Engineering With Nature® Workshop on DoD Installations – Day 1

Dr. Todd Bridges
Dr. Jeff King
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US Army Corps of Engineers®

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Session Objectives and Ground Rules

Engage with the changing climate around DoD Installations

Create familiarity with EWN on DoD Installations

Live in an EWN Future on DoD Installations

Brainstorm ways forward for natural infrastructure across the DoD

Ground rules

- Leave your rank in the waiting room
- Be comfortable in the unknown
- Engage in open dialogue and blue sky thinking
- Engage using all means possible – chat too!
- Use video as security allows
- Technical support for the day is Katherine Wagner – kwagner@tofflerassociates.com

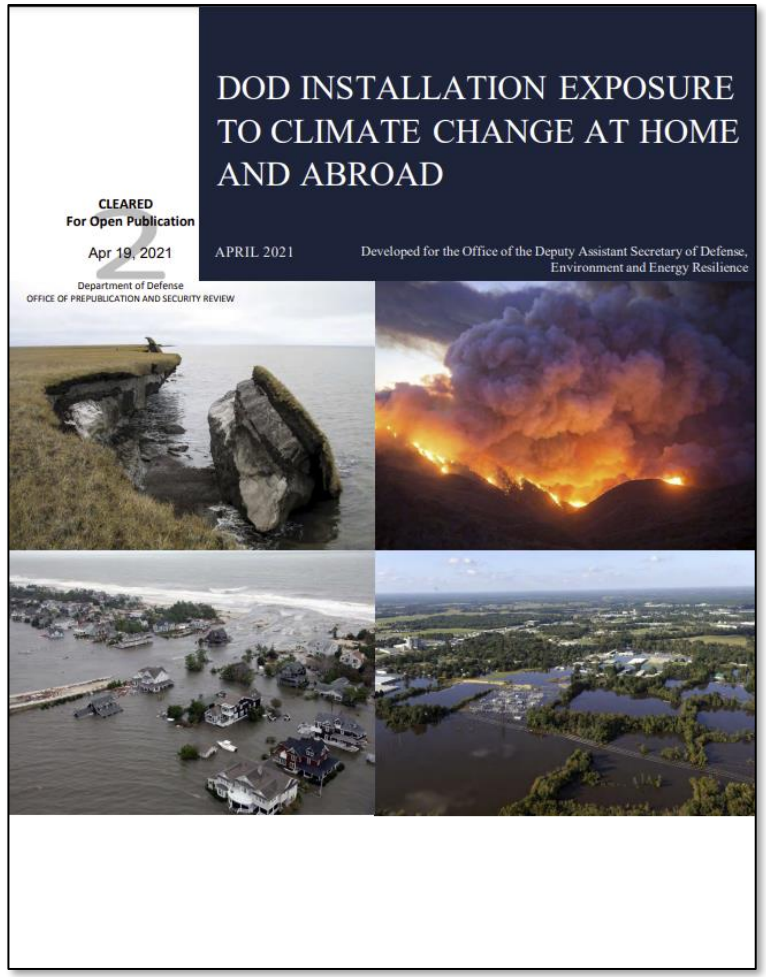
Projected Workshop Outputs

- High-level summary post-workshop asset (immediate-term)
- Post-Workshop Product (long-term)

Mr. Richard Kidd

Deputy Assistant Secretary of Defense for Environment and Energy Resilience

Office of the Assistant Secretary of Defense for Sustainment (OASD-S)



Engineering With Nature®

…the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaboration.

Key Elements:

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Increase and diversify infrastructure value
- Science-based collaboration to organize and focus interests, stakeholders, and partners

"The mission of US Army Corps of Engineers is to deliver vital public and military engineering services; partnering in peace and war to strengthen our nation's security, energize the economy and reduce risks from disasters. Engineering With Nature supports this mission which is why it will always be an important initiative for the Corps." LTG Scott A. Spellman, 55th Chief of Engineers, Commanding General, USACE

Dr. Todd Bridges
Engineering With Nature Initiative National Lead

Myths surrounding natural infrastructure on DoD Installations

"Adaptively managing multi-layered solutions to natural hazards is beyond the capacity of DoD."

"Total lifetime costs of nature-based solutions are higher than conventional solutions."

"We don't know how to build nature-based solutions and have no guidance for doing so."

"Simple, single solutions are what we need."

"I can't quantify the total benefits of nature-based solutions."

Dr. Todd Bridges
Engineering With Nature Initiative National Lead

Over the course of this workshop, let's explore together:

- Where are there additional opportunities for us to advance demonstrations and pilots together?
- What do you need from the EWN initiative to expand the reach of nature-based solutions on your installations and across your communities? How can EWN facilitate success?
- What are the structural and cultural enablers that will get natural infrastructure and gray infrastructure solutions considered in the same context and in concert with each other?
- How might we expand and make additional use of natural infrastructure on DoD installations beyond what you see in these presentations and in the pre-reads provided?

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EWN on DoD Installations – Practical Application

These vignettes will illustrate:

- Unique installation resilience challenges posed by climate impacts
- Engineering with Nature solutions in progress and mature on DoD Installations
- Environmental, societal, and cost benefits of EWN solutions
- Mission assurance/resilience related benefits
- ***Creativity in engineering***

Engineering With Nature® Workshop on DoD Installations

NAVAL BASE VENTURA COUNTY POINT MUGU

ALYSSA MANN
PROJECT DIRECTOR, THE NATURE CONSERVANCY
AUGUST 24, 2021

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NBVC Point Mugu: Restoring Coastal Wetlands for Climate Resilience

