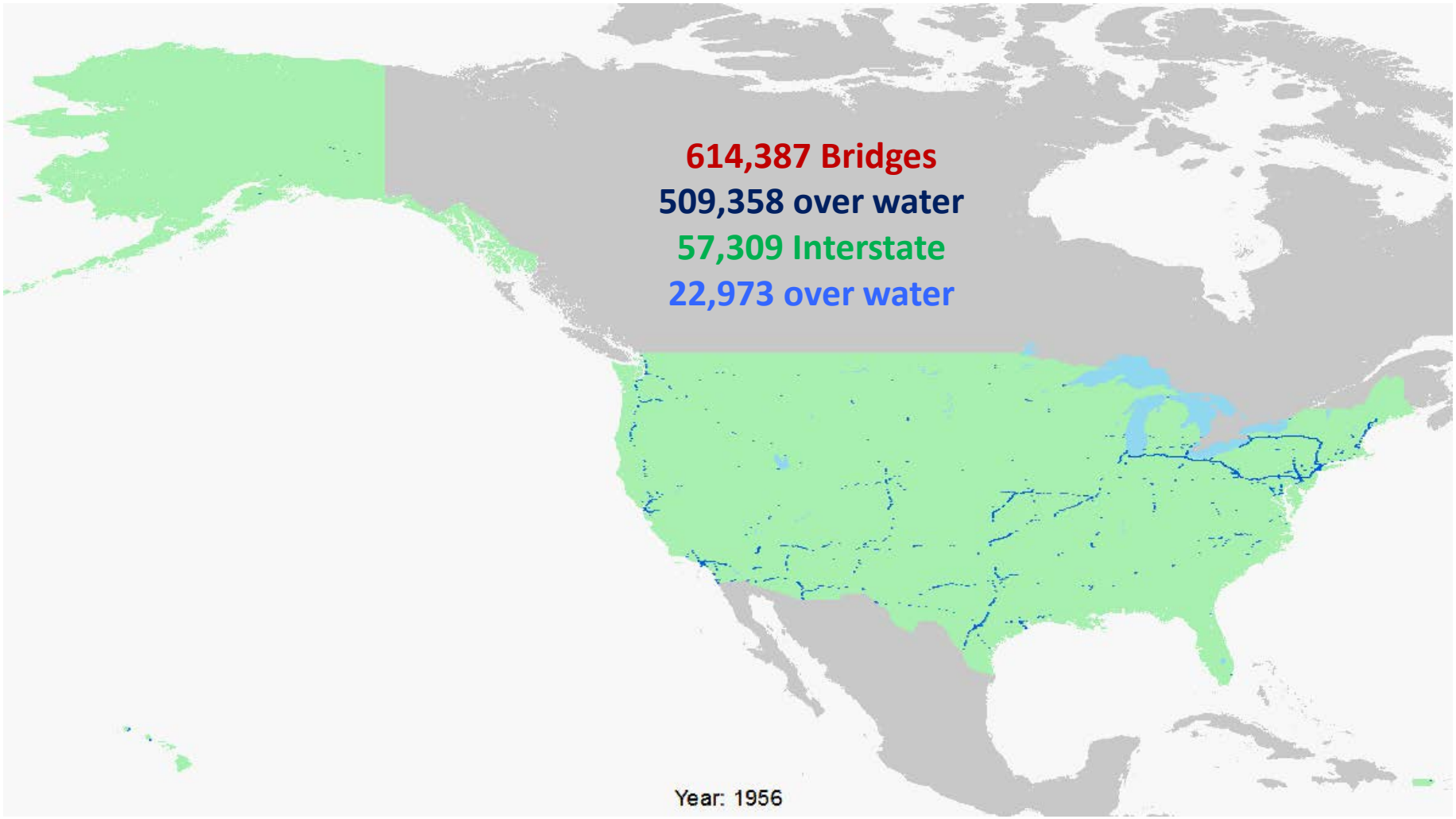
Bridges :: A Microcosm of a System

- **Count: 57,309**
  - *Rural: 25,176*
  - *Urban: 32,133*
  - *Over Water: 22,973*

- **Averages**
  - *Year Built: 1973 (44 years)*
  - *Reconstructed : 1993 (24 years)*
  - *Traffic Lanes: 3*
  - *Daily Traffic: 36,540 vehicles*
  - *% Trucks: 17%*



Interstates :: Bridges over Time …



Interstates :: How Did We Get Here?

Presidential terms and some milestones on our journey …










Interstates :: Change

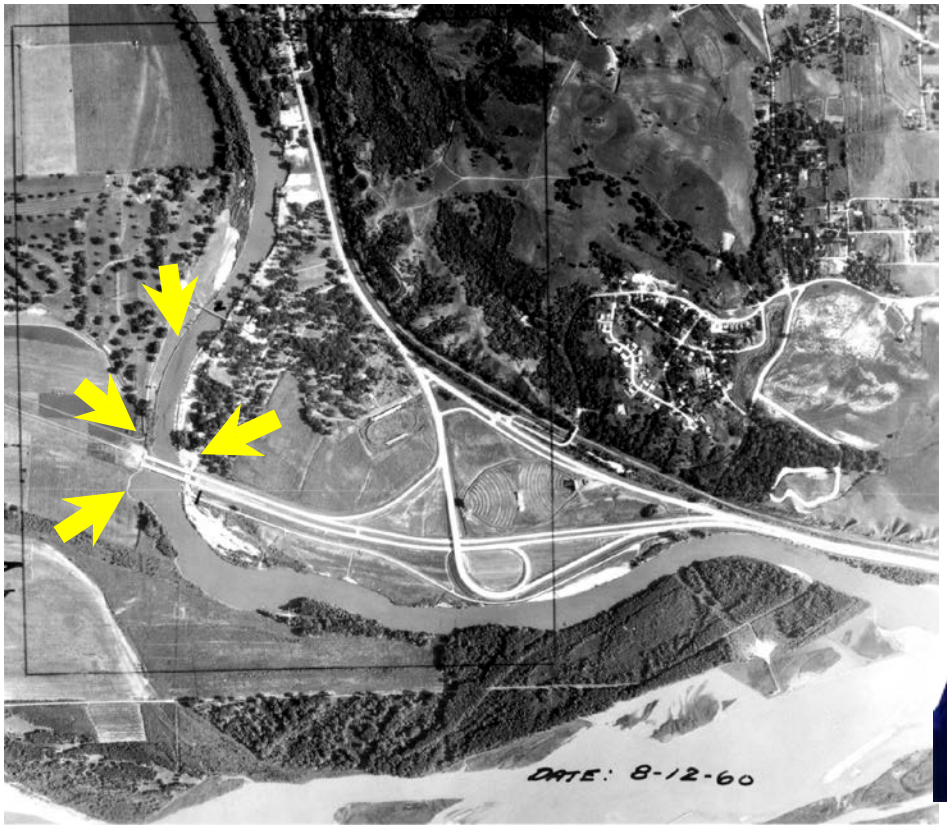
A Federal Design Standard

Designs for all Interstate culverts and bridges over streams shall … accommodate floods at least as great as that for a 50-year frequency or the greatest flood of record, whichever is the greater, with the runoff based on the land development expected in the watershed 20 years hence ….”

