



A Decision-Making Framework for Adapting to more Flooding and Erosion: Introducing the Flood Adaptation Hierarchy

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Upper Susquehanna Watershed

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Our Mission:

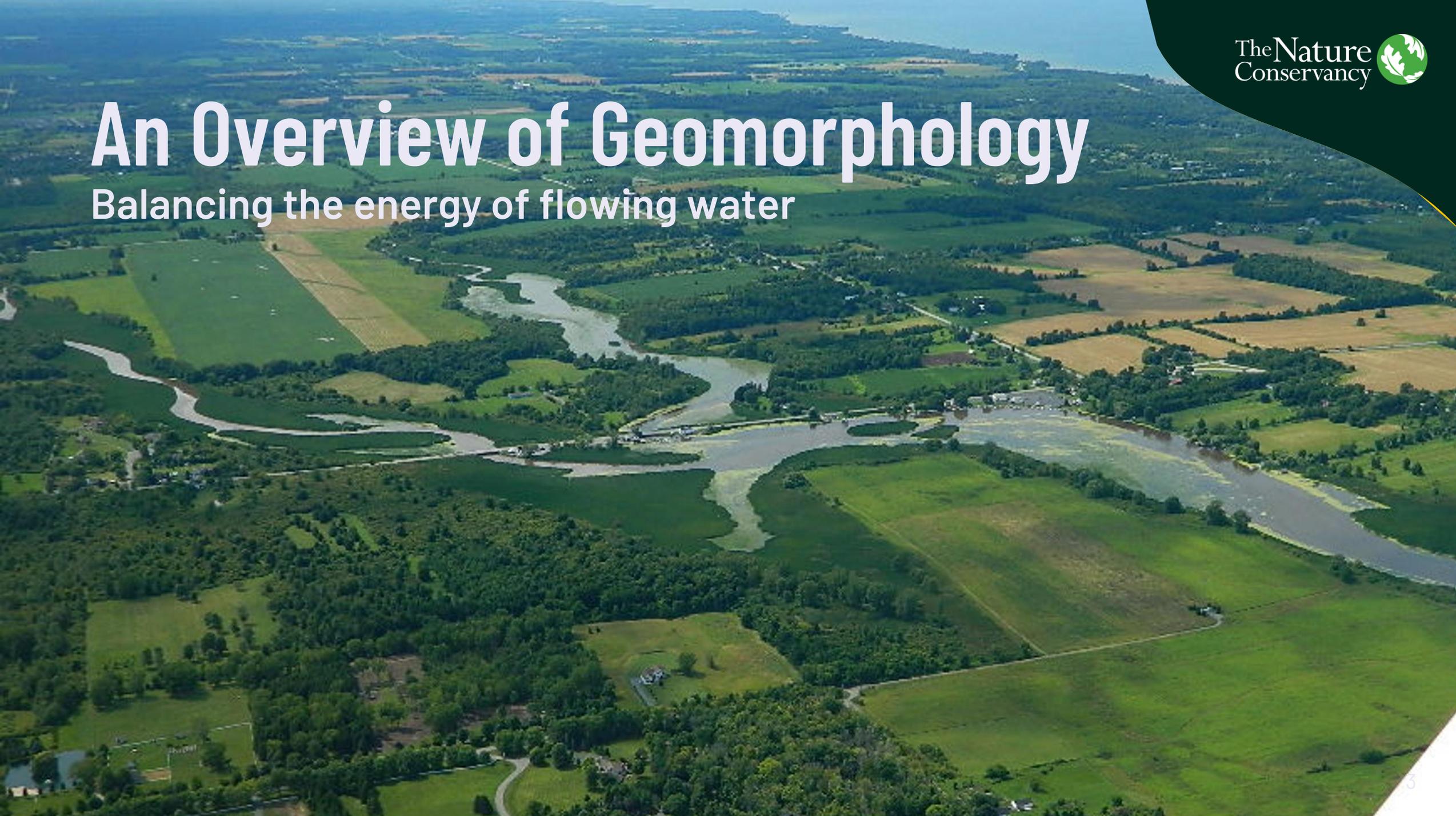
To conserve the lands and waters on which all life depends.

Our Vision:

TNC in NY envisions a New York where floodplains and shorelines function naturally and dynamically, and people are safe from the impacts of rising water and eroding lands.