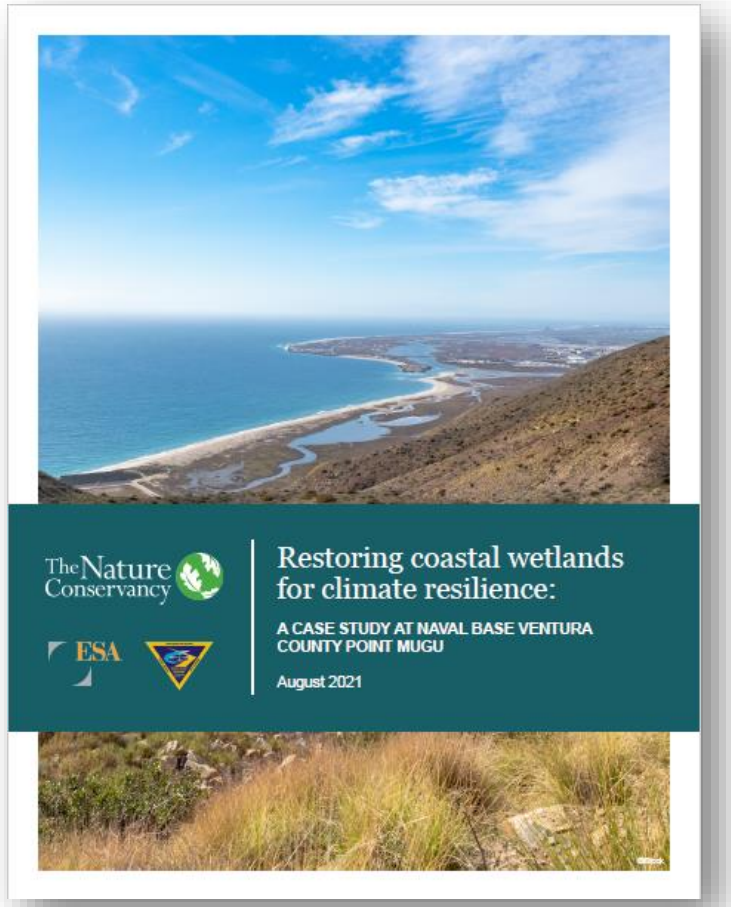
Unique partnership between Commander Navy Region Southwest (CNRSW) and The Nature Conservancy.

NBVC is vulnerable to multiple coastal hazards, with a large portion of its built and natural assets projected to convert to open water by 2060.

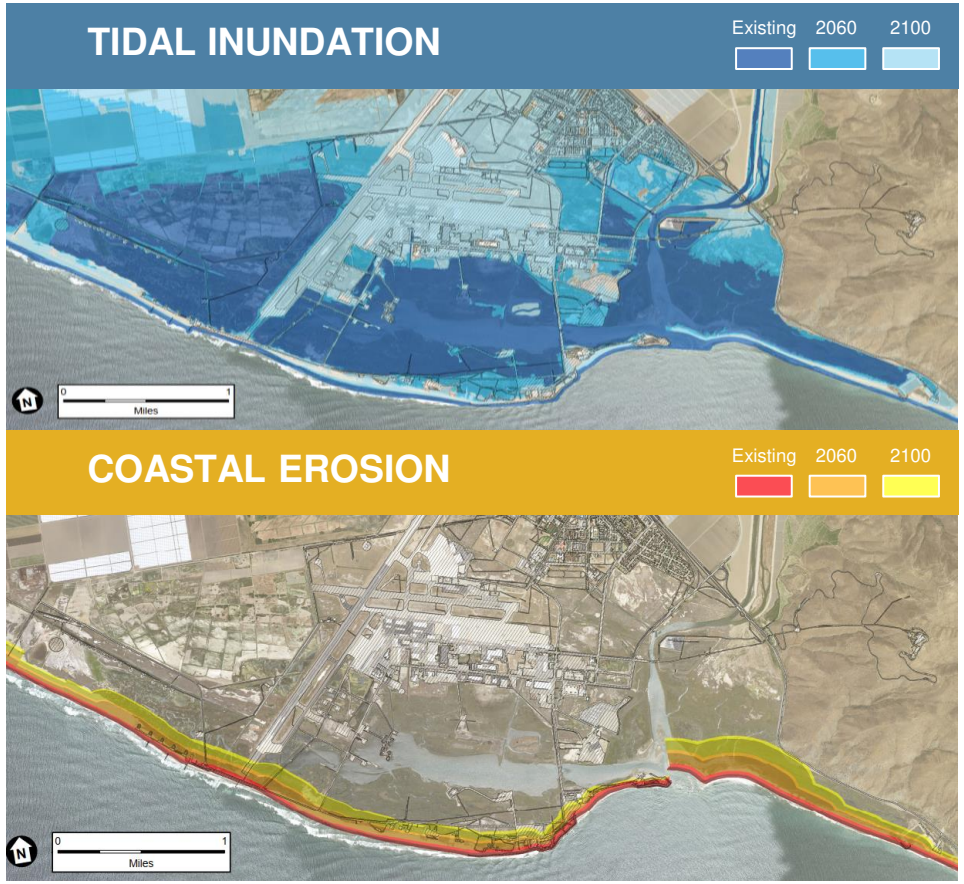
Point Mugu is home to one of the largest remaining salt marsh habitats in southern California, which serve as critical buffers to base assets and support critical biodiversity.

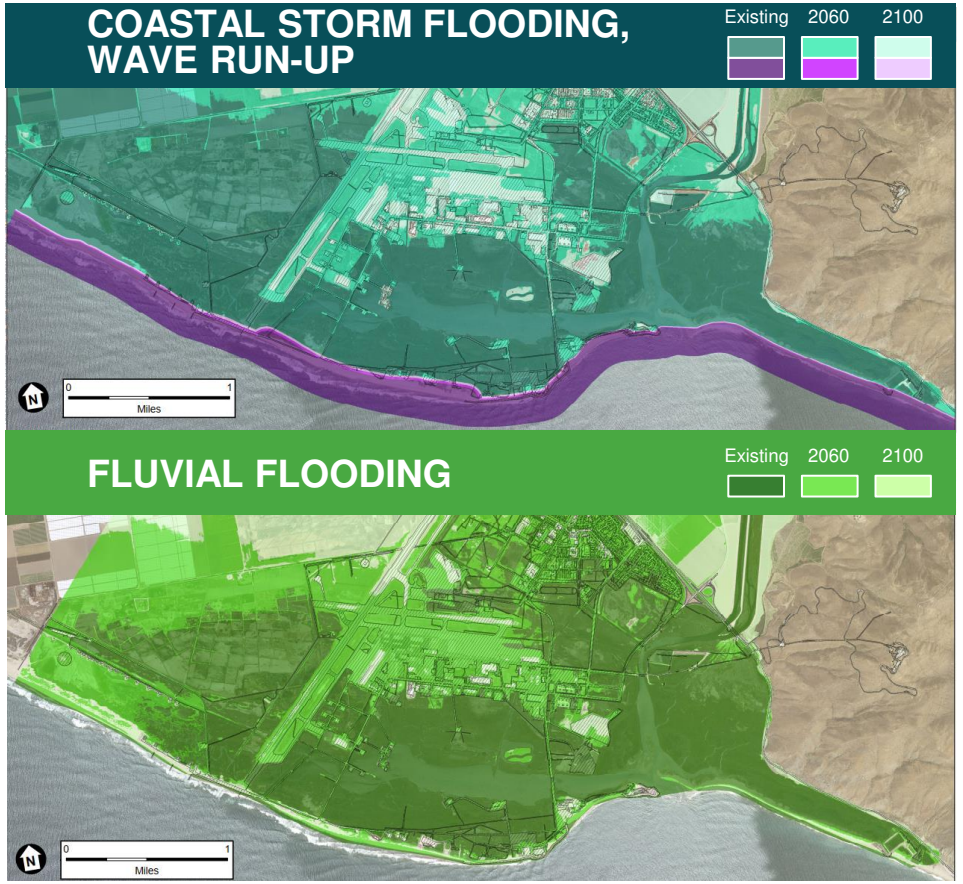
Adaptation Vision:

- Balances *defense in place* and *relocation with restoration.*
- Recognizes that relocation with restoration is the only option for long-term resilience that meets the military mission and ecological goals.
- Traditional hardening accelerates erosion and habitat loss, and is reserved only for critical assets essential in their current location.
- Reduces asset footprint by 30% and creates 700 acres of space for restoration, significantly reducing vulnerability to current and future hazards.
- Couples nature-based strategies *inside* and *outside* the fence line for greater installation and regional resilience.