Policy and Procedure Memorandum 20-4
Bureau of Public Roads
August 10,1956

Interstates :: Uncertainty

1 April 1962 :: I-29 Bridge on Big Sioux River



National Bridge Inspection Standards

SILVER BRIDGE TUMBLES,
TOLL, 7 DEAD, 41 MISSING

SPECIAL EDITION

Point Pleasant Register

Mason County's Daily Newspaper

Vol. XXXIII NO. 303 Point Pleasant, W. Va. SATURDAY, DEC. 15, 1967 Price 5c

'I Couldn't Understand Why I Made It'

Five Survivors Give Accounts

Divers Begin Search For Untold Loss

Eye Witnesses Tell Of Tragedy

1974 :: FHWA Floodplain Regulation

RULES AND REGULATIONS 36331

all lands therein, the Federal share shall be increased by a percentage of the remaining cost equal to the percentage that the area of all such lands in such State is of its total area; or

(2) May be increased to 100 percent of the replacement cost of a comparable facility upon the request of the State when concurred in by the Federal Highway Administrator if the increased payment would be in the public interest.

(b) The Federal share payable for any repair or reconstruction of Federal roads may equal 100 percent of the cost regardless of whether such highways or roads are on any Federal-aid system.

§ 630.507 Eligibility of work.

(a) Emergency funds may participate in:

(1) Repairs to or reconstruction of damaged facilities of the highway within the right-of-way limits. Control features for stream channels outside the highway right-of-way shall not be eligible for emergency funds unless:

(i) The public highway agency has responsibility for the maintenance and proper operation of the stream channel section, and

(ii) The control features are necessary to preserve satisfactory operation of the highway system involved.

(2) Relocation or rebuilding, including costs of right-of-way, at higher elevations and the extension, replacement, or raising of any bridges affected where clearly economically justified to prevent future recurring damage under similar conditions.

(3) Temporary operations, including emergency repairs undertaken during or immediately following the occurrence for the purpose of:

(i) Reducing the extent of the damage;

(ii) Protecting remaining facilities; or

(iii) Restoring travel.

(4) Preliminary engineering. If performed by consultants prior approval of the contract by FHWA is required.

(b) Temporary operations and preliminary engineering as set forth in § 630.507(a)(3) and (4), respectively, may proceed without prior program approval and authorization provided the need for such is subsequently approved by the FHWA. This work must be included in a program to provide a basis for reimbursement.

(c) Permanent restoration work shall not be performed prior to program approval and authorization by the FHWA unless performed as part of an emergency repair project.

(d) Replacement highway facilities having more traffic lanes than the destroyed facility are limited in emergency relief reimbursement to a share of the cost of a new facility to current design standards of comparable traffic capacity to the destroyed facility.

§ 630.508 Submission of programs and allocation of funds.

(a) The FHWA concurrence in the official State proclamation and approval of the State's application is the basis for emergency funds allocations. After the allocation of emergency funds, the State highway department shall promptly submit a detailed program of projects individually justified and prepared in accordance with Federal-aid highway program procedures to the FHWA for approval.

(b) Authorization letters permitting the State to proceed with an approved program of projects shall establish the obligation of Federal funds.

§ 630.509 Processing of emergency projects.

(a) For projects located on a Federal-aid system, processing shall be by the State Highway Department in accordance with normal procedures for Federal-aid highway projects.

(b) For eligible projects not located on a Federal-aid system, the surveys and plans, specifications, and estimates (PS&E) shall be prepared by:

(1) The agency or organization having jurisdiction over such roads; or

(2) The FHWA and the appropriate agency or organization.

(c) Work shall be undertaken by the contract method where feasible. Requirements of advertising for bids may be waived if:

(1) Such procedure is authorized by State or local law, and

(2) Bids are solicited from a reasonable number of contractors or material supply companies.

The FHWA shall approve any such waiver.

§ 630.510 Expediting emergency projects.

After the approval of programs, all programs shall be constructed promptly as delay in the construction of an approved emergency project may result in withdrawal of the project from the approved emergency program.

NORBERT T. TIEMANN,
Federal Highway Administrator.

[FR Doc.74-23430 Filed 10-8-74;8:45 am]

PART 650—BRIDGES, STRUCTURES, AND HYDRAULICS

Hydraulic Design of Highway Encroachment on Flood Plains; Erosion and Sediment Control

Federal Highway Administration's Chapter I of Title 23, Code of Federal Regulations is amended by adding thereto Part 650, Bridges, Structures and Hydraulics; Subpart A—Hydraulic Design of Highway Encroachment on Flood Plains and Subpart B—Erosion and Sediment Control on Highway Construction Projects.

Subpart A relates to the economical use of flood plains consistent with national environmental policies and the lessening of flood losses in connection with federally-financed improvements. Additionally, this part codifies the appropriate elements of the "Flood Hazard Evaluation Guidelines for Federal Executive Agencies," May 1972, published by the Water Resources Council. Subpart B relates to minimizing water pollution and soil erosion during highway construction.

The matters affected relate to grants, benefits, or programs within the purview of 5 U.S.C. 553(a)(2), therefore, general notice of proposed rulemaking is not required. Therefore, these regulations are effective on the date of issuance set forth below.

Issued on October 3, 1974.

