

An aerial photograph of a coastal landscape. A long, narrow sandy beach runs diagonally from the bottom left towards the top right. To the left of the beach is a large body of water, possibly a bay or lagoon, with a green, vegetated island in the distance. To the right of the beach is the open ocean with blue waves breaking onto the shore. The sky is a pale, hazy blue.

# Facilitating Investments in Natural Infrastructure: Successes in Advancing Policy

Sarah Murdock, The Nature Conservancy  
ACES Conference, December 6, 2018

# Session Outline

## 1. Making the Case

- Case studies
- Evidence of effectiveness and cost-effectiveness

## 2. Leads to policy advancement

- Water Resources Development Act
- FEMA promotion of nature-based approaches
- Floodplain by Design in Washington State

## 3. Continuing the progress

- Build the body of evidence





# Making the Case: What challenges can nature address?

Reduce risk from disasters AND  
provide additional societal benefits

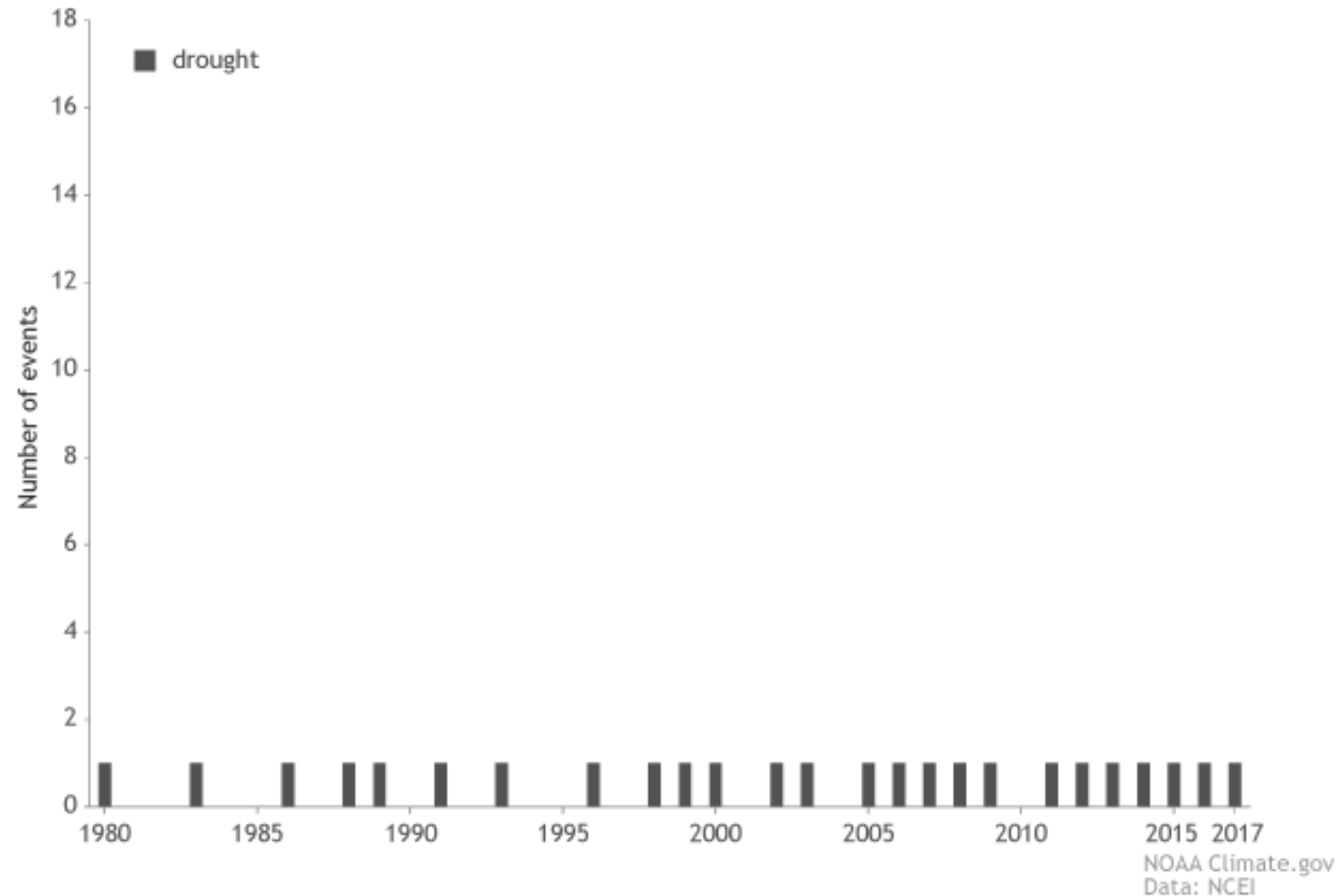


**Natural coastal systems**  
provide services:

- Wave attenuation
- Flood storage capacity
- Erosion control
- Water filtration
- Wildlife habitat
- Recreational use

# Making the Case: Important to indicate growing costs of extreme weather and climate impacts

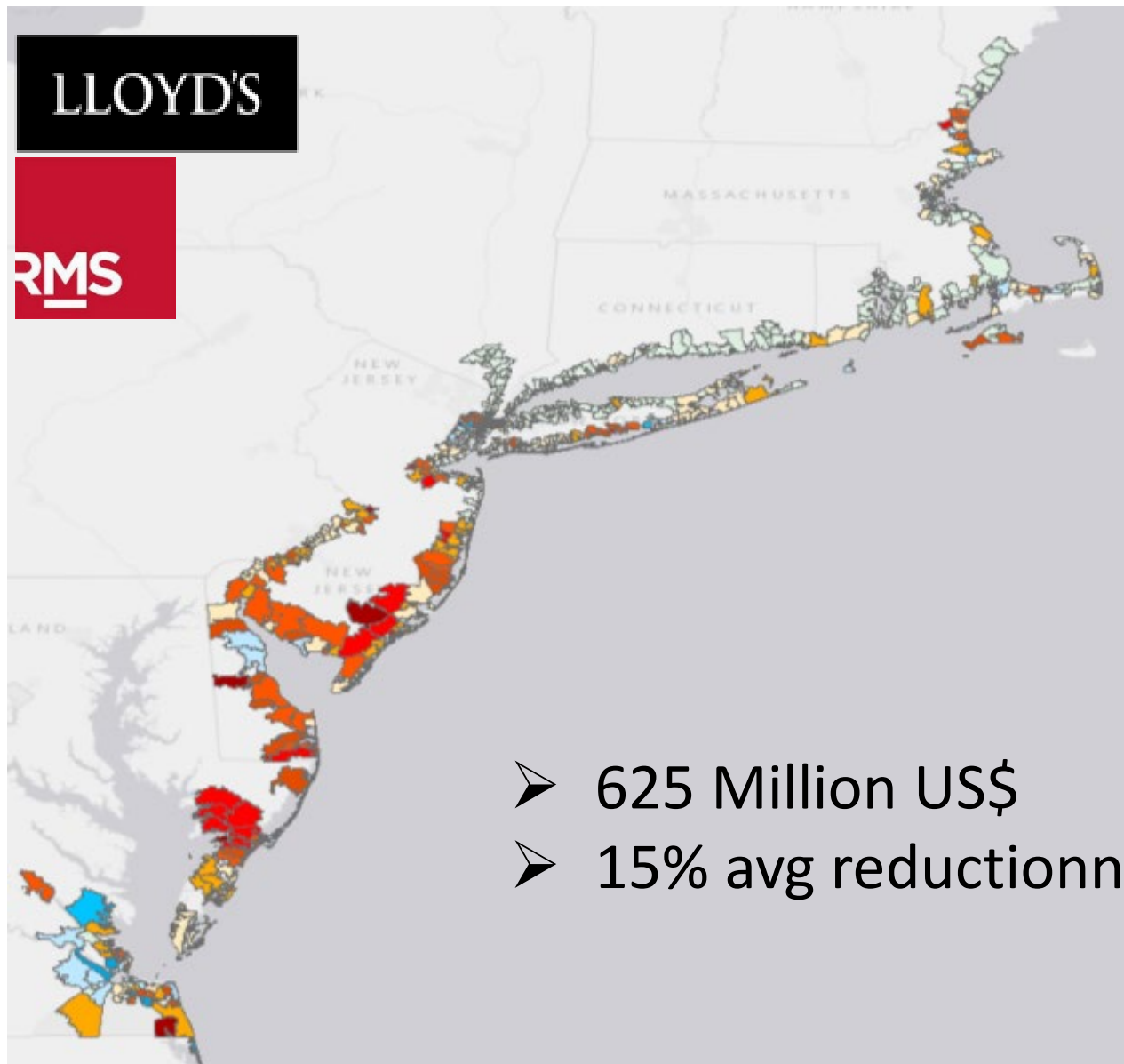
Billion-dollar disasters by type, from 1980-2017