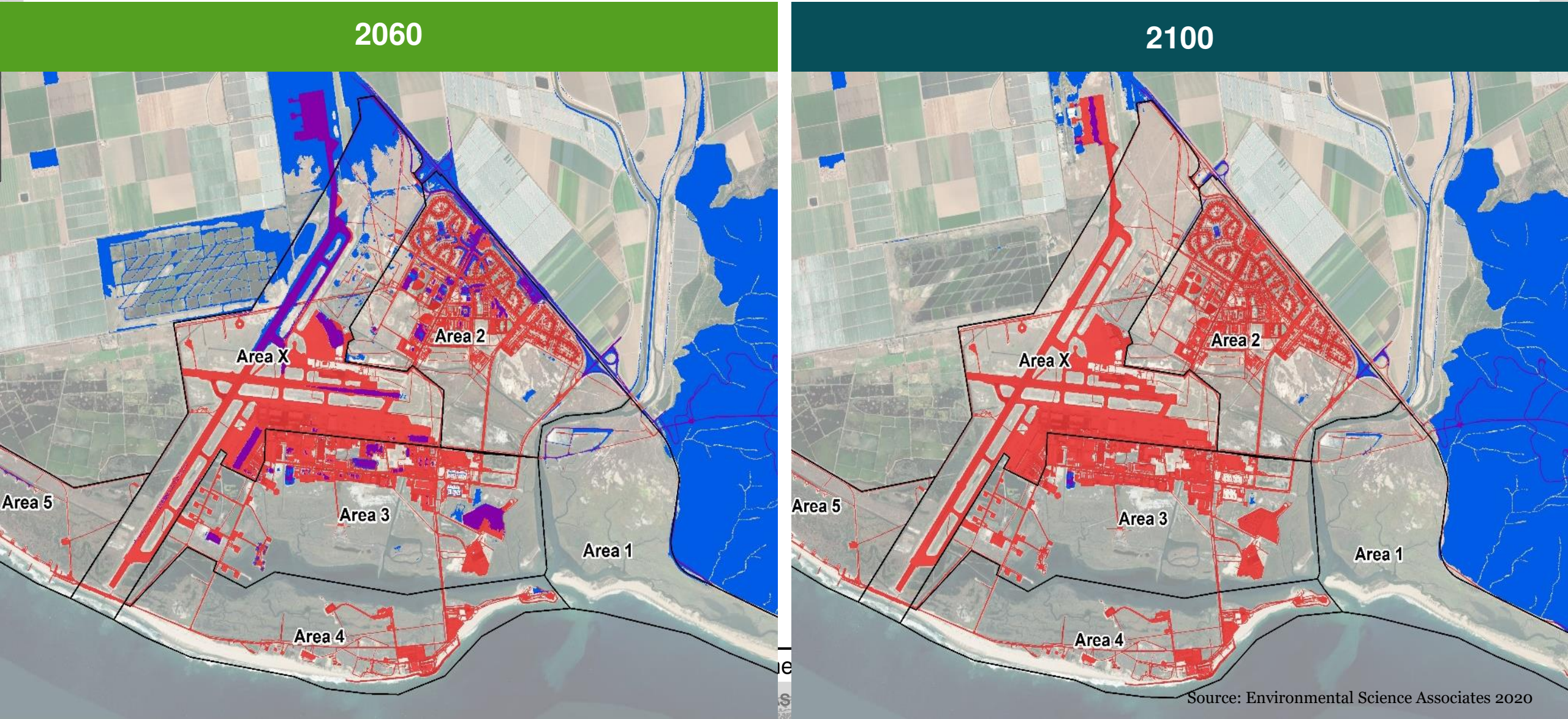
Without Action, NBVC Assets are Vulnerable to Erosion and Flooding





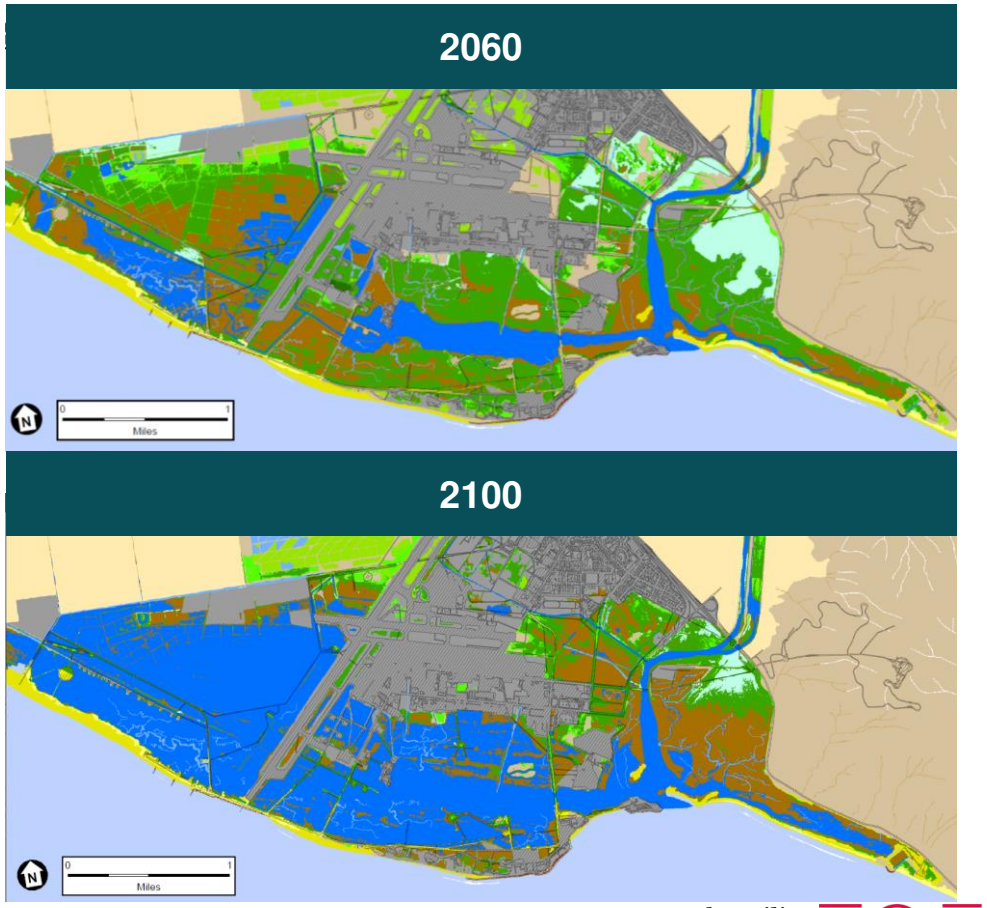
Source: Environmental Science Associates 2020