J. R. COUPAL, Jr.,
Deputy Administrator.

Subpart A—Hydraulic Design of Highway Encroachment on Flood Plains

Sec.
650.101 Purpose.
650.103 Policy.
650.105 Definitions.
650.107 Design standards.
650.109 Studies and reports.
650.111 Federal participation in construction costs.

Subpart B—Erosion and Sediment Control on Highway Construction Projects

Sec.
650.201 Purpose.
650.203 Policy.
650.205 Definitions.
650.207 Plans, specifications, and estimates.
650.209 Construction.

AUTHORITY: 23 U.S.C. 315; 49 C.F.R. 1.48(b).

Subpart A—Hydraulic Design of Highway Encroachment on Flood Plains

§ 650.101 Purpose.

The purpose of this subpart is to prescribe policies and procedures for hydraulic designs for highway projects constructed with Federal-aid funds and projects under the direct supervision of the Federal Highway Administration.

§ 650.103 Policy.

(a) It is the policy of the Federal Highway Administration to encourage a broad and unified effort to prevent uneconomic, hazardous or unnecessary use and development of the Nation's flood plains, and in particular to lessen the risk of flood losses in connection with federally-financed improvements; and to comply with the "Flood Hazard Evaluation Guidelines for Federal Executive Agencies," May 1972, published by the Water Resources Council.

(b) It is the policy of the Federal Highway Administration that, where practicable, highway locations shall avoid areas subject to flooding.

§ 650.105 Definitions.

(a) The term "basic flood" shall mean the 100-year flood.

(b) The term "conveyance of the basic flood" shall mean the ability to accommodate passage of the 100-year flood.

(1) Conveyance may be through structures or both through structures and over the highway.

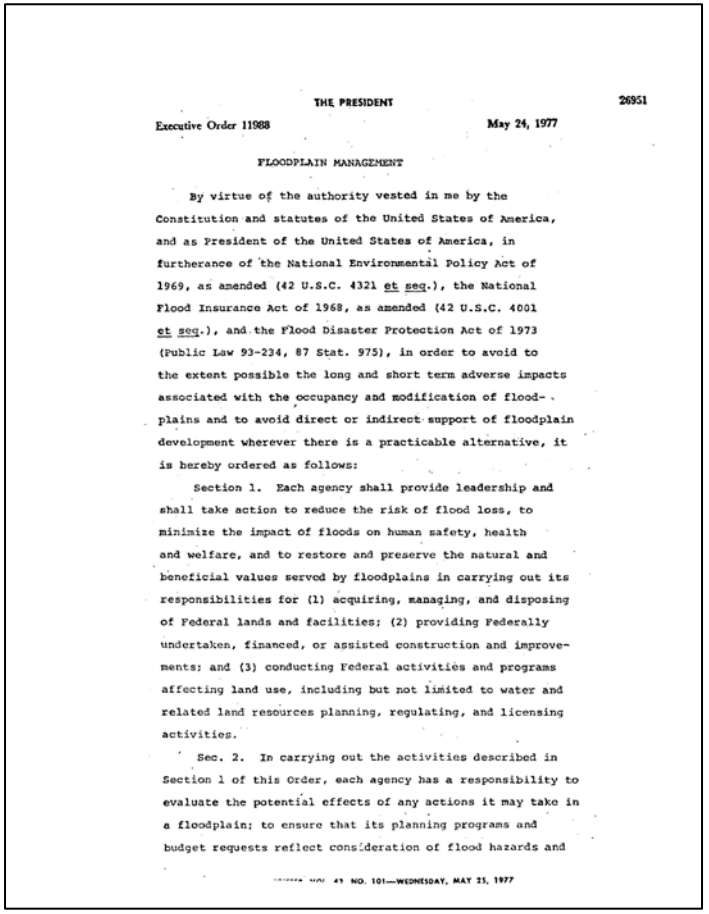
(2) Conveyance along a highway may include inundation of the highway.

(c) The term "design flood" shall mean the peak discharge, volume (if appropriate), and stage or wave crest elevation of the flood associated with the recurrence interval selected for the design of a high-

FEDERAL REGISTER, VOL. 39, NO. 197—WEDNESDAY, OCTOBER 9, 1974

Interstates :: Integrating NEPA & Floodplains

1977 :: Executive Order 11988



THE PRESIDENT 26951

Executive Order 11988 May 24, 1977

FLOODPLAIN MANAGEMENT

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 et seq.), and the Flood Disaster Protection Act of 1973 (Public Law 93-234, 87 Stat. 975), in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, it is hereby ordered as follows:

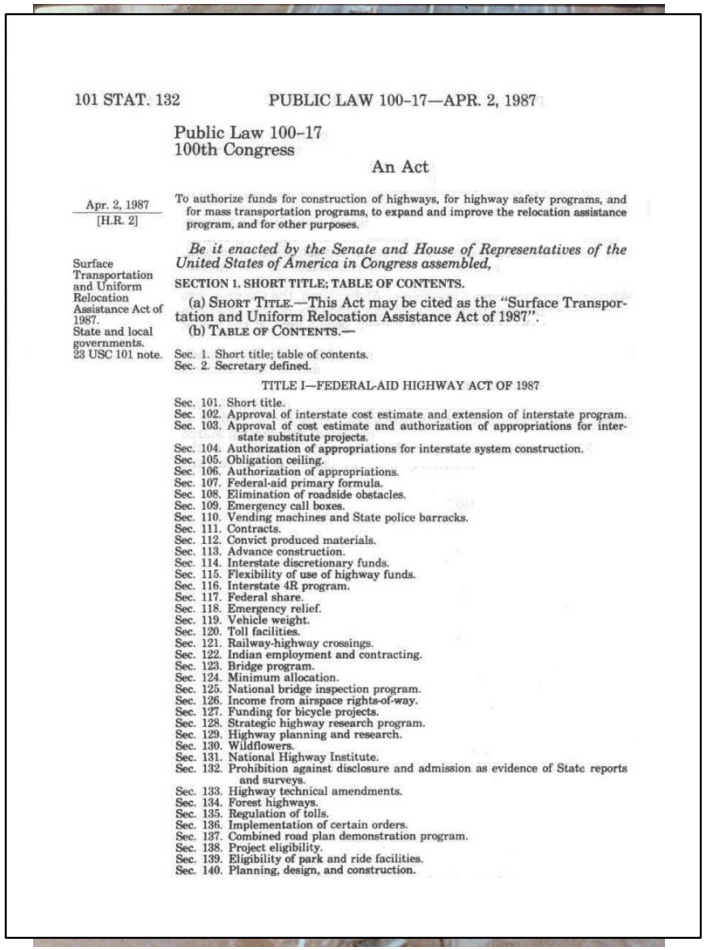
Section 1. Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Sec. 2. In carrying out the activities described in Section 1 of this Order, each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain; to ensure that its planning programs and budget requests reflect consideration of flood hazards and

[illegible] NO. 101—WEDNESDAY, MAY 25, 1977

Interstates :: Not Done Yet!