# Making the Case: Communicate the effectiveness and cost-effectiveness



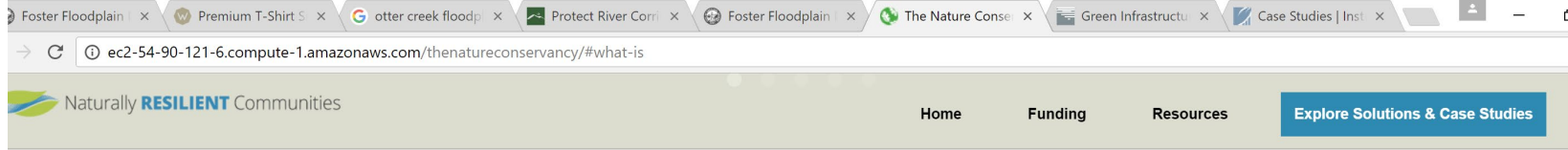
# Making the Case: Studies measuring ecosystem value



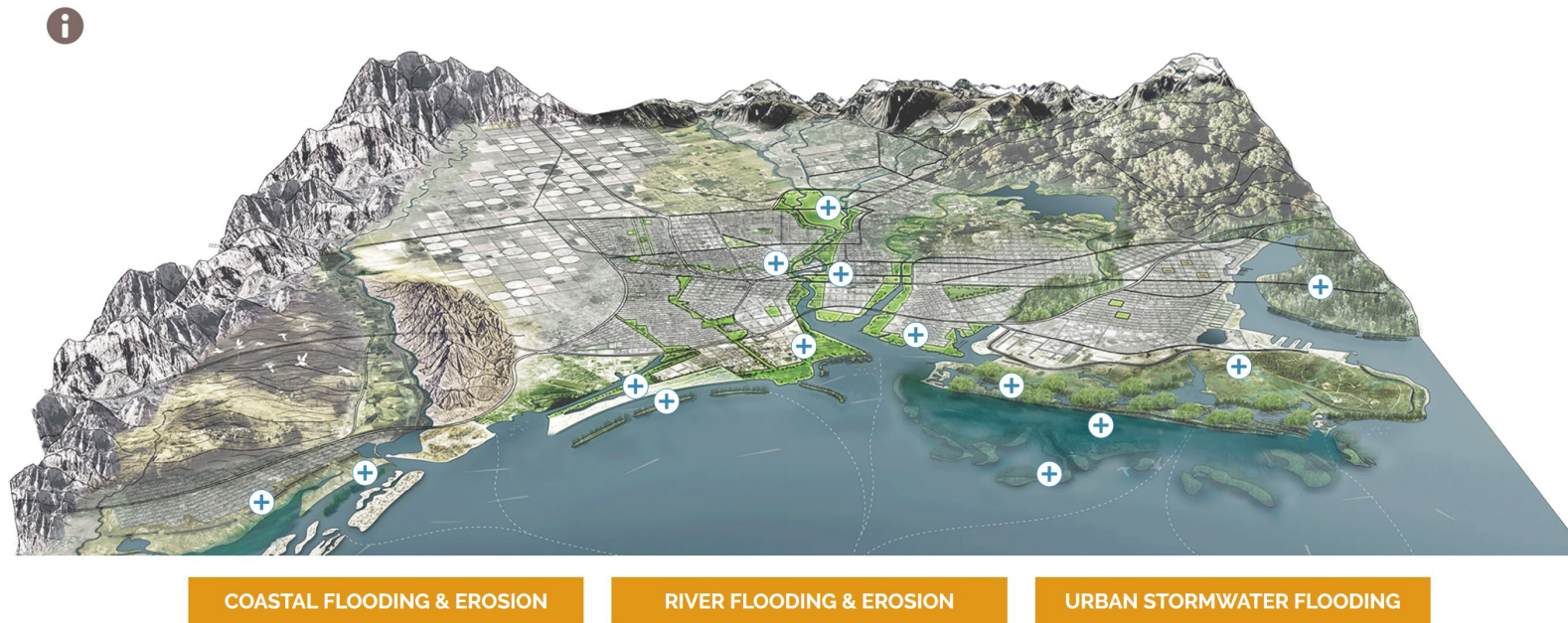
Narayan, Beck, et al. 2017. Scientific Reports.