Asset Vulnerability and Resilience at Mugu



Source: Environmental Science Associates 2020

Without Action, Salt Marsh is Lost with Sea-level Rise, a critical buffer to base assets

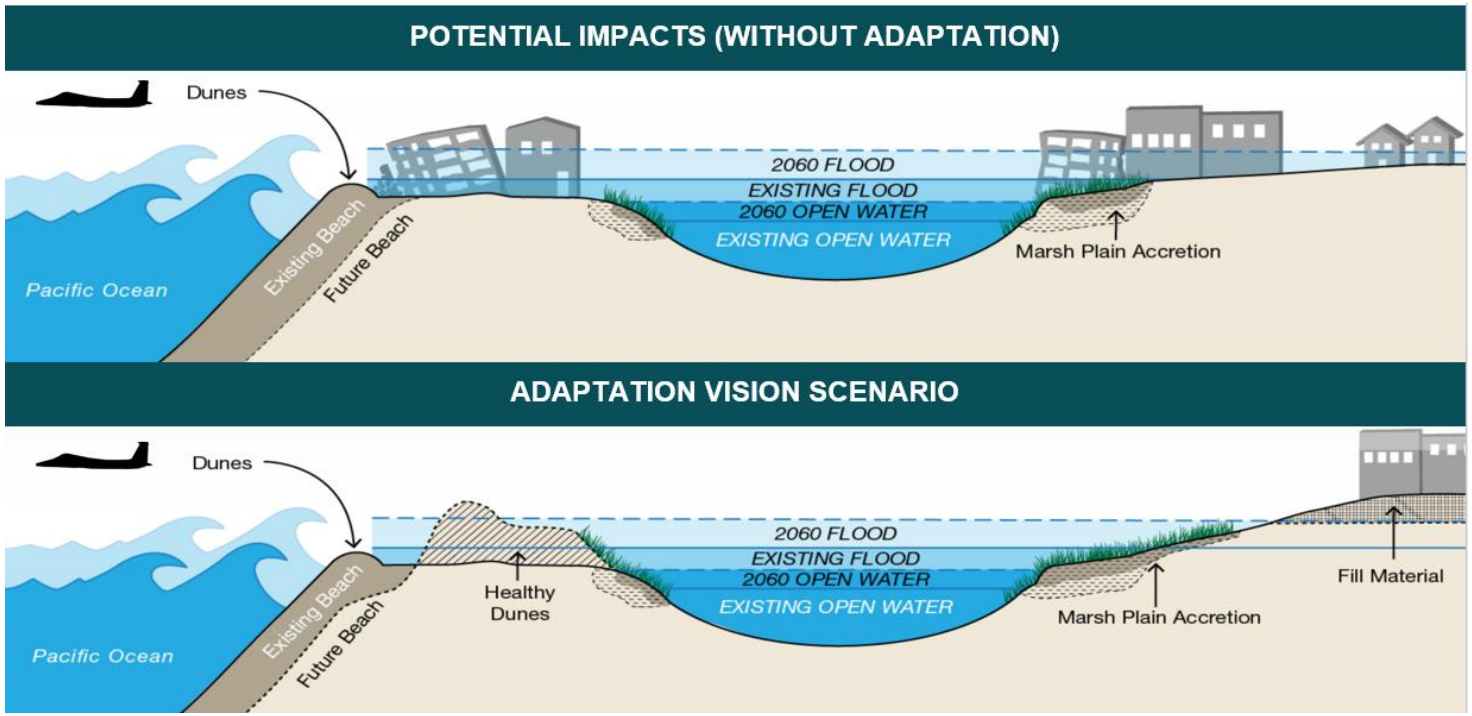


Source: Coastal Resilience Ventura

Adaptation Vision

Major Takeaways

1. Relocation with restoration provides long-term resilience to meet the military mission and ecological goals.
2. Traditional hardening accelerates erosion and habitat loss, reducing capacity for protective services.
3. Consideration of hybrid solutions critical; necessity to defend critical assets in essential locations.
4. Opportunity for nature-based strategies for flood protection – 700+ acres for coastal habitat migration and restoration.
5. Nature-based strategies *inside* and *outside* the fence line enhance regional and installation resilience.



Source: Environmental Science Associates 2020

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Aberdeen Proving Ground – Upper Chesapeake Bay Coastal Resilience Plan

Sam Whitin, CERP
EA Engineering, Science, and Technology
24 August 2021

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US Army Aberdeen Proving Grounds

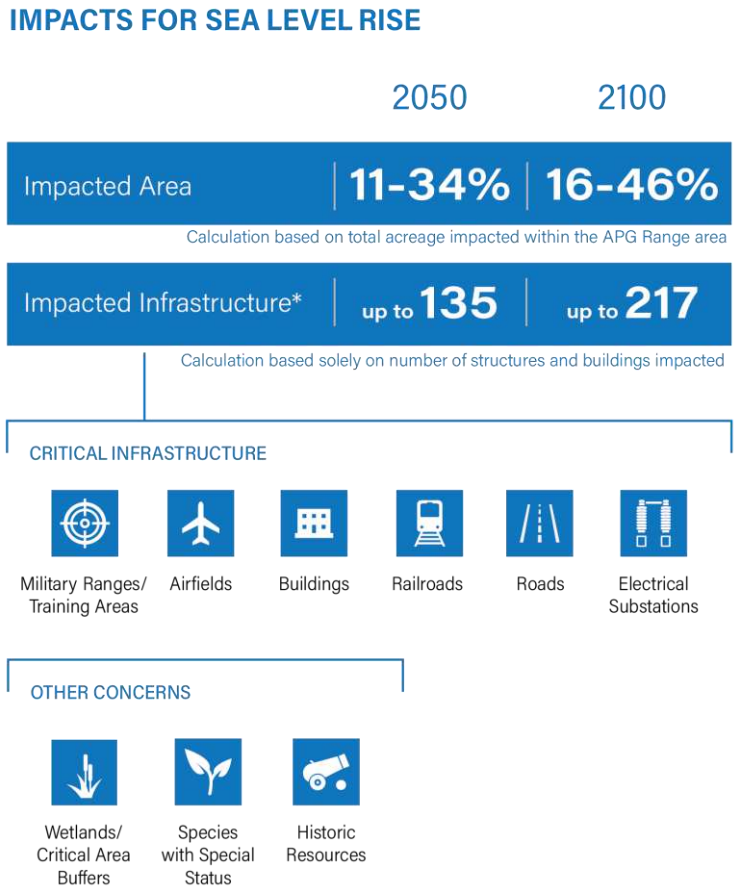
Coastal Resilience Regional Planning

Regional Planning Process to Protect Installation Mission as well as Community Assets