I-90 – Schoharie Creek - Surface Transportation and Uniform Relocation Assistance Act



101 STAT. 132 PUBLIC LAW 100-17—APR. 2, 1987

Public Law 100-17
100th Congress

An Act

Apr. 2, 1987
[H.R. 2]

To authorize funds for construction of highways, for highway safety programs, and for mass transportation programs, to expand and improve the relocation assistance program, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Surface Transportation and Uniform Relocation Assistance Act of 1987.
State and local governments.
23 USC 101 note.

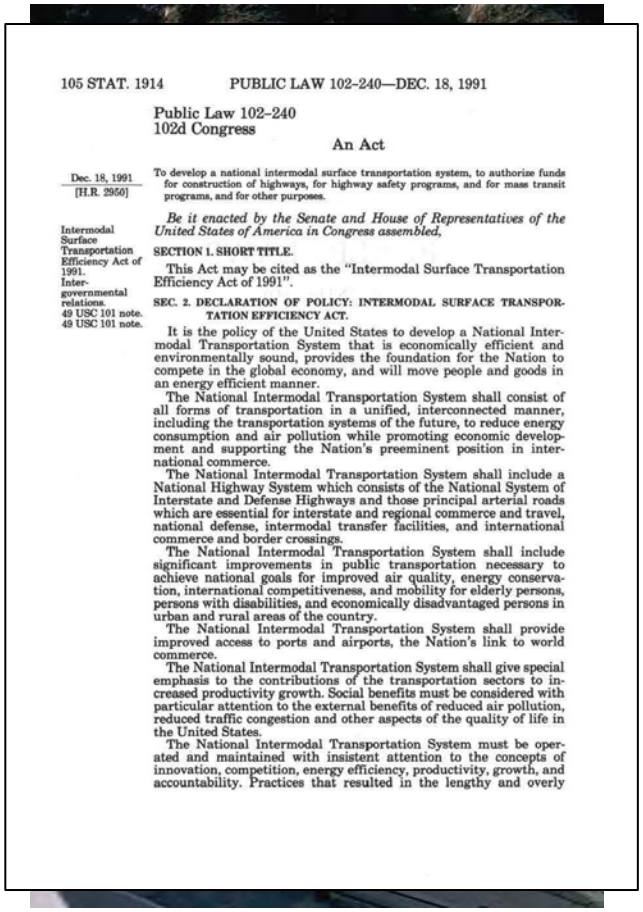
SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Surface Transportation and Uniform Relocation Assistance Act of 1987".

(b) TABLE OF CONTENTS.—

Interstates :: Ending an Era

I-5 – 1994 Northridge Earthquake
Efficiency Act of 1991



105 STAT. 1914 PUBLIC LAW 102-240—DEC. 18, 1991

Public Law 102-240
102d Congress

An Act

Dec. 18, 1991
[H.R. 2950]

To develop a national intermodal surface transportation system, to authorize funds for construction of highways, for highway safety programs, and for mass transit programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Intermodal Surface Transportation Efficiency Act of 1991.
Inter-governmental relations.
49 USC 101 note.
49 USC 101 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Intermodal Surface Transportation Efficiency Act of 1991".

SEC. 2. DECLARATION OF POLICY: INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT.

It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner.

The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future, to reduce energy consumption and air pollution while promoting economic development and supporting the Nation's preeminent position in international commerce.

The National Intermodal Transportation System shall include a National Highway System which consists of the National System of Interstate and Defense Highways and those principal arterial roads which are essential for interstate and regional commerce and travel, national defense, intermodal transfer facilities, and international commerce and border crossings.

The National Intermodal Transportation System shall include significant improvements in public transportation necessary to achieve national goals for improved air quality, energy conservation, international competitiveness, and mobility for elderly persons, persons with disabilities, and economically disadvantaged persons in urban and rural areas of the country.

The National Intermodal Transportation System shall provide improved access to ports and airports, the Nation's link to world commerce.

The National Intermodal Transportation System shall give special emphasis to the contributions of the transportation sectors to increased productivity growth. Social benefits must be considered with particular attention to the external benefits of reduced air pollution, reduced traffic congestion and other aspects of the quality of life in the United States.

The National Intermodal Transportation System must be operated and maintained with insistent attention to the concepts of innovation, competition, energy efficiency, productivity, growth, and accountability. Practices that resulted in the lengthy and overly