# Making the Case: Case studies ([www.NRCSolutions.org](http://www.NRCSolutions.org))



## EXPLORE THE DIFFERENT TYPES OF NATURE-BASED SOLUTIONS



## FIND YOUR SOLUTION

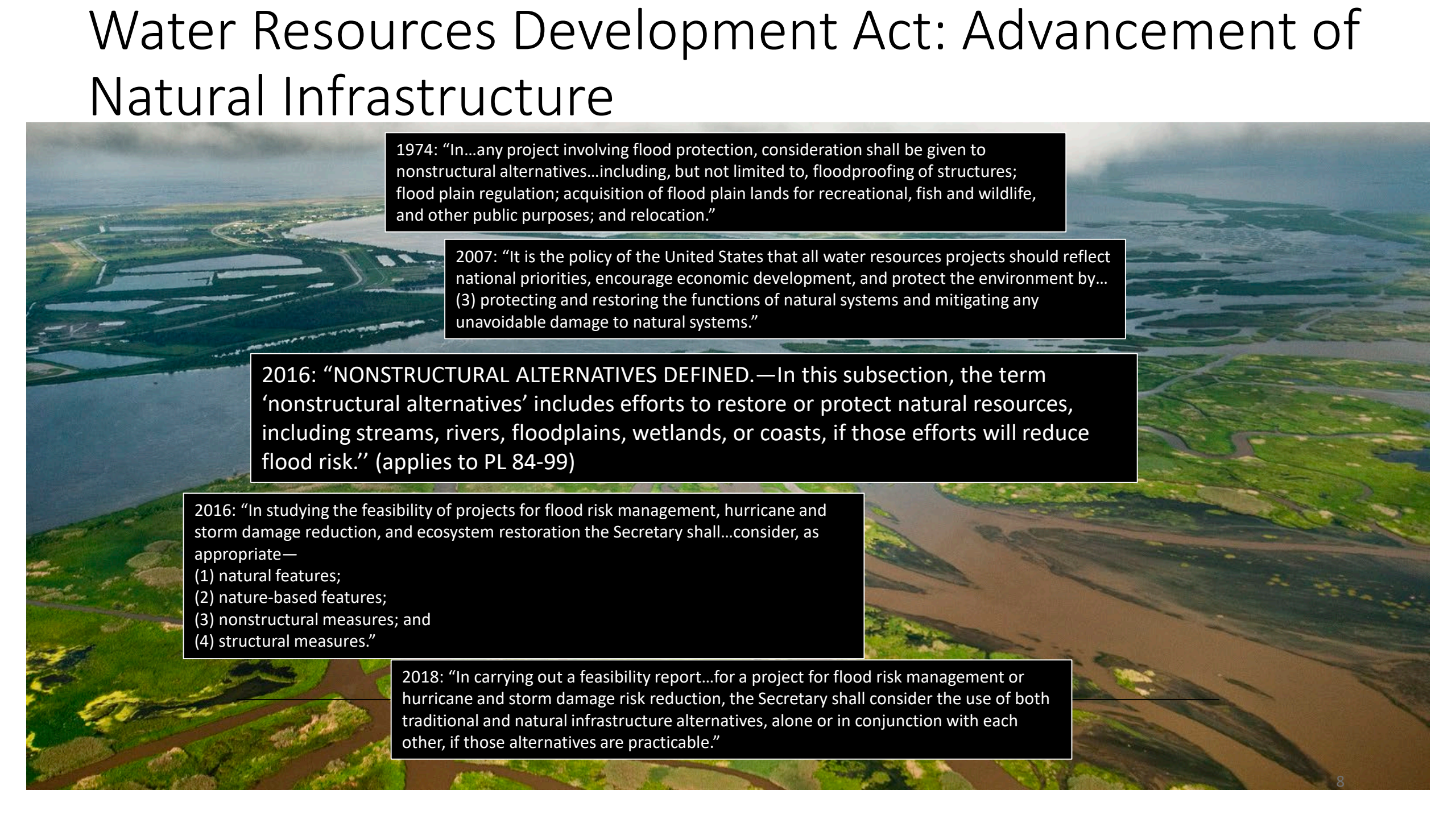


S A S A K I





# Water Resources Development Act: Advancement of Natural Infrastructure



1974: “In...any project involving flood protection, consideration shall be given to nonstructural alternatives...including, but not limited to, floodproofing of structures; flood plain regulation; acquisition of flood plain lands for recreational, fish and wildlife, and other public purposes; and relocation.”

2007: “It is the policy of the United States that all water resources projects should reflect national priorities, encourage economic development, and protect the environment by... (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.”

2016: “NONSTRUCTURAL ALTERNATIVES DEFINED.—In this subsection, the term ‘nonstructural alternatives’ includes efforts to restore or protect natural resources, including streams, rivers, floodplains, wetlands, or coasts, if those efforts will reduce flood risk.” (applies to PL 84-99)

2016: “In studying the feasibility of projects for flood risk management, hurricane and storm damage reduction, and ecosystem restoration the Secretary shall...consider, as appropriate—

- (1) natural features;
- (2) nature-based features;
- (3) nonstructural measures; and
- (4) structural measures.”

2018: “In carrying out a feasibility report...for a project for flood risk management or hurricane and storm damage risk reduction, the Secretary shall consider the use of both traditional and natural infrastructure alternatives, alone or in conjunction with each other, if those alternatives are practicable.”



# FEMA- Mitigation grant emphasis on Nature-based projects



FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities  
Floodplain and Stream Restoration

based



FEMA

Fact Sheet

Federal Insurance and Mitigation Administration

Climate Resilient Mitigation Activities  
Green Infrastructure Methods

## Green Infrastructure Methodology

Green infrastructure is a sustainable approach to natural landscape preservation and storm water management that can be used for hazard mitigation activities as well as provide additional ecosystem benefits. Green



# FLOODPLAIN BY DESIGN – WASHINGTON STATE PROGRAM

REDUCING RISK. RESTORING RIVERS.