Relative sea level rise is occurring at rapid rate in the Chesapeake

Unique features of the installation/EWN solution:

- Plan looked a *regional* vulnerabilities and NNBF adaptation opportunities
- Chesapeake Security Corridor (Office of Local Defense Community Cooperation) funding was a unique approach to providing support
- Similar funding approach is being mimicked at USMC Parris Island, Norfolk, Newport and other communities
- Opportunities to reuse sediment will reduce costs in implementing regional adaptation efforts and reduce costs associated with navigational improvement projects while also ensuring mission success
- Recreational, ecological, and infrastructure needs all pointed heavily to using NNBF to build resiliency to protect the military mission and surrounding community



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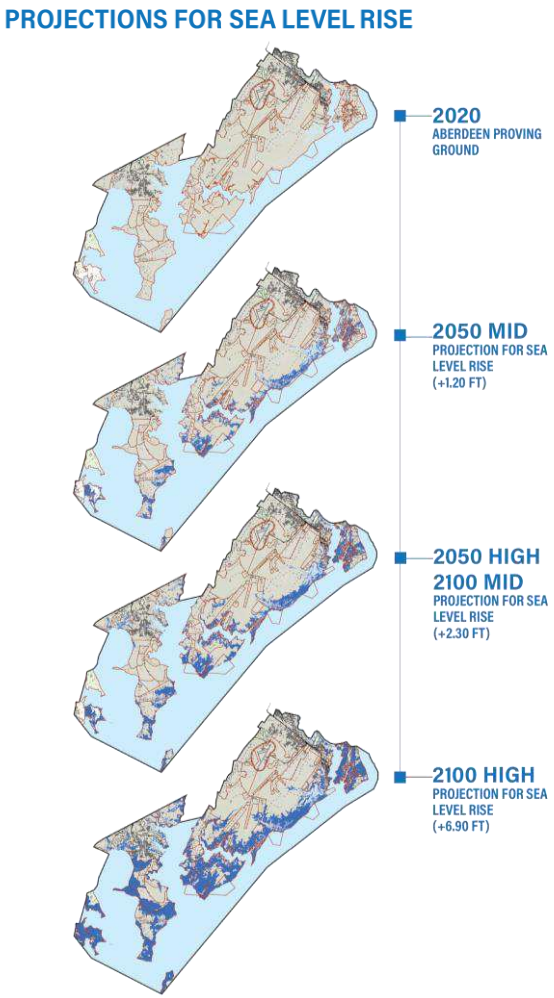
US Army Aberdeen Proving Grounds

Coastal Resilience Regional Planning



- High availability of sediment within the region suggested that re-use of sediment in developing NNBF strategies would likely be a priority
  - Focus on thin-layer placement and marsh restoration/creation
- Protection of transportation and neighboring community assets ensures that APG installation is accessible during a flood/storm emergency to ensure mission succes
- Challenges:
  - Working with installation needs as well as those of 3 neighboring counties
  - Protecting sensitive installation information within a public planning document

Ideas in the Plan aren't useful until implemented – follow through is critical.

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TYNDALL AFB COASTAL RESILIENCE

JEFF MIXSON
USAF, TAFB CR PROGRAM MANAGER
24 AUG 2021

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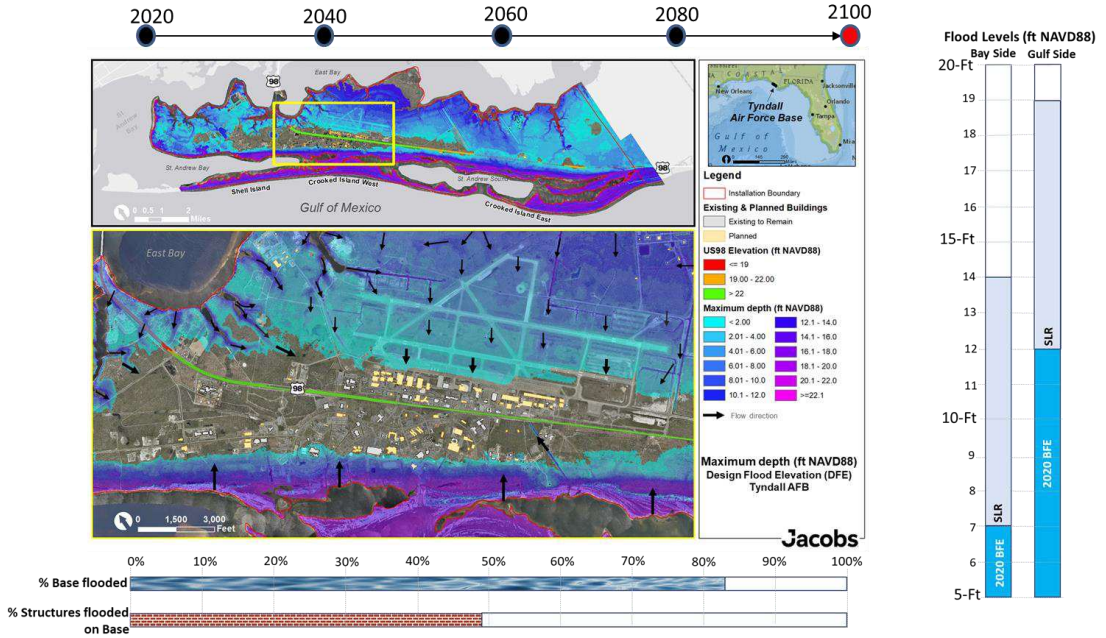
Tyndall AFB Coastal Resilience Overview

Tyndall AFB Features:

- Low-Lying Peninsula w/ ~40mi coastline
  - Gulf of Mexico and St Andrews Bay
- Prone and vulnerable to:
  - Hurricanes
  - Sea Level Rise