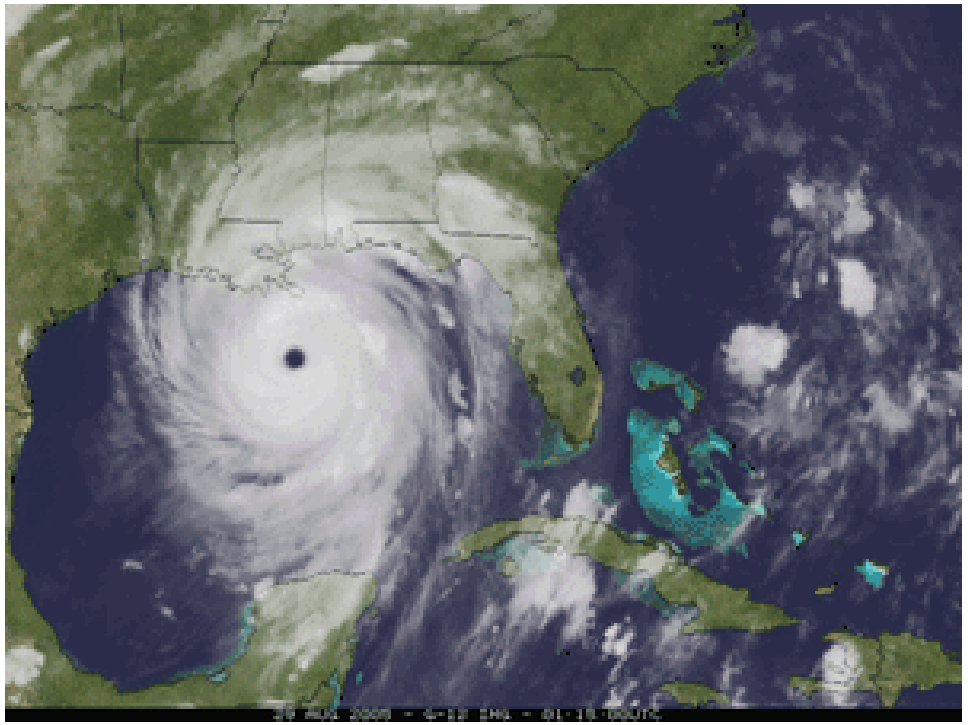
Interstates :: Status Quo

Example: Floodplains & Transportation

- Part of Planning Process
- Alignment with NEPA on projects
- 200,000 Bridges built using floodplain regulation
- Informs Construction, Maintenance, and ER activities
- Integrated in State DOT & AASHTO approaches

Interstates :: End of Status Quo?

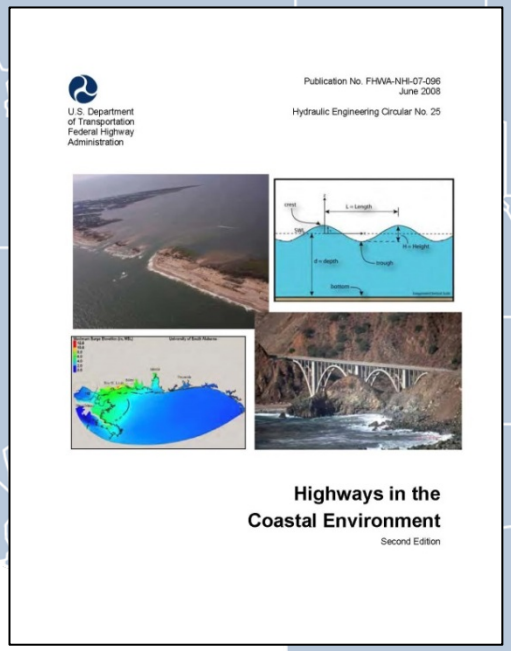
Aging Infrastructure & Natural Events



Interstates :: Resilience to Coastal Events

2003-2004-2005 :: Coastal Storm Events

Outcomes :: Coastal Studies & Guidance

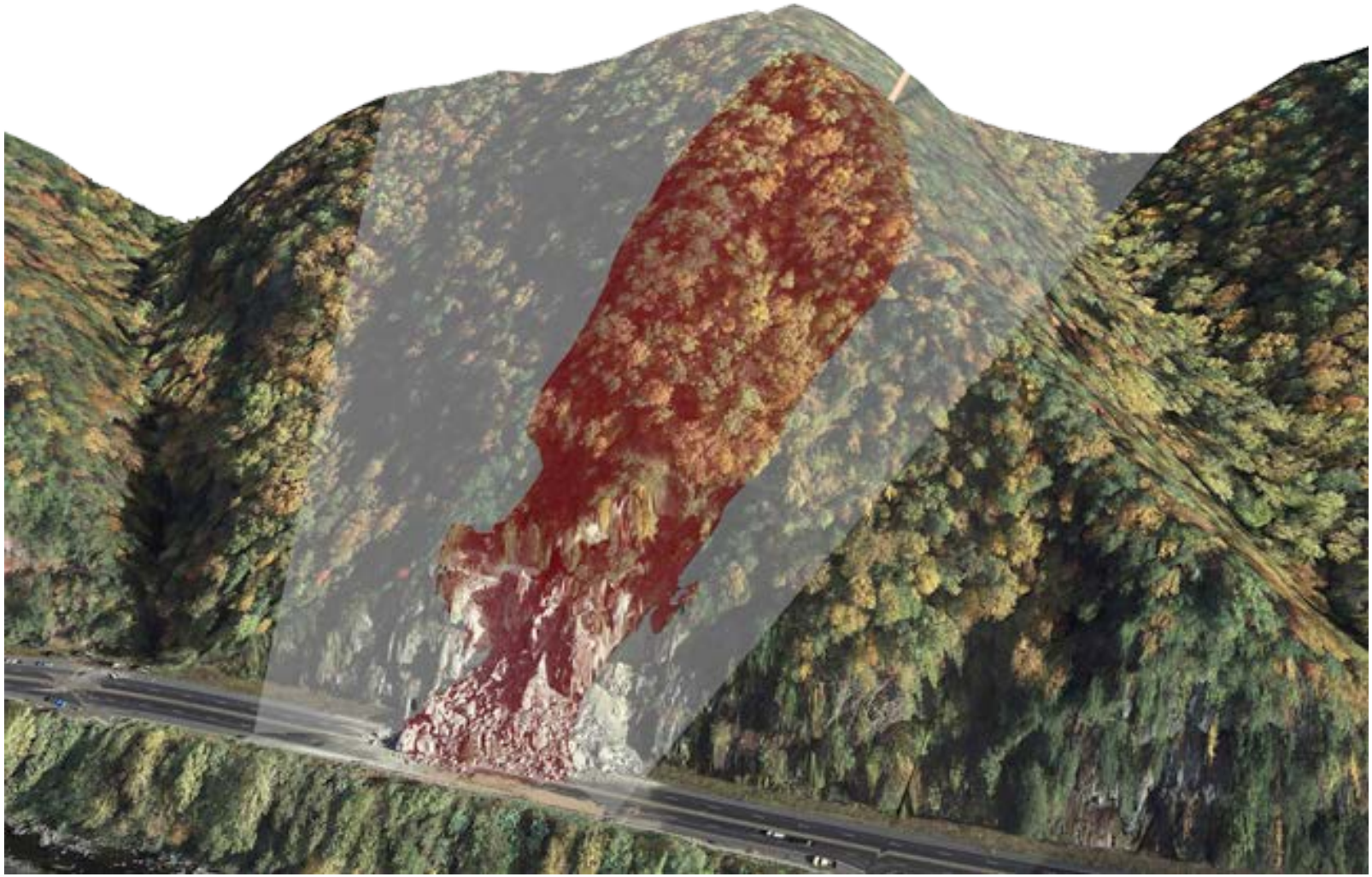


2008

Interstates :: Managing Assets & Risk

I-35W – Mississippi River (2007)

Interstates :: GeoHazards



I-40 – Rockslide (2009)

Interstates :: Pavements

I-20 – Iowa Flooding (2011)

Interstates :: An Imperative for Change

Moving Ahead for Progress in the 21st Century

One Hundred Twelfth Congress
of the
United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Tuesday, the third day of January, two thousand and twelve

An Act

To authorize funds for Federal-aid highways, highway safety programs, and transit programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; ORGANIZATION OF ACT INTO DIVISIONS; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Moving Ahead for Progress in the 21st Century Act" or the "MAP–21".