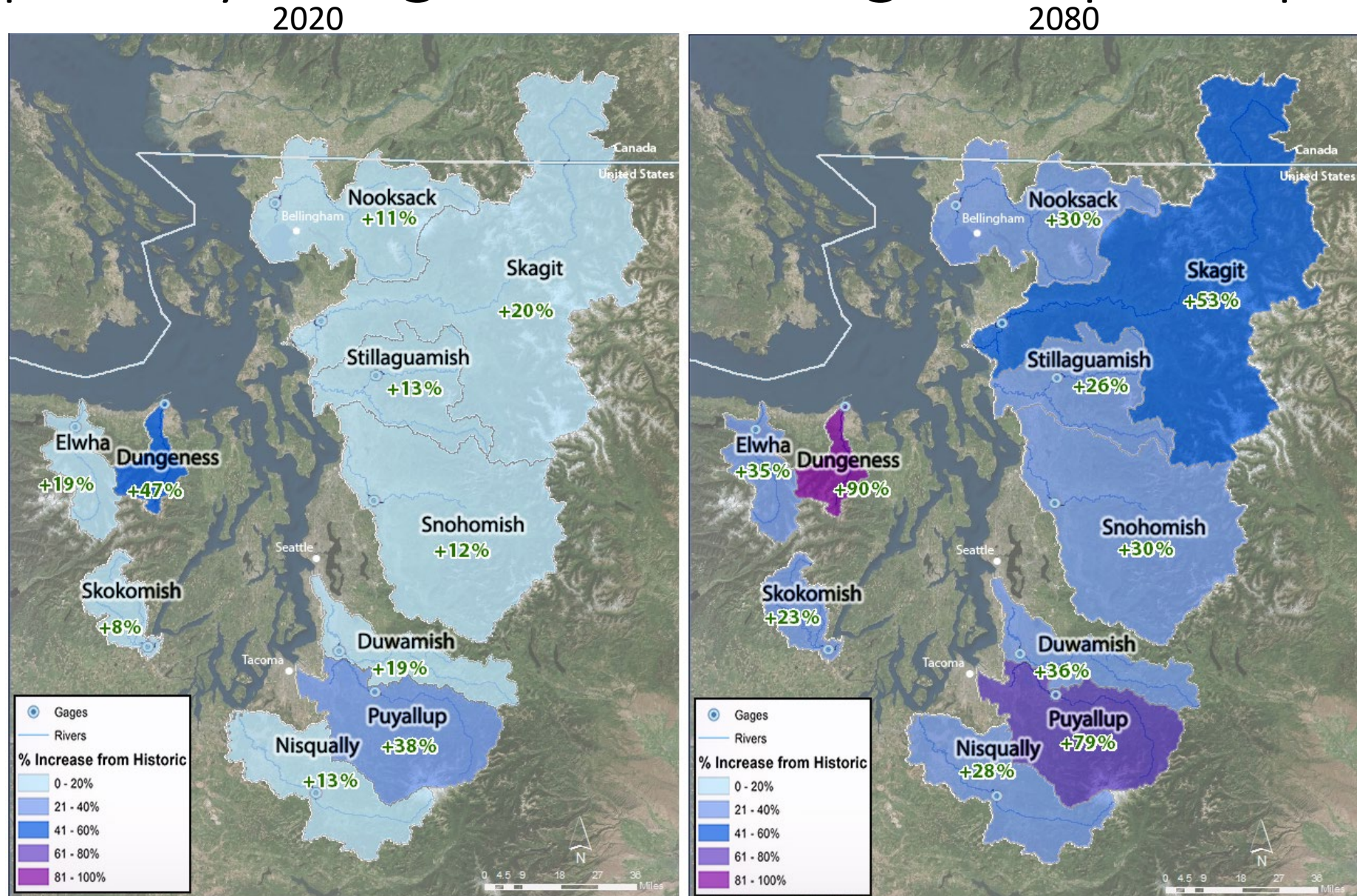
## GOALS

- Significantly reduce flood risks
- Accelerate habitat restoration