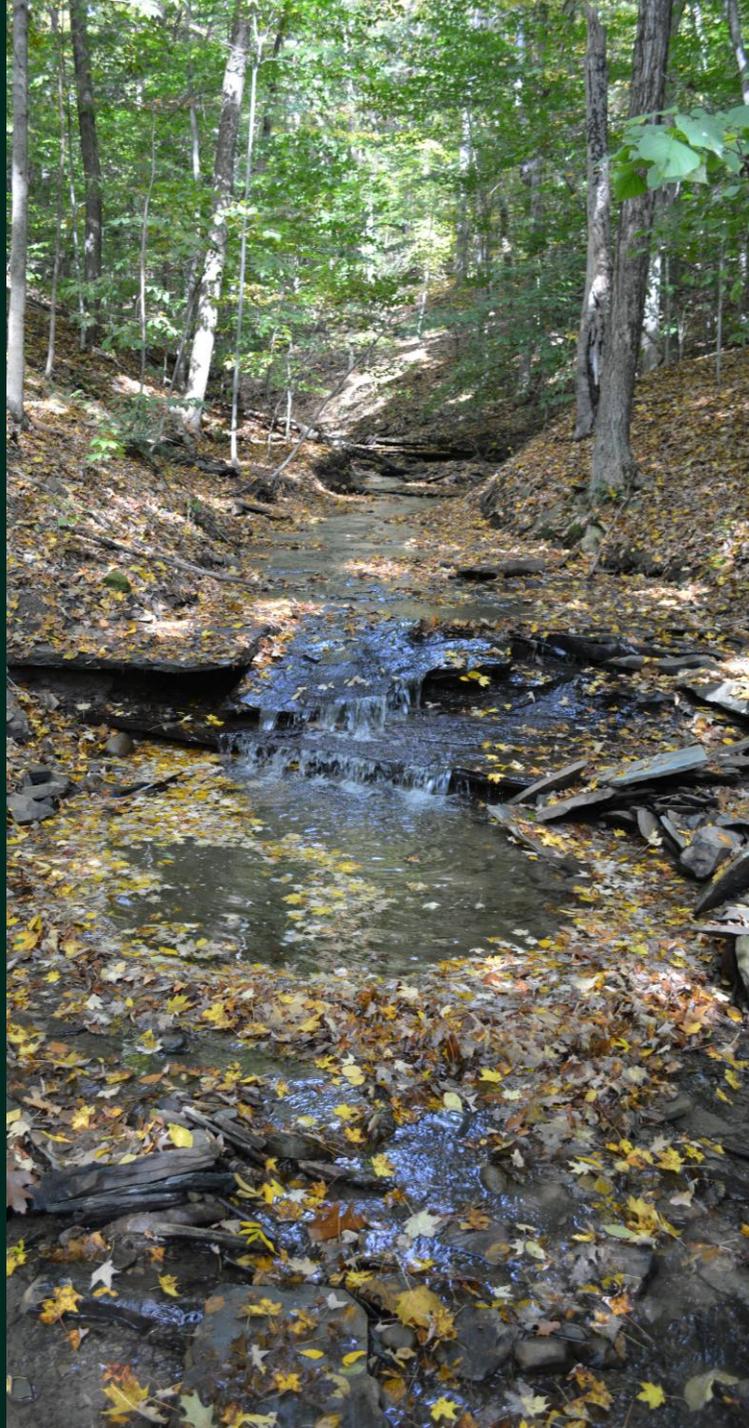
An Overview of Geomorphology

Balancing the energy of flowing water



From Low Flow to High Flow

Streams balance energy



Mechanisms for Dissipating Energy

Spreading onto floodplain

Moving sediment

Creating meanders

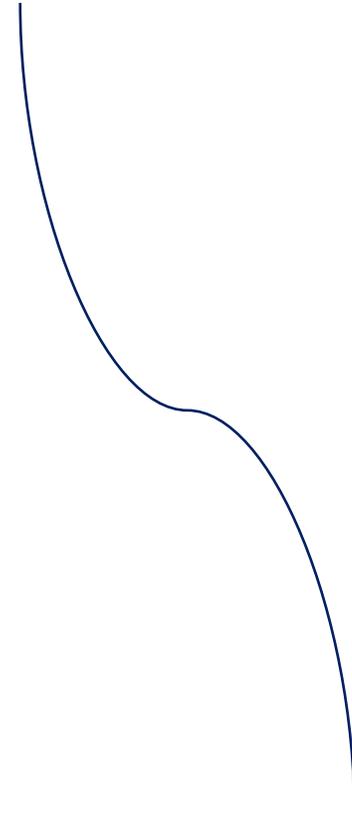
Stream Channel With Meanders



Stream Length With Meanders



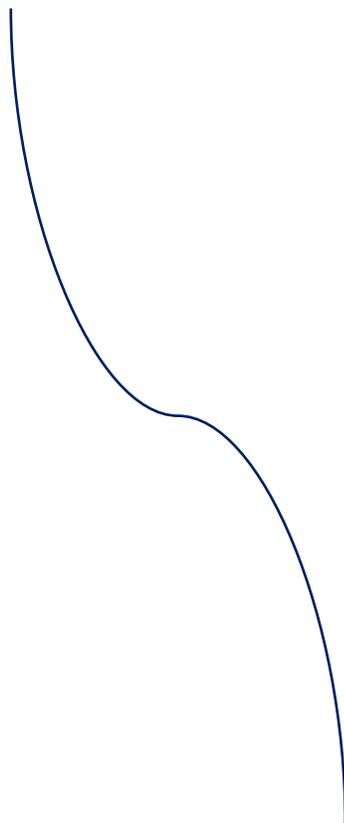
Stream Length Without



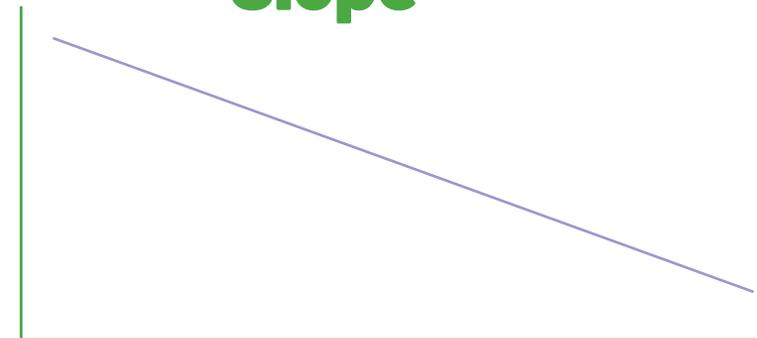
Stream Length With Meanders



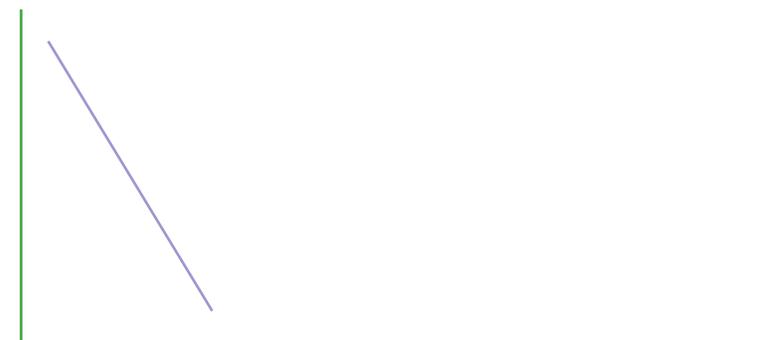
Stream Length Without



Change in Channel Slope



100:1



20:1

Human Alteration Changes the Balance of Energy

**Streams have to shift in order to
rebalance the energy.**

They need space to do this.