(b) DIVISIONS.—This Act is organized into 8 divisions as follows:

(1) Division A–Federal-aid Highways and Highway Safety Construction Programs.

(2) Division B–Public Transportation.

(3) Division C–Transportation Safety and Surface Transportation Policy.

(4) Division D–Finance.

(5) Division E–Research and Education.

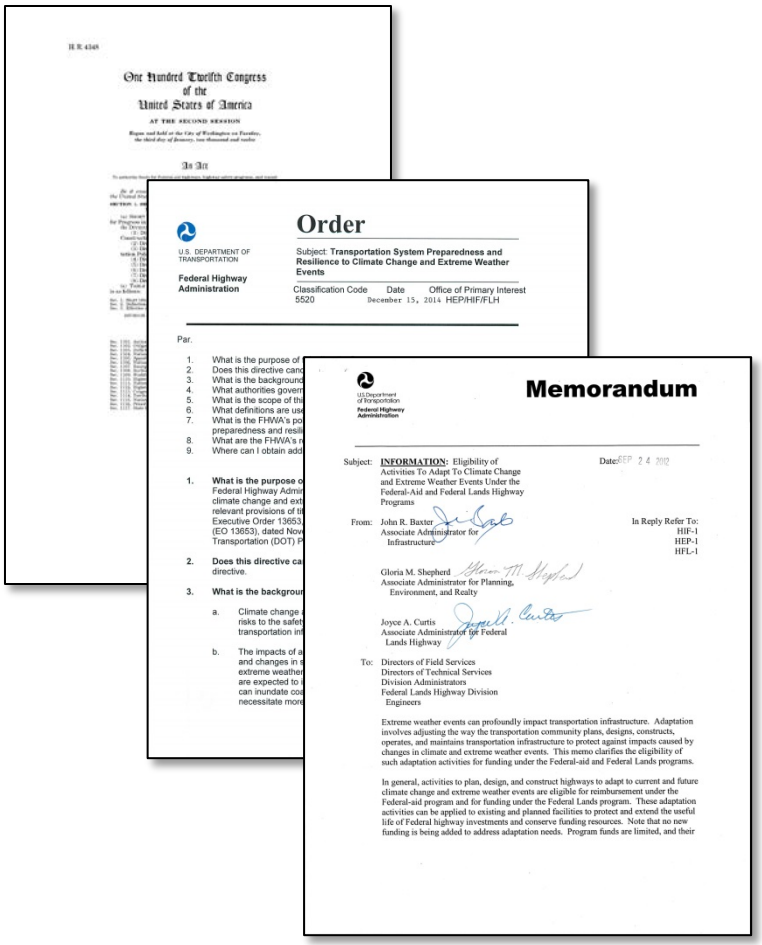
(6) Division F–Miscellaneous.

(7) Division G–Surface Transportation Extension.

(8) Division H–Budgetary Effects.

(c) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

FHWA Responses :: Policy



One Hundred Twelfth Congress
of the
United States of America
AT THE SECOND SESSION

An Act

U.S. DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

Order

Subject: Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events

Classification Code 5520 | Date December 15, 2014 | Office of Primary Interest HEP/HIF/FLH

Par.

1. What is the purpose of
2. Does this directive canc
3. What is the backgroun
4. What authorities govern
5. What is the scope of thi
6. What definitions are us
7. What is the FHWA's po preparedness and resili
8. What are the FHWA's r
9. Where can I obtain add

1. **What is the purpose o** Federal Highway Admir climate change and ext relevant provisions of th Executive Order 13653 (EO 13653), dated Nov Transportation (DOT) P

2. **Does this directive ca** directive.

3. **What is the backgrou**

a. Climate change risks to the safet transportation int

b. The impacts of a and changes in extreme weather are expected to can inundate cos necessitate more

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** Eligibility of Activities To Adapt To Climate Change and Extreme Weather Events Under the Federal-Aid and Federal Lands Highway Programs

Date: SEP 24 2012

From: John R. Baxter
Associate Administrator for Infrastructure

In Reply Refer To:
HIF-1
HEP-1
HFL-1

Gloria M. Shepherd
Associate Administrator for Planning, Environment, and Realty

Joyce A. Curtis
Associate Administrator for Federal Lands Highway

To: Directors of Field Services
Directors of Technical Services
Division Administrators
Federal Lands Highway Division Engineers

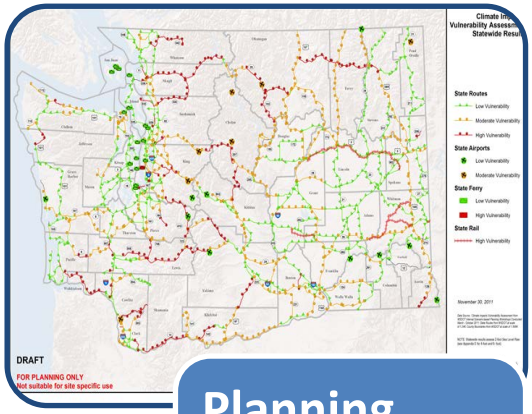
Extreme weather events can profoundly impact transportation infrastructure. Adaptation involves adjusting the way the transportation community plans, designs, constructs, operates, and maintains transportation infrastructure to protect against impacts caused by changes in climate and extreme weather events. This memo clarifies the eligibility of such adaptation activities for funding under the Federal-aid and Federal Lands programs.