Tyndall AFB Coastal Resilience Background:

- USAF charged by Congress to make TAFB a resilient base after $4B Infrastructure Rebuild Appropriation
  - Funding not sufficient for anything outside of infrastructure (i.e. buildings, flightlines)
- USAF funded study to evaluate coastal resilience alternatives and funding solutions outside MILCON
  - Quick realization that there was broad support for a non-traditional approach from outside Gov't agencies, local/state agencies, and private organizations
- USAF funded second one-year effort to explore outside funding opportunities and further refine coastal resilience concept



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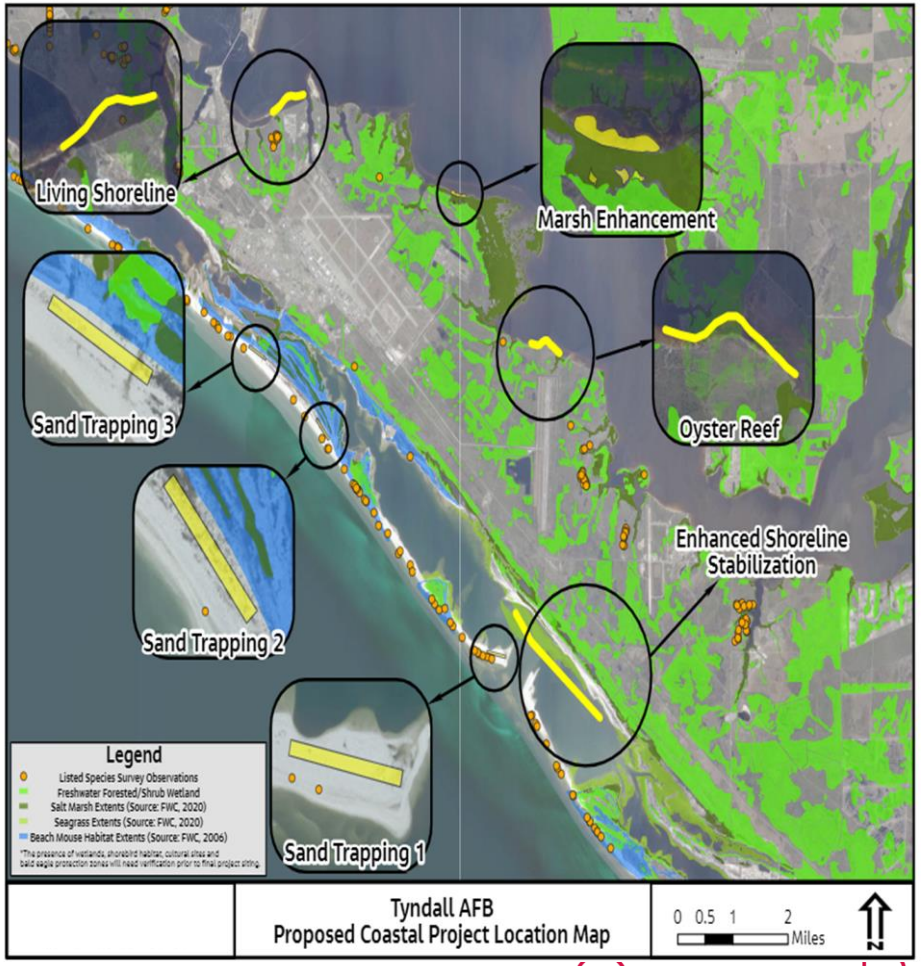
Tyndall Coastal Resilience Pilot Projects

Tyndall AFB Engineering with Nature :

- TAFB plans on executing 4 major pilot projects and monitoring their outcomes for larger scale implementation
- TAFB developed and planned a multi-pronged approach based on environmental characteristics & geography of the base
- Nature-based solutions were specifically targeted due to low life-cycle costs, numerous co-benefits, modelling & simulation outcomes, extensive interest and financial support from external stakeholders and the expected flood risk reduction which provides mission assurance



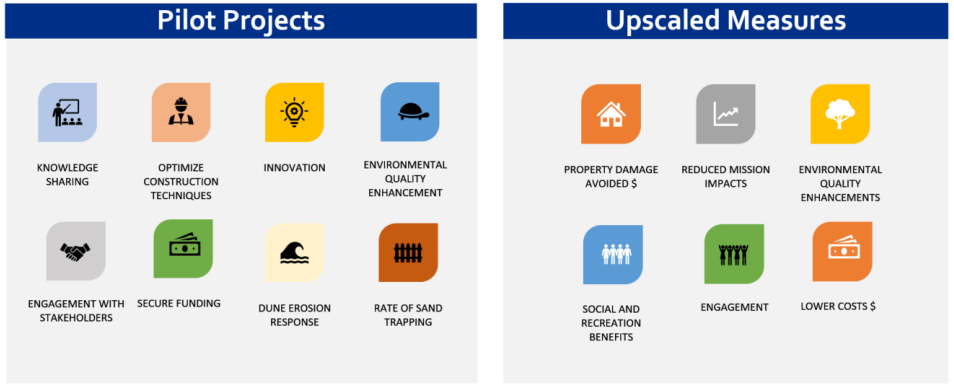
TAFB Coastal Resilience Challenges & Benefits

Tyndall AFB EWN Challenges & Benefits:

- USAF leadership needed data to understand what EWN could bring to the fight (new concept)
  - Detailed modelling and analysis completed to show flood risk reduction or improved mission assurance
  - ROI projected
- Concern from TAFB personnel about the magnitude of the rebuild and concurrent EWN implementation (i.e. environmental and maintenance)
  - Data provided to show positive NPV in most cases vs. hefty O&M budget in out-years
  - Environmental permitting can be handled outside of rebuild
- Concern from TAFB leadership about funding
  - To date over $10M in in-kind contributions identified
  - Awarded $4.8M in FY21
  - Targeting $16.1M in FY22
- Too many benefits to list (see graphic on right)
  - TAFB Coastal Resilience & EWN recognized with International Award

Measures of Success

The pilot projects are either small-scale construction projects or feasibility studies with the intent to learn from them so successful approaches can be scaled up for future coastal restoration projects.



Panel and Dr. Bridges Q&A

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Let's try a poll!

10 Minute Break

Welcome Back!