- Support agriculture, recreation, and clean water





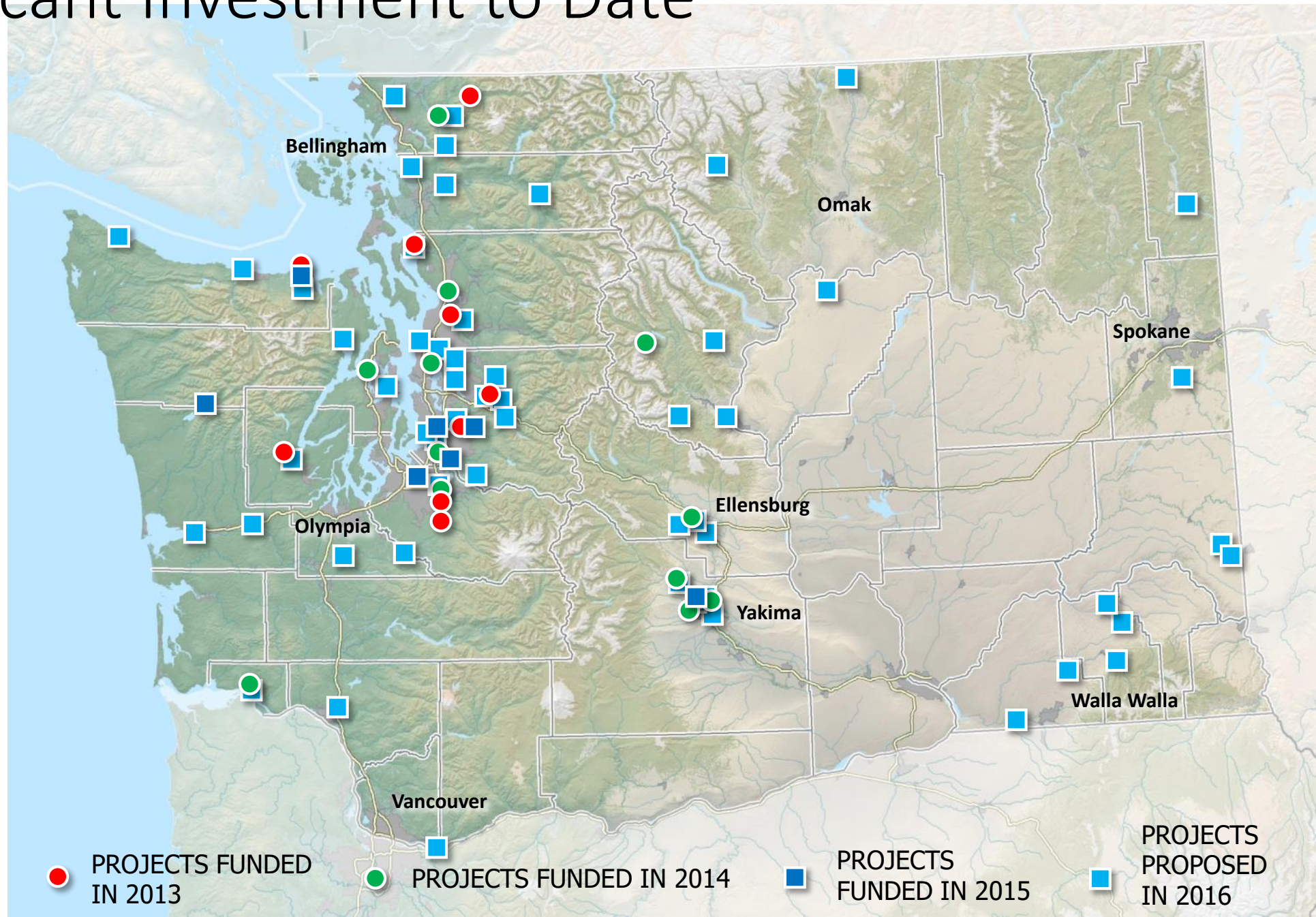
# Floodplain by Design – Addressing multiple impacts