In general, activities to plan, design, and construct highways to adapt to current and future climate change and extreme weather events are eligible for reimbursement under the Federal-aid program and for funding under the Federal Lands program. These adaptation activities can be applied to existing and planned facilities to protect and extend the useful life of Federal highway investments and conserve funding resources. Note that no new funding is being added to address adaptation needs. Program funds are limited, and their

- **FHWA Order 5520**
  Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events
  - ***Defines & places context of "Extreme Events"***
  - ***FHWA decides what are appropriate scientific approaches***
- **FHWA "Eligibility Memo"**

FHWA Response :: Looking at Project Delivery

Goal: Mainstream consideration of risk, resilience, and future conditions in transportation decision making



Planning

- Long Range Transportation Plans
- Asset Management Plans

Project Level

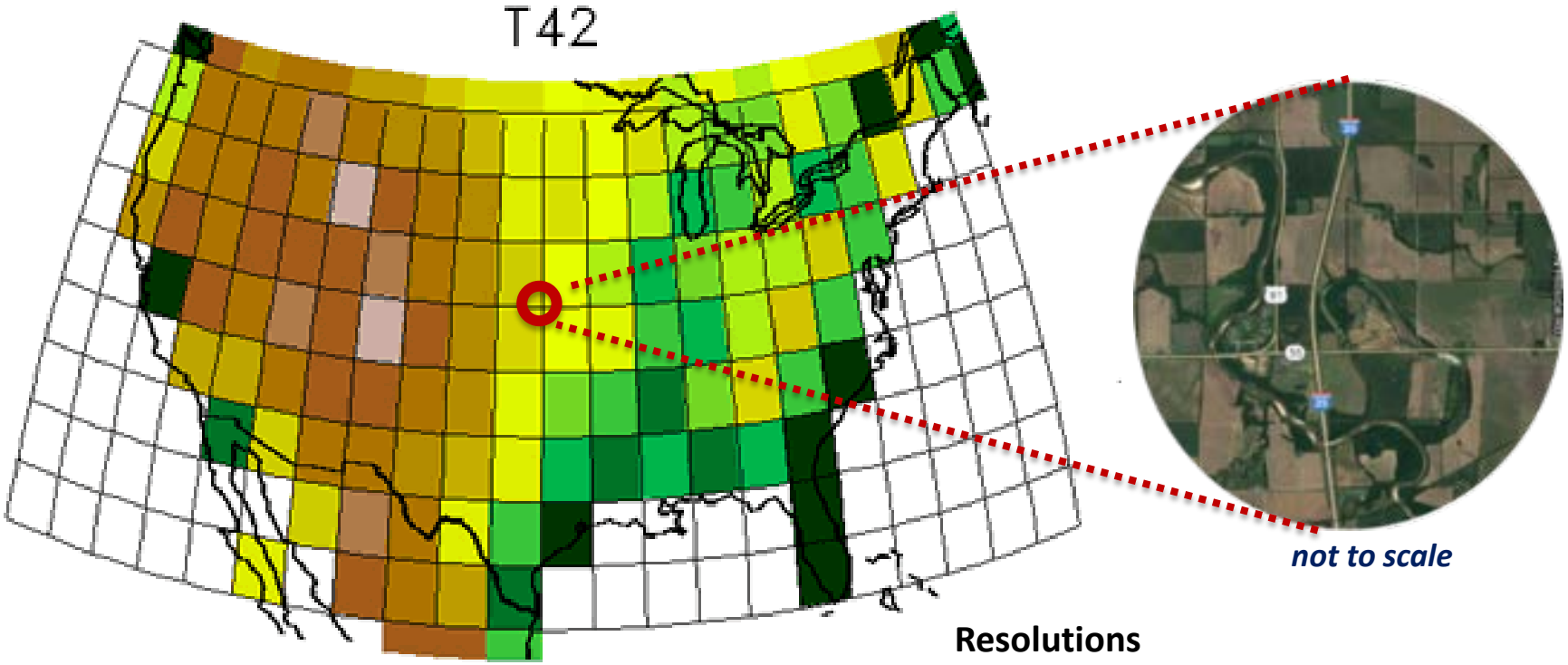
- Environmental Processes
- Engineering
- Design

Operations and Maintenance

- Emergency Relief
- Snow Removal Programs

FHWA Response: Understanding Science (and limits)

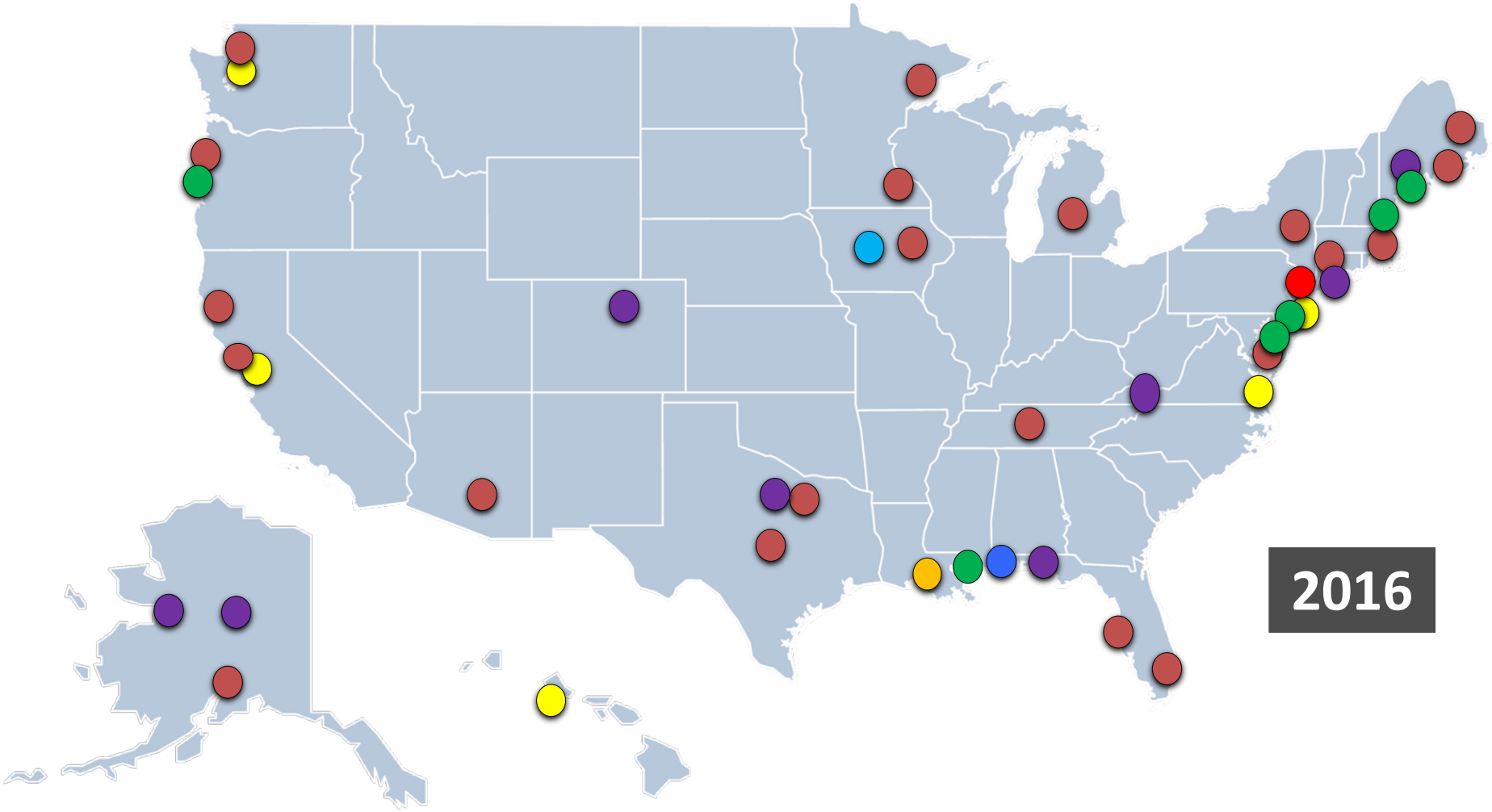
While advancing in complexity, global climate models currently lack required fidelity needed by engineers