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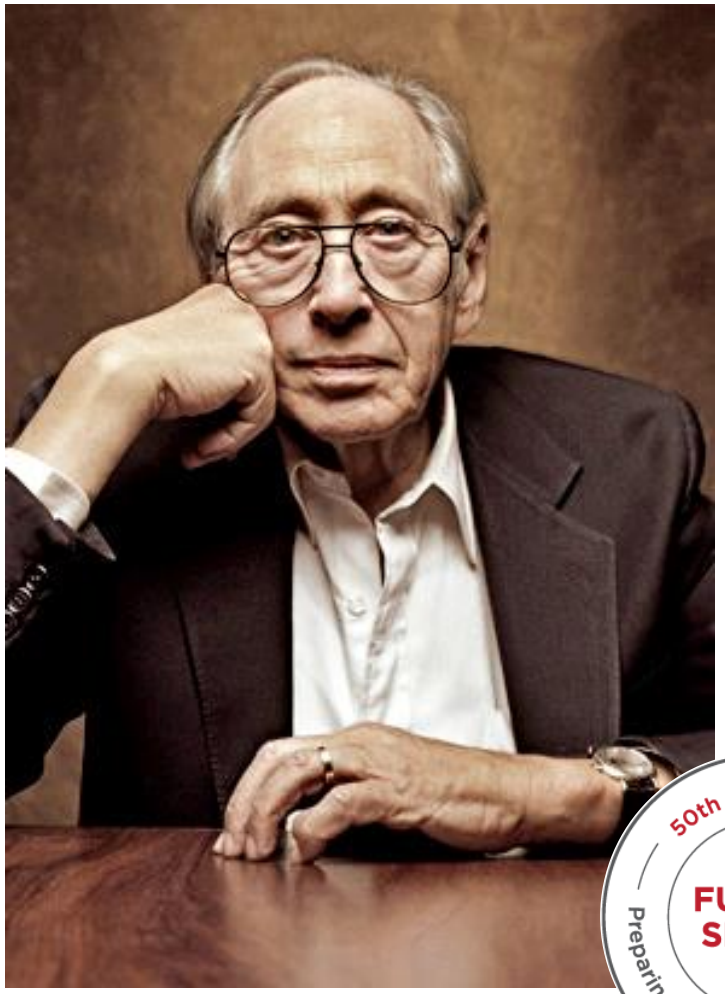
Live In The Future Breakout Activity



50th Anniversary
FUTURE SHOCK
Preparing for Tomorrow, Acting Today

The inability to speak with precision and certainty about the future is no excuse for silence…it is more important to be imaginative and insightful than to be one hundred percent "right."

– Alvin Toffler, *Future Shock*

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Live In The Future Breakout Activity

We have created three future scenarios around fictional CONUS installations where EWN has taken center stage as part of the efforts to enhance mission and installation resilience.

<u>These scenarios will illustrate:</u>

- **Unique installation resilience challenges posed by changing climate**
- **Engineering with Nature solutions in-progress and mature on DoD Installations**
- **Environmental, societal, and cost benefits of EWN solutions**
- **Mission assurance/resilience related benefits**
- ***Creativity in engineering***

Live In The Future Breakout Activity

These scenarios each present their own unique sets of benefits, challenges, and impacts designed to stretch your thinking and the realm of the possible surrounding EWN in the future.

Rules and Reminders:

- **Everyone will be assigned to a breakout group**
- **Don’t fight the scenario**
- **Don’t be limited by today’s constraints**
- **Being right is not important – use imagination to explore what’s plausible**
- **Understand the end goal – *to explore possibility and opportunity***
- **We will debrief!**

Scenario Vignettes – EWN 2050

Naval Air Station Curry Florida Coast	Fort Allen Midwest	Prince Air Force Base Rocky Mountains
A coastal naval air installation with an ISR and training missions that is challenged by rising sea levels and more frequent extreme weather events.	A large western US Army installation with a maneuver and training footprint that is challenged by drought its and subsequent impacts.	A mountainous USAF installation with strategic nuclear and R&D mission focus that is challenged by increased impacts from frequent wildfires.

What are the characteristics of these scenarios? In what ways have nature-based solutions provided value?

Scenario Summaries

Threats:
- Coastal inundation
- Hurricane and tropical storm surge
- ISR and system testing delays

Mitigation:
- Mangrove forest
- Oyster shoals
- Dune management

Benefits:
- Mission assurance
- Community integration/ecotourism
- Wildlife preservation

Threats:
- Drought
- Wildfires
- Training delays and cancellation

Mitigation:
- Forest management/Afforestation
- Landscape design around ranges
- Water retention (bioswales)

Benefits:
- Mission assurance
- Local economic stimulus
- Soldier mental health emphasis

Threats:
- Wildfires
- Erosion and mudslides
- US strategic deterrence and R&D

Mitigation:
- Forest management/Afforestation
- Landscape design around flightlines

Benefits:
- Mission assurance
- Maintain installation beauty
- Local partnerships

Thank You!

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Engineering With Nature® on DoD Installations Workshop– Day 2

Dr. Todd Bridges
Dr. Jeff King

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Session Objectives and Ground Rules

Engage with the changing climate around DoD Installations

Create familiarity with EWN on DoD Installations

Live in an EWN Future on DoD Installations

Brainstorm ways forward for natural infrastructure across the DoD

Ground rules

- Be comfortable in the unknown
- Engage in open dialogue and blue sky thinking
- Use video as security allows
- Technical support for the day is Katherine Wagner – kwagner@tofflerassociates.com

Dr. Todd Bridges

Engineering With Nature
Initiative National Lead

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+ Landscape Architecture
Design Research Initiative

What did we learn yesterday?

Myths surrounding natural infrastructure on DoD Installations

"Adaptively managing multi-layered solutions to natural hazards is beyond the capacity of DoD."

"We don't know how to build nature-based solutions and have no guidance for doing so."

"Total lifetime costs of nature-based solutions are higher than conventional solutions."

"Simple, single solutions are what we need."