New York State is Experiencing More Flooding and Erosion

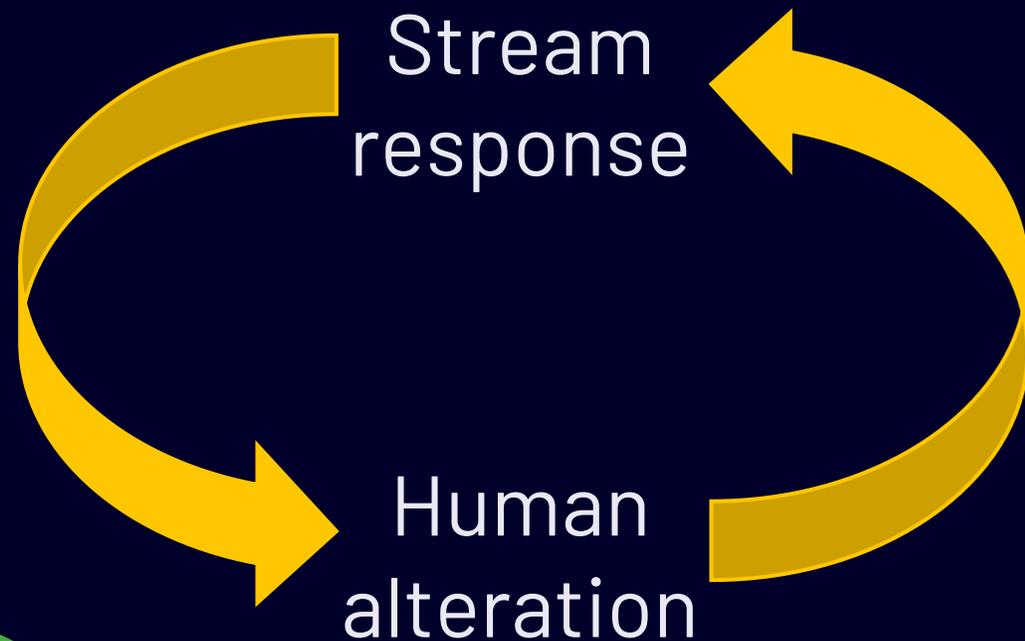
According to the EPA, large floods have become more frequent across the Northeast, including New York, between 1965 and 2015. This trend correlates with an increase in heavy rainfall events.¹

Over the past 12 years, every county in New York State has seen flooding. 16 counties have had 5 or more federal flood disasters.²

¹[Climate Change Indicators: River Flooding | US EPA](#)

²[Flood Response and Substantial Damage in New York State - NYSDEC](#)

New York State is Experiencing More Flooding and Erosion



To break this cycle
Our streams need us to give them room to move and shift so they can rebalance increasing energy.

What the Experts Have to Say

- Make way for water – give our streams space
- Take the long-term view
- Accrue protective benefits
 - Reduced property damage
 - Reduced social & economic disruptions
 - Reduced negative health impacts
- Choose sustainable solutions
- Look across landscape rather than project by project

How We Have Historically Responded



Defend



Accommodate



Relocate

A More Resilient Response



Protect



Relocate



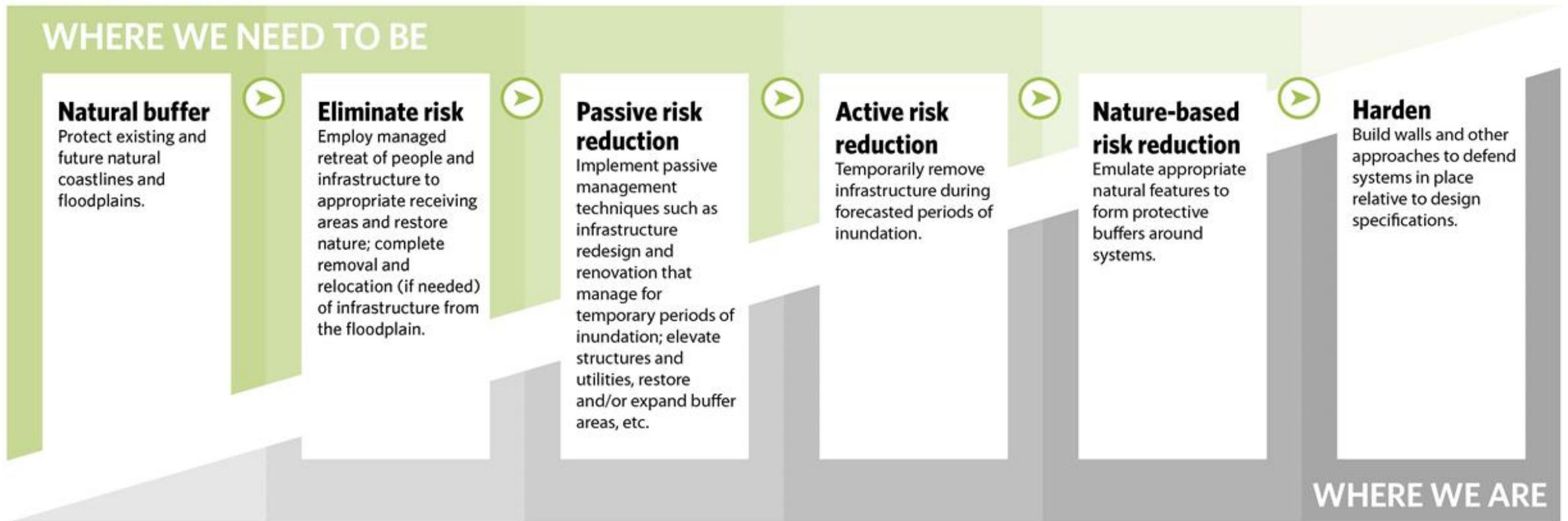
Accommodate



Defend

A new framework for flood adaptation: introducing the Flood Adaptation Hierarchy

Peck et al. 2022 <https://doi.org/10.5751/ES-13544-270405>



Andrew Peck, Stevie Adams, Andrea Armstrong, Anna Bartlett, Marci Bortman, Alison Branco, Michelle Brown, Jessica Donohue, Mali’o Kodis, Michael McCann, and Elizabeth Smith

A More Resilient Response



Protect



Relocate



Accommodate



Defend

What the Experts Have to Say

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Protect

- Give our streams room to adapt
- Eliminate risk to people
- Benefits accrue
- Minimal longterm maintenance



Relocate



Accommodate



Defend

- Might be the only option for defending infrastructure and other community assets
- Buy time for a more resilient solution

Buying Time



Image: FloodBreak

Why We Need the Flood Adaptation Hierarchy

- There is no silver bullet solution
- It will take a combination of all tiers to grow community resilience to flooding and erosion
- We must include consideration of all tiers in creating our vision for the future of our communities
- We must meaningfully weigh the tradeoffs of these different approaches before deciding on a solution

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