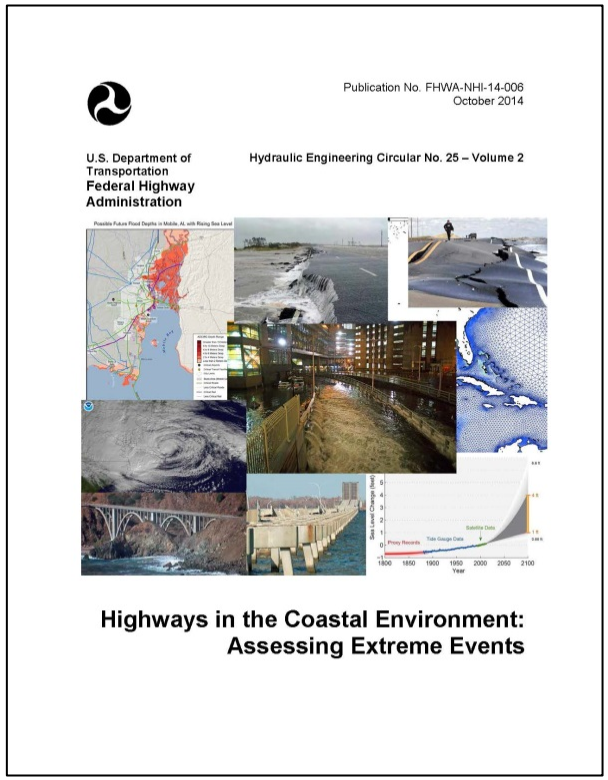
Resolution map: Warren Washington, NCAR
http://scied.ucar.edu/longcontent/climate-modeling

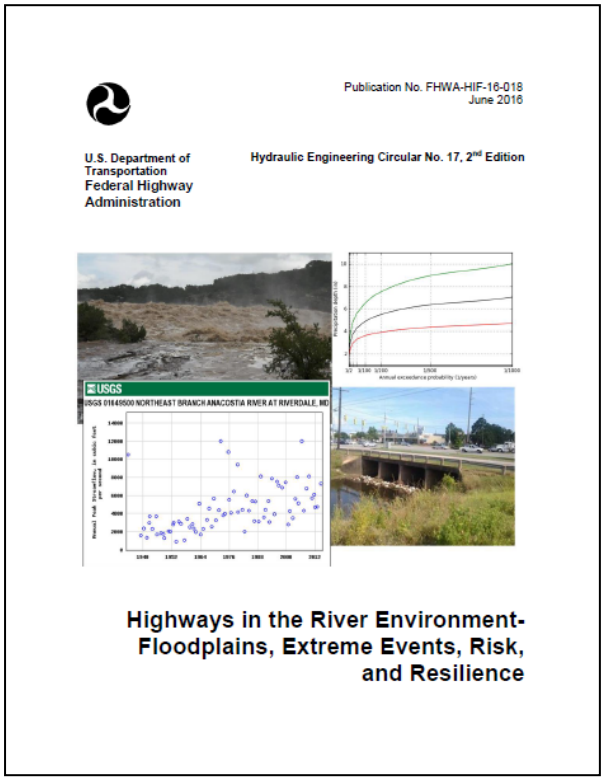
Resolutions
T42: 120 x 180 miles Mid-1990's
T85: 60 x 90 miles Current
T170 & T340 Future

FHWA Response :: Studies, Pilots, & Case Studies



FHWA Response :: New Technical Resources





FHWA Response :: Encourage New Technologies

EDC-4 – Collaborative Hydraulics: Advancing to the Next Generation of Engineering

Interstates :: What's Next?

Support :: Future Interstate Study activities

Future Interstate Study

The Interstate Highway System (IHS) is a key component of the US transportation system. While it makes up only 1.2 percent roadway line-miles of the country's public road system, it handles nearly 25 percent of the total vehicle miles traveled (VMT) annually and almost 40 percent of the nation's total truck traffic. The IHS of today, with a network little changed since its inception, serves more traffic than the entire U.S. road network served when the IHS was authorized in 1956. However, what was once a premier system that stood as a symbol and enabler of American growth and economic vigor is showing its age.

The Future Interstate Study is being done pursuant to Section 6021 of the Fixing America's Surface Transportation Act of 2015 which calls for the Transportation Research Board to conduct "a study on the actions needed to upgrade and restore the Dwight D. Eisenhower National System of Interstate and Defense Highways to its role as a premier system that meets the growing and shifting demands of the 21st century."

Outreach :: Engage our Partners!

Focus :: Direction from Leadership!

New Administration, new Opportunities

Questions?