Data from University of Washington Climate Impacts Group



# Significant Investment to Date





# Natural Infrastructure: Continue to build the body of evidence




## Measures Guidebook for Flood and Storm Risk Reduction Projects



### TABLE OF CONTENTS

Introduction.....	3
Chapter 1: Physical Exposure Metrics .....	8
Core Physical Exposure Metrics.....	9
1.1 Erosion Reduction and Shoreline Stabilization Afforded by Intertidal and Shallow Nearshore Reefs .....	9
1.2 Attenuation of Wave and Storm Induced Flooding by Coastal Ecosystems .....	12
1.3 Flood Attenuation in River Floodplains .....	18
Chapter 2: Environmental Metrics .....	22
Core Environmental Metrics.....	23
2.1 Coastal Habitat Extent and Connectivity.....	23
2.2 Abundance and Diversity of Target Species .....	28
Additional Environmental Metrics .....	31
2.3 Water Clarity in Coastal Systems.....	31
2.4 Water Quality in Freshwater Systems .....	36
2.5 Habitat Protection .....	39
2.6 Carbon Sequestration.....	42
Chapter 3: Economic Metrics .....	44
Core Economic Metrics.....	45
3.1 Cost of Project .....	45
3.2 Damages Avoided.....	46
Additional Economic Metrics .....	51
3.3 Lifecycle Costs.....	51
3.4 Jobs Touched .....	54
Chapter 4: Social Metrics.....	56
Core Social Metrics .....	57
4.1 People Benefitted.....	57
Additional Social and Economic Metrics .....	61
4.2 Recreation .....	62
4.3 Economic Development .....	63
4.4 Property Values .....	64
4.5 Public Awareness.....	65
4.6 Policy Change.....	66
Chapter 5: Ecosystem Services.....	67
Appendix 1: References and Literature Cited .....	74



An aerial photograph showing a coastal town on the right side, with a dense residential area and a prominent white water tower. To the left of the town is a large body of water, likely a bay or inlet, with a marshy area in the foreground. The marsh is characterized by a grid-like pattern of narrow channels and larger open areas of green vegetation. The sky is clear and blue.

Thank You  
Questions?

Sarah W. Murdock | [smurdock@tnc.org](mailto:smurdock@tnc.org)