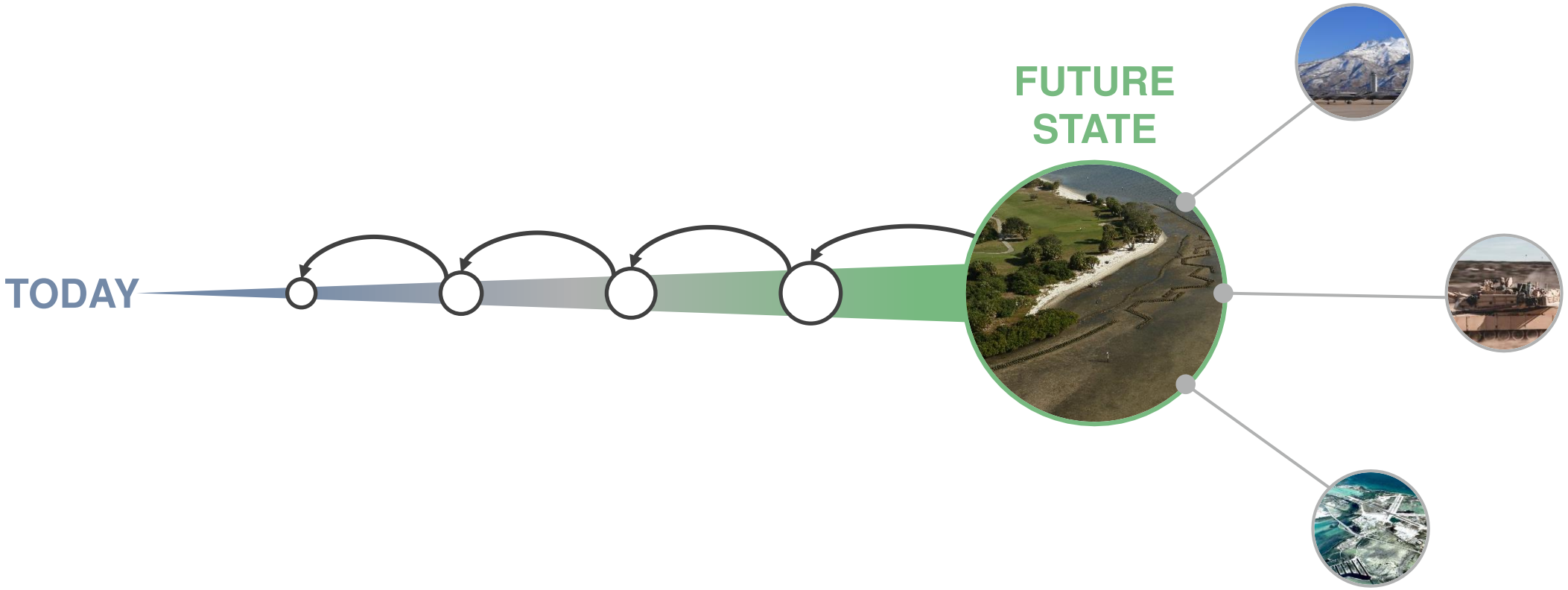
"I can't quantify the total benefits of nature-based solutions."

What did we learn yesterday?

Opportunities	Value	Challenges
• Nature doesn't see boundaries – taking a regional approach to solution design, funding, and benefits • Gray and green infrastructure synthesis • Awareness and education • Carbon sequestration	• Collective value of green infrastructure– quantifying the value of ecosystem services • Quantify the value of avoided losses • Installations are a great place to test novel nature-based solutions. Installations can be an R&D lab for nature-based solutions	• Aware, aligned, and supportive leadership • Policy and funding alignment • Alignment across large and complex set of stakeholders • Scale of the challenge

Making this Future a Reality

What were the series of events and enablers that led to this future?



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Drivers of Change that Lead to the Future

Partnerships

Organizational

Policy

Process

National Security Priorities

Procedure

DoD Doctrine

Public Awareness

Investment

Engineering Standards

Community Benefits

Public Attitude Towards Climate

Legal

Local

Congressional

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Making this Future a Reality Breakout Activity

We have created three future scenarios around fictional CONUS installations where Engineering With Nature has taken center stage as part of the efforts to enhance mission and installation resilience.

<u>These scenarios will illustrate:</u>

- **Unique installation resilience challenges posed by changing climate**
- **Nature-based solutions in-progress and mature on DoD Installations**
- **Environmental, societal, and cost benefits of nature-based solutions**
- **Mission assurance/resilience related benefits**
- ***Creativity in engineering***

Making this Future a Reality Breakout Activity

These scenarios each present their own unique sets of benefits, challenges, and impacts designed to stretch your thinking and the realm of the possible surrounding EWN in the future.

Today, let's explore:

- **What got us to the outcomes illustrated in these scenarios?**
- **What needs to be implemented over the next 30 years to create resilience via nature-based solutions on installations?**
- **What partnerships need to be forged?**
- **What standards need to be created or adopted?**
- **What enablers need to be unleashed or emphasized?**

Remember:

- Everyone will be assigned a group
- Don't fight the scenario!
- Don't be constrained by today
- Explore *possibility*
- We will debrief!

Scenario Summaries

Threats: • Coastal inundation • Hurricane and tropical storm surge • ISR and system testing delays **Mitigation:** • Mangrove forest • Oyster shoals • Dune management **Benefits:** • Mission assurance • Community integration/ecotourism • Wildlife preservation	**Threats:** • Drought • Wildfires • Training delays and cancellation **Mitigation:** • Forest management/Afforestation • Landscape design around ranges • Water retention (bioswales) **Benefits:** • Mission assurance • Local economic stimulus • Soldier mental health emphasis	**Threats:** • Wildfires • Erosion and mudslides • US strategic deterrence and R&D **Mitigation:** • Forest management/Afforestation • Landscape design around flightlines **Benefits:** • Mission assurance • Maintain installation beauty • Local partnerships

Scenario Vignettes

Naval Air Station Curry Florida Coast, US	Fort Allen Midwest, US	Prince Air Force Base Rocky Mountains, US
A coastal naval air installation with an ISR and training missions that is challenged by rising sea levels and more frequent extreme weather events.	A large western US Army installation with a maneuver and training footprint that is challenged by drought its and subsequent impacts.	A mountainous USAF installation with strategic nuclear and R&D mission focus that is challenged by increased impacts from frequent wildfires.

What got us here? What were the enablers?

Debrief

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10 Minute Break

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+ Landscape Architecture
Design Research Initiative

Welcome Back!

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Taking Immediate Actions

We all have that dream home in mind, but there are obvious steps before we get there…

- Plot of land
- Foundation
- Framing
- Plumbing/Electrical
- Drywall
- Flooring
- Paint
- Finishes
- Appliances
- ….

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Actions that Impact Your Ecosystem

What actions can you take?
What support do you need in order to take those actions?

Action Planning Breakout Activity

We have created three future scenarios around fictional CONUS installations where Engineering With Nature has taken center stage as part of the efforts to enhance mission and installation resilience.

Let's bring it back from the future and focus on the next five years (2021-2026):

- **What are all these groups in our ecosystem doing as part of the process to get to the future?**
- **What is their role?**
- **How do we leverage these diverse stakeholders across the ecosystem for action?**
- **What do YOU think needs to be done?**
- **What do you need from these entities to realize the future?**
- **Communicating the value of today to ensure the success of tomorrow**

Action Planning Breakout Activity

Using our discussions of the last two days as a backdrop, let's now focus on the actions of today.

Remember:

- **Everyone will be assigned a group**
- **Focus on the immediate term**
- **Focus on the Who's and the What's**
- **Explore *possibility***
- **We will debrief!**

What actions can you take?
What support do you need from others in order to take those actions?

Debrief

Thank You